DESIGNER'S NOTES FOR DETAILS AND SCHEDULES

1. REFER TO DESIGNER'S NOTES ON THE DETAILS. REMOVE DESIGNER'S NOTES PRIOR TO ISSUING.

2. GROUP COMMON DETAILS, SUCH AS PIPING, AS MUCH AS POSSIBLE.

3. MANUAL AIR VENTS ARE REQUIRED ON CHILLED AND HEATING HOT WATER SYSTEMS AND AT LOCAL HIGH POINTS. LOCAL HIGH POINT IS A SECTION OF PIPE AT A HIGHER ELEVATION THAN THE SECTION OF PIPE IMMEDIATELY DOWNSTREAM AND IMMEDIATELY UPSTREAM.

4. FOR EQUIPMENT SCHEDULES:
   A. PROVIDE SCHEDULES FOR EXISTING FANS OR OTHER EQUIPMENT THAT MUST BE MODIFIED OR REBALANCED. SHOW EXISTING AND FUTURE CAPACITIES AND MOTOR SIZES.
   B. DO NOT USE DITTO MARKS FOR REPETITIVE ENTRIES.
   C. USE IN SCHEDULES WHERE THE COLUMN HEADING IS NOT APPLICABLE TO INDICATE THAT THE LACK OF AN ENTRY WAS NOT AN OMISSION.
   D. GROUP SCHEDULES AS MUCH AS POSSIBLE. SEE HVAC DESIGN MANUAL FOR SEQUENCE OF SCHEDULES.

5. ALL DUCTWORK, WITHOUT EXCEPTION, AND ALL PIPING 150mm [6"] AND LARGER SHALL BE SHOWN IN DOUBLE LINE.

ABBREVIATION AND SYMBOL NOTES

1. THE COMPOSITE LIST OF ABBREVIATIONS IS COORDINATED WITH THE UNITED STATES NATIONAL CAD STANDARD VERSION 4.0, LEGACY VA LIST OF ABBREVIATIONS, AND ASHRAE. THIS LIST SHALL BE USED FOR ALL VA PROJECTS AND EDITED, AS REQUIRED, TO BE PROJECT SPECIFIC. THE DESIGNER MAY SELECT AND USE ADDITIONAL ABBREVIATIONS, IF REQUIRED, FROM ANY KNOWN SOURCES.

2. THE LIST OF SYMBOLS IS MOSTLY BASED ON THE VA MASTER LIST OF STANDARD SYMBOLS AND HAS BEEN UPDATED IN CONSULTATION WITH OTHER SOURCES, SUCH AS, NATIONAL CAD STANDARD VERSION 4, AND ISA (THE INSTRUMENTATION, SYSTEMS, AND AUTOMATION SOCIETY). THIS LIST SHALL BE USED FOR ALL VA PROJECTS AND EDITED, AS REQUIRED, TO BE PROJECT SPECIFIC. THE DESIGNER CAN SELECT AND USE ADDITIONAL SYMBOLS, IF REQUIRED, FROM ANY KNOWN SOURCE.
1. ALL PIPING AND DUCTS IN FINISHED ROOMS OR SPACES SHALL BE CONCEALED IN A FURRED CHASE OR ABOVE HARD SUSPENDED CEILING, OR ACOUSTICAL CEILING.

2. THE FIRST FIGURE OF DUCT SIZE INDICATES DIMENSION OF FACE SHOWN OR INDICATED. DUCT SIZES ARE NET INSIDE DIMENSIONS.

3. ACCESS PANELS IN HARD SUSPENDED CEILINGS ARE REQUIRED FOR ALL VALVES, TRAPS, DAMPERS, CLEANOUTS, CONTROLS, ETC. ACCESS PANELS SHALL BE FURNISHED AND INSTALLED UNDER THE ARCHITECTURAL SPECIFICATIONS. COORDINATE LOCATION WITH MECHANICAL INSTALLATION AND DEMONSTRATE ACCESS TO EQUIPMENT SERVED.

4. TOTAL STATIC PRESSURE NOTED IN THE SCHEDULES INCLUDES DUCT SYSTEM, TERMINAL UNITS, FILTERS, COILS, ETC. LOSS FOR FILTERS SHALL BE FOR FILTERS AT 50% LOADING.

5. FOR TYPICAL STEAM AND WATER PIPING CONNECTIONS TO EQUIPMENT, SEE STANDARD EQUIPMENT DETAILS.

6. DIFFUSER, REGISTER AND GRILLE SIZES SHOWN ON FLOOR PLANS ARE NECK SIZES.

7. WATER PIPE CONNECTIONS TO AIR HEATING AND COOLING COILS SHALL BE MADE TO PROVIDE COUNTER FLOW BETWEEN WATER AND AIR.

8. WALL TYPE EXHAUST REGISTERS NOTED AS "BR" ON DRAWINGS ARE TO BE INSTALLED WITH BOTTOM ELEVATION OF REGISTER AT 175mm [7"] ABOVE FINISHED FLOOR.

9. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF CEILING DIFFUSERS, REGISTERS, AND GRILLES.

10. STEAM HEADER SET PRESSURE:  ____ kPa [PSIG] NORMAL  
 __  ____ kPa [PSIG] LOW DEMAND PERIODS

11. ALTITUDE—BOILER ROOM FLOOR: ___ M [FT.] ABOVE SEA LEVEL

12. SEISMIC PROVISIONS // REQUIRED – SEE SPECS // NOT REQUIRED //
ALL PRESSURES LISTED ARE GAGE PRESSURE UNLESS OTHERWISE NOTED
ABBREVIATIONS

A/E  ARCHITECT / ENGINEER  C  CENTIGRADE (CELSIUS)
AAH  AIR TO AIR HEAT EXCHANGER  CAV  CONSTANT AIR VOLUME
AV  AUTOMATIC AIR VENT  CC  COOLING COIL
A  AIR  CCD  COOLING COIL CONDENSATE DRAIN
ACC  AIR COOLED CONDENSER  CD  CEILING DIFFUSER
ACCH  AIR COOLED CHILLER  CD-1  CONSTRUCTION DOCUMENTS (SUBMISSION1)
ACCU  AIR COOLED CONDENSING UNIT  CD-2  CONSTRUCTION DOCUMENTS (SUBMISSION2)
ACD  AUTOMATIC CONTROL DAMPER,  CENT  CENTRIFICAL
MODULATING  CFH  CUBIC FEET PER HOUR
ACD-TP  AUTOMATIC CONTROL DAMPER,  CFM  CUBIC FEET PER MINUTE
          TWO POSITION  CFT  CUBIC FEET
ACU  AIR CONDITIONING UNIT  CFP  CHEMICAL FEED PUMP
AD  ACCESS DOOR  CG  CEILING GRILLE
AF  AFTER FILTER  CH  CHILLER
AFCV  AIR FLOW CONTROL VALVE  CHP  CHILLED WATER PUMP
AFF  ABOVE FINISHED FLOOR  CHW  CHILLER WATER
AFMS  AIR FLOW MEASURING STATION  CHR  CHILLED WATER RETURN
AFW  AIR FOIL WHEEL (FAN)  CHS  CHILLED WATER SUPPLY
AHU  AIR HANDLING UNIT  CI  CAST IRON
AMP  AMPERE  CM  CARBON MONOXIDE
AP  ACCESS PANEL  CM  CUBIC METER
APD  AIR PRESSURE DROP  CM/S  CUBIC METER PER SECOND
AQST  AQUASTAT  CO  CLEAN OUT
ARI  AIR CONDITIONING AND REFRIGERATION INSTITUTE  CO2  CARBON DIOXIDE
AS  AIR SEPARATOR  COMP  COMPRESSOR UNIT
ASHRAE  AMERICAN SOCIETY OF HEATING REFRIGERATION AIR  COP  COEFFICIENT OF PERFORMANCE
          CONDITIONING ENGINEERS  CP  CONDENSATE PUMP
ASME  AMERICAN SOCIETY OF MECHANICAL ENGINEERS  CR  CEILING REGISTER
AW  AIR WASHER  CS  CONDENSATE STORAGE TANK
AX  AXIAL FLOW  CSG  CLEAN STEAM GENERATOR

B  BOILER  CT  COOLING TOWER
BD  BUTTERFLY DAMPER  CU  CONDENSING UNIT
BDD  BACKDRAFT DAMPER  CUH  CABINET UNIT HEATER
BOR  BASE BOARD RADIATOR  CV  CONSTANT VOLUME
BFP  BACKFLOW PREVENTER  CW  COLD WATER (POTABLE)
BFT  BOILER PLANT FIRE TUBE  CWCC  CHILLED WATER COOLING COIL
BG  BOTTOM GRILLE  CWP  CONDENSER WATER PUMP
BHP  BRAKE HORSEPOWER  CWR  CONDENSER WATER RETURN (TO
BHW  HOT WATER HEATING BOILER  COOLING TOWER)
BHX  BOILER BLOWDOWN HEAT EXCHANGER  CWS  CONDENSER WATER SUPPLY (FROM
BIW  BACKWARD INCLINED WHEEL (FAN)  COOLING TOWER)
BMT  BONE MARROW TRANSPLANT  D  DAMPER - AUTOMATIC
BR  BOTTOM REGISTER  Db  DRY-BULB TEMPERATURE
BSC  BIOLOGICAL SAFETY CABINETS  DB  DECIBELS
BT  BLOWOFF TANK  DCW  DOMESTIC COLD WATER
BTC  BLOWOFF TANK CONTROL VALVE  DD-1  DESIGN DEVELOPMENT (SUBMISSION 1)
BTU  BRITISH THERMAL UNIT  DD-2  DESIGN DEVELOPMENT (SUBMISSION 2)
BTUH  BRITISH THERMAL UNIT PER HOUR  DDC  DIRECT DIGITAL CONTROLS
BWT  BOILER PLANT WATER TUBE  DEG  DEGREE

DETAIL TITLE:  ABBREVIATIONS

SCALE : NONE
DATE ISSUED: 11/01/2017  CAD DETAIL NO.:  SD230511–03.DWG
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<td>OA</td>
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<tr>
<td>OAD</td>
<td>OUTDOOR AIR DAMPER</td>
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<tr>
<td>OAG</td>
<td>OUTSIDE AIR GRILLE</td>
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<td>OAI</td>
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<td>OUTSIDE DIAMETER</td>
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<td>OFM</td>
<td>OIL FLOWMETER</td>
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<tr>
<td>OR</td>
<td>OPERATING ROOM</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>P</td>
<td>PUMP</td>
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<tr>
<td>Pa</td>
<td>PASCAL</td>
</tr>
<tr>
<td>PC</td>
<td>PUMPED CONDENSATE</td>
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<tr>
<td>PCF</td>
<td>POUNDS PER CUBIC FOOT (FEET)</td>
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<tr>
<td>PD</td>
<td>PRESSURE DROP</td>
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<td>PROPELLER (TYPE) EXHAUST FAN</td>
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<td>PF</td>
<td>PRE-FILTER</td>
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<td>PGW</td>
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<tr>
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<td>PRESSURE REGULATING (VALVE) STATION</td>
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<tr>
<td>PSI</td>
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<td>PTAC</td>
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<tr>
<td>R/E</td>
<td>RETURN OR EXHAUST</td>
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<td>RA</td>
<td>RETURN AIR</td>
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<tr>
<td>RAHX</td>
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<td>RAT</td>
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<td>Description</td>
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<td>VALVE</td>
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<td>VANE-AXIAL FAN</td>
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<td>VAV</td>
<td>VARIABLE AIR VOLUME</td>
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<tr>
<td>VD</td>
<td>VOLUME DAMPER (MANUAL OPPOSED BLADE)</td>
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<td>VARIABLE FREQUENCY DRIVE</td>
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<td>WASTE ANESTHESIA GAS</td>
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<td>Wb</td>
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<td>WC</td>
<td>WATER COOLED</td>
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<td>WCCH</td>
<td>WATER COOLED CHILLER</td>
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<td>WCCU</td>
<td>WATER COOLED CONDENSING UNIT</td>
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<tr>
<td>WCHP</td>
<td>WATER COOLED HEAT PUMPS</td>
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<tr>
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<td>WATER COOLED PACKAGED UNIT</td>
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<td>WEF</td>
<td>WALL EXHAUST FAN</td>
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<td>WATER FILTER</td>
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<td>WATER SIDE PRESSURE DROP</td>
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<tr>
<td>YR</td>
<td>YEAR</td>
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</table>
DRAWING SYMBOLS

2
H4
DETAIL NUMBER
DRAWING NUMBER WHERE DRAWN

A
H7
SECTION LETTER
DRAWING NUMBER WHERE SHOWN

BUILDING NO. WHERE EQUIPMENT IS LOCATED.
EQUIPMENT ABBREVIATION (SUPPLY FAN)
SUPPLY FAN NO. 3 IN BUILDING NO. 26
TYPICAL UNIT NO.

BUILDING NO. WHERE EQUIPMENT IS LOCATED
ITEM (TERMINAL UNIT SHOWN)
ITEM NUMBER (TERMINAL UNIT NO. 1)
SERVED BY AIR HANDLER UNIT NO. 1
DUCTWORK SYMBOLS

- **SUPPLY DUCT (UP & DOWN)**
- **EXHAUST DUCT (UP & DOWN)**
- **RETURN DUCT (UP & DOWN)**
- **ROUND AND SQUARE 4-WAY CEILING DIFFUSERS**
- **SQUARE 3-WAY CEILING DIFFUSERS**
- **SQUARE 2-WAY CEILING DIFFUSERS**
- **SQUARE 1-WAY CEILING DIFFUSERS**
- **LINEAR SLOT DIFFUSER**
- **SUPPLY TOP REGISTER OR GRILLE (WALL TYPE)**
- **EXHAUST OR RETURN CEILING REGISTER OR GRILLE**
- **EXHAUST OR RETURN BOTTOM REGISTER OR GRILLE (WALL TYPE)**
- **EXHAUST OR RETURN REGISTER OR TOP GRILLE (WALL TYPE)**
- **VANED ELBOW & AIR SPLIT TYPE DUCT TAKE-OFF**
- **CONNECT NEW DUCT TO EXISTING DUCT**
- **INCLINED RISE, IN DIRECTION OF AIR FLOW**
- **INCLINED DROP, IN DIRECTION OF AIR FLOW**
- **LIMIT OF DEMOLITION**

**Department of Veterans Affairs**

**DETAIL TITLE / DUCTWORK SYMBOLS**

**SCALE :** NONE

**DATE ISSUED:** DECEMBER 2008

**CAD DETAIL NO.:** SD230511-09.DWG
DUCTWORK SYMBOLS

FLEXIBLE CONNECTION, EQUIPMENT, VIBRATION, OR SEISMIC

VANED ELBOW (PROVIDE ALL SQUARE OR RECTANGULAR ELBOWS WITH VANES EVEN IF SYMBOL IS MISSING)

VANED ELBOW (SHORT RADIUS)

STANDARD RADIUS ELBOW (LONG RADIUS)

NEW DUCT (INSIDE DIMENSIONS: WIDTH x DEPTH)

EXISTING DUCT TO REMAIN

EXISTING DUCT TO BE REMOVED

LOUVER (LOUVER SPECIFIED IN ARCHITECTURAL SECTION.)

