SEQUENCE (AHU–13):

A. GENERAL: WITH THE H–O–A SWITCH IN THE "AUTO" POSITION, THE SYSTEM SHALL START THROUGH THE BAS SYSTEM PROVIDED THE SAFETIES HAVE BEEN SATISFIED. WHEN THE AHU IS ENERGIZED, THE SUPPLY FAN AND RETURN FAN SHALL OPERATE CONTINUOUSLY, THE CHILLED WATER COOLING VALVE AND OUTSIDE AIR/RELIEF DAMPERS WILL MODULATE IN SEQUENCE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE. AS THE UNIT STARTS UP, THE VFD SHALL SLOWLY SPEED THE FANS UP. THE FAN SPEED SHALL BE MODULATED BY THE VFD TO MAINTAIN A CONSTANT SUPPLY PRESSURE MEASURED AT THE SUPPLY DISCHARGE. AIRFLOW TO BE MEASURED BY PIEZOMETER AND THE PRESSURE SHALL BE SET BY THE INSTALLING CONTRACTOR TO MAINTAIN THE SCHEDULED AIRFLOW. THE FAN RAMP UP SPEED SHALL BE ADJUSTABLE.

B. DISCHARGE AIR TEMPERATURE CONTROL:
   1. PROVIDE OUTSIDE AIR TEMPERATURE, RETURN AIR TEMPERATURE AND RETURN DUCT HUMIDITY SENSORS. THE CHILLED WATER COIL VALVE SHALL MODULATE OPEN TO MAINTAIN SETPOINT.
   2. IF THE CATH LAB ROOM HUMIDITY SENSOR READS A RELATIVE HUMIDITY GREATER THAN 60% RH, THEN THE DISCHARGE AIR TEMPERATURE SHALL BE RESET DOWNWARD AT A RATE OF 1F PER 5 MINUTES (ADJ.) UNTIL THE SETPOINT REACHES 55F OR UNTIL THE ZONE REACHES 55% RH.
   3. IF THE DISCHARGE AIR TEMPERATURE IS BELOW SETPOINT, THE UNIT SHALL OPERATE WITH THE OUTSIDE AIR DAMPER IN THE MINIMUM POSITION AND THE RETURN DAMPER AT THE CORRESPONDING POSITION.

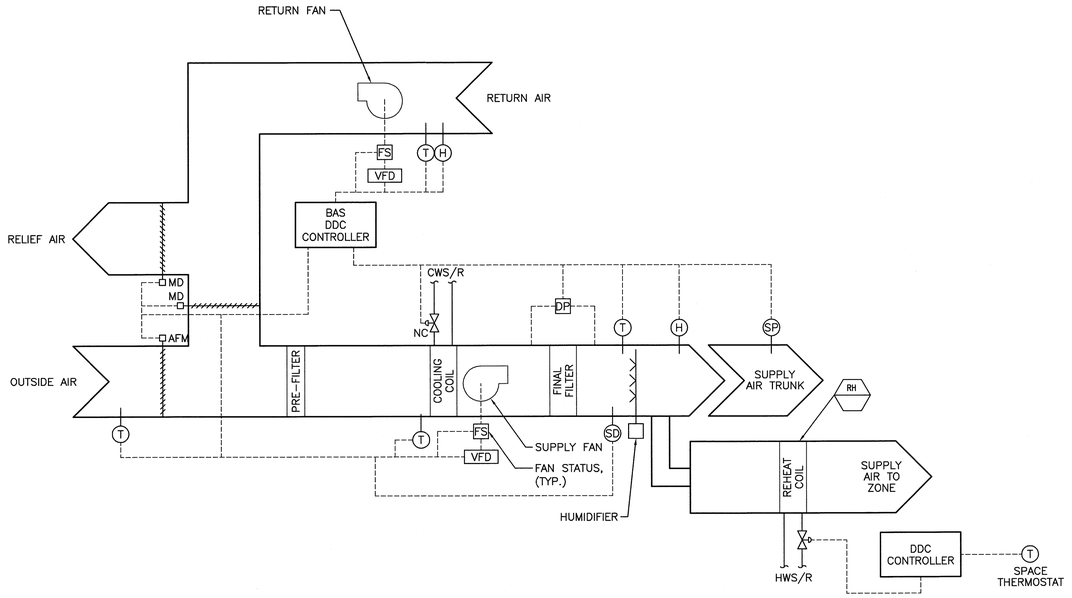
C. REHEAT COILS
   1. DUAL TEMPERATURE THERMOSTAT/SENSOR MAINTAINS CONSTANT SPACE TEMPERATURE BY MODULATING THE REHEAT COIL VALVE. ON A RISE IN TEMPERATURE ABOVE THE HEATING SET POINT THE REHEAT COIL VALVE SHALL MODULATE FULLY CLOSED. AS THE SPACE TEMPERATURE DROPS BELOW THE SPACE TEMPERATURE SETPOINT, THE REHEAT COIL VALVE SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE.

