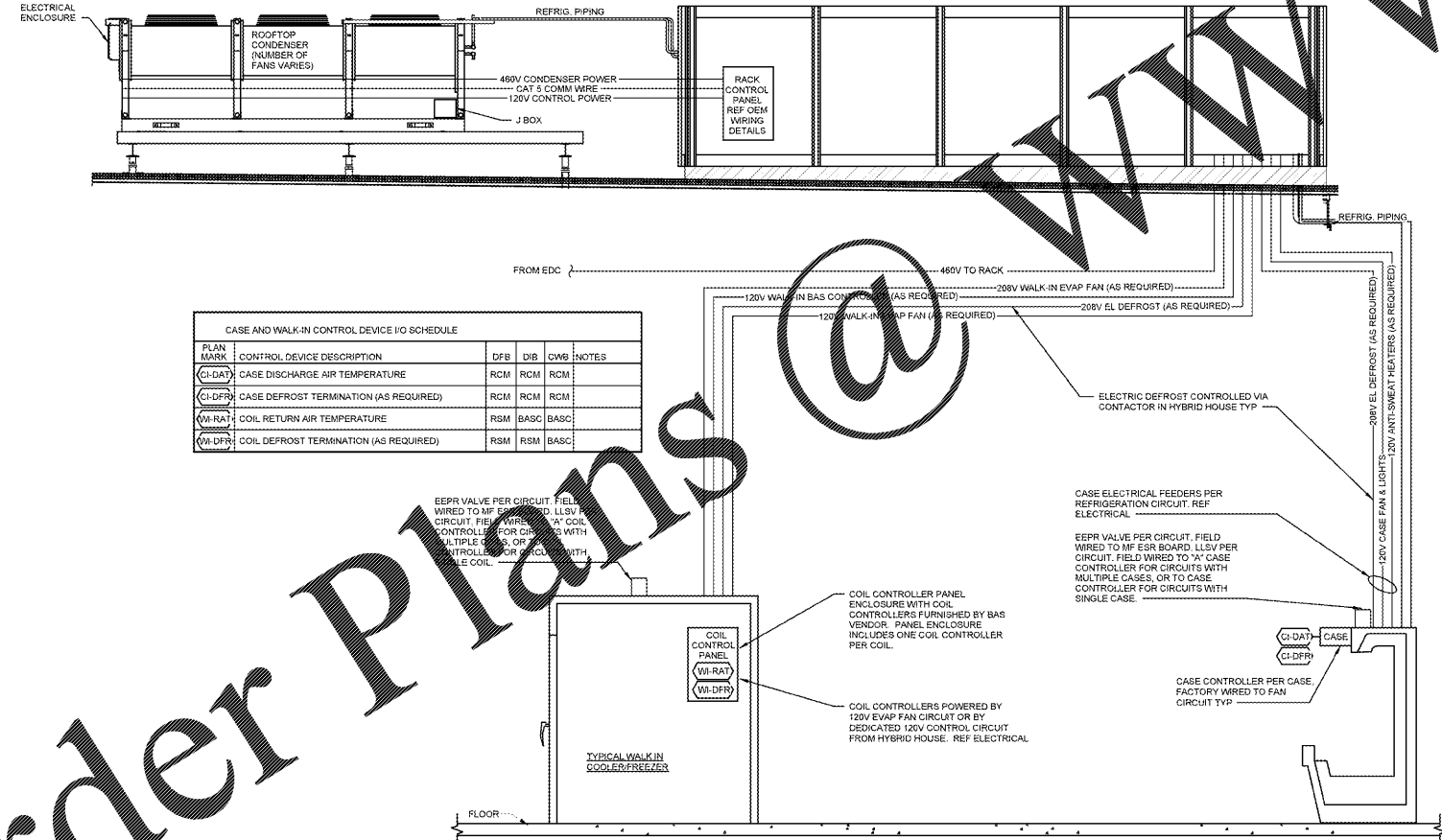


Order Plans

1 CASE AND WALK-IN PIPING AND ELECTRICAL ONE-LINE DIAGRAM
NTS



PLAN MARK	CONTROL DEVICE DESCRIPTION	DFB	DR	DWB	NOTES
(CI-DAT)	CASE DISCHARGE AIR TEMPERATURE	RCM	RCM	RCM	
(CI-DFTR)	CASE DEFROST TERMINATION (AS REQUIRED)	RCM	RCM	RCM	
(WI-RAT)	COIL RETURN AIR TEMPERATURE	RSM	BASC	BASC	
(WI-DFTR)	COIL DEFROST TERMINATION (AS REQUIRED)	RSM	RSM	BASC	

