

Job Name Sofix Chemical Plant  
Location Tennessee  
Engineer  
Contractor

Job Number  
Quote Number QMJANDRT08072019-1  
Representative Steve Bandy  
Rep Office Chattanooga

ER

Mechanical Modules: (4) MSS050XCHGEAA-DBMBM-AAQ-CB-B  
Accessory Modules:

SUMMARY PERFORMANCE DATA													
							EVAPORATOR			CONDENSER			
Load	Capacity (Tons)	kW	THR MBtu/h	kW/ton	EER	COP	Flow Rate (GPM)	Leaving °F	ΔP (ft)	Flow Rate (GPM)	Entering °F	Leaving °F	ΔP (ft)
100%	86.16	131.9	1.484	1.531	7.837	2.300	248.2	5.000	5.795	322.7	85.00	94.30	6.284
75%	64.62	82.79	1.058	1.281	9.366	2.740	248.2	5.000	5.795	322.7	75.00	81.56	6.284
50%	43.08	47.76	0.6800	1.108	10.83	3.170	248.2	5.000	5.795	322.7	65.00	69.21	6.284
25%	21.54	25.43	0.3453	1.181	10.16	2.980	248.2	5.000	5.795	322.7	65.00	67.14	6.284

The 25, 50 % points have incorporated a cycling penalty per AHRI 550/590.

Cooling COP		Heating COP		Heating and Cooling COP	
2.300		N/A		N/A	

	kW/Ton	EER	COP
With Tower Relief (per AHRI 550/590)	NPLV:IP 1.188	10.10	2.964

EVAPORATOR DESIGN DATA (Based on 50% PG)	
Entering Temperature	15.00
Leaving Temperature	5.000
Design Flow (GPM)	248.2
Pressure Drop (Full Load)	2.509 PSI / 5.795 ft H2O
Chiller Minimum Flow	248.2
Minimum GPM for sizing system bypass	248.2
Heat Exchanger Type	Brazed Plate
Fouling Factor	.000100
Header Size	6"
Header Connection Type	Grooved Coupling

CONDENSER DESIGN DATA (Based on Water)	
Entering Temperature	85.00
Leaving Temperature	94.30
Design Flow (GPM)	322.7
Pressure Drop (Full Load)	2.720 PSI / 6.284 ft H2O
Chiller Minimum Flow	322.7
Minimum GPM for sizing system bypass	322.7
Heat Exchanger Type	Brazed Plate
Fouling Factor	.000250
Header Size	6"
Header Connection Type	Grooved Coupling

PHYSICAL DATA		
	Section 1	Section 2
Length (in.)	128	
Width (in.)	56	
Height (in.)	67	
Estimated Dry weight (lbs)	7800	
Estimated Operating weight (lbs)	8400	
Refrigerant Type	R-410A	
Refrigerant Charge (lbs per circuit)	18	

ELECTRICAL DATA (Direct Connect Per Module)				
	MCA	MOP		
(4) MSS050X	68	100		
Voltage	460/60/3			

Dimensions are estimated and do not include J-Boxes

CHILLER DATA	
Compressor Description	Scroll
Options	With Tower Relief (per AHRI 550/590)
Compressor RLA (Amps)	30

MOUNTING/LIFTING FRAME	
Materials	Option Not Selected
I-Beam Size	Option Not Selected
Bolt together frame - # of pieces	Option Not Selected
End Type	Option Not Selected

\*Parallel feeds not required (Assumes no larger than 300 MCM/kcmil wire)

Software Version #: 1.0.4435.29800

Performance Run Date: 8/15/2019 11:29:29 AM

Outside the scope of AHRI Standard 550/590 (I-P).



