A1 SIZE – 594mm x 841mm

LOOP M681–AHU ADMINISTRATION BUILDING VENTILATION FAN FIELD MOUNTED COMPONENTS

PS1	1	AFS222	DIFF. PRESSURE SWITCH SPDT CONTACTS 0.2" TO 12" WC
JZ	1	R742581D15	MOO. CURRENT VALVE 40A 3 PHASE 600V 60HZ
TE7	1	L7022A1002	TEMP. SENSOR 500 OHM, AVG TYPE
TS16	1	T675A1706	TEMP. CONTROL THERMOSTAT –16 TO 38°C
	1	1J1524A	BULB HOLDER
FS	1	FS4–3	MCDONNELL MILLER FLOW SWITCH
TS15	1	T675A1052	TEMP. CONTROL THERMOSTAT PIPE MTD. SPDT
	1	112622AA	1/2" WELL
TS14	1	T675A100J	TEMP. CONTROL THERMOSTAT PIPE MTD. SPOT
	1	311266D	BULB HOLDER

PANEL MOUNTED COMPONENTS

KY	1	CB–1004870	POTTER & BRUMFIELD SOLID STATE RELAY TIME DELAY. 120 VAC
	1	27E122	POTTER & BRUMFIELD SOCKET 8–PIN
HS3	1	800T–A2A	ALLEN–BRADLEY PUSHBUTTON 1–NC, 1–NO CONTACT, BLACK OPERATOR
	2	B00T–X5JB	ALLEN–BRADLEY LEGEND PLATE 'RESET' 120 VAC COIL 3PDT CONTACT
	2	27E123	POTER & BRUMFIELD SOCKET 11–PIN
FF, JM	2	800T–Q10	ALLEN–BRADLEY PILOT LIGHT 120 VAC
	2	800T–N26R	ALLEN–BRADLEY PILOT LIGHT CAP 'RED'
	1	800T–N26A	ALLEN–BRADLEY PILOT LIGHT CAP 'AMBER'
ET	1	AT72D1188	TRANSFORMER 120/24 VAC
TC1	1	R74420A1012	ELECTRONIC TEMPERATURE CONTROLLER 0–50°C
	1	EC2	FUSE BLOCK 2.0 AMP

SEQUENCE OF OPERATION

AIR HANDLING UNIT M681–AHU RUNS CONTINUOUSLY AND PROVIDES HEATING AND VENTILATION TO THE ADMINISTRATION BUILDING.

WITH THE SUPPLY FAN INDEXED TO OPERATE FROM THE HAND–OFF–AUTO SELECTOR SWITCH M681–HS2 TIME DELAY RELAY M681–KY IS ENERGIZED AND BEGINS TIMING FOR AN ADJUSTABLE TIME PERIOD TO ALLOW THE SUPPLY FAN TO START–UP AND ESTABLISH AIR FLOW. SHOULD THE TIME DELAY EXPIRE BECAUSE THE AIR FLOW PROVIDING SWITCH M681–PS1 INDICATES NO AIR FLOW, THE SUPPLY FAN SHUTS DOWN. THE LOSS OF FLOW PILOT LIGHT M681–FF IS ENERGIZED, AND R1 RELAY CONTACT PROVIDES A LOSS OF FLOW FAILURE SIGNAL TO THE DCS (DISTRIBUTED COMPUTER SYSTEM)

RESET PUSHBUTTONS M6B1–HS3 ALLOWS THE OPERATOR TO RESET THE CONTROL SYSTEM AND RE–INITIATE THE START–UP SEQUENCE DESCRIBED.

PANEL DOOR MOUNTED PILOT LIGHTS M681–MM AND M681–MO PROVIDE "FAN RUN" AND "FAN STOP" INDICATION RESPECTIVELY. A FAN RUN INDICATOR SIGNAL IS ALSO PROVIDED TO THE DCS.

