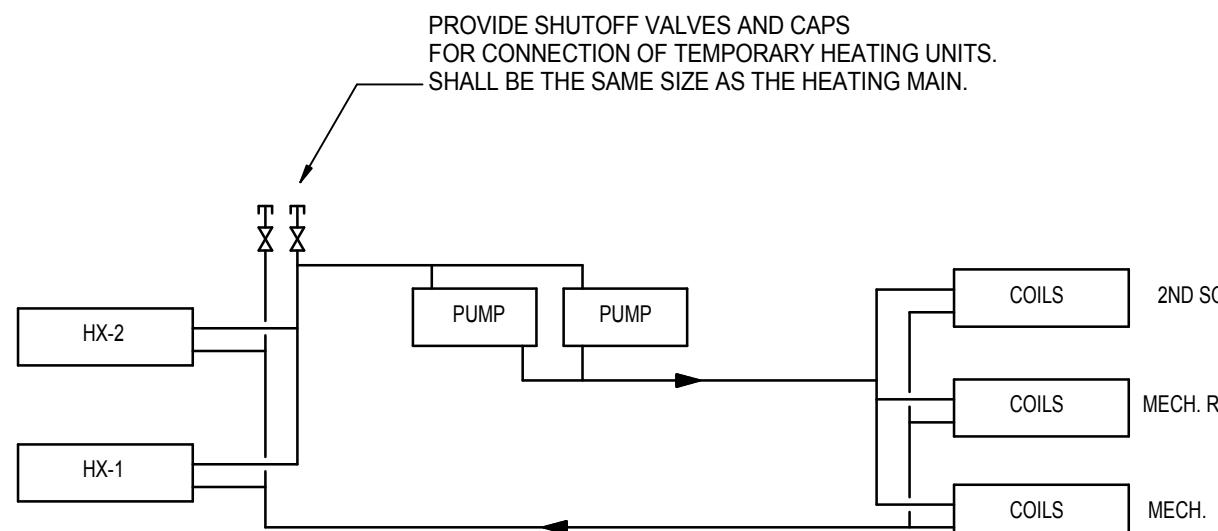
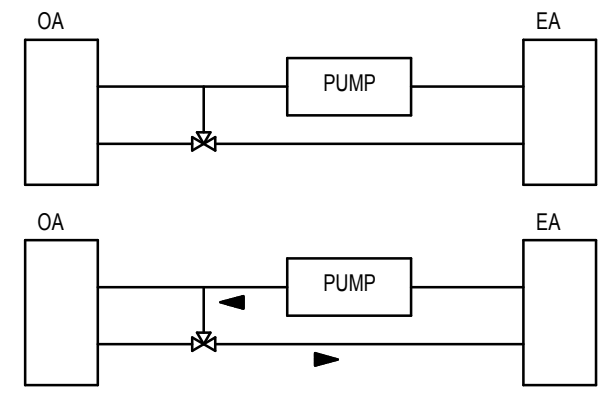