FLEXIBLE DUCTWORK (INSULATED)

DUCT WITH SOUND LINING

MANUAL VOLUME DAMPER

FIRE DAMPER

BACK DRAFT DAMPER
DUCTWORK SYMBOLS

//FIRE//SMOKE// DAMPER
(VA DOES NOT ALLOW COMBINATION FIRE/SMOKE DAMPERS.)

POINT OF CHANGE IN DUCT CONSTRUCTION BY STATIC PRESSURE CLASS. THE NUMBER Assigns PRESSURE CLASS (IN. OF WATER) WHICH WILL ACCOMMODATE MAXIMUM OPERATING PRESSURE IN THE DUCT SUBSECTION. THE SYMBOL CONTINUES THE ASSIGNMENT UNTIL THE DUCT TERMINATES OR ANOTHER SYMBOL APPEARS. A "N" SUPERSCRIPT INDICATES NEGATIVE PRESSURE.

AUTOMATIC CONTROL DAMPER MODULATING

AUTOMATIC CONTROL DAMPER TWO POSITION

STAINLESS STEEL DUCT

MANUAL SPLITTER DAMPER

STANDARD BRANCH SUPPLY OR RETURN, NO SPLITTER (45° TAP)

DUCT MOUNTED COIL (HOT WATER OR STEAM COIL)

DUCT MOUNTED COIL (ELECTRIC)
TERMINAL UNIT SYMBOLS

- **CONVECTOR OR RADIATOR (RECESSED)**

- **CONVECTOR OR RADIATOR (WALL HUNG)**

- **FLOOR MOUNTED VERTICAL RECESSED FAN COIL UNIT. LETTER INDICATES UNIT SIZE.**

- **FLOOR MOUNTED VERTICAL CABINET FAN COIL UNIT. LETTER INDICATES UNIT SIZE.**

- **THRU WALL AIR CONDITIONING UNIT. LETTER INDICATES UNIT SIZE.**

- **WINDOW TYPE AIR CONDITIONING UNIT. LETTER INDICATES UNIT SIZE.**

- **FLOOR MOUNTED HEAT PUMP. LETTER INDICATES UNIT SIZE.**

- **AIR CURTAIN**

- **UNIT HEATER (HORIZONTAL)**

- **UNIT HEATER (VERTICAL)**

- **2’x2’ RADIANT CEILING PANEL**

- **2’x4’ RADIANT CEILING PANEL**
AIR TERMINAL SYMBOLS

- TERMINAL UNIT WITH REHEAT COIL
- DOUBLE DUCT MIXING BOX.
- FAN POWERED VARIABLE VOLUME TERMINAL UNIT WITH HEATING COIL.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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<tbody>
<tr>
<td>S-60</td>
<td>High Pressure Steam (60 PSIG and Above)</td>
</tr>
<tr>
<td>CR-60</td>
<td>High Pressure Steam Condensate Return</td>
</tr>
<tr>
<td>S-30</td>
<td>Medium Pressure Steam (16 PSIG Thru 59 PSIG)</td>
</tr>
<tr>
<td>CR-30</td>
<td>Medium Pressure Steam Condensate Return</td>
</tr>
<tr>
<td>S-15</td>
<td>Low Pressure Steam (15 PSIG and Below)</td>
</tr>
<tr>
<td>CR-15</td>
<td>Low Pressure Steam Condensate Return</td>
</tr>
<tr>
<td>PC</td>
<td>Condensate Pump Discharge</td>
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<tr>
<td>HWS</td>
<td>Hot Water Heating Supply</td>
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<tr>
<td>HWR</td>
<td>Hot Water Heating Return</td>
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<tr>
<td>GHS</td>
<td>Glycol-Water Heating Supply</td>
</tr>
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<td>GHR</td>
<td>Glycol-Water Heating Return</td>
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<td>SWS</td>
<td>Solar Water Supply</td>
</tr>
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<td>SWR</td>
<td>Solar Water Return</td>
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<tr>
<td>RL</td>
<td>Refrigerant Liquid</td>
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<tr>
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<td>Refrigerant Suction</td>
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<td>Refrigerant Hot Gas</td>
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<td>CWS</td>
<td>Condenser Water Supply (From Tower)</td>
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<tr>
<td>CWR</td>
<td>Condenser Water Return (To Tower)</td>
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<td>CHR</td>
<td>Chilled Water Return</td>
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<td>Chilled Glycol-Water Supply</td>
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<td>Chilled Glycol-Water Return</td>
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<td>MW</td>
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<td>Glycol-Water Run Around Supply</td>
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<td>GRR</td>
<td>Glycol-Water Run Around Return</td>
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<tr>
<td>X</td>
<td>Existing Pipe to Be Removed</td>
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# PIPING SYMBOLS

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<tr>
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<tr>
<td>TC</td>
<td>TUBE CLEANER WATER SUPPLY</td>
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<tr>
<td>BO</td>
<td>BOILER BLOWOFF</td>
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<td>CBD</td>
<td>CONTINUOUS BLOWDOWN</td>
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<td>BWS</td>
<td>BOILER WATER SAMPLE</td>
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<td>OVERFLOW</td>
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<td>NATURAL GAS IGNITER FUEL</td>
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<td>LIQUEFIED PETROLEUM GAS IGNITER FUEL</td>
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<td>CSH</td>
<td>CONSTANT SUPPORT HANGER (TYPE 54, 55, 56)*</td>
</tr>
<tr>
<td>SS</td>
<td>SLIDING SUPPORTS (TYPE 35)*</td>
</tr>
</tbody>
</table>

* Type numbers refer to manufacturer's Standardization Society Standard Practice SP-58.
GENERAL PIPING SYMBOLS

- Direction of pipe pitch (down)
- Direction of flow
- Anchor
- Reducer or increaser
- Eccentric reducer
- Top connection, 45° or 90°
- Bottom connection, 45° or 90°
- Side connection
- Capped outlet
- Rise or drop in pipe
- Union
- Pipe up
- Pipe down
- Inverted bucket trap set including piping accessories see detail
- Float & thermostatic trap set including piping accessories see detail
- Thermostatic trap set including piping accessories see detail
- Thermometer
- Pressure gage
- Venturi flow meter
- Refrigerant sight glass
- Test plug (pressure/temperature)
- Automatic air vent
- Manual air vent
- Quick-couple hose connector
VALVE SYMBOLS

GATE VALVE – THREADED/FLANGED
GLOBE VALVE – THREADED/FLANGED
GATE VALVE WITH 3/4" HOSE ADAPTER
CHECK VALVE
WYE STRAINER (WITH BALL VALVE & HOSE CONNECTION)
WYE STRAINER WITH VALVED DRAIN AND QUICK-COUPLE HOSE CONNECTOR
FLEXIBLE CONNECTION
ANGLE GLOBE VALVE
BUTTERFLY VALVE
BALL VALVE
MODULATING CONTROL VALVE
MODULATING CONTROL BUTTERFLY VALVE
TWO POSITION CONTROL VALVE
THREE-WAY MODULATING CONTROL VALVE
THREE-WAY TWO POSITION CONTROL VALVE
PRESSURE REGULATING VALVE
PRESSURE SAFETY VALVE
AUTOMATIC BALANCING CONTROL VALVE
WATER BALANCE DEVICE
CIRCUIT SETTER VALVE
GATE VALVE WITH GLOBE-VALVED BYPASS
PLUG VALVE
CONTROL VALVE (CV) – FLOAT-OPERATED
PRESSURE REDUCING VALVE (PRV)
WATER LEVEL CONTROLLER
FLOW METER
CONTROLS SYMBOLS

T
ROOM THERMOSTAT/TRANSMITTER – WALL MOUNT

M
ROOM HUMIDISTAT (MOISTURE)/TRANSMITTER – WALL MOUNT

TT
TEMPERATURE TRANSMITTER

TT
TEMPERATURE TRANSMITTER, AVERAGING ELEMENT

MT
MOISTURE (HUMIDITY) TRANSMITTER

PT
PRESSURE TRANSMITTER

SPS
STATIC PRESSURE SENSOR

FT
FLOW TRANSMITTER

IT
CURRENT TRANSMITTER

CT
CONDUCTIVITY TRANSMITTER

SD
SMOKE DETECTOR

PDT
PRESSURE DIFFERENTIAL TRANSMITTER

PDS
PRESSURE DIFFERENTIAL SWITCH

HS
HAND SWITCH (HAND-OFF-AUTO SWITCH)

ZC
VALVE OR DAMPER POSITION CONTROLLER

KR
LOCAL RECORDING TIME CLOCK (RUNTIME)

TSL
TEMPERATURE SWITCH, LOW (FREEZESTAT)

TSH
TEMPERATURE SWITCH, HIGH (FREEZESTAT)

LC
LEVEL CONTROLLER

LT
LEVEL TRANSMITTER

DATE ISSUED: SEPTEMBER 2010    CAD DETAIL NO.:  SD230511-18.DWG

SCALE : NONE
CONTROLS SYMBOLS

- PSH: PRESSURE SWITCH HIGH
- PSL: PRESSURE SWITCH LOW
- EPT: ELECTRONIC TO PNEUMATIC TRANSDUCER
- AT CO2: CARBON DIOXIDE TRANSMITTER
- AT CO: CARBON MONOXIDE TRANSMITTER
- AT OC: OCCUPANCY SENSOR
- LTCP: LOCAL TEMPERATURE CONTROL PANEL
- HVAC: HVAC CONTROL PANEL
- VSMC: VARIABLE SPEED MOTOR CONTROLLER
- ECC: INTEGRATE CONTROL POINT ON REMOTE GRAPHICS WORKSTATION AT ENERGY CONTROL CENTER
- TC: TEMPERATURE CONTROLLER. SEE SEQUENCE OF OPERATION
- PC: PRESSURE CONTROLLER. SEE SEQUENCE OF OPERATION
- SC: SPEED CONTROLLER. SEE SEQUENCE OF OPERATION
- FC: FLOW CONTROLLER. SEE SEQUENCE OF OPERATION
- FSH: FLOW SWITCH HIGH
- FSL: FLOW SWITCH LOW
- KC: TIME CLOCK CONTROLLING EQUIPMENT ON A SCHEDULE
CONTROLS SYMBOLS

TEMPERATURE SENSING ELEMENT FOR TRANSMITTING TEMPERATURE TO EMCS
(PROVIDE 12 INCHES [200mm] MINIMUM LENGTH IN DUCT WHEN SPACE PERMITS.)

SENSOR WITH AVERAGING ELEMENT TO TRANSMIT TEMPERATURE TO EMCS

MOTOR STARTER

ELECTRIC OPERATED CONTROL DAMPER/OR VALVE
DESIGNER'S NOTE:
SHOW ON THE DRAWINGS OTHER SPECIFIED AND SPECIAL PIPE SUPPORTS WHERE REQUIRED.

NOTES:
SEE SPECIFICATION FOR DETAILED HANGER REQUIREMENTS

MAXIMUM PIPE/TUBING SUPPORT SPACING

<table>
<thead>
<tr>
<th>Nom. Size</th>
<th>THD</th>
<th>25</th>
<th>50</th>
<th>60</th>
<th>85</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
<th>450</th>
<th>500</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPE</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[mm]</td>
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</tr>
<tr>
<td>TUBING</td>
<td>[F]</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
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<td>600</td>
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</tr>
</tbody>
</table>

NOTE: FOR TRAPEZEE HANGER TAKE SPACING OF SMALLEST SIZE ON TRAPEZEE.

PIPE HANGERS

NTS
**DETAIL FOR SUPPORTING PIPE ON ROOF**

**NOTES:**
- PROVIDE RESTRAINING CLAMPS 2438mm [8'-0"] O.C.
### PIPE ANCHOR SCHEDULE

<table>
<thead>
<tr>
<th>D</th>
<th>P</th>
<th>C</th>
<th>N</th>
<th>S</th>
<th>BOLT PATTERN</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>mm</td>
<td>in</td>
</tr>
<tr>
<td>102</td>
<td>4</td>
<td>16</td>
<td>⅜</td>
<td>19</td>
<td>¾</td>
</tr>
<tr>
<td>76</td>
<td>3</td>
<td>13</td>
<td>½</td>
<td>13</td>
<td>½</td>
</tr>
<tr>
<td>64</td>
<td>2½</td>
<td>10</td>
<td>⅜</td>
<td>10</td>
<td>⅜</td>
</tr>
<tr>
<td>51</td>
<td>2</td>
<td>10</td>
<td>⅜</td>
<td>10</td>
<td>⅜</td>
</tr>
<tr>
<td>38</td>
<td>1½</td>
<td>10</td>
<td>⅜</td>
<td>6</td>
<td>¾</td>
</tr>
</tbody>
</table>

**Instructions:**
- Insulate as indicated for all chilled water.
- Insulate pipe only for steam, condensate & heating water.

