

FACILITY MANAGEMENT DDC SYSTEM SEQUENCE OF OPERATION

- DIRECT DIGITAL CONTROL (DDC)
 THE DDC SYSTEM SHALL CONSIST OF AN EXTENSION OF THE EXISTING DDC SYSTEM AND SHALL CONTAIN THE EQUIPMENT POINTS LISTED ON THE DRAWINGS AND/OR NOTED IN THE SPECIFICATIONS. IN ADDITION, THE DDC SYSTEM SHALL HAVE:
- STORAGE TO RETAIN ONE YEARS WORTH OF SENSOR AND ALARM READINGS FOR ALL CONNECTED EQUIPMENT.
 - CAPABILITY TO GENERATE EQUIPMENT REPORTS ON DEMAND.
 - REMOTE SHALUP TO THREE INDIVIDUALS AS DESIGNATED BY THE JETPORT. STORAGE TO RETAIN ONE YEARS WORTH OF SENSOR AND ALARM READINGS FOR ALL CONNECTED EQUIPMENT.
 - EXPANDABILITY TO INCLUDE AN ADDITIONAL AHU AND FPVAV.
 - BATTERY BACKUP FOR AN ORDERLY SHUTDOWN.

CHILLERS:
 THE DDC SYSTEM SHALL ENABLE THE CHILLERS FOR OPERATION WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 55 DEG F. (ADJUSTABLE) CHILLERS SHALL BE CONTROLLED IN A LEAD/LAG SEQUENCE AS FOLLOWS: THE VFD EQUIPPED CHILLER SHALL RUN AND SHALL MODULATE ITS COMPRESSOR TO FOLLOW THE COOLING LOAD UNTIL THE LOAD REACHES 95% OF THE CHILLER CAPACITY (ADJUSTABLE) AT WHICH POINT THE CONSTANT SPEED CHILLER SHALL START AND SHALL CARRY THE LOAD WHILE RUNNING AT CONSTANT SPEED AND THE VFD EQUIPPED CHILLER SHALL STOP. AS THE COOLING LOAD INCREASES BEYOND THE CONSTANT RPM CHILLERS 100% CAPACITY POINT, THE VFD EQUIPPED CHILLER SHALL START AND MODULATE TO CARRY THE BALANCE OF THE LOAD.

COOLING TOWERS
 ONE COOLING TOWER SHALL BE ASSOCIATED WITH EACH CHILLER. THE TOWER FAN AND PUMP SHALL BE ENABLED WHENEVER THE ASSOCIATED CHILLER IS ENABLED AND THE TOWER SHALL RUN TO REJECT THE CONDENSER WATER HEAT TO ATMOSPHERE. THE TOWER FANS SHALL BE MODULATED BY THE DDC SYSTEM TO MAINTAIN A LEAVING TOWER WATER TEMPERATURE SET POINT EQUAL TO THE AMBIENT WET BULB TEMPERATURE PLUS 5 DEG F. (ADJUSTABLE) WHEN THE OUTDOOR TEMPERATURE DROPS BELOW 40 DEG F, THE COOLING TOWERS SHALL BE LOCKED OUT.

CONDENSER PUMPS
 THE CONDENSER WATER PUMPS SHALL BE ARRANGED IN A LEAD/LAG SEQUENCE. BEFORE EITHER CHILLER CAN START, CONDENSER BARREL FLOW MUST BE PROVIDED. IF THE LEAD CONDENSER WATER PUMP FAILS TO START, THE LAG PUMP WILL BE STARTED AND THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE. THE LEAD AND LAG PUMPS SHALL BE SWITCHED OVER ON A WEEKLY BASIS.

CHILLED WATER PUMPS
 EACH CHILLER HAS AN ASSOCIATED CONSTANT RPM SUPPLY PUMP. BEFORE A CHILLER CAN START, EVAPORATOR BARREL FLOW MUST BE PROVIDED. IF THE SUPPLY PUMP FOR THE CHILLER FAILS TO START, THE OTHER CHILLER SUPPLY PUMP WILL BE STARTED AND THE ASSOCIATED CHILLER STARTUP SEQUENCE INITIATED. THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE.