DEFROST CONTROL TABLE OF EVENTS

MODE	APPLICATION	SUPPLY SOLENOID VALVES		FANS		DEFROST HEATERS	
		ALL	OFF	ON	OFF	ON	OFF
PUMP OUT	ALL	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
DEFROST CYCLE	ELECTRIC DEFROST - CASE	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
	OFF-CYCLE DEFROST - CASE	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
	ELECTRIC DEFROST - WALK-IN	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
DRIP TIME	OFF-CYCLE - WALK-IN	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
	ELECTRIC DEFROST - CASE	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
	OFF-CYCLE DEFROST - CASE	OFF	OFF	ON OR OFF, PER CASE OEM	OFF	ON	OFF
FAN DELAY	AS REQUIRED	ON	ON	OFF	OFF	OFF	OFF
RESUME REFRIGERATION	ALL	ON	ON	ON	ON	ON	OFF

CONDENSER AND RECEIVER DEFROST

CONDENSER CONTROL: CONDENSER CONTROL SHALL EMPLOY AN AMBIENT TEMPERATURE (WALK-IN) DIFFERENTIAL TROOPING APPROACH THAT RESETS THE SATURATED CONDENSING TEMPERATURE CONTROL SETPOINT (SCP) TO MAXIMUM CAPACITY. THE INFLUENT POINTS REQUIRED TO ACHIEVE CONDENSER FAN SPEED CONTROL AND CONDENSER CAPACITY SPLIT CONTROL SHALL RESIDE IN AND BE A FUNCTION OF THE MANUFACTURER PROVIDED CONTROLS. ALL CONDENSER CONTROL FUNCTION SHALL BE THE RESPONSIBILITY OF THE OEM.

APPLICABLE CONDENSERS SHALL APPLY A SINGLE VFD PER CONDENSER AND SHALL CONTROL THE BYPASS ALL FANS COLLECTIVELY AS ONE COMMON VARIABLE FREQUENCY CONTROL. THE VFD SPEED COMMAND, FROM MINIMUM SPEED TO MAXIMUM SPEED, SHALL BE A FUNCTION OF AMBIENT DRY BULB TEMPERATURE SUCH THAT CONSTANT TEMPERATURE DIFFERENCE (TD) IS MAINTAINED BETWEEN THE SATURATED CONDENSING TEMPERATURE AND AMBIENT TEMPERATURE. REFERENCE THE DX INVERTER REFRIGERATION SETTINGS TABLE. THE LOWER SCT BYPASS MODE SHALL BE DETERMINED BY THE OEM. A FAILSAFE VFD BYPASS MODE THAT OVERRIDES ALL FANS TO 100% SPEED AND AVAILABLE COIL SURFACE AREAS TO 100% SHALL BE INCLUDED. THE BYPASS MODE SHALL ENGAGE THE CONDENSER FAN CONTROLS, DISABLE THE VFD AND INITIATE A VFD BYPASS MODE ANNUNCIATION TO THE BAS. BYPASS MODE IS INITIATED UPON ANY VFD FAULT OR VIA A BAS OVERRIDE COMMAND.

SURGE RECEIVERS SHALL HAVE A NORMALLY CLOSED SOLENOID (SURGE SOLENOID) IN THE BYPASS LINE AROUND THE RECEIVER. THE SURGE SOLENOID SHALL OPEN WHEN THE DROP LEG TEMPERATURE IS BELOW THE SURGE SOLENOID CUT-IN TEMPERATURE DETERMINED BY THE OEM. THE SURGE SOLENOID SHALL CLOSE WHEN THE DROP LEG TEMPERATURE IS ABOVE THE SURGE SOLENOID CUT-OUT TEMPERATURE DETERMINED BY THE OEM.