**Note:**

WHERE USED FOR COPPER TUBE OR PIPE, BRAZE TO FABRICATED STEEL ANCHOR

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**SMALL PIPE ANCHOR 38-102mm [1½"-4"]**

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**DETAIL TITLE:** SMALL PIPE ANCHOR 38-104mm [1-1/2"-4"]

**SCALE:** NONE

**DATE ISSUED:** 11/01/2017

**CAD DETAIL NO.:** SD230511-23.DWG
# LARGE PIPE ANCHOR 152–457mm [6”–18”]

## PIPE ANCHOR SCHEDULE

<table>
<thead>
<tr>
<th>D (mm)</th>
<th>L (in)</th>
<th>P (in)</th>
<th>T (in)</th>
<th>E (in)</th>
<th>N</th>
<th>S (in)</th>
<th>BOLT PATTERN</th>
</tr>
</thead>
<tbody>
<tr>
<td>152</td>
<td>6</td>
<td>216</td>
<td>8½</td>
<td>19</td>
<td>¾</td>
<td>10</td>
<td>¾</td>
</tr>
<tr>
<td>203</td>
<td>8</td>
<td>254</td>
<td>10</td>
<td>19</td>
<td>¾</td>
<td>13</td>
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</tr>
<tr>
<td>254</td>
<td>10</td>
<td>305</td>
<td>12</td>
<td>19</td>
<td>¾</td>
<td>13</td>
<td>½</td>
</tr>
<tr>
<td>305</td>
<td>12</td>
<td>356</td>
<td>14</td>
<td>19</td>
<td>¾</td>
<td>13</td>
<td>½</td>
</tr>
<tr>
<td>356</td>
<td>14</td>
<td>406</td>
<td>16</td>
<td>19</td>
<td>¾</td>
<td>13</td>
<td>½</td>
</tr>
<tr>
<td>406</td>
<td>16</td>
<td>457</td>
<td>18</td>
<td>19</td>
<td>¾</td>
<td>13</td>
<td>½</td>
</tr>
<tr>
<td>457</td>
<td>18</td>
<td>508</td>
<td>20</td>
<td>25</td>
<td></td>
<td>1</td>
<td>¾</td>
</tr>
</tbody>
</table>

**INSULATE AS INDICATED FOR ALL CHILLED WATER.**

**INSULATE PIPE ONLY FOR STEAM, CONDENSATE & HEATING WATER.**

**NOTES:**

A. INSTALL WALL PLATE FIRST THEN WELD ON REMAINING ASSEMBLY. ONE WALL PLATE FOR BOTH CHILLED WATER S.&R. IS OPTIONAL.

**ANCHOR BOLTS**

N = NUMBER S = SIZE
DRILL $\phi = S + 3.175\text{mm}$
DRILL $\phi = S + \frac{1}{8}$

---

**Department of Veterans Affairs**

**DETAIL TITLE:** LARGE PIPE ANCHOR 152–457mm [6”–18”]

**SCALE:** NONE

**DATE ISSUED:** 11/01/2017  
**CAD DETAIL NO.:** SD230511–24.DWG
NOTES:
1. PROVIDE ANCHORS ONLY WHERE SHOWN
   ON DRAWINGS.
2. EXTEND SLEEVE ABOVE FLOOR WHERE
   SPECIFIED.

DESIGNER'S NOTE:
SHOW REQUIRED ANCHORS ON PLAN, SECTIONS
OR DIAGRAMS.

PIPE SLEEVE
WHERE SPECIFIED

RISER
CLAMP

BOLT

PLAN

FIRE-STOPPING
MATERIAL

RISER CLAMP

PIPE

INSULATION

BOLT (TYPICAL)

FLOOR
SLAB

PIPE SLEEVE
WHERE SPECIFIED

RISER CLAMP. BOTTOM
CLAMP REQUIRED AT
ANCHOR POINTS ONLY.

ELEVATION

SUPPORT/ANCHOR FOR PIPE RISERS

NTS

DETAIL TITLE: SUPPORT/ANCHOR FOR PIPE RISERS

SCALE: NONE

DATE ISSUED: 11/01/2017   CAD DETAIL NO.: SD230511-25.DWG
SUPPORT ANCHOR (CONDENSER WATER OR CHILLED WATER)

1/4"x1 1/4" [6.4x31.4mm] IRON PIPE STRAP
FLANGED CONNECTION
1/4"x1 1/4" [6.4x31.4mm] IRON PIPE CLAMP

WATER STOP
EXTERIOR WALL
PIPE SLEEVE
HIGH DENSITY POLYETHYLENE (HDPE) SLEEVE WITH INTEGRAL HOLLOW MOLDED WATER STOP RING 4" [100mm] LARGER THAN OUTSIDE DIAMETER OF PIPE

4" [100mm]
5/8" [16mm]Ø ROD

SCALE : NONE
DETAIL TITLE / SUPPORT ANCHOR (CONDENSER WATER OR CHILLED WATER)

DATE ISSUED: DECEMBER 2008 CAD DETAIL NO.: SD230511-26.DWG
NOTES:
1. COORDINATE TRENCH DETAIL WITH ARCHITECTURAL & STRUCTURAL.
2. REFER TO SPECIFICATION, SEALING & CAULKING.

DESIGNER'S NOTE:
COORDINATE TRENCH DETAIL WITH ARCHITECTURAL & STRUCTURAL.
STEAM LINE

CONSIST OF TWO "U" BOLTS WITH NUT & LOCK NUT ON STEAM LINE. SPOT WELD "U" BOLT TO PIPE & BOLT TO CHANNEL.

SIZE OF STEAM LINE GOVERN SIZE OF CHANNEL.

CONDENSATE RETURN LINE

PROVIDE ONE "U" BOLT WITH NUT & LOCK NUT ON RETURN LINE. SPOT WELD "U" BOLT TO PIPE & BOLT TO CHANNEL.

CHANNEL TO BE SET IN SIDE WALL OF TRENCH.

CONCRETE TRENCH

<table>
<thead>
<tr>
<th>SIZE OF PIPE [INCH [mm]]</th>
<th>SIZE OF &quot;U&quot; BOLT [INCH [mm]]</th>
<th>SIZE OF CHANNEL [INCH [mm]]</th>
</tr>
</thead>
</table>

SCHEDULE FOR 8 FT. [2.4m] SPAN OR LESS.

ANCHOR INSTALLATION

STEAM/CONDENSATE PIPING IN TRENCH

NTS
NOTE:
1. SEISMIC SEPARATION ASSEMBLY DETAIL SHOWN IN NFPA 13 (SPRINKLER PIPING), UTILIZING FLEXIBLE MECHANICAL COUPLINGS, MAY BE USED IN LIEU OF PIPING DETAIL SHOWN ABOVE.

SCHEDULE FOR PIPING CROSSING A SEISMIC JOINT

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>PIPE</th>
<th>DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

DIMENSIONS INCHES [mm]

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
</tr>
</thead>
</table>

PIPING CROSSING A SEISMIC JOINT DETAIL "A"

DESIGNER'S NOTE:
1. THIS CONFIGURATION SHOWN IN THIS DETAIL IS A SUGGESTED ARRANGEMENT, NOT MANDATED FOR USE IN AS IS CONDITION. THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER IN CHARGE OF THE PROJECT SHALL PROVIDE SEISMIC CALCULATIONS AND MODIFY THE CONFIGURATION AS NEEDED TO MAKE THE ARRANGEMENT PROJECT-SPECIFIC. THE MECHANICAL DESIGNER SHALL COMPLETE THE BLANK SCHEDULES BY INSERTING THE DISTANCES, TO BE CALCULATED AND FURNISHED BY PROVIDED BY THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER.
SCHEDULE FOR PIPING CROSSING A SEISMIC JOINT

ANCHOR
SEISMIC JOINT

RISE UP 12" [300mm] MINIMUM
HANGER (CLOSE TO ELBOW)

ANCHOR

DETAIL "B"

(PLASTIC PIPE FOR PRESSURIZED SYSTEMS)

SCHEDULE FOR PIPING CROSSING A SEISMIC JOINT

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>PIPE</th>
<th>DETAIL</th>
<th>DIMENSIONS INCHES [mm]</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>a</td>
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</tbody>
</table>

PIPING CROSSING A SEISMIC JOINT
DETAIL "B"

DESIGNER'S NOTE:
1. THIS CONFIGURATION SHOWN IN THIS DETAIL IS A SUGGESTED ARRANGEMENT, NOT MANDATED FOR USE IN AS IS CONDITION. THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER IN CHARGE OF THE PROJECT SHALL PROVIDE SEISMIC CALCULATIONS AND MODIFY THE CONFIGURATION AS NEEDED TO MAKE THE ARRANGEMENT PROJECT-SPECIFIC. THE MECHANICAL DESIGNER SHALL COMPLETE THE BLANK SCHEDULES BY INSERTING THE DISTANCES, TO BE CALCULATED AND FURNISHED BY PROVIDED BY THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER.
**PIPING CROSSING A SEISMIC JOINT DETAIL “C”**

**DESIGNER’S NOTE:**
1. THIS CONFIGURATION SHOWN IN THIS DETAIL IS A SUGGESTED ARRANGEMENT, NOT MANDATED FOR USE IN AS IS CONDITION. THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER IN CHARGE OF THE PROJECT SHALL PROVIDE SEISMIC CALCULATIONS AND MODIFY THE CONFIGURATION AS NEEDED TO MAKE THE ARRANGEMENT PROJECT-SPECIFIC. THE MECHANICAL DESIGNER SHALL COMPLETE THE BLANK SCHEDULES BY INSERTING THE DISTANCES, TO BE CALCULATED AND FURNISHED BY PROVIDED BY THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER.

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**SCHEDULE FOR PIPING CROSSING A SEISMIC JOINT**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>PIPE</th>
<th>DETAIL</th>
<th>DIMENSIONS INCHES [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Notes:**

- **COPPER PIPE**
- **FLEXIBLE HOSE**
- **SEISMIC JOINT**
- **ANCHOR**
- **HANGER**

**Scale:** None

**Date Issued:** December 2008

**CADD Detail No.:** SD230511-31.DWG
SCHEDULE FOR PIPING CROSSING A SEISMIC JOINT

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>PIPE</th>
<th>DETAIL</th>
<th>DIMENSIONS INCHES [mm]</th>
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<tbody>
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</tbody>
</table>

PIPING CROSSING A SEISMIC JOINT DETAIL "D"

DESIGNER'S NOTE:
1. THIS CONFIGURATION SHOWN IN THIS DETAIL IS A SUGGESTED ARRANGEMENT, NOT MANDATED FOR USE IN AS IS CONDITION. THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER IN CHARGE OF THE PROJECT SHALL PROVIDE SEISMIC CALCULATIONS AND MODIFY THE CONFIGURATION AS NEEDED TO MAKE THE ARRANGEMENT PROJECT-SPECIFIC. THE MECHANICAL DESIGNER SHALL COMPLETE THE BLANK SCHEDULES BY INSERTING THE DISTANCES, TO BE CALCULATED AND FURNISHED BY PROVIDED BY THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER.
DETAIL "E"
(STEEL PIPE FOR WATER)

SECTION
PIPING CROSSING A SEISMIC JOINT DETAIL "E"

DESIGNER'S NOTE:
1. THIS CONFIGURATION SHOWN IN THIS DETAIL IS A SUGGESTED ARRANGEMENT, NOT MANDATED FOR USE IN AS IS CONDITION. THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER IN CHARGE OF THE PROJECT SHALL PROVIDE SEISMIC CALCULATIONS AND MODIFY THE CONFIGURATION AS NEEDED TO MAKE THE ARRANGEMENT PROJECT-SPECIFIC. THE MECHANICAL DESIGNER SHALL COMPLETE THE BLANK SCHEDULES BY INSERTING THE DISTANCES, TO BE CALCULATED AND FURNISHED BY PROVIDED BY THE REGISTERED PROFESSIONAL STRUCTURAL ENGINEER.
### ISOMETRIC VIEW

#### TABLE OF FORCES AND MOMENTS DUE TO THERMAL EXPANSION AND WEIGHT OF STEAM LEAD AND VALVES

<table>
<thead>
<tr>
<th>BOILER NO.</th>
<th>Fx [LB] [Kg]</th>
<th>Fy [LB] [Kg]</th>
<th>Fz [LB] [Kg]</th>
<th>Mx [FT LB] [J]</th>
<th>My [FT LB] [J]</th>
<th>Mz [FT LB] [J]</th>
</tr>
</thead>
<tbody>
<tr>
<td>-------------</td>
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</tbody>
</table>

#### TABLE OF FORCES AND MOMENTS DUE TO SEISMIC ACTION OF THE STEAM LEAD AND VALVES

<table>
<thead>
<tr>
<th>BOILER NO.</th>
<th>Fx [LB] [Kg]</th>
<th>Fy [LB] [Kg]</th>
<th>Fz [LB] [Kg]</th>
<th>Mx [FT LB] [J]</th>
<th>My [FT LB] [J]</th>
<th>Mz [FT LB] [J]</th>
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<tbody>
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</tr>
</tbody>
</table>

#### NOTES:

1. **Boilers shall be designed to withstand the forces and moments shown above.**

2. **Add any Fy force (500 LB [230 Kg] minimum) as an estimation of the weight effect of the steam lead and valve on the boiler. Boiler and pipe hanger suppliers shall coordinate to determine the exact Fy force which will be imposed on the steam nozzles.**

3. **Delete the seismic table on non-seismic areas.**

### FORCES AND MOMENTS ON BOILER STEAM NOZZLES

**NTS**

---

**Department of Veterans Affairs**

**Detail Title:** / Forces and Moments on Boiler Steam Nozzles

**Scale:** None

**Date Issued:** February 2008  
**CADD Detail No.:** SD230511-34.DWG
VIBRATION ISOLATION BASES

NUMBER OF ISOLATION UNITS AS REQUIRED

TYPE "B"
WELDED STEEL BASE

STRUCTURAL STEEL FRAME
SLEEVE
ANCHOR BOLT
REINFORCING BARS

SECTION A–A

ALL WELDED STEEL FRAMEWORK

NUMBER OF ISOLATION UNITS AS REQUIRED

TYPE "1"
CONCRETE INERTIA BASE

TYPICAL STRUCTURAL STEEL MEMBER FOR EQUIPMENT

DRIVEN EQUIPMENT

MOTOR SHAFT

SCALE : NONE

DATE ISSUED : DECEMBER 2008 CADD DETAIL NO. : SD230541–01.DWG
NOTES:
1. ATTACH THRUST RESTRAINTS SYMMETRICALLY ON BOTH SIDES OF THE FAN DISCHARGE.
2. ADJUST RESTRAINT TO ALLOW 1/4” [6 mm] MOVEMENT OF FAN AT START AND STOP.