4. Compressors, heat exchangers, piping and controls shall be mounted on a heavy gauge, powder coated steel frame. Electrical controls, contactors, and relays for each module shall be mounted within that module.
- D. Chilled and Condenser Water Mains: Each module shall include supply and return mains for both chilled and condenser water. Cut grooved end connections are provided for interconnection to (six)-inch (6.625") standard outside diameter piping with grooved type couplings. Rolled grooved shall be unacceptable. Chilled water mains shall be insulated with ¾" closed cell insulation. Water Mains shall be installed such that they are beneath any power or control wiring so as to insure for safe operation in the event of condensation or minor piping leaks.
- E. Evaporators and condensers: Each evaporator and condenser shall be brazed plate heat exchangers constructed of 316 stainless steel; designed, tested, and stamped in accordance with UL 1995 code for 650 psig refrigerant side working pressure and 360 psig water side working pressure. Both the condenser and evaporator heat exchanger shall be mounted below the compressor, to eliminate the effect of migration of refrigerant to the cold evaporator with consequent liquid slugging on start-up.
- F. Compressor: Each module shall contain two hermetic scroll compressors independently circuited and mounted to the module with rubber-in-shear isolators. Each system also includes high discharge pressure and low suction pressure manual reset safety cut-outs.
- G. Central Control System.
1. Scheduling of the various compressors shall be performed by a microprocessor based control system (Master Controller). A new lead compressor is selected every 24 hours to assure even distribution of compressor run time.
  2. The Master Controller shall monitor and report the following on each refrigeration system:
    - a. Discharge Pressure Fault
    - b. Suction Pressure Fault
    - c. Compressor Winding Temperature
    - d. Suction Temperature
    - e. Evaporator Leaving Chilled Water Temp.
  3. The Master Controller shall be powered by the chillers single point power connection and shall monitor and report the following system parameters:
    - a. Chilled Water Entering and Leaving Temperature
    - b. Condenser Water Entering and Leaving Temperature
    - c. Chilled Water and Condenser Water Flow
  4. An out of tolerance indication from these controls or sensors shall cause a "fault" indication at the Master Controller and shutdown of that compressor with the transfer of load requirements to the next available compressor. In the case of a System Fault the entire chiller will be shut down. When a fault occurs, the Master Controller shall record conditions at the time of the fault and store the data for recall.

This information shall be capable of being recalled through the keypad of the Master Controller and displayed on the Master Controller's 2 line by 40 character back-lit LCD. A history of faults shall be maintained including date and time of day of each fault (up to the last 20 occurrences).

2. The Chiller control system shall respond to Entering Water Temperature (constant primary flow) or to Leaving Water Temperature (variable primary flow) and will have an integral reset based on entering water temperature to provide for efficient operation at part-load conditions.

E. Power Phase Monitor (PPM)

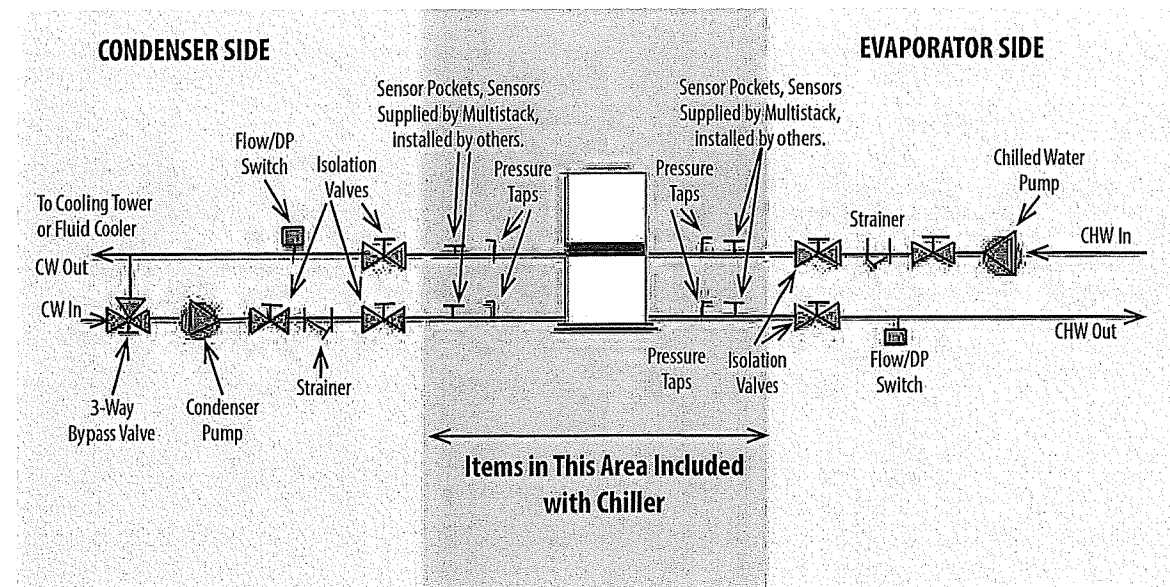
1. Provide a Power Phase Monitor on the incoming power supply to the chiller. This device shall prevent the chiller from operating during periods when the incoming power is unsuitable for proper operation.
2. The Power Phase Monitor shall provide protection against the following conditions:
  - a. Low Voltage (Brown-Out)
  - b. Phase Rotation
  - c. Loss of Phase
  - d. Phase Imbalance

