

**DETAIL**  
**DIAGRAMMATIC**  
**DETAIL**

- NOTES:
1. PIPING SYMBOLIZED WITH \* INDICATES PIPING TO BE ROUTED DOWN TO NEAREST FLOOR SURFACE + 6". PIPING SO ROUTED FROM PRESSURE RELIEF VALVES SHALL BE FULL SIZE AND SHALL BE SUPPORTED INDEPENDENTLY SO THAT NO WEIGHT IS APPLIED TO THE PIPING.
  2. MANUAL FILL VALVE WITH LABEL TO READ: "MANUAL FILL VALVE IS ONLY TO BE USED TO FILL SYSTEM UPON START-UP OR LOSS OF SYSTEM FLOW AND DETERMINED BY SYSTEM PRESSURE. VALVE SHALL BE LEFT IN THE NORMALLY CLOSED POSITION."

**HEATING**

THE LEAD BOILER AND PUMP START AS A FUNCTION OF THE EMS/CPU ENERGY MANAGEMENT SYSTEM CENTRAL PROCESSING UNIT WHICH IS PROGRAMMED TO CONSIDER THE OF DAY AND OUTSIDE AIR TEMPERATURE (RELATIVE TO THE SETPOINT). THE EMS/CPU WILL MONITOR THE LEAVING AND ENTERING WATER TEMPERATURES TO THE BOILER AND WILL PROVIDE A STRAIGHT-LINE HOT WATER RESET. WHEN THE O.A. IS 30°, THE HWS TEMPERATURE SHALL BE 160°. AND WHEN THE O.A. IS 65°, THE HWS TEMPERATURE SHALL BE 142°. THE EMS/CPU SHALL BE PROGRAMMED SO THAT AN INLET TEMPERATURE OF LESS THAN 60° (SOFTWARE ADJUSTABLE) TO THE BOILER WILL CAUSE THE "BOILER LOOP MIXING VALVE" V-1 TO MODULATE OPEN AND BYPASS SUPPLY HOT WATER DIRECTLY BACK TO THE RETURN. THE BOILER PUMP WILL START ON FOR A MINIMUM OF 5 MINUTES AFTER THE BOILER HAS SHUT OFF. (AS DETERMINED BY TEMPERATURE DIFFERENCE ACROSS THE BOILER), 1/TYPICAL OF THE LEAD AND LAG BOILERS.

THE LAG BOILER AND PUMP WILL START WHEN THE SYSTEM HEATING DEMAND BTUHS EQUALS 50% OF THE BOILER OUTPUT CAPACITY AND WILL SHUT OFF AT 75% CAPACITY OF ONE BOILER. A TIME DELAY ON THE LAG BOILER WILL ALLOW THE LEAD BOILER A 30 MINUTE HEAD START TO BRING THE SYSTEM UP TO 90% CAPACITY DURING MORNING WARMUP.

**COOLING**

COOLING FROM THE CENTRAL SYSTEM CAN BE SUPPLIED UNDER ANY ONE OF THREE DIFFERENT MODES: 1) CHILLER ONLY, 2) ICE TANKS ONLY, AND 3) A COMBINATION OF BOTH. COOLING IS INITIATED BY OUTDOOR AIR TEMPERATURE AND BUILDING LOAD, BUT THE PARTICULAR MODE TO BE USED IS PRIMARILY DETERMINED BY TIME-OF-DAY AS ESTABLISHED BY THE PEAK RATE SCHEDULE, A-11, TIME-OF-USE METEERING.

