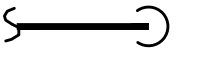
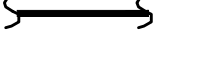
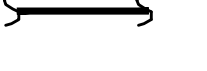






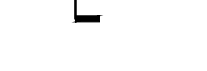


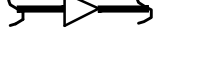


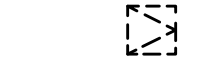
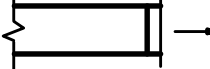

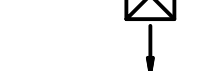

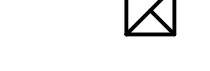
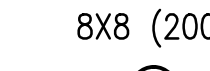


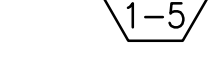
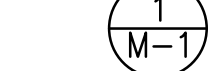
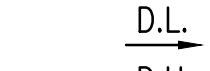
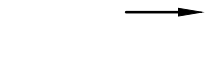
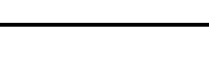
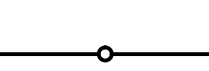
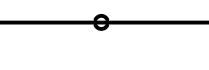
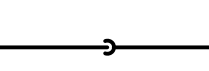
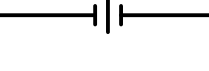


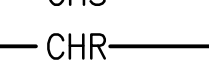

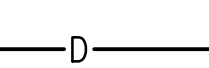



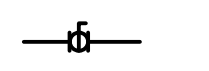








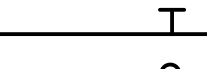

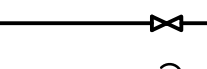

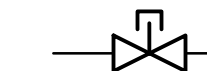
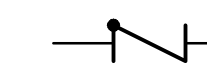
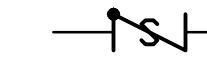
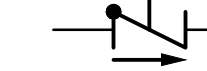

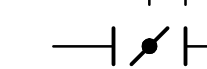
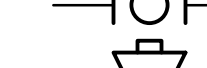
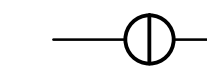
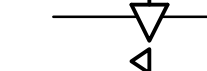


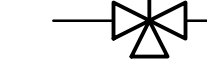
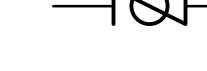





## SYMBOLS AND ABBREVIATION

 RECTANGULAR DUCTWORK (WIDTH X DEPTH)  RECTANGULAR DUCTWORK (WIDTH X DEPTH)  FLAT OVAL DUCTWORK  ROUND DUCTWORK (SIZE, DIAMETER)  1" ACOUSTICALLY LINED DUCTWORK (UNO)  SQUARE-THROATED ELBOW W/TURNING VANES  RADIUS ELBOW  MANUAL VOLUME DAMPER (MVD)  TRANSITION WITH FLAT SIDE  TRANSITION ON CENTER  RECTANGULAR-TO-ROUND TRANSITION  TAKE-OFF TAP TO RECTANGULAR DUCT AND VOLUME DAMPER  CONICAL TAP TO RECTANGULAR DUCT AND VOLUME DAMPER  FLEXIBLE CONNECTOR  EXISTING DUCTWORK TO REMAIN	 ACCESS REQUIRED FOR EQUIPMENT SERVICE  SIDE WALL REGISTER/GRILLE  CEILING DISTRIBUTION 4-WAY THROW  RETURN AIR GRILLE  EXHAUST GRILLE  8X8 (200) THERMOSTAT (MAX. 48" A.F.F.)  CARBON MONOXIDE DETECTOR  EQUIPMENT TAG, DESCRIPTION FCU, FLOOR LEVEL *1* (GROUND=1, FIRST=2, SECOND=3), UNIT NUMBER *5*  DETAIL REFERENCE, DETAIL 1, SHEET NUMBER M-1  D.L. DOOR LOUVER - UNDER ARCHITECT SECTION  D.U. DOOR UNDERCUT - UNDER ARCHITECT SECTION  COMBINATION FIRE SMOKE DAMPER (CFSD)  FIRE DAMPER (FD)
---	---

