Test, Adjust and Balance Report

Report Issue Date	10/5/2023
Job Name	Steamboat Base Village
Job Number	22300093
Job Address	2305 Mount Werner Circle Steamboat Springs, Colorado 80487
Customer Name	MTech Mechanical 12300 Pecos Street Westminister, Colorado 80234
Engineering Firm	ME Engineers (Golden) 14143 Denver West Pkwy Golden, Colorado 80401
TAB Project Manager	James O'Brien
Lead Technician	Shane Reich
TAB Firm Address	2373 Central Park Blvd. Suite 100, Denver, CO 80238

Table of contents

AHU	Air Handling Unit
AC or ACU	Air Conditioning Unit
ACCU	Air Cooled Condensing Unit
AMP	Amperage
AVG	Average
A.D.	Air Density
BAS	Building Automation System
BHP	Brake Horsepower
CD	Ceiling Diffuser
CFM	Cubic Feet Per Minute
CH	Chiller
CHW	Chilled Water
CHWR	Chilled Water Return
CHWS	Chilled Water Supply
C.S	Carbon Steel
DAT	Discharge Air Temperature
D.B.	Dry Bulb Temperature
DD	Direct Drive
DAI	Diameter
DSP	Discharge Static Pressure
EAT	Entering Air Temperature
EDC	Electric Duct Coil
EDH	Electric Duct Heater
EF	Exhaust Fan
EFF	Efficiency
EMS	Energy Management System
EWT	Entering Water Temperature
F	Degrees Fahrenheit
FCU	Fan Coil Unit
FH	Flow Hood
FG	Floor Grille
FE	Floor Exhaust
FR	Floor Return
FLA	Full Load Amperage
FPB	Fan Powered Box
FPBH	Fan Powered Box with Heat
FPM	Feet Per Minute
FS	Floor Supply
Ft. H20	Feet of Water Column
FTU	Fan Terminal Unit
GPM	Gallons Per Minute
HEPA	High Efficiency Particulate Arrestance
HOA	Hand, Off, Auto Switch
HP	Horsepower
HPS	High Pressure Steam
HRC	Heat Recovery Coil
HVAC	Heating, Ventilation & Air Conditioning

HWR	Heating Water Return
HWS	Heating Water Supply
I/A	Inaccessible
I/D	Inside Diameter
LAT	Leaving Air Temperature
LD	Linear Diffuser
LPS	Low Pressure Steam
LWG	Low Wall Grille
LWT	Leaving Water Temperature
MAU/ MUA	Make Up Air Unit
MBH	1,000 BTU's per Hour
N/A	Not Applicable
N.F.	No Flow
N/I	Not Installed
N/L	Not Listed
N/S	Not Specified
OD	Outside Diameter
OED	Open Ended Duct
OA	Outside Air
OAT	Outside Air Temperature Preheat
PHC	Coil
Ph	Phase
PTAC	Packaged Terminal Air Conditioner
PSI	Pounds per Square Inch
P/T	Pressure/Temperature
RA	Return Air
RF or RAF	Return Air Fan
RG	Return Grille
RHC	Reheat Coil
RPM	Revolutions Per Minute
RTU	Rooftop Unit
SA	Supply Air
SEF	Smoke Exhaust Fan
SF or SAF	Supply Air Fan
S.F.	Service Factor
SP	Static Pressure
SSP	Suction Static Pressure
TAB/T&B	Testing, Adjusting & Balancing
TSP	Total Static Pressure
VAV	Variable Air Volume
VD	Volume Damper
VFD	Variable Frequency Drive
WB	Wet Bulb Temperature
WC	Water Column
WSHP	Water Source Heat Pump Pressure
DP	Differential Pressure
DT	Differential Temperature

Phase 2

: ERV-1A.01

Date	Description
☐ 10/04/2023	VAV 1A.04 shows 0 cfm when damper is over 75%, but shows cfm if damper is locked to 75%. even can show above design cfm values.

MTech note: Grimes corrected 10/6/23, reading correctly now.

: VAV-1A.01

Date	Description
☐ 10/02/2023	No balance dampers installed, diffusers are right next to eachother and serve the same space. read as is.

: EAV-1A.05

Date	Description
☐ 09/26/2023	No design value given for 4th grille. design matched similar EAV 1A.03

Technician
Shane Reich

System
ERV-1A.01

Test Date
10/04/23

Air Apparatus Data	
Asset ID	-
Location	ERV1 P.014
Service	Building
Manufacturer	Trane
Model Number	CSAA021UAL00
Serial Number	H22A16895
Type	ERU Direct Drive

Motor Data	Supply	Exhaust
Motor Manufacturer	Baldor	Baldor
Motor H.P. / Frame	15 / 254T	10 / 215T
Efficiency / Power Factor	0.93 / 0.85	0.917 / 0.82
Motor RPM	1765	1770
Voltage	230 / 460 /	460 / /
Phase	3	3
Full Load Amps	35 / 18 /	12.5 / /
Service Factor	1.15	1.15
Corr. Nameplate Amps	16.632	11.88 / /

Filter Data	
Filter Service/ Rating	Pre-Filter / Merv14
Filter Quantity / Filter Size/ Filter Type	3 / 16x24x2 / Disposable
Filter Quantity / Filter Size/ Filter Type	3 / 16x25x2 / Disposable

Design Data	
Supply Air CFM	10000
Outside Air CFM	10000
Return Air CFM	-
Exhaust Air CFM	10000
Outlet / Inlet Summation	10000 / 10000
Motor RPM	-
Motor HP/ Volts / Ph	15 / 10 / 460 / 3
External SP / Total SP	1.5 / -

Final Test Data	
Supply Air CFM	9130
Outside Air CFM	9130
Return Air CFM	-
Exhaust Air CFM	9034
Sup CFM Test Method	Terminal Unit Summation
Exh CFM Test Method	Traverse

Final Test Data	Supply	Exhaust
Motor RPM	Direct Drive	Direct Drive
Motor Speed Setting	Variable	
Motor Operating Hz	60	75
Ext SP Suction / Disch	-0.297 / 1.1403	
Ext Static Pressure	1.44	
Fan SP Suct / Disch	-0.9919 / 1.2485	
Total Fan SP	2.24	1.63
Electrical Meas Method	VFD Display	V/A Meter
Voltage	484 / 484 / 484	484 / 484 / 484
Amperage	7.9 / 7.9 / 7.9	9.94 / 9.94 / 9.94
Motor B.H.P	7	8

Supplemental Data	
3x Pre-filter	16x24x4
3x Pre-filter	16x25x4
Duct Static Pressure Set Point	1.10

Date	Note Description

Date	Note Description
10/04/2023	VAV 1A.04 shows 0 cfm when damper is over 75%, but shows cfm if damper is locked to 75%. even can show above design cfm values.

MTech note: Grimes corrected 10/6/23, reading correctly now.

Technician
Shane Reich

System
ERV Exhaust discharge

Test Date
10/03/23

Design Data	
Design Airflow (CFM)	10000
Location	Exhaust Duct

Meter Settings	
Duct Shape	Rectangular
Duct Width (in)	20
Duct Height (in)	37
Area (Sq Ft)	5.14
Ak (Sq Ft)	5.14

Test Data	
Instrument	Airfoil
Temperature (F)	72
Static Pressure (in wg)	-0.0187
Average FPM	1758
Total Airflow (CFM)	9034
% of Design	90%

POS	1	2	3	4	5	6	7	8	9	10
1	1895	2141	1137							
2	2077	1516	1191							
3	2512	2047	2011							
4	2499	1892	1490							
5	2258	1923	1220							
6	1844	2191	1008							
7	1574	1752	1126							
8	1662	2003	1215							
9										
10										
11										
12										
13										
14										
15										

37

20

Technician
Shane Reich

System
VAV-1A01

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	14
Cal. Factor	4597
DDC Address	-
Instrument	
DDC Max CFM	2208
DDC Min CFM	-

Supplemental Data	
AK	2.9

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Storage P.042	1	A1	48x12	1100	679	653	59%		
Storage P.042	2	A1	48x12	1100	2674	1572	143%		
Total				2200	3353	2225	101%	0	0

Date	Note Description
10/02/2023	No balance dampers installed, diffusers are right next to eachother and serve the same space. read as is.

Technician
Shane Reich

System
VAV-1A.02

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	8
Cal. Factor	1046
DDC Address	-
Instrument	Airfoil
DDC Max CFM	734
DDC Min CFM	148

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
HFCU 1A.10	1	OA	6 in	50	133	51	102%	15	20
HFCU 1A.11	2	OA	6 in	200	248	208	104%	35	33
HFCU 1A.12	3	OA	6 in	200	257	193	96%	35	38
HFCU 1A.13	4	OA	6 in	200	255	212	106%	35	32
Hallway	5	H	6 in	80	136	77	96%	25	20
Total				730	1029	741	102%	145	143

Technician
Shane Reich

System
VAV-1A03

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	14
Cal. Factor	2646
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	2645
DDC Min CFM	-

Supplemental Data	
AK	0.87

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Open Area	1	A1	18x10	660	1007	671	102%		
Open Area	2	A1	18x10	660	1012	664	101%		
Open Area	3	A1	18x10	660	258	679	103%		
Open Area	4	A1	18x10	670	49	652	97%		
Total				2650	2326	2666	101%	0	0

Technician
Shane Reich

System
VAV-1A.04

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	12
Cal. Factor	3163
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	2644
DDC Min CFM	-

Supplemental Data	
AK	0.87

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Lockers P.033	1	A1	18x10	670	603	610	91%		
Lockers P.033	2	A1	18x10	660	720	659	100%		
Lockers P.033	3	A1	18x10	660	699	673	102%		
Lockers P.033	4	A1	18x10	660	766	682	103%		
Total				2650	2788	2624	99%	0	0

Technician
Shane Reich

System
VAV-1A.05

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	12
Cal. Factor	1046
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	606
DDC Min CFM	318

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	% Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Future Tenant P.027	1	A1	10x8	305	303	303	99%	161	164
HFCU-1A.08	2	Traverse	12x10	300	307	307	102%	159	148
Total				605	610	610	101%	320	312

Technician
Shane Reich

System
VAV-1A06

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	12
Cal. Factor	1305
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	950
DDC Min CFM	-

Supplemental Data	
AK	1.8

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Receiving P.011	1	A1	30x12	950	1089	953	100%		
Total				950	1089	953	100%	0	0

Technician
Shane Reich

System
VAV-1A07

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	6
Cal. Factor	356
DDC Address	-
Instrument	Capture Hood
DDC Max CFM	218
DDC Min CFM	115

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Corridor	1	H	6 in	100	12	94	94%	60	55
Corridor	2	H	6 in	95	48	99	104%	40	47
Office P.028	3	H	6 in	20	32	22	110%	14	15
Total				215	92	215	100%	114	117

Technician
Shane Reich

System
EAV-1A.01

Test Date
09/26/23

Sheet Data	
Inlet Size (in)	14
Cal. Factor	2966.15
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	2966
DDC Min CFM	-

Supplemental Data	
AK	1.4

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Storage P.042	1	G1	24x12	540	931	538	100%		
Storage P.042	2	G1	24x12	540	588	546	101%		
Storage P.042	3	G1	24x12	540	350	530	98%		
Storage P.042	4	G1	24x12	540	221	533	99%		
Storage P.042	5	G1	24x12	540	160	549	102%		
Total				2700	2250	2696	100%	0	0

Technician
Shane Reich

System
EAV-1A.02

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	12
Cal. Factor	2497
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	1373
DDC Min CFM	-

Supplemental Data	
1 AK	0.8
2,7 AK	0.67
3,4,5,6 AK	0.29

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Lockers P.033	1	G1	12x12	400	645	412	103%		
Family RR P.036	2	F1	12x12	360	196	372	103%		
Family RR P.036	4	G2	8x8	75	88	71	95%		
Family RR P.036	5	G2	8x8	75	124	69	92%		
Janitor P.035A	6	G2	8x8	50	131	51	102%		
Womens RR P.035	7	F1	12x12	360	513	373	104%		
Janitor P.035A	3	G2	8x8	50	116	49	98%		
Total				1370	1813	1397	102%	0	0

Technician
Shane Reich

System
EAV-1A03

Test Date
09/27/23

Sheet Data	
Inlet Size (in)	14
Cal. Factor	2215
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	1675
DDC Min CFM	-

Supplemental Data	
AK	1.1

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Lockers P.033	1	G1	18x12	415	848	438	106%		
Lockers P.033	2	G1	18x12	415	529	394	95%		
Lockers P.033	3	G1	18x12	415	299	384	93%		
Lockers P.033	4	G1	18x12	430	191	387	90%		
Total				1675	1867	1603	96%	0	0

Technician
Shane Reich

System
EAV-1A.04

Test Date
09/27/23

Sheet Data	
Inlet Size (in)	14
Cal. Factor	404
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	351
DDC Min CFM	-

Supplemental Data	
AK	0.48

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Storage P.040	1	F2	10x10	350	308	348	99%		
Total				350	308	348	99%	0	0

Technician
Shane Reich

System
EAV-1A.05

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	12
Cal. Factor	1601.51
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	1674
DDC Min CFM	-

Supplemental Data	
AK	1.1

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Lockers P.033	1	G1	18x12	415	657	419	101%		
Lockers P.033	2	G1	18x12	415	443	428	103%		
Lockers P.033	3	G1	18x12	415	244	408	98%		
Lockers P.033	4	G1	18x12	430	234	412	96%		
Total				1675	1578	1667	100%	0	0

Date	Note Description
09/26/2023	No design value given for 4th grille. design matched similar EAV 1A.03

Technician
Shane Reich

System
EAV-1A.06

Test Date
10/02/23

Sheet Data	
Inlet Size (in)	10
Cal. Factor	1778
DDC Address	-
Instrument	Velocity Grid
DDC Max CFM	1573
DDC Min CFM	-

Supplemental Data	
1 AK	0.35

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	% Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Ski Patrol RR P.026	1	F1	8x8	120	649	131	109%		
Adjacent Area	2	Traverse	20x12	1455	835	1373	94%		
Total				1575	1484	1504	95%	0	0

Technician
Shane Reich

System
EAV-1A.07

Test Date
10/03/23

Sheet Data	
Inlet Size (in)	6
Cal. Factor	946
DDC Address	-
Instrument	Airfoil
DDC Max CFM	601
DDC Min CFM	-

Supplemental Data	
AK	0.35

Area Served	Outlet			Design CFM	Test 1 CFM	Final CFM	%Design CFM	Design MIN CFM	Final Min CFM
	No	Type	Size						
Kitchen Prep P.029	1	G1	30x12	600	861	608	101%		
Total				600	861	608	101%	0	0

Technician
Shane Reich

System
HFCU 1A.01 Supply

Test Date
09/27/23

Sheet Data	
Sheet Type	Standard
Instrument	Velocity Grid

Supplemental Data	
Fan speed	15%
AK	0.58

Area Served	Outlet			Design CFM	Preliminary			Final CFM	%to Design
	No	Type	Size		CFM 1	CFM 2	CFM 3		
Storage P.042	1	A1	12x10	450	534	447		447	99%
Storage P.042	2	A1	12x10	450	473	429		429	95%
Storage P.042	3	A1	12x10	450	432	469		469	104%
Storage P.042	4	A1	12x10	450	305	478		478	106%
Total				1800	1744	1823	0	1823	101%

Technician
Shane Reich

System
HFCU 1A.02 Supply

Test Date
09/27/23

Sheet Data	
Sheet Type	Standard
Instrument	Velocity Grid

Supplemental Data	
AK	0.58
Fan speed	15%

Area Served	Outlet			Design CFM	Preliminary			Final CFM	%to Design
	No	Type	Size		CFM 1	CFM 2	CFM 3		
Lockers P.033	1	A1	12x10	450	670	432		432	96%
Lockers P.033	2	A1	12x10	450	726	468		468	104%
Lockers P.033	3	A1	12x10	450	814	453		453	101%
Lockers P.033	4	A1	12x10	450	851	481		481	107%
Total				1800	3061	1834	0	1834	102%

Technician
Shane Reich

System
HFCU 1A.03 Supply

Test Date
09/27/23

Sheet Data	
Sheet Type	Standard
Instrument	Velocity Grid

Supplemental Data	
Fan speed	16
AK	0.58

Area Served	Outlet			Design CFM	Preliminary			Final CFM	%to Design
	No	Type	Size		CFM 1	CFM 2	CFM 3		
Lockers P.033	1	A1	12x10	450	467			467	104%
Lockers P.033	2	A1	12x10	450	475			475	106%
Lockers P.033	3	A1	12x10	450	473			473	105%
Lockers P.033	4	A1	12x10	450	477			477	106%
Total				1800	1892	0	0	1892	105%

Technician
Shane Reich

System
HFCU 1A.04 Supply

Test Date
09/27/23

Sheet Data	
Sheet Type	Standard
Instrument	Velocity Grid

Supplemental Data	
AK	0.58
Fan speed	15%

Area Served	Outlet			Design CFM	Preliminary			Final CFM	%to Design
	No	Type	Size		CFM 1	CFM 2	CFM 3		
Lockers P.033	1	A1	12x10	450	589	629	407	407	90%
Lockers P.033	2	A1	12x10	450	838	755	465	465	103%
Lockers P.033	3	A1	12x10	450	774	786	447	447	99%
Lockers P.033	4	A1	12x10	450	853	761	455	455	101%
Total				1800	3054	2931	1774	1774	99%

Technician
Shane Reich

System
HFCU 1A.05 Supply

Test Date
09/27/23

Sheet Data	
Sheet Type	Standard
Instrument	Velocity Grid

Supplemental Data	
Fan speed	16%
AK	0.58

Area Served	Outlet			Design CFM	Preliminary			Final CFM	%to Design
	No	Type	Size		CFM 1	CFM 2	CFM 3		
Lockers P.033	1	A1	12x10	300	418	283		283	94%
Lockers P.033	2	A1	12x10	300	444	311		311	104%
Lockers P.033	3	A1	12x10	300	436	282		282	94%
Lockers P.033	4	A1	12x10	300	257	291		291	97%
Lounge P.039	5	A1	12x10	300	71	271		271	90%
Lounge P.039	6	A1	12x10	300	160	313		313	104%
Total				1800	1786	1751	0	1751	97%

Technician
Shane Reich

System
HFCU 1A.06 Supply

Test Date
09/27/23

Sheet Data	
Sheet Type	Standard
Instrument	Capture Hood/Velocity Grid

Supplemental Data	
AK	0.58
Fan speed	29%

Area Served	Outlet			Design CFM	Preliminary			Final CFM	%to Design
	No	Type	Size		CFM 1	CFM 2	CFM 3		
Lockers P.033	1	A1	12x10	250	592	254	171	224	90%
Guest Services P.034	2	H	8 in	175	173	92	146	168	96%
Storage P.034A	3	H	8 in	175	189	97	144	169	97%
Total				600	954	443	461	561	94%

Technician
Shane Reich

System
CH-3A.01

Test Date
06/12/23

Hyrdonic Equipment	
Type of Equipment	Chiller
Location	Balcony
Manufacturer	Trane
Model Number	RTAF 170E UAJH XUA1 NT4X 1NWN CCV1 HBPX XXXA XF0
Serial Number	U22A00662

Design Data	
Primary Service	
Prim Design GPM	374
Prim Design Press Drop	48.9 ft
Secondary Service	
Sec Design GPM	
Sec Design Press Drop	

Primary Data	
Act Water Flow GPM	340
Actual Press Drop	41.58
Valve Setting	Full Open
% of Design	91%
Setpoint	11.0psi
EWT	48
LWT	44

Secondary Data	
Act Water Flow GPM	
Actual Press Drop	
Valve Setting	
% of Design	0%
Setpoint	
EWT	
LWT	

Technician
Shane Reich

Test Date
10/02/23

Sheet Data	
Service	Chilled Water Total P2
Press Range	-

Unit No.	Design GPM	Make	Model #	Valve Size	Act PD	Units	Valve Pos	Final GPM	% Des
HFCU-1A.01	8.1	IMI	UA-125	1 in	0.202	psi	40%	7.87	97%
HFCU-1A.2	8.1	IMI	UA-125	1 in	0.225	psi	30%	8.3	102%
HFCU-1A.3	8.1	IMI	UA-075	1/2 in	2.353	psi	100%	7.35	91%
HFCU-1A.4	8.1	IMI	UA-125	1 in	0.236	psi	30%	8.49	105%
HFCU-1A.5	8.1	IMI	UA-125	1 in	0.216	psi	30%	8.13	100%
HFCU-1A.6	2.7	IMI	UA-125	1 in	0.029	psi	10%	2.98	110%
WFCU 1A.07	9.5	IMI	UA-125	1 in	0.294	psi	40%	9.49	100%
Total	52.7							52.61	

Technician
Shane Reich

Test Date
10/02/23

Sheet Data	
Service	Hot Water Total P2
Press Range	-

Unit No.	Design GPM	Make	Model #	Valve Size	Act PD	Units	Valve Pos	Final GPM	% Des
BBR-1	2.9	IMI	UA-100	1 in	0.283	psi	40%	3.17	109%
HFCU 1A.01	3.5	IMI	UA-100	1 in	0.283	psi	20%	3.17	91%
HFCU 1A.2	3.5	IMI	UA-100	1 in	0.338	psi	20%	3.46	99%
HFCU 1A.3	3.5	IMI	UA-075	1/2 in	2.803	psi	90%	3.6	103%
HFCU 1A.4	3.5	IMI	UA-100	1 in	0.332	psi	20%	3.43	98%
HFCU 1A.5	3.5	IMI	UA-100	1 in	0.322	psi	40%	3.37	96%
HFCU 1A.6	1.3	IMI	UA-100	1 in	0.052	psi	10%	1.36	105%
CUH 1A.10	1.31	IMI	UA-100	1 in	0.054	psi	10%	1.38	105%
Total	23.01							22.94	

ADDITIONAL DOCUMENTS

MISCELLANEOUS

SYMBOL	DESCRIPTION
1 / SIM / A101	SECTION NO. / SECTION VIEW SHEET NO.
A / M1-01	DETAIL DESIGNATION
AHU / 1.01	POWERED EQUIPMENT DESIGNATION
VAV / 1.01	NON POWERED EQUIPMENT DESIGNATION
TYPE / LENGTH	BASEBOARD EQUIPMENT DESIGNATION
2" 1	SHEET KEY NOTES
	POINT OF DISCONNECTION
	ARROW INDICATES DIRECTION OF FLOW
	EXTERIOR WALL LOUVER (UNDER ARCH. SECTION)
UC	UNDERCUT DOOR (UNDER ARCH. SECTION)
D/L	DOOR LOUVER (UNDER ARCH. SECTION)
L/D	LOUVER DOOR FULL HEIGHT, (UNDER ARCH. SECTION)

SYMBOL	DESCRIPTION
	SUPPLY DIFFUSER-4-WAY THROW
	SUPPLY DIFFUSER-3-WAY THROW
	SUPPLY DIFFUSER-2-WAY THROW
	SUPPLY DIFFUSER-1-WAY THROW
	CEILING ACCESS PANEL
	RETURN DIFFUSER
	EXHAUST DIFFUSER
H	HUMIDIFIER
	FLEXIBLE DUCT CONNECTION
	SUPPLY AIR FLOW SYMBOL
	RETURN/EXHAUST AIR FLOW SYMBOL
	HEAT TRACE

EQUIPMENT DESIGNATION

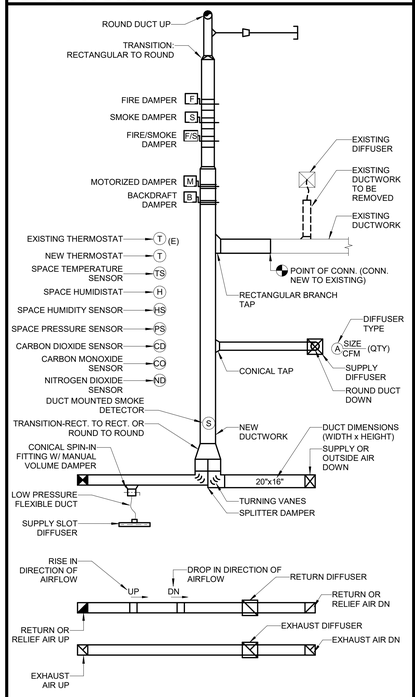
LEVEL

01 - LEVEL 01
02 - LEVEL 02
03 - LEVEL 03
04 - LEVEL 04
05 - LEVEL 05
06 - LEVEL 06

FCU 1A.01

- INDICATES TYPE OF EQUIPMENT
- INDICATES UNIT NUMBER WITHIN AREA
- INDICATES AREA (A,B,C,D,E,F,G) ETC.

DUCTWORK



PIPING TYPES

DOUBLE LINE PIPING (2" AND ABOVE)	SINGLE LINE PIPING (UP TO 2")	PIPE TYPE
CHS	CHS	CHILLED WATER SUPPLY
CHR	CHR	CHILLED WATER RETURN
HWS	HWS	HEATING WATER SUPPLY
HWR	HWR	HEATING WATER RETURN
CWS	CWS	CONDENSER WATER SUPPLY
CWR	CWR	CONDENSER WATER RETURN
D	D	CONDENSATE DRAIN
HPS	HPS	HIGH PRESSURE STEAM SUPPLY
MPS	MPS	MEDIUM PRESSURE STEAM SUPPLY
LPS	LPS	LOW PRESSURE STEAM SUPPLY
HPR	HPR	HIGH PRESSURE CONDENSATE RETURN
MPR	MPR	MEDIUM PRESSURE CONDENSATE RETURN
LPR	LPR	LOW PRESSURE CONDENSATE RETURN
RS	RS	REFRIGERANT SUCTION
RL	RL	REFRIGERANT LIQUID
RHG	RHG	REFRIGERANT HOT GAS
A	A	CONTROL AIR (PNEUMATIC)
BD	BD	BOILER BLOW DOWN
BF	BF	BOILER FEED
BO	BO	BLOW OFF
CF	CF	CHEMICAL FEEDER
PCS/R	PCS/R	PROCESS COOLING WATER SUPPLY/RETURN
HTWS/R	HTWS/R	HIGH TEMP. HOT WATER SUPPLY/RETURN
PHWS/R	PHWS/R	PRIMARY OR DISTRICT HEATING WATER SUPPLY/RETURN
PCHS/R	PCHS/R	PRIMARY OR DISTRICT CHILLED WATER SUPPLY/RETURN
PR	PR	PUMPED CONDENSATE RETURN
(E)	(E)	EXISTING PIPING
(E)	(E)	EXISTING PIPING TO BE REMOVED

PIPING SYMBOLS

SYMBOL	ABBREVIATION	DESCRIPTION
FITTINGS:		
	P&T	PRESSURE/TEMPERATUR E PORT TAPS
	CR	CONCENTRIC REDUCER
	ER	ECCENTRIC REDUCER
EJ	EJ	EXPANSION JOINT
	U	UNION
	T	THERMOMETER W/ THERMOWELL
	AV	AIR VENT
	FC	FLEXIBLE PIPE CONNECTOR
FS	FS	FLOW SWITCH
PS	PS	PRESSURE SWITCH
	PG	PRESSURE GAUGE W/ GAUGE COCK
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		PIPE CAP OR PLUG
	IV	ISOLATION VALVE, RE: SPECS
	OS&Y	OUTSIDE STEM AND YOKE
	DV	DRAIN VALVE W/ HOSE END CONNECTION
		BALL VALVE W/ HOSE CONNECTION
	CV	CHECK VALVE WITH INDICATION OF FLOW DIRECTION
	PRV	PRESSURE REDUCING VALVE
S	SV	SOLENOID VALVE
F / C1	FCV	AUTO FLOW CONTROL VALVE W/ TEST PORTS
	CS,BV	CIRCUIT SETTER OR BALANCING VALVE
	GLV	GLOBE VALVE (STRAIGHT PATTERN)
	GLV	GLOBE VALVE (ANGLE PATTERN)
	BFV	BUTTERFLY VALVE
	BV	BALL VALVE
	TCV	AUTOMATIC TEMPERATURE CONTROL VALVE, 2-WAY
	TCV	AUTOMATIC TEMPERATURE CONTROL VALVE, 3-WAY
	BV	BALANCING VALVE
	TMP	TEMPERATURE/PRESSURE RELIEF VALVE
		VALVE IN RISER
	STR	STRAINER W/ BLOW-OFF & CAPPED HOSE END CONNECTION
	ST	STEAM TRAP

ABBREVIATIONS:

ABBREVIATION	DESCRIPTION
A	
A	AIR (COMPRESSED)
ABV	ABOVE
A/C	AIR CONDITIONING
AC	ALTERNATING CURRENT
	AIR COMPRESSOR
ACCH	AIR COOLED CHILLER
ACCU	AIR COOLED CONDENSING UNIT
AD	ACCESS DOOR
	AREA DRAIN
ADJ	ADJUSTABLE
AF	AIR FILTER
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AL	ALUMINUM
AMB	AMBIENT
AP	ACCESS PANEL
APD	AIR PRESSURE DROP
ARI	AMERICAN REFRIGERANT INSTITUTE
ARCH	ARCHITECT
AS	AIR SEPARATOR
ASHRAE	AMERICAN SOCIETY OF HEATING AND REFRIGERATION ENGINEERS
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
AV	ACID VENT
	AIR VENT
AVG	AVERAGE
AW	ACID WASTE
AWS	AMERICAN WELDING SOCIETY
AUX	AUXILIARY
B	
B	BOILER
BC	BELOW COUNTER
B/C	BACK OF CURB
BFV	BUTTERFLY VALVE
BH	BOX HYDRANT
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BM	BENCHMARK
BOD	BOTTOM OF DUCT (AFF)
BOF	BOTTOM OF FOOTING
BOS	BOTTOM OF STRUCTURE
BT	BATH TUB
	BREAK TANK
BTU	BRITISH THERMAL UNIT
BV	BALL VALVE
BWV	BACK WATER VALVE
C	
C	CELSIUS
CAB	CABINET
CAV	CONSTANT AIR VOLUME
CB	CATCH BASIN
CC	COOLING COIL
CD	CONDENSATE DRAIN LINE
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CIRC	CIRCULATING
CL	CENTERLINE
CLG	CEILING
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CPI	CAST IRON PIPE INSTITUTE
CPVC	CHLORINATED POLYVINYL CHLORIDE
CO	CLEANOUT
COL	COLUMN
COMB	COMBINATION
COMP	COMPRESSOR
CON	CONVERTER
CONC	CONCRETE
	CONCENTRIC
COND	CONDENSER
	CONDENSATE
CONN	CONNECTION
CONT	CONTINUOUS
	CONTINUATION
CONTR	CONTROLLER
	CONTRACTOR
COP	COEFFICIENT OF PERFORMANCE
CRAC	COMPUTER ROOM A/C UNIT
CRT	CATHODE RAY TUBE
CRU	CONDENSATE RETURN UNIT
CT	COOLING TOWER
CTR	CENTER
CU	COPPER
CW	COLD WATER
CWP	CONDENSER WATER PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CV	CONSTANT VOLUME
D	
dB	DECIBEL
DB	DRY-BULB
DC	DOUBLE DUCT CONSTANT VOLUME
	DIRECT CURRENT
DDC	DIRECT DIGITAL CONTROL
DESIG	DESIGNATION
DEFL	DEFLECTION
DTL	DETAIL
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIFF	DIFFUSER
DIM	DIMENSION
DISC	DISCONNECT
DN	DOWN
DP	DISCHARGE PLENUM
DPR	DAMPER
DS	DOUNSPOUT
	DOUBLE SUCTION
DV	DOUBLE DUCT VAV
DW	DISHWASHER
DWG	DRAWING
DWH	DOMESTIC WATER HEATER
DWP	DOMESTIC WATER PUMP
DX	DIRECT EXPANSION
E	
(E)	EXISTING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
EDB	ENTERING DRY BULB
EDF	ELECTRIC DRINKING FOUNTAIN
EDH	ELECTRIC DUCT HEATER
EDR	EFFECTIVE DIRECT RADIATION
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EFF	EFFICIENCY
EJ	EXPANSION JOINT
EL	ELEVATION
EMRG	EMERGENCY
ENCL	ENCLOSURE
ENGR	ENGINEER
ENT	ENTERING
ES	END SUCTION
	EMERGENCY SHOWER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
ETR	EXISTING TO REMAIN
EVAP	EVAPORATOR
EWB	ENTERING WET BULB
EWT	ENTERING WATER TEMPERATURE
EX	EXPLOSION PROOF
EXT	EXTERNAL
EXTG	EXISTING
F	
F	DEGREE FAHRENHEIT
FBO	FURNISHED BY OTHERS
FCO	FLOOR CLEAN OUT
FCS	FLOOR CONTROL SWITCH
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
	FIRE DAMPER
FDS	FIRE DEPARTMENT SIAMESE
FDV	FIRE DEPARTMENT VALVE
FG	FIBERGLASS
FF	FINAL FILTER
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FIXT	FIXTURE
FLA	FULL LOAD AMPS
FLEX	FLEXIBLE
FL	FLOW LINES
FLR	FLOOR
FP	FAN POWERED MIXING BOX
	FIRE PUMP
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FRIC	FRICTION
FRZR	FREEZER
FS	FLOW SWITCH
	FIRE SPRINKLER
FSK	FLOOR SINK
FT	FOOT
	FEET
FT WC	FEET, WATER COLUMN
FUT	FUTURE
G	
G	GAS
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GLV	GLOBE VALVE
GND	GROUND
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GSH	GRAND SENSIBLE HEAT
GV	GATE VALVE
H	
HB	HOSE BIBB
HC	HEATING COIL
HD	HEAD
	HUB DRAIN
HF	HUMIDIFIER
HORIZ	HORIZONTAL
HP	HORSEPOWER
	HALON PANEL
HPU	HEAT PUMP UNIT
HKP	HOUSEKEEPING PAD
HSC	HORIZONTAL SPLIT CASE
HSTAT	HUMIDISTAT
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HU	HUMIDIFIER SECTION
HW	HOT WATER
HWC	HOT WATER CIRCULATOR
HWP	HOT WATER PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ
I	
ID	INSIDE DIAMTER
IE	INVERT ELEVATION
IH	INFRARED HEATER
IN	INCH
IN WC	INCH, WATER COLUMN
INSUL	INSULATION
INT	INTERNAL
	INTERIOR
IW	INDIRECT WASTE
J	
JB	JUNCTION BOX
JP	JOCKEY PUMP
K	
KEC	KITCHEN EQUIPMENT CONTRACTOR
KO	KNOCKOUT
KVA	KILOVOLT AMPS
KW	KILOWATT
L	
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LBS	POUNDS
LBS/HR	POUNDS PER HOUR
LF	LINEAR FEET
LP	LOW PRESSURE
LRA	LOCKED ROTOR AMPS
LVG	LEAVING
LVL	LEVEL
LWB	LEAVING WET BULB
LWCO	LOW WATER CUT OFF
LWT	LEAVING WATER TEMPERATURE
M	
MA	MAKE-UP AIR
MAT	MIXED AIR TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTUH
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MI	MALLEABLE IRON
MIN	MINIMUM
MOCP	MAXIMUM OVER CURRENT PROTECTION
MP	MEDIUM PRESSURE
MS	MOP SINK
MTD	MOUNTED
MTL	METAL
MU	MAKE-UP
MUA	MAKE-UP AIR UNIT
MVD	MANUAL VOLUME DAMPER
N	
(N)	NEW
NC	NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO	NUMBER
NTS	NOT TO SCALE
O	
OA	OUTSIDE AIR
OAF	OUTSIDE AIR FAN
OAHU	OUTSIDE AIR HANDLING UNIT
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OD	OUTSIDE DIAMETER
	OVERFLOW DRAIN
OFCU	OUTSIDE AIR FAN COIL UNIT
OPG	OPENING
OS&Y	OPEN STEM AND YOLK
P	
P	PUMP
	PLUMBING EQUIPMENT
PC	PLUMBING CONTRACTOR
PCR	PUMPED CONDENSATE RETURN
PD	PRESSURE DROP
	PLANTER DRAIN
PF	PRE-FILTER
PH	PHASE
	POST HYDRANT
PIV	POST INDICATOR VALVE
PLBG	PLUMBING
PNEU	PNEUMATIC
PNL	PANEL
PNTH	PENTHOUSE
PP	POLYPROPYLENE
PPM	PARTS PER MILLION
PRESS	PRESSURE
PRI	PRIMARY
PRS	PRIMARY REDUCING STATION
PRV	PRESSURE REDUCING VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH, GAUGE
PT	PLUMBING TRIM
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PWL	SOUND POWER LEVEL
Q	
QTY	QUANTITY
R	
(R)	REMOVE
	RELOCATE
RA	RETURN AIR
RAD	REFRIGERATED AIR DRYER
RAF	RETURN AIR FAN
RAG	RETURN AIR GRILLE
RAT	RETURN AIR TEMPERATURE
RCP	REFLECTED CEILING PLAN
	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
RE	REFERENCE
	REFER
RECIRC	RECIRCULATE
RED	REDUCER
REFR	REFRIGERATOR
REG	REGISTER
REINF	REINFORCING
REQD	REQUIRED
REV	REVISION
	REVISE
RF	RETURN FAN
RH	RELATIVE HUMIDITY
RHG	REFRIGERANT HOT GAS
RKVA	RUNNING KILOVOLT AMPS
RKW	RUNNING KILOWATTS
RL	REFRIGERANT LIQUID
RLA	RUNNING LOAD AMPS
RM	ROOM
	REFRIGERANT MACHINE
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
RTU	ROOFTOP UNIT
RV	RELIEF VALVE
S	
SA	SUPPLY AIR
SAF	SUPPLY AIR FAN
SAG	SUPPLY AIR GRILLE
SAN	SANITARY SEWER
SAR	SUPPLY AIR REGISTER
SCHED	SCHEDULE
SCFM	STANDARD AIR CUBIC FEET PER MINUTE
SCR	SILICON CONTROLLED RECTIFIER
SD	STORM DRAIN
SE	SEWAGE EJECTOR
SEC	SECONDARY
SECT	SECTION
SENS	SENSIBLE
SF	SQUARE FEET
SFCS	SPRINKLER FLOOR CONTROL STATION
SH	SHOWER
SHT	SHEET
SIM	SIMILAR
SK	SINK
SKVA	STARTING KILOVOLT AMPS
SKW	STARTING KILOWATTS
SM	SHEET METAL
SP	STATIC PRESSURE
	SUMP PUMP
SPEC	SPECIFICATION
SPR	SPRINKLER
SQ	SQUARE
SS	STAINLESS STEEL
	SERVICE SINK
SSD	SUBSURFACE DRAIN
SSFU	SANITARY SEWER FIXTURE UNITS
SSSC	SOLID STATE SPEED CONTROL
STD	STANDARD
STL	STEEL
STR	STRAINER
SURF	SURFACE
SUSP	SUSPEND
SV	SANITARY VENT
ST	SOUND TRAP
T	
TC	TEMPERATURE CONTROL
TD	TRENCH DRAIN
TDH	TOTAL DYNAMIC HEAD
TF	TRANSFER FAN
TG	TRANSFER GRILLE
TH BLK	THRUST BLOCK
TOD	TOP OF DUCT (AFF)
TOP	TOP OF PIPE (AFF)
TP	TRAP PRIMER
TPD	TRAP PRIMER DEVICE
TSP	TOTAL STATIC PRESSURE
TSTAT	THERMOSTAT
TYP	TYPICAL
U	
U	URINAL
U/F	UNDERFLOOR
U/S	UNDERSLAB
UCD	UNDERCUT DOOR
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES
UNO	UNLESS NOTED OTHERWISE
UTR	UP THROUGH ROOF
V	
V	VOLT, VENT
VA	VOLT-AMPERE
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VALVE BOX
	VACUUM BREAKER
VCP	VITRIFIED CLAY PIPE
VD	VOLUME DAMPER
VEL	VELOCITY
VERT	VERTICAL
VFD	VARIABLE FREUENCY DRIVE
VIB	VALVE IN BOX
VOV	VALVE ON VERTICAL
VP	VACUUM PUMP
VR	VARIABLE AIR VOLUME REHEAT
VSD	VARIABLE SPEED DRIVE
VTR	VENT THROUGH ROOF
W	
W	WATT, WASTE, WIDTH
W/	WITH
W/O	WITHOUT
WB	WETBULB
WC	WATER CLOSET
WCO	WALL CLEANOUT
WF	WATER FILTER
WH	WALL HYDRANT
WM	WATER METER
WP	WEATHERPROOF
WPD	WATER PRESSURE DROP
WWF	WELDED WIRE FABRIC
WT	WATER TIGHT
	WEIGHT
Y	
Y	YARD HYDRANT
Z	
Z	ZONE