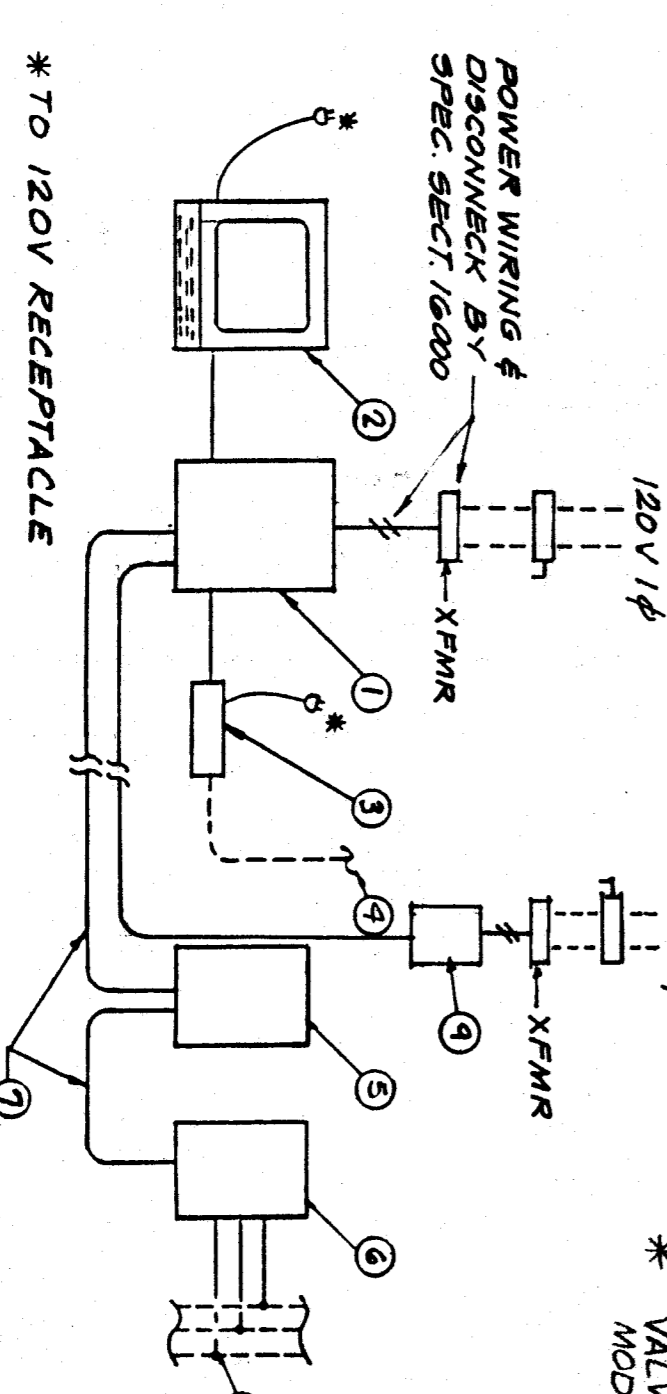
THE INTENT OF THE SYSTEM DESIGN IS OPTIMIZE COOLING PERFORMANCE BY:

1. NOT ALLOWING THE CHILLER AND CHILLER PUMP TO START DURING "ON-PEAK" HOURS AS DEFINED BY PEAK RATE STRUCTURE A-11.
2. RUNNING THE CHILLER AT FULL-LOAD DURING "OFF-PEAK" HOURS TO MAXIMIZE TANK CHARGING.
3. MINIMIZE CHILLER USAGE THE NEXT DAY DURING "PARTIAL-PEAK" HOURS BY USING UP STORED ICE FROM THE NIGHT BEFORE. SOME OPERATION DURING "PARTIAL-PEAK" HOURS WILL BE REQUIRED TO MAINTAIN STORAGE CAPACITY AT THE END OF THE DAY EXCEED 20% OF TOTAL STORAGE CAPACITY.
4. ALLOW SCHOOL PERSONNEL TO INTERACT WITH THE LOCAL EMS/CPU FOR SPECIAL PROGRAMMING THAT MAY BE REQUIRED ON ANY PARTICULAR DAY.

INPUT POINT #	DESCRIPTION OF CONTROL POINT
1	SYSTEM RETURN WATER TEMPERATURE
2	SYSTEM SUPPLY WATER TEMPERATURE
3	WATER TEMPERATURE ENTERING BOILER(S)
4	WATER TEMPERATURE LEAVING BOILER #1
5	WATER TEMPERATURE LEAVING BOILER #2
6	HOT WATER TEMPERATURE SUPPLY TO MAIN LOOP
7	WATER TEMPERATURE ENTERING ICE BANK
8	WATER TEMPERATURE LEAVING ICE BANK
9	CHILLED WATER LOOP SUPPLY TEMPERATURE
10	WATER TEMPERATURE ENTERING CHILLER
11	WATER TEMPERATURE LEAVING CHILLER
12	SYSTEM LOOP FLOWMETER
13	SYSTEM LOOP PRESSURE
14	OUTSIDE AIR SENSOR
15	PULSE RESET SWITCH FROM UTILITY METER
16	SPARE