B1 COOLING FLOW PIPING DIAGRAM

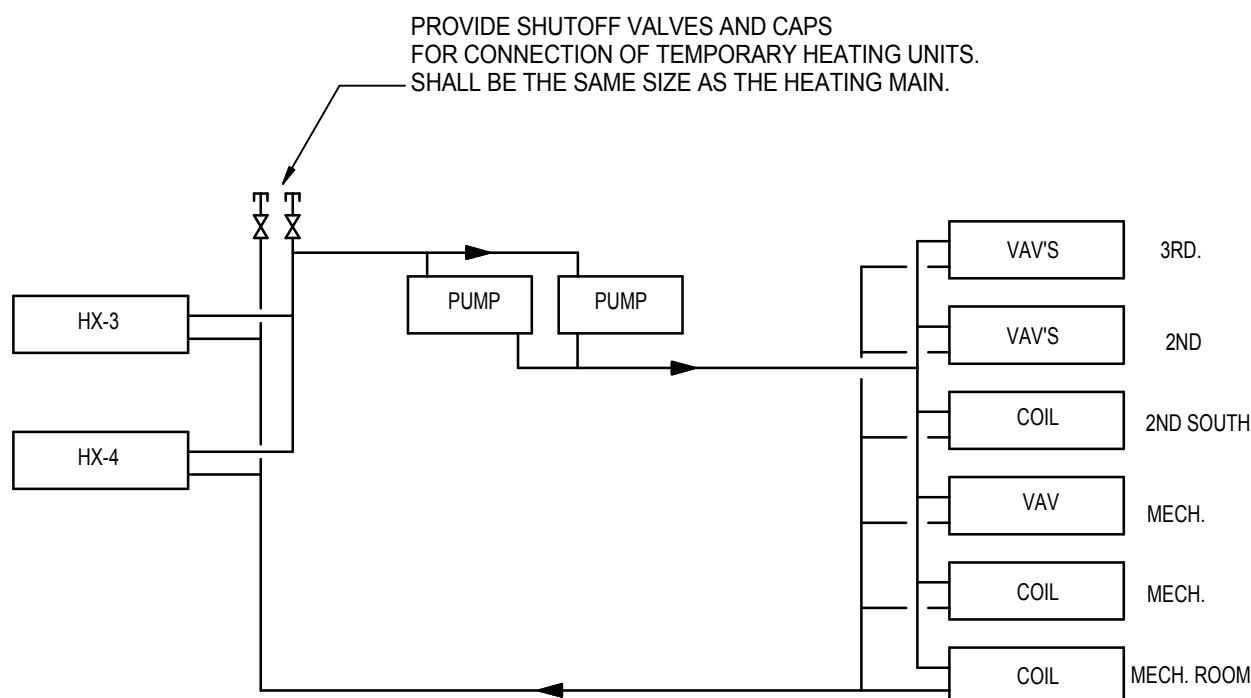


C1 PREHEAT FLOW PIPING DIAGRAM

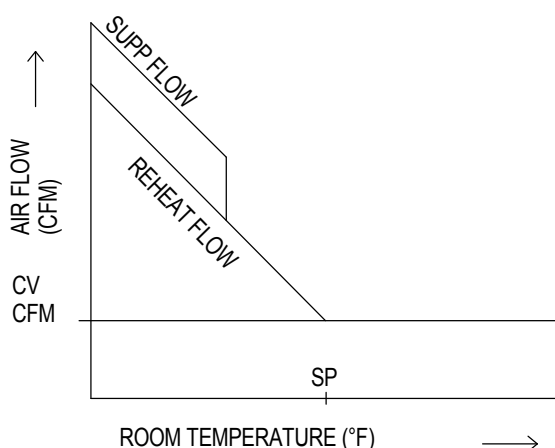
SEE DETAILS ON SHEETS 5-MH502, 5-MH503, 5-MH504 AND 5-PL501 FOR ALL REQUIRED VALVES, CONTROLS, ETC.



B3 ENERGY RECOVERY-SEE 1F/MH502



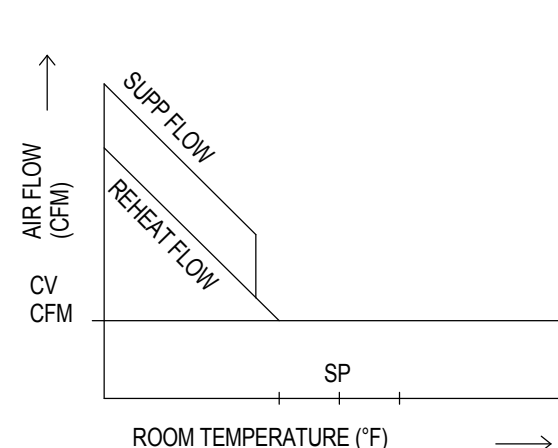
C3 HEATING FLOW PIPING DIAGRAM



A. UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT  $\pm 5^\circ$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

B. VALVE V-2 SHALL BE ENABLED WHEN OUTSIDE AIR FALLS BELOW  $40^\circ\text{F}$  (ADJ) AND VALVE V-1 HAS BEEN MODULATED OPEN ABOVE 30% (ADJ) V-2 SHALL THEN BE MODULATED TO MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

C. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.