THE CHILLED WATER SYSTEM SUPPLY PUMPS SHALL BE ARRANGED IN A LEAD/LAG SEQUENCE. IF THE LEAD CHILLED WATER SYSTEM SUPPLY WATER PUMP FAILS TO START, THE LAG PUMP WILL BE STARTED AND THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE. THE LEAD AND LAG PUMPS SHALL BE SWITCHED OVER ON A WEEKLY BASIS. EACH PUMP SHALL BE EQUIPPED WITH A VFD AND THE PUMP RPM SHALL BE MODULATED TO MAINTAIN A CHILLED WATER RETURN TEMPERATURE SET POINT OF 56 DEG F. (ADJUSTABLE)

CHILLED WATER SYSTEM (CHWS)
 THE CHILLED WATER SYSTEM SHALL SERVE TWO NEW AIR HANDLING UNIT (AHU) CHILLED WATER COILS AND SHALL BE PIPED FOR PROVISION TO SERVE ADDITIONAL AHU IN A FUTURE. THE COILS SHALL BE PIPED TO THE CHILLED WATER COILS WITH THREE-WAY CONTROL VALVES WHICH WILL SERVE AS BYPASSES WHEN NOT DIRECTING FLOW THROUGH THE COILS.

BOILERS:
 THE PLANT SHALL CONTAIN TWO DUAL-FUEL (NATURAL GAS/NO. 2 FUEL OIL) FIRED HOT WATER BOILERS. EACH BOILER SHALL BE EQUIPPED WITH A MODULATING BURNER INCLUDING A VFD ON THE BURNER MOTOR. THE DDC SYSTEM SHALL ENABLE THE BOILERS FOR OPERATION WHEN THE OUTDOOR AIR TEMPERATURE IS BELOW 50 DEG F. (ADJUSTABLE) THE BOILER BURNER SHALL MODULATE TO MAINTAIN THE BOILER WATER SUPPLY SET POINT WHICH WILL BE RESET BY THE DDC SYSTEM TO FOLLOW THE AMBIENT TEMPERATURE. AN ASSOCIATED BOILER SUPPLY PUMP SHALL CYCLE TO PROVIDE HEAT TO THE HYDRONIC WATER HEATING SYSTEM TO MAINTAIN THE SYSTEM SUPPLY SETPOINT. A SYSTEM OF EXHAUST FANS MOUNTED AT THE FLEUE OUTLET SHALL MODULATE TO MAINTAIN A CONSTANT DRAFT PRESSURE SET POINT. THE BOILER PLAN SHALL PROVIDE WATER FOR THE HYDRONIC HEATING SYSTEM AND SHALL PROVIDE DOMESTIC HOT WATER DURING THE HEATING SEASON. DURING THE SUMMER MONTHS, THE BOILERS SHALL BE SHUT OFF.

DOMESTIC WATER HEATER:
 DURING THE SUMMER MONTHS, THE BOILERS SHALL BE LOCKED OUT AND DOMESTIC HOT WATER SHALL BE SUPPLIED BY A PAIR OF DUAL-FUEL (NATURAL GAS/NO. 2 FUEL OIL) FIRED DOMESTIC WATER HEATERS. A SYSTEM OF EXHAUST FANS MOUNTED AT THE FLEUE OUTLET SHALL MODULATE TO MAINTAIN A CONSTANT DRAFT PRESSURE SET POINT. A DOMESTIC HOT WATER RECIRCULATION PUMP SHALL RUN CONTINUOUSLY TO MAINTAIN HOT WATER FLOW TO REMOTE FIXTURES.

HYDRONIC SYSTEM SUPPLY PUMPS
 THE DDC SYSTEM SHALL ENABLE THE HYDRONIC SYSTEM SUPPLY PUMPS FOR OPERATION WHEN THE OUTDOOR AIR TEMPERATURE IS BELOW 50 DEG F. (ADJUSTABLE) THE HYDRONIC SYSTEM SUPPLY PUMPS SHALL BE ARRANGED IN A LEAD/LAG SEQUENCE. IF THE LEAD HYDRONIC SYSTEM SUPPLY PUMP FAILS TO START, THE LAG PUMP WILL BE STARTED AND THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE. THE LEAD AND LAG PUMPS SHALL BE SWITCHED OVER ON A WEEKLY BASIS. THE PUMPS SHALL BE FURNISHED WITH VFDS AND THE PUMP RPM SHALL BE MODULATED TO MAINTAIN A SYSTEM SUPPLY/RETURN TEMPERATURE DIFFERENTIAL OF 28 DEG F. (ADJUSTABLE)