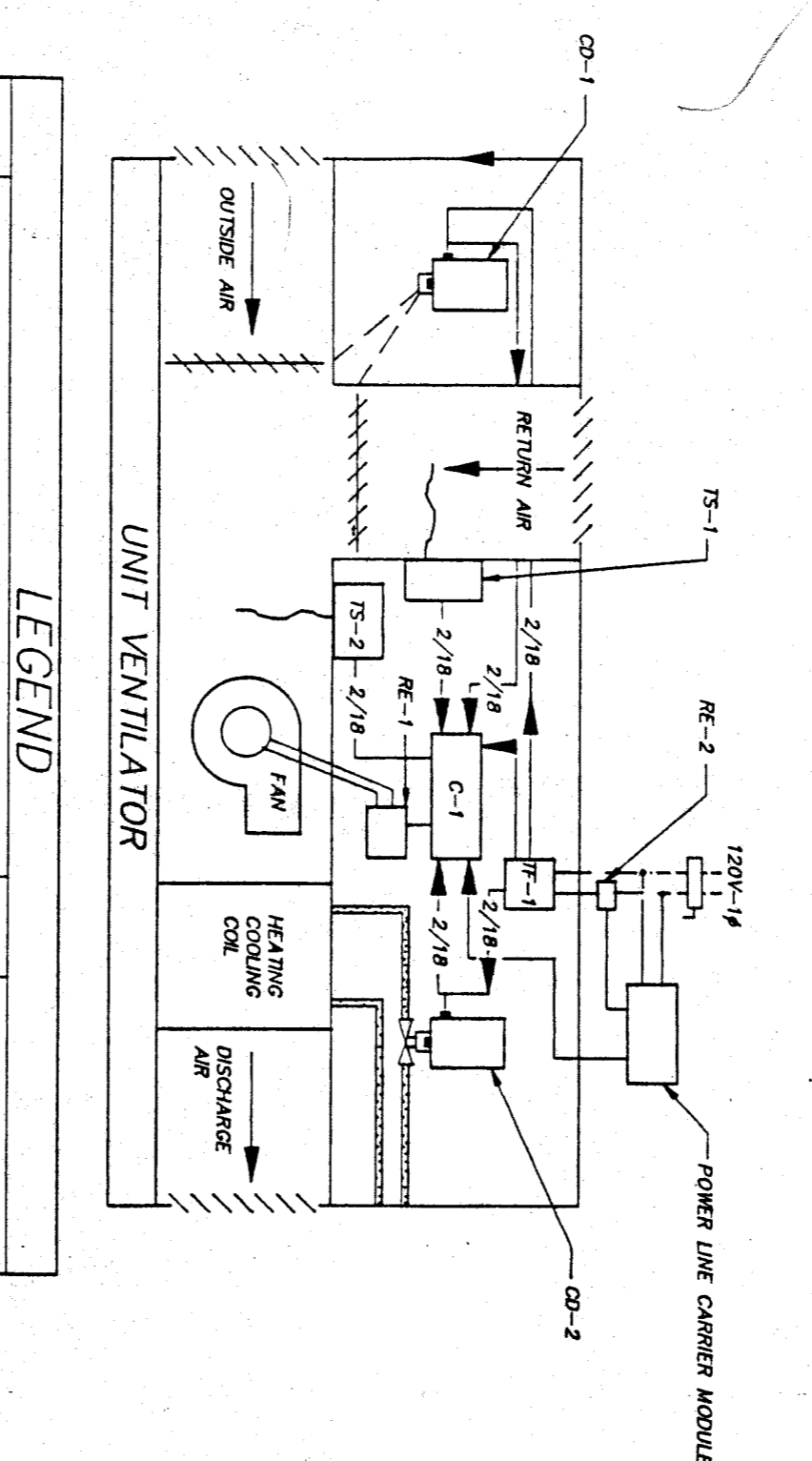
**COOLING CONTROL SCHEDULE**

MODE	VALVE V-2	VALVE V-3	VALVE V-5	ICE BUILDER	SYSTEM PUMPS	CHILLER
COOLING MODE	A	B	B	ON	ON	ON
	B	A	B	OFF	ON	ON
CHILLER ONLY COOLING	OP	CL	OP	OFF	ON	ON
	MOD	MOD	CL	ON	ON	OFF
ICE BUILDING MODE	OP	OP	CL	ON	OFF	ON
	CL	OP	CL	ON	OFF	ON
CHILLER/ICE BUILDER COOLING	MOD	MOD	CL	ON	ON	ON
	CL	MOD	CL	ON	ON	ON



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- NOTES FOR DETAIL B/M-3:
1. BARBER-COLMAN NETWORK GOOD MODEL GCM-84211 "GLOBAL CONTROL MODULE".
  2. DUMB TERMINAL CONSISTING OF MONOCHROME SCREEN VIEWING TERMINAL AND KEYBOARD; WISE-85. CONNECT TO 1.
  3. 1200 BAUD EXTERNAL MODEM CONNECTING TO 1 VIA RS-232 CONNECTION.
  4. DEDICATED TELEPHONE LINE TO BE FURNISHED BY OWNER, INCLUDING ALL CONNECTION COSTS.
  5. BARBER-COLMAN MODEL GCS 81000 POWER LINE CARRIER COMMAND SYNTHESIZER FURNISHED DISTRIBUTION.
- NOTE: CONTRACTOR FURNISHING POWER LINE CARRIER EQUIPMENT SHALL COORDINATE THE INSTALLATION WITH LIGHT DIMMING SYSTEM AS SPECIFIED ON THE ELECTRICAL PLANS AND PROVIDE A DIMMING SYSTEM THAT WILL NOT BE AFFECTED BY SIGNALS GENERATED THROUGH THE LIGHT DIMMING SYSTEM.
- BARBER-COLMAN COMMAND TRANSMITTER RECEIVER.
6. INTERCONNECTING WIRING BETWEEN GLOBAL CONTROL MODULE AND POWER LINE CARRIER COMMAND SYNTHESIZER BY SPECIFICATION SECTION 15900.
  7. EXISTING A.C. WIRING.
  8. BARBER-COLMAN NETWORK GOOD LCM CONTROLLER AT MECHANICAL EXPANSION ENCLOSURE.