### **PART 3      INSTALLATION**

#### ***3.01   PIPING SYSTEM FLUSHING PROCEDURE***

- A. Prior to connecting the chiller to the condenser and chilled water loop, the piping loops shall be flushed with a detergent and hot water (110-130° F) mixture to remove previously accumulated dirt and other organics. In old piping systems with heavy encrustation of inorganic materials consult a water treatment specialist for proper passivation and/or removal of these contaminants.
- B. During the flushing, a 30 mesh (max.) Y-strainers (or acceptable Equivalent) shall be in place in the system piping and examined periodically as necessary to remove collected residue. The use of on board chiller strainers shall not be acceptable. The flushing process shall take no less than 6 hours or until the strainers when examined after each flushing are clean. Old systems with heavy encrustation shall be flushed for a minimum of 24 hours and may take as long as 48 hours before the filters run clean.

Detergent and acid concentrations shall be used in strict accordance with the respective chemical manufacturer's instructions. After flushing with the detergent and/or dilute acid concentrations the system loop shall be purged with clean water for at least one hour to ensure that all residual cleaning chemicals have been flushed out.



## Recommended Piping

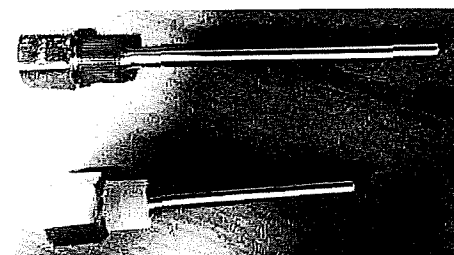
All piping must be properly and adequately supported at coupling connections and suitable intervals along the piping runs. Hanger design must provide for the weight of fluids in the piping system when the chiller is in operation.

Multistack modules are equipped with brazed plate heat exchangers made of 316 stainless steel. Multistack recommends use of a 30-mesh system strainer, Y-type basket or equal, in each condenser and evaporator inlet header.

It is the installing contractor's responsibility to make sure the water systems have been flushed and the strainers are clean and clear of debris before starting the chiller. Do not flush piping so as to push debris into or through the through the chiller heat exchangers.

## Important

Be sure to install the supplied sensor wells in the system piping. The wells should be installed a few feet from the chiller in the entering and leaving chilled water and entering and leaving condenser water pipes.



Typical Sensor Wells

## Flow Protection

Proof of chilled water and condenser water flow is required by the Master Controller inputs. Paddle-type or Differential Pressure (DP) switches may be used. Switches can be supplied by Multistack as an option, otherwise they are to be field supplied and installed. Chillers purchased with chilled or condenser water pump modules have a DP switch installed across the pump to verify operation. Multistack recommends a paddle-type switch be installed in the leaving chilled water piping using a differential pressure switch. Install it across the inlet and outlet water connections to the chilled and/or condenser water piping connections.

## System Water Volume

A properly sized chilled water system must have enough time (at least three minutes) to properly control and respond to changes in load and to prevent short cycling of the chiller. To ensure the system water volume is adequate, a general rule of thumb is:

$$7\text{-}10 \text{ gallons of water per ton or Acceptable Chilled Water Volume} = \text{Chilled Water Design GPM} \times 3$$