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△ Date	Description
2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

NOT FOR CONSTRUCTION

Project Name

SSRC | BASE AREA IMPROVEMENTS

Project Number

003.7835.000

Description

MECHANICAL LEGEND

Scale

1/8" = 1'-0"

2A-M0.000

GENERAL MECHANICAL CONTRACT REQUIREMENTS:

GENERAL:

1. UNLESS OTHERWISE NOTED, THE WORK DESCRIBED ON THE PLANS AND SPECIFICATIONS SHALL INCLUDE THE FURNISHING AND INSTALLATION OF ALL LABOR AND MATERIALS NECESSARY FOR COMPLETE AND OPERATIONAL HVAC, FIRE PROTECTION AND PLUMBING SYSTEMS. CONTRACTOR SHALL FURNISH THESE EVEN IF ITEMS REQUIRED TO ACHIEVE THIS (I.E. OFFSETS, ISOLATION AND BALANCING DEVICES, MAINTENANCE CLEARANCES, ETC.) ARE NOT SPECIFICALLY SHOWN.

2. DATA GIVEN ON THE DRAWINGS IS AS EXACT AS COULD BE SECURED. ABSOLUTE ACCURACY IS NOT GUARANTEED AND THE CONTRACTOR SHALL OBTAIN AND VERIFY EXACT LOCATIONS, MEASUREMENTS, LEVELS, SPACE REQUIREMENTS, POTENTIAL CONFLICTS WITH OTHER TRADES, ETC. AT THE SITE AND SHALL SATISFACTORILY ADAPT HIS WORK TO THE ACTUAL CONDITIONS OF THE JOB.

3. THE DRAWINGS ARE DIAGRAMMATICAL IN NATURE AND SHALL NOT BE SCALED. THEY SHOW CERTAIN PHYSICAL RELATIONSHIPS WHICH MUST BE ESTABLISHED WITHIN THE DIVISION 21,22 AND 23 WORK AND ITS INTERFACE WITH OTHER WORK. ESTABLISHING THIS RELATIONSHIP IN THE FIELD IS THE EXCLUSIVE RESPONSIBILITY OF THE CONTRACTOR. THIS DIVISION SHALL COORDINATE ITS WORK WITH ALL DIVISIONS OF THE WORK AND ADJUST ITS WORK AS REQUIRED BY THE ACTUAL CONDITIONS OF THE PROJECT.

   A. THE CONTRACTOR SHALL VISIT THE SITE BEFORE SUBMITTING A BID TO BECOME THOROUGHLY FAMILIAR WITH THE ACTUAL CONDITIONS OF THE PROJECT. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF EXISTING CONDITIONS.

   B. CERTAIN SYSTEMS REQUIRE ENGINEERING OF INSTALLATION DETAILS BY CONTRACTOR. UNLESS FULLY DETAILED IN THE CONTRACT DOCUMENTS, SUCH ENGINEERING IS THE EXCLUSIVE RESPONSIBILITY OF THE CONTRACTOR.

   C. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE WHERE CLEARANCES ARE LIMITED, AND WHERE INSTALLATION DRAWINGS OR SCHEMATICS, "CONSTRUCTION DRAWINGS", OR COORDINATION DRAWINGS MAY BE REQUIRED IN ACCORDANCE WITH, OR IN EXCESS OF, THOSE REQUIRED BY THE SPECIFICATIONS. THE CONTRACTOR SHALL PREPARE ALL SUCH COORDINATION DRAWINGS AS PART OF THE BASE CONTRACT. SUCH DRAWINGS MAY BE SUBMITTED TO THE ARCHITECT/ENGINEER FOR RECORD AND COMMENT. ANY WORK INSTALLED WITHOUT APPROVED COORDINATION DRAWINGS IS DONE AT THE CONTRACTOR'S RISK.

4. THESE NOTES ONLY SUPPLEMENT, AND DO NOT REPLACE, THE SPECIFICATIONS.

5. DEFINITIONS AND TERMINOLOGY

   A. THE DEFINITIONS OF DIVISION 1 AND THE GENERAL CONDITIONS OF THIS SPECIFICATION ALSO APPLY TO THE DIVISION 21,22 AND 23 CONTRACT DOCUMENTS.

   B. "CONTRACT DOCUMENTS" CONSTITUTE THE DRAWINGS, SPECIFICATIONS, GENERAL CONDITIONS, PROJECT MANUALS, ETC., PREPARED BY ENGINEER (OR OTHER DESIGN PROFESSIONAL IN ASSOCIATION WITH ENGINEER) FOR CONTRACTOR'S BID OR CONTRACTOR'S NEGOTIATIONS WITH THE OWNER. THE DIVISION 21,22 AND 23 DRAWINGS AND SPECIFICATIONS PREPARED BY THE ENGINEER ARE NOT CONSTRUCTION DOCUMENTS.

   C. "CONSTRUCTION DOCUMENTS", "CONSTRUCTION DRAWINGS", AND SIMILAR TERMS FOR DIVISION 21,22 AND 23 WORK REFER TO INSTALLATION DIAGRAMS, SHOP DRAWINGS AND COORDINATION DRAWINGS PREPARED BY THE CONTRACTOR USING THE DESIGN INTENT INDICATED ON THE ENGINEER'S CONTRACT DOCUMENTS. THESE SPECIFICATIONS DETAIL THE CONTRACTOR'S RESPONSIBILITY FOR "ENGINEERING BY CONTRACTOR" AND FOR PREPARATION OF CONSTRUCTION DOCUMENTS.

   D. "(N)" INDICATES "NEW" EQUIPMENT TO BE PROVIDED UNDER THIS CONTRACT.

   E. "(E)" INDICATES "EXISTING" EQUIPMENT ON SITE WHICH MAY OR MAY NOT NEED TO BE RELOCATED AS A PART OF THIS WORK.

   F. "(R)" INDICATES EXISTING EQUIPMENT TO BE RELOCATED AS PART OF THIS WORK.

   G. "FURNISH" MEANS TO "SUPPLY" AND USUALLY REFERS TO AN ITEM OF EQUIPMENT.

   H. "INSTALL" MEANS TO "SET IN PLACE, CONNECT AND PLACE IN FULL OPERATIONAL ORDER".

   I. "PROVIDE" MEANS TO "FURNISH AND INSTALL".

   J. "EQUIVALENT" MEANS "MEETS THE SPECIFICATIONS OF THE REFERENCE PRODUCT OR ITEM IN ALL SIGNIFICANT ASPECTS." SIGNIFICANT ASPECTS SHALL BE AS DETERMINED BY THE ARCHITECT/ENGINEER.

   K. "WORK BY OTHER(S) DIVISIONS"; "RE: XX DIVISION", AND SIMILAR EXPRESSIONS MEANS WORK TO BE PERFORMED UNDER THE CONTRACT DOCUMENTS, BUT NOT NECESSARILY UNDER THE DIVISION OR SECTION OF THE WORK ON WHICH THE NOTE APPEARS. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO COORDINATE THE WORK OF THE CONTRACT BETWEEN HIS/HER SUPPLIERS, SUBCONTRACTORS AND EMPLOYEES. IF CLARIFICATION IS REQUIRED, CONSULT ARCHITECT/ENGINEER BEFORE SUBMITTING BID.

   L. BY INFERENCE, ANY REFERENCE TO A "CONTRACTOR" OR "SUB-CONTRACTOR" MEANS THE ENTITY WHICH HAS CONTRACTED WITH THE OWNER FOR THE WORK OF THE CONTRACT DOCUMENTS.

   M. "ENGINEER" MEANS THE DESIGN PROFESSIONAL FIRM WHICH HAS PREPARED THESE CONTRACT DOCUMENTS. ALL QUESTIONS, SUBMITTALS, ETC. OF THIS DIVISION SHALL BE ROUTED THROUGH THE ARCHITECT TO THE ENGINEER (THROUGH PROPER CONTRACTUAL CHANNELS).

ELECTRICAL COORDINATION:

1. VERIFY THE ELECTRICAL SERVICE PROVIDED BY THE ELECTRICAL CONTRACTOR BEFORE ORDERING ANY MECHANICAL EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS.

2. PROVIDE PREMIUM EFFICIENCY MOTORS WITH 1.15 SERVICE FACTOR ON ALL EQUIPMENT, MOTORS SHALL BE CAPABLE OF OPERATING CONTINUOUSLY AT 105°F UNDER JOBSITE CONDITIONS AND ALTITUDE.

3. UNLESS NOTED OTHERWISE, ALL MECHANICAL EQUIPMENT SHALL BE PROVIDED WITH HOA SWITCH AND STARTER COMPATIBLE WITH EQUIPMENT AND BMS SYSTEM. STARTERS SHALL BE PROVIDED BY DIVISION 21,22 AND 23 UNLESS IN A MOTOR CONTROL CENTER. ALL DISCONNECTS SHALL BE FURNISHED BY DIVISION 26.

4. THE ELECTRICAL POWER FOR CERTAIN EQUIPMENT PROVIDED UNDER DIVISION 21,22 AND 23 HAS NOT BEEN SPECIFICALLY INDICATED ON THE ELECTRICAL DRAWINGS AND MUST BE PROVIDED BY AND FIELD COORDINATED BY THE DIVISION 21,22 AND 23 TRADE REQUIRING SUCH POWER.

   SUFFICIENT POWER FOR THIS PURPOSE SHALL BE FURNISHED AS "SPARE", DEDICATED CIRCUIT CAPACITY IN DIVISION 26'S PANELBOARDS. ALL WIRING, CONDUIT AND ELECTRICAL DEVICES DOWNSTREAM OF THE PANELBOARDS IS THE RESPONSIBILITY OF THE DIVISION 21,22 AND 23 TRADE REQUIRING THE POWER UNLESS OTHERWISE SHOWN ON THE ELECTRICAL DRAWINGS.

   SUCH EQUIPMENT IS HEREBY DEFINED AS:

   A. ELECTRICAL HEAT TRACE. REQUIRED HEAT TRACE LOCATIONS, CAPACITIES AND SPECIFICATION ARE SHOWN OR INDICATED ON THE DRAWINGS. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

   B. FIRE PROTECTION AIR COMPRESSORS, DRY-PIPE CONTROL PANELS AND VALVES. REQUIRED CONNECTIONS ARE INCLUDED IN THE DIVISION 21 WORK, AND WILL BE SHOWN BY THAT CONTRACTOR'S ENGINEERED SYSTEM DESIGN DRAWINGS.

      (1) PRE-ACTION SYSTEM INITIATION SIGNALS (SUCH AS SMOKE DETECTORS, OR GENERAL ALARM CONDITIONS IN A PRE-ACTION ZONE) SHALL BE PROVIDED UNDER DIVISION 28 FIRE-ALARM WORK.

      (2) DIVISION 21 SHALL PROVIDE PRE-ACTION CONTROL PANEL AND INTERCONNECTION BETWEEN NEAREST SUITABLE FIRE ALARM PANEL AND LOCATION OF PRE-ACTION VALVE(S).

      (3) DIVISION 28 SHALL PROVIDE INTERCONNECTION BETWEEN FIRE COMMAND CENTER ALARM PANEL (PROVIDED UNDER DIVISION 28) AND REMOTE COMMUNICATION FIRE ALARM PANEL (PROVIDED UNDER DIVISION 28).

   C. TEMPERATURE CONTROL PANELS, CONTROL AIR COMPRESSORS AND LINE VOLTAGE POWER FOR 24V CONTROL TRANSFORMERS. REQUIRED CONNECTION ARE INCLUDED IN DIVISION 230900 AND WILL BE SHOWN BY THAT CONTRACTOR'S CONTROL SUBMITTAL DRAWINGS.

   D. IT IS NOT PERMISSIBLE TO UTILIZE "SPARE" POWER FROM ADJACENT POWER CIRCUITS TO SERVE ANY OF THE ABOVE LOADS. ALL POWER MUST COME FROM DEDICATED CIRCUITS.

5. SMOKE DETECTORS:

   FOR AIR HANDLING UNITS AND AIR SYSTEMS WITH A CAPACITY EXCEEDING 2000 CFM, PROVIDE UL LISTED SMOKE DETECTORS IN RETURN AIR SYSTEMS IN ACCORDANCE WITH THE INTERNATIONAL MECHANICAL CODE AND ELSEWHERE AS SHOWN ON THE DRAWINGS.

   SMOKE DETECTORS WILL BE FURNISHED AND SET IN PLACE UNDER THIS DIVISION. DETECTORS WILL BE WIRED UNDER DIVISION 28. SMOKE DETECTORS MUST BE OF THE SAME MANUFACTURER, AND COMPATIBLE WITH THE FIRE FLARM SYSTEM PROVIDED UNDER DIVISION 28 (IF APPLICABLE).

   CONNECT RELAY(S) TO FAN CONTROL CIRCUIT TO STOP FAN WHEN SMOKE IS DETECTED.

INSTALLATION:

1. SUSPEND EACH TRADE'S WORK SEPARATELY FROM THE STRUCTURE. DUCTWORK SHALL BE HELD TIGHT TO STRUCTURE EXCEPT WHERE OTHERWISE SHOWN.

2. INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY INDICATED OTHERWISE OR WHERE LOCAL CODES OR REGULATIONS TAKE PRECEDENCE.

3. PROVIDE MANUFACTURER'S RECOMMENDED SERVICE CLEARANCE AROUND ALL EQUIPMENT REQUIRING SAME.

4. PROVIDE FOR SAFE CONDUCT OF THE WORK, CAREFUL REMOVAL AND DISPOSITION OF MATERIALS AND PROTECTION OF PROPERTY WHICH IS TO REMAIN UNDISTURBED.

5. PROVIDE ACCESS DOORS FOR ALL EQUIPMENT, VALVES, CLEANOUTS, ACTUATORS AND CONTROLS WHICH REQUIRE ACCESS FOR ADJUSTMENT OR SERVICING AND WHICH ARE LOCATED IN OTHERWISE INACCESSIBLE LOCATIONS.

   A. FOR EQUIPMENT LOCATED IN "ACCESSIBLE LOCATIONS" SUCH AS LAY-IN CEILINGS: LOCATE EQUIPMENT TO PROVIDE ADEQUATE SERVICE CLEARANCE FOR NORMAL MAINTENANCE WITHOUT REMOVING ARCHITECTURAL, ELECTRICAL OR STRUCTURAL ELEMENTS SUCH AS THE CEILING SUPPORT SYSTEM, ELECTRICAL FIXTURES, ETC. "NORMAL MAINTENANCE" INCLUDES, BUT IS NOT LIMITED TO:FILTER CHANGING; GREASING OF BEARINGS; USING P/T PORTS FOR PRESSURE OR TEMPERATURE MEASUREMENTS; SERVICING CONTROL VALVES AND SERVICING CONTROL PANELS.

6. ISOLATE ALL PRESSURIZED PIPE (WATER, ETC.) AT EACH RISER, BRANCH, PIECE OF EQUIPMENT, AND AREA SERVED.

7. PROVIDE PRIMERS FOR ALL FLOOR DRAINS AND FLOOR SINKS SHOWN ON DRAWINGS. PRIMERS MAY BE CONNECTED TO FLUSH FIXTURES OR BE STAND ALONE. SEE SPECIFICATIONS.

8. NO DOMESTIC WATER, CHILLED WATER, OR HEATING WATER LINES SHALL BE LOCATED EXPOSED IN FINISHED SPACES OR BELOW THE BUILDING SLAB UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

9. NO GAS LINES SHALL BE LOCATED BELOW BUILDING SLAB.

10. ALL CURBS, ROOF JACKS, ROOF THIMBLES, SANITARY VENTS, ROOF DRAINS, ETC. SHALL BE COMPATIBLE WITH ROOFING SYSTEM TO BE PROVIDED. REFERENCE ARCHITECTURAL DIVISION FOR REQUIRED FLASHING DETAILS.

11. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL CONCRETE EQUIPMENT PAD DIMENSIONS, BASED ON THE FINAL EQUIPMENT SELECTION, TO THE STRUCTURAL AND GENERAL CONTRACTOR FOR INCLUSION IN THOSE CONTRACTOR'S WORK AS DESCRIBED BY THE GENERAL CONTRACTOR.

12. WARRANTY: AT A MINIMUM, THE ENTIRE MECHANICAL SYSTEM SHALL BE WARRANTED AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR AFTER ACCEPTANCE OF THE SYSTEM BY THE OWNER. REFER TO INDIVIDUAL SPECIFICATION SECTIONS FOR SPECIFIC WARRANTY REQUIREMENTS.

DUCTWORK INSTALLATION:

1. SEAL ALL SEAMS (LONGITUDINAL AND TRANSVERSE) AIR TIGHT WITH SEALANT PER SPECIFICATIONS.

2. DUCT DIMENSIONS ARE INSIDE CLEAR.

3. DIFFUSER NECK SIZE IS SAME AS FLEXIBLE DUCT SIZE.

4. UNLESS OTHERWISE NOTED, ALL CHANGES IN DIRECTION SHALL BE MADE WITH RADIUS ELBOWS WITH RADIUS TO CENTERLINE EQUAL TO 1.5 DUCT WIDTH.

5. WHERE REQUIRED FOR SPACE CONSTRAINTS, PROVIDE MITERED ELBOWS WITH TURNING VANES AS FOLLOWS:

   A. FOR DUCT WIDTHS OF 36" OR LESS, PROVIDE MANUFACTURED SINGLE WIDTH TURNING VANES, WITH NO TRAILING EDGES AND SPACING IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS FOR "STANDARD SPACING".

   B. USE DOUBLE THICKNESS (AIRFOIL) BLADES WITHOUT TRAILING EDGES FOR DUCT WIDTHS GREATER THAN 36".

6. ALL FLEXIBLE DUCTS SHALL NOT BE LESS THAN 4', OR MORE THAN 10' IN LENGTH. INSTALL FLEXIBLE DUCTWORK SUCH THAT:

   A. MINIMUM OVERALL LENGTH OF 3D, STRAIGHT INTO NECK OF DIFFUSER.

   B. MAXIMUM OF 135° OF TOTAL TURNING IN ENTIRE LENGTH OF FLEXIBLE DUCT.

   C. MINIMUM TURNING RADIUM OF R = 1.5D.

   D. WHERE:
      * D = FLEXIBLE DUCT DIAMETER
      * R = RADIUS OF TURN AS MEASURED TO CENTERLINE OF DUCT.

7. RETURN AIR PLENUM: THE HVAC SYSTEM WILL USE THE SPACE ABOVE THE CEILING AS A RETURN AIR PLENUM. CONTRACTOR SHALL CONFORM TO THE REQUIREMENTS OF NFPA AND LOCAL CODE REQUIREMENTS FOR ALL MATERIAL INSTALLED IN THE RETURN AIR PLENUM.

   A. IN ADDITION, THE CONTRACTOR SHALL PROVIDE A COMPLETE RETURN AIR PATH BETWEEN ALL RETURN AIR DEVICES (GRILLES ETC.) AND THEIR RESPECTIVE HVAC UNIT. MAXIMUM VELOCITY OF RETURN AIR IN PLENUM SHALL GENERALLY NOT EXCEED 250 FEET PER MINUTE, NOR EXCEED 750 FEET PER MINUTE AT ANY CROSS-SECTION OF THE RETURN AIR PATH.

8. BRANCH LINES:

   A. MAKE ALL TAPS TO ROUND DUCTWORK WITH CONICAL TEES.

   B. MAKE ALL TAPS TO RECTANGLE DUCTWORK WITH 45° ENTRY OR CONICAL SPIN IN TO ROUND.

   C. INCLUDE DAMPERS AT ALL BRANCH LINES.

10. DUCT SIZES NOT CALLED OUT SHALL BE DETERMINED BASED ON 0.08" S.P. LOSS OR LESS PER 100 FT. OF LENGTH.

11. ASSUME ROUND OR OVAL DUCTS IN EXPOSED AREAS.

12. INCLUDE DAMPERS AT ALL BRANCH LINES, WHERE SHOWN ON THE DRAWINGS, AND WHERE OTHERWISE REQUIRED FOR BALANCING.

PIPE INSTALLATION:

1. ALL PIPING SHALL BE ADEQUATELY SUPPORTED FROM THE BUILDING STRUCTURE TO PREVENT SAGGING, POCKETING, SWAYING OR DISPLACEMENT BY MEANS OF HANGERS AND SUPPORTS. PIPING IS NOT TO BE SUPPORTED BY EQUIPMENT.

2. PROVIDE DIELECTRIC UNIONS BETWEEN DISSIMILAR MATERIALS.

3. PROVIDE MANUAL AIR VENTS AND CAPPED HOSE-END DRAINS WITH ISOLATION VALVES AT PIPING HIGH AND LOW POINTS.

4. WELD PIPE IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS. WELDERS SHALL BE CERTIFIED FOR TYPE OF WORK BEING PERFORMED.

5. FLUSH OUT PIPING AND REMOVE CONTROL DEVICES BEFORE PERFORMING PRESSURE TEST. DO NOT USE PIPING SYSTEM VALVES TO ISOLATE SECTIONS WHERE TEST PRESSURE EXCEEDS VALVE PRESSURE RATING. PRESSURIZE PIPING AT 100 PSIG. IF LEAKAGE IS OBSERVED OR IF TEMPERATURE COMPENSATED PRESSURE DROP EXCEEDS 1% OF TEST PRESSURE, REPAIR LEAKS AND RETEST. DO NOT USE AIR PRESSURE TO TEST PLASTIC PIPE.

6. PROVIDE SUPPORT UNDER ELBOWS ON PUMP SUCTION AND DISCHARGE LINES.

7. ALL STRAINERS SHALL BE FURNISHED WITH A "ROUGHING" SCREEN AND TWO (2) SCREENS FOR NORMAL OPERATION. INSTALL STRAINER WITH ROUGHING SCREEN AND OPERATE SYSTEM FOR 24 HOURS MINIMUM (RUN DOMESTIC WATER SYSTEMS AT MAX FLOW FOR A MINIMUM OF ONE HALF (1/2) HOUR. REMOVE ROUGHING SCREEN AND INSTALL NORMAL SCREEN, AFTER TWO WEEKS OF NORMAL OPERATION INSTALL NEW NORMAL SCREEN.

8. PIPING SIZES SHALL BE BASED ON 2' OR LESS HEAD LOSS PER 100 FEET OF LENGTH. VELOCITIES SHALL NOT EXCEED 10 FEET PER SECOND.

9. INSTALL ALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHIN THE PIPING SYSTEM. ENSURE ALL REQUIRED PIPE EXPANSION WILL OCCUR IN THE PROPER DIRECTION AND SEGMENT OF PIPE. PROPERLY ANCHOR (RE: SPECIFICATIONS) ALL PIPING REQUIRING EXPANSION/CONTRACTION ISOLATION. COORDINATE PIPE EXPANSION/CONTRACTION TO PREVENT DAMAGE TO ANY AND ALL BUILDING COMPONENTS.

10. PROVIDE ISOLATION VALVES AT EVERY HYDRONIC BRANCH LINE.

CONDENSATE DRAINAGE:

1. PROVIDE CONDENSATE DRAINAGE FOR ALL COOLING COILS AND OVERFLOW PANS.

2. ROUTE CONDENSATE PIPING, FULL SIZE OF DRIP PAN CONNECTION, TO NEAREST CODE APPROVED RECEPTACLE. INSULATE WHERE LOCATED ABOVE FINISHED CEILINGS.

3. HEAT TRACE CONDENSATE LINES FROM FOOD SERVICE EQUIPMENT.

LOUVERS:

1. ALL LOUVERS LOCATED ON EXTERIOR WALLS SHALL BE PROVIDED BY DIVISION 23. REQUIRED LOUVER FREE AREAS ARE INDICATED ON DIVISION 23 DRAWINGS. IT IS THE RESPONSIBILITY OF THIS CONTRACTOR TO CONFIRM THAT THE REQUIRED FREE AREA HAS BEEN PROVIDED, PRIOR TO CONNECTION TO THAT LOUVER. DIVISION 23 SHALL PROVIDE ALL LOUVER PLENUMS.

CUTTING, PATCHING AND DEMOLITION:

1. KEEP DEMOLITION & CUTTING TO MINIMUM REQUIRED FOR PROPER EXECUTION OF WORK.

2. BE RESPONSIBLE FOR ALL CUTTING AND PATCHING NECESSARY FOR THE COMPLETION OF THE WORK.

3. NO CUTTING (NOT SHOWN ON THE CONTRACT DOCUMENTS) SHALL BE DONE WITHOUT THE APPROVAL OF THE ARCHITECT AS TO LOCATIONS, METHOD AND EXTENT OF THE CUTTING.

4. REPAIR ALL ACCIDENTAL OR INTENTIONAL DAMAGE TO MATCH EXISTING CONSTRUCTION WITH NO NOTICEABLE DIFFERENCE IN CONTINUITY, APPEARANCE OR FUNCTION.

5. ALL "CAPPED" SANITARY AND VENT LINES SHALL BE RECONNECTED OR RE-ROUTED AS NECESSARY TO PREVENT "DEAD-ENDS" IN THE PIPING. ALL PIPING SHALL DRAIN TO ACTIVE SANITARY WASTE LINES AND ALL BRANCHES WITH TRAPS SHALL BE ADEQUATELY VENTED.

GENERAL PLUMBING CONTRACT REQUIREMENTS:

1. THE GENERAL MECHANICAL REQUIREMENTS PERTAIN TO THE WORK OF THIS DIVISION.

2. PREPARE SHOP DRAWINGS OF ALL NEW WORK (INCLUDING SLEEVE LOCATIONS) TO VERIFY LOCATIONS AND COORDINATION OF WORK BETWEEN TRADES PRIOR TO INSTALLATION.

3. ALL DRAIN GRATES, CLEANOUT COVERS, AND OTHER FINISHED, EXPOSED COMPONENTS SHALL BE PROTECTED FROM DAMAGE. DAMAGED COMPONENTS SHALL BE REPLACED BY CONTRACTOR AT NO ADDITIONAL COST TO THE CONTRACT.

4. COORDINATE ROUTING OF ALL PLUMBING PIPING BELOW SLAB WITH STRUCTURAL GRADE BEAMS, TIE BEAMS, ETC. ALLOW FOR REROUTING OF PIPING AS REQUIRED.

5. ALL REQUIRED OPENINGS IN CONCRETE BEAMS AND STRUCTURAL WALLS ARE TO BE ACCOMPLISHED USING SLEEVES PROPERLY SIZED FOR THE PIPE THEY SERVE. CORE DRILLING IN BEAMS IS NOT ALLOWED. CORE DRILLING IN PANS IS ALLOWED UPON PRIOR APPROVAL OF ARCHITECT AND STRUCTURAL ENGINEER.

6. HORIZONTAL STORM AND SANITARY PIPING SHALL RUN AT A SLOPE OF 1/4" PER FOOT MINIMUM FOR 3" AND SMALLER PIPING. 4" AND LARGER PIPING SHALL RUN AT 1/8" PER FOOT MINIMUM.

7. NO DOMESTIC WATER LINES SHALL BE LOCATED EXPOSED IN FINISHED SPACES OR BELOW THE BUILDING SLAB UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

8. WHERE SHOWN, MINIMIZE THE NUMBER OF JOINTS ON ANY PRESSURIZED PIPING BELOW CONCRETE SLABS. ALL BELOW GRADE PIPING TO BE PRESSURE TESTED AND WITNESSED BY ARCHITECT BEFORE BACKFILLING.

9. ALL CLEANOUTS FOR HORIZONTAL STORM DRAINAGE SYSTEM SHALL BE PIPE SIZE OR MAXIMUM 6" FOR LARGER PIPE.

10. IN ADDITION TO THE CLEANOUT LOCATIONS SHOWN ON DRAWINGS, PROVIDE ADDITIONAL CLEANOUTS AT:
    A. ALL UPPER TERMINALS.

    B. EACH RUN OF PIPING WHICH IS MORE THAN 100 FEET IN LENGTH OR FRACTION THEREOF.

    C. HORIZONTAL LINES 5 FEET OR MORE.

    D. HORIZONTAL LINES FOR EACH AGGREGATE CHANGE OF DIRECTION EXCEEDING 135 DEGREES.

    E. AT THE BASE OF ALL WASTE AND VENT RISERS. ALL VERTICAL CLEANOUTS SHALL BE SIZED TO ACCOMMODATE THE LARGEST PIPE ON THAT BRANCH LINE, BUT NEVER LARGER THAN 4".

11. NO GAS LINES SHALL BE LOCATED BELOW BUILDING SLAB. ALL GAS PIPING IN AIR PLENUMS TO BE WELDED.

12. PROVIDE ISOLATION VALVES ON ALL PIPING SERVING HOSE BIBBS.

13. ANY ELECTRICAL SPACE NOT CONSTRUCTED WITH A SUB-ROOF WHICH MAY HAVE PLUMBING PIPING AT THE CEILING OF THESE SPACES SHALL HAVE A DRIP PAN INSTALLED BELOW THE PIPING. DRIP PANS SHALL BE 1.5 TIMES THE WIDTH OF THE PIPING SERVED WITH A MINIMUM OF 2" HIGH SIDES. DRIP PANS SHALL BE SUSPENDED FROM THE PIPING SERVED AND SHALL SLOPE AT A MINIMUM 1/8"/FT. DRIP PANS SHALL DISCHARGE WITH MIN. 1-1/2" DR TO FLOOR DRAINS.

    A. DO NOT LOCATE PIPING DIRECTLY ABOVE ANY ELECTRICAL EQUIPMENT IN ELECTRICAL ROOMS.

14. MAINTAIN DESIGNATED PLUMBING FIXTURE HEADER SIZE FOR FULL BANK OF FIXTURES.

15. PROVIDE GAS VENTS EXTENDING CONTINUOUSLY FROM ALL INTERIOR GAS REGULATORS TO THE EXTERIOR OF THE BUILDING. TERMINATE AT AN APPROVED LOCATION. SIZE VENTS SUCH THAT MINIMUM VENT SIZE (FOR VENT WHICH IS 10 FEET OR LESS IN LENGTH) EQUALS RELIEF OUTLET PIPE SIZE. INCREASE VENT PIPE SIZE ONE PIPE SIZE FOR EVERY ADDITIONAL TEN FEET OF VENT PIPE LENGTH.

    A. PROVIDE AN ISOLATION VALVE DOWNSTREAM OF EVERY INTERIOR GAS REGULATOR.

STRUCTURE:

1. DO NOT PENETRATE STRUCTURAL MEMBERS. ALL EQUIPMENT SUPPORTS SHALL BE ATTACHED TO THE LOAD BEARING MEMBERS OF STRUCTURAL ELEMENTS. DO NOT OVER-STRESS ANY STRUCTURAL MEMBERS. CONTACT STRUCTURAL ENGINEER FOR ALLOWABLE LOADS FOR SPECIFIC MEMBERS.