THE BREAKER FOR HC3 HEATING COIL SHOULD BE LEFT OFF DURING THE WINTER HEATING SEASON AND THE SUMMER COOLING SEASON. THE HEATING COIL SHOULD ONLY BE USED AS A PRIMARY HEAT SOURCE IN FALL AND SPRING SEASON WHEN HOT WATER BOILERS DO NOT SUPPLY 681 HEATING SYSTEM. THE ELECTRIC HEATING COIL SHOULD NOT BE USED AS A BACK–UP HEAT SOURCE SINCE THE HOT WATER SYSTEM SUPPLIES ALL THE NECESSARY PRIMARY HEAT REQUIRED WHEN THE SYSTEM OPERATES PROPERLY. IF THE ELECTRIC COIL SYSTEM SHOULD COME ON, THE RESULT WILL BE THAT PRIMARY HEAT IS SUPPLIED FROM THE ELECTRIC HEAT COIL, WITHOUT ANY REMOTE INDICATION TO SHOW THAT, AND THE HOT WATER SYSTEM TEMPERATURE REGULATION IS DISABLED INDEFINITELY UNTIL SOMEONE RESETS THE ELECTRIC HEAT CONTROLLER OFF.

THIS IS BECAUSE OF A DESIGN FAULT THAT PLACES THE ELECTRIC HEAT COIL CONTROLLER ENABLE SENSOR (TS–16) BETWEEN THE HOT WATER AND ELECTRIC HEAT COILS AND HAS HOT WATER CONTROLLER SENSOR (M681–TE2) AFTER BOTH COILS. CONSEQUENTLY, WHENEVER THE ELECTRIC COIL COMES ON, THE HOT WATER SYSTEM WILL SEE SET POINT TEMPERATURE OF THE ELECTRIC COIL (>20° C.) AND WILL NOT ALLOW ANY HOT WATER HEATING. THIS HOT WATER HEATING IN TURN IS REQUIRED TO TURN OFF THE ELECTRIC COIL CONTROLLER ENABLE SWITCH.

SOLID STATE CONTROLLER M681–TC1 RECEIVES A HOT DECK TEMPERATURE INPUT FROM SENSOR M681–TE7 (LOCATED DOWN STREAM OF THE ELECTRIC REHEAT COIL) MODULATES THE ELECTRIC HEAT COIL THROUGH SOLID STATE CURRENT VALVE M681–JZ. TEMPERATURE CONTROLLER M681–TC1 MODULATES THE ELECTRIC REHEAT COIL FROM 0–100% AS REQUIRED TO MAINTAIN IT'S ADJUSTABLE SETPOINT TEMPERATURE (25°).

THE HOT WATER HEAT COIL IS PROTECTED BY HOT WATER RETURN FLOW SWITCH M681–FS AND HOT WATER RETURN TEMPERATURE CONTROLLER M681–TS15. WITH THE TEMPERATURE IN THE HOT WATER RETURN DROPPING BELOW TET.4PERATURE CONTROLLER M681–TS15 ADJUSTABLE SETPOINT (71°C) OR THE HOT WATER RETURN FLOW SWITCH M681–FS DETECTING A "NO FLOW" CONDITION. THE SUPPLY FAN IS DE–ENERGIZIED. BOTH M6B1–FS AND M6B1–TS15 SAFETY CONTROLS ARE LOCKED OUT BY OUTDOOR AIR MOUNTED TEMPERATURE CONTROLLER M681–TS14 WHEN THE OUTDOOR AIR TEMPERATURE RISES ABOVE IT'S ADJUSTABLE SETPOINT (4°C). WITH THE OUTSIDE AIR TEMPERATURE ABOVE 4&&DC, THE SUPPLY FAN RUNS CONTINUOUSLY REGARDLESS OF THE HOT WATER RETURN FLOW OR TEMPERATURE. WITH THE SUPPLY OPERATING, THE PNEUMATIC MIXED AIR CONTROLS ARE ENABLED TO OPERATE. THE PNEUMATIC MIXED AIR CONTROL SYSTEM MODULATES THE OUTSIDE AND RETURN AIR MOTORIZED DAMPERS TO MAINTAIN THE ADJUSTABLE MIXED AIR SETPOINT (13°C)