## PIPING SYMBOLS

 ELBOW TURNED UP  ELBOW TURNED DOWN  TEE TURNED UP  TEE TURNED DOWN  CAP  RISE OR DROP IN PIPE  UNION  PIPE CONTINUES  POINT OF CONNECTION  POINT OF DISCONNECTION  CHILLED WATER SUPPLY PIPING  CHILLED WATER RETURN PIPING  HEATING HOT WATER SUPPLY PIPING  HEATING HOT WATER RETURN PIPING  COOLING COIL CONDENSATE OR EQUIPMENT DRAIN PIPING  VALVE IN RISER  FLOW IN DIRECTION OF ARROW  GATE VALVE  CHECK VALVE  BUTTERFLY VALVE (FOR SIZES 2 1/2" AND LARGER) AND BALL VALVE (FOR 2" AND SMALLER)  MANUAL AIR VENT  REFRIGERANT SIGHT GLASS	 TEMPERATURE AND PRESSURE TEST PORT  CONTROL VALVE  SOLENOID VALVE  ISOLATION VALVE  PIPE DROP  PIPE RISE  LOCK SHIELD VALVE  CHECK VALVE, SWING OR LIFT  SILENT CHECK VALVE  STOP CHECK VALVE  ANGLE STOP CHECK VALVE  BUTTERFLY VALVE  BALL VALVE  SQUARE HEAD COCK  BALANCING VALVE  PLUG VALVE (TYPE AS NOTED)  PRESSURE REDUCING VALVE  TWO-WAY AUTOMATIC CONTROL VALVE  THREE-WAY AUTOMATIC CONTROL VALVE  FLOW CONTROL VALVE
--	--