2. DO NOT UTILIZE POWER DRIVEN ANCHORS FOR ANY LOCATIONS WHICH REQUIRE THE LOAD TO BE HELD IN TENSION. SEE STRUCTURAL DIVISION FOR ADDITIONAL RESTRICTIONS.

3. SEE ALSO STRUCTURAL DIVISION FOR ACCEPTABLE ANCHORING AND SUPPORT MEANS, METHODS, AND LOCATIONS.

4. PROVIDE FLEXIBLE CONNECTORS, EXPANSION LOOPS, EXPANSION JOINTS, ADDITIONAL FITTINGS OR EQUIVALENT TO ACCOMMODATE THE THERMAL EXPANSION OF THE BUILDING THROUGH STRUCTURAL EXPANSION JOINTS. PROVIDE SUCH FITTING AT EVERY PIPE, DUCT, CONDUIT, ETC. CROSSING OF A STRUCTURAL EXPANSION JOINT.

CONSTRUCTION VENTILATION:

1. WHERE EXISTING OR NEW MECHANICAL SYSTEMS ARE USED FOR TEMPORARY VENTILATION OR CLIMATE CONTROL, MECHANICAL EQUIPMENT INSTALLER SHALL PROVIDE CONSTRUCTION FILTERS, MAINTAIN EQUIPMENT, AND CLEAN, ADJUST AND PUT IN NEW CONDITION BEFORE BUILDING OCCUPANCY. PARTS AND LABOR WARRANTY SHALL NOT BE CONSIDERED TO START UNTIL ACCEPTANCE OF SYSTEM BY OWNER.

2. PROVIDE CONSTRUCTION FILTERS INSTALLED AT ALL AIR MOVING DEVICES THROUGHOUT THE CONSTRUCTION. REMOVE FILTERS ONLY FOR BALANCING AND FINAL TURNOVER. INSPECT ALL NON-CONSTRUCTION FILTERS AND REPLACE ALL THOSE DEEMED NECESSARY BY THE ENGINEER PRIOR TO ACCEPTANCE OF THE SYSTEM BY THE OWNER.

GAS FIRED VENTING REQUIREMENTS:

1. REFER TO SPECIFICATION 23 51 00 FLUE SYSTEMS FOR GAS-FIRED EQUIPMENT VENTING REQUIREMENTS.

ELECTRIC HEAT FREEZE PROTECTION:

1. PIPE HEAT TRACE CABLE:

   A. HEAT TRACE CABLE SHALL BE INSTALLED BY A LICENSED ELECTRICIAN.

   B. APPLY THE HEAT TRACE CABLE ON THE PIPE AFTER PRESSURE TESTING.

      (1) DO NOT SPIRAL WRAP ON PIPE.

      (2) MAKE ONE WRAP AT VALVES.

      (3) SECURE TO PIPE WITH METHODS APPROVED BY MANUFACTURER.

   C. APPLY "ELECTRICALLY TRACED" SIGNS ON OUTSIDE OF INSULATION.

   D. TEST PER MANUFACTURER'S RECOMMENDATIONS.

   E. APPLY HEAT TRACE TO THE FOLLOWING PIPING SYSTEMS.

      (1) DOMESTIC WATER (COLD, HOT, RECIRC.) EXPOSED TO FREEZING CONDITIONS.

      (2) SANITARY TRAPS AND THE DOWNSTREAM HORIZONTAL PIPE WHERE EXPOSED TO FREEZING CONDITIONS.

      (3) STORM PIPING SUBJECT TO FREEZING CONDITIONS.

   F. ALL HEAT TRACE PIPE SHALL BE INSULATED PER SPECIFICATIONS.

   G. COORDINATE ALL HEAT TRACING AND REQUIRED CIRCUITS WITH ELECTRICAL CONTRACTOR.

FIRE PROTECTION NOTES:

1. FIRE PROTECTION NOTES

   A. SUBMIT SHOP DRAWINGS SHOWING PROPOSED LAYOUT OF FIRE PROTECTION SYSTEM. DRAWINGS SHALL SHOW ACTUAL EQUIPMENT TO BE USED, DIMENSIONS AND HYDRAULIC CALCULATIONS. SHOP DRAWINGS SHALL BE APPROVED BY THE LOCAL AUTHORITY HAVING JURISDICTION PRIOR TO SUBMITTAL TO ENGINEER OR ARCHITECT.

   B. SHOW THE CONNECTING MAIN AND BRANCH PIPE SIZES FOR ALL RELOCATED EXISTING SPRINKLER HEADS.

   C. CONFORM TO HAZARD OCCUPANCY REQUIREMENTS OF NFPA 13.

2. THE ENTIRE BUILDING SHALL BE SERVED BY A WET PIPE TYPE FIRE SPRINKLER SYSTEM. COORDINATE ELECTRICAL, FIRE PROTECTION AND MECHANICAL SPACE REQUIREMENTS CAREFULLY BEFORE PROCEEDING WITH INSTALLATION.

3. EXTEND THE EXISTING SPRINKLER SYSTEM, RELOCATE EXISTING AND ADD NEW SPRINKLER HEADS IN ACCORDANCE WITH NFPA 13, ALL APPLICABLE CODES AND ORDINANCES AND PROJECT REQUIREMENTS TO COMPLETELY PROTECT THE NEW WORK.

4. SYSTEM SHALL BE INSTALLED COMPLETE AND OPERATIONAL, INCLUDING WATER FLOW INDICATOR, CONNECTIONS TO EXISTING ALARM, DRAIN PIPING, IDENTIFICATION SIGNS, ETC.

5. WORK SHALL BE PERFORMED BY A QUALIFIED FIRE SPRINKLER INSTALLER WITH A MINIMUM OF (5) FIVE YEARS EXPERIENCE IN SIMILAR INSTALLATIONS.

6. COORDINATE ALL WORK WITH ALL OTHER TRADES.

7. SUPPLY OWNER AN EXTRA STOCK OF SIX SPRINKLER HEADS (6), THREE (3) OF EACH TYPE, AND A SPRINKLER WRENCH.

FIRE STOPPING:

1. FIRE STOPPING REQUIREMENT: PENETRATIONS THROUGH RATED WALLS AND FLOORS SHALL BE SEALED WITH A MATERIAL CAPABLE OF PREVENTING THE PASSAGE OF FLAMES AND HOT GASSES WHEN SUBJECTED TO THE REQUIREMENTS OF THE TEST STANDARD SPECIFIC FOR FIRE STOPS ASTM-E-814. ACCEPTANCE MATERIALS NCLUDE: DOW CORNING RTV FIRE STOP FOAM FOR BARE PIPE, METAL CONDUIT, AND ELECTRICAL CABLE; 3M FIRE DAM 21,22 AND 230 CAULK FOR BARE PIPE, METAL CONDUIT, AND BUILDING CONSTRUCTION; GAPS 3M FS-195 INTUMESCENT STRIPS FOR INSULATED PIPES, PLASTIC PIPE OR CONDUIT, AND ELECTRICAL CABLE.

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△ Date	Description
2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

NOT FOR CONSTRUCTION

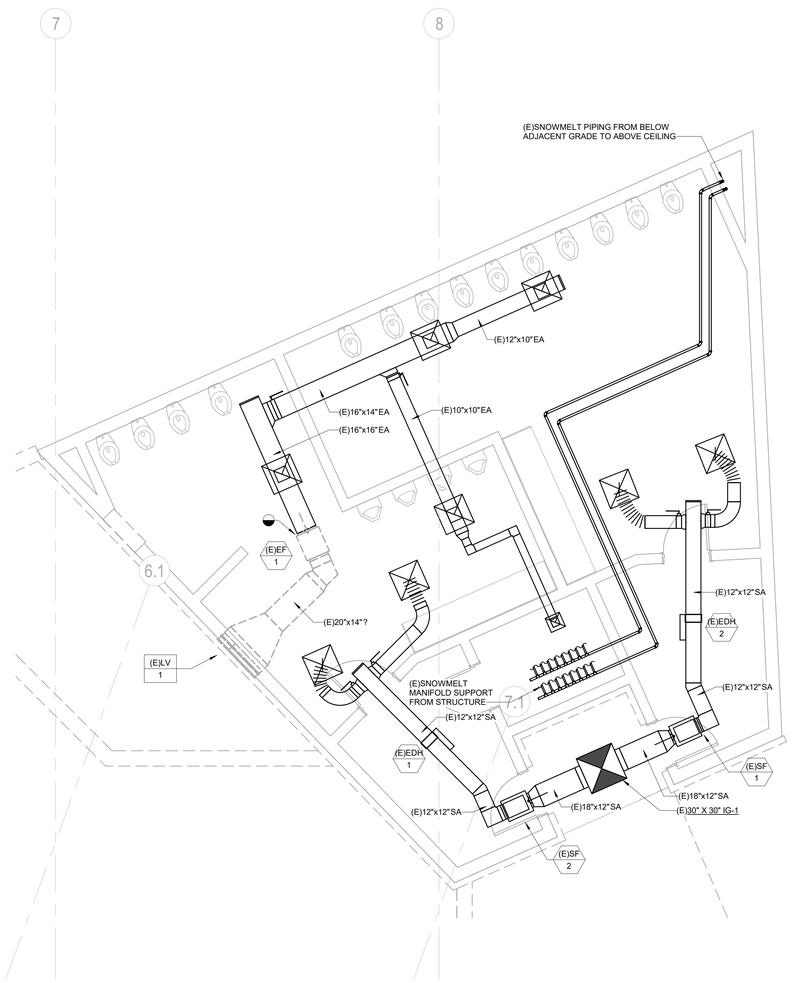
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL GENERAL NOTES

Scale
1/8" = 1'-0"

2A-M0.001



1 LOWER LEVEL 01 - GONDOLA BUILDING LOWER LEVEL 01 - MECHANICAL ENLARGED PLAN
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. EXISTING DUCTWORK, PIPING, EQUIPMENT, ETC. SHOWN HAS BEEN COMPILED FROM RECORD DRAWINGS AND PREVIOUS DESIGN PLANS. NEITHER THE ACCURACY OF THESE PLANS NOR THE EXTENT OF UNDOCUMENTED CHANGES SINCE HAS BEEN FIELD VERIFIED. THIS INFORMATION IS SHOWN TO HELP IDENTIFY THE "SCOPE OF WORK," BUT ANY PRICING EXERCISE OR BID SHOULD INVOLVE A THOROUGH REVIEW OF FIELD CONDITIONS PRIOR TO FINALIZING.

2. THE DRAWINGS IS DIAGRAMMATIC IN NATURE. DEMOLISHED WORK IS SHOWN BOLD AND DASHED TO REFLECT THE GENERAL DEMOLITION SCOPE. UTILIZE THE ARCHITECTURAL DRAWINGS AND MECHANICAL PLANS TO FURTHER DEFINE THE LIMITS OF DEMOLITION WORK.

3. SOME NOTES AND CALLOUTS ARE FROM RECORD DRAWINGS AND REFLECT EXISTING DUCTWORK, PIPING, AND EQUIPMENT FOR CLARITY.

4. PATCH AND SEAL EXISTING DUCTS TO REMAIN AT ALL POINTS OF DISCONNECTION NOT OTHERWISE BEING RECONNECTED WITH NEW WORK.

5. CAP ALL EXISTING PIPING TO REMAIN AT ALL POINTS OF DISCONNECTION NOT OTHERWISE BEING RECONNECTED WITH NEW WORK.

6. CAP OR COVER DUCT OPENINGS DURING DEMOLITION AND CONSTRUCTION (TYPICAL).

7. CONTRACTOR TO COORDINATE ALL NEW WORK WITH EXISTING SYSTEMS, RELOCATING AS NECESSARY.

8. DEMO GRDs IN ALL LOCATIONS WHERE CEILINGS ARE TO BE DEMOLISHED, RE: ARCHITECTURAL DEMO PLANS.

9. CONTRACTOR TO PROVIDE FULL AIR AND WATER BALANCE FOR ALL AFFECTED SYSTEMS, PROVIDE BALANCING PRIOR TO CONSTRUCTION AND FOR FINAL TAB REPORT AT END OF CONSTRUCTION, RE: SCHEDULE.

10. REBALANCE ALL AFFECTED (E) EXHAUST FAN SYSTEMS, WHERE DEMO/REWORK IS SHOWN ON THE DRAWINGS, REFER TO PLANS FOR LOCATIONS.

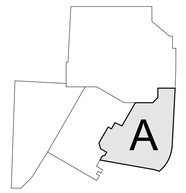
11. RECONNECT (E) PIPING TO REPLACED EQUIPMENT.

12. EXTEND (E) PIPING TO RELOCATED EQUIPMENT.

13. MAINTAIN SYSTEM CONTINUITY FOR ALL SYSTEMS THAT PASS THROUGH DEMO SCOPE AREA AND SERVE OTHER AREAS OUTSIDE THE SCOPE OF WORK.

KEYNOTES

KEY PLAN



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△	Date	Description
	2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

NOT FOR CONSTRUCTION

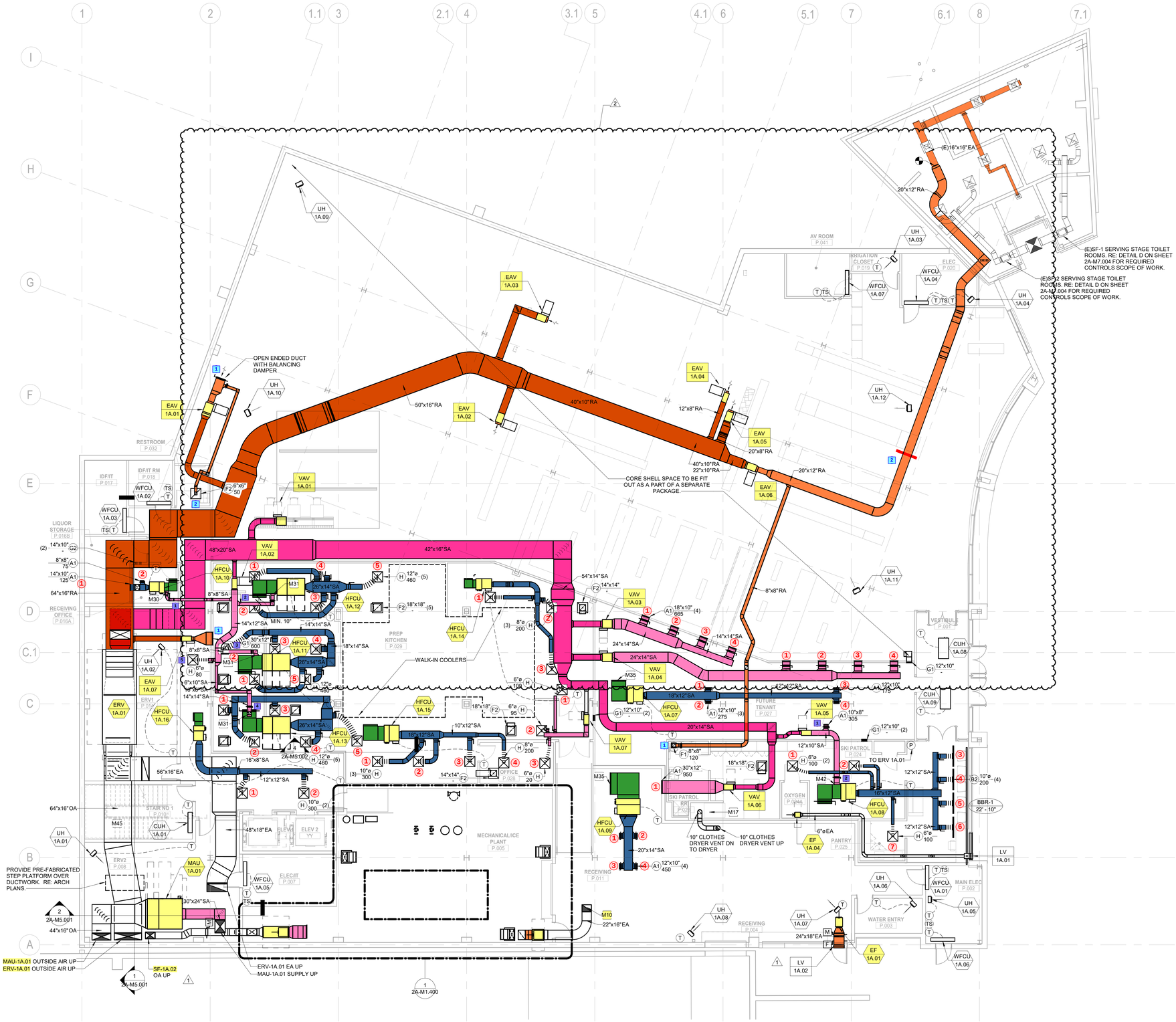
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL DEMO PLAN - LEVEL 00

Scale
1/4" = 1'-0" Ref North

2A-MD1.200



1 MECHANICAL PLAN - LOWER LEVEL 00 PROMENADE

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. THE DRAWINGS ARE DIAGRAMMATIC IN NATURE. THE CONTRACTOR IS RESPONSIBLE FOR ALL OFFSETS, TRANSITIONS, ELBOWS, ETC. AS REQUIRED IN DUCTWORK, PIPING, SUPPORTS, ETC. TO COMPLETE THE WORK IN A CLEAN FUNCTIONAL INSTALLATION THAT IS FULLY COORDINATED WITH ALL OTHER TRADES. ANY PRICING EFFORT SHALL TAKE THESE FACTORS INTO ACCOUNT.

2. MAINTAIN CODE REQUIRED AREA OF SEPARATION FROM OUTSIDE AIR INTAKES TO TERMINATIONS OF EXHAUST, COMBUSTION AIR, PLUMBING VENTS, ETC.

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4. PROVIDE MANUAL BALANCE DAMPERS IN ALL SUPPLY DUCT BRANCH TAPS, DOWNSTREAM OF VAV BOXES AND DUCTED FAN COIL UNITS.

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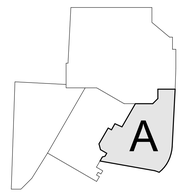
KEYNOTES

M10	EF 1A.03 EXHAUST DUCT ROUTED UP IN SHAFT TO GV 3A.01.
M17	MAINTAIN 12" TALL AIR PATHWAY ABOVE DRYER TO ALLOW ROOM AIR TO ENTER REAR SIDE OF DRYER.
M30	PROVIDE 50 CFM OF VENTILATION AIR TO RETURN BOOT OFF THE INLET OF THE FAN COIL.
M31	PROVIDE 200 CFM OF VENTILATION AIR TO RETURN BOOT OFF THE INLET OF THE FAN COIL.
M35	PROVIDE GRD TYPE G1 SIZED TO MATCH RA BOOT/HFCU INLET.
M42	PROVIDE 300 CFM OF VENTILATION AIR TO RETURN BOOT OFF THE INLET OF THE FAN COIL.
M44	GRILLE LOCATED IN CEILING PLENUM.
M45	OA DUCT ROUTED BELOW STAIR. RE: SECTION 1/2A-M5.001.

KEY PLAN



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△	Date	Description
	2022.02.04	BP5: IFC
1	2022.03.24	BP5: BULLETIN 03 - PERMIT COMMENT RESPONSES
2	2022.04.26	BP5: BULLETIN 05

Seal / Signature

COLORADO LICENSED 56806 MATHEW E. EDWARDS PROFESSIONAL ENGINEER

4/26/2022

Project Name

SSRC | BASE AREA IMPROVEMENTS

Project Number

003.7835.000

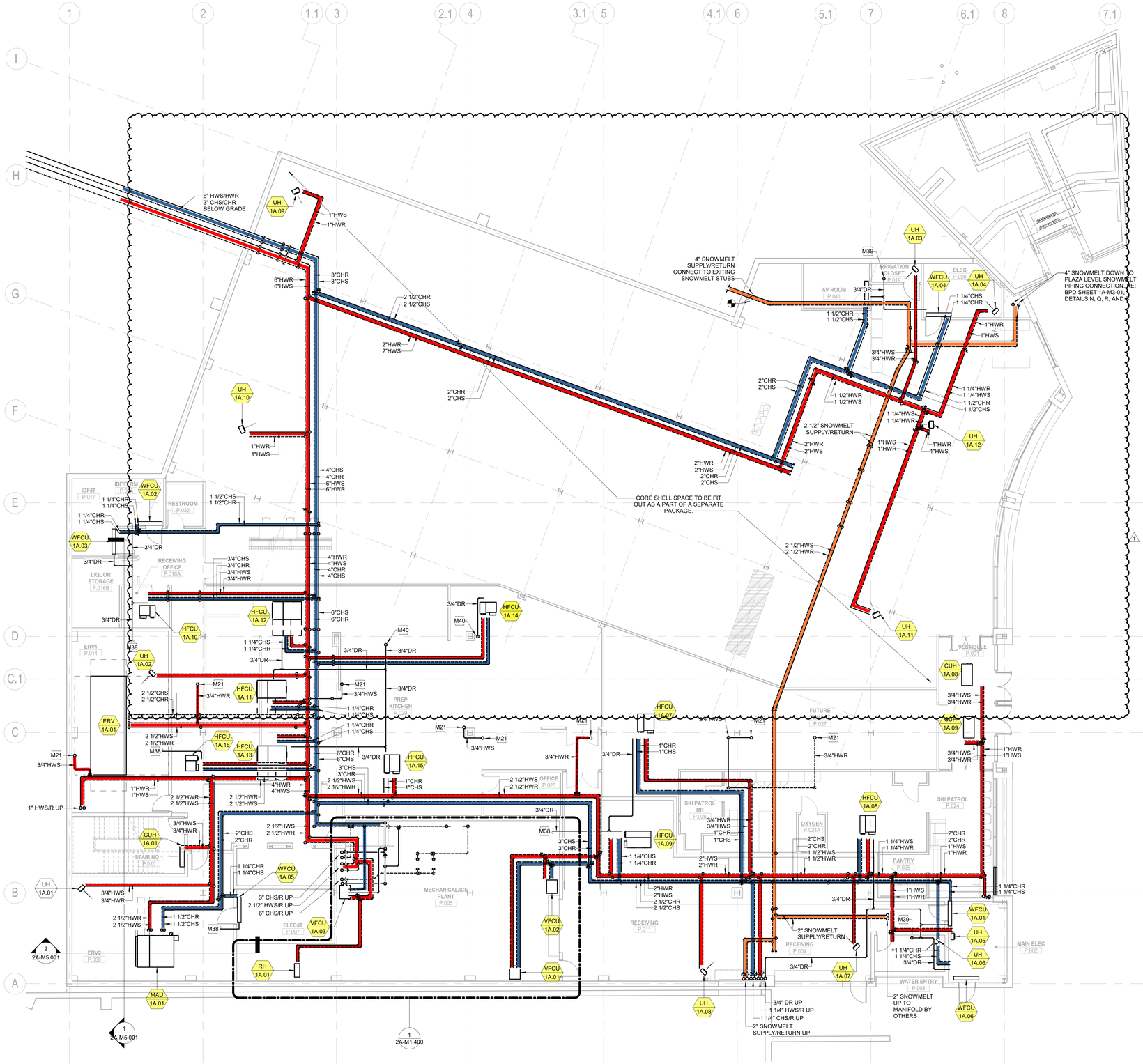
Description

MECHANICAL PLAN - LEVEL 00

Scale

1/8" = 1'-0" Ref North

2A-M1.200



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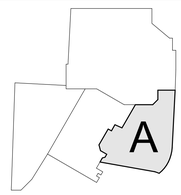
KEYNOTES

M21	HEATING WATER PIPING UP TO LEVEL 1 BASEBOARD RADIATION.
M38	ROUTE CONDENSATE DRAIN TO NEAREST FLOOR DRAIN IN MECHANICAL ROOM.
M39	CONDENSATE DRAIN DOWN TO FLOOR DRAIN.
M40	CONDENSATE DRAIN DOWN EXTERIOR OF WALK-IN COOLER WALL TO FLOOR SINK.

1 MECHANICAL PLAN - LOWER LEVEL 00 PROMENADE

SCALE: 1/8" = 1'-0"

KEY PLAN



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Date	Description
2022.02.04	BP5: IFC
2022.04.26	BP5: BULLETIN 05

Seal / Signature

COLORADO LICENSED MAUREEN E. EDWARDS 56806 PROFESSIONAL ENGINEER
4/26/2022

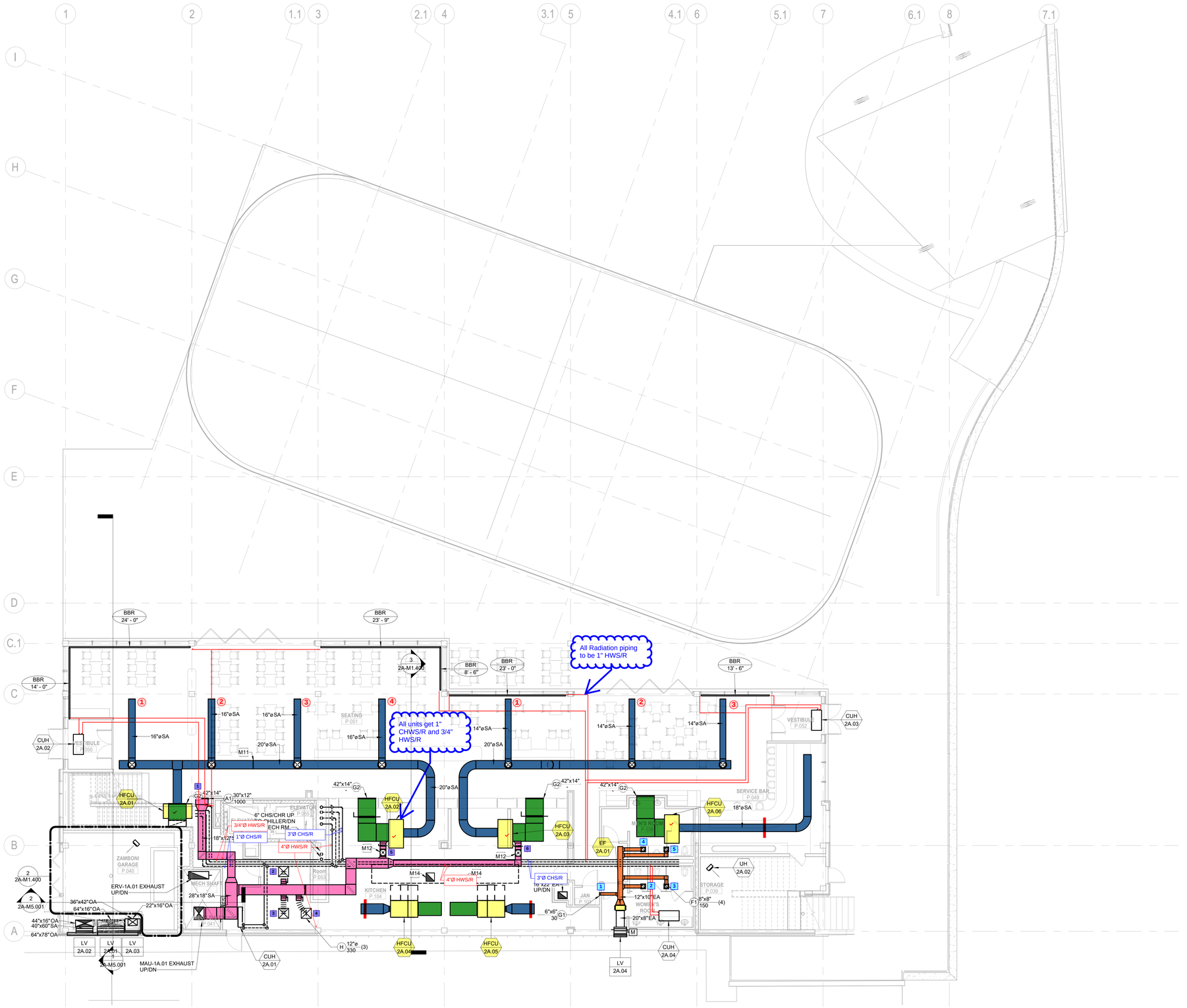
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL PIPING PLAN - LEVEL 00

Scale
1/8" = 1'-0" Ref North

2A-M1.210



1 MECHANICAL PLAN - LEVEL 01 PLAZA
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

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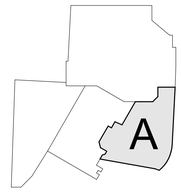
KEYNOTES

M11	PROVIDE A BULKHEAD, DUCTWORK TO APPEAR CONTINUOUS.
M12	PROVIDE 1000 CFM OF VENTILATION AIR TO RETURN BOOT OFF THE INLET OF THE FAN COIL
M14	PROVIDE GREASE EXHAUST DUCTWORK TO KITCHEN HOODS, REFER TO FOOD SERVICE DRAWINGS FOR CONNECTION LOCATIONS.

KEY PLAN



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△	Date	Description
	2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

NOT FOR CONSTRUCTION

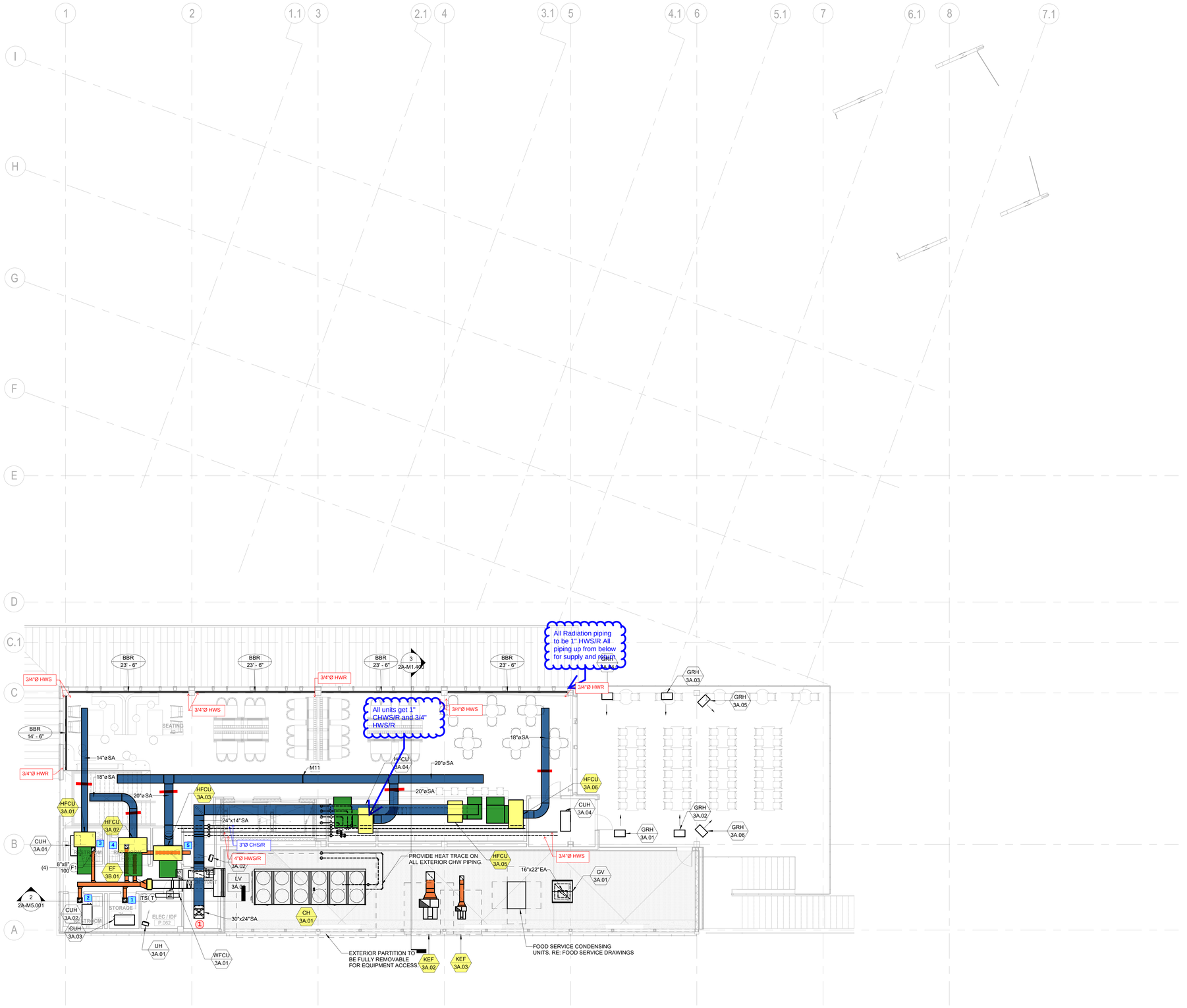
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL PLAN - LEVEL 01

Scale
1/8" = 1'-0" Ref North

2A-M1.201



1 MECHANICAL PLAN - LEVEL 02 PLAZA

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

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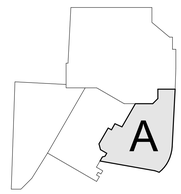
KEYNOTES

M11	PROVIDE A BULKHEAD, DUCTWORK TO APPEAR CONTINUOUS.