THE PNEUMATIC TEMPERATURE CONTROL SYSTEM MODULATES THE FACE/BYPASS MOTORIZED DAMPERS IN SEQUENCE WITH THE HOT WATER PREHEAT COIL MOTORIZED VALVE M681–TV1 TO MAINTAIN THE FAN DISCHARGE AIR ADJUSTABLE SETPOINT TEMPERATURE (13°C). THE PNEUMATIC CONTROLS SYSTEM DRL\IES THE HOT CONTROL VALVE M6B1–TV1 TO THE FULL HEAT POSITION WITH THE OUTSIDE AIR TEMPERATURE BELOW 4°C. WITH THE
CONTROL SYSTEM IN THIS MODE. THE PNEUMATIC CONTROLS MODULATE THE FACE AND BYPASS DAMPERS TO MAINTAIN THE FAN DISCHARGE SETPOINT TEMPERATURE.

THE PNEUMATIC TEMPERATURE CONTROL SYSTEM MODULATES COLD DECK COOLING COIL MOTORIZED VALVE M681–TV3 TO MAINTAIN THE ADJUSTABLE COLD DECK SETPOINT TEMPERATURE (13°C)

THE PNEUMATIC TEMPERATURE CONTROL SYSTEM MODULATES THE HOT DECK HOT WATER REHEAT COIL MOTORIZED VALVE M681–TV2 TO MAINTAIN THE ADJUSTABLE HOT DECK TEMPERATURE SETPOINT (24°C). THE HOT DECK TEMPERATURE SETPOINT IS RESET FROM PNEUMATIC OUTSIDE AIR TEMPERATURE. THE HOT DECK SETPOINT IS RESET FROM 24°C TO 32°C WITH OUTSIDE AIR TEMPERATURE AT –30°C.

IT IS THE FUNCTION OF M681–R4 FAN AIR FLOW SWITCH RELAY TO SHUTDOWN THE M687 EXHAUST FAN AND TO ALSO TURN OFF PNEUMATIC RELAY M681–PR1 WHICH IN TURN REVERTS THE DAMPERS TO THEIR NORMAL POSITIONS.

NOTES

1. THIS DRAWING SUPERCEDES SEP–1026A.
2. THE ENGINEER'S DESIGN RESPONSIBILITY IS LIMITED TO THE REPLACEMENT OF THE DCS WITH PLC–BASED CONTROL.

REFERENCE DRAWINGS	DESCRIPTION
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APEGM Certificate of Authorization
SNC-Lavalin Inc.
No. 4489

NO.	REVISIONS	DATE	DESIGN	CHECK
00	ISSUED FOR CONSTRUCTION – 976–2016	2017/04/05	SSB	TMC

CH2MHILL. SNC·LAVALIN KGS GROUP

DESIGNED BY: S. BOGHOSIAN	CHECKED BY: T. CHURCH
DRAWN BY: S. HAILU	APPROVED BY: E. RYCZKOWSKI
SCALE: NTS	ISSUED FOR CONSTRUCTION BY: J. SHUMKA
DATE: 2016/08/29	DATE: 2017/04/05
CONSULTANT NO.: 474248	

ENGINEER'S SEAL
PROVINCE OF MANITOBA
T.M. CHURCH
Member 32682
REGISTERED PROFESSIONAL ENGINEER
Apr. 5, 2017

Winnipeg
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

SOUTH END WATER POLLUTION CONTROL CENTRE
SEWPCC UPGRADING/EXPANSION PROJECT
ELECTRICAL – MOTOR STARTER SCHEMATIC
ADMINISTRATION BUILDING
AHU–M681

CITY DRAWING NUMBER	SHEET	REV.	SIZE
1–0102–EMCL–M621	002	00	A1

PLOT DATE: Mar 30, 2017 – 9:49am
FILE NAME: 1–0102–EMCL–M621–002.dwg

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