THRUSt REsTAINT FoR FAnts

DESIGNER'S NOTE:
ON THE VIBRATION ISOLATION SCHEDULE OR UNDER THE TITLE OF THIS DETAIL DESIGNATE FANS REQUIRING RESTRAINT. THIS IS USUALLY SEPARATELY MOUNTED FAN SECTIONS FOR STATIC PRESSURE OVER 4” [100 mm] AND POSSIBLY FOR AXIAL FLOW FANS FOR STATIC PRESSURE OVER 4” [100 mm].
CONCRETE EQUIPMENT BASES

SECTION A–A (BASE NOT POURED WITH SLAB)

SECTION A–A (BASE POURED WITH FLOOR SLAB)

TYPICAL ANCHOR BOLT NUT & WASHER

PROVIDE DOUBLE SLAB REINFORCING IN BASE AREA

SECTION B–B

EQUIPMENT BASE PLATE

NOTE:
L & W DIMENSIONS SHALL BE 6" [150mm] GREATER THAN THE EQUIPMENT BASE PLATE.

CONCRETE EQUIPMENT BASES

DESIGNER'S NOTE:
THIS DETAIL IS PRIMARILY FOR PUMPS WITHOUT ISOLATORS. COORDINATE DETAIL WITH ARCHITECTURAL AND STRUCTURAL.
NOTE:
NOT REQUIRED FOR AIR TERMINAL UNITS.

EQUIPMENT WEIGHT 250 LBS. [114KG] OR LESS

SEISMIC BRACING FOR LIGHT SUSPENDED EQUIPMENT

FLOOR MOUNT EQUIPMENT RESTRAINED BY RESILIENT PADS (TYPE DS)

CROSS BRACING RODS ALL FOUR SIDES

EQUIPMENT WEIGHT 250 LBS. [114KG] OR LESS

NOTE:
NOT REQUIRED FOR AIR TERMINAL UNITS.

SEISMIC BRACING FOR EQUIPMENT
STEEL EXPANSION SHIELD FOR EXISTING CONSTRUCTION AND INSERTS FOR NEW CONSTRUCTION. THIS TYPE SHALL BE USED ONLY IN SLABS OR BEAMS OF 4" [100mm] MIN DEPTH.

CONCRETE FLOOR SLAB

3/8" [10mm] MIN DIA EXPANSION BOLTS FOR EXISTING CONSTRUCTION AND INSERTS FOR NEW CONSTRUCTION.

CLIP ANGLE

3/8" [10mm] MIN DIA INSERTS NEW CONSTRUCTION ONLY.

NUTS & WASHERS

TURNBUCKLE

3/8" [10mm] MIN DIA HANGER RODS

FOR PIPES UNDER 2" [50mm] IN SIZE USE
1 1/2"x1 1/2"x1/4" [40x40x6.4mm] ANGLE.
ALL PIPES 2" [50mm] & LARGER USE
3"x3"x1/4" [75x75x6.4mm] ANGLE
FIRE PROTECTION FOR CEILING OUTLETS

DESIGNER NOTES:
1. SHOW LOCATION ON FLOOR PLANS
NOTES:

1. INSTALLATION OF SENSORS AND TRANSMITTERS SHALL CONFORM TO RECOMMENDATIONS OF MANUFACTURERS OF TRANSMITTERS.
CW OR SW

BYPASS

3’-6”
[1.1M]

FLOOR

WATER METER

80 MESH STRAINER

N.C.

SUPPORT BRACKET ANCHORED TO WALL OR COLUMN

ELEVATION

WATER METER INSTALLATION

NTS

DETAIL TITLE / WATER METER INSTALLATION

SCALE : NONE

DATE ISSUED : DECEMBER 2008

CADD DETAIL NO. : SD230911-02.DWG
LEGEND

ITEM NO. DESCRIPTION
1. ALARM BELL (WATER LEVEL)
2. 2 DRAFT GAUGES
   A. WINDBOX (0 TO _____mm(____IN) WC) (SEE NOTE 4)
   B. FURNACE (0 TO _____mm(____IN) WC) (SEE NOTE 4)
   C. BOILER OUTLET (-_____mm(____IN) TO +_____mm(____IN) WC)
      (SEE NOTE 5)
   D. ECONOMIZER OUTLET (-25mm(-1") TO +25mm(+1") WC)
      (SEE NOTE 5)
3. ALARM HORN (FLAME FAILURE, LOW WATER CUTOUT)
4. BURNER CONTROL SYSTEM ANNUNCIATOR
5. ROW OF BURNER CYCLE PILOT-LIGHTS
6. ROW OF BURNER CONTROL SWITCHES
7. BOILER WATER LEVEL CONTROL STATION
8. ECONOMIZER TEMPERATURE INDICATOR
9. SELECTOR SWITCH FOR ECONOMIZER TEMPERATURE INDICATOR
10. BURNER STOP SWITCH

NOTES:
1. INTERIOR OF PANEL SHALL BE UTILIZED FOR MOUNTING RELAYS, BURNER CONTROL PROGRAMMER, AND OTHER DEVICES.
2. PROVIDE FRONT OR REAR ACCESS DOORS FULL HEIGHT AND WIDTH OF PANEL.
3. PANEL DIMENSIONS APPROX. 1M(3'-0")Wx0.5M(1'-6")Dx2.3M(7'-6")H.
4. WINDBOX AND FURNACE DRAFT GAGE SCALE RANGES RECOMMENDED BY BOILER AND BURNER MANUFACTURER.
5. SCALE RANGE OF BOILER OUTLET DRAFT GAGE MUST BE COORDINATED WITH ECONOMIZER DRAFT LOSS. IF THERE IS NO ECONOMIZER, RANGE SHOULD BE -25mm(-1") TO +25mm(+1") WC.
6. BOILER COMBUSTION CONTROL SUBMASTER, DRAFT CONTROL AND OXYGEN TRIM CONTROL STATIONS MAY BE LOCATED ON THIS PANEL.

BURNER CONTROL PANEL
FOR WATER TUBE BOILERS
1. **Panel Approx.**: 3810mm [12'-6"]x610mm [2'-0"]x2438mm [8'-0"]H. Show actual size on OWS.

2. Some recording & monitoring functions may be handled by a computer work station & therefore may be deleted from the panel.

3. On some projects, it may be desirable to locate emergency generator annunciators & meters on this panel.

4. Provide smoke density monitors only on plants burning heated oil or where required by local codes.

5. On plants where draft control systems are provided, consider locating the draft gages on this panel above the boiler operation recorders. The gages are normally located on the burner control panels.

6. **Delete the "Engineering Notes" from the project drawings.**

---

**Boiler Plant Instrumentation Panel**

**Caution**: Do not delete the "Engineering Notes" from the project drawings.
GENERAL NOTES:
1. MAINTAIN NEGATIVE AIR PRESSURE (0.01 INCH WATER COLUMN [25 PASCAL]) BETWEEN THE AIR ROOM AND THE ANTEROOM AND THE ANTEROOM AND THE CORRIDOR BY MODULATING VALVE V1.
   ALL ROOMS SHALL HAVE A PERMANENTLY INSTALLED DEVICE AND/OR MECHANISM TO CONSTANTLY MONITOR THE DIFFERENTIAL AIR PRESSURE BETWEEN THE PATIENT ROOM AND THE CORRIDOR. A LOCAL VISUAL MEANS SHALL BE PROMPT TO INDICATE WHENEVER NEGATIVE DIFFERENTIAL PRESSURE IS NOT MAINTAINED. (STROBE LIGHT)
2. MAINTAIN THE ATTACHED TOILET, IF ANY, AT NEGATIVE AIR PRESSURE WITH RESPECT TO THE AIR ROOM. HOWEVER, THE DESIGN NEED NOT INCLUDE A PRESSURE DIFFERENTIAL SENSOR FOR VERIFICATION.
3. LOCATE EXHAUST AIR REGISTER OVER THE PATIENT BED ON THE CEILING. AS AN ALTERNATE, THE EXHAUST AIR REGISTER CAN BE LOCATED ON THE WALL NEAR THE PATIENT HEAD, IF FEASIBLE.
4. LOCATE THE SUPPLY AIR OUTLET TO BLOW AIR TOWARDS THE OCCUPIED AREA.
5. PROVIDE A DEDICATED EXHAUST SYSTEM FOR THE AIR ROOMS WITHOUT MIXING IT WITH ANY OTHER EXHAUST.

TYPICAL AIR BALANCE EXAMPLE:
1. THE PATIENT BEDROOM IS KEPT UNDER NEGATIVE PRESSURE BY ENSURING AIR MOVEMENT INTO THE BEDROOM SPACE FROM THE ANTE ROOM AND ADJOINING CORRIDOR.
2. THE SUPPLY AIR SYSTEM SHALL CONSIST OF THE CONSTANT VOLUME AIR DELIVERY FROM A DEDICATED AIR TERMINAL UNIT WITH REHEAT COIL TO THE ISOLATION SUITE AS FOLLOWS:
   A - PATIENT BEDROOM  MINIMUM 12 ACHP SUPPLY AIR (ASHRAE STANDARD 170-2008).
   INCREASE SUPPLY AIR VOLUME, IF REQUIRED, TO MEET THE INSIDE DESIGN CONDITIONS IN COOLING AND/OR HEATING MODES.
   EXAMPLE: 400 CFM [190 L/S]
   C - PATIENT TOILET  DO NOT SUPPLY AIR INTO THE TOILET. DRAW MAKE-UP AIR FROM THE PATIENT'S BEDROOM AND EXHAUST AT THE RATE OF 10 ACHP OR 60 CFM [28 L/S]. EXAMPLE: 60 CFM [26 L/S]
3. THE DEDICATED EXHAUST AIR SYSTEM SHALL BE BALANCED AS FOLLOWS:
4. COORDINATE DOOR UNDER CUTS FOR DOORS BETWEEN ANTE ROOM AND PATIENT (1") [2.54 CM], DOOR TO CORRIDOR.

AIR SYSTEM FOR AIRBORNE INFECTION ISOLATION ROOM (AI)(WITH ANTE ROOM)

DESIGNER'S NOTE:
1. ENSURE FINAL DESIGN REFLECTS PROJECT SPECIFIC REQUIREMENTS AND MEETS ASHRAE 170, LATEST EDITION WITH ALL ADDENDUMS.

DETAIL TITLE / AIR SYSTEM FOR AIRBORNE INFECTION ISOLATION ROOM W/ANTE ROOM

SCALE: 1:100

DATE ISSUED: MAY 2011

CAD DETAIL NO: SD230893-01.DWG
GENERAL NOTES:

1. Maintain negative air pressure (0.01 inch water column [0.5 Pascal]) between the air room and the corridor by modulating valve V1. All rooms shall have a permanently installed device and/or mechanism to constantly monitor the differential air pressure between the patient room and the corridor. A local visual means shall be provided to indicate whenever negative differential pressure is not maintained. (Strobe light)

2. Maintain the attached toilet, if any, at negative air pressure with respect to the air room. However, the design need not include a pressure differential sensor for verification.

3. Locate exhaust air register over the patient bed on the ceiling. As an alternate, the exhaust air register can be located on the wall near the patient head, if feasible.

4. Locate the supply air outlet to blow air towards the occupied area.

5. Provide a dedicated exhaust system for all rooms without mixing it with any other exhaust.

TYPICAL AIR BALANCE EXAMPLE:

1. The patient bedroom is kept under negative pressure by ensuring air movement into the bedroom space from the adjoining corridor.

2. The supply air system shall consist of the constant volume air delivery from a dedicated air terminal unit with reheat coil to the isolation suite as follows:

   A - Patient Bedroom: Minimum 12 ACH supply air (ASHRAE Standard 170 2008). Increase supply air volume, if required, to meet the inside design conditions in cooling and/or heating modes. Example: 400 CFM [190 L/s]

   B - Patient Toilet: Do not supply air into the toilet. Draw make-up air from the patient’s bedroom and exhaust at the rate of 10 ACH or 60 CFM [28 L/s]. Example: 60 CFM [28 L/s]

3. The dedicated exhaust air system shall be balanced as follows:

   A - Patient Bedroom: 400 CFM [190 L/s] (supply) + 100 CFM [47 L/s] infiltrated from corridor = 500 CFM [240 L/s] (exhaust), total exhaust 500 CFM [240 L/s].

AIR SYSTEM FOR AIRBORNE INFECTIOUS ISOLATION ROOM (AIL) (WITHOUT ANTEROOM)

NTS

DESIGNER’S NOTE:

1. Ensure final design reflects project specific requirements and meets ASHRAE 170, Latest Edition with all Addendums.
SEQUENCE OF OPERATION:

WHEN FILTER PRESSURE DROP RISES TO 2" [7 KPA] OF WATER COLUMN, FILTER STATUS LIGHT (RED) SHALL BE ENERGIZED.

HEPA FILTER CONTROLS FOR AUTOPSY EXHAUST SYSTEMS
SEQUENCE OF OPERATION FOR VARIABLE AIR VOLUME AIR HANDLING UNIT WITH MINIMUM OUTSIDE AIR

1. GENERAL

1.1 UNIT IS NORMALLY STARTED AND STOPPED REMOTELY AT THE ECC. H-0-4 SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE. WHEN THE UNIT IS "OFF" D-1, D-3 SHALL BE FULLY CLOSED. WHEN THE UNIT IS "ON" D-1, D-3 SHALL BE FULLY OPEN. D-2 AND D-3 SHALL MODULATE IN ACCORDANCE WITH THE FOLLOWING SEQUENCE.

2. TEMPERATURE CONTROL

2.1 SUPPLY AIR TEMPERATURE, SENSED BY TT-1, SHALL BE MAINTAINED AT SETPOINT VIA DIGITAL CONTROL PANEL BY MODULATING V-1 OR D-2 AND D-3 OR V-2 IN SEQUENCE.


2.3 WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS BETWEEN 60°F (15.6°C) AND THE SUPPLY AIR TEMPERATURE SENSED BY TT-1, DAMPER D-2 SHALL FULLY CLOSE AND D1 and D3 SHALL BE FULLY OPEN (MAXIMUM OUTSIDE AIR POSITION). THE DIGITAL CONTROL PANEL SHALL MODULATE V-1 TO MAINTAIN THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1.

2.4 WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS BELOW THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1, DAMPERS D1, D-2 AND D3 SHALL MODULATE TO MAINTAIN THE SCHEDULED SUPPLY AIR TEMPERATURE. IF D-2 IS OPEN AND D-3 IS CLOSED TO MINIMUM OUTSIDE AIR, V-2 SHALL MODULATE DOWN TO MAINTAIN THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1.