D. THE UNIT FINAL FILTER STATUS SHALL BE MEASURED AND INDICATED ON THE GRAPHICAL INTERFACE TO INDICATE PRESSURE DROP ACROSS THE FILTER AND PROVIDE NOTIFICATION FOR FILTER CHANGE OUT.

E. SAFETY DEVICES:
   1. AN ALARM SHALL BE ACTIVATED ANYTIME THE AIR HANDLER UNIT IS COMMANDED "ON" AND FAILS TO OPERATE.
   2. AN ALARM SHALL BE ACTIVATED ANYTIME THE DISCHARGE AIR TEMPERATURE DROPS 40°F.
   3. DETECTION OF SMOKE AT THE EXISTING DUCT SMOKE DETECTOR SHALL STOP UNIT FANS AND CLOSE OUTSIDE AIR AND EXHAUST AIR DAMPERS AND PLACE THE UNIT IN ALARM.

NOTE:

1. SEE SHEET M–001 FOR LEGEND AND ABBREVIATIONS.



G1 | * | NOT TO SCALE

G6 | VARIABLE VOLUME ROOF–TOP AIR HANDLER W/ REHEAT CONTROL SCHEMATIC & SEQUENCE OF OPERATION | NOT TO SCALE

SPECIFICATIONS AND NOTES

GENERAL
1. VERIFY ALL MEASUREMENTS AND EXISTING CONDITIONS IN THE FIELD. GENERAL SCHEMATIC LAYOUT IS INDICATED; ALL OFFSETS, OBSTRUCTIONS, AND EXISTING CONFIGURATIONS AND CONSTRAINTS MUST BE FIELD VERIFIED.
2. RENOVATION WORK WILL TAKE PLACE IN AN OCCUPIED HOSPITAL. INSTALLATIONS SHALL NOT AFFECT ONGOING OPERATIONS. HOURS AVAILABLE TO PERFORM WORK AND DISRUPTION TO OPERATION OF SYSTEMS AND UTILITIES WILL NEED TO BE COORDINATED WITH MAINE MEDICAL CENTER.
3. OBTAIN NECESSARY PERMITS AND PAY ASSOCIATED FEES.
4. COORDINATE ANY SERVICE DISRUPTIONS WITH THE OWNER.
5. INSTALL ALL COMPONENTS IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS, ALL LOCAL CODES AND STANDARDS, AND MAINE MEDICAL CENTER REQUIREMENTS.
6. DRAWINGS ARE DIAGRAMMATIC ONLY; FIELD–VERIFY ALL EXISTING CONDITIONS. COORDINATE INSTALLATIONS WITH OTHER TRADES. COORDINATE ELECTRICAL POWER REQUIREMENTS FOR ALL MOTORS.
7. THE INTENTION OF THESE CONTRACT DOCUMENTS IS TO CALL FOR FINISHED WORK, FULLY TESTED AND READY FOR OPERATION. ANY COMPONENTS OR LABOR NOT MENTIONED IN THE CONTRACT DOCUMENTS BUT REQUIRED FOR FUNCTIONING SYSTEMS SHALL BE PROVIDED. SHOULD THERE APPEAR TO BE ANY DISCREPANCIES OR QUESTIONS OF INTENT, THE CONTRACTOR SHALL REFER THE MATTER TO THE ARCHITECT FOR DECISION BEFORE START OF ANY RELATED WORK.
8. PERFORM WORK IN ACCORDANCE WITH LOCAL CODES.
9. SEAL ALL DUCT AND PIPE PENETRATIONS THROUGH FIRE RATED WALLS AND FLOORS WITH FIRE SEALANT.
10. OBSERVE THE OWNER'S CLEANLINESS PROTOCOLS.