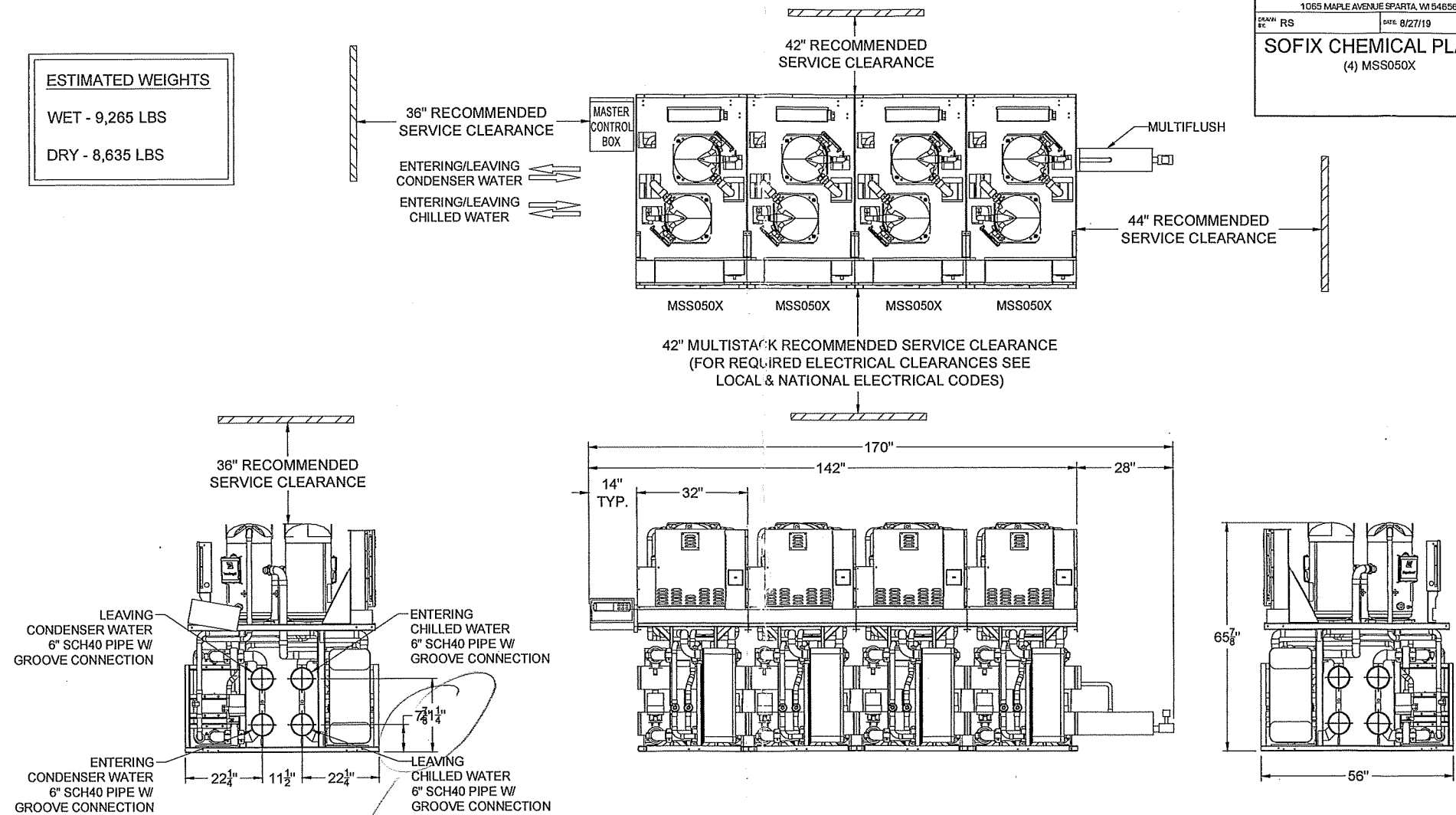
If the system heat exchangers, piping and components cannot hold the necessary chilled water volume, a properly sized chilled water storage tank should be added.

## Condenser Water Temperature Control

For installations where entering condenser water temperature could be lower than 65°F Multistack recommends installing a three-way tower bypass valve to maintain a minimum of 65°F entering condenser water temperature. This is based on a 10°F Delta-T system.

**ESTIMATED WEIGHTS**  
 WET - 9,265 LBS  
 DRY - 8,635 LBS

**MULTISTACK**  
ORIGINATORS. INNOVATORS. NEVER THE IMITATORS.  
 1065 MAPLE AVENUE SPARTA, WI 54656  
 DRAWN BY: RS DATE: 8/27/19  
**SOFIX CHEMICAL PLANT**  
 (4) MSS050X



IF CHILLER IS GOING TO BE INSTALLED IN A PIT, CONTACT FACTORY.  
 LAYOUT DRAWINGS ARE FOR REFERENCE ONLY, DIMENSIONAL DATA IS SUBJECT TO CHANGE UPON FINAL DESIGN

7 7/8 & 11 1/4  
 Don't trust this dimension until  
 machine is on site.  
 P.C.Hill 10/11/2019.