3. AIR FLOW CONTROL

3.1 THE SUPPLY AIR FLOW SHALL BE CONTROLLED BY THE DIGITAL CONTROL PANEL, MODULATING THE SUPPLY AIR FAN VARIABLE SPEED MOTOR CONTROLLER TO MAINTAIN 1.0" (25mm) OF DUCT STATIC PRESSURE (FIELD ADJUSTABLE). SENSED BY SPS-1. RESET STATIC PRESSURE BASED ON ACTUAL BUILDING LOAD BY PULLING ALL ATU.

3.2 THE DIGITAL CONTROL PANEL, USING TOTAL SUPPLY AIR AND RETURN AIR FLOW SIGNALS, SHALL RESET THE RETURN AIR FAN VSMC TO MAINTAIN A CONSTANT AIR FLOW DIFFERENCE BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR.

3.3 USING HIGH PRESSURE SENSOR SPS-2 LOCATED AT THE SUPPLY FAN DISCHARGE, SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 3" (75mm) OF STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-2 DOES EXCEED 3" (75mm) THE SUPPLY AIR FAN SHALL STOP. SPS-2 SHALL BE HARDWIRED TO THE SUPPLY FAN VSMC AND UNIT SHALL BE SHUTDOWN IN HAND,AUTO OR BYPASS MODE. SPS-2 WILL REQUIRE MANUAL RESET AT THE DEVICE.

4. HUMIDITY CONTROL

4.1 WHEN THE DIGITAL CONTROL PANEL IS NOT CALLING FOR HUMIDITY, SENSED BY RETURN AIR HUMIDITY H-1, 2-WAY "ON-OFF" CONTROL VALVE V-3 SHALL REMAIN CLOSED. WHEN THE DIGITAL CONTROL PANEL IS CALLING FOR HUMIDITY, V-3 SHALL REMAIN OPEN.

4.2 RETURN AIR HUMIDITY SHALL BE MAINTAINED AT SETPOINT OF 35% RH (ADU) VIA DIGITAL CONTROL PANEL BY MODULATING CONTROL VALVE V-4 TO MAINTAIN THE DESIRED HUMIDITY. THE DCC SHALL OVERDAMP THE CONTROL TO MAINTAIN HUMIDITY OF 98% AS SENSED BY H-2. DCC SHALL CLOSE VALVE V-3 WHenever THE SUPPLY FAN IS OFF. VALVE V-4 SHALL BE INTERLOCKED WITH A TEMPERATURE SWITCH TO KEEP THE HUMIDIFIER OFF UNTIL CONDENSATE TEMPERATURE APPROACHES STEAM TEMPERATURE.

5. FREEZE PROTECTION

5.1 IF THE AIR TEMPERATURE AS SENSED BY TT-3 FALLS BELOW 45°F (7°C), AN ALARM SIGNAL SHALL INDICATE AT THE DCC AND ECC. IF THE TEMPERATURE FALLS BELOW 40°F (4.4°C), AS SENSED BY THE TSL THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DIGITAL CONTROL PANEL AND ECC. TSL SHALL BE HARDWIRED TO THE SUPPLY FAN UNIT AND UNIT SHALL BE SHUTDOWN IN HAND,AUTO OR BYPASS MODE. TSL WILL REQUIRE MANUAL RESET AT THE DEVICE.

6. AUTOMATIC SHUTDOWN/RESTART

6.1 WHEN SMOKE IS DETECTED BY DUCT SMOKE DETECTOR, SO, THE SUPPLY AND RETURN FANS SHALL SHUT OFF AND AN ALARM SIGNAL SHALL BE TRANSMITTED TO THE FIRE ALARM SYSTEM. ALL SMOKE DAMPERS IN THE SUPPLY AND RETURN DUCTS SHALL CLOSE.

6.2 EXHAUST DAMPERS SERVING AREA OF THE SUPPLY FAN SHALL CONTINUE TO RUN. SUPPLY AND RETURN FANS SHALL RESTART AND SMOKE DAMPERS SHALL OPEN WHEN FIRE ALARM CIRCUIT IS RESET.

7. EMERGENCY CONSTANT SPEED OPERATION

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<th>INPUTS</th>
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**POINTS LIST FOR VAV AIR HANDLING UNIT WITH MINIMUM OUTSIDE AIR**

**NTS**
NOTES:
1. EMERGENCY GENERATOR SHALL BE INTERLOCKED WITH D3. WHEN EMERGENCY GENERATOR IS ENERGIZED D3 SHALL OPEN. WHEN EMERGENCY GENERATOR IS DE-ENERGIZED D3 SHALL CLOSE, PROVIDED ROOM EXHAUST FAN IS OFF.

2. ROOM EXHAUST FAN SHALL BE INTERLOCKED WITH D3 & ROOM THERMOSTAT T1. WHEN ROOM THERMOSTAT RISES ABOVE 85°F [29°C] ROOM EXHAUST FAN SHALL RUN & D3 SHALL OPEN. WHEN ROOM THERMOSTAT DROPS BELOW 80°F [27°C] ROOM EXHAUST FAN SHALL STOP & D3 SHALL CLOSE, PROVIDED EMERGENCY GENERATOR IS DE-ENERGIZED.

3. POWER OPERATED, OPPOSED BLADE, DAMPERS D1 & D2 SHALL BE INTERLOCKED WITH ROOM THERMOSTAT T2 SET AT 60°F [16°C]. ON A RISE IN ROOM TEMPERATURE ABOVE 60°F [16°C] D1 SHALL MODULATE OPEN & D2 SHALL MODULATE CLOSED. ON A DROP IN ROOM TEMPERATURE BELOW 60°F [16°C], D1 SHALL MODULATE CLOSED & D2 SHALL MODULATE OPEN.

4. ELECTRIC UNIT HEATER SHALL BE INTERLOCKED WITH ROOM THERMOSTAT T3 SET AT 45°F [7.2°C]. ON A DROP IN ROOM TEMPERATURE BELOW 43°F [6.1°C] ELECTRIC UNIT HEATER SHALL BE ENERGIZED & ON A RISE IN ROOM TEMPERATURE ABOVE 47°F [8.3°C].
NOTES:

1. THE DAMPER SHALL REMAIN CLOSED DURING NORMAL OPERATION AND OPEN UPON LOSS OF POWER FROM A SIGNAL FROM THE SMOKE DETECTOR, LOCATED AT THE TOP OF THE HOISTWAY. COORDINATE NUMBER OF CONTACTS WITH THE ELECTRICAL AND FIRE PROTECTION DESIGNS.

2. SHOW DAMPER LOCATION AND SIZE ON THE DRAWINGS.

3. PROVIDE A BINARY DDC POINT TO SOUND AN ALARM AT ECC.

4. REMOTE ALARM SHALL BE ACTIVATED WHEN THE HOISTWAY SMOKE DETECTOR DETECTS SMOKE.

HOISTWAY VENT DAMPER (HVD) CONTROLS

DESIGNER’S NOTES:

1. THE AREA OF VENTS SHALL NOT BE LESS THAN 3.0% OF THE TOTAL HOISTWAY AREA OR 3 SQUARE FEET (0.28 SQUARE METERS) FOR EACH ELEVATOR CAR, WHICHEVER IS GREATER.
NOTE:
MAINTAIN UPSTREAM AND DOWNSTREAM DISTANCES RECOMMENDED BY METER MANUFACTURERS

DESIGNER'S NOTE:
MODIFY DETAIL AS REQUIRED TO BE PROJECT SPECIFIC FOR THE TYPE OF METER BEING USED.
CONTROL SYSTEM CONFIGURATION
OPTION 1 —
NEW BACNET ECC, UPGRADE EXISTING CONTROLS WITH NEW BACNET CONTROLS
SYSTEM, INSTALL NEW BACNET COMMUNICATIONS NETWORK.

NOTES:
1. REPLACE EXISTING ECC WITH NEW BACNET (B-AWS) ENGINEERING
   CONTROL CENTER.
2. REPLACE ALL EXISTING CONTROLLERS WITH NEW BACNET
   CONTROLLERS.
3. INSTALL NEW BACNET COMMUNICATION NETWORK.
4. INSTALL MULTIPLE BUILDING CONTROLLERS (B-BC) AS REQUIRED.
5. INSTALL NEW CONTROLLERS (B-AAC, B-ASC) AS REQUIRED.
6. PROVIDE NEW PORTABLE OPERATOR TERMINAL.

BACNET SYSTEM ARCHITECTURE OPTION 1
BACNET SYSTEM ARCHITECTURE OPTION 2

NOTES:
1. REPLACE EXISTING ECC WITH NEW BACNET (B-AMS) ENGINEERING CONTROL CENTER (ECC)
2. INSTALL NEW BACNET CONTROLLERS AS REQUIRED
3. INSTALL NEW BACNET GATEWAY WITH FULL COMMUNICATION TO EXISTING CONTROLLERS
4. INSTALL MULTIPLE BUILDING CONTROLLERS AS REQUIRED
5. INSTALL NEW BACNET COMMUNICATION NETWORK
6. PROVIDE NEW PORTABLE OPERATORS TERMINAL

EXISTING CONTROLLER PROTOCOL

NEW BACNET COMMUNICATION NETWORK

NEW BACNET ENGINEERING CONTROL CENTER (ECC)

NEW BACNET GATEWAY WITH FULL COMMUNICATION TO EXISTING CONTROLLERS

ECC INSTALLATION INSTRUCTIONS

DATE ISSUED: SEPTEMBER 2010
CAD DETAIL NO.: SD230923-12.DWG
CONTROL SYSTEM CONFIGURATION
OPTION 3 - NEW BACNET ECC, INSTALL NEW BACNET CONTROLS ON CURRENT PROJECT. INSTALL NEW COMMUNICATIONS NETWORK. EXISTING ECC AND CONTROLLER TO REMAIN.

EXISTING ENGINEERING CONTROL CENTER

EXISTING CONTROLLER

EXISTING CONTROLLER PROTOCOL

NOTES:
1. INSTALL NEW BACNET (B=AW) ENGINEERING CONTROL CENTER (ECC).
2. EXISTING ECC, ASSOCIATED COMMUNICATION NETWORK AND CONTROLLERS TO REMAIN.
3. INSTALL NEW BACNET COMMUNICATION NETWORK.
4. INSTALL MULTIPLE BUILDING CONTROLLERS (B=BC) AS REQUIRED.
5. INSTALL NEW CONTROLLERS (B=AAC, B=ASC) AS REQUIRED.
6. PROVIDE NEW PORTABLE OPERATORS TERMINAL.

BACNET SYSTEM ARCHITECTURE OPTION 3

NTS
NOTES:
1. INSTALL NEW BACNET SOFTWARE ON EXISTING ENGINEERING CONTROL CENTER (ECC.)
2. REUSE EXISTING COMMUNICATION NETWORK.
3. EXISTING CONTROLLERS TO REMAIN.
4. INSTALL MULTIPLE BUILDING CONTROLLERS AS REQUIRED.
5. INSTALL NEW CONTROLLERS (B-AAC, B-ASC) AS REQUIRED.
6. PROVIDE NEW PORTABLE OPERATORS TERMINAL.

BACNET SYSTEM ARCHITECTURE OPTION 4
SEQUENCE OF OPERATION FOR AIR HANDLING UNIT FOR SURGICAL SUITE (VAV)

1. GENERAL

_1.1_ UNIT IS NORMALY STARTED AND STOPPED REMOTELY AT THE ECC. THE UNIT WILL

NORMALLY OPERATE 24 HOUR/DAY. H-O-A SWITCH SHALL BE KEPT IN THE "AUTO"

POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE WHEN

THE UNIT IS "OFF" D-1, D-3, D-4 AND SHALL BE FULLY CLOSED. WHEN THE UNIT IS

"ON" D-6, SD-1 AND SD-2 SHALL BE FULLY OPEN. D-1, D-2 AND D-3 SHALL

MODULATE IN ACCORDANCE WITH THE FOLLOWING SEQUENCE:

2. TEMPERATURE CONTROL

_2.1_ SUPPLY AIR TEMPERATURE SETPOINT (AS SET BY ECC), SENSED BY SENSOR TT-1, SHALL

BE MAINTAINED BY SERVICING V-1 AND V-2. HEATING AND COOLING CONTROL VALVES

SHALL BE MODULATED VIA PID CONTROL LOOP TO MAINTAIN THE SUPPLY AIR TEMP.

VALUES V-1 AND V-2 SHALL NOT BE OPENED SIMULTANEOUSLY.

_2.2_ WHEN THE OUTSIDE AIR ENTHALPY AS CALCULATED BY TT-2 AND MT-3 IS LOWER THAN

THE RETURN AIR ENTHALPY AS CALCULATED BY TT-4 AND MT-1 (AND THE OUTSIDE AIR

DRY BULB IS LESS THAN THE RETURN/EXHAUST DRY BULB TT-4) THE UNIT ECONOMIZER

MODE SHALL BE ENABLED. WHEN THE ECONOMIZER IS ENABLED DAMPERS D-1, D-2,

AND D-3 SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR SETPOINT AS SENSED BY

THE DISCHARGE AIR SENSOR TT-1.

_2.3_ WHEN THE OUTSIDE AIR ENTHALPY, OR TEMPERATURE, IS HIGHER THAN THE RETURN AIR

ENTHALPY, OR TEMPERATURE, THE ECONOMIZER SHALL BE DISABLED, DAMPERS D-1 AND

D-3 SHALL CLOSE, D-2 SHALL OPEN AND D-4 SHALL MODULATE TO MAINTAIN THE

MINIMUM OUTSIDE AIR CFM SETPOINT.

3. AIR FLOW CONTROL

_3.1_ THE SUPPLY AIR FLOW SHALL BE CONTROLLED BY THE DIGITAL CONTROL PANEL.

MODULATING THE SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER TO MAINTAIN THE

TOTAL SUPPLY AIR CFM DURING OCCUPIED MODE. RESET SUPPLY AIR CFM AS EACH 2

POSITION AIR TERMINAL UNIT SWITCHES TO UNOCCUPIED MODE.

_3.2_ THE DIGITAL CONTROL PANEL, USING TOTAL SUPPLY AIR AND RETURN AIR FLOW SIGNALS,

SHALL RESET THE RETURN AIR FAN TO MAINTAIN A CONSTANT FLOW DIFFERENCE

BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR.