FIRE PROTECTION
1. ALL WORK MUST BE CAREFULLY COORDINATED WITH THE NEW AND RENOVATED HVAC AND MEDICAL EQUIPMENT INSTALLATIONS.
2. REVISE THE EXISTING WET SPRINKLER SYSTEM TO ACCOMMODATE NEW EQUIPMENT INSTALLATIONS. DESIGN, FURNISH, INSTALL, AND TEST THE REQUIRED SPRINKLER SYSTEM. SPRINKLER TYPES SHALL BE QUICK RESPONSE TYPES, STYLE TO MATCH EXISTING. ALL WORK SHALL BE IN ACCORDANCE WITH NFPA–13.
3. SPRINKLER OCCUPANCY HAZARD CLASSIFICATIONS:
   A. CARDIAC CATH LAB AND CONTROL ROOM: LIGHT HAZARD.
   B. CARDIAC CATH LAB EQUIPMENT ROOM: ORDINARY HAZARD, GROUP 1.
4. PREPARE WORKING PLANS FOR APPROVAL BY THE STATE FIRE MARSHALL'S OFFICE, LOCAL FIRE DEPARTMENT, AND THE OWNER'S INSURANCE CARRIER.
5. COORDINATE ANY SYSTEM IMPAIRMENTS WITH MAINE MEDICAL CENTER. BEFORE SHUTTING OFF A SECTION OF THE SPRINKLER SYSTEM TO MAKE SPRINKLER TIE–INS, NOTIFY THE LOCAL FIRE DEPARTMENT, PLAN THE WORK CAREFULLY, AND ASSEMBLE ALL MATERIALS TO ENABLE COMPLETION IN THE SHORTEST TIME POSSIBLE. WORK STARTED ON CONNECTIONS SHOULD BE COMPLETED WITHOUT INTERRUPTION AND PROTECTION RESTORED AS PROMPTLY AS POSSIBLE. DURING THE IMPAIRMENT, PROVIDE EMERGENCY HOSE EXTINGUISHERS AND MAINTAIN EXTRA WATCH SERVICE IN THE AFFECTED AREAS.
6. PROVIDE RECORD DRAWINGS AND CALCULATIONS TO THE OWNER UPON COMPLETION OF THE WORK.

MECHANICAL VIBRATION AND SEISMIC CONTROLS
1. MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK SHALL BE MOUNTED ON VIBRATION ISOLATORS TO PREVENT THE TRANSMISSION OF VIBRATION AND MECHANICALLY TRANSMITTED SOUND TO THE BUILDING STRUCTURE.
2. MECHANICAL SYSTEMS SHALL BE SEISMICALLY BRACED TO ALLOW THEM TO REMAIN IN PLACE WITHOUT SEPARATION OF ANY PART WHEN SUBJECTED TO THE SEISMIC FORCES SPECIFIED AND THE SYSTEMS WILL BE FULLY OPERATIONAL AFTER THE SEISMIC EVENT. MECHANICAL SYSTEMS WILL INCLUDE ALL NEW EQUIPMENT, DUCTWORK AND PIPING.
3. REQUIREMENTS:
   A. APPLICABLE CODE: INTERNATIONAL BUILDING CODE 2003.
   B. GENERAL: PERFORMANCE REQUIREMENTS TO BE USED IN THE DESIGN OF SEISMIC CONTROLS SHALL USE DESIGN FORCES CALCULATED AS FOLLOWS:
      I. SEISMIC USE GROUP: GROUP III.
      II. SEISMIC DESIGN CATEGORY: D.
      III. COMPONENT IMPORTANCE FACTOR (IP): 1.5.
      IV. SDS: 0.371

PIPING INSULATION
1. FIBERGLASS INSULATION WITH ALL SERVICE JACKET, 25 FLAME SPREAD, 50 SMOKE DEVELOPED. DOMESTIC COLD WATER: 1" THICKNESS. DOMESTIC HOT WATER: PIPE SIZES 1" AND SMALLER RUNOUTS UP TO 12' IN LENGTH: 1 INCH THICKNESS. ALL OTHER DHW PIPING SIZES: 1" THICKNESS.
2. FLEXIBLE ELASTOMERIC THERMAL INSULATION, EQUAL TO NOMACO K–FLEX LS, 25 FLAME SPREAD, 50 SMOKE DEVELOPED. COOLING COIL CONDENSATE AND CHILLED WATER: 2" THICKNESS OUTSIDE OF BUILDING AND 1" THICKNESS INSIDE OF BUILDING. APPLY CONTINIOUS PVC JACKETING ON OUTDOOR INSTALLATIONS.