KEY PLAN



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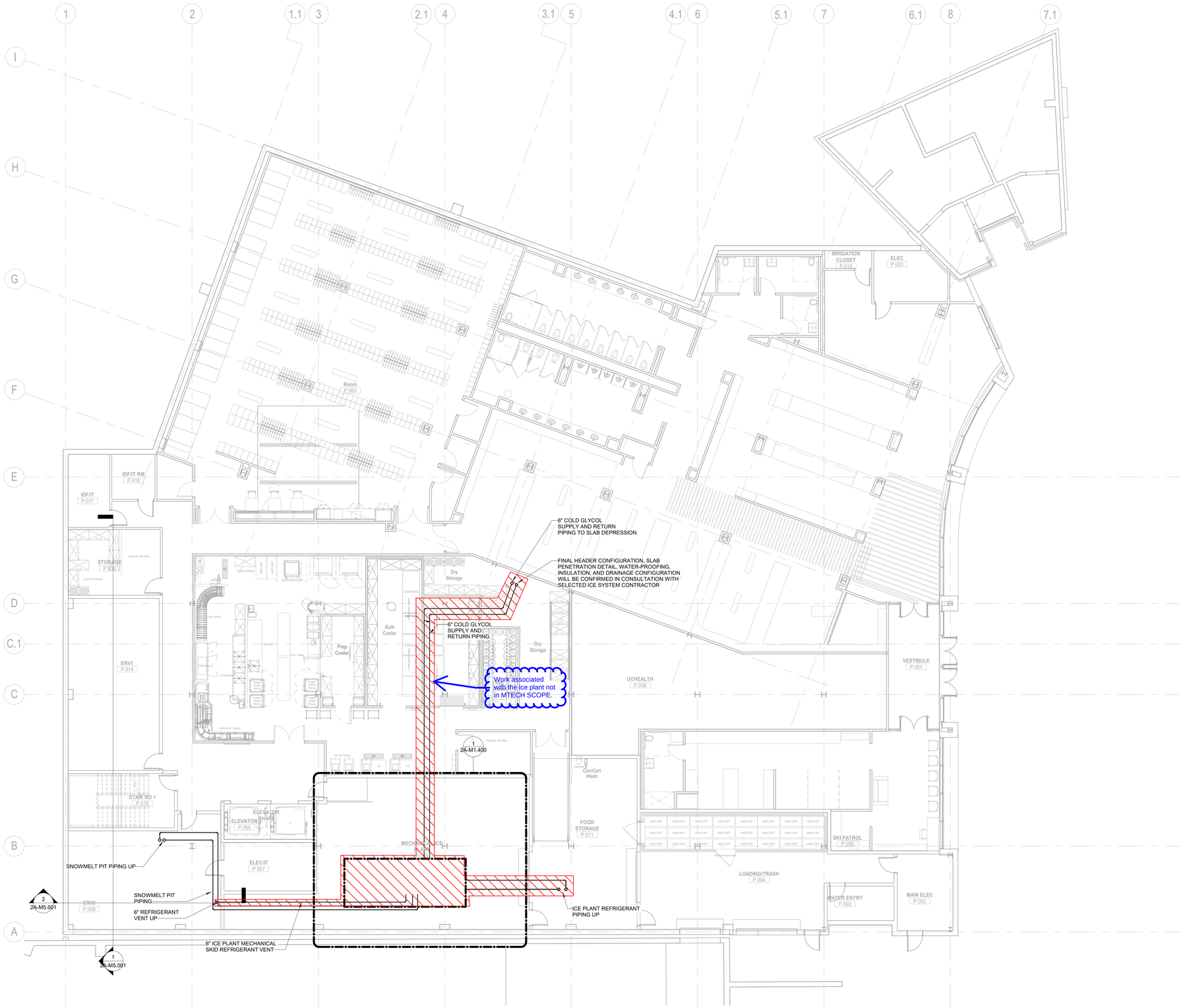
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL PLAN - LEVEL 02

Scale
1/8" = 1'-0"
Ref North

2A-M1.202



1 ICE PLANT PLAN - LOWER LEVEL 00 PROMENADE

SCALE: 1/8" = 1'-0"

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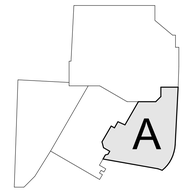
Project Number
003.7835.000

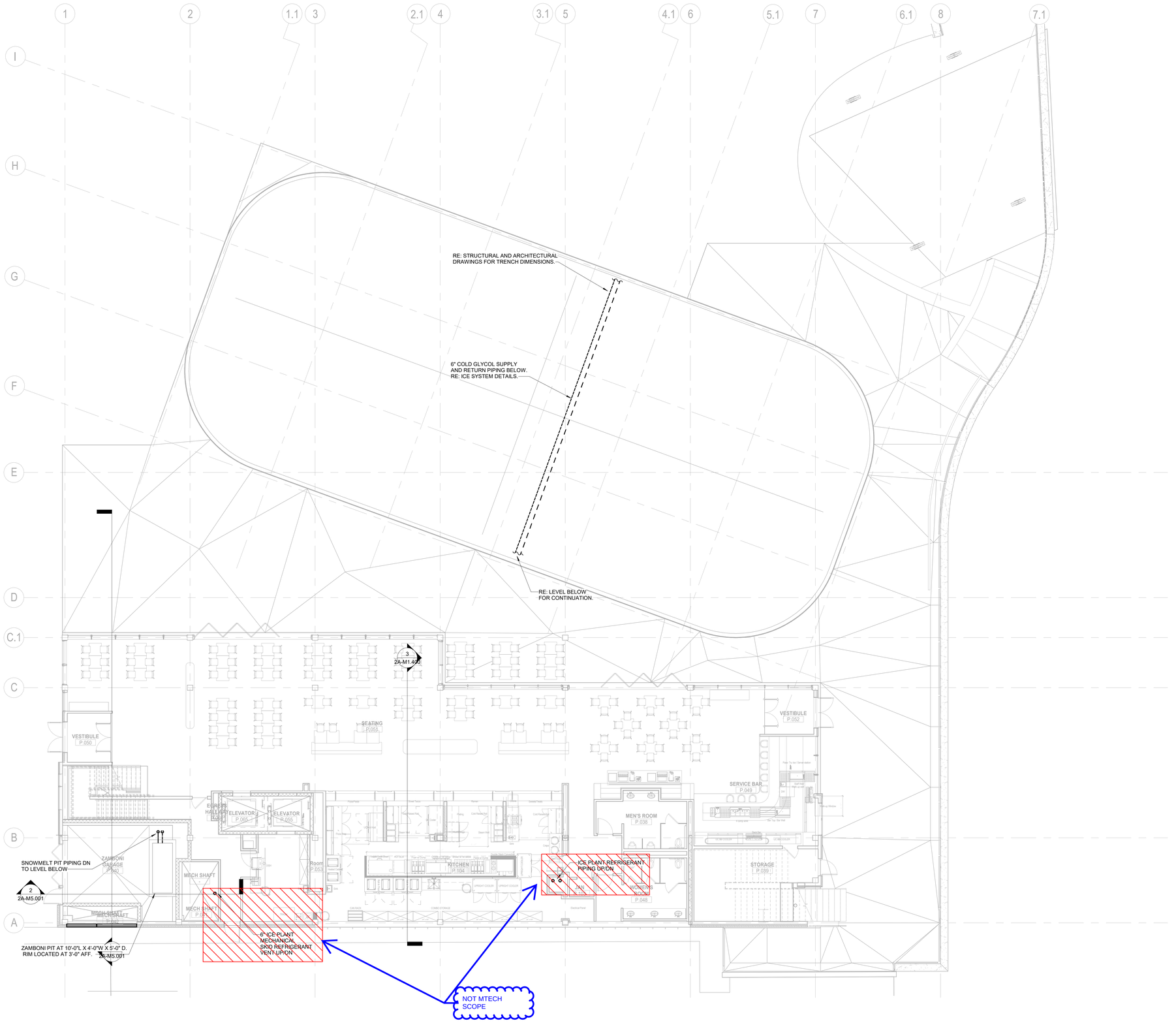
Description
ICE PLANT PLAN - LEVEL 00

Scale
1/8" = 1'-0" Ref North

2A-M1.300

KEY PLAN





1 ICE PLANT PLAN - LEVEL 01 PLAZA

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

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2. MAINTAIN CODE REQUIRED AREA OF SEPARATION FROM OUTSIDE AIR INTAKES TO TERMINATIONS OF EXHAUST, COMBUSTION AIR, PLUMBING VENTS, ETC.

3. COORDINATE EQUIPMENT HOUSEKEEPING PAD DIMENSIONS AND LAYOUT WITH THE GENERAL CONTRACTOR BASED ON FINAL EQUIPMENT SIZES.

4. PROVIDE MANUAL BALANCE DAMPERS IN ALL SUPPLY DUCT BRANCH TAPS DOWNSTREAM OF VAV BOXES.

5. PROVIDE MANUAL BALANCE DAMPERS IN ALL EXHAUST DUCT BRANCH TAPS.

6. COORDINATE SPACE TEMPERATURE SENSORS AND THERMOSTAT LOCATIONS TO ALIGN VERTICALLY WITH LIGHT SWITCHES.

7. TEMPERATURE CONTROLS CONTRACTOR SHALL SUBMIT PLANS INDICATING ALL SPACE TEMPERATURE SENSORS, T-STATS, HUMIDITY SENSORS, ETC. AS PART OF SUBMITTAL PROCESS FOR A/E REVIEW PRIOR TO ROUGH-IN.

8. PROVIDE THROUGH FACE BALANCING FOR ALL DIFFUSERS, REGISTERS, AND GRILLES ABOVE INACCESSIBLE AREAS.

9. PROVIDE TURNING VANES IN ALL 90° DUCT ELBOWS.

10. INSTALL EXPOSED DUCTWORK AS HIGH AS POSSIBLE.

11. ALL DUCT/PIPE PENETRATIONS THROUGH FIRE RATED/SMOKE RATED PARTITIONS SHALL BE CAULKED AND SEALED TO MEET THE RATING REQUIRED. REFER TO LIFE SAFETY DRAWINGS FOR FIRE/SMOKE RATING REQUIREMENTS.

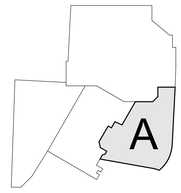
12. PROVIDE ISOLATION VALVES AT EACH BRANCH LINE OFF OF RISER.

13. PROVIDE 3/4" BRANCH PIPING TO ALL TERMINAL UNITS, UNLESS NOTED OTHERWISE.

14. PROVIDE CONDENSATE DRAIN FROM ALL CHILLED WATER COILS AND DX EVAPORATOR COILS TO NEAREST MOP SINK OR MECHANICAL ROOM FLOOR DRAIN. PROVIDE CONDENSATE PUMP FOR WALL MOUNTED UNITS AND CONCEALED UNITS THAT CANNOT BE GRAVITY DRAINED TO TERMINATION LOCATION

KEYNOTES

KEY PLAN



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△	Date	Description
	2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

NOT FOR CONSTRUCTION

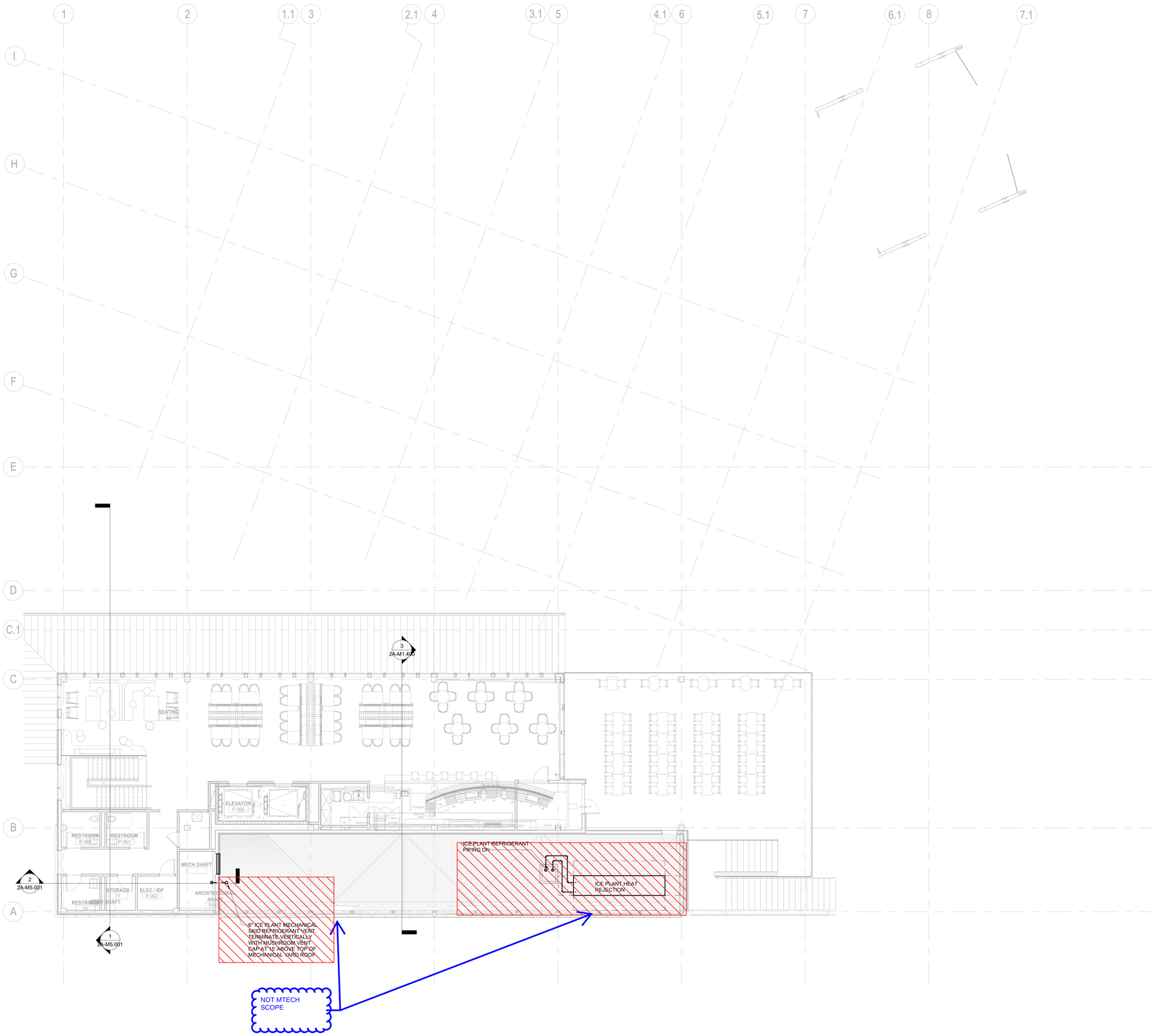
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
ICE PLANT PLAN - LEVEL 01

Scale
1/8" = 1'-0" Ref North

2A-M1.301



1 ICE PLANT PLAN - LEVEL 02 PLAZA

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

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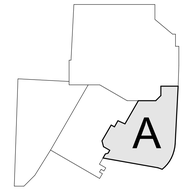
KEYNOTES

KEY PLAN



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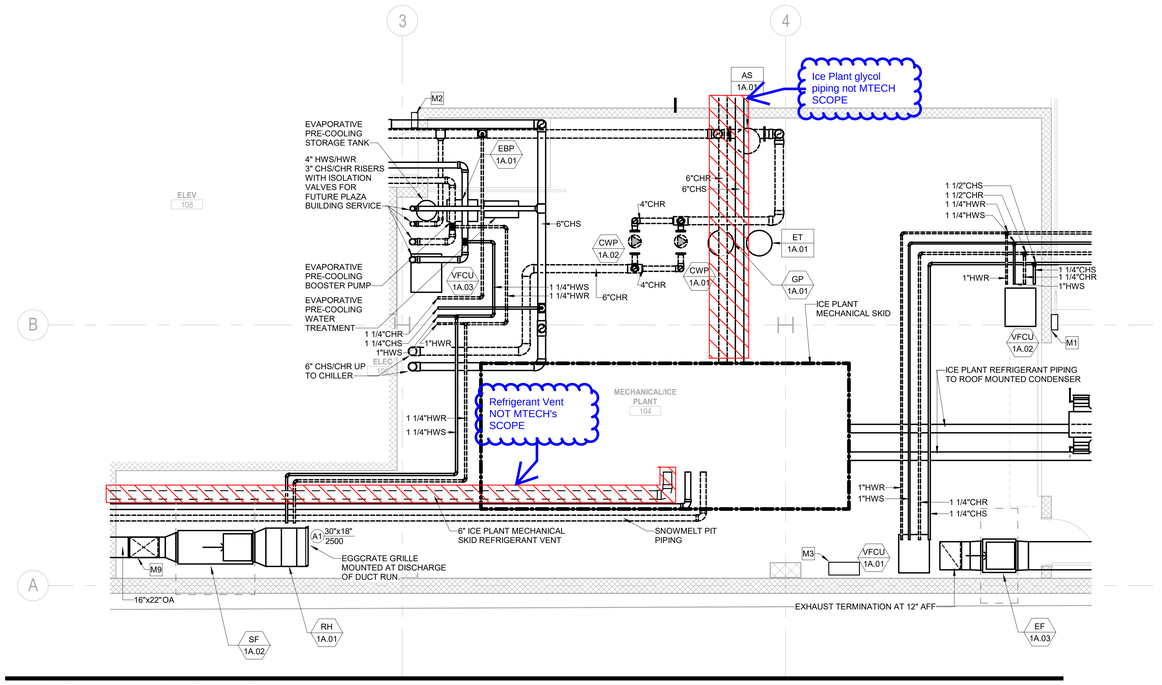
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
ICE PLANT PLAN - LEVEL 02

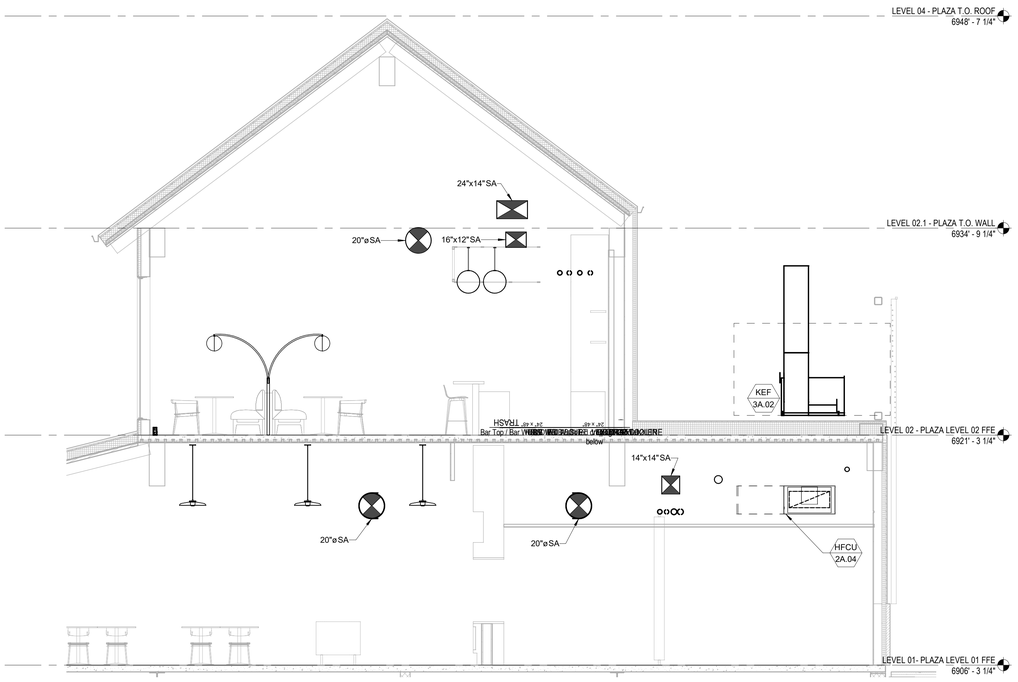
Scale
1/8" = 1'-0" Ref North

2A-M1.302



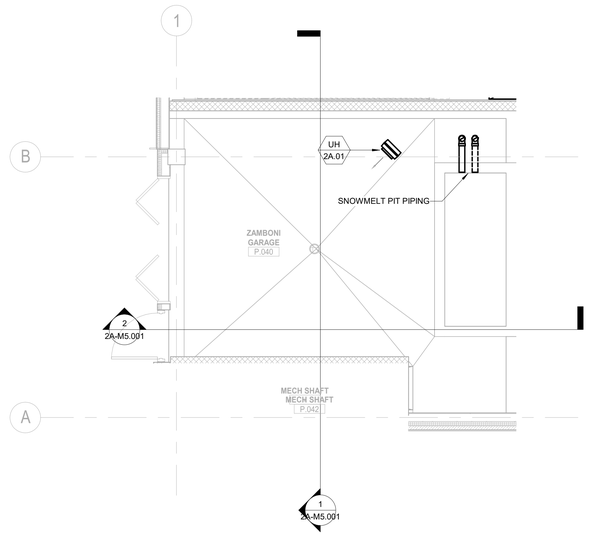
1 MECHANICAL/ICE PLANT ROOM

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



3 MEP SECTION

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



2 ZAMBONI GARAGE - LEVEL 01 PLAZA

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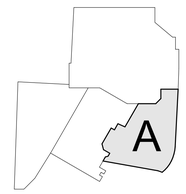
KEYNOTES

M1	REFRIGERANT LEAK DETECTION SYSTEM REMOTE MONITORING SYSTEM.
M2	REFRIGERANT LEAK DETECTION SYSTEM REMOTE MONITORING PANEL.
M3	REFRIGERANT LEAK MONITORING SYSTEM. RE: SPECIFICATION 13 10 61 ICE RINK REFRIGERATION AND PIPING.
M9	OUTSIDE AIR DUCT ROUTING UNDER SUPPLY AIR DUCT FROM MAU 1A.01 AND ELBOWED UP TIGHT TO STRUCTURE IN THE MECHANICAL/ICE PLANT ROOM.

KEY PLAN



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Project Name

SSRC | BASE AREA IMPROVEMENTS

Project Number

003.7835.000

Description

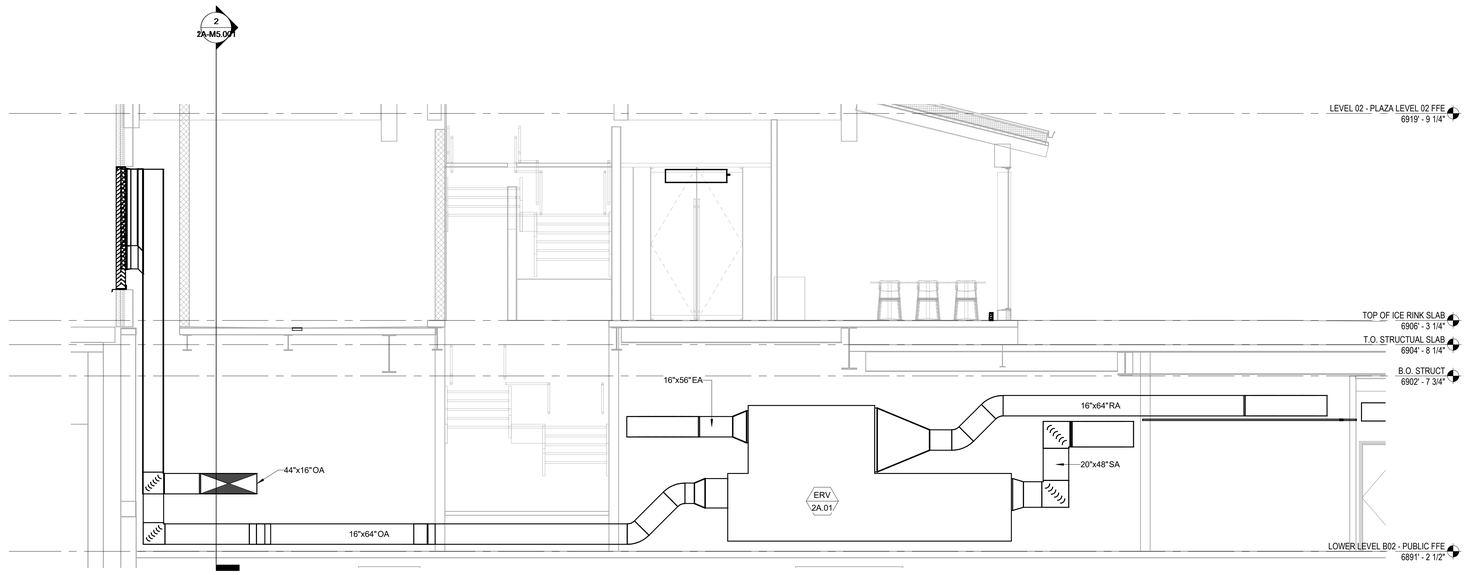
MECHANICAL ENLARGED PLANS

Scale

1/4" = 1'-0"

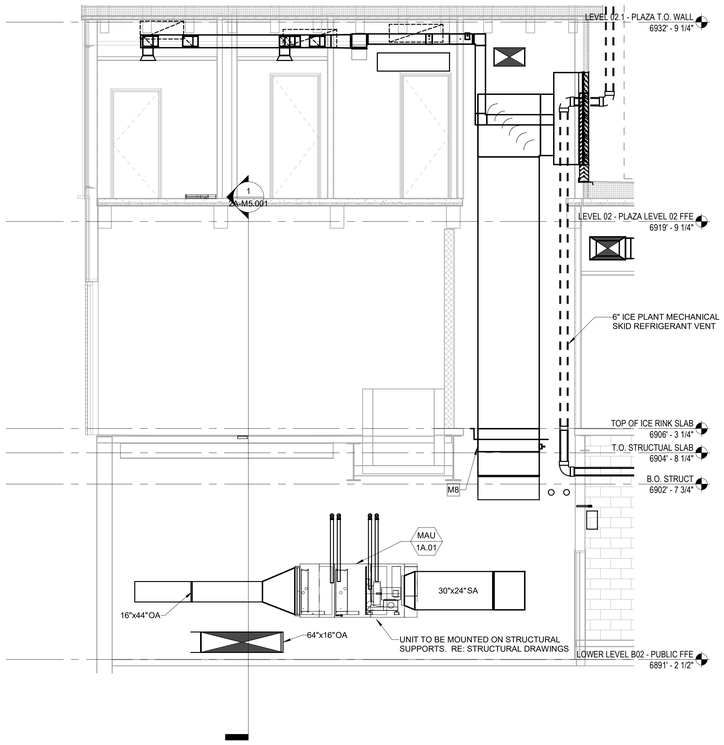
Ref North

2A-M1.400



1 PROMENADE MECHANICAL SECTION 1

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



2 PROMENADE MECHANICAL SECTION 2

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

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MECHANICAL SECTIONS

Scale

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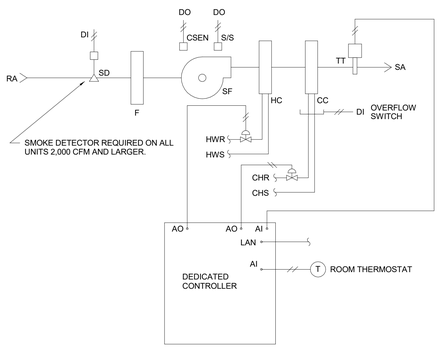
2A-M5.001



D ICE PLANT FAN COIL UNIT CONTROL
NONE

SEQUENCE OF OPERATION:

A. GENERAL:
1. THE FOLLOWING SEQUENCE OF OPERATION INCLUDES REQUIRED FUNCTIONALITY OF THE FAN COIL UNIT. POINTS REQUIRED TO EXECUTE THIS SEQUENCE SHALL BE COORDINATED BETWEEN THE EQUIPMENT PROVIDER AND TEMPERATURE CONTROLS CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. SUBMIT LIST OF ITEMS TO BE PROVIDED BY THE TEMPERATURE CONTROLS CONTRACTOR IN ORDER TO EXECUTE THIS SEQUENCE.

B. OCCUPIED MODE:
1. WHEN THE UNIT IS IN THE OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE INTERMITTENTLY. THE SUPPLY FAN SHALL DELIVER CONSTANT AIRFLOW. COOLING VALVE AND HEATING VALVE (WHERE APPLICABLE) SHALL MODULATE IN SEQUENCE TO MAINTAIN SPACE TEMPERATURE SETPOINT.
2. UNITS ARE INTENDED TO REMAIN IN OCCUPIED MODE 24 HOURS PER DAY, 7 DAYS PER WEEK, YEAR-ROUND.

C. UNOCCUPIED MODE:
1. WHEN THE UNIT ENTERS UNOCCUPIED MODE THE SUPPLY FAN SHALL BE OFF, COOLING CONTROL VALVE SHALL CLOSE, AND HEATING CONTROL VALVE SHALL CLOSE.

D. FAN SAFETY CONTROLS:
1. DE-ENERGIZE THE SUPPLY FAN WHENEVER THE OVERFLOW SENSOR HAS TRIPPED OR SUPPLY FAN STATUS INDICATES A FAILURE (AFTER A TWO-MINUTE DELAY). MANUAL RESET REQUIRED FOR ALL FAILURES.
2. ALARM THE BMS WITH THE APPROPRIATE ALARM MESSAGE.

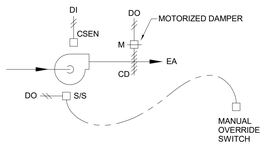
E. SMOKE DETECTION SHUTDOWN:
1. UNITS 2,000 CFM AND LARGER: WHEN SMOKE IS DETECTED AT THE RETURN AIR INLET, THE SUPPLY FAN SHALL BE DE-ENERGIZED, THE COOLING SHALL BE DISABLED, AND HEATING SHALL BE DISABLED.

F. REFRIGERANT LEAK DETECTION:
1. WHEN A REFRIGERANT LEAK IS DETECTED IN THE ROOM, THE UNIT SHALL CONTINUE IN CURRENT OPERATING MODE.

G. SPACE TEMPERATURE CONTROL:
1. PROVIDE A DISCHARGE AIR TEMPERATURE SENSOR FOR EQUIPMENT MONITORING.
2. PROVIDE A DEAD-BAND BETWEEN COOLING AND HEATING WHERE THE COOLING AND HEATING ARE DISABLED AND THE SUPPLY FAN SHALL BE OFF.

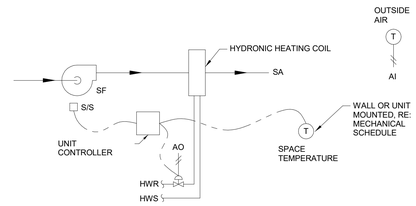
H. HEATING CONTROL:
1. THE HEATING CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE HEATING SETPOINT. HEATING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.

I. COOLING CONTROL:
1. THE COOLING CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE COOLING SETPOINT. COOLING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.



E LOADING DOCK EXHAUST FAN CONTROL
NONE

A. FAN SHALL BE INTERLOCKED WITH ENERGY RECOVERY VENTILATOR SERVING SAME AREA. MOTORIZED DAMPER SHALL OPEN AND FAN SHALL BE ENERGIZED WHENEVER ASSOCIATED ENERGY RECOVERY VENTILATOR IS OPERATING.
B. PROVIDE WALL MOUNTED OVERRIDE SWITCH TO MANUALLY START THE FAN AND OPEN THE MOTORIZED DAMPER. WALL MOUNTED OVERRIDE SWITCH TO BE LOCATED IN LOADING/TRASH AREA NEAR EXTERIOR ENTRY DOOR. SWITCH SHALL BE LABELED WITH TWO POSITIONS: "MANUAL ON" AND "AUTO-BMS CONTROL".

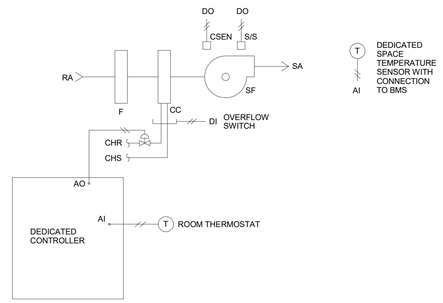


A HYDRONIC CABINET UNIT HEATER/ HYDRONIC UNIT HEATER CONTROL
NONE

A. THERMOSTAT SHALL CYCLE FAN & OPEN HEATING WATER VALVE TO MAINTAIN SPACE SETPOINT. HEATING VALVE COMMANDED POSITION TO BE REPORTED TO THE BMS AS PERCENTAGE OPEN.
B. WHERE REMOTE MOUNTED THERMOSTAT IS INDICATED, PROVIDE CONTROL TRANSFORMER AND LOW VOLTAGE THERMOSTAT BY TEMPERATURE CONTROLS CONTRACTOR.
C. ALL HEATERS SERVING BUILDING ENTRY VESTIBULES SHALL BE PROVIDED WITH BMS RELAY TO INTERRUPT POWER AND PREVENT UNIT OPERATION WHEN OUTSIDE AIR IS ABOVE 45 DEGREES F. EACH VESTIBULE THERMOSTAT SHALL BE CONFIGURED TO HEAT THE VESTIBULE TO NO HIGHER THAN 60 DEGREES F.

B HYDRONIC FIN TUBE CONTROL
NONE

A. 2-WAY MODULATING CONTROL VALVE SHALL OPEN TO MAINTIAIN SPACE TEMPERATURE HEATING SETPOINT. MULTIPLE SECTIONS MAY BE CONTROLLED VIA THE SAME VALVE WITHIN THE SAME TEMPERATURE ZONE (EXPOSURE). UP TO 50 LINEAL FEET OF FIN TUBE MAY BE CONNECTED TO A SINGLE HEATING WATER CONTROL VALVE. HEATING WATER CONTROL VALVES SHALL OPERATE AS THE FIRST STAGE OF HEATING FOR ASSOCIATED ZONE. HEATING VALVE POSITION TO BE REPORTED TO THE BMS AS PERCENTAGE OPEN.



C WALL MOUNTED FAN COIL UNIT CONTROL
NONE

SEQUENCE OF OPERATION:

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C. UNOCCUPIED MODE:
1. WHEN THE FCU ENTERS UNOCCUPIED MODE THE SUPPLY FAN SHALL BE OFF AND THE COOLING CONTROL VALVE SHALL CLOSE.

D. FAN SAFETY CONTROLS:
1. ALARM THE BMS WHEN SPACE TEMPERATURE RISES ABOVE 80F (ADJ.). ALARM THE BMS WITH APPROPRIATE MESSAGE.

E. COOLING CONTROL:
1. THE COOLING CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE COOLING SETPOINT. COOLING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.

CONTROL LEGEND

ABBR	DESCRIPTION
AI	ANALOG INPUT
AO	ANALOG OUTPUT
BDD	BACKDRAFT DAMPER
BTU	BTU METER
C	CONTROLLER
CC	COOLING COIL
CD	CONTROL DAMPER
CFM	AIRFLOW MEASURING SENSOR
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
CO2	CARBON DIOXIDE
COND	CONDENSATE OVERFLOW
COV	CHANGE OF VALUE
CSEN	CURRENT SENSOR
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
DP	DIFFERENTIAL PRESSURE
EA	EXHAUST AIR
ES	END SWITCH
F	FILTER ASSEMBLY OR FAIL
FACP	FIRE ALARM CONTROL PANEL
FAS	FIRE ALARM SYSTEM
FC	FAIL CLOSED
FCU	FAN COIL UNIT
FM	FLOW METER
FO	FAIL OPEN
FR	FREEZESTAT
FRN	FURNACE
FS	FLOW SWITCH
FSCP	FIREFIGHTER SMOKE CONTROL PANEL
FSPD	FAN SPEED
FT	FLOW TRANSMITTER
H	HUMIDITY OR HIGH
HC	HEATING COIL
H/L	HIGH/LOW
HH	HIGH LIMIT HUMIDITY SWITCH
HS	HUMIDITY SENSOR
HT	HUMIDITY TRANSMITTER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
IR	INTERLOCK RELAY
L	LEVEL OR LOW
LAN	LOCAL AREA NETWORK CONNECTION
M	MOTORIZED CONTROL
MIN	MINIMUM
ND	NITROGEN DIOXIDE
OA	OUTSIDE AIR
OS	OCCUPANCY SENSOR
P	SPACE STATIC PRESSURE
P-E	PNEUMATIC ELECTRIC SWITCH
PHC	PREHEAT COIL
PT	PRESSURE TRANSMITTER
PZ	PIEZOMETER RING
RA	RETURN AIR
RF	RETURN FAN
S	SPACE TEMPERATURE SENSOR
S/S	START/STOP
SA	SUPPLY AIR
SC	SPEED CONTROL
SD	SMOKE DETECTOR
SF	SUPPLY FAN
SPT	STATIC PRESSURE TRANSMITTER
SR	SWITCHING RELAY
T	THERMOSTAT
TM	THERMAL MASS METER
TO	TIMED OVERRIDE SWITCH
TS	TEMPERATURE SENSOR
TT	TEMPERATURE TRANSMITTER
TTAB	TEMPERATURE TRANSMITTER W/AVERAGING BULB
V	VALVE
VFD	VARIABLE FREQUENCY DRIVE
VP	VIRTUAL POINT
VS	VELOCITY SENSOR
WBT	WET BULB TEMPERATURE TRANSMITTER

MISCELLANEOUS NON-DDC CONTROL:

A. CHEMICAL TREATMENT: PROVIDE REQUIRED FIELD WIRING INTERLOCKS.

B. MISCELLANEOUS PUMPS: PUMPS SHALL OPERATE PER SCHEDULE AND DRAWINGS. FOR EXAMPLE, RECIRCULATION PUMPS CYCLE TO MAINTAIN DHW TEMPERATURE.

MISCELLANEOUS DDC CONTROL:

A. AUTOMATED INTERFACE: PROVIDE WEB-BASED INTERFACE FOR REMOTE ACCESS TO THE BMS. INTERFACE SHALL BE PASSWORD PROTECTED AND SHALL ALLOW FOR FULL CONTROL OF ALL BMS FUNCTIONALITY.

B. FIRE ALARM SYSTEM INTERFACE: PROVIDE CONNECTION TO FIRE ALARM SYSTEM AND REPORT FIRE ALARM CONDITION AT BMS OPERATOR STATION.

C. PUMPS SHALL OPERATE PER OTHER APPLICABLE CONTROL SECTIONS. BMS SHALL MONITOR ALL PUMPS INCLUDING GLYCOL FEED PUMPS. DOMESTIC HOT WATER RECIRCULATION PUMP(S) ARE EXCLUDED.