_3.3_ USING HIGH PRESSURE SENSOR PSH LOCATED AT THE SUPPLY FAN DISCHARGE, SHALL

PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 3° [75mm] OF STATIC PRESSURE

(FIELD ADJUSTABLE). IF STATIC PRESSURE AT PSH DOES EXCEED 3° [75mm] THE

SUPPLY AIR FAN SHALL STOP. PSH SHALL BE HARDWIRED TO THE SUPPLY FAN AND UNIT

SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. PSH WILL REQUIRE MANUAL

RESET AT THE DEVICE.

_3.4_ USING LOW PRESSURE SENSOR PSL LOCATE AT THE RETURN FAN INLET, SHALL PREVENT

THE RETURN FAN FROM DEVELOPING OVER 3° [75mm] OF NEGATIVE STATIC

PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT PSL DOES EXCEED 3° [75mm]

THE RETURN AIR FAN SHALL STOP. PSL SHALL BE HARDWIRED TO THE RETURN FAN

AND UNIT SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. PSL WILL REQUIRE

MANUAL RESET.

4. HUMIDITY CONTROL

_4.1_ WHEN THE DIGITAL CONTROL PANEL IS NOT CALLING FOR HUMIDITY, SENSED BY RETURN

AIR HUMIDITY MT-1, 2-WAY "ON-OFF" CONTROL VALVE V-3 SHALL REMAIN CLOSED.

WHEN THE DIGITAL CONTROL PANEL IS CALLING FOR HUMIDITY, V-3 SHALL REMAIN OPEN.

_4.2_ RETURN AIR HUMIDITY SHALL BE MAINTAINED AT SETPOINT OF 42°F [5.6°C] DEW POINT

(ACU) VIA DIGITAL CONTROL PANEL BY MODULATING CONTROL VALVE V-4 TO MAINTAIN

THE DESIRED HUMIDITY. THE DRYBULB TRANSMITTER T-4 AND HUMIDITY TRANSMITTER H-1

IN RETURN AIR SHALL BE USED TO CALCULATE RETURN AIR DEWPOINT TEMPERATURE.

V-3 SHALL BE CLOSED WHENEVER THE RETURN AIR DEWPOINT IS > 45°F [7°C]. OCP

SHALL CLOSE VALVE V-3 WHENEVER THE SUPPLY FAN IS OFF. VALVE V-4 SHALL BE

INTERLOCKED WITH A TEMPERATURE SWITCH TO KEEP THE HUMIDIFIER OFF UNTIL

CONDENSATE TEMPERATURE APPROACHES STEAM TEMPERATURE.

5. FREEZE PROTECTION

_5.1_ IF THE AIR TEMPERATURE AS SENSED BY TT-3 FALLS BELOW 45°F [7°C], AN ALARM

SIGNAL SHALL INDICATE AT THE OCP AND ECC. IF THIS TEMPERATURE FALLS BELOW 40°F

[4.4°C], AS SENSED BY THE TSL THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND

A CRITICAL ALARM SHALL INDICATE AT THE DIGITAL CONTROL PANEL AND ECC. TSL SHALL

BE HARDWIRED TO THE SUPPLY AND RETURN FAN AND BOTH SHALL BE SHUTDOWN IN

HAND, AUTO OR BYPASS MODE. TSL WILL REQUIRE MANUAL RESET AT THE DEVICE.

6. LOSS OF COOLING PROTECTION

_6.1_ IF THE AIR TEMPERATURE AS SENSED BY TT-1 RAISES ABOVE 65°F [18°C], AN ALARM

SIGNAL SHALL INDICATE AT THE OCP AND ECC. IF THIS TEMPERATURE RAISES ABOVE 70°F

[21°C], AS SENSED BY TT-1 THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND A

CRITICAL ALARM SHALL INDICATE AT THE DIGITAL CONTROL PANEL AND ECC.

7. AUTOMATIC SMOKE SHUTDOWN/RESTART

_7.1_ WHEN SMOKE IS DETECTED BY DUCT SMOKE DETECTOR, SO, THE SUPPLY AND RETURN

FANS SHALL SHUT OFF AND AN ALARM SIGNAL SHALL BE TRANSMITTED TO THE FIRE

ALARM SYSTEM. ALL SMOKE DAMPERS IN THE SUPPLY AND RETURN DUCTS SHALL CLOSE.

_7.2_ EXHAUST FANS SERVING AREA OF THE SUPPLY FAN SHALL CONTINUE TO RUN. SUPPLY

AND RETURN FANS SHALL RESTART AND SMOKE DAMPERS SHALL OPEN WHEN FIRE ALARM

CIRCUIT IS RESET.

8. EMERGENCY CONSTANT SPEED OPERATION

_8.1_ UPON FAILURE OF THE VSMC, THE SUPPLY AND RETURN FANS SHALL BE

STARTED/STOPPED MANUALLY AT THE DIGITAL CONTROL PANEL OR THE ECC THROUGH

THE BY-PASS STARTER. FANS SHALL THEN BE OPERATED AT CONSTANT SPEED.
GENERAL NOTES:

1. MAINTAIN POSITIVE AIR PRESSURE (0.01 INCH WATER COLUMN [2.5 PASCAL]) BETWEEN THE PE ROOM AND THE ANTEROOM AND THE ANTEROOM AND THE CORRIDOR BY MODULATING VALVE V1. PE ROOMS SHALL HAVE A PERMANENTLY INSTALLED DEVICE AND/OR MECHANISM TO CONSTANTLY MONITOR THE DIFFERENTIAL AIR PRESSURE BETWEEN THE PATIENT ROOM AND THE CORRIDOR. A LOCAL VISUAL MEANS SHALL BE PROVIDED TO INDICATE WHENEVER POSITIVE DIFFERENTIAL PRESSURE IS NOT MAINTAINED. (SYROSE LITE)

2. MAINTAIN THE ATTACHED TOILET, IF ANY, AT NEGATIVE AIR PRESSURE WITH RESPECT TO THE PE ROOM. HOWEVER, THE DESIGN NEED NOT INCLUDE A PRESSURE DIFFERENTIAL SENSOR FOR VERIFICATION.

3. LOCATE THE SUPPLY AIR OUTLET OVER THE PATIENT BED ON THE CEILING WITHOUT CREATING A DRAFT CAUSING PATIENT DISCOMFORT. LOCATE RETURN AIR INLET NEAR THE ROOM DOOR.

TYPICAL AIR BALANCE EXAMPLE:

1. THE PATIENT BEDROOM IS KEPT UNDER POSITIVE PRESSURE BY ENSURING AIR MOVEMENT FROM THE BEDROOM SPACE AND THE ADJOINING CORRIDOR INTO THE ANTE ROOM.

2. THE SUPPLY AIR SYSTEM SHALL CONSIST OF THE CONSTANT VOLUME AIR DELIVERY FROM A DEDICATED AIR TERMINAL UNIT WITH REHEAT COIL TO THE ISOLATION SUITE, AS FOLLOWS:


   B - ANTE ROOM: SUPPLY AIR IS NOT REQUIRED FOR THIS SPACE. EXFILTRATE 100 CFM [47 L/S] OF AIR FROM PATIENT ROOM, THRU ANTE ROOM INTO THE CORRIDOR. EXAMPLE: 100 CFM [28 L/S]

   C - PATIENT TOILET: DO NOT SUPPLY AIR INTO THE TOILET. DRAW MAKE-UP AIR FROM THE PATIENT'S BEDROOM AND EXHAUST AT THE RATE OF 10 ACDFH OR 60 CFM [28 L/S]. EXAMPLE: 60 CFM [28 L/S]

   D - RETURN AIR FROM PATIENT ROOM: 400 CFM [189 L/S] (SUPPLY AIR) – 100 CFM [47 L/S] TO ANTE ROOM + 60 CFM [28 L/S] TO TOILET = 240 CFM [115 L/S] RETURN AIR SETTING OF AFCV V1, IN THE RA DUCT.

AIR SYSTEM FOR PROTECTIVE ENVIRONMENT ROOM (PE) (WITH ANTEROOM)

NOTES:

1. ENSURE FINAL DESIGN REFLECTS PROJECT SPECIFIC REQUIREMENTS AND MEETS ASHRAE 170, LATEST EDITION WITH ALL ADDENDUMS.

DEPARTMENT: VENTILATION

DETAIL TITLE: AIR SYSTEM FOR PROTECTIVE ENVIRONMENT ROOM W/ANTEROOM

SCALE: NONE

DATE ISSUED: MAY 2011

CAD DETAIL NO.: SD230823-17.DWG
GENERAL NOTES:
1. MAINTAIN POSITIVE AIR PRESSURE (0.01 INCH WATER COLUMN [2.5 PASCAL]) BETWEEN THE PE ROOM AND THE SPACES THAT ARE NOT THE PE ROOMS INCLUDING THE CORRIDOR BY MODULATING VALVE V1. PE ROOMS SHALL HAVE A PERMANENTLY INSTALLED DEVICE AND/OR MECHANISM TO CONSTANTLY MONITOR THE DIFFERENTIAL AIR PRESSURE BETWEEN THE PATIENT ROOM AND THE CORRIDOR. A LOCAL VISUAL MEANS SHALL BE PROVIDED TO INDICATE WHENEVER POSITIVE DIFFERENTIAL PRESSURE IS NOT MAINTAINED. (STROBE LIGHT)
2. MAINTAIN THE ATTACHED TOILET, IF ANY, AT NEGATIVE AIR PRESSURE WITH RESPECT TO THE PE ROOM. HOWEVER, THE DESIGN NEED NOT INCLUCDE A PRESSURE DIFFERENTIAL SENSOR FOR VERIFICATION.
3. LOCATE THE SUPPLY AIR OUTLET OVER THE PATIENT BED ON THE CEILING WITHOUT CREATING A DRAFT CAUSING PATIENT DISCOMFORT. LOCATE RETURN AIR INLET NEAR THE ROOM DOOR.

TYPICAL AIR BALANCE EXAMPLE:
1. THE PATIENT BEDROOM IS KEPT UNDER POSITIVE PRESSURE BY ENSURING AIR MOVEMENT FROM THE BEDROOM SPACE AND THE ADJOINING CORRIDOR.
2. THE SUPPLY AIR SYSTEM SHALL CONSIST OF THE CONSTANT VOLUME AIR DELIVERY FROM A DEDICATED AIR TERMINAL UNIT WITH REHEAT COIL TO THE ISOLATION SUITE, AS FOLLOWS:
   A - PATIENT BEDROOM 12 ACHP (MINIMUM - ASHRAE STANDARD 170 2008), INCREASE THE SUPPLY AIR VOLUME IF REQUIRED TO MEET THE INSIDE DESIGN CONDITIONS IN COOLING AND/OR HEATING MODE. EXAMPLE: 400 CFM [190 L/S]
   B - PATIENT TOILET DO NOT SUPPLY AIR INTO THE TOILET. DRAW MAKE-UP AIR FROM THE PATIENT'S BEDROOM AND EXHAUST AT THE RATE OF 10 ACHP OR 60 CFM [28 L/S]. EXAMPLE: 60 CFM [28 L/S]
   C - RETURN AIR FROM PATIENT ROOM 400 CFM [189 L/S] (SUPPLY AIR) – 100 CFM [47 L/S] TO CORRIDOR + 60 CFM [28 L/S] TO TOILET) = 240 CFM [115 L/S] SETTING OF ACDV V1, IN THE RA DUCT.

AIR SYSTEM FOR PROTECTIVE ENVIRONMENT ROOM (PE) (WITHOUT ANTEROOM)

DESIGNER'S NOTE:
1. ENSURE FINAL DESIGN REFLECTS PROJECT SPECIFIC REQUIREMENTS AND MEETS ASHRAE 170, LATEST EDITION WITH ALL ADDENDUMS.
1. Anteroom shall be maintained at a negative pressure (0.01 inch water column [2.5 Pascal]) with respect to both ALL/PE room and the corridor or any adjoining space by modulating valve V2. Valve V1 is used to maintain a positive pressure between the patient room and the anteroom. Conduit rooms shall have permanently installed devices and/or mechanisms to constantly monitor the differential air pressure between the patient room and anteroom and the corridor and the anteroom. A local visual means shall be provided to indicate whenever positive differential pressure is not maintained in the patient room with respect to the anteroom (strobe light). A local visual means shall be provided to indicate whenever negative differential pressure is not maintained in the anteroom with respect to the corridor (strobe light).

2. Maintain the attached toilet, if any, at negative air pressure with respect to the ALL/PE room. However, the design need not include a pressure differential sensor for verification.

3. Locate the supply air outlet over the patient bed on the ceiling without creating a draft causing patient discomfort. Locate exhaust air inlet near the patient room door.

Typical air balance example:

1. The patient bedroom is kept under positive pressure by ensuring air movement from the bedroom space to the anteroom by modulating valve V1. The anteroom is kept at negative pressure with respect to the corridor by modulating valve V2.

2. The supply air system shall consist of the constant volume air delivery from a dedicated air terminal unit with reheat coil to the isolation suite as follows:

   A - Patient bedroom minimum 12 ACH supply air (ASHRAE standard 170 2008).
   Increase supply air volume, if required, to meet the inside design conditions in cooling and/or heating modes. Example: 400 CFM [190 L/s].

   B - Anteroom supply air is not required for this space. Ex-filtrate patient room air and corridor air to exhaust minimum 10 ACH supply air (ASHRAE standard 170) as measured and controlled by valve V-2. For this example, infiltrate 100 CFM [47 L/s] from corridor into the anteroom to maintain pressure. This will ensure the anteroom is negative with respect to the ALL/PE room and with respect to the corridor.

   C - Patient toilet do not supply air into the toilet. Draw make-up air from the patient’s bedroom and exhaust at the rate of 10 ACH or 60 CFM [28 L/s]. Example: 60 CFM [28 L/s].