PIPING
1. ALL PIPING SHALL BE PRESSURE TESTED. SUPPORT ALL PIPING IN ACCORDANCE WITH MSS STANDARD PRACTICE SP–69. PROVIDE ADJUSTABLE CLEVIS HANGERS, WITH INSULATION SHIELDS AS REQUIRED.
2. FORCED DWV AND INDIRECT WASTE: COPPER TUBE, TYPE L; COPPER PRESSURE FITTINGS; SOLDERED JOINTS.
3. CHILLED WATER 2" AND LESS: TYPE L COPPER. CHILLED WATER 2–1/2" AND LARGER: TYPE L COPPER OR SCHEDULE 40 STEEL.

VALVES
1. HOT WATER:
   A. BALL VALVES, NPS 2 AND SMALLER: TWO–PIECE, 600–PSIG CWP RATING, COPPER ALLOY.
   B. BALANCE VALVES, NPS 2 AND SMALLER: BRONZE BODY, BALL TYPE, 125–PSIG RATING, CONNECTIONS FOR PORTABLE DIFFERENTIAL PRESSURE METER, MEMORY STOP.

VAV WATER HEATING COILS
1. TUBES: 5/8 INCH OD SEAMLESS COPPER ARRANGED IN PARALLEL OR STAGGERED PATTERN, EXPANDED INTO FINS, BRAZED JOINTS.
2. FINS: ALUMINUM OR COPPER CONTINUOUS PLATE TYPE WITH FULL FIN COLLARS.
3. CASING: DIE FORMED CHANNEL FRAME OF 16 GAGE GALVANIZED STEEL WITH 16 GAGE MOUNTING HOLES ON 3 INCH CENTERS.
4. HEADERS: SEAMLESS COPPER TUBE WITH SILVER BRAZED JOINTS.
5. INSTALL IN DUCTS AND CASINGS IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE. PROVIDE ACCESS DOORS FOR CLEANING.

METAL DUCTWORK
1. GALVANIZED STEEL DUCTWORK: ASTM A653 GALVANIZED STEEL SHEET, LOCK–FORMING QUALITY, AND G90 ZINC COATING. ALL DUCTWORK SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH SMACNA STANDARDS. CONSTRUCT DUCT SYSTEMS SO THAT LEAKAGE DOES NOT EXCEED ONE PERCENT OF THE TOTAL AIR QUANTITIES. SEAL ALL DUCT JOINTS.
2. PROVIDE VOLUME DAMPERS AT ALL BRANCH DUCTS.
3. INSULATE SUPPLY DUCTWORK WITH 1–½" FIBERGLASS BLANKET WITH VAPOR BARRIER JACKET EQUAL TO SCHULLER MICROLITE TYPE 75, ASTM C533, WITH FSK FACING.
4. SEAL NEW AND EXISTING DUCTWORK (WHERE POSSIBLE) TO SMACNA SEAL CLASS A STANDARDS.
5. DUCTWORK OUTSIDE SHALL RECEIVE 2 LAYERS OF 2" POLYISOCYANURATE W/ FLEX CLAD OR ENGINEER APPROVED EQUAL FOR WEATHERTIGHT SEAL.

INSULATED FLEXIBLE DUCTS
1. ALUMINUM LAMINATE AND POLYESTER FILM WITH LATEX ADHESIVE SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE, FIBERGLASS INSULATION, POLYETHYLENE VAPOR BARRIER FILM. R–VALUE = 4.2, UL 181, CLASS 1.

IDENTIFICATION
1. PIPE–MARKING LABELS: FURNISH AND INSTALL IN ACCORDANCE WITH ANSI/OSHA REQUIREMENTS. IDENTIFY VALVES WITH TAGS. IDENTIFY ALL EQUIPMENT SUCH AS AIR CONDITIONING UNITS, CONDENSING UNITS, AND HUMIDIFIER WITH STENCIL PAINTING OR TAGS.