D. REFERENCE MECHANICAL EQUIPMENT SCHEDULES (ESPECIALLY "FANS") FOR ADDITIONAL CONTROL SEQUENCES.

E. FANS:
1. UNLESS NOTED OTHERWISE, PROVIDE START, STOP, AND STATUS AT BMS OPERATOR STATION FOR ALL FANS. PROVIDE STATUS ONLY FOR FANS OPERATED VIA LINE VOLTAGE THERMOSTAT, MANUAL SWITCH, OR LOCAL TIMER. FAN STATUS SHALL BE INDICATED VIA CURRENT SENSOR AT FAN ELECTRICAL CONNECTION.
2. RE: MECHANICAL SCHEDULES FOR ADDITIONAL REQUIREMENTS.

F. ELECTRICAL AND DATA ROOM TEMPERATURE MONITORING:
1. PROVIDE SPACE TEMPERATURE SENSOR IN EACH ELECTRICAL ROOM AND DATA ROOM FOR BMS TEMPERATURE MONITORING AND HIGH/LOW ALARMING.

G. ELECTRIC HEAT TRACE SYSTEMS:
1. EACH HEAT TRACE SYSTEM SHALL OPERATE UNDER ITS OWN SELF CONTAINED CONTROLS. ALARM BMS WHEN FAILURE US DETECTED AT EACH HEAT TRACE CONTROLLER. ALARMS SHALL BE ADDRESSABLE TO EACH HEAT TRACE SYSTEM.
2. HEAT TRACE SYSTEMS:
2.1. PLAZA LEVEL CHILLED WATER SUPPLY/RETURN PIPING TO CHILLER

H. EXHAUST, RELIEF, AND INTAKE DAMPERS:
1. EXHAUST, RELIEF, AND INTAKE LOCATIONS THAT CONTAIN MOTORIZED DAMPERS SHALL INTERLOCK THE POSITION OF THE DAMPER WITH THE OPERATION OF THE ASSOCIATED EQUIPMENT. WHEN THE EQUIPMENT IS ENABLED, THE DAMPER SHALL BE OPEN. WHEN THE EQUIPMENT IS DISABLED, THE DAMPER SHALL BE CLOSED. ALL DAMPERS TO BE FAST-ACTING OR AN EQUIPMENT DELAY SHALL BE PROVIDED TO PREVENT FULL AIRFLOW PRIOR TO DAMPER REACHING FULL OPEN POSITION.

H. SUMP LEVEL ALARMS:
1. PROVIDE LEVEL ALARM AT EACH PLUMBING SUMP. ALARM THE BMS WHEN AN OVERFLOW CONDITION EXISTS. ALARM MAY BE EITHER A DEDICATED LEVEL ALARM OR CONNECTION TO THE ASSOCIATED SUMP PUMP.
2. SUMP LEVEL ALARMS:
2.1. ELEVATOR SUMPS
2.2. SUMP PUMPS
2.3. SEWAGE EJECTORS

I. ICE SYSTEM:
1. PROVIDE THE FOLLOWING POINTS FROM THE ICE SYSTEM CONTROLS AT THE BMS OPERATOR STATION: SLAB TEMPERATURE (2 LOCATIONS), BRINE SUPPLY TEMPERATURE, REFRIGERANT LEAK DETECTION ALARM.

CONTROL SYSTEM GENERAL NOTES:

DESIGN INTENT:

A. THE CONTROL DRAWINGS AND SEQUENCES ARE PROVIDED TO COMMUNICATE A DESIGN INTENT FOR CONTROL OF INDICATED SYSTEMS. ALTERNATIVE CONTROL METHODS MAY BE USED WHERE PRACTICAL OR WHERE NECESSARY TO MEET REQUIRED SYSTEM PERFORMANCE. WHERE ALTERNATIVE CONTROL METHODS ARE USED TO MEET THE DESIGN INTENT, THESE METHODS SHALL BE INDICATED IN SUBMITTAL TO ENGINEER FOR EVALUATION. ENGINEER SHALL DETERMINE IF A SUBMITTED ALTERNATIVE CONTROL METHOD MEETS THE DESIGN INTENT.

B. ALTHOUGH THE MECHANICAL DRAWINGS MAY INDICATE A PRODUCT AS BASIS OF DESIGN, THE CONTROL DRAWINGS AND SEQUENCES ARE PROVIDED TO INDICATE A DESIGN INTENT FOR THE COMPLETE SYSTEM THAT IS APPLICABLE TO MULTIPLE POTENTIAL PRODUCTS OR MANUFACTURERS. CONTROL METHODS SHALL BE DEVELOPED BY THE TEMPERATURE CONTROLS CONTRACTOR AND/OR EQUIPMENT PROVIDER IN ORDER TO ACHIEVE THE REQUIRED SYSTEM PERFORMANCE.

REQUIRED COORDINATION:

A. THE DIVISION 23 CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION BETWEEN EQUIPMENT PROVIDERS AND TEMPERATURE CONTROLS CONTRACTOR IN ORDER TO FULLY SATISFY THE DESIGN INTENT. INTERFACE BETWEEN THE BMS AND CONTROLLED EQUIPMENT, INCLUDING ITEMS PROVIDED BY EACH ENTITY, COMMUNICATION PROTOCOL, SIGNAL TYPE, ETC., SHALL BE COORDINATED PRIOR TO RELEASE OF EQUIPMENT FOR PRODUCTION.

B. THE TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE SUBMITTAL DRAWINGS AND PRODUCT DATA FOR THE ENTIRE CONTROL SYSTEM TO ENGINEER FOR REVIEW. THE DIVISION 230900 SUBMITTAL SHALL DISTINGUISH WHERE SPECIFIC SEQUENCE ELEMENTS ARE PROVIDED WITHIN THE BUILDING MANAGEMENT SYSTEM OR WITHIN PACKAGED EQUIPMENT CONTROLLERS. RE: SPECIFICATIONS FOR REQUIREMENTS.

C. REFER TO SPECIFICATION SECTION 23 05 01 MECHANICAL AND ELECTRICAL COORDINATION.

SEQUENCE OF OPERATION GENERAL NOTES:

GENERAL:

A. ALTHOUGH EACH SEPARATE CONTROL DIAGRAM MAY INDICATE AN OUTDOOR AIR TEMPERATURE SENSOR, OUTDOOR AIR HUMIDITY SENSOR, AND/OR OUTSIDE AIR CARBON DIOXIDE SENSOR, TEMPERATURE CONTROLS CONTRACTOR MAY UTILIZE ONE OF EACH SENSOR AS A COMMON INPUT TO THE SYSTEM FOR USE IN MULTIPLE SEQUENCES. COORDINATE LOCATION WITH ARCHITECT/ENGINEER PRIOR TO INSTALLATION.

B. PROVIDE INDIVIDUAL INPUTS OR OUTPUTS FOR EACH POINT LISTED IN THE POINTS LISTS OR CONTROL DIAGRAM. PROVIDE ANY ADDITIONAL POINTS NOT LISTED IN THE POINTS LIST OR CONTROL DIAGRAM, BUT REQUIRED TO MEET THE SEQUENCE OF OPERATION, AT NO ADDITIONAL COST TO THE OWNER. ALL ANALOG OUTPUTS SHALL BE 4-20MA, 0-10VDC OR 0-20VDC UNLESS OTHERWISE INDICATED.

C. ALL SETPOINTS SHALL BE FULLY ADJUSTABLE AT THE OPERATOR WORKSTATION UNLESS NOTED OTHERWISE.

D. PROVIDE OVERRIDE CONTROL OF ALL POINTS AT THE OPERATOR WORKSTATION UNLESS NOTED OTHERWISE OR WHERE PROHIBITED BY EQUIPMENT PACKAGED CONTROLLERS.

E. IN THE EVENT OF A POWER OUTAGE OR OTHER MALFUNCTION, THE CURRENTLY ENABLED CONTROLS SEQUENCES SHALL BE MAINTAINED. RE: SPECIFICATIONS. IN ADDITION, CHILLED WATER VALVES SHALL FAIL CLOSED AND HEATING WATER VALVES SHALL FAIL OPEN.

OCCUPANCY SCHEDULES:

A. THE FOLLOWING SPECIAL OCCUPANCY SCHEDULE MODES ARE HEREBY DEFINED:
1. OCCUPIED MODE
2. UNOCCUPIED MODE

B. ANY DEVICE UTILIZING ON/OFF CONTROL OR SCHEDULING VIA BMS SHALL BE CAPABLE OF BEING PROGRAMMED TO CONFORM TO ANY OF THE ABOVE SEQUENCES.

C. THE BMS SHALL STAGE AIR HANDLERS TO/FROM OCCUPIED MODE TO MINIMIZE SUDDEN CHANGES IN SYSTEM FLOW REQUIREMENTS.

INITIAL SPACE THERMOSTAT SEPOINTS

A. INITIAL SPACE THERMOSTAT SETPOINTS SHALL BE AS FOLLOWS:

1. OCCUPIED SPACES:
COOLING: 76F
HEATING: 70F
2. MECHANICAL AND ELECTRICAL ROOMS:
COOLING: 80F
HEATING: 65F
3. BUILDING ENTRY VESTIBULES:
HEATING: 60F
4. MISCELLANEOUS HEATING-ONLY AREAS:
HEATING: 65F

ALL SPACE THERMOSTAT SETPOINTS CORRESPONDING TO EQUIPMENT CONTROLLED BY THE BMS SHALL BE ADJUSTABLE FROM THE BMS OPERATOR STATION.

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Date	Description
2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

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NOT FOR CONSTRUCTION

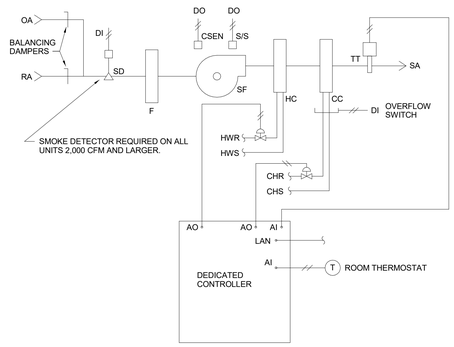
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL CONTROLS

Scale
1/8" = 1'-0"

2A-M7.001



A FAN COIL UNIT CONTROL
NONE

SEQUENCE OF OPERATION:

A. GENERAL:
1. THE FOLLOWING SEQUENCE OF OPERATION INCLUDES REQUIRED FUNCTIONALITY OF THE FAN COIL UNIT. POINTS REQUIRED TO EXECUTE THIS SEQUENCE SHALL BE COORDINATED BETWEEN THE EQUIPMENT PROVIDER AND TEMPERATURE CONTROLS CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. SUBMIT LIST OF ITEMS TO BE PROVIDED BY THE TEMPERATURE CONTROLS CONTRACTOR IN ORDER TO EXECUTE THIS SEQUENCE.

B. OCCUPIED MODE:
1. WHEN THE FCU IS IN THE OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY. THE SUPPLY FAN SHALL DELIVER CONSTANT AIRFLOW. COOLING VALVE AND HEATING VALVE SHALL MODULATE IN SEQUENCE TO MAINTAIN DISCHARGE AIR TEMPERATURE. DISCHARGE AIR TEMPERATURE SHALL BE RESET AS NECESSARY TO MAINTAIN SPACE TEMPERATURE.

C. UNOCCUPIED MODE:
1. WHEN THE FCU ENTERS UNOCCUPIED MODE THE SUPPLY FAN SHALL BE OFF, COOLING CONTROL VALVE SHALL CLOSE. AND HEATING CONTROL VALVE SHALL CLOSE.
2. SPACE TEMPERATURE SHALL BE SETBACK AND MAINTAINED BELOW A 5F (ADJ.) OFFSET TO OCCUPIED MODE COOLING SETPOINT AND ABOVE A 10F (ADJ.) OFFSET TO OCCUPIED MODE HEATING SETPOINT.
3. WHEN COOLING IS REQUIRED IN THE SPACE, THE SUPPLY FAN SHALL CYCLE ON AND COOLING SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE.
4. WHEN HEATING IS REQUIRED IN THE SPACE, THE SUPPLY FAN SHALL CYCLE ON AND HEATING SHALL MODULATE TO FULL.
5. UPON SPACE TEMPERATURE REACHING UNOCCUPIED MODE SETPOINT, UNIT SHALL CYCLE OFF.

D. OPTIMUM START WARM-UP MODE:
1. PRIOR TO SCHEDULED OCCUPANCY, IF THE SPACE TEMPERATURE IS LESS THAN THE MORNING WARM-UP SETPOINT OF 70F (ADJ.), THE OPTIMUM START WARM-UP SEQUENCE SHALL BE INITIATED.
2. THE CONTROL SYSTEM SHALL CALCULATE THE REQUIRED TIME TO BRING SPACE TEMPERATURE TO OCCUPIED HEATING SETPOINT BASED ON THE CURRENT SPACE TEMPERATURE AND THE CURRENT OUTSIDE AIR TEMPERATURE WHEN THE SEQUENCE IS INITIATED.
3. UPON INITIATING OPTIMUM START WARM-UP MODE, THE SUPPLY FAN AND HEATING SHALL MODULATE AS OUTLINED IN OCCUPIED MODE SEQUENCE TO MAINTAIN SPACE TEMPERATURE SETPOINT.
4. COOLING SHALL BE LOCKED OUT.
5. REVERT TO OCCUPIED MODE WHEN SPACE TEMPERATURE HAS REACHED OCCUPIED HEATING SETPOINT.

E. OPTIMUM START COOL-DOWN MODE:
1. PRIOR TO SCHEDULED OCCUPANCY, IF THE SPACE TEMPERATURE IS MORE THAN THE MORNING COOL-DOWN SETPOINT OF 78F (ADJ.), THE OPTIMUM START COOL-DOWN SEQUENCE SHALL BE INITIATED.
2. THE CONTROL SYSTEM SHALL CALCULATE THE REQUIRED TIME TO BRING SPACE TEMPERATURE TO OCCUPIED COOLING SETPOINT BASED ON THE CURRENT SPACE TEMPERATURE AND THE CURRENT OUTSIDE AIR TEMPERATURE WHEN THE SEQUENCE IS INITIATED.
3. UPON INITIATING OPTIMUM START COOL-DOWN MODE, THE SUPPLY FAN AND COOLING SHALL MODULATE AS OUTLINED IN OCCUPIED MODE SEQUENCE TO MAINTAIN SPACE TEMPERATURE SETPOINT.
4. HEATING SHALL BE LOCKED OUT.
5. REVERT TO OCCUPIED MODE WHEN SPACE TEMPERATURE HAS REACHED OCCUPIED COOLING SETPOINT.

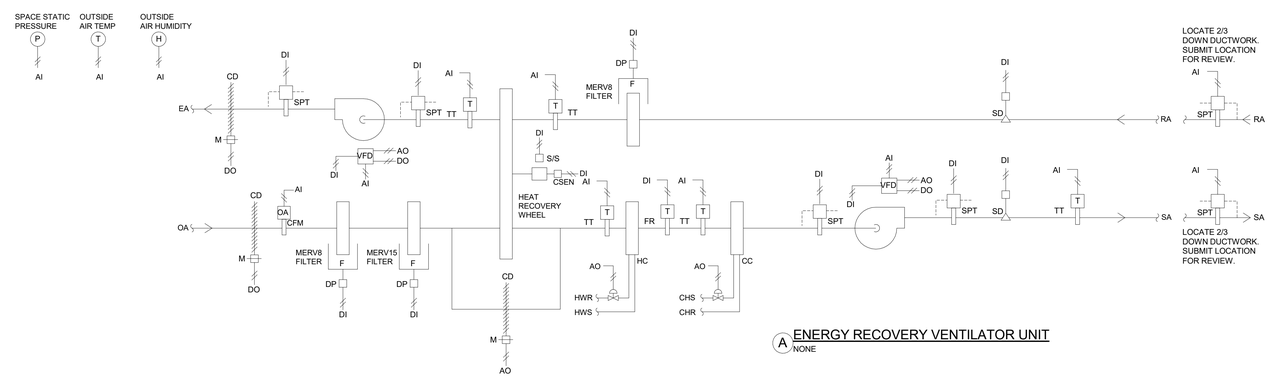
F. FAN SAFETY CONTROLS:
1. DE-ENERGIZE THE SUPPLY FAN WHENEVER THE OVERFLOW SENSOR HAS TRIPPED OR SUPPLY FAN STATUS INDICATES A FAILURE (AFTER A TWO-MINUTE DELAY). MANUAL RESET REQUIRED FOR ALL FAILURES.
2. ALARM THE BMS WITH THE APPROPRIATE ALARM MESSAGE.

G. SMOKE DETECTION SHUTDOWN:
1. UNITS 2,000 CFM AND LARGER: WHEN SMOKE IS DETECTED AT THE RETURN AIR INLET, THE SUPPLY FAN SHALL BE DE-ENERGIZED, THE COOLING SHALL BE DISABLED, AND HEATING SHALL BE DISABLED.
2. WHEN A FAN COIL UNIT HAS SHUT DOWN DUE TO SMOKE DETECTION, THE ASSOCIATED VENTILATION SYSTEM SERVING THE UNIT SHALL BE SHUT DOWN. PROVIDE ADDRESSABLE ALARM AT THE BMS OPERATOR STATION.
3. WHEN THE VENTILATION SYSTEM SERVING THE UNIT HAS SHUT DOWN DUE TO SMOKE DETECTION, THE FCU SUPPLY FAN SHALL BE DE-ENERGIZED, COOLING SHALL BE DISABLED, AND HEATING SHALL BE DISABLED.

H. DISCHARGE AIR TEMPERATURE:
1. PROVIDE A CASCADE RESET (VIA PID LOOP) OF DISCHARGE AIR TEMPERATURE TO MAINTAIN SPACE TEMPERATURE.
2. PROVIDE A DEAD-BAND BETWEEN COOLING AND HEATING WHERE THE COOLING AND HEATING ARE DISABLED AND THE SUPPLY FAN SHALL REMAIN ENERGIZED.

I. HEATING CONTROL:
1. THE HEATING CONTROL VALVE SHALL MODULATE TO MAINTAIN THE DAT. HEATING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.

J. COOLING CONTROL:
1. THE COOLING CONTROL VALVE SHALL MODULATE TO MAINTAIN THE DAT. COOLING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.



A ENERGY RECOVERY VENTILATOR UNIT
NONE

SEQUENCE OF OPERATION:

A. CONFIGURATION, RE: SCHEDULE

B. OCCUPIED MODE:
1. WHEN THE ERV IS IN THE OCCUPIED MODE, THE SUPPLY AND RETURN FANS SHALL OPERATE CONTINUOUSLY. THE SUPPLY FAN VFD SHALL MODULATE TO MAINTAIN THE SUPPLY DUCT STATIC PRESSURE AND THE EXHAUST FAN VFD SHALL MODULATE TO MAINTAIN THE EXHAUST DUCT STATIC PRESSURE. CHILLED WATER CONTROL VALVE, HEATING WATER CONTROL VALVE, AND HEAT RECOVERY WHEEL SHALL MODULATE IN SEQUENCE TO MAINTAIN DISCHARGE AIR TEMPERATURE (DAT). THE ERV SHALL ENTER OCCUPIED MODE BASED ON TIME OF DAY SCHEDULE AT BMS OPERATOR STATION.

C. UNOCCUPIED MODE:
1. WHEN THE ERV IS IN THE UNOCCUPIED MODE THE SUPPLY AND EXHAUST FANS SHALL BE OFF, THE HEAT WHEEL SHALL STOP, CHILLED WATER CONTROL VALVE SHALL CLOSE, HEATING WATER CONTROL VALVE SHALL CLOSE, THE OUTSIDE AIR DAMPER SHALL CLOSE, AND THE EA DAMPER SHALL CLOSE.
2. WHEN TEMPERATURE DOWNSTREAM OF THE HEATING COIL FALLS TO 45F (ADJ.), HEATING WATER VALVE SHALL MODULATE TO FULL OPEN AND REMAIN OPEN UNTIL TEMPERATURE DOWNSTREAM OF THE HEATING COIL RISES ABOVE SETPOINT.

D. FAN SAFETY CONTROLS:
1. DE-ENERGIZE THE SUPPLY AND EXHAUST FANS WHENEVER EITHER SMOKE DETECTOR HAS TRIPPED, HEAT RECOVERY ROTATION DETECTION FAILS, OR A FAN STATUS INDICATES A FAILURE (AFTER A TWO-MINUTE DELAY). SMOKE DETECTORS AND FAN FAILURES REQUIRE A MANUAL RESET.
2. DE-ENERGIZE THE SUPPLY AND EXHAUST FANS WHEN THE SUPPLY FAN DISCHARGE STATIC PRESSURE HIGH-LIMIT REACHES 4.0 INCHES WC (ADJ.).
3. DE-ENERGIZE THE SUPPLY AND EXHAUST FANS WHEN THE EXHAUST FAN DISCHARGE STATIC PRESSURE HIGH-LIMIT REACHES 2.0 INCHES WC (ADJ.).
4. PROVIDE SUCTION STATIC PRESSURE SWITCH AT INLET OF SUPPLY FAN. SWITCH TO BE TIED TO SUPPLY FAN START CIRCUIT. DE-ENERGIZE SUPPLY AND EXHAUST FAN WHEN SUCTION SUPPLY FAN STATIC PRESSURE HIGH-LIMIT REACHES 3.0 INCHES WC (ADJ.)
5. ALARM THE BMS WITH THE APPROPRIATE ALARM MESSAGE.

E. VFD CONTROL:
1. WHEN THE SUPPLY AND EXHAUST FANS ARE TURNED ON, EACH VFD SHALL SLOWLY RAMP UP TO SETPOINT AND MODULATE TO MAINTAIN THE CORRESPONDING DUCT STATIC PRESSURE. THE STATIC PRESSURE SENSORS SHALL BE LOCATED BY THIS DIVISION.
2. SUBMIT SENSOR LOCATIONS TO ENGINEER FOR REVIEW.
3. SENSING DEVICE SHALL BE MULTIPLE POINT, NON-PULSATING STATIC SENSING SECTION WITH SELF AVERAGING MANIFOLD.

F. OUTSIDE AIR MONITORING AND TRENDING:
1. MEASURE AND TREND THE OUTDOOR AIRFLOW THROUGH THE OUTDOOR AIRFLOW MEASURING STATION LOCATED AT THE INTAKE OF THE UNIT.

G. BUILDING PRESSURE CONTROL:
1. ZONE LEVEL EXHAUST AND VENTILATION:
1.1. EACH EXHAUSTED AREA IS PROVIDED WITH A CONSTANT VOLUME EAV BOX FOR PRESSURE INDEPENDENT EXHAUST AIRFLOW CONTROL. EACH VENTILATED AREA IS PROVIDED WITH EITHER A CONSTANT VOLUME OR A VARIABLE VOLUME VAV BOX FOR PRESSURE INDEPENDENT VENTILATION AIRFLOW CONTROL AND BUILDING PRESSURE CONTROL.
1.2. ALL EXHAUST EAV BOXES SHALL MODULATE TO MAINTAIN FIXED EXHAUST AIRFLOW RATES INDICATED.
1.3. SUPPLY VAV BOXES LOCATED IN THE SAME SPACE AS EAV BOXES SHALL BE CONSTANT VOLUME AND SHALL MODULATE TO MAINTAIN FIXED VENTILATION SUPPLY AIRFLOW.
1.4. SUPPLY VAV BOXES LOCATED IN AREAS THAT ARE NOT PROVIDED WITH EAV BOXES (HEALTH CLINIC, FOOD STORAGE, ETC.) SHALL MODULATE TOGETHER TO MAINTAIN POSITIVE BUILDING STATIC PRESSURE SETPOINT OF 0.03" W.C. AS MEASURED IN THE HEALTH CLINIC SPACE. SUPPLY VAV BOXES SHALL MODULATE AS A PERCENTAGE OF DESIGN AIRFLOW UP TO A MAXIMUM OF 125% OF DESIGN CFM.
2. SYSTEM STARTUP:
2.1. PRIOR TO EQUIPMENT STARTUP, ENSURE VENTILATION SYSTEM HAS ADEQUATE OPENINGS ONTO EACH AREA TO ALLOW FOR VENTILATION SUPPLY AIR FOR TESTING. DO NOT OPERATE THE ERV AT AIRFLOWS HIGHER THAN THE CONNECTED VAV BOXES CAN WITHSTAND.

H. DISCHARGE AIR CONDITIONS:
1. COOLING MODE: WHEN OUTSIDE AIR RISES ABOVE 65F (ADJ.), THE UNIT SHALL ENTER COOLING MODE.
1.1. DISCHARGE AIR DRY BULB TEMPERATURE SHALL FLOAT FROM A MINIMUM OF 65F (ADJ.) TO A MAXIMUM DISCHARGE AIR DRY BULB TEMPERATURE SETPOINT OF 70F (ADJ.). WHEN DISCHARGE AIR IS BETWEEN MINIMUM AND MAXIMUM, CHILLED WATER CONTROL VALVE SHALL CLOSE, THE HEAT WHEEL SHALL BE DISABLED, AND THE OUTSIDE AIR BYPASS DAMPER SHALL BE OPEN. IF DISCHARGE AIR TEMPERATURE RISES ABOVE SETPOINT, THE COOLING CONTROL VALVE SHALL MODULATE TO MAINTAIN DISCHARGE AIR DRY BULB TEMPERATURE SETPOINT.
1.2. CHILLED WATER COOLING AND HEAT WHEEL SHALL BE ENABLED TOGETHER IN STAGES.

2. HEATING MODE: WHEN OUTSIDE AIR FALLS BELOW 65F (ADJ.), THE UNIT SHALL ENTER HEATING MODE.
2.1. THE BMS SHALL CONTROL HEATING WATER CONTROL VALVE TO ENSURE UNIT DISCHARGE AIR DRY BULB TEMPERATURE DOES NOT FALL BELOW 65F (ADJ.) MINIMUM.
2.2. THE BMS SHALL RESET DISCHARGE AIR DRY BULB TEMPERATURE SETPOINT ACCORDING TO THE FOLLOWING RESET STRATEGY:

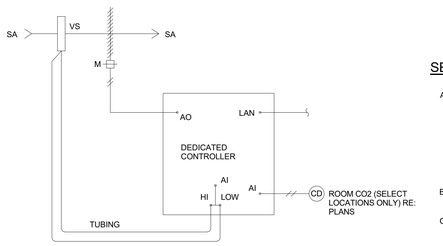
OUTSIDE AIR DRY BULB TEMPERATURE	DISCHARGE AIR DRY BULB TEMPERATURE
20 DEGREES F	75 DEGREES F (ADJ.)
50 DEGREES F	65 DEGREES F (ADJ.)
BETWEEN 20-50 DEGREES F	RAMP LINEARLY BETWEEN 75-65 F

2.3. HEATING WATER CONTROL VALVE AND HEAT WHEEL SHALL BE ENABLED TOGETHER IN STAGES.
2.4. 3. IF DISCHARGE AIR DRY BULB TEMPERATURE DROPS BELOW 40F (ADJ.), DE-ENERGIZE FANS AND CLOSE OA AND RELIEF AIR DAMPERS. ALARM BMS.

I. COOLING CONTROL:
1. STAGE 1 - CHILLED WATER CONTROL VALVE:
1.1. WHEN DISCHARGE AIR DRY BULB TEMPERATURE RISES ABOVE SETPOINT, CHILLED WATER COOLING SHALL BE ENABLED AND SHALL MODULATE TO MAINTAIN DISCHARGE AIR DRY BULB TEMPERATURE SETPOINT.
2. STAGE 2 - HEAT WHEEL CONTROL:
2.1. WHEN OUTSIDE AIR TEMPERATURE IS GREATER THAN EXHAUST AIR TEMPERATURE, THE HEAT WHEEL SHALL ROTATE AT CONSTANT SPEED AND THE OUTSIDE AIR BYPASS DAMPER SHALL BE CLOSED.
2.2. WHEN HEAT WHEEL IS DISABLED, HEAT WHEEL SHALL STOP AND THE OUTSIDE AIR BYPASS DAMPER SHALL BE OPEN.
3. STAGE 1 AND STAGE 2 SHALL BE ENABLED TOGETHER WHEN STAGE 2 CONDITIONS ARE MET.
4. COOLING SHALL BE DISABLED IF THE UNIT IS IN HEATING MODE. EITHER THE SUPPLY OR EXHAUST FAN IS OFF, OR THE DISCHARGE AIR SENSORS HAVE FAILED.

J. HEATING CONTROL:
1. STAGE 1 - HEAT WHEEL CONTROL:
1.1. UPON A CALL FOR HEATING, THE HEAT WHEEL SHALL ROTATE AT CONSTANT SPEED AND THE OUTSIDE AIR BYPASS DAMPER SHALL BE CLOSED.
1.2. FROST CONTROL: WHEN THE EXHAUST AIR TEMPERATURE LEAVING THE HEAT WHEEL FALLS TO THE FROST PROTECTION SETPOINT OF 25F (ADJ.), THE HEAT WHEEL SHALL CONTINUE TO ROTATE AT CONSTANT SPEED AND THE OUTSIDE AIR BYPASS DAMPER SHALL SLOWLY OPEN AND MODULATE TO MAINTAIN EXHAUST AIR FROST PROTECTION SETPOINT. WHEN THE OUTSIDE AIR BYPASS DAMPER HAS MODULATED TO FULL OPEN POSITION AND THE EXHAUST AIR TEMPERATURE LEAVING THE HEAT WHEEL FALLS BELOW 20F (ADJ.) FOR 5 MINUTES, THE HEAT WHEEL SHALL STOP AND THE OUTSIDE AIR BYPASS DAMPER SHALL CLOSE. WHEN THE OUTSIDE AIR TEMPERATURE RISES TO 20F (ADJ.), THE HEAT WHEEL SHALL RUN AT CONSTANT SPEED AND FROST CONTROL MODE SHALL BE RE-INITIATED.
2. STAGE 2 - HEATING WATER CONTROL VALVE:
2.1. WHEN STAGE 1 - HEAT WHEEL CONTROL IS ENABLED AND DISCHARGE AIR DRY BULB TEMPERATURE SETPOINT IS NOT MET, THE HEATING WATER CONTROL VALVE SHALL OPEN AND MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
3. HEATING SHALL BE DISABLED IF EITHER THE SUPPLY OR EXHAUST FAN IS OFF.

K. ADDITIONAL ALARMS:
1. ALARM THE BMS WHEN FILTER PRESSURE DROP EXCEEDS DIRTY FILTER SETPOINT. FILTER ALARMS SHALL BE ADDRESSABLE TO EACH FILTER.



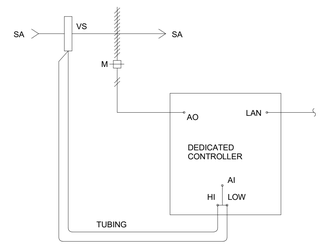
A VENTILATION SUPPLY VARIABLE AIR VOLUME (VAV) BOX
NONE

SEQUENCE OF OPERATION:

A. OCCUPIED MODE:
1. CONSTANT VOLUME UNITS: WHEN AIR HANDLING SYSTEM IS IN OCCUPIED MODE, UNIT SHALL MODULATE TO MAINTAIN CONSTANT AIRFLOW.
2. UNIT SHALL REPORT DAMPER POSITION AND PRIMARY AIRFLOW AS SEPARATE VALUES TO THE BMS. REPORT DAMPER POSITION AS PERCENTAGE OPEN. REPORT PRIMARY AIRFLOW IN CFM.

B. UNOCCUPIED MODE:
1. UNIT VOLUME DAMPER SHALL BE FULLY CLOSED.

C. ALARMS:
1. ALARM THE TIME, VAV BOX DESIGNATION, AND DURATION OF ALL VAV OVER-RIDES.



EXHAUST & VENTILATION RELIEF VARIABLE AIR VOLUME (VAV) BOXES
A NONE

SEQUENCE OF OPERATION:

A. OCCUPIED MODE:
1. CONSTANT VOLUME UNITS: WHEN AIR HANDLING SYSTEM IS IN OCCUPIED MODE, UNIT SHALL MODULATE TO MAINTAIN CONSTANT AIRFLOW.
2. UNIT SHALL REPORT CONTROL DAMPER POSITION AND PRIMARY AIRFLOW AS SEPARATE VALUES TO THE BMS. REPORT DAMPER POSITION AS PERCENTAGE OPEN. REPORT PRIMARY AIRFLOW IN CFM.

B. UNOCCUPIED MODE:
1. UNIT VOLUME DAMPER SHALL BE FULLY CLOSED.

C. ALARMS:
1. ALARM THE TIME, VAV BOX DESIGNATION, AND DURATION OF ALL VAV OVER-RIDES.

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△	Date	Description
	2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

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NOT FOR CONSTRUCTION

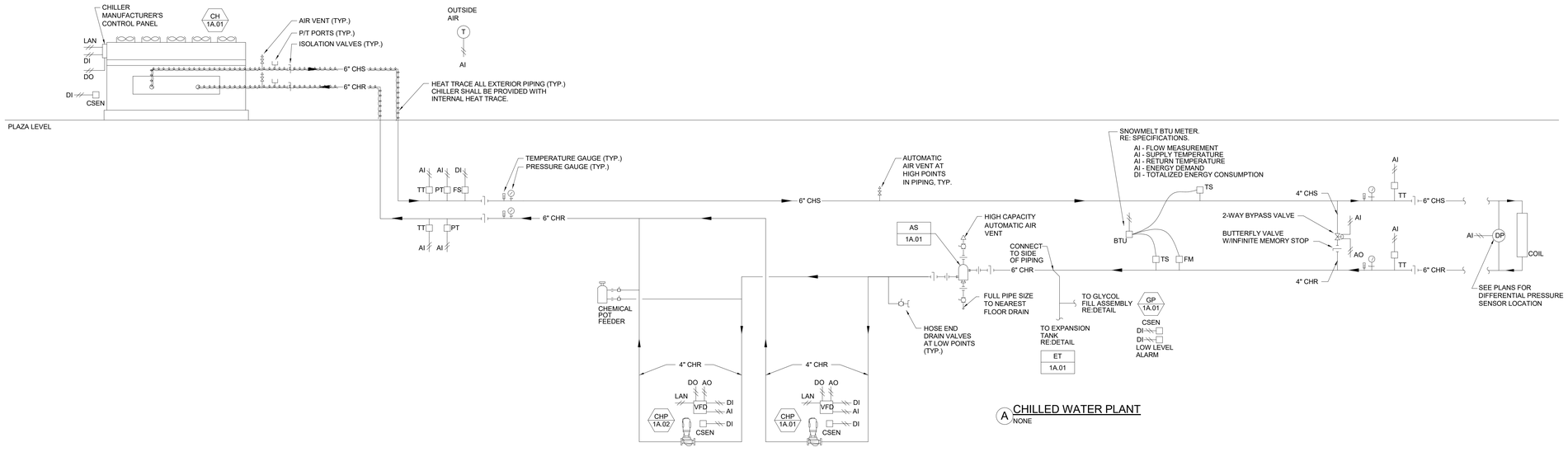
Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

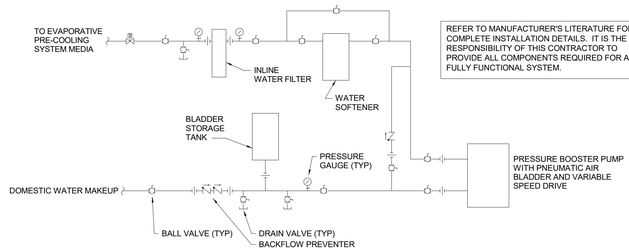
Description
MECHANICAL CONTROLS

Scale
1/8" = 1'-0"

2A-M7.002



A CHILLED WATER PLANT
NONE



B EVAPORATIVE PRE-COOLING SYSTEM CONTROL
NONE

SEQUENCE OF OPERATION:

A. GENERAL:
1. THE PROJECT INCLUDES ONE EVAPORATIVE PRE-COOLING SYSTEM WHICH SERVES THE PROMENADE BUILDING AIR-COOLED CHILLER.
2. CONTROL FOR THE EVAPORATIVE PRE-COOLING SYSTEM SHALL BE INTERLOCKED WITH CHILLER PACKAGED CONTROLS.
3. PROVIDE SLOW CLOSING SOLENOID VALVE TO MINIMIZE RAPID PRESSURE CHANGE IN THE SYSTEM.