3. The dedicated exhaust air system shall be balanced as follows:


4. Coordinate doors under cuts for door between anteroom and patient (1 1/2 [3.8 cm]) door to corridor.

AIR SYSTEM FOR COMBINATION AIRBORNE INFECTION ISOLATION (AI)/PROTECTIVE ENVIRONMENT (PE) ROOM WITH NEGATIVE ANTEROOM

DESIGNER’S NOTE:
1. Ensure final design reflects project specific requirements and meets ASHRAE 170, latest edition with all addendums.
LEGEND

V1  AIR FLOW CONTROL VALVE PRESSURE INDEPENDENT TYPE

GENERAL NOTES:

1. ANTEROOM SHALL BE MAINTAINED AT A POSITIVE PRESSURE (0.01 INCH WATER COLUMN [2.5
PASCAL]) WITH RESPECT TO BOTH ANTI/PE ROOM AND THE CORRIDOR OR ANY ADJOINING
SPACE BY MODULATING VALVE V1. COMBO ROOMS SHALL HAVE PERMANENTLY INSTALLED DEVICES
AND/OR MECHANISMS TO CONSTANTLY MONITOR THE DIFFERENTIAL AIR PRESSURE BETWEEN THE
PATIENT ROOM AND ANTE ROOM AND THE CORRIDOR AND ANTE ROOM. A LOCAL VISUAL MEANS
SHALL BE PROVIDED TO INDICATE WHENEVER POSITIVE DIFFERENTIAL PRESSURE IS NOT
MAINTAINED WITH RESPECT TO ANTE ROOM AND EITHER THE ANTI/PE ROOM OR THE CORRIDOR.
(STORLITE)

2. MAINTAIN THE ATTACHED TOILET, IF ANY, AT NEGATIVE AIR PRESSURE WITH RESPECT TO THE PE
ROOM. HOWEVER, THE DESIGN NEED NOT INCLUDE A PRESSURE DIFFERENTIAL SENSOR FOR
VERIFICATION.

3. LOCATE THE SUPPLY AIR OUTLET OVER THE PATIENT BED ON THE CEILING WITHOUT CREATING A
DRAFT CAUSING PATIENT DISCOMFORT. LOCATE EXHAUST AIR INLET NEAR THE PATIENT ROOM
DOOR.

TYPICAL AIR BALANCE EXAMPLE:

1. THE PATIENT BEDROOM IS KEPT UNDER POSITIVE PRESSURE WITH RESPECT TO THE ADJOINING
CORRIDOR BY MODULATING VALVE V1.

2. THE SUPPLY AIR SYSTEM SHALL CONSIST OF THE CONSTANT VOLUME AIR DELIVERY FROM A
DEDICATED AIR TERMINAL UNIT WITH REHEAT COIL TO THE ISOLATION SUITE AS FOLLOWS:

   A - PATIENT BEDROOM  MINIMUM 12 ACPH SUPPLY AIR (ASHRAE STANDARD 170 2008).
       INCREASE SUPPLY AIR VOLUME, IF REQUIRED, TO MEET THE INSIDE
       DESIGN CONDITIONS IN COOLING AND/OR HEATING MODES.
       EXAMPLE: 400 CFM [190 L/S]

   B - ANTE ROOM  MINIMUM 10 ACPH (ASHRAE STANDARD 170 2008) TO BE
       EX-FILTRATED TO THE CORRIDOR AND INTO ANTI/PE ROOM AS
       FOLLOWS: SUPPLY ANTE ROOM AT THE RATE OF 140 CFM [66
       100 CFM [47 L/S] EX-FILTRATED INTO THE CORRIDOR.
       EXAMPLE: 140 CFM [66 L/S] TOTAL SUPPLY AIR

   C - PATIENT TOILET  DO NOT SUPPLY AIR INTO THE TOILET. DRAW MAKE-UP AIR FROM
       THE PATIENT'S BEDROOM AND EXHAUST AT THE RATE OF 10 ACPH
       OR 50 CFM [28 L/S]. EXAMPLE: 60 CFM [28 L/S]

3. THE DEDICATED EXHAUST AIR SYSTEM SHALL BE BALANCED AS FOLLOWS:

   A - PATIENT BEDROOM  400 CFM [190 L/S] (SUPPLY) - 60 CFM [28 L/S] (TOILET) +
       100 CFM [47 L/S] INEX-FILTRATED FROM ANTE ROOM (ANTE ROOM)
       380 CFM [180 L/S] EXHAUSTED FROM ANTI/PE ROOM. 100 CFM
       [47 L/S] IS EX-FILTRATED TO CORRIDOR FROM ANTE ROOM. TOTAL
       EXHAUST 440 CFM [210 L/S]

4. COORDINATE DOORS UNDER CUTS FOR DOOR BETWEEN ANTE ROOM AND PATIENT (1") [2.54
   CM], DOOR TO CORRIDOR.

AIR SYSTEM FOR COMBINATION AIRBORNE
INFECTION ISOLATION (AIJ)/PROTECTIVE
ENVIRONMENT (PE) ROOM WITH POSITIVE ANTEROOM

NTS

DESIGNER'S NOTE:

1. ENSURE FINAL DESIGN REFLECTS PROJECT SPECIFIC REQUIREMENTS AND MEETS ASHRAE 170,
   LATEST EDITION WITH ALL ADDENDUMS.

SCALE: NONE

DATE ISSUED: MAY 2011

CAD DETAIL NO: SD230923-20.DWG
NOTE: THIS DETAIL SHOWS BASIC REQUIREMENTS ONLY AND IS NOT INTENDED FOR USE ON PROJECT DRAWINGS. THE PROJECT ENGINEER MUST PROVIDE A COMPLETE DESIGN WHICH CONFORMS TO PROJECT REQUIREMENTS.

UNDERGROUND FUEL OIL STORAGE TANK

- **Access Cover**: Sealed Water Tight
- **Grade**: 3" [76mm] Maximum
- **SOIL Separator**: 22" [559mm] Dia. Manway (Typical)
- **Hanger**: Wear Plate 1/4" [6mm] Thick, 12" [304mm] SQ Steel (Typ.)
- **Leak Detector Sensor**: For Double Wall Tank
- **Ladder or Aluminum 2 1/2" [64mm] Wide Stringers 3/4" [19mm] Dia. Rungs Anchor at Bottom Guide at Top
- **Bedding Material**: Reinforced Concrete Ballast Pad Design for Buoyancy of Empty Tank with Credit for Backfill
- **ENCLOSURE**: Sealed Water Tight (Typ.)
- **LEAK DETECTOR Sensor**: For Double Wall Tank
- **COMPRESSED FOAM BOARD**: Secondary Containment
- **SECONDARY CONTAINMENT**: Typical Pipe Hold-Down Straps
- **TURN BUCKLE**: LEAK DETECTOR SENSOR FOR DOUBLE WALL TANK
- **END ELEVATION**: 6" [150mm] 12" [300mm]
76mm [3"] IS MINIMUM DISTANCE FROM BODY TO CENTERLINE OF HANDLE.

OPEN DRAIN (NOTE 3)

CONNECTION TO PRESSURE VESSEL OR PIPE

25mm [1"] VENT PIPE THROUGH ROOF SUPPORT AS INDICATED ON DWGS. (NOTES 1, 2)

PIPE THREADED INTO ELBOW (SAME SIZE AS ELBOW)

DRIP PAN ELBOW (SECTIONAL VIEW)

610mm [24" MAX] FLEXIBLE CONNECTOR

20mm [3/4"] DRAIN TO FLOOR DRAIN OR OPEN SIGHT DRAIN (NOTE 4)

NOTES:
1. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, SIZE THE VENT PIPE SO THAT STEAM IS NOT BLOWN OUT AT THE VENT PIPE ENTRANCE. UTILIZE THE CALCULATION METHOD CONTAINED IN ANSI B31.1, POWER PIPING CODE, APPENDIX II.

2. VENT PIPE SHALL TERMINATE 1829mm [6"] MIN. ABOVE FINISHED ROOF.

3. DISCHARGE OF DRAIN SHALL BE DIRECTED AWAY FROM PLATFORMS OR OTHER AREAS WHICH PERSONNEL MAY OCCUPY.

4. NO OTHER DRAIN SHALL BE CONNECTED TO THE DRIP PAN ELBOW DRAIN PIPE.
BOILER FEEDWATER PUMPS FLOW DIAGRAM

- From feedwater generator to feedwater generator with bypass to condensate storage tank.
- Boiler feedwater pump No. 1 (typical).
- Boiler feedwater pump No. 2.
- Boiler feedwater pump No. 3.
- Emergency boiler connection to outside of building.
- To boilers and economizers.

750mm Vac-2614kPa [30" Vac-30PSI]

D-150°C [300-300°F]

D-200kPa [0-300PSI]

NOTE:
Capacity of each pump approx.
125% of one boiler.

Designer's Note:
See 503251110-04 basic flow diagram - condensate and boiler feedwater for complete system.

Plug
Coupling
To tank
Union
Coupling
Orifice
Pump discharge

Detail: Pump recirculation orifice assembly.

(CAD detail no. 50325111-01/17)

Date Issued: 10/01/2017

NTS
THE RELIEF VALVE IS HOT WATER UNDER PRESSURE AND SHOULD BE VENTED DOWN TO THE FLOOR TWO INCHES ABOVE FLOOR DRAIN OR IN A TRENCH DRAIN IS PREFERRED. USE A SAFETY VALVE ON A HOT WATER HEATER.

FROM FEEDWATER PUMPS

VENT INTO BOILER ROOM

SRV-1

STACK

PROVIDE TEMPERATURE TRANSMITTERS HERE

ECONOMIZER (TYPICAL)

BOILER (TYPICAL)

FROM CHEMICAL FEEDER

2ND BO LINE REQUIRED IF BOILER HAS TWO BO CONNECTIONS

TO BO TANK OR IF SPECIFIED TO BLOWDOWN HEAT RECOVERY

TO SAMPLE COOLER

BOILER WATER LEVEL CONTROL SYSTEM

(SEE SPECS FOR TYPE OF SYSTEM)
EXPANDED RETURN MAIN

PERFORATED TUBE 1"x1/8" [25x6mm] THICK GUIDE FINS WELDED TO PERFORATED TUBE

SECTION A-A

INCREASER

RETURN MAIN

FLOW

SECTION EXPANDED RETURN MAIN

A
SIZE, TRAP DISCHARGE LINE
15mm [1/2"] 20mm [3/4"]

B
SIZE, 45° WELDING NIPPLE
25mm [1"] 32mm [1-1/4”]

C
LENGTH OF EXPANDED MAIN AHEAD OF TRAP DISCHARGE PIPE
175mm [7”] 175mm [7”]

D
LENGTH OF PERFORATED PIPE
415mm [16-1/2”] 415mm [16-1/2”]

E
LENGTH OF EXPANDED MAIN FOLLOWING PERFORATED PIPE
50mm [2"] 50mm [2”]

RETURN MAIN SIZE

UP TO 40mm [1-1/2”] 50mm [2”] 75mm [3”] & OVER

EXPANDED RETURN MAIN SIZE

65mm [2-1/2”] SAME SIZE

NOTES:
1. 15mm [1/2”] PERFORATED TUBE SHALL HAVE 40 – 16mm [1/8”] DIAMETER HOLES SPACED 40mm [1-1/2”] O.C. IN 4 ROWS.

2. 20mm [3/4”] PERFORATED TUBE SHALL HAVE 78 – 6mm [1/8”] DIAMETER HOLES SPACED 40mm [1-1/2”] O.C. IN 6 ROWS.

3. HOLES IN TUBE SHALL BE SPACED EQUALLY AROUND PERIMETER.

DESIGNER’S NOTE:
THIS DETAIL SHALL ONLY BE USED FOR LIMITED SITUATIONS WHERE THE DESIGNER CONDUCTS A FULL ANALYSIS OF THE SYSTEM AND ITS IMPACTS, TO ENSURE THAT CONDENSATE DOES NOT FLASH AND CREATE A WATER HAMMER. REFERENCE THE STEAM DESIGN MANUAL VOLUME 3.

HIGH PRESSURE STEAM TRAP DISCHARGE INTO PUMPED CONDENSATE RETURN LINE

nts

DEPARTMENT OF VETERANS AFFAIRS

DETAIL TITLE: HIGH PRESSURE STEAM TRAP DISCHARGE INTO PUMPED CONDENSATE RETURN LINE

SCALE : NONE

DATE ISSUED: 11/01/2017 CAD DETAIL NO.: SD232111-09.DWG
NOTE:
MAINTAIN UPSTREAM AND DOWNSTREAM DISTANCES RECOMMENDED BY METER MANUFACTURERS.

DESIGNER'S NOTE:
MODIFY DETAIL AS REQUIRED TO BE PROJECT SPECIFIC FOR THE TYPE OF METER BEING USED.

WATER FLOW MEASURING STATION
(WITH BTU METER)

NTS
NOTE:
PROVIDE THE APPROPRIATE WELL DEPTH TO HAVE THE NECESSARY INSULATION STAND-OFF DISTANCE.

INSTALLATION OF THERMOMETER WELLS

HORIZONTAL

VERTICAL

DETAIL TITLE: INSTALLATION OF THERMOMETER WELLS

SCALE: NONE

DATE ISSUED: 11/01/2017  CADD DETAIL NO.: SD232113-02.DWG
TUBING, PIPING, AND CONDUITS PASSING THROUGH PRE-FAB INSULATED WALL PANELS

DETAIL TITLE: TUBING, PIPING, AND CONDUITS PASSING THROUGH PRE-FAB INSULATED WALL PANELS

SCALE : NONE

DATE ISSUED : 11/01/2017 CADD DETAIL NO. : SD232113-03.DWG

Department of Veterans Affairs
NOTES:
1. SEE EXPANSION TANK SYSTEM SCHEDULE FOR COMPONENT SIZES.
2. RELIEF VALVE FOR CHILLED WATER SYSTEM IS SHOWN, OMIT WHEN RELIEF VALVE IS SHOWN ON HEAT EXCHANGER DETAIL. TANK SYSTEM IS USED ONLY FOR HOT WATER HEATING.
3. PROVIDE STRAINER IN AIR SEPARATOR WHEN INDICATED IN EXPANSION TANK SCHEDULE.
4. FOR HOT WATER SYSTEMS 50mm [2"] AND SMALLER AND CHILLED WATER SYSTEMS USE IN-LINE AIR PUSHER IN LIEU OF AIR SEPARATOR.
5. SET PRESSURE REDUCING VALVE SO PRESSURE AT HIGHEST POINT IN SYSTEM HAS A MINIMUM OF 28kPa [4 PSI].