REISSUE	A	B	C	D	C.pco WITH EVD TWIN EXPANSION VALVE CONTROL	III MULTISTACK Sparta, Wisconsin 54656 ALL DIMENSIONS IN INCHES / DO NOT SCALE DRAWINGS	B 1000-8432	D
DATE	REVISION	BY	DATE	REVISION	JOB NAME:	2-10VDC MOTORIZED BUTTERFLY VALVE EVAPORATOR SIDE (BELIMO GRB24-MFT)	INTERCONNECT DIAGRAM WATER COOLED, FLUID COOLER, DHRC, AND VMEH WITH COMPRESSOR MOTOR PROTECTOR	
1	F	D	10/16/14	MLG	DRAWN BY: MLG	2-10VDC MOTORIZED BUTTERFLY VALVE CONDENSER SIDE (BELIMO GRB24-MFT)	SCALE: NONE	
			4/13/17	ESF	DATE: 9/24/14	CHECKED BY:		
			5/18/17	ESF		DATE:		
			4/18/18	ESF				

LEGEND

CB

CIRCUIT BREAKER

CC

COMPRESSOR CONTACTOR

CPT

CONTROL POWER TRANSFORMER

CR

CONTROL RELAY

EXV

ELECTRONIC EXPANSION VALVE

FS1

FLOW SWITCH (THERMAL DISPERSION)  
EVAPORATOR SIDE

FS2

FLOW SWITCH (THERMAL DISPERSION)  
CONDENSER SIDE

HP

HIGH PRESSURE SWITCH

HPT

HIGH PRESSURE TRANSDUCER

LPT

LOW PRESSURE TRANSDUCER

M1, M2

MOTOR, COMPRESSOR

MV1

MOTORIZED BUTTERFLY VALVE; EVAPORATOR  
(PROPORTIONAL CONTROL) BELIMO-GRB24-MFT

MV2

MOTORIZED BUTTERFLY VALVE; CONDENSER  
(PROPORTIONAL CONTROL) BELIMO-GRB24-MFT

MTC

MOTOR TEMPERATURE CONTROL

TS

TERMINAL STRIP

NOTES:

Δ

 ON HIGHER SHORT CIRCUIT CURRENT RATING (SCCR) UNITS  
CB3 WILL BE A COMPACT CIRCUIT PROTECTOR (CCP)  
WHICH IS A MINIATURE, FUSED DISCONNECT WITH CLASS CC FUSES.

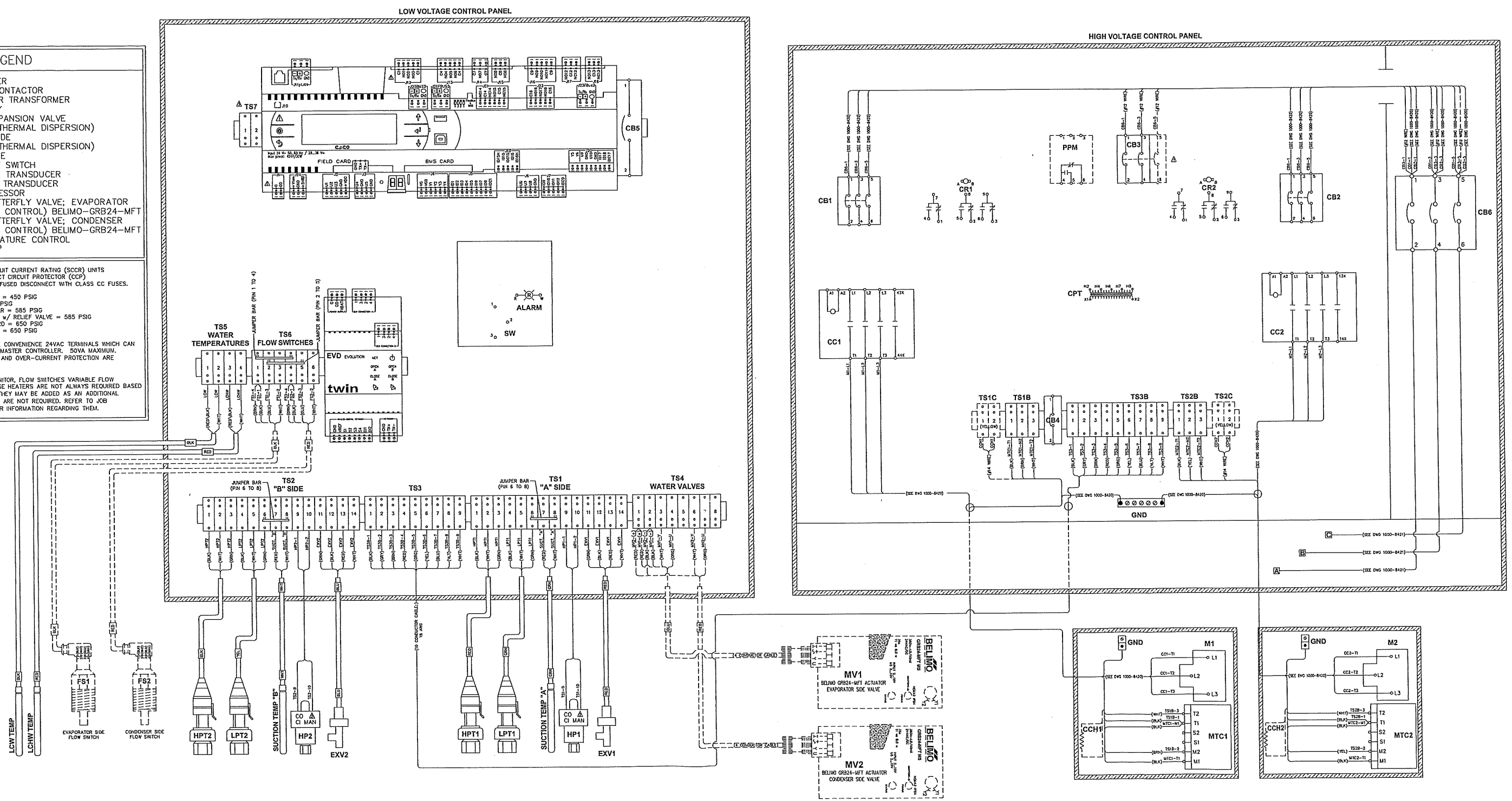
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 R134A HEAT RECOVERY = 450 PSIG  
WATER COOLED = 475 PSIG  
LOW TEMP FLUID COOLER = 585 PSIG  
R410A HEAT RECOVERY w/ RELIEF VALVE = 585 PSIG  
FLUID COOLER STANDARD = 650 PSIG  
R410A HEAT RECOVERY = 650 PSIG