B. OPERATION:
1. ON A CALL FOR COOLING AT THE CHILLER, THE BOOSTER PUMP SHALL ENERGIZE AND THE SOLENOID VALVE SHALL OPEN TO DELIVER COOLING WATER TO THE EVAPORATIVE PRE-COOLING MEDIA AT THE UNIT CONDENSER. WHEN THE CHILLER NO LONGER HAS A CALL FOR COOLING, THE BOOSTER PUMP SHALL BE DE-ENERGIZED AND THE SOLENOID VALVE SHALL CLOSE.

CHILLED WATER PLANT SEQUENCE OF OPERATION:

A. GENERAL
1. THE BMS SHALL INDEPENDENTLY MONITOR POINTS INDICATED ON THE CONTROL DIAGRAM AND ALL POINTS REQUIRED TO PERFORM THE FOLLOWING SEQUENCES AND MONITORING FUNCTIONS.
2. THE BMS SHALL ENABLE/DISABLE THE CHILLED WATER SYSTEM BASED UPON:
   A. OUTDOOR AIR TEMPERATURE - ENABLE CHILLER SYSTEM WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 55F (ADJ.)
   B. SYSTEM LOAD
   C. MANUAL OR FORCED

B. SEQUENCE OF OPERATION:
1. INTENT: THE BMS SHALL CONTROL THE CHILLED WATER SYSTEM INCLUDING PUMPS, VALVES, AND THE PACKAGED CHILLER MICROPROCESSOR. THE BMS SHALL PERFORM ALL START/STOP, TEMPERATURE SETPOINT, AND SCHEDULING FUNCTIONS. THE PACKAGED CHILLER MICROPROCESSOR WILL PERFORM ALL INTERNAL CHILLER TEMPERATURE CONTROL FUNCTIONS, ECONOMIZER FUNCTIONS, AND CHILLER SAFETY FUNCTIONS AND SHALL COMMUNICATE WITH THE BMS VIA A SERIAL COMMUNICATION INTERFACE.
2. START SEQUENCE: UPON SIGNAL TO ENABLE AT THE BMS OPERATOR STATION, THE BMS SHALL:
   A. ENABLE THE VARIABLE SPEED DISTRIBUTION PUMPING SYSTEM. BYPASS VALVE POSITION OPEN.
   B. START AND PROVE BOTH CHILLED WATER PUMPS.
   C. CONTINUALLY MONITOR THE PRESSURE IN THE SUPPLY AND RETURN PIPING MAINS TO THE CHILLER AND DISPLAY BOTH PRESSURE AND PRESSURE DIFFERENTIAL AT THE BMS OPERATOR'S WORKSTATION. CONTINUALLY MONITOR FLOW TO THE CHILLER VIA FLOW METER AND DISPLAY AT THE BMS OPERATOR'S WORKSTATION. DISPLAY BOTH MINIMUM AND OPERATING EVAPORATOR FLOW FOR THE CHILLER AT BMS OPERATOR'S WORKSTATION.
   D. MODULATE BYPASS VALVE, AS NECESSARY, TO MAINTAIN PLANT MINIMUM FLOW (ADJ.) AS MEASURED AT THE PLANT BTU METERING STATION. WHEN FLOW IS ABOVE REQUIRED MINIMUM CHILLER FLOW, BYPASS VALVE SHALL MODULATE CLOSED.
   E. ENABLE THE CHILLER VIA SIGNAL TO THE PACKAGED CHILLER MICROPROCESSOR ONCE MINIMUM FLOW TO THE CHILLER IS PROVEN.
3. STOP SEQUENCE: UPON SIGNAL TO DISABLE AT THE BMS OPERATOR STATION, THE BMS SHALL:
   A. DISABLE THE CHILLERS VIA SIGNAL TO THE PACKAGED CHILLER MICROPROCESSOR.
   B. CONFIRM THE CHILLER HAS STOPPED VIA COMMUNICATION INTERFACE WITH THE PACKAGED CHILLER MICROPROCESSOR.
   C. DISABLE ALL CHILLED WATER PUMPS.
   D. OPEN BYPASS VALVE.
   E. CHILLER SHALL NOT BE RESTARTED FOR A FIVE MINUTE DELAY (ADJ.).
4. TEMPERATURE CONTROL: UPON SUCCESSFUL STARTUP, PACKAGED CHILLER MICROPROCESSOR SHALL MAINTAIN CHILLED WATER SUPPLY TEMPERATURE SETPOINT ADJUSTABLE AT THE BMS OPERATOR STATION.
   A. INITIAL CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL BE 44 DEGREES F.
   B. CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL BE RESET BY THE BMS ACCORDING TO THE FOLLOWING RESET SCHEDULE:

OUTSIDE AIR DRY BULB TEMPERATURE	CHILLED WATER LEAVING TEMPERATURE
80 DEGREES F (ADJ.)	44 DEGREES F (ADJ.)
60 DEGREES F (ADJ.)	50 DEGREES F (ADJ.)
BETWEEN 80-60 DEGREES F	RAMP LINEARLY BETWEEN 44-50F

   C. WHEN CHILLED WATER SUPPLY TEMPERATURE IS RESET ABOVE INITIAL SETPOINT AND ANY ZONE SERVED IS ABOVE COOLING SETPOINT FOR MORE THAN 10 CONSECUTIVE MINUTES (ADJ.), CHILLED WATER SETPOINT SHALL BE RETURNED TO INITIAL CHILLED WATER SETPOINT. AFTER DELAY OF 1 HOUR (ADJ.), CHILLED WATER SUPPLY TEMPERATURE RESET SHALL BE ENABLED.
   D. CHILLER ECONOMIZER MODE: WHEN OUTSIDE AIR IS 5 DEGREES F (ADJ.) LOWER THAN THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT, THE PACKAGED CHILLER MICROPROCESSOR SHALL ENABLE ECONOMIZER MODE. WHEN ECONOMIZER MODE IS ENABLED, THE PACKAGED CHILLER MICROPROCESSOR SHALL STOP COMPRESSOR COOLING AND DIVERT WATER AS REQUIRED FOR FREE COOLING. ALARM BMS IF ECONOMIZER MODE IS ENABLED AND CHILLED WATER SUPPLY TEMPERATURE IS ABOVE SETPOINT FOR 15 MINUTES (ADJ.).
5. PUMP CONTROL: ONCE CHILLER START SEQUENCE IS COMPLETE, THE PUMP VFD'S SHALL MODULATE THEIR RESPECTIVE PUMPS IN PARALLEL TO MAINTAIN SYSTEM DIFFERENTIAL PRESSURE SETPOINT. REQUIRED MINIMUM SYSTEM FLOW SHALL BE 200 GPM (ADJ.) VFD HZ SETPOINTS TO MAINTAIN MINIMUM FLOW SHALL BE DETERMINED DURING TESTING AND BALANCING AND SHALL BE DETERMINED AND PROGRAMMED FOR TWO PUMPS RUNNING IN PARALLEL AND ONLY ONE PUMP RUNNING DURING MINIMUM FLOW CONDITION. THE BMS SHALL BE CAPABLE OF ENABLING AND DISABLING INDIVIDUAL PUMP VFD'S SEPARATELY AT THE BMS OPERATOR STATION. IN RESPONSE TO LOW-LOAD, THE VFD'S SHALL MODULATE THEIR RESPECTIVE PUMPS IN PARALLEL TO MAINTAIN A SYSTEM DIFFERENTIAL PRESSURE SETPOINT.
   A. INITIAL DIFFERENTIAL PRESSURE SETPOINT SHALL BE DETERMINED UPON SYSTEM TESTING AND BALANCING.
13. BYPASS VALVE CONTROL: ONCE CHILLED WATER FLOW APPROACHES PLANT MINIMUM FLOW (AS INDICATED VIA DIRECT MEASUREMENT AT CHILLED WATER FLOW METER), THE BYPASS VALVE SHALL MODULATE OPEN TO MAINTAIN MINIMUM SYSTEM FLOW. AS BYPASS VALVE APPROACHES FULL OPEN, PUMP VFD'S SHALL INCREASE, IF NECESSARY, TO ENSURE CHILLED WATER FLOW DOES NOT DECREASE BELOW MINIMUM SYSTEM FLOW.
14. CHILLED WATER PUMP FAILURE: UPON FAILURE OF ONE OF THE CHW PUMPS, RESET SEQUENCE TO UTILIZE REMAINING PUMP AND GENERATE AN APPROPRIATE ALARM AT THE BMS OPERATOR STATION.
15. CHILLER FAILURE: UPON CHILLER FAILURE, THE BMS SHALL ALARM AND SHALL AUTOMATICALLY INITIATE A CHILLED WATER PLANT SHUT DOWN.
16. COMMUNICATION FAILURE: UPON A LOSS OF SIGNAL FROM THE PACKAGED CHILLER MICROPROCESSOR, THE BMS SHALL ALLOW THE SYSTEM TO CONTINUE TO RUN AND SHALL GENERATE AN APPROPRIATE ALARM AT THE BMS OPERATOR STATION.
18. SYSTEM SOFT START: THE CHILLER SEQUENCING SOFTWARE SHALL PROVIDE OPERATOR ADJUSTABLE CHILLED WATER TEMPERATURE RAMP RATES TO ENSURE THAT THE SYSTEM WATER TEMPERATURE DOES NOT APPROACH SETPOINT TOO QUICKLY OR TOO SLOWLY AT SYSTEM START-UP. THIS PREVENTS THE UNNECESSARY OPERATION OF CHILLERS AND LIMITS SYSTEM ELECTRICAL DEMAND DURING DISTRIBUTION LOOP TEMPERATURE PULL DOWN. THE MAXIMUM COOL DOWN RATE IN THE CHILLED WATER LOOP SHALL NOT EXCEED 2F PER MINUTE (ADJ.).
21. CHILLER STATUS DISPLAY: THE BMS SHALL PROVIDE AN OPERATING STATUS REPORT FOR THE CHILLER INCLUDING THE FOLLOWING:
   A. CHILLER OPERATING MODE (COOLING MODE, ECONOMIZER MODE, OFF)
   B. CHILLER LEAVING WATER TEMPERATURE SETPOINT.
   C. CHILLED WATER ENTERING AND LEAVING TEMPERATURES.
   D. CHILLED WATER ENTERING AND LEAVING PRESSURES.
   E. CHILLER DIFFERENTIAL PRESSURE.
   F. CHILLER WATER FLOW.
   G. CHILLER LOAD AS MEASURED AT BTU METERING STATION.
   H. CHILLER LOAD IN PERCENTAGE OF TOTAL CHILLER CAPACITY.
22. DIAGNOSTIC/PROTECTION: THE BMS SHALL BE ABLE TO ALARM FROM ALL SENSED POINTS AND DIAGNOSTIC ALARMS SENSED BY THE PACKAGED CHILLER MICROPROCESSOR. ALARM LIMITS SHALL BE DESIGNED FOR ALL SENSED ANALOG POINTS.
23. CHILLER PLANT STATUS DISPLAY: THE BMS SHALL PROVIDE A PLANT STATUS REPORT. THE DISPLAY SHALL INCLUDE THE FOLLOWING:
   A. ON/OFF STATUS OF CHILLER.
   B. ON/OFF STATUS AND SPEED OF EACH PUMP.
   C. SYSTEM DIFFERENTIAL PRESSURE AND SETPOINT.
   D. CHILLER DIFFERENTIAL PRESSURE AND FLOW.
   E. BYPASS VALVE POSITION.
   F. PLANT EWT AND LWT.
   G. CALCULATED TOTAL PLANT TONNAGE PRODUCTION.
24. SYSTEM DIAGNOSTIC AND ALARM INDICATION: THE PACKAGED CHILLER MICROPROCESSOR SHALL DISPLAY LOCALLY ALL THE ALARM, MONITORING, AND OPERATION CONDITIONS AS DESCRIBED IN SPECIFICATIONS. IT SHALL ALSO SUPPLY TO THE BMS A COMMON BINARY STATUS FOR ANY OF THESE ALARM CONDITIONS.
25. FREEZE PROTECTION: UPON A DROP IN OUTDOOR AIR TEMPERATURE TO 0F, ONE PRIMARY CHILLED WATER PUMP SHALL ENERGIZE, PUMP VARIABLE FREQUENCY DRIVE SHALL MODULATE TO MINIMUM SPEED, AND BYPASS VALVE SHALL OPEN FOR A PERIOD OF 2 MINUTES (ADJ.) EVERY 2 HOURS (ADJ.) FOR SUPPLEMENTARY FREEZE PROTECTION.
26. HEAT TRACE: MONITOR HEAT TRACE ON EXTERIOR PIPING. ALARM BMS UPON FAILURE OF HEAT TRACE SYSTEM.

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△	Date	Description
	2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

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MECHANICAL CONTROLS

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2A-M7.003

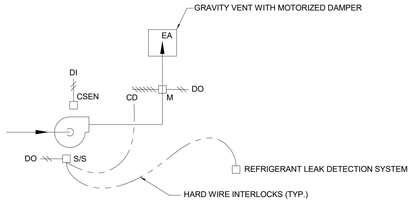
ENERGY METER SCHEDULE/POINTS LIST

SYSTEM: ENERGY METERING SYSTEM

POINT DESCRIPTION	TYPE	LOAD CATEGORY	ENERGY DEMAND UNIT	ENERGY DEMAND HOURLY PEAK	ENERGY DEMAND DAILY PEAK	ENERGY DEMAND MONTHLY PEAK	ENERGY DEMAND ANNUAL PEAK	ENERGY CONSUMPTION UNIT	ENERGY CONSUMPTION HOURLY TOTAL	ENERGY CONSUMPTION DAILY TOTAL	ENERGY CONSUMPTION MONTHLY TOTAL	ENERGY CONSUMPTION ANNUAL TOTAL	REMARKS
BUILDING MAIN ELECTRICAL SERVICE METER (BY UTILITY)	E	MAIN	kW	X	X	X	X	kWh	X	X	X	X	
PANEL L1N2 - LIGHTING	E	LTG	kW	X	X	X	X	kWh	X	X	X	X	
PANEL K1N1 - PLAZA BUILDING KITCHEN LEVEL 00	E	PLUG	kW	X	X	X	X	kWh	X	X	X	X	DATA FOR EACH KITCHEN SPACE DERIVED VIA SINGLE CONNECTION TO KITCHEN METERING SYSTEM.
PANEL K2N1 - PLAZA BUILDING KITCHEN & BAR LEVEL 01 & LEVEL 02	E	PLUG	kW	X	X	X	X	kWh	X	X	X	X	DATA FOR EACH KITCHEN SPACE DERIVED VIA SINGLE CONNECTION TO KITCHEN METERING SYSTEM.
PANEL L1N1 - LIGHTING	E	LTG	kW	X	X	X	X	kWh	X	X	X	X	OBTAIN PANEL LOAD BY DEDUCTING PANEL R3N1 METERED USAGE FROM PANEL L1N1 METERED USAGE.
PANEL R3N1 - PLUG LOADS	E	PLUG	kW	X	X	X	X	kWh	X	X	X	X	
CHILLER ELECTRICITY METER	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	
PANEL R1N1 - PLUG LOADS	E	PLUG	kW	X	X	X	X	kWh	X	X	X	X	
PANEL M2N4 - ZAMBONI ROOM & WATER HEATERS	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	
PANEL M1N3 - MECHANICAL LOADS	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	OBTAIN PANEL LOAD BY DEDUCTING ZAMBONI ROOM METERED USAGE FROM PANEL M1N3 METERED USAGE.
HEAT TRACE PANEL - PROCESS LOAD	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	OBTAIN PANEL LOAD BY DEDUCTING HEAT TRACE METERED USAGE FROM PANEL M1N3 METERED USAGE.
PANEL M1N2 - MECHANICAL LOADS	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	OBTAIN PANEL LOAD BY DEDUCTING PANEL R1N4 METERED USAGE FROM PANEL M1N2 METERED USAGE.
PANEL R1N4 - PLUG LOADS	E	PLUG	kW	X	X	X	X	kWh	X	X	X	X	
PANEL M1N1 - MECHANICAL LOADS	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	
ICE PLANT MCC ELECTRICITY METER	E	MECH	kW	X	X	X	X	kWh	X	X	X	X	
BUILDING LIGHTING	VIR		kW	X	X	X	X	kWh	X	X	X	X	OBTAIN BY ADDING ALL BUILDING LTG METERS
BUILDING HVAC/PLUMBING	VIR		kW	X	X	X	X	kWh	X	X	X	X	OBTAIN BY ADDING ALL BUILDING MECH METERS. DO NOT DOUBLE COUNT SUB-METERS.
BUILDING PLUG LOAD	VIR		kW	X	X	X	X	kWh	X	X	X	X	OBTAIN BY ADDING ALL BUILDING PLUG LOAD METERS. DO NOT DOUBLE COUNT SUB-METERS.
CHILLER PLANT BTU METER	BTU	MECH	TONS	X	X	X	X	TON-HRS	X	X	X	X	
CHILLER PLANT EFFICIENCY	VIR		kW/TON										SEE NOTE 10 BELOW.
PROMENADE BUILDING MAIN NATURAL GAS SERVICE METER	NG	MAIN	TH/H	X	X	X	X	THERMS	X	X	X	X	
NATURAL GAS SERVICE TO PLAZA BUILDING KITCHENS	NG	MECH	TH/H	X	X	X	X	THERMS	X	X	X	X	
NATURAL GAS SERVICE TO PLAZA FIRE PITS	NG	MECH	TH/H	X	X	X	X	THERMS	X	X	X	X	
MAIN DOMESTIC WATER SERVICE	DW	MAIN	GAL/H	X	X	X	X	GAL	X	X	X	X	
ICE PLANT PROCESS WATER	DW	PLB	GAL/H	X	X	X	X	GAL	X	X	X	X	
IRRIGATION WATER	DW	PLB	GAL/H	X	X	X	X	GAL	X	X	X	X	

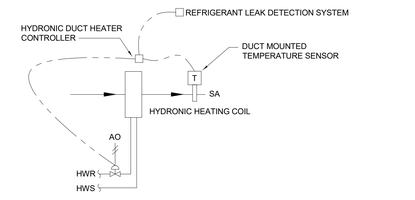
GENERAL NOTES:

1. TYPE CODES:
   - E: ELECTRICITY
   - NG: NATURAL GAS
   - DW: DOMESTIC WATER
   - BTU: BTU METER
   - VIR: VIRTUAL METER OBTAINED VIA ADDITION OR SUBTRACTION
2. LOAD CATEGORIES:
   - MAIN: MAIN BUILDING METER
   - MECH: MECHANICAL
   - LTG: LIGHTING
   - PLB: PLUMBING
   - PLUG: PLUG LOAD
   - PROC: PROCESS
3. ALL METERS SHALL RECORD AT INTERVALS OF ONE HOUR OR LESS.
4. ALL METERS SHALL REPORT BOTH DEMAND (kW OR BTU/h) AND CONSUMPTION (kWh OR THERMS) UNLESS OTHERWISE NOTED.
5. MAIN ELECTRICAL SERVICE ENTRANCE METERS SHALL RECORD POWER FACTOR AND REPORT HOURLY. RECORD HOURLY VALUES FOR A MINIMUM OF THREE YEARS.
6. ALL METERS INDICATED SHALL HAVE DIRECT CONNECTION TO THE BMS VIA SERIAL COMMUNICATION UNLESS OTHERWISE NOTED.
7. RECORDED DATA FOR EACH METER SHALL INCLUDE HOURLY, DAILY, MONTHLY, AND ANNUAL PEAK DEMAND AND TOTAL CONSUMPTION. INFORMATION FOR EACH METER POINT INDICATED SHALL BE REPORTED AT THE BMS OPERATOR STATION IN CALENDAR FORMAT. DATA SHALL BE STORED FOR A MINIMUM OF THREE YEARS.
8. METERED DATA SHALL BE REMOTELY ACCESSIBLE THROUGH THE BMS.
9. METERING SYSTEM SHALL BE EXPANDABLE TO INCLUDE ADDITIONAL METERS FOR SHELL AREAS INDICATED ON ARCHITECTURAL DRAWINGS.
10. REPORT HOURLY CHILLER PLANT kW/TON USING 1 HOUR MEASUREMENT OF TOTAL ELECTRICITY CONSUMED (kWh) DIVIDED BY SAME 1 HOUR MEASUREMENT OF TOTAL COOLING ENERGY PRODUCED (TON-HRS). REPORT MONTHLY MAXIMUM AND MINIMUM CHILLER kW/TON. DATA SHALL BE STORED FOR A MINIMUM OF THREE YEARS.
11. WHERE METERED CATEGORY VIRTUAL POINTS ARE INDICATED, DO NOT DOUBLE COUNT SUB-METERS. FOR METERS IN SERIES, COUNT ONLY THE UPSTREAM METER IN THE CATEGORY TOTAL.



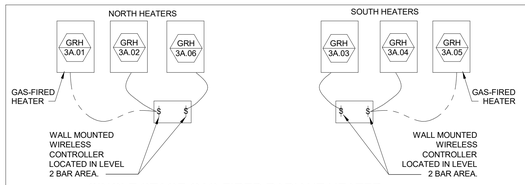
A ICE PLANT EXHAUST FAN CONTROL
NONE

A. FAN SHALL BE INTERLOCKED WITH SUPPLY FAN SERVING SAME AREA. FAN TO RUN CONTINUOUSLY AT A LOW SPEED OF 700CFM. UPON REFRIGERANT LEAK DETECTION SYSTEM ACTIVATION, MODULATE FAN TO HIGH SPEED OF 2500CFM.



B HYDRONIC REHEAT COIL CONTROL
NONE

A. INTERLOCK HYDRONIC DUCT HEATER WITH VENTILATION SUPPLY FAN SERVING SAME AREA. MODULATE CONTROL VALVE TO MAINTAIN VENTILATION SUPPLY AIR TEMPERATURE OF 65F (ADJ.) CONTINUOUSLY.

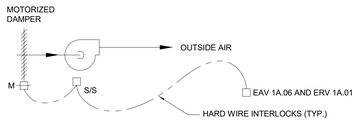


E SINGLE STAGE GAS-FIRED RADIANT HEATER SPACE TEMPERATURE CONTROL
NONE

A. OUTDOOR HEATER TO BE PROVIDED WITH WALL-MOUNTED ON/OFF CONTROLLERS LOCATED IN THE LEVEL 2 BAR AREA. HEATERS SHALL BE GROUPED TOGETHER WITH ONE CONTROLLER SERVING NORTH HEATERS AND ONE CONTROLLER SERVING SOUTH HEATERS. THE FOLLOWING UNIT GROUPINGS SHALL BE PROVIDED WITH ON/OFF SWITCH CONTROL.

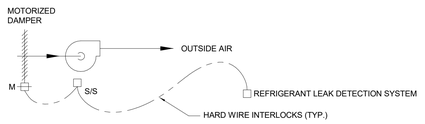
SOUTH CONTROLLER:
1. GRH 3A.01 AND GRH 3A.02
2. GRH 3A.06

NORTH CONTROLLER:
1. GRH 3A.03 AND GRH 3A.04
2. GRH 3A.05



D STAGE TOILET EXHAUST SYSTEM
NONE

A. EXISTING SUPPLY FAN SHALL BE INTERLOCKED WITH ERV 1A.01 AND EAV 1A.06. FAN TO RUN CONTINUOUSLY WHILE ERV 1A.01 IS RUNNING.



C ICE PLANT SUPPLY FAN VENTILATION CONTROL
NONE

A. FAN SHALL BE INTERLOCKED WITH EXHAUST FAN SERVING SAME AREA. FAN TO RUN CONTINUOUSLY AT A LOW SPEED OF 700CFM. UPON REFRIGERANT LEAK DETECTION SYSTEM ACTIVATION, MODULATE FAN TO HIGH SPEED OF 2500CFM.

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△ Date	Description
2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

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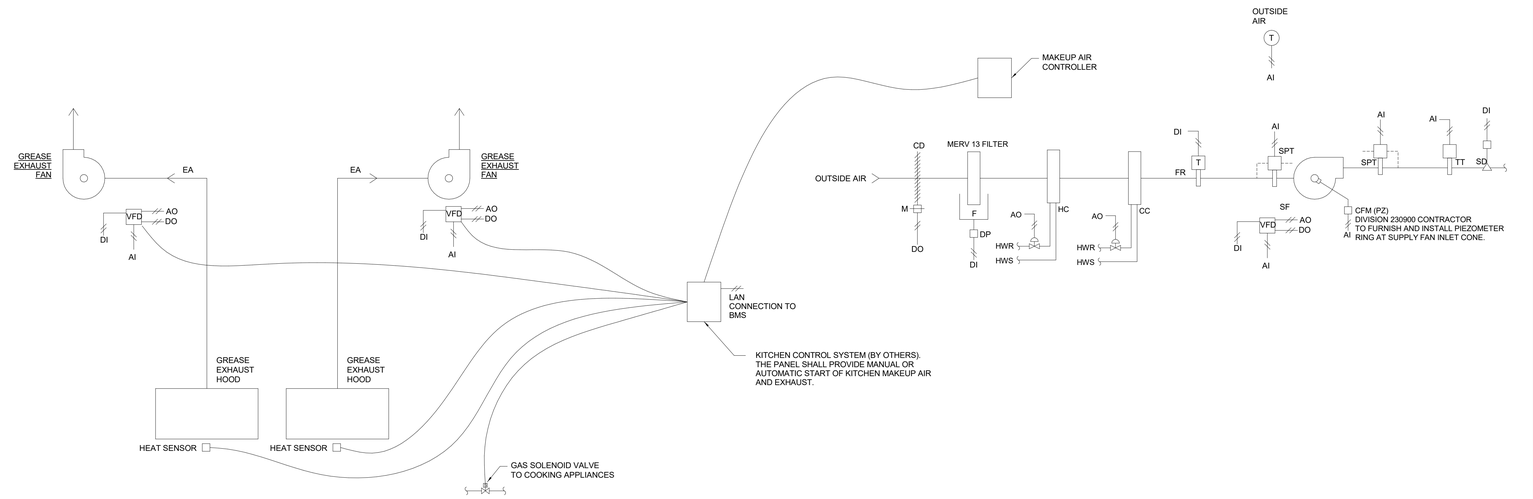

KITCHEN MAKEUP AIR AND KITCHEN EXHAUST FAN SYSTEM:

A. CONFIGURATION, RE: SCHEDULE

B. GENERAL:
1. THE KITCHEN MAKEUP AIR UNIT AND GREASE EXHAUST FANS SHALL BE CONTROLLED BY THE KITCHEN CONTROL SYSTEM (BY OTHERS).
2. THE FOLLOWING SEQUENCE SHALL BE EXECUTED BY THE KITCHEN CONTROL SYSTEM.
3. REFER TO FOOD SERVICE PLANS AND SPECIFICATIONS.

C. OCCUPIED MODE:
1. THE MUA UNIT AND GREASE EXHAUST FANS FAN SHALL ENTER OCCUPIED MODE UPON REMOTE SIGNAL FROM KITCHEN CONTROL SYSTEM OR UPON HIGH TEMPERATURE AT ANY EXHAUST HOOD. THE MUA SUPPLY FAN SHALL OPERATE CONTINUOUSLY AND THE OA DAMPER SHALL BE OPEN 100%. COOLING AND HEATING SHALL MODULATE IN SEQUENCE TO MAINTAIN DISCHARGE AIR TEMPERATURE. MUA SUPPLY FAN SHALL MODULATE SUPPLY AIRFLOW IN ORDER TO MAINTAIN CONSTANT SUPPLY AIRFLOW.
2. WHEN KITCHEN IS IN OCCUPIED MODE THE GREASE EXHAUST FAN SHALL OPERATE AT FIXED SPEED TO DELIVER CONSTANT AIRFLOW. WHEN ANY HEAT SENSOR MOUNTED WITHIN A HOOD INDICATES THAT COOKING ACTIVITY IS PRESENT, BOTH FANS SHALL RAMP TO 100% AIRFLOW. WHEN ALL HEAT SENSORS INDICATE THAT COOKING ACTIVITY IS NOT PRESENT, THE SYSTEM SHALL CONTINUE TO RUN WITH CONSTANT GREASE AIRFLOW UNTIL THE KITCHEN CONTROL SYSTEM RETURN TO UNOCCUPIED MODE.
4. KITCHEN OCCUPIED MODE SHALL RUN FOR A MINIMUM RUN-TIME OF 15 MINUTES (ADJ.).

D. UNOCCUPIED MODE:
1. THE MUA UNIT AND GREASE EXHAUST FANS SHALL ENTER UNOCCUPIED MODE UPON REMOTE SIGNAL FROM KITCHEN CONTROL SYSTEM. IF ANY HEAT DETECTOR IN THE KITCHEN INDICATES THAT COOKING ACTIVITY IS PRESENT, THE SYSTEM SHALL NOT ENTER UNOCCUPIED MODE AND SHALL REMAIN IN OCCUPIED MODE.
2. WHEN KITCHEN IS IN UNOCCUPIED MODE, THE MUA SUPPLY FAN SHALL BE OFF, THE MUA OUTSIDE AIR DAMPER SHALL BE CLOSED, COOLING SHALL BE DISABLED, AND HEATING SHALL BE DISABLED.
3. WHEN KITCHEN IS IN UNOCCUPIED MODE, THE GREASE EXHAUST FANS SHALL BE DISABLED.

E. FAN SAFETY CONTROLS:
1. DE-ENERGIZE THE MUA SUPPLY FAN AND CLOSE THE MUA OUTSIDE AIR DAMPER WHENEVER THE MUA SUPPLY DUCT SMOKE DETECTOR HAS TRIPPED. SMOKE DETECTOR SHALL REQUIRE A MANUAL RESET. KITCHEN GREASE EXHAUST FANS SHALL CONTINUE TO RUN IF OPERATING.
2. DE-ENERGIZE THE MUA SUPPLY FAN AND CLOSE THE MUA OUTSIDE AIR DAMPER WHENEVER THE MUA SUPPLY FAN HAS FAILED (AFTER A TWO-MINUTE DELAY). FAN FAILURE SHALL REQUIRE A MANUAL RESET. KITCHEN GREASE EXHAUST FANS CONTINUE TO RUN IF OPERATING.
3. PROVIDE SUCTION STATIC PRESSURE SWITCH AT INLET OF MUA SUPPLY FAN. SWITCH TO BE TIED TO SUPPLY FAN START CIRCUIT. DE-ENERGIZE THE MUA SUPPLY FAN AND CLOSE THE MUA OUTSIDE AIR DAMPER WHEN SUCTION STATIC PRESSURE HIGH-LIMIT REACHES 2.0 INCHES WC (ADJ.). KITCHEN GREASE EXHAUST FAN SHALL CONTINUE TO RUN IF OPERATING.

F. KITCHEN SAFETY CONTROLS:
1. NORMALLY CLOSED GAS SOLENOID VALVE(S) SHALL BE INTERLOCKED WITH KITCHEN HOOD CONTROL SYSTEM, MUA SUPPLY FAN AND KITCHEN GREASE EXHAUST FANS.

G. VFD CONTROL:
1. WHEN THE MUA SUPPLY FAN IS ENABLED IN OCCUPIED MODE, THE VFD SHALL SLOWLY RAMP UP TO SETPOINT AND MODULATE TO MAINTAIN CONSTANT SUPPLY AIRFLOW.
2. WHEN THE GREASE EXHAUST FANS ARE ENABLED IN OCCUPIED MODE, THE VFD SHALL SLOWLY RAMP UP TO SETPOINT AND MODULATE TO MAINTAIN CONSTANT EXHAUST AIRFLOW.

H. DISCHARGE AIR TEMPERATURE:
1. WHEN SYSTEM IS IN OCCUPIED MODE, COOLING AND HEATING SHALL BE ENABLED IN SEQUENCE TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT. DISCHARGE AIR TEMPERATURE COOLING SETPOINT SHALL BE 70F (ADJ.). DISCHARGE AIR TEMPERATURE HEATING SETPOINT SHALL BE 65F (ADJ.).

I. HEATING CONTROL:
1. THE HEATING CONTROL VALVE SHALL MODULATE TO MAINTAIN THE DAT. HEATING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.

J. COOLING CONTROL:
1. 1. THE COOLING CONTROL VALVE SHALL MODULATE TO MAINTAIN THE DAT. COOLING CONTROL VALVE SHALL CLOSE IF THE FANS ARE OFF.

K. HOOD FIRE PROTECTION SYSTEM:
1. IN THE EVENT OF A FIRE, THE HOOD FIRE PROTECTION SYSTEM, BY OTHER DIVISION, SHALL SEND A SIGNAL THROUGH THE FIRE PROTECTION SYSTEM TO SHUT DOWN THE MUA SUPPLY FAN. KITCHEN GREASE EXHAUST FANS TO BREAK STANDARD OPERATING INTERLOCK WITH MUA AND CONTINUE IN EXHAUST MODE. ALARM SIGNAL FROM THE FIRE PROTECTION SYSTEM SHALL BE REPLICATED AT THE BMS.
2. UPON ACTIVATION OF THE HOOD FIRE PROTECTION SYSTEM, POWER SHALL BE CUT OFF TO THE GAS SOLENOID VALVE AND THE VALVE SHALL CLOSE.

(A) MAKEUP AIR UNIT AND KITCHEN EXHAUST FAN CONTROL
NONE

(1) MEC CONTROLS 1A-M7.004
1/8" = 1'-0"

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Scale
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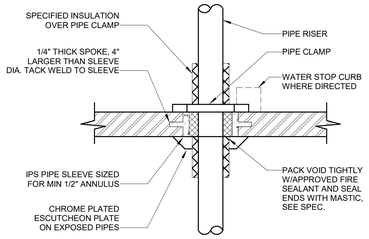
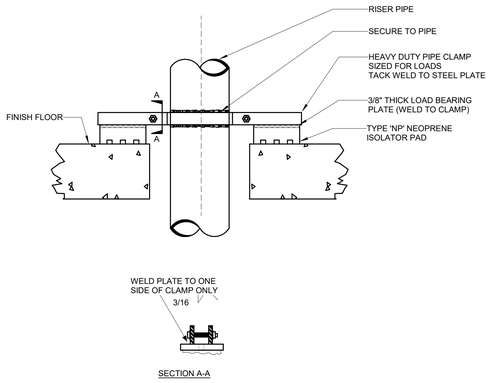
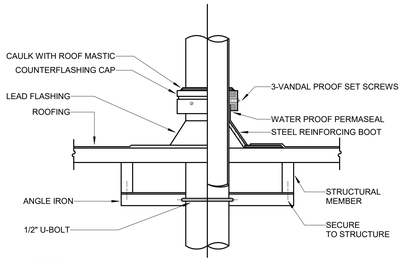
2A-M7.005



7 PIPE THROUGH FLOOR SLAB DETAIL
NO SCALE



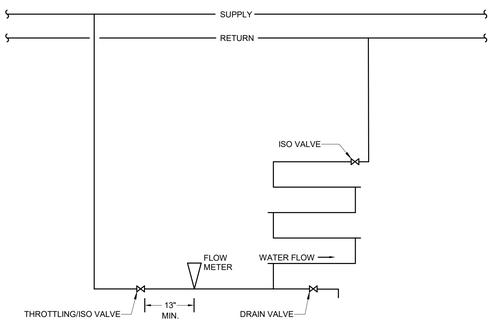
9 RISER ISOLATION SUPPORT
NO SCALE



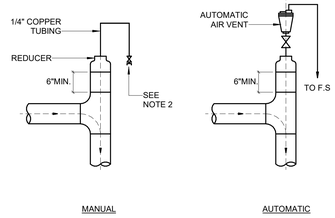
NOTES:

1. OMIT ANGLE IRON AND 1/2" U-BOLT FOR PIPE 1-1/2" AND SMALLER.

8 PIPE THROUGH ROOF
NO SCALE



3 CORROSION COUPON RACK
NO SCALE



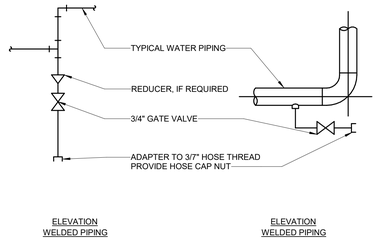
NOTE:

1. INSTALL MANUAL AIR VENT AT HIGH POINTS WHERE FLOW CHANGES DIRECTION. INSTALL AUTOMATIC AIR VENT TO PIPING WHICH INSTALLED IN EXPOSED AREA INCLUDING FAN ROOM AND MECHANICAL ROOM.