HYDRONIC SYSTEM
 THE DDC SYSTEM SHALL MONITOR THE HYDRONIC SYSTEM SUPPLY TEMPERATURE, RETURN TEMPERATURE, SUPPLY PRESSURE OFF THE PUMPS AND RETURN PRESSURE JUST BEFORE THE PUMPS. THE HYDRONIC SYSTEM SUPPLY TEMPERATURE SHALL BE RESET FROM THE OUTDOOR AIR TEMPERATURE IN ACCORDANCE WITH THE FOLLOWING SCHEDULE:

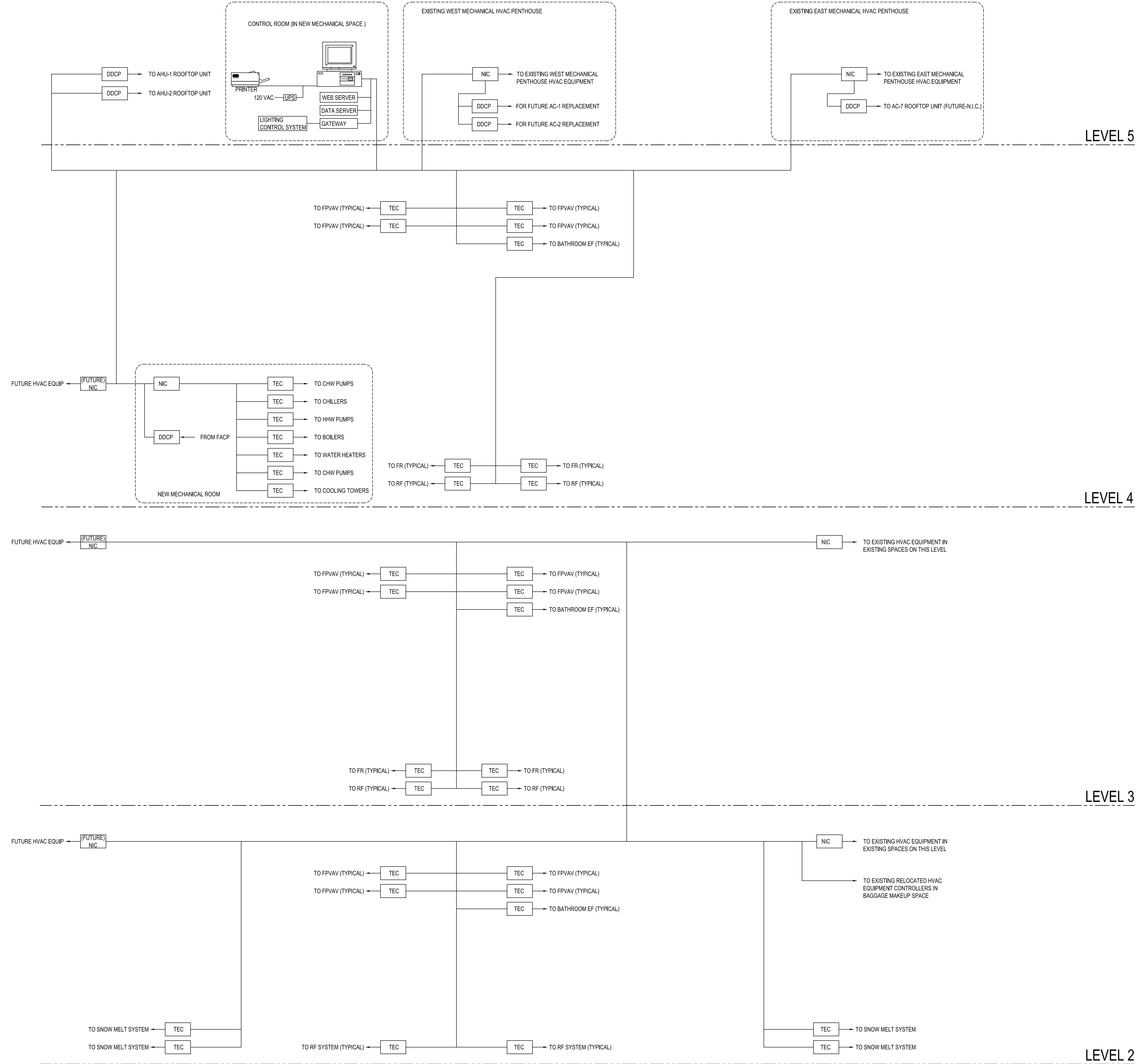
OUTDOOR AIR TEMPERATURE	HYDRONIC WATER SUPPLY TEMPERATURE
50 DEG F (ADJUSTABLE)	140 DEG F (ADJUSTABLE)
0 DEG F (ADJUSTABLE)	180 DEG F (ADJUSTABLE)