AUTOMATIC TEMPERATURE CONTROLS
1. CONTROLS SHALL BE AN EXTENSION OF THE EXISTING HONEYWELL EXCELL DDC SYSTEM.
2. EXTEND EXITING DDC CONTROL SYSTEM TO SERVE THE NEW ROOF–TOP UNIT (AHU–13), NEW BLOWER COILS (BC–1), AND TO ASSOCIATED REHEAT COILS.
3. PROVIDE TEMPERATURE SENSORS AND HUMIDITY SENSOR WHERE INDICATED OR AS REQUIRED TO MEET THE SEQUENCES.
4. REFER TO DRAWINGS FOR SEQUENCE OF CONTROLS.

TESTING, ADJUSTING, AND BALANCING (T–A–B)
1. TEST, ADJUST, AND BALANCE EQUIPMENT AND DISTRIBUTION SYSTEMS IN ACCORDANCE WITH NEBB OR AABC PROCEDURAL STANDARDS. TESTS SHALL BE PERFORMED BY AND INDEPENDENT T–A–B AGENCY.
2. T–A–B NEW AHU, NEW BLOWER COILS, AND ASSOCIATED SYSTEMS.
3. T–A–B NEW CHILLED WATER SYSTEM AND REHEAT COILS.
4. T–A–B ALL NEW AND REVISED AIR INLETS AND OUTLETS, INCLUDING DESIGN AND ACTUAL CFM. TEST AND ADJUST ADJACENT AFFECTED AREAS IF REQUIRED.
5. CATH LAB #2 SHALL BE CONFIGURED FOR 15 AC/HR (AS INDICATED) W/ 3 ACH/HR OF OUTSIDE AIR. PRECENTAGE OF OUTSIDE AIR AT THE AIR HANDLER SHALL BE CALIBRATED FOR DUCT LEAKAGE

BLOWER COIL SEQUENCE OF OPERATION (BC–1)

A. GENERAL:
   1. UNIT SHALL BE PROVIDED WITH FACTORY MOUNTED CONTROLS WITH INTERFACE TO COMMUNICATE WITH EXISTING BAS SYSTEM.
   2. WITH THE H–O–A SWITCH IN THE "AUTO" POSITION, UNIT SHALL START THROUGH THE BAS SYSTEM PROVIDED THE SAFETIES HAVE BEEN SATISFIED.

B. SUPPLY FAN CONTROL: THE UNIT SUPPLY FAN SHALL RUN BASED ON THE SPACE COOLING TEMPERATURE SET POINT.

C. DISCHARGE AIR TEMPERATURE CONTROL:
   1. THE COOLING COIL 3–WAY VAVLE SHALL MODULATE TO MAINTAIN THE SPACE TEMPERATURE SET POINT OF 55°F (ADJ).

D. SAFETY DEVICES:
   1. ROOM HIGH TEMPERATURE ALARM.

A1 | SPECIFICATIONS

A12 | MISC. SEQUENCE OF OPERATION

144 Fore Street P.O. Box 618
Portland, Maine 04104
tel. (207) 772-3846
fax. (207) 772-1070
www.smrtinc.com

ARCHITECTURE
ENGINEERING
PLANNING
INTERIOR DESIGN
COMMISSIONING
SMRT

STATE OF MAINE
PETER W BROWN
No. 5743
LICENSED PROFESSIONAL ENGINEER

Maine Medical Center
Cath Lab #2 Reno
PORTLAND, ME

ISSUED FOR CONSTRUCTION
3-30-09
CURRENT ISSUE STATUS:

REV	DESCRIPTION	DATE
0	ISSUED FOR CONSTRUCTION	3-30-09

GRAPHIC SCALE: 0" 1"

SCALE:	NOT TO SCALE
PROJECT MANAGER:	KD
JC/DRAWN BY:	BAL
A/E OF RECORD:	PWB
CAD FILE:	M-651-09009
PROJECT NO:	09009
DATE:	3-30-09

SHEET TITLE:
SEQUENCE OF OPERATIONS

SHEET No. M-651