DESIGNER'S NOTE:
VALUES SHALL BE INDICATED ON EITHER SIDE OF AIR SEPARATOR AS REQUIRED BY CLOSENESS OF VALUES SERVING ADJACENT EQUIPMENT. WHERE CHARGING OF TANK IS PROPOSED PROVIDE NECESSARY TAPINGS. PROVIDE AND SHOW A LOW WATER ALARM ON CHILLED SYSTEMS TO INDICATE NO WATER IN TANK.

HORIZONTAL EXPANSION TANK – PIPING CONNECTIONS
NOTES:
1. SEE EXPANSION TANK SYSTEM SCHEDULE FOR COMPONENT SIZES.
2. FOR HOT WATER SYSTEMS 50mm [2"] AND SMALLER AND CHILLED WATER SYSTEMS USE IN-LINE AIR PURGER IN LIEU OF AIR SEPARATOR.
3. SET PRESSURE REDUCING VALVE SO PRESSURE AT HIGHEST POINT IN SYSTEM HAS A MINIMUM OF 28kPa [4 PSIG].
4. PROVIDE STRAINER IN AIR SEPARATOR IF INDICATED IN EXPANSION TANK SCHEDULE.
5. RELIEF VALVE FOR CHILLED WATER SYSTEM IS SHOWN. OMIT WHEN RELIEF VALVE IS SHOWN ON HEAT EXCHANGER DETAIL AND SYSTEM IS USED ONLY FOR HOT WATER HEATING.

DESIGNER'S NOTE:
GATE VALVES SHALL BE INDICATED ON EITHER SIDE OF AIR SEPARATOR AS REQUIRED BY CLOSENESS OF VALVES SERVING ADJACENT EQUIPMENT. WHERE CHARGING OF TANK IS PROPOSED PROVIDE NECESSARY TAPINGS. PROVIDE AND SHOW A LOW WATER ALARM ON CHARGED SYSTEMS TO INDICATE NO WATER IN TANK.
NOTES:
1. PROVIDE LOW WATER LEVEL ALARM. PROVIDE A LOW WATER LEVEL AT ECC. RELIEF VALVE DRAIN SHALL RETURN TO TANK AS SHOWN ON THIS DETAIL.

2. SET REGULATING VALVE TO MAINTAIN MAKE-UP PRESSURE AT 15 PSIG [103 kPa] ABOVE HIGHEST SYSTEM PRV SETTING.

3. MAKE-UP PIPING SYSTEM DOES NOT REQUIRE INSULATION.

4. OPERATE PUMP MANUALLY AS REQUIRED TO FILL.

INDIRECT GLYCOL MAKE-UP SYSTEM
(PIPING AND CONTROLS)

DESIGNER’S NOTE:
PLUMBING DRAWINGS SHOULD INCLUDE DOMESTIC COLD-WATER HOSE BIB NEAR THE GLYCOL-WATER MAKE-UP SYSTEM. FOR SMALL SYSTEMS (50 GAL [200 L] OR LESS) A POT FEEDER, AT THE HIGH POINT IN THE PIPING, MAY BE USED FOR MAKE-UP IN LIEU OF THE PUMPED MAKE-UP.

DATE ISSUED: MARCH 2010
CADD DETAIL NO.: SD232113-06.DWG
TYPICAL CHILLED AND HOT WATER PIPING DRAIN VALVE CONNECTIONS

NOTES:
1. DRAIN ALL LOW POINTS AS INDICATED ABOVE.
2. WHERE SCALE POCKETS ARE SHOWN ON PIPE RISER DIAGRAMS AND/OR PLANS LOCATE DRAIN AT BOTTOM OF SCALE POCKET.

DESIGNER'S NOTE:
SHOW SCALE POCKETS ON MAJOR CIRCULATING WATER PIPING RISER DIAGRAMS AND/OR PLANS.

TYPICAL MANUAL AIR VENT

NOTES:
1. VENT ALL HIGH POINTS INDICATED ABOVE.
2. IF AUTOMATIC AIR VENTS ARE USED, PIPE DISCHARGE TO DRAIN.

DRAIN VALVE AND AIR VENT CONNECTIONS (HYDRONIC SYSTEMS)
DRAIN LINE SHALL BE AT LEAST THE SAME SIZE AS THE NIPPLE ON THE DRAIN PAN.

PIPING SHALL BE RIGID COPPER TYPE L OR TYPE M UNLESS NOTE BELOW IS MET.

PITCH DOWN TOWARD DRAIN

CLEAN OUT

FLOOR SINK

NOTE:
1. CPVC PIPE MAY BE USED ONLY IF APPROVED BY LOCAL VA AND IS INDOORS AND DOES NOT PASS THROUGH RATED BARRIERS.
2. DIELECTRIC FITTING TO BE USED WHEN TWO DISSIMILAR METALS ARE TO BE CONNECTED.

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<thead>
<tr>
<th>UNIT TYPE</th>
<th>A</th>
<th>B</th>
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<tr>
<td>DRAW THRU</td>
<td>2” [50mm] PLUS X</td>
<td>X</td>
</tr>
<tr>
<td>BLOW THRU</td>
<td>1” [25mm] MINIMUM</td>
<td>2X</td>
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WHERE X = STATIC PRESSURE IN PAN

AIR HANDLING UNIT DRAIN TRAP DETAIL

NTS
LONG RADIUS ELBOW (TYPICAL)

PIECE ALIGNMENT GUIDES (TYPICAL)

W + 25 FT. [7.6m]
APPROXIMATE MINIMUM

PLAN

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<tr>
<th>EXPANSION LOOP DETAIL</th>
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<tr>
<td>LOOP NO.</td>
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W: Approximate minimum
H: Approximate minimum

Department of Veterans Affairs

DETAIL TITLE / EXPANSION LOOP DETAIL

SCALE: NONE

DATE ISSUED: DECEMBER 2008
CADD DETAIL NO.: SD232113-09.DWG
SEQUENCE OF OPERATION:
1. STEAM CONTROL VALVE SHALL MODULATE TO MAINTAIN THE LEAVING HOT WATER TEMPERATURE AT SET POINT.

2. THE LEAVING HOT WATER TEMPERATURE SHALL BE RESET INVERSELY WITH THE OUTDOOR TEMPERATURE AS SCHEDULED.

3. THE LEAD AND LAG PUMPS AND HEAT EXCHANGERS SHALL BE SEQUENTIAL BY THE OPERATOR CONTROLS AT THE PRE-DETERMINED INTERVAL (USUALLY 7 DAYS). IN THE EVENT THE PUMP FAILS TO START WITHIN 30 SECONDS, AN ALARM SHALL BE INITIATED AND THE SECOND PUMP SHALL START AUTOMATICALLY.

VALVE SEQUENCE:
1. SUGGESTED VALVE SEQUENCE. DELETE THIS SEQUENCE FROM THIS DETAIL IF SEQUENCE IS SHOWN ON CONTROLS DRAWINGS OR SPECS.

2. V-1 (1/3) MODulates TO MAINTAIN HW TEMPERATURE AT SETPOINT. WHEN V-1 HAS REACHED FULLY OPEN POSITIONS, V-2 (2/3) STARTS TO MODULATE OPEN.

3. IF HX-2, V-3 AND V-4 ARE NOT REDUNDANT BACKUP, THEN THE STAGING ABOVE CONTINUES AS FOLLOWS: PROVIDE, ADDITIONAL MOTORIZED ISOLATION VALVES AT THE THE HWS AND HWR FOR EACH HX’S. WHEN V-2 HAS REACHED FULLY OPEN POSITION, THE ISOLATION VALVES AT HX-2 HWS HWS AND HWR LINES FULLY OPEN, AFTER WHICH V-3 (1/3) STARTS TO MODULATE OPEN. WHEN V-3 HAS REACHED FULLY OPEN POSITION. V-4 (2/3) STARTS TO MODULATE OPEN.

## DUAL HEAT EXCHANGER CONTROLS (HEATING SYSTEM)
SEE SCHEDULES FOR RELIEF VALVE SETTING

RUN DRAIN LINE FROM RELIEF VALVE TO NEAREST FLOOR DRAIN. (TYP.)

DDC TEMPERATURE SENSORS (TYP.)

THMOMETER (TYP.)

IF THE SECOND HEAT EXCHANGER IS NOT A REDUNDANT 100% BACK UP UNIT, THEN PROVIDE A MOTORIZED ISOLATION VALVE HERE.

TEST PLUG (TYP.)

IF THE SECOND HEAT EXCHANGER IS NOT A REDUNDANT 100% BACK UP UNIT, THEN PROVIDE A MOTORIZED ISOLATION VALVE HERE.

NOTES:
1. THE ABOVE DETAIL SHOWS REQUIRED PIPING FOR TWO HEAT EXCHANGERS IN PARALLEL. INDICATE IF 100% REDUNDANT OR NOT.
2. PROVIDE SADDLE SUPPORTS AND LEGS OR HANGERS FOR HEAT EXCHANGER. MOUNTING HEIGHT SHALL BE ADJUSTED TO FACILITATE GRAVITY RETURN OF STEAM CONDENSATE.
3. MAKE THE BYPASS THE SAME SIZE AS THE CONNECTIONS TO THE CONTROL VALVES.
4. CONTROL VALVES SHALL BE IN A ½ AND ¾ SIZE ARRANGEMENT.
TERMINAL UNIT WATER COILS - PIPING CONNECTIONS

DESIGNER’S NOTE:

1. THIS DETAIL IS APPLICABLE TO: 2-PIPE FAN COIL UNITS (CHILLED OR HOT WATER)
   ○ VAV/CV AIR TERMINAL UNITS (REHEAT COIL)
   ○ DUCT-MOUNTED REHEAT COIL
   ○ CABINET UNIT HEATERS
NOTE:

1. PROVIDE IN CHILLED WATER MAIN AND IN CONDENSER WATER MAIN.

2. LOCATE PILOT TUBE TAPS 20 PIPE DIAMETERS DOWNSTREAM AND 10 PIPE DIAMETERS UPSTREAM FROM THE NEAREST PIPE FITTING.
   
   EITHER TOP OR SIDE LOCATION. BOTH ARE NOT REQUIRED AT SAME LOCATION.

PITOT TEST CONNECTIONS

DESIGNER’S NOTE:

SHOW LOCATION OF PILOT TEST CONNECTIONS ON FLOOR PLANS FOR CONDENSER WATER PIPING TO COOLING TOWER. THIS IS REQUIRED FOR FLOW MEASUREMENT BY ASME COOLING TOWERS TEST CODE.
MOBILE INDIRECT GLYCOl MAKE-UP SYSTEM
(PIPING AND CONTROLS)

NOTES:
1. PROVIDE LOW WATER LEVEL ALARM. PROVIDE A LOW WATER LEVEL AT ECC. RELIEF VALVE
   DRAIN SHALL RETURN TO A 55 GALLON DRUM.
2. SET REGULATING VALVE TO MAINTAIN MAKE-UP PRESSURE AT 15 PSIG [103 kPa] ABOVE
   HIGHEST SYSTEM PRV SETTING.
3. MAKE-UP PIPING SYSTEM DOES NOT REQUIRE INSULATION.
4. OPERATE PUMP MANUALLY AS REQUIRED TO FILL.

DESIGNER'S NOTE:
PLUMBING DRAWINGS SHOULD INCLUDE DOMESTIC COLD-WATER HOSE BIB NEAR THE GLYCOL-
WATER MAKE-UP SYSTEM. FOR SMALL SYSTEMS (50 GAL [200 L] OR LESS) A POT FEEDER,
AT THE HIGH POINT IN THE PIPE, MAY BE USED FOR MAKE-UP IN LIEU OF THE PUMPED
MAKE-UP.
PIPE HANGERS - PROVIDE DOUBLE DEFLECTION NEOPRENE (TYPE HN) FOR FIRST TWO ON EACH SIDE OF PUMP (SEE NOTE NO. 1)

NOTES:
1. SUPPORT PUMP FROM PIPING ONLY. DO NOT SUPPORT PUMP FROM MOTOR.

DESIGNER'S NOTE:
1. CHECK VALVE IS OPTIONAL FOR SINGLE PUMP, EXCEPT FOR COOLING TOWER PUMP.
2. ELIMINATE BALANCING DEVICE WHEN PUMP CONTROLLED BY VARIABLE SPEED DRIVE.
FIRST 3 HANGERS FOR EACH PIPE AND BRANCH SHALL BE SPRING & NEOPRENE TYPE. TYPE "H" FOR 4" [100mm] DIA. PIPE & SMALLER. TYPE "H-P" FOR 5" [125mm] DIA. PIPE & LARGER.

NOTES:
SEE SPECIFICATION SECTION "PUMPS" FOR Y STRAINER OPTION

RIGID PIPE HANGER

INSTALL HANGER AS CLOSE TO PIPE ELBOW AS POSSIBLE (TYPICAL)

CHECK VALVE

1/2" [15mm]

FLEXIBLE CONNECTOR (TYPICAL)

PUMP

FLOOR

VIBRATION ISOLATOR (TYPICAL)

CONCRETE INERTIA BASE

DRAIN

1" [25mm] MIN. DIA. PIPE STAND

NOTES: CHECK VALVE IS OPTIONAL FOR SINGLE PUMP, EXCEPT FOR COOLING TOWER PUMP.
FIRST 3 HANGERS FOR EACH PIPE AND BRANCH SHALL BE SPRING & NEOPRENE TYPE. TYPE "H" FOR 4" [100mm] DIA. PIPE & SMALLER. TYPE "H-P" FOR 5" [125mm] DIA. PIPE & LARGER.

RIGID PIPE HANGER

INSTALL HANGER AS CLOSE TO PIPE ELBOW AS POSSIBLE (TYPICAL)

1/2" [15mm] MECHANICAL COUPLING (6" MIN.[150 MM] SPACING) (TYPICAL)

PUMP

FLOOR

NOTES:
SEE SPECIFICATION SECTION "PUMPS" FOR Y STRAINER OPTION

SINGLE SUCTION FLOOR-MOUNTED PUMPS - CONNECTIONS WITH MECHANICAL COUPLINGS

DESIGNER'S NOTE:
1. CHECK VALVE IS OPTIONAL FOR SINGLE PUMP, EXCEPT FOR COOLING TOWER PUMP. USE THIS DETAIL ONLY FOR PUMPS IN A MECHANICAL BUILDING WHERE POSSIBLE VIBRATION WILL NOT BE OBJECTABLE AND WHERE APPROVED BY VA.

2. COUPLINGS SHALL NOT BE USED ON HOT WATER SYSTEMS.