THE SYSTEM DISCHARGE HEADER SHALL HAVE AN ELECTRONIC RECEIVER PRESSURE REGULATING VALVE. THE PRESSURE REGULATING VALVE SHALL BE SET BY THE OEM TO MAINTAIN THE MINIMUM REQUIRED LIQUID PRESSURE IN THE RECEIVER.

THE FOLLOWING RECEIVER ALARM EVENTS SHALL BE COMMUNICATED BY THE OEM CONTROLLER TO THE BAS: RECEIVER LOW LEVEL ALARM, RECEIVER DISCHARGE ALARM.

DIRECT EXPANSION (DX) CASE AND WALK-IN EVAPORATOR OPERATION

DX CIRCUIT TEMPERATURE CONTROL:

FIXTURES SHALL BE DEFINED AS REFRIGERATED DISPLAY CASES AND REFRIGERATED WALK-IN COOLER AND FREEZER COILS. CIRCUITS SHALL BE DEFINED AS A GROUP OF FIXTURES WHICH SHARE A COMMON SET OF TEMPERATURE CONTROL VALVES. EACH REFRIGERATION CIRCUIT SHALL HAVE A NORMALLY CLOSED LIQUID LINE SOLENOID VALVE (LLSV) AND ELECTRONIC PRESSURE REGULATOR (EPR) USED TO MAINTAIN CASE TEMPERATURE CONTROL BOUNDARIES.

CIRCUIT LLSV AND EPR CONTROL: THE "A" CASE CONTROLLER SHALL CYCLE THE LLSV ON WHEN THE CONTROL TEMPERATURE EXCEEDS THE UPPER CONTROL LIMIT AND SHALL CYCLE THE LLSV OFF WHEN THE CONTROL TEMPERATURE IS BELOW THE LOWER CONTROL LIMIT. THE EPR POSITION SHALL BE MODULATED BY THE MF ESR BOARD TO MAINTAIN THE CONTROL TEMPERATURE OF THE CIRCUIT TO SET POINT DURING NORMAL NON-DEFROST OPERATIONAL TEMPERATURE CONTROL LIMITS SHALL BE DEFINED, PER CIRCUIT, IN THE DISCHARGE AIR TEMPERATURE AND DEFROST PARAMETERS TABLE.

CIRCUIT FAN CONTROL - LOW TEMPERATURE CASE FANS SHALL BE CONTROLLED INTERNALLY TO THE CASE AS REQUIRED BY THE CASE OEM FOR PROPER DEFROST CONTROL. WALK-IN COIL FANS SHALL BE CONTROLLED VIA RELAY AT RACK. MEDIUM TEMPERATURE FIXTURE FANS SHALL OPERATE CONTINUOUSLY WITHOUT CONTROL BY THE CASE CONTROLLER. ALL FIXTURE FANS SHALL OPERATE CONTINUOUSLY DURING REFRIGERATION MODE. FAN CONTROL DURING DEFROST IS DEFINED IN THE FOLLOWING DEFROST CONTROL SEQUENCES AND DEFROST CONTROL TABLE OF EVENTS.

DEFROST CONTROL: DEFROST CONTROL SCHEMES SHALL BE DEFINED AS EITHER ELECTRIC DEFROST OR OFF-CYCLE DEFROST. DEFROST FREQUENCIES (CYCLES PER DAY) ARE GOVERNED BY A MASTER DEFROST SCHEDULE THAT RESIDES IN THE BUILDING AUTOMATION SYSTEM (BAS) AND ARE DETERMINED BY FIXTURE TYPE AND APPLICATION.

ELECTRIC DEFROST: DEFROST HEATERS SHALL BE CONTROLLED BY BAS RELAY OUTPUTS LOCATED IN THE RACK DEFROST PANEL. THE DEFROST CYCLE SEQUENCE OF EVENTS SHALL PROCEED IN ORDER FROM PUMPOUT MODE, DEFROST MODE, DRIP MODE AND FAN DELAY MODE AS APPLICABLE. REFERENCE THE DEFROST CONTROL TABLE OF EVENTS FOR VALVE, FAN AND HEATER OPERATIONAL STATUS FOR EACH MODE. THE DEFROST DURATION SHALL HAVE A MAXIMUM (UPPER) TEMPERATURE TERMINATION VALUE AND A MAXIMUM TIME LIMIT THAT ARE DEFINED BY THE FIXTURE MANUFACTURER. THE PRIMARY DEFROST TERMINATION LIMIT SHALL BE BASED ON TEMPERATURE. IF THE UPPER TEMPERATURE TERMINATION LIMIT IS NOT REACHED WITHIN THE SPECIFIED MAXIMUM TIME DURATION, THE DEFROST CYCLE SHALL BE TERMINATED UNTIL THE NEXT SCHEDULED DEFROST EVENT. AFTER THE DRIP MODE AND FAN DELAY MODE HAVE ELAPSED, THE FIXTURE SHALL RESUME NORMAL REFRIGERATION MODE.