## AIR SIDE SEQUENCE OF OPERATIONS

1. OCCUPIED HOURS:  
DURING OCCUPIED HOURS ALL THE MAIN SYSTEMS FANS WILL START AND THE OUTSIDE AIR (OSA) DAMPERS SHALL BE SET AT THEIR MINIMUM AIR SETTINGS.
2. UNOCCUPIED HOURS:  
DURING UNOCCUPIED HOURS ALL THE MAIN SYSTEMS WILL BE SHUT DOWN AND THE OUTSIDE AIR DAMPERS SHALL BE COMPLETELY CLOSED.
3. AH SYSTEM SEQUENCE OF OPERATIONS  
NEW AIR HANDLING UNITS (SEE SCHEDULE)
  - A. UNIT TO BE CONTROLLED BY AN EXISTING DDC-EMS SYSTEM
    1. EACH UNIT CONSIST OF CONSTANT VOLUME VFD AIR FANS, FILTERS, ECONOMIZERS CHILLED WATER AND NEW HOT WATER COILS. A DDC UNITARY CONTROLLER WILL BE MOUNTED ON EACH UNIT TO MONITOR AND CONTROL UNIT OPERATION.
    2. THE UNITS AIR DISTRIBUTION IS EXISTING
    3. THE UNITS ARE NEW, PROVIDE ZONE DAMPERS AS PER SCHEDULES
    4. EACH UNIT START/STOP WILL FOLLOW AN OPERATOR INPUT OPERATION SCHEDULE. IF AN UNIT SUPPLY FAN FAILS DURING OPERATION, THE DDC CONTROLLER WILL INITIATE AN ALARM.
    5. A MICROPROCESSOR BASED TEMPERATURE CONTROLLER IS EXISTING IN EACH ZONE TO MONITOR SPACE TEMPERATURE AND ALLOW LOCAL SETPOINT ADJUSTMENTS. THE DDC CONTROLLER WILL RESET THE UNIT SUPPLY AIR TEMPERATURE ACCORDING TO SPACE ZONE COOLING OR HEATING DEMAND. THE DDC CONTROLLER WILL MODULATE THE CHILLED WATER OR HOT WATER COIL VALVE OPENING BY MEANS OF PID CONTROL TO ACHIEVE THE SUPPLY AIR TEMPERATURE SETPOINT.
    6. IF THE SPACE TEMPERATURE IS WITHIN THE DEADBAND BETWEEN THE COOLING AND HEATING SETPOINTS, BOTH THE CHILLED WATER AND HOT WATER COIL VALVES WILL BE CLOSED. THE UNIT SUPPLY AIR FAN WILL CONTINUE TO OPERATE UNTIL THE SCHEDULED STOP TIME IS REACHED.
    7. FILTER CLEANLINESS WILL BE CONTINUOUSLY MONITORED VIA A DIFFERENTIAL PRESSURE SENSOR.
    8. AN ON/OFF SWITCH WILL BE PROVIDED ON THE UNITARY CONTROLLER TO PERMIT MANUAL ON/OFF OF EACH UNIT.
    9. WHEN THE SCHEDULED STOP TIME IS REACHED, THE DDC CONTROLLER WILL SHUT OFF THE UNIT. THE CONTROLLER WILL CLOSE CHILLED WATER AND HOT WATER COIL VALVES, AND RETURN ANY MOTORIZED DAMPERS TO THE NORMAL POSITION.
    10. THE EXISTING SMOKE DETECTORS WILL BE RE-INSTALLED IN EACH UNIT SUPPLY AND RETURN AIR STREAMS, UPON DETECTION OF SMOKE, THE DETECTOR WILL SEND A SIGNAL TO THE FIRE ALARM CONTROL PANEL WHICH WILL SHUT OFF THE SUPPLY FAN. THE SMOKE DETECTOR WILL HAVE AN AUXILIARY CONTACT TO CONNECT TO THE DDC CONTROLLER.
    11. THE OPERATOR SHALL DEFINE HIGH AND LOW LIMITS FOR SPACE TEMPERATURE. IF SPACE TEMPERATURE EXCEEDS THESE LIMITS, THE DDC CONTROLLER WILL INITIATE A HIGH OR LOW TEMPERATURE ALARM FOR THAT SPACE.
  - UNITS (SEE SCHEDULE) WITH 100% ECONOMIZER CONTROL SET AT 55°F AIR HANDLERS WITH FACTORY ECONOMIZERS OR WITH FIELD SUPPLIED ECONOMIZERS  