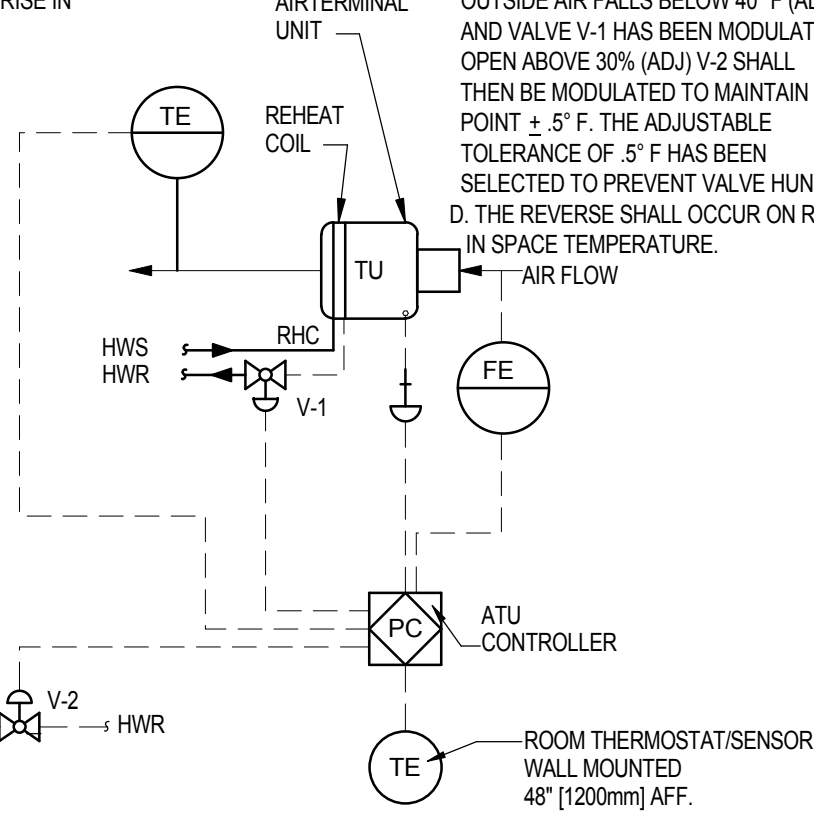


A. SET POINTS SHALL BE SET AS FOLLOWS: COOLING  $75^\circ\text{F}$  (ADJ) HEATING  $70^\circ\text{F}$  (ADJ) DEADBAND OF  $5^\circ\text{F}$  BETWEEN HEATING AND COOLING SET POINT WILL BE MAINTAINED.

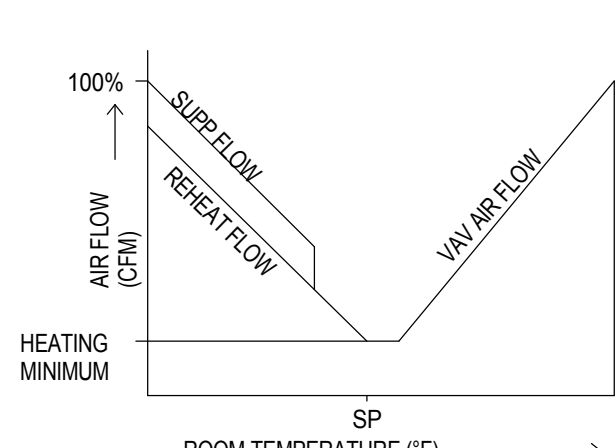
B. UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT  $\pm 5^\circ$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

C. VALVE V-2 SHALL BE ENABLED WHEN OUTSIDE AIR FALLS BELOW  $40^\circ\text{F}$  (ADJ) AND VALVE V-1 HAS BEEN MODULATED OPEN ABOVE 30% (ADJ) V-2 SHALL THEN BE MODULATED TO MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

D. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.



C5 CONSTANT VOLUME AIR TERMINAL UNIT CONTROL DIAGRAM



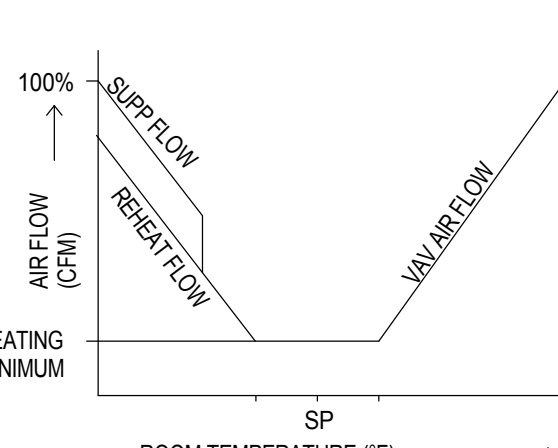
A. UPON FALL IN SPACE TEMPERATURE THE VAV DAMPER WILL MODULATE TO MINIMUM POSITION.

B. UPON FURTHER DROP IN SPACE TEMPERATURE VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

C. VALVE V-2 SHALL BE ENABLED WHEN OUTSIDE AIR FALLS BELOW  $40^\circ\text{F}$  (ADJ) AND VALVE V-1 HAS BEEN MODULATED OPEN ABOVE 30% (ADJ) VALVE V-2 SHALL MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

D. VALVE V-2 SHALL BE ENABLED WHEN OUTSIDE AIR FALLS BELOW  $40^\circ\text{F}$  (ADJ) AND VALVE V-1 HAS BEEN MODULATED OPEN ABOVE 30% (ADJ) VALVE V-2 SHALL MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

E. THE REVERSE SHALL OCCUR ON A RISE IN SPACE TEMPERATURE.