OFF-CYCLE: WHEN A DEFROST EVENT IS INITIATED VIA COMMAND FROM THE BAS, THE OFF-CYCLE DEFROST FOLLOWS THE SAME TIME-TEMPERATURE SEQUENCES AS ELECTRIC DEFROST LESS THE INITIATION AND TERMINATION OF THE ELECTRIC DEFROST HEATERS. ALL FANS STAY ON CONTINUOUSLY THROUGH THE DEFROST EVENT.

DISCHARGE COMPRESSOR AND SUBCOOLER OPERATION

FIXTURE LIGHTING CONTROL: LIGHTS SHALL BE CONTROLLED BY THE LOCAL CASE CONTROLLER AND GOVERNED BY A SCHEDULE RESIDING IN THE MAIN BAS CONTROLLER. EXCESSIVE COMPRESSOR CYCLING (START/STOP) SHALL BE MONITORED BY THE USER. THE COMPRESSOR STAGING CONTROL OPERATION AND RESPONSE SHALL PREVENT EXCESSIVE COMPRESSOR CYCLING (START/STOP). EXCESSIVE COMPRESSOR CYCLING IS DEFINED AS MORE THAN 6 CYCLE EVENTS IN 60 MINUTES.

THE EQUIPMENT MANUFACTURER SHALL INDICATE WHICH COMPRESSORS/LOADERS ARE TO OPERATE IN WHAT ORDER FOR THE CORRECT STAGING CAPACITY. WHEN A VFD IS APPLIED FOR STAGING CAPACITY CONTROL, IT SHALL BE THE DEFAULT LEAD COMPRESSOR AND SHALL OPERATE CONTINUOUSLY WITHOUT CYCLING. EQUAL RUN TIME ALGORITHMS SHALL BE APPLIED TO SYSTEMS WITH EVENLY SIZED COMPRESSORS.

THE FOLLOWING ALARM EVENTS SHALL BE COMMUNICATED BY THE OEM CONTROLLER TO THE BAS AND SHALL CYCLE OFF THE COMPRESSOR: COMPRESSOR HIGH PRESSURE SWITCH, COMPRESSOR OIL FAILURE SWITCH, RACK PHASE LOSS.

SUBCOOLER:

THE RACK OEM SHALL DETERMINE THE FUNCTIONAL CONTROL AND OPERATION OF THE SUB-COOLER AND ASSOCIATED COMPONENTS TO MAINTAIN THE SUBCOOLED LIQUID TEMPERATURE WITHIN THREE DEGREES OF TARGET.

LIQUID PRESSURE REGULATOR:

LIQUID PRESSURE REGULATOR SHALL MAINTAIN A LIQUID SUPPLY PRESSURE WITHIN FIVE POUNDS OF THE TARGET.

STIPULATION FOR THE USE OF THIS PLAN SHALL BE THAT THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES AND FOR OBTAINING ALL NECESSARY CONTRACTS AND AGREEMENTS FROM THE MANUFACTURER OF THE EQUIPMENT TO BE INSTALLED. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY CONTRACTS AND AGREEMENTS FROM THE MANUFACTURER OF THE EQUIPMENT TO BE INSTALLED.

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ISSUE BLOCK

NO.	DESCRIPTION	DATE

CHECKED BY: MM
DRAWN BY: PWD
FILE NAME: REM4
PROTO CYCLE: 10/28/16
DOCUMENT DATE: 01/09/17

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT C WEBB ON THE DATE AND/OR TIME STAMP SHOWN USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

REFRIG ENERGY MANAGEMENT DETAILS

CPC

SHEET: **REM4**