- AHU HEATING COILS
 THE DDC SYSTEM SHALL MODULATE THE AHU HEATING COIL THREE WAY CONTROL VALVES TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- FAN POWERED VARIABLE AIR VOLUME (FPVAV) HEATING COILS
 THE DDC SYSTEM SHALL MODULATE THE FPVAV HEATING COIL CONTROL VALVES TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- FINNED RADIATION
 THE DDC SYSTEM SHALL CYCLE TWO WAY CONTROL VALVES TO CONTROL FLOW THROUGH PEDESTAL MOUNTED FINNED RADIATION MOUNTED ALONG THE EXTERIOR WALLS. THE VALVES SHALL CYCLE TO MAINTAIN A SPACE TEMPERATURE SET POINT FROM A WALL MOUNTED THERMOSTAT.
- RADIANT FLOORS
 THE DDC SYSTEM SHALL START AND STOP RADIANT FLOOR CIRCULATION PUMPS TO DISTRIBUTE WATER THROUGH A SYSTEM OF POLYETHYLENE PIPING BURIED IN CONCRETE FLOOR SLABS. EACH PUMP SHALL BE CYCLED TO MAINTAIN A FLOOR SLAB SET POINT CONTROLLED BY A SENSOR BURIED IN THE ASSOCIATED SLAB.
- SNOW MELT SYSTEM
 THE DDC SYSTEM SHALL START AND STOP SNOW MELT SYSTEM CIRCULATION PUMPS TO DISTRIBUTE A PROPYLENE GLYCOL/WATER SOLUTION THROUGH A SYSTEM OF POLYETHYLENE PIPING BURIED IN CONCRETE ROOF OR AREAWAY SLABS. A SMALL PLATE AND FRAME HEAT EXCHANGER SHALL SEPARATE THE HYDRONIC WATER SYSTEM FROM THE GLYCOL/WATER SNOW MELT SYSTEM PIPING. AN OUTDOOR AIR TEMPERATURE SENSOR SHALL START THE SNOW MELT CIRCULATION PUMPS WHEN THE OUTDOOR AIR TEMPERATURE DROPS BELOW 35 DEG F. (ADJUSTABLE). EACH PUMP SHALL BE CYCLED TO MAINTAIN A SLAB SET POINT CONTROLLED BY A SENSOR BURIED IN THE ASSOCIATED SLAB. A PRECIPITATION SENSOR SHALL SHIFT THE SYSTEM FROM "DLE" TO "SNOWMELT" MODE.

BATHROOM EXHAUST FANS:
 BATHROOM EXHAUST FANS SHALL BE CONTROLLED BY THE DDC SYSTEM ON AN OCCUPIED/UNOCCUPIED SCHEDULE.

CONCESSION AREA EQUIPMENT AND FANS:
 CONCESSION AREA EQUIPMENT AND FANS SHALL BE FURNISHED AND INSTALLED BY OTHERS AND ARE NOT IN THE SCOPE OF THIS CONTRACT.

DIESEL GENERATOR SEQUENCE OF OPERATION
 IN AN EMERGENCY, THE GENERATOR PLANT SHALL START AUTOMATICALLY, AS SOON AS THE GENERATOR MOTOR STARTS, THE INTAKE AND RELIEF DAMPERS SHALL OPEN.



SHEET NOTES

Issue	Date	Issue Description	By	Check
01	12/03/08	75% DESIGN DEVELOPMENT	PWZ	RHB
02	01/23/09	95% CONSTRUCTION DOCUMENTS	PWZ	RHB
02	10/28/09	ISSUED FOR PERMIT	PWZ	RHB

GENERAL NOTES

A SEE SHEET M00.00 FOR LEGEND AND GENERAL NOTES.

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Signature: *Robert Brown*
 PROJECT NAME: PWM Terminal Enhancement
 PROJECT NUMBER: 09-8395-000
 CAD FILE NAME: T:\6330101\Sheets\M12.01.dwg
 DESCRIPTION: MECHANICAL CONTROL DIAGRAMS
 SCALE: NOT TO SCALE

M12.01