AS OSA TEMPERATURE DROPS BELOW THE SET POINT, A CONTROLLER SHALL BE ABLE, FROM AN OUTDOOR AIR SENSOR AND A RETURN AIR SENSOR, TO PROVIDE TEMPERATURE INPUTS TO FULLY OPEN THE (OSA) OUTSIDE AIR & RELIEF AIR DAMPERS, CLOSE THE (RA) RETURN AIR DAMPER, START THE RELIEF/EXHAUST AIR FAN AND DEENERGIZE THE CHILLED WATER SYSTEM (CHILLERS LOCK OUT) TO PROVIDE FREE ENERGY COOLING FOR THE SPACE. (100% OSA & DESIGNED RELIEF/EXHAUST).  
AS OSA TEMPERATURE GOES ABOVE THE SET POINT, THE CONTROLLER SHALL BE ABLE, BY THE OSA SENSOR, TO PROVIDE TEMPERATURE INPUTS TO CLOSE THE OSA DAMPER TO THE MINIMUM POSITION, OPEN THE RETURN AIR DAMPER, DEENERGIZE THE RELIEF/EXHAUST FAN, AND REENERGIZE THE CHILLERS(S) TO NORMAL OPERATION.
12. GAS/ELECTRIC UNITS WITH MODULATING POWER EXHAUST/ECONOMIZERS: (ROOFTOP UNITS)  
NORMAL OPERATION IS INITIATED BY A REMOTE ELECTRONIC CONTROL SYSTEMS AS SCHEDULED SET AT THE USERS OR LOAD REQUIREMENTS.  
NORMAL START-UP SEQUENCE SHALL ENERGIZE INDOOR FAN, OUTDOOR FAN AND COMPRESSOR(S). COOLING TO MODULATE AS REQUIRED.
  - A. UNIT TO BE CONTROLLED BY A PROGRAMMABLE THERMOSTAT WITH FAN AND OFF-HEAT/COOL CONTROL
  - B. UNIT OPERATION AT STARTUP, UNIT INDOOR EVAPORATOR FAN WILL BE ENERGIZED TO RUN CONTINUOUSLY AND THE ECONOMIZER/OSA DAMPERS WILL BE OPEN TO THE MINIMUM OUTSIDE AIR (OSA) POSITION.
  - C. COOLING-WHEN THE THERMOSTAT CALLS FOR COOLING, THE MECHANICAL COOLING CYCLES ON (THE COMPRESSOR(S) AND OUTDOOR CONDENSER FAN(S) WILL START.) AS CONDITIONED SPACE TEMPERATURE APPROACHES THE THERMOSTAT'S COOLING SET POINT, THE MECHANICAL COOLING STAGE CYCLES OFF. AFTER MECHANICAL COOLING SHUTS OFF, THE EVAPORATOR (INDOOR) FAN CONTINUES TO RUN.
  - D. HEATING-UPON CALL FOR HEAT, THE INDUCED DRAFT MOTOR IS ENERGIZED TO START, THE MAIN GAS VALVE IS ENERGIZED AND THE HEATING CYCLES ON.  
AS SPACE TEMPERATURE APPROACHES THE HEATING TEMPERATURE SET POINT, HEATING STAGE CYCLES OFF.  
AFTER BURNERS ARE DEENERGIZED, THE UNIT INDOOR EVAPORATOR-FAN MOTOR CONTINUES TO RUN.
  - E. NORMAL SHUTDOWN SEQUENCE SHALL STOP ALL THE FANS AND COMPRESSOR(S) AND DE-ENERGIZE THE ENTIRE SYSTEM ALL. THE DAMPERS SHALL RETURNS TO A FULLY CLOSED POSITION
  - F. 100% ECONOMIZER CONTROL SET AT 55°F  
AS OSA TEMPERATURE DROPS BELOW THE SET POINT, A CONTROLLER SHALL BE ABLE, FROM AN OUTDOOR AIR SENSOR AND A RETURN AIR SENSOR, TO PROVIDE TEMPERATURE INPUTS TO FULLY OPEN THE (OSA) OUTSIDE AIR DAMPER, CLOSE THE (RA) RETURN AIR DAMPERS, MODULATE THE POWER EXHAUSTER AND ECONOMIZER OSA AIR DAMPER AND DEENERGIZE THE CONDENSING UNIT (COMPRESSOR LOCK OUT) TO PROVIDE FREE ENERGY COOLING FOR THE SPACE. (100% OSA & RELIEF/EXHAUST).  
AS OSA TEMPERATURE GOES ABOVE THE SET POINT, THE CONTROLLER SHALL BE ABLE, BY THE OSA SENSOR, TO PROVIDE TEMPERATURE INPUTS TO CLOSE THE OSA DAMPERS TO THE MINIMUM POSITION, OPEN THE RETURN AIR DAMPER, MODULATE THE RELIEF/EXHAUST FAN, AND REENERGIZE THE CONDENSING UNIT TO NORMAL OPERATION.