**LEGEND**

NO.	DESCRIPTION	REQ'D.	B-C PART NO.
1	QUALITY THERMOSTAT PROGRAMMABLE CONTROLLER	1	92-8001-333/202
2	1/2" M.O.D. 120V/60 HZ. 15 AMP. 2-POLY. SWITCH	1	92-8002-333/202
3	FAN SPEED RELAY	1	92-8003-333/202
4	24 VAC. 50 VA. TRANSFORMER	1	92-8004-333/202
5	24 VAC. 50 VA. TRANSFORMER	1	92-8005-333/202
6	24 VAC. 50 VA. TRANSFORMER	1	92-8006-333/202
7	24 VAC. 50 VA. TRANSFORMER	1	92-8007-333/202
8	24 VAC. 50 VA. TRANSFORMER	1	92-8008-333/202
9	24 VAC. 50 VA. TRANSFORMER	1	92-8009-333/202

**UNIT VENTILATOR**

**DIAGRAMMATIC**

**DETAIL**

UNIT VENTILATOR FAN COIL CONTROL DIAGRAM

**FAN COIL SEQUENCE OF OPERATION**

FAN COIL SEQUENCE OF OPERATION STARTS TO UNIT VENTILATOR: PROVIDE MAIN VENTILATED TEMPERATURE CONTROLS A.S. AS INDICATED ON PLANS.

UNIT VENTILATOR SEQUENCE OF OPERATION

THE UNIT VENTILATORS ARE STARTED AND STOPPED BY GROUPS (WINGS, USE, ETC.) FROM THE ENERGY MANAGEMENT SYSTEM. THE UNIT VENTILATORS ARE STARTED AND STOPPED BY THE ENERGY MANAGEMENT SYSTEM. THE UNIT VENTILATORS ARE STARTED AND STOPPED BY THE ENERGY MANAGEMENT SYSTEM. THE UNIT VENTILATORS ARE STARTED AND STOPPED BY THE ENERGY MANAGEMENT SYSTEM.

WHEN THE SAMPLING TEMPERATURE IS BELOW THE HEATING SET-POINT THE OUTSIDE AIR DAMPER IS TO OPEN AND THE FAN WILL OPERATE AT HIGH SPEED. AT SET-POINT THE OUTSIDE AIR DAMPER IS TO CLOSE AND THE FAN WILL OPERATE AT LOW SPEED. AT SET-POINT THE OUTSIDE AIR DAMPER IS TO CLOSE AND THE FAN WILL OPERATE AT LOW SPEED. AT SET-POINT THE OUTSIDE AIR DAMPER IS TO CLOSE AND THE FAN WILL OPERATE AT LOW SPEED.

WHEN THE SAMPLING TEMPERATURE IS ABOVE THE COOLING SET-POINT, THE OUTSIDE AIR DAMPER CLOSURES TO THE MINIMUM POSITION AND THE COIL VALVE MODULATES TO 90%. THE UNIT VENTILATOR HEATING/COOLING MODE SELECTION.

THE UNIT VENTILATOR HEATING/COOLING MODE IS SELECTED FROM THE SIGNAL FROM THE EMS/CPU TO THE UNIT VENTILATOR CONTROLLER. THE UNIT VENTILATOR HEATING/COOLING MODE IS SELECTED FROM THE SIGNAL FROM THE EMS/CPU TO THE UNIT VENTILATOR CONTROLLER.

ONCE STARTED, THE UNIT VENTILATOR FAN SHALL RUN CONTINUOUSLY UNTIL SHUT OFF BY THE EMS/CPU. THE FAN SHALL OPERATE AT HIGH SPEED WHEN THE UNIT VENTILATOR CALLS FOR HEATING OR COOLING, BUT SHALL OPERATE AT LOW SPEED WHEN THE UNIT VENTILATOR CALLS FOR HEATING OR COOLING. THE UNIT VENTILATOR SHALL OPERATE AT LOW SPEED WHEN THE UNIT VENTILATOR CALLS FOR HEATING OR COOLING.

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DATE  
7-26-90  
REVISIONS

APPROVED  
Date: 7-26-90  
Structural System Designer  
Checked By: [Signature]

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job number  
8-711  
sheet number  
M-3  
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