2. INSTALL HOSE VALVE ABOVE CEILING IN AN ACCESSIBLE LOCATION.

3. WELDED PIPE FITTING SHOWN. SCREWED FITTING SIMILAR.

10 AIR VENT DETAIL
NO SCALE

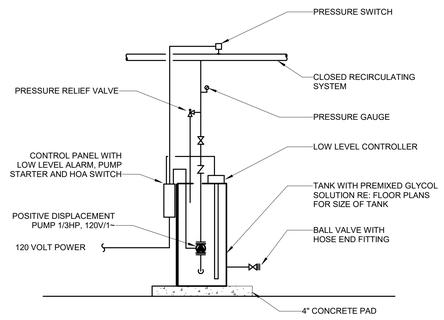


NOTES:

1. PROVIDE DRAIN VALVES AT LOW POINTS OF WATER SYSTEM.

2. WHERE SCALE POCKETS ARE SHOWN ON PIPE RISER DIAGRAMS AND/OR PLANS LOCATE DRAIN AT BOTTOM OF SCALE POCKET.

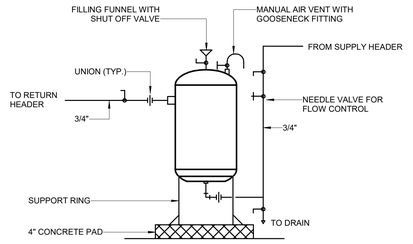
4 DRAIN VALVE CONNECTION DETAIL
NO SCALE



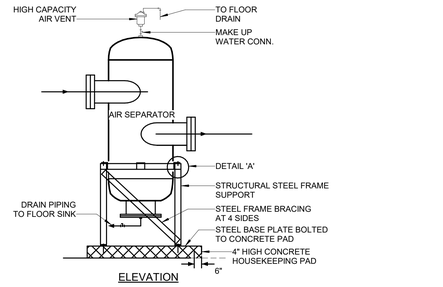
NOTE:

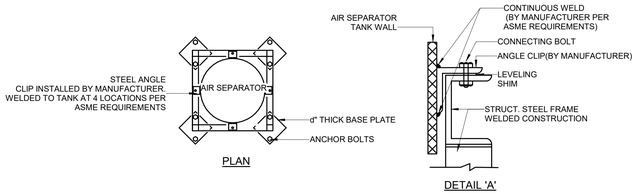
1. GLYCOL FEEDER SHALL BE A PACKAGED SYSTEM PROVIDED BY THE WATER TREATMENT SUPPLIER. H.O.H OR EQUIVALENT.

6 GLYCOL FEED ASSEMBLY DETAIL
NO SCALE

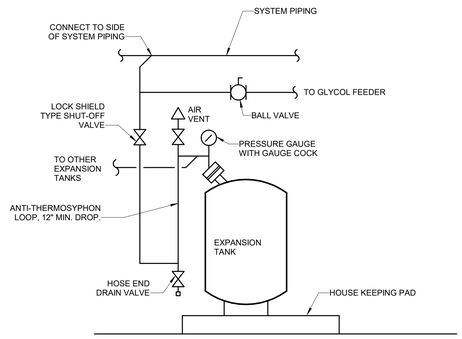


2 CHEMICAL POT FEEDER
NO SCALE

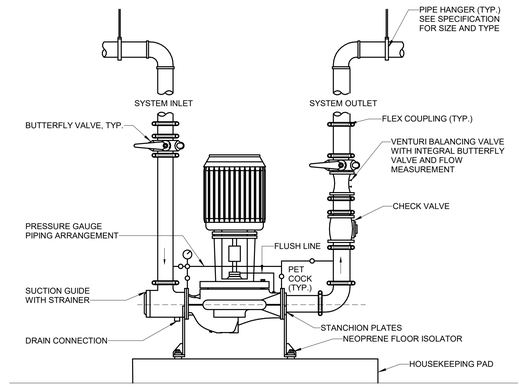




1 AIR SEPARATOR MOUNTING
NO SCALE



5 EXPANSION TANK DETAIL
NO SCALE



11 INLINE PUMP DETAIL - 5HP AND LARGER
NO SCALE

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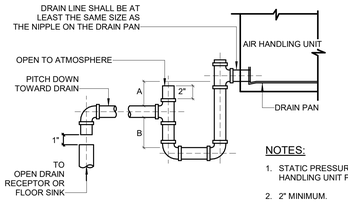
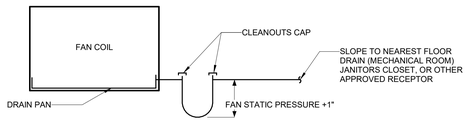


NOTES:

1. STATIC PRESSURE OF AIR HANDLING UNIT PLUS 1".
2. 2" MINIMUM.

DRAW THROUGH COIL		BLOW THROUGH COIL	
A	B	A	B
SEE NOTE 1	SEE NOTE 2	SEE NOTE 2	SEE NOTE 1

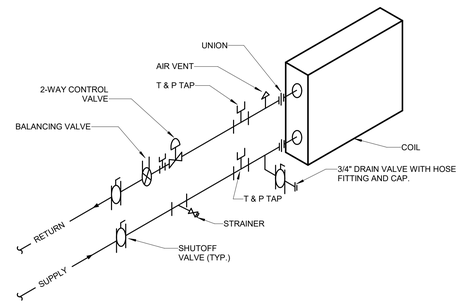
2 DRAIN AND TRAP FROM AIR HANDLING UNIT
NO SCALE



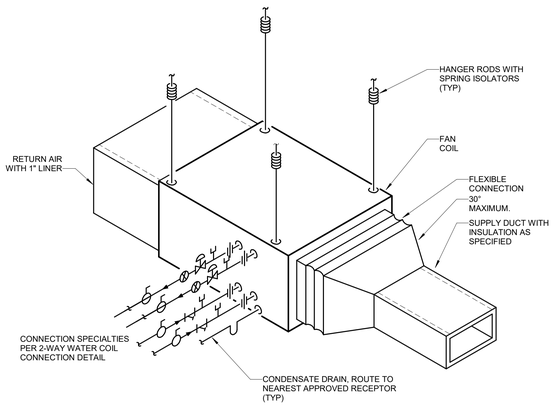
NOTE:

1. INSULATE CONDENSATE DRAIN WHEN ABOVE CEILINGS.

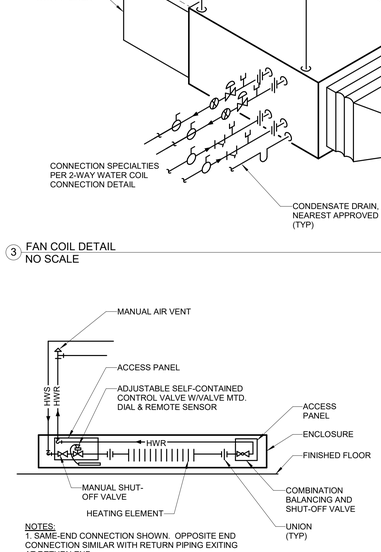
1 FAN COIL UNIT CONDENSATE DRAIN DETAIL
NO SCALE



7 TYPICAL WATER COIL CONNECTION DETAIL (2 WAY CONTROL)
NO SCALE

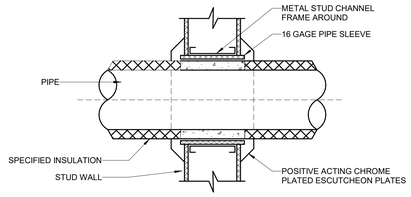


3 FAN COIL DETAIL
NO SCALE



NOTES:
1. SAME-END CONNECTION SHOWN. OPPOSITE END CONNECTION SIMILAR WITH RETURN PIPING EXITING AT RETURN END.

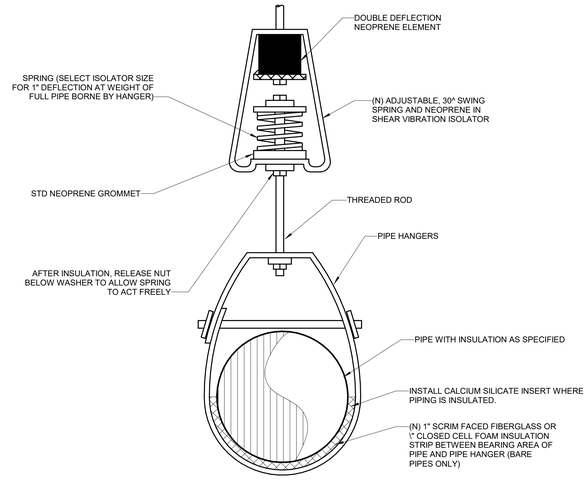
4 HOT WATER BASEBOARD DETAIL
NO SCALE



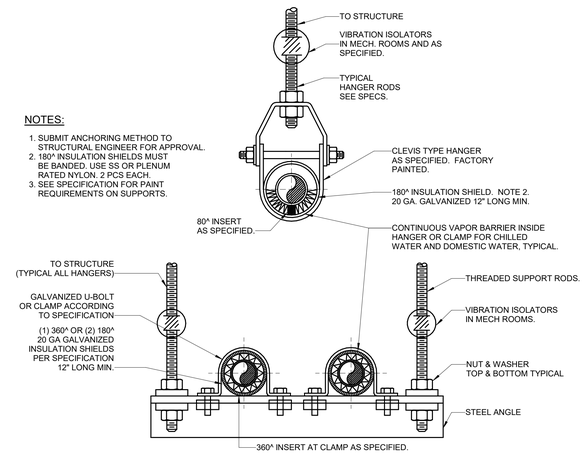
NOTE:

1. OMIT ESCUTCHEON PLATES FOR CONCEALED PIPES.

5 PIPE THROUGH STUD WALL DETAIL
NO SCALE



8 VIBRATION ISOLATION HANGER DETAIL
NO SCALE



NOTES:

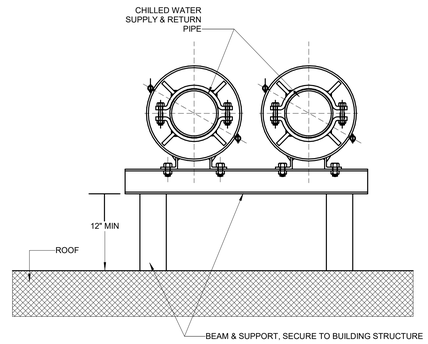
1. SUBMIT ANCHORING METHOD TO STRUCTURAL ENGINEER FOR APPROVAL.
2. 180^ INSULATION SHIELDS MUST BE BANDED. USE SS OR PLENUM RATED NYLON. 2 PCS EACH.
3. SEE SPECIFICATION FOR PAINT REQUIREMENTS ON SUPPORTS.

6 TYPICAL PIPE HANGER DETAIL
NO SCALE

NOTE:

USE ROOF MEMBRANE MANUFACTURER'S MATERIALS. PATCH AND REPAIR ROOF TO COMPLY WITH ALL ROOF WARRANTIES.

9 REFRIGERANT PIPING COVER PENETRATION
NO SCALE



10 ROOF PIPE SUPPORT
1/8" = 1'-0"

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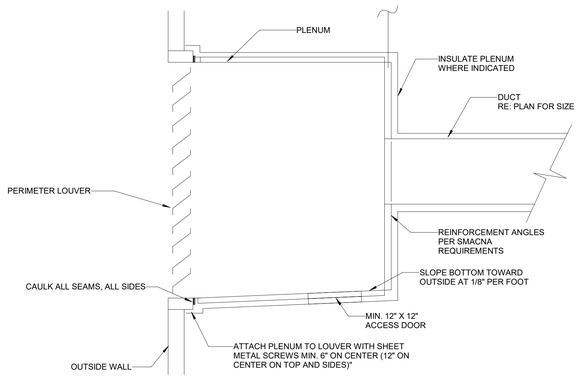

6 EXTERIOR LOUVER PLENUM BOX DETAIL
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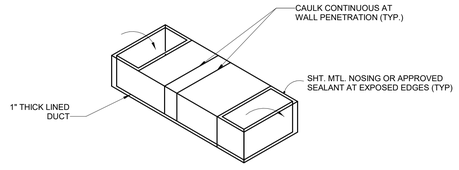
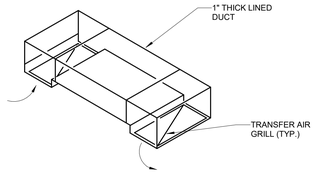
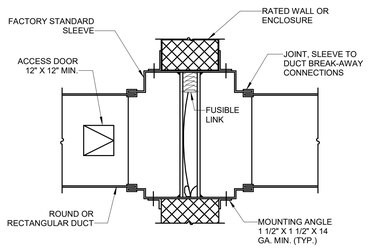


RETURN AIR TRANSFER BOOT



TRANSFER AIR DUCT

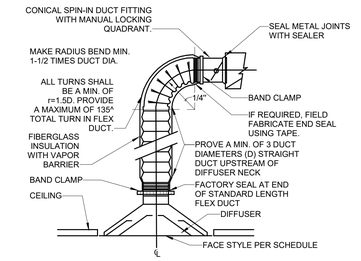
15 RETURN AIR TRANSFER BOOT AND AIR DUCT
NO SCALE



NOTES:

1. DYNAMIC FIRE DAMPER SHALL BE USED.
2. FIRE DAMPERS SHALL BE INSTALLED STRICTLY PER MANUFACTURER'S PRINTED INSTRUCTIONS.
3. FIRE DAMPERS SHALL COMPLY WITH THE REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE AND INTERNATIONAL MECHANICAL CODE.
4. MANUFACTURER'S INSTALLATION INSTRUCTIONS SHALL BE MADE AVAILABLE TO INSPECTING AUTHORITIES.

7 FIRE DAMPER
NO SCALE



2 CEILING DIFFUSER DETAIL
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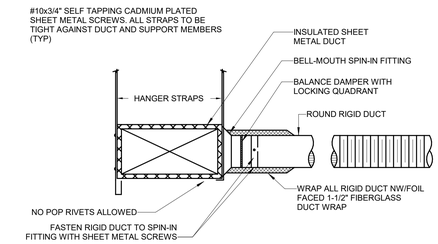
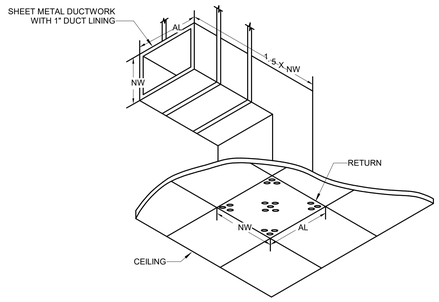


8 FLEX DUCT/ SPIN-IN FITTING DETAIL
NO SCALE



14 RETURN AIR BOOT DETAIL
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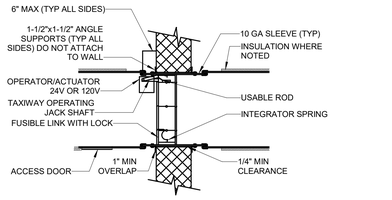
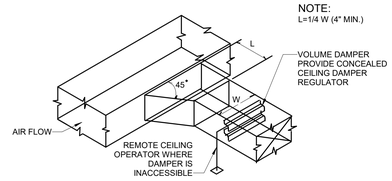
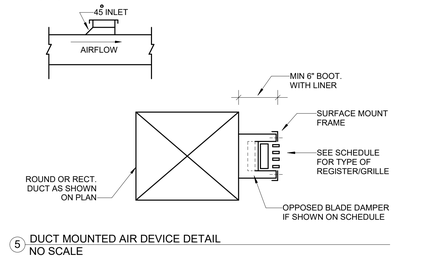


3 COMBINATION FIRE SMOKE DAMPER DETAIL
NO SCALE



1 BRANCH DUCT TAKE-OFF DETAIL
NO SCALE



5 DUCT MOUNTED AIR DEVICE DETAIL
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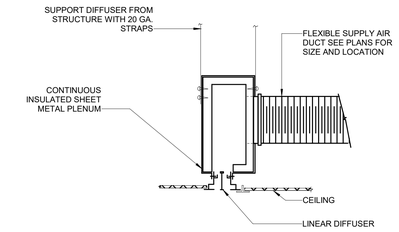

11 LINEAR DIFFUSER AND PLENUM DETAIL
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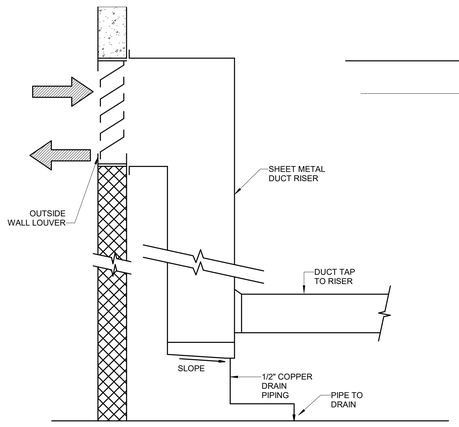
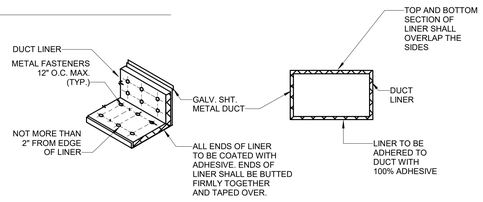


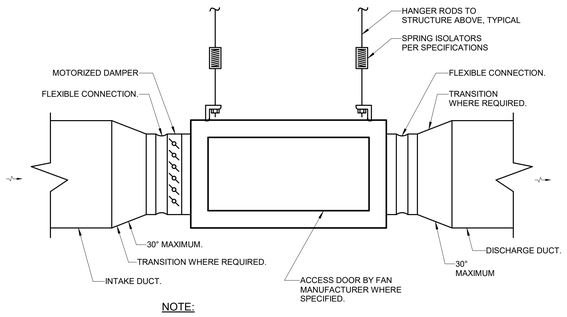
NOTE:

1. DOUBLE BASE OF PLENUM TO DRAIN INLET.

12 OUTSIDE WALL LOUVER DUCT CONNECTION
NO SCALE



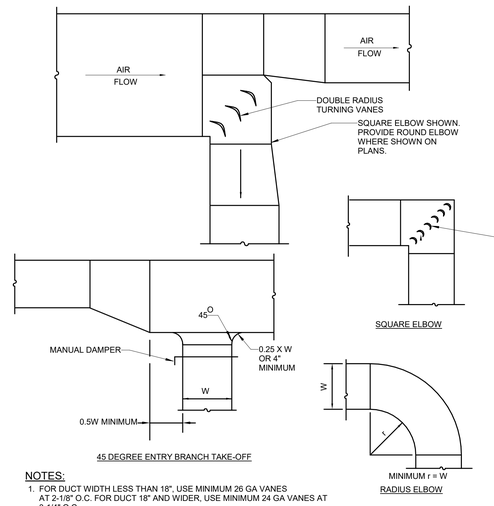
4 DUCT LINER DETAIL
NO SCALE



NOTE:

1. INSTALL FAN WITH PROPER SERVICE CLEARANCE TO MOTOR AND ALL PARTS FOR PROPER AIR MOVEMENT AS RECOMMENDED BY THE MANUFACTURER.

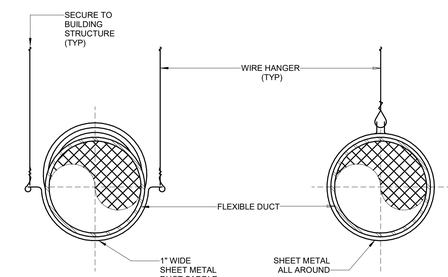
10 INLINE FAN DETAIL
NO SCALE



NOTES:

1. FOR DUCT WIDTH LESS THAN 18", USE MINIMUM 26 GA VANES AT 2-1/8" O.C. FOR DUCT 18" AND WIDER, USE MINIMUM 24 GA VANES AT 3-1/4" O.C.
2. FITTINGS TO BE 2 GAGES HEAVIER THAN CONNECTED DUCT.

13 RECTANGULAR DUCT FITTINGS AND TAKE-OFF
NO SCALE



NOTE:

1. SUPPORT AT 3' MAX.

9 FLEXIBLE DUCT SUPPORT
NO SCALE

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△	Date	Description
	2021.12.03	100% DESIGN DEVELOPMENT - PLAZA BUILDING

Seal / Signature

NOT FOR CONSTRUCTION

Project Name

SSRC | BASE AREA IMPROVEMENTS

Project Number

003.7835.000

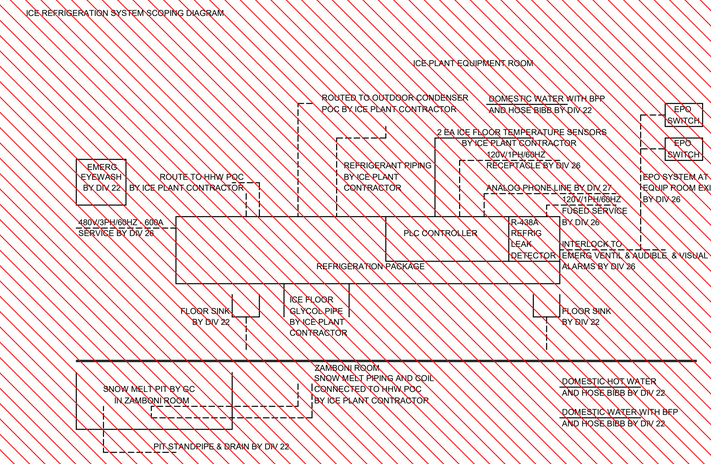
Description

MECHANICAL DETAILS

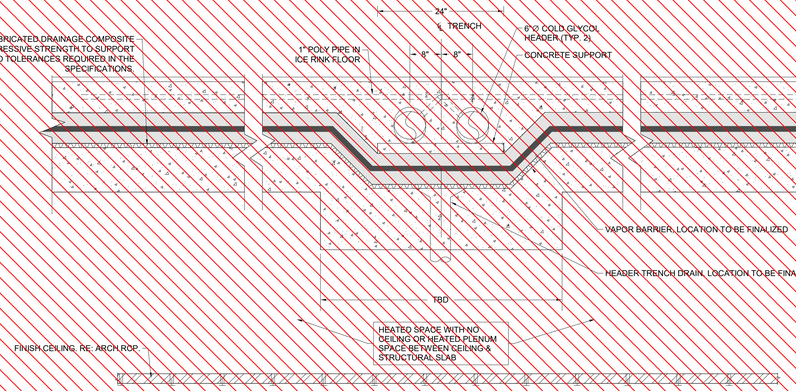
Scale

NO SCALE

2A-M8.002



1 ICE SYSTEM COORDINATION
NO SCALE

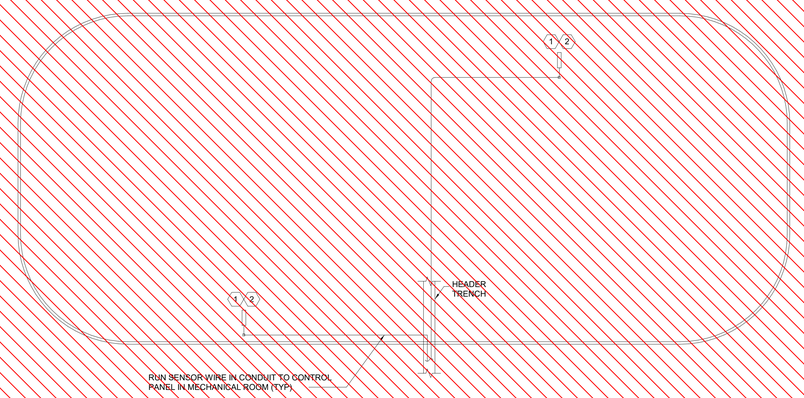


NOTES:
1. EXAMPLE HEADER DETAIL IS SHOWN TO IDENTIFY PERFORMANCE CRITERIA. ULTIMATELY, THE ICE SHEET CONTRACTOR SHALL WORK WITH THE DESIGN TEAM TO DEVELOP THE FINAL CONFIGURATION TO MEET THE OWNER'S REQUIREMENTS IN A MANNER SUITABLE FOR LONG-TERM WARRANTY AND PERFORMANCE. MINIMIZING EFFECTS OF DEFLECTION, CONDENSATION, AND POTENTIAL WATER MIGRATION ARE EXAMPLES OF CRITICAL VARIABLES THIS EXAMPLE ATTEMPTS TO ADDRESS.
2. FINAL HEADER CONFIGURATION, SLAB PENETRATION DETAIL, WATERPROOFING, INSULATION, AND DRAINAGE CONFIGURATION WILL BE CONFIRMED IN CONSULTATION WITH SELECTED ICE SYSTEM CONTRACTOR DURING FINAL DESIGN PROCESS.
3. ICE SHEET CONTRACTOR TO NOTE IMPORTANCE OF DETERMINING EFFECTIVE WATER CONTROL METHODS ABOVE AND BELOW STRUCTURAL SLAB. DESIGN ASSIST ROLE WILL INCLUDE CONSULTATION ON THESE SYSTEMS FOR A FINAL CONFIGURATION SUITABLE FOR WARRANTY BY ICE SHEET CONTRACTOR.

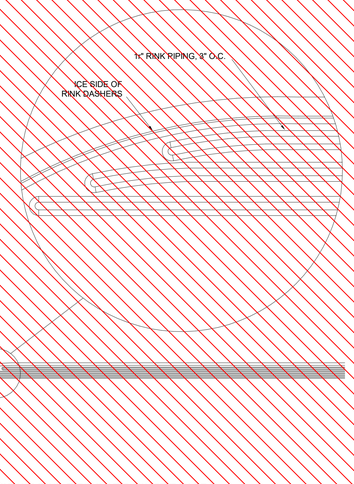
2 SECTION AT HEADER TRENCH
NO SCALE

NOT MTECH SCOPE OF WORK

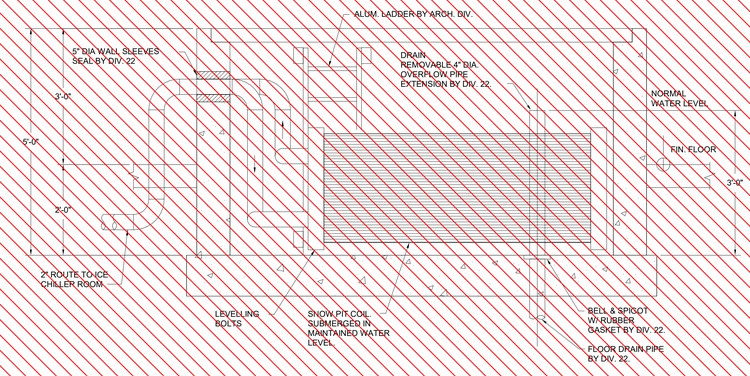
NOTES
1. RINK FLOOR TEMPERATURE: RTD.
2. RUN RTD IN DEDICATED CONDUIT TO CONTROL PANEL IN REFRIGERATION ROOM.



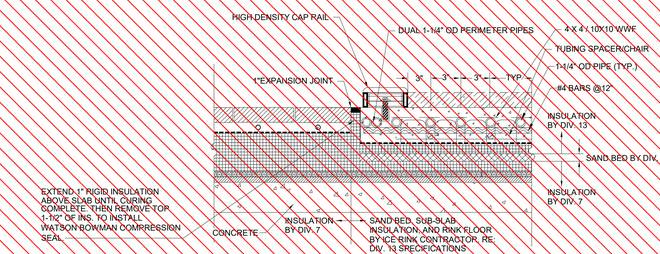
3 RINK TEMPERATURE SENSOR PLAN VIEW
NO SCALE



4 ENLARGED VIEW OF ICE RINK PIPING AT DASHER BOARD
NO SCALE



5 SNOW MELT PIT COIL DETAIL
NO SCALE



6 THRESHOLD AT ICE RINK - OVER STRUCTURE
NO SCALE

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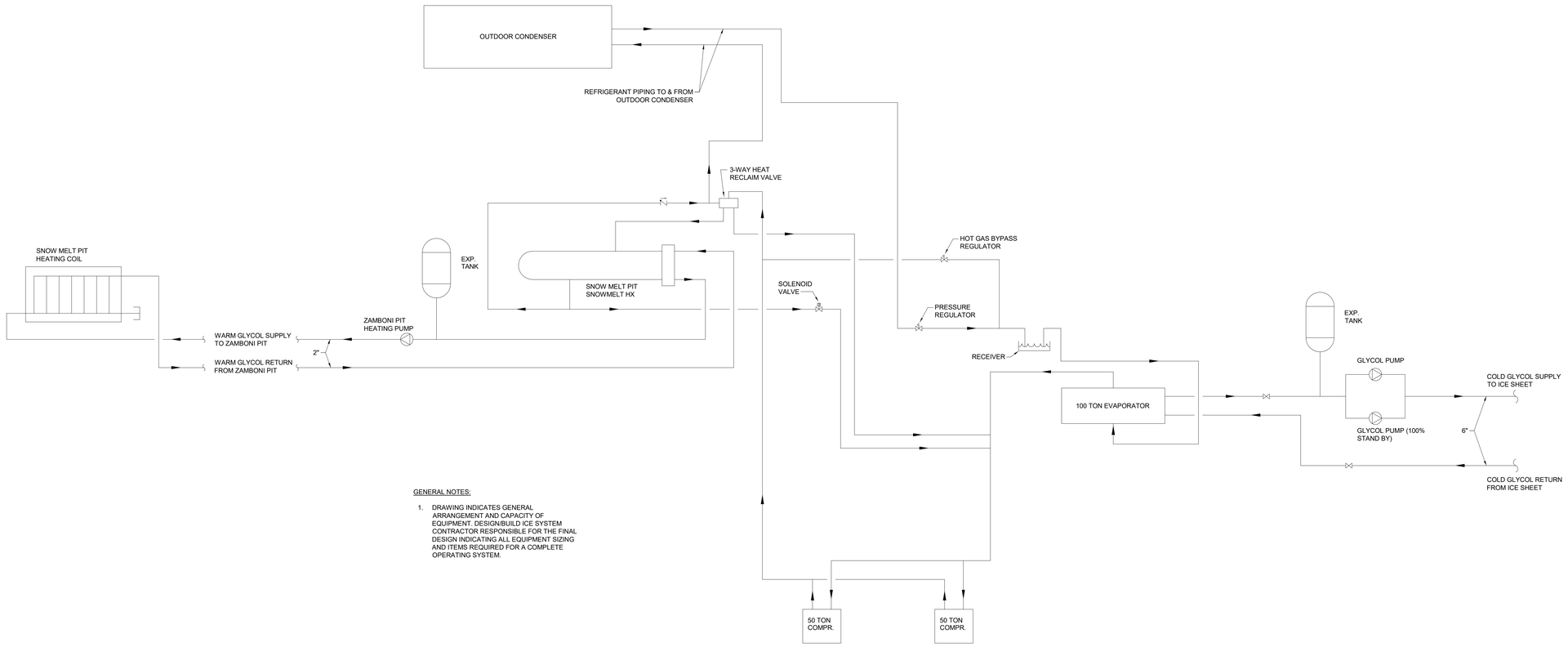
Description
ICE PLANT DETAILS

Scale
NO SCALE

2A-M9.000



GENERAL NOTES:

1. DRAWING INDICATES GENERAL ARRANGEMENT AND CAPACITY OF EQUIPMENT. DESIGN/BUILD ICE SYSTEM CONTRACTOR RESPONSIBLE FOR THE FINAL DESIGN INDICATING ALL EQUIPMENT SIZING AND ITEMS REQUIRED FOR A COMPLETE OPERATING SYSTEM.

A ICE SHEET SYSTEM SCHEMATIC FLOW DIAGRAM – R438A SYSTEM

NO SCALE

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ICE PLANT DETAILS

Scale

1/8" = 1'-0"

2A-M9.001

AIR-COOLED CHILLER SCHEDULE

PREVIOUSLY PRICED NO QUOTE NEEDED

CODE (CH)	MANUFACTURER/ MODEL NO.	CAPACITY NOM. (TONS)	CAPACITY ACTUAL (MBH)	CHILLED WATER DATA EWT (F)	CHILLED WATER DATA LWT (F)	CHILLED WATER DATA GPM	CHILLED WATER DATA WPD (FT)	CHILLED WATER DATA DESIGN DB (F)	CHILLED WATER DATA ECOP	ELECTRICAL CHILLER VOLT	CHILLER PH	CHILLER MCA	CHILLER MOP	CHILLER FUSE	CHILLER DISCON	CHILLER FEEDER	HEAT TRACE VOLT	HEAT TRACE PH	HEAT TRACE MOP	HEAT TRACE FUSE	HEAT TRACE DISCON.	HEAT TRACE FEEDER	KW/TON NPLV EER	KW/TON AT DESIGN CONDITIONS	HEIGHT (IN)	WIDTH (IN)	LENGTH (IN)	OPERATING WEIGHT (LBS)	REMARKS
3A.01	TRANE/RTAF	170	1740	54	44	374	40	88	86	460	3	321	450	RE: ONE-LINES			277	1	20	-	S.T.O.	(2#12, #12G) 3/4"C	9.7	15.3	9.934	98.0	98.0	274.0	12,500	

GENERAL NOTES:
1. FLUID CONTAINS 30% PROPYLENE GLYCOL.
2. JOB SITE ELEVATION = 6,700 FT.
3. PROVIDE FREE COOLING COIL WITH INTERNAL DIVERTING VALVE.
4. PROVIDE MANUFACTURER'S STANDARD ROOF CURB, 14" CURB HEIGHT. PROVIDE 2" DEFLECTION SPRING ISOLATORS PER MECHANICAL SPECIFICATIONS.
5. PROVIDE 115V CONVENIENCE OUTLET.
6. PROVIDE SINGLE POINT POWER CONNECTION FOR CHILLER. PROVIDE CONTROL TRANSFORMER AS REQUIRED. HEAT TRACE CONNECTION SHALL BE VERIFIED BY MANUFACTURER FOR SINGLE POINT OR DEDICATED HEAT TRACE CONNECTION.
7. PROVIDE VARIABLE SPEED COMPRESSORS FOR CAPACITY CONTROL.
8. PROVIDE EVAPORATIVE PRE-COOLING SYSTEM, EVAPORCOOL OR EQUAL. PROVIDE BOOSTER PUMP, WATER TREATMENT, EXPANSION TANK, MEDIA AT CHILLER AIR INTAKES, AND COMPLETE PIPING SYSTEM TO PROVIDE DOMESTIC WATER TO EVAPORATIVE PRE-COOLING MEDIA. INTERLOCK WITH CHILLER TO OPERATE ON CALL FOR COOLING.