Δ

 TS7-1 AND TS7-2 ARE CONVENIENCE 24VAC TERMINALS WHICH CAN  
BE USED TO POWER A MASTER CONTROLLER, 50VA MAXIMUM.  
DISCONNECTING MEANS AND OVER-CURRENT PROTECTION ARE  
FROM CB4, NOT CB5.

----- THE POWER PHASE MONITOR, FLOW SWITCHES VARIABLE FLOW  
VALVES AND CRANKCASE HEATERS ARE NOT ALWAYS REQUIRED BASED  
ON THE APPLICATION. THEY MAY BE ADDED AS AN ADDITIONAL  
FEATURE EVEN IF THEY ARE NOT REQUIRED. REFER TO JOB  
SPECIFIC SELECTION FOR INFORMATION REGARDING THEM.







REV. BY DATE	A	MULTISTACK		B	1001-0188	A
CHANGED TERMINATION RESISTOR TO 120 OHM 5/22/19 ESF		Sparta, Wisconsin 54656		COMMUNICATIONS INTERCONNECT DIAGRAM C.pCO		
JOB NAME:		ALL DIMENSIONS IN INCHES / DO NOT SCALE DRAWINGS		SCALE: NONE		
DRAWN BY: ESF DATE: 2/14/18		CHECKED BY:		ENGR: APPR: DATE:		

**NETWORK ADDRESSING**

EACH CONTROL BOARD IN THE NETWORK MUST HAVE A UNIQUE ADDRESS. TO CHANGE THE ADDRESS OF THE CONTROLLER, PRESS THE RECESSED BUTTON TO THE LEFT OF THE 7 SEGMENT LED DISPLAY AT THE BOTTOM OF THE BOARD FOR 5 SECONDS; THE ADDRESS DISPLAY WILL GET BRIGHTER. PRESS AND RELEASE THIS BUTTON REPEATEDLY TO INCREMENT THE ADDRESS. ONCE THE DESIRED ADDRESS IS DISPLAYED, RELEASE THE BUTTON. AFTER A FEW SECONDS, THE BRIGHTNESS OF THE LED DISPLAY WILL DECREASE INDICATING THE ADDRESS HAS BEEN SAVED IN THE MEMORY.

VALID MODULE NUMBERS ARE 1 THRU 15  
MASTER CONTROL ADDRESS = 30  
REMOTE DISPLAY (OPTIONAL) = 32

\*120 OHM; 1/4 WATT TERMINATION RESISTORS AT MASTER CONTROLLER AND LAST ADDRESSED MODULE BOARD BETWEEN (-) AND (+)