13. VARIABLE SPEED AIR FAN:  
NEW SUPPLY FANS SERVING THE NEW AH UNITS SHALL BE VARIABLE SPEED FANS. FAN START/STOP WILL FOLLOW AN OPERATOR INPUT SCHEDULE WHICH WILL BE THE SAME AS THE OPERATION SCHEDULE OF COILS THEY SERVE.  
A DUCT STATIC PRESSURE SENSOR WILL BE PROVIDED FOR EACH FAN. FAN SPEED WILL BE MODULATED USING PID CONTROL LOGIC TO ACHIEVE THE STATIC PRESSURE SETPOINT.  
UPON FAN STARTUP, THE DDC CONTROLLER WILL GRADUALLY INCREASE FAN SPEED UNTIL THE MINIMUM FLOW STATIC PRESSURE SETPOINT IS ACHIEVED. WHEN ANY COIL IS ACTIVATED THE OUTSIDE AIR DAMPER OF THE CORRESPONDING AH UNIT WILL BE OPENED TO THE MAXIMUM POSITION. THE DDC CONTROLLER WILL RESET THE OUTSIDE AIR DUCT STATIC PRESSURE SETPOINT HIGHER TO FORCE A HIGHER OUTSIDE AIR FAN SPEED. WHEN ALL OUTSIDE DAMPERS ARE AT THE MAXIMUM POSITIONS, THE STATIC PRESSURE SETPOINT WILL BE SET TO THE MAXIMUM FLOW STATIC PRESSURE LIMIT.  
THE STATIC PRESSURE SENSOR WILL BE LOCATED IN THE SUPPLY AIR FAN SECTION  
THE DDC CONTROLLER WILL INITIATE A LOW FLOW ALARM AND SHUT OFF THE OUTSIDE SUPPLY FAN WHEN:
  - a) THE FAN CANNOT DEVELOP SUFFICIENT AIRFLOW TO ACHIEVE THE MINIMUM FLOW STATIC PRESSURE SETPOINT WITHIN AN OPERATOR DEFINABLE TIME DELAY AFTER STARTUP.
  - b) THE FAN CANNOT ACHIEVE THE STATIC PRESSURE SETPOINT WITHIN AN OPERATOR DEFINABLE TIME DELAY AFTER THE SETPOINT IS RESET, OR
  - c) THE FAN FAILS TO MAINTAIN THE STATIC PRESSURE SETPOINT.
14. COORDINATE CONTROLS WITH UNIT MANUFACTURER, CONTROL AND ELECTRICAL CONTRACTORS FOR CONNECTION TO POWER AND LIFE SAFETY SYSTEMS AS REQUIRED BY CODE.  
INSTALLATION OF FIELD DEVICES SUCH AS RELAYS, SENSORS, LOCAL CONTROL DEVICES, ETC SHALL FOLLOW THE INSTRUCTIONS IN THE CONTRACT DOCUMENTS. OTHERWISE THE CONTROLS CONTRACTOR SHALL FIELD VERIFY THE OPTIMUM LOCATIONS FOR MOUNTING THE DEVICES.
15. THE CONTROL CONTRACTOR SHALL, AS PART OF HIS SHOP DRAWING ACTIVITY, PREPARE AND SUBMIT TO THE USERS ENGINEER CONTROL/WIRING & PIPING DIAGRAMS WHICH INDICATES, GRAPHICALLY AND WITH SUFFICIENT DETAIL, THE INTENT OF THE ABOVE DESCRIBED SEQUENCE OF OPERATIONS. THESE CONTROL WIRING AND/OR PIPING DIAGRAMS SHALL BE SUPPORTED WITH APPROPRIATE MANUFACTURER'S CATALOG DATA AND POWER REQUIREMENT.

PRIME CONTRACTOR: POJOAQUE PUEBLO SERVICES



GLENDALE OFFICE  
 2011  
 CAMARILLO OFFICE  
 2011  
 TEL: (805)987-4001  
 TEL: (805)987-4001  
 TEL: (805)987-4001  
 TEL: (805)987-4001  
 FAX: (805)987-4004  
 FAX: (805)987-4004  
 FAX: (805)987-4004  
 FAX: (805)987-4004  
 JOB NO. 08-038



DESIGN FOR:  
**BUILDING 1408**  
**REPLACE CHILLER, BOILER AND AHU'S**  
 EDWARDS AIR FORCE BASE, CALIFORNIA 93523-8450

QUOTE/DWG #:

DRAWN BY:

TS

CHECKED BY:

DATE:  
12/05/2008

SCALE:  
AS NOTED

REVISION HISTORY

1	
2	
3	
4	
5	

PROJECT  
FA9301-06-D-0010

M0.2

RECEIVED DRAWINGS