PUMP SCHEDULE

CODE	MANUFACTURER/ MODEL NO.	SERVICE	PUMP TYPE	GPM	HEAD (FT)	NPSHR (FT)	IMPELLER DIA (IN)	BHP	ELECTRICAL HP	VOLT	PH	FLA	FUSE	DISCON.	FEEDER	REMARKS
CWP-1A.01	TACO/SKV 3006D	PRIMARY CHILLED WATER LOOP	INLINE	200	75	12	5.2	5.14	7.5	460	3	11	15A LPS-RK	30A/3P	(3#12, #12G) 3/4"C	A,B,C
CWP-1A.02	TACO/SKV 3006D	PRIMARY CHILLED WATER LOOP	INLINE	200	75	12	5.2	5.14	7.5	460	3	11	15A LPS-RK	30A/3P	(3#12, #12G) 3/4"C	A,B,C
GP-1B.01	NEPTUNE/G-50	GLYCOL FEEDER	POS. DISP.	--	--	--	--	--	0.5	120	1	10	-	CORD & PLUG	(2#12, #12G) 3/4"C	C,D

GENERAL NOTES:
1. PROVIDE MAGNETIC STARTER WITH AUXILIARY CONTACTS AND HOA SWITCH ON ALL THREE PHASE MOTORS.
2. PROVIDE PREMIUM EFFICIENCY MOTORS FOR MOTORS 1 HP AND OVER PER NEMA STANDARD MG1-2003, TABLES 12-12 AND 12-13.
3. FOR PARALLEL PUMP APPLICATIONS MANUFACTURER SHALL REVIEW SINGLE PUMP OPERATION SUCH THAT PUMP CAN OPERATE AND NOT EXCEED THE END OPERATION POINT ON THE PUMP CURVE AND MOTOR HP IS PROPERLY SELECTED TO PREVENT OVERLOADING.
4. REFER TO DRAWINGS TO DETERMINE REQUIRED PUMP REQUIRED PUMP ARRANGEMENT. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING.

REMARK NOTES:
A. PROVIDE WITH VARIABLE FREQUENCY DRIVE WITH INTEGRAL OVER-CURRENT PROTECTION AND GROUND FAULT PROTECTION PER NEC 430.
B. 50% CAPACITY (PARALLEL PUMP APPLICATION).
C. FLUID CONTAINS 30% PROPYLENE GLYCOL. ALL PUMP COMPONENTS IN CONTACT WITH FLUID SHALL BE COMPATIBLE WITH GLYCOL. ADJUST STANDARD CATALOG PERFORMANCE TO ACCOUNT FOR USE OF GLYCOL.
D. ELECTRICAL CONNECTION TO 120V WALL RECEPTACLE.

REHEAT COIL

CODE (RH)	AREA SERVED	MANUFACTURER/ MODEL NO.	MAX CFM	MIN CFM	APD "W.C.	HEATING COIL EAT	HEATING COIL LAT	HEATING COIL MBH	HEATING COIL GPM	HEATING COIL ROW	HEATING COIL WPD (FT)	INLET SIZE	OUTLET SIZE	REMARKS
1A.01	LEVEL 00	GREENHECK/HW58S02B06	2500	750	0.29	-10.0	25.0	73.9	9.7	2.0	1.6	26"X15"	26"X15"	A,B

GENERAL NOTES
1. MOUNT PER MANUFACTURER'S INSTALLATION INSTRUCTIONS INCLUDING ALL UL LISTING REQUIREMENTS.
2. HEATING COIL DISCHARGE TEMPERATURES SHALL NOT EXCEED 100F OR HAVE A TEMPERATURE RISE GREATER THAN 45F.
3. EWT =150F, LWT = 130F.
4. WATER CONTAINS 30% PROPYLENE GLYCOL.
5. JOB SITE ELEVATION = 6700 FT.

REMARK NOTES
A. PROVIDE LINE VOLTAGE DUCT MOUNTED THERMOSTAT DOWNSTREAM OF HEATER. CONTROL TO 65F LEAVING AIR TEMP.
B. INTERLOCK HEATER WITH ICE PLANT VENTILATION SYSTEM.

EVAPORATIVE PRE-COOLING BOOSTER PUMP SCHEDULE

CODE (EBP)	MANUFACTURER/ MODEL NO.	SERVICE	CAPACITY GPM	CAPACITY PSI	ELECTRICAL HP	VOLT	PH	AMPS	FUSE	DISCON.	FEEDER	OPERATING WEIGHT (LBS)	REMARKS
1A.01	TOWLE WHITNEY/TW1000-15W-40	CHILLER EVAPORATIVE PRE-COOLING SYSTEM	15	40	1/2	480	3	3	15A LPS-RK	30A/3P	(3#12, #12G) 3/4"C	100	

GENERAL NOTES:
1. PUMP SHALL BE PROVIDED BY EVAPORATIVE PRE-COOLING SYSTEM MANUFACTURER. REFER TO SPECIFICATIONS.
2. PUMP SHALL BE CENTRIFUGAL TYPE WITH FACTORY WIRED VARIABLE FREQUENCY DRIVE.
3. PROVIDE PUMP WITH INTEGRAL DIAPHRAGM EXPANSION TANK SIZED BY EVAPORATIVE PRE-COOLING SYSTEM MANUFACTURER.
4. PROVIDE THE FOLLOWING PUMP COMPONENTS: RELIEF VALVE, CHECK VALVE, STEEL FRAME, PRESSURE GAUGE, TANK TEE, BRASS NIPPLE, AND COPPER FITTINGS.
5. REFER TO MECHANICAL CONTROLS DRAWINGS FOR REQUIRED EVAPORATIVE PRE-COOLING SYSTEM PIPING AND CONTROL FUNCTIONS.

GAS RADIANT HEATER SCHEDULE

CODE (GRH)	MANUFACTURER/ MODEL NO.	SERVICE	OUTPUT (MBH)	ELECTRICAL AMP	VOLT	PH	FUSE	DISC	FEEDER	REMARKS
3A.01	BROMIC / TUNGSTEN BH0420033	PLAZA PATIO	43	2	120	1	-	S.T.O.	(2#12, #12G) 3/4"C	A,B,C,D,E
3A.02	BROMIC / TUNGSTEN BH0420033	PLAZA PATIO	43	2	120	1	-	S.T.O.	(2#12, #12G) 3/4"C	A,B,C,D,E
3A.03	BROMIC / TUNGSTEN BH0420033	PLAZA PATIO	43	2	120	1	-	S.T.O.	(2#12, #12G) 3/4"C	A,B,C,D,E
3A.04	BROMIC / TUNGSTEN BH0420033	PLAZA PATIO	43	2	120	1	-	S.T.O.	(2#12, #12G) 3/4"C	A,B,C,D,E
3A.05	BROMIC / TUNGSTEN BH0420033	PLAZA PATIO	43	2	120	1	-	S.T.O.	(2#12, #12G) 3/4"C	A,B,C,D,E
3A.06	BROMIC / TUNGSTEN BH0420033	PLAZA PATIO	43	2	120	1	-	S.T.O.	(2#12, #12G) 3/4"C	A,B,C,D,E

GENERAL NOTES:
1. JOBSITE ELEVATION: 6,700FT.
2. FUEL SOURCE: NATURAL GAS.

REMARK NOTES
A. SUSPENDED FROM STRUCTURE.
B. PROVIDE A CEILING POLE MOUNT
C. SUBMIT COLOR PALETTE FOR COLOR SELECTION BY ARCHITECT.
D. PROVIDE REMOTE WALL SWITCH. SUBMIT WALL SWITCH PRODUCT DATA.
E. PROVIDE MANUFACTURER HEAT DEFLECTOR.

EXPANSION TANK

CODE (ET)	MANUFACTURER/ MODEL NO.	SERVICE	DESIGN PARAMETERS SYSTEM VOLUME	DESIGN PARAMETERS MIN. TEMPERATURE (F)	DESIGN PARAMETERS MAX. TEMPERATURE (F)	OPERATING PARAMETERS MIN. PRESSURE (PSIG)	OPERATING PARAMETERS MAX. PRESSURE (PSIG)	CONFIG.	TYPE	MIN. ACCEPT. (GAL)	PRECHARGE (PSIG)	REMARKS
1A.01	TACO/CA300-125	CHILLED WATER	3,000	40	90	20	67.5	VERTICAL	B	79.0	20.0	

GENERAL NOTES:
1. TYPE: B=FULL ACCEPTANCE BLADDER.
2. LOCATE GLYCOL FEEDER CONNECTION AT EXPANSION TANK CONNECTION TO HYDRONIC SYSTEM. REFER TO DETAIL.
3. PROVIDE MAKEUP WATER WITH FILL PRESSURE NO HIGER THAN 20 PSI.
4. PROVIDE PRESSURE RELIEF VALVE SET AT 75 PSIG.
5. FLUID CONTAINS 30% PROPYLENE GLYCOL.

AIR SEPARATOR

CODE (AS)	SERVICE	DESIGN PARAMETERS SYSTEM FLOW (GPM)	DESIGN PARAMETERS PIPE SIZE (IN)	DESIGN PARAMETERS MAX PD (FT. HD.)	MANUFACTURER/ MODEL NO.	DIMENSIONS DIAMETER (IN.)	DIMENSIONS HEIGHT (IN.)	WEIGHT (LBS)	REMARKS
1A.01	CHILLED WATER	385	6	1	TACO/ACT06F	20	41	800.0	

GENERAL NOTES:
1. FLUID CONTAINS 30% PROPYLENE GLYCOL.
2. PROVIDE WITH STRAINER.
3. PROVIDE FLOOR STAND SUPPORT.

MAKE-UP AIR UNIT

PREVIOUSLY PRICED NO QUOTE NEEDED

CODE (MUA)	AREA SERVED	LOCATION	MANUFACTURER/ MODEL NO.	CFM	TYPE	SUPPLY FAN TSP "W.C. (ALT.)	SUPPLY FAN ESP "W.C. (ALT.)	SUPPLY FAN HP	OSA CFM	COOLING CAPACITY EAT (°F) DB	COOLING CAPACITY EAT (°F) WB	COOLING CAPACITY LAT (°F) DB	COOLING CAPACITY LAT (°F) WB	COOLING CAPACITY WATER FLOW (GPM)	COOLING CAPACITY FACE VEL (FPM)	COOLING CAPACITY WPD "W.C.	HEATING CAPACITY EAT (°F) DB	HEATING CAPACITY EAT (°F) WB	HEATING CAPACITY LAT (°F)	HEATING CAPACITY WATER FLOW (GPM)	HEATING CAPACITY WPD "W.C.	FILTERS TYPE (PRE/FINAL)	FILTERS APD ("W.C.)	ELECTRICAL (FAN) VOLT	PH	MCA	FUSE	DISC	FEEDER SIZE	MIN SCCR	WEIGHT LBS	REMARKS
1A.01	PLAZA	PROMENADE	TRANE/UCCAG12C0F0REH5Z	6000	VFD	2.1	1.50	5	6000	86	56.2	70.8	50	12.7	500	0.7	10	-2	80	48	4.2	2" MERV 13	0.28	460	3	10.6	15A LPS-RK	30A/3P	(4#12, #12G) 3/4"C	10 KA	1500	A,B,C,D,E,F

GENERAL NOTES:
1. PROVIDE PREMIUM EFFICIENCY MOTORS FOR MOTORS 1 HP AND OVER PER MENA STANDARD MG1-2003, TABLES 12-12 AND 12-13.
2. PROVIDE FACTORY MOUNTED COMBINATION STARTER/DISCONNECT WIRED TO MOTORS WITH AUXILIARY CONTACTS AND HOA SWITCH ON ALL THREE PHASE MOTORS.
3. INSTALL UNITS WITH ADEQUATE CLEARANCE FOR COIL PULL, FILTER REPLACEMENT AND TO FULLY OPEN ACCESS DOORS.
   PROVIDE A MINIMUM OF 3 FEET CLEARANCE IN FRONT OF DISCONNECTS SWITCHES AND CONTROL PANELS. COMPLY FULLY WITH NEC.
4. UNIT STATIC PRESSURE CAPABILITY SHALL INCLUDE SCHEDULED EXTERNAL STATIC PRESSURE PLUS ALL SCHEDULED INTERNAL PRESSURE DROPS, INCLUDE VALVES FOR WETTED COILS AND DIRTY FILTERS.
5. SCHEDULED FAN VALUES (CFM, SP AND HP) ARE ACTUAL AT ALTITUDE. MOTOR HP HAS BEEN ADJUSTED FROM SEA LEVEL CONDITIONS FOR OPERATION AT JOBSITE ELEVATION. JOB SITE ELEVATION = 6700 FT.
6. PROVIDE DUCT SMOKE DETECTORS IN THE SUPPLY AIR OF ALL UNITS 2000 CFM OR GREATER. RE: MECHANICAL CONTROLS DIAGRAMS.
7. HEATING WATER: EWT = 150F, LWT = 130F, 30% PROPYLENE GLYCOL.

REMARK NOTES:
A. PROVIDE UNIT WITH DOUBLE WALL CONSTRUCTION, CHILLED WATER COOLING SECTION, AND HEATING HOT WATER COIL SECTION.
B. PROVIDE INTERNAL VIBRATION ISOLATION.
C. PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
D. PROVIDE UNIT WITH END DISCHARGE CONFIGURATION (HORIZONTAL).
E. PROVIDE UNIT WITH END DUCTED INTAKE CONFIGURATION (HORIZONTAL).
F. UNIT SHALL HAVE ACCESS AND PIPING CONNECTIONS ON THE LEFT HAND SIDE WHEN LOOKING INTO THE UNIT OUTSIDE AIR INTAKE.

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Description
MECHANICAL SCHEDULES

Scale

2A-MEP0.000

VAV BOX SCHEDULE

CODE (VAV)	AREA SERVED	MANUFACTURER/ MODEL NO.	DESIGN CFM AIRFLOW (CFM)	DESIGN CFM DESIGN (CFM)	CAPACITY (CFM) MAX.	CAPACITY (CFM) MIN.	MAX. NC @ DESIGN MAX.	INLET SIZE	OUTLET SIZE	REMARKS
1A.01	WHITE BOX	TITUS DESV 14	2200	2200	3000	450	-	14	20 X 17.5	A
1A.02	DISHWASHING	TITUS DESV 8	730	730	900	145	-	8	12 X 10	B
1A.03	WHITE BOX	TITUS DESV 14	2650	2650	3000	450	-	14	20 X 17.5	A
1A.04	WHITE BOX	TITUS DESV 14	2650	2650	3000	450	-	14	20 X 17.5	A
1A.05	UC HEALTH + SKI PATROL	TITUS DESV 8	605	320	900	145	-	8	12 X 10	B
1A.06	LOADING/TRASH	TITUS DESV 10	950	950	1400	230	-	10	14 x 12.5	A
1A.07	FOOD STORAGE/OFFICE	TITUS DESV 6	215	215	500	80	-	6	12 X 8	B

GENERAL NOTES
1. MOUNT WITH 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF THE BOX.
2. MAXIMUM OUTLET S.P.= 0.75".
3. MAXIMUM NC LEVELS ARE RADIATED SOUND DATA AND BASED ON THE MAXIMUM BOX CFM LISTED AND AT A PRESSURE DROP ACROSS THE BOX OF 2.0".
4. JOBSITE ELEVATION = 6700FT.

REMARK NOTES
A. CONSTANT VOLUME BOX.
B. VARIABLE VOLUME BOX.

EAV BOX SCHEDULE

CODE (EAV)	AREA SERVED	MANUFACTURER/ MODEL NO.	DESIGN CFM AIRFLOW (CFM)	DESIGN CFM DESIGN (CFM)	CAPACITY (CFM) MAX.	CAPACITY (CFM) MIN.	MAX. NC @ DESIGN MAX.	INLET SIZE	OUTLET SIZE	REMARKS
1A.01	WHITE BOX/ RESTROOM	TITUS DESV 14	2750	2750	3000	450	-	14	20 X 17.5	A
1A.02	WHITE BOX	TITUS DESV 12	1800	1800	2000	325	-	12	16 X 15	A
1A.03	WHITE BOX	TITUS DESV 12	1800	1800	2000	325	-	12	16 X 15	A
1A.04	WHITE BOX	TITUS DESV 6	350	350	500	80	-	6	12 X 8	A
1A.05	WHITE BOX	TITUS DESV 12	1200	1200	2000	325	-	12	16 X 15	A
1A.06	STAGE RESTROOMS	TITUS DESV 12	1575	1575	2000	325	-	12	16 X 15	A
1A.07	KITCHEN	TITUS DESV 8	600	600	900	145	-	8	12 X 10	A

GENERAL NOTES
1. MOUNT WITH 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF THE BOX.
2. MAXIMUM OUTLET S.P.= 0.5".
3. MAXIMUM NC LEVELS ARE RADIATED SOUND DATA AND BASED ON THE MAXIMUM BOX CFM LISTED AND AT A PRESSURE DROP ACROSS THE BOX OF 2.0".
4. JOBSITE ELEVATION = 6700FT.

REMARK NOTES
A. PROVIDE CONSTANT VOLUME BOX.

ENVIRONMENTAL FAN SCHEDULE

CODE	MANUFACTURER/ MODEL NO.	SERVICE	LOCATION	TYPE	MAX CFM	LOW CFM	ESP "W.C. (ALT.)	DRIVE	ELECTRICAL HP	VOLT	PH	FLA	DISC.	FEEDER	FUSE	MTG	CTRL	SOUND POWER LwA	DECIBEL LEVEL dBA	REMARKS
EF 1A.01	GREENHECK/SQ-100-VG	LOADING/TRASH	LOWER LEVEL	INLINE	900	-	0.3	EC	1/4	120	1	4.9	$.T.O.	(2#12, #12G) 3/4"C	-	1	I	67	56	B
SF 1A.02	GREENHECK/BSQ140	MECHANICAL/ICE PLANT SUPPLY	LOWER LEVEL	INLINE	2500	750	1	VFD(B)	1	460	3	2.1	30A/3P	(4#12, #12G) 3/4"C	15A LPS-RK	1	II	81	69	A,B,C
EF 1A.03	GREENHECK/SQ160-VG	MECHANICAL/ICE PLANT EXHAUST	LOWER LEVEL	INLINE	2500	750	0.5	EC	3/4	120	1	13.8	30A/1P	(2#10, #12G) 3/4"C	20A LPS-RK	1	II	74	62	A,G,K
EF 1A.04	GREENHECK/SQ-60-VG	OXYGEN ROOM	LOWER LEVEL	INLINE	50	--	0.3	EC	1/15	120	1	2.8	$.T.O.	(2#12, #12G) 3/4"C	-	1	V	58	46	F
EF 2A.01	GREENHECK/CSP-A700-VG	TOILET EXHAUST	PLAZA 1	INLINE	630	-	0.5	EC	76 W	120	1	4.1	$.T.O.	(2#12, #12G) 3/4"C	-	1	III	-	-	B
EF 3A.01	GREENHECK/CSP-A700-VG	TOILET EXHAUST	PLAZA 2	INLINE	400	-	0.5	EC	76 W	120	1	4.1	$.T.O.	(2#12, #12G) 3/4"C	-	1	III	-	-	B
KEF 3A.02	CAPTIVEAIRE/USBI24DD-RM	KITCHEN GREASE EXHAUST	PLAZA 2	UTILITY	3840	-	2	VFD(D)	3	208	3	10.2	30A/3P	(4#12, #12G) 3/4"C	15A LPN-RK	3	IV	-	-	E,H,J
KEF 3A.03	CAPTIVEAIRE/USBI13DD-RM	KITCHEN GREASE EXHAUST	PLAZA 2	UTILITY	846	-	1.25	EC	1	120	1	11.6	$.T.O.	(2#12, #12G) 3/4"C	-	3	IV	-	-	E,H,K

GENERAL NOTES:
1. DRIVE TYPE: VFD(B) = BELT DRIVE FAN WITH VARIABLE FREQUENCY DRIVE.
VFD(D) = DIRECT-DRIVE WITH VARIABLE FREQUENCY DRIVE.
EC = DIRECT DRIVE ELECTRONICALLY COMMUTATED MOTOR (ECM)-PROVIDE DIAL SPEED CONTROLLER ON FAN MOTOR UNLESS NOTED OTHERWISE.
2. SCHEDULED FAN VALUES (CFM, SP AND HP) ARE ACTUAL AT ALTITUDE. MOTOR HP HAS BEEN ADJUSTED FROM SEA LEVEL CONDITIONS FOR OPERATION AT JOB SITE ELEVATION. JOB SITE ELEVATION = 6,700 FT.
3. PROVIDE MAGNETIC STARTER WITH AUXILARY CONTACTS AND HOA SWITCH ON ALL THREE PHASE UNITS EXCEPT WHEN PROVIDED WITH VARIABLE FREQUENCY DRIVE.
3. PROVIDE PREMIUM EFFICIENCY MOTORS FOR MOTORS 1 HP AND OVER PER NEMA STANDARD MG1-2003, TABLES 12-12 AND 12-13.

MOUNTING (MTG):
1. INSTALL FAN WITH FLEXIBLE CONNECTIONS AT DUCT INLET AND OUTLET AND WITH HANGING VIBRATION ISOLATORS.
2. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
3. UNIT TO BE INSTALLED ON 28" ROOF CURBS BELOW FAN MOUNTING POINTS. PROVIDE SPRING ISOLATORS.

CONTROL (CTRL):
I. INTERLOCK WITH ENERGY RECOVERY VENTILATOR SERVING THE SAME AREA. MONITOR VIA BMS AND PROVIDE MANUAL OVERRIDE SWITCH.
II. RUN CONTINUOUSLY AT LOW SPEED FOR ROOM VENTILATION AND PROVIDE MAX CFM OVERRIDE IN REFRIGERANT PURGE MODE, CONTROL VIA DDC SYSTEM.
III. INTERLOCK WITH MAKE UP AIR UNIT SERVING THE SAME AREA AND RUN CONTINUOUSLY. MONITOR VIA BMS.
IV. REFER TO CONTROL DIAGRAM.
V. RUN CONTINUOUSLY. MONITOR FAN STATUS AT BMS.

REMARK NOTES:
A. PROVIDE BELT AND MOTOR GUARD.
B. PROVIDE MOTORIZED BACKDRAFT DAMPER AT ROOF OR WALL PENETRATION.
C. PROVIDE INTEGRAL FILTER HOUSING WITH 2" MERV 8 FILTER.
D. PROVIDE WITH WALL HOUSING, WEATHERHOOD AND OSHA WIRE GUARD.
E. GREASE EXHAUST APPLICATION. FAN SHALL BE UL 742 LISTED. REFER TO DRAWINGS FOR FAN ROTATION AND INLET/OUTLET CONFIGURATION.
F. PROVIDE GRAVITY BACKDRAFT DAMPER.
G. PROVIDE MOTORIZED BACKDRAFT DAMPER AT OUTDOOR GRAVITY VENT. RE: GRAVITY VENT SCHEDULE AND SECTION 4 ON DRAWING 2A-M5.001.
H. PROVIDE STACK EXTENSIONS PER DETAILS 4 AND 5 ON DRAWING 2A-M8.003.
J. PROVIDE FAN WITH VARIABLE FREQUENCY DRIVE. RE: MECHANICAL CONTROL DIAGRAM.
K. PROVIDE FAN WITH EC FAN MOTOR SUITABLE FOR 0-10VDC CONTROL SIGNAL. RE: MECHANICAL CONTROL DIAGRAM.

GRILLE REGISTER DIFFUSER SCHEDULE

CODE	MANUFACTURER/ MODEL NO.	SERVICE	TYPE	ACCESSORIES	FACE SIZE	REMARKS
A1	PRICE / 520L	SUPPLY	LOUVERED		NECK +2"	
A2	PRICE / 620L	SUPPLY	LOUVERED		NECK +2"	A
A3	PRICE / 520	SUPPLY	DOUBLE DEFLECTION		NECK +2"	
B1	PRICE / SDS	SUPPLY	LINEAR SLOT	48" FACTORY PLENUM	(1) 1" SLOT, 48" LENGTH	
B2	PRICE / SDS	SUPPLY	LINEAR SLOT	48" FACTORY PLENUM	(2) 1" SLOT, 48" LENGTH	
B3	PRICE / SDS	SUPPLY	LINEAR SLOT	48" FACTORY PLENUM	(3) 1" SLOT, 48" LENGTH	
C1	PRICE / SDS	SUPPLY	LINEAR SLOT	60" FACTORY PLENUM	(1) 1" SLOT, 60" LENGTH	
C2	PRICE / SDS	SUPPLY	LINEAR SLOT	60" FACTORY PLENUM	(2) 1" SLOT, 60" LENGTH	
C3	PRICE / SDS	SUPPLY	LINEAR SLOT	60" FACTORY PLENUM	(3) 1" SLOT, 60" LENGTH	
D	PRICE / SDGE	SUPPLY	SPIRAL MOUNT	AIR SCOOP		A
E	PRICE / SDGE	EXHAUST/RETURN	SPIRAL MOUNT	PERFORATED		A
F1	PRICE / PDDR	EXHAUST/RETURN	PERFORATED		12"x12"	
F2	PRICE / PDDR	EXHAUST/RETURN	PERFORATED		24"x24"	
G1	PRICE / 510L	EXHAUST/RETURN	LOUVERED		SEE PLANS	
G2	PRICE / 530L	EXHAUST/RETURN	LOUVERED		SEE PLANS	
H	PRICE / SPD	SUPPLY	SQUARE CEILING		24"x24"	
H1	PRICE / SPD	SUPPLY	SQUARE CEILING		12"x12"	
J1	PRICE / SDR	RETURN	LINEAR SLOT	48" FACTORY PLENUM	(1) 1" SLOT, 48" LENGTH	
J2	PRICE / SDR	RETURN	LINEAR SLOT	48" FACTORY PLENUM	(2) 1" SLOT, 48" LENGTH	
J3	PRICE / SDR	RETURN	LINEAR SLOT	48" FACTORY PLENUM	(3) 1" SLOT, 48" LENGTH	

GENERAL NOTES:
1. SEE PLANS FOR CFM AND NECK SIZE.
2. MAXIMUM NOISE CRITERIA (NC) SHALL BE 30 UNLESS OTHERWISE NOTED.
3. COLOR TO BE COORDINATED WITH ARCHITECT.
4. MATERIAL IS STEEL UNLESS OTHERWISE NOTED.
5. PROVIDE A REMOTE, THROUGH FACE, CABLE OPERATED BALANCING DAMPER WHEN INSTALLED IN AN INACCESSIBLE CEILING.
6. PROVIDE FRAME AND TRIM COMPATIBLE WITH CEILING SYSTEM. RE: ARCHITECTURAL RCP DRAWINGS.
7. PROVIDE SQUARE TO ROUND ADAPTER FOR RECTANGULAR FACE GRILLES CONNECTED TO ROUND BRANCH DUCTS.

REMARK NOTES:
A. ALUMINUM CONSTRUCTION.

GRAVITY VENT SCHEDULE

CODE (GV)	MANUFACTURER/ MODEL NO.	SERVICE	CFM	HOOD SIZE __" X __"	THROAT SIZE __" X __"	THROAT VELOCITY (FPM)	PRESSURE DROP (IN)	ELECTRICAL (MOTORIZED DAMPER) WATTS	VOLT	PH	FLA	DISC.	FUSE	FEEDER	REMARKS
3A.01	GREENHECK/FGR	ICE PLANT EXHAUST	2500	51 X 41	36 X 36	420	0.024	50	120	1	1	$.T.O	-	(2#12, #12G) 3/4"C	

GENERAL NOTES:
1. PROVIDE 48" CUSTOM ROOF CURB. CURB SPACE BELOW GRAVITY VENT TO INCLUDE DUCTED EXHAUST AND REFIRGERANT PIPING FROM BELOW. PIPING TO EXIT SIDE OF ROOF CURB. RE: SECTION 4 ON DRAWING 2A-M5.001.
2. PRESSURE DROP INCLUDES LOSS DUE TO ACCESSORIES.
3. JOB SITE ELEVATION = 6700 FT.
4. PROVIDE 120V MOTORIZED DAMPER WITH INTERLOCK TO REFRIGERANT EXHAUST FAN.
5. PROVIDE BIRD SCREEN.

REFRIGERANT CALCULATIONS

ROOM	REFRIGERANT TYPE	REFRIGERANT CLASSIFICATION	ESTIMATED TOTAL REFRIGERANT CHARGE (LBS) (NOTE 2)	ROOM AREA (SF)	ROOM VOLUME (CF)	NORMAL VENTILATION RATE (CFM)	EMERGENCY VENTILATION RATE (CFM)
ICE PLANT	R-438A	A1	600	1380	16560	750	2,500

GENERAL NOTES
1. INFORMATION ABOVE IS BASED ON THE BASIS OF DESIGN AND THE 2018 INTERNATIONAL MECHANICAL CODE.
2. ESTIMATED TOTAL REFRIGERANT CHARGE IS THE MAXIMUM CHARGE ANTICIPATED WITHIN THE ICE PLANT SKID.

SNOW MELT MANIFOLDS

MANIFOLD CODE (SMM)	ZONE	LOCATION	MANIFOLD TOTAL HEADER (GPM)	MANIFOLD TOTAL PD (FT H20)	ZONE CIRCUITS QTY. OF CIRCUITS	CIRCUIT LENGTH (FT)	TUBE SPACING (IN)	TUBE DIAMETER (IN)	CIRCUIT FLOW (GPM)	MIN. FLUID TEMP EWT(°F)	MIN. FLUID TEMP LWT(°F)	ZONE AREA (SF)	TOTAL RADIANT LOAD (BTUH)	NOTES
SNOWMELT AREA #1: TERRACE HEATED SLAB												1600	288,000	A, B
2A.01	LEVEL 2 TERRACE	L1 STORAGE RM.	26	28.3	10	253	9	3/4	2.6	91	66			
SNOWMELT AREA #2: CONCRETE STAIR												340	61,200	A, B
2A.02	LEVEL 2 TERRACE STAIR	L1 STORAGE RM.	6.91	13.7	3	191	9	3/4	2.3	105	85			

GENERAL NOTES
1. CONTRACTOR TO VERIFY LOOP LENGTHS.
2. BALANCE MANIFOLDS ACCORDING TO MANUFATURER'S RECOMMENDATIONS. COORDINATE BALANCING OF SYSTEM WITH BASE AREA SNOWMELT CONTRACTOR.
3. REFER TO SPECIFICATIONS FOR TUBING AND MANIFOLD REQUIREMENTS.

REMARK NOTES
A. SNOW MELT SYSTEM CONTAINS 50% PROPYLENE GLYCOL.
B. MOUNT MANIFOLD ON STORAGE ROOM WALL.

MECHANICAL LOUVER SCHEDULE

CODE (LV)	LOCATION	AIRFLOW	VELOCITY	MINIMUM FREE AREA (SF)	REMARKS
1A.01	OXYGEN ROOM	50	500	0.1	A,B
1A.02	LOADING/TRASH	900	750	1.2	A,B
2A.01	BUILDING INTAKE	18500	500	37.0	A,B
2A.02	TOILET EXHAUST	200	1000	0.2	A,B
3A.01	EXHAUST	10400	1000	10.4	A,B

GENERAL NOTES
1. LOUVERS SCHEDULED HERE ARE CONNECTED TO MECHANICAL SYSTEMS.
2. LOUVERS ARE PROVIDED BY ANOTHER DIVISION. MECHANICAL CONTRACTOR TO COORDINATE LOUVER SELECTIONS, BY OTHERS, TO MATCH CRITERIA LISTED HERE.
3. REFER TO ARCH. DWGS. AND SPECIFICAIONS FOR EXACT SIZE AND LOCATION.

REMARK NOTES
A. PROVIDE INSULATED PLENUM. SLOPE BASE OF PLENUM TO DRAIN WATER OUT THROUGH LOUVER FACE. RE: MECHANICAL DETAILS.
B. PROVIDE BIRD SCREEN.

BASEBOARD RADIATION SCHEDULE (HYDRONIC)

CODE (BBR)	MANUFACTURER/ MODEL NO.	CAPACITY (BTUH/LF)	GPM/ FT	ROWS	ENCLOSURE HEIGHT (IN)	REMARKS
BBR-1	ZEHNDER RITTLING/IBG 3/4C	570	0.057	2	14	A,B
BBR-2	ZEHNDER RITTLING/PIBG1210	690	0.069	2	6	A,B,C
BBR-3	ZEHNDER RITTLING/PIBG1210	690	0.069	2	6	A,B,D

GENERAL NOTES:
1. EWT= 150˚F, LWT= 130˚F, 30% GLYCOL.
2. MINIMUM FLOW FOR CIRCUIT IS 1 GPM.
3. PROVIDE WALL TO WALL ENCLOSURE UNLESS OTHERWISE NOTED.
4. ENCLOSURE COLOR SELECTED BY ARCHITECT.
5. TUBE MATERIAL IS COPPER, FIN MATERIAL ALUMINUM UNLESS OTHERWISE NOTED.

REMARK NOTES:
A. PROVIDE ZEHNDER RITTLING TYPE PIBGS BAR GRILLE ENCLOSURE, 16GA CONSTRUCTION WITH BOTTOM OPEN INLET, TOP OUTLET, SURFACE MOUNTED, AND ENCLOSED BACK.
B. INTERLOCK CONTROL WITH HVAC ZONE SERVING SAME SPACE. BASEBOARD SHALL ACT AS FIRST STAGE HEATING.
C. PROVIDE PEDESTAL BRACKETS. MAINTAIN 1-1/4" GAP BETWEEN MULLION. RE: BBR-2 BASEBOARD DETAIL.
D. PROVIDE PEDESTAL BRACKETS. ENCLOSE GAP BETWEEN MULLION. RE: BBR-3 BASEBOARD DETAIL.

CEILING HEATER SCHEDULE (ELECTRIC)

CODE (ECH)	MANUFACTURER/ MODEL NO.	AREA SERVED	CONFIG	ELECTRICAL CFM	KW	VOLT	PH	FLA	FUSE	DISC	FEEDER	REMARKS
LC.01	INDEECO/CCI SERIES	BASEMENT ELEC...	CEILING SURFACE...	160	1.5	120	1	12.5	-	$.T.O.	(2#12, #12G) 3/4"C	A
LC.02	INDEECO/CCI SERIES	LEVEL 4 RESTROOM	CEILING SURFACE...	160	1.5	120	1	12.5	-	$.T.O.	(2#12, #12G) 3/4"C	A
LC.03	INDEECO/CCI SERIES	LEVEL 4 RESTROOM	CEILING SURFACE...	160	1.5	120	1	12.5	-	$.T.O.	(2#12, #12G) 3/4"C	A

GENERAL NOTES:
1. PROVIDE DISCONNECT BY UNIT MANUFACTURER.
2. SUBMIT COLOR PALETTE FOR SELECTION BY ARCHITECT.

REMARK NOTES:
A. PROVIDE REMOTE WALL MOUNTED THERMOSTAT.

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Date	Description
2022.02.04	BP5: IFC
1 2022.03.24	BP5: BULLETIN 03 - PERMIT COMMENT RESPONSES
2 2022.04.26	BP5: BULLETIN 05

Seal / Signature

COLORADO LICENSED MATTHEW E. EDWARDS 56806 PROFESSIONAL ENGINEER
4/26/2022

Project Name
SSRC | BASE AREA IMPROVEMENTS

Project Number
003.7835.000

Description
MECHANICAL SCHEDULES

Scale

2A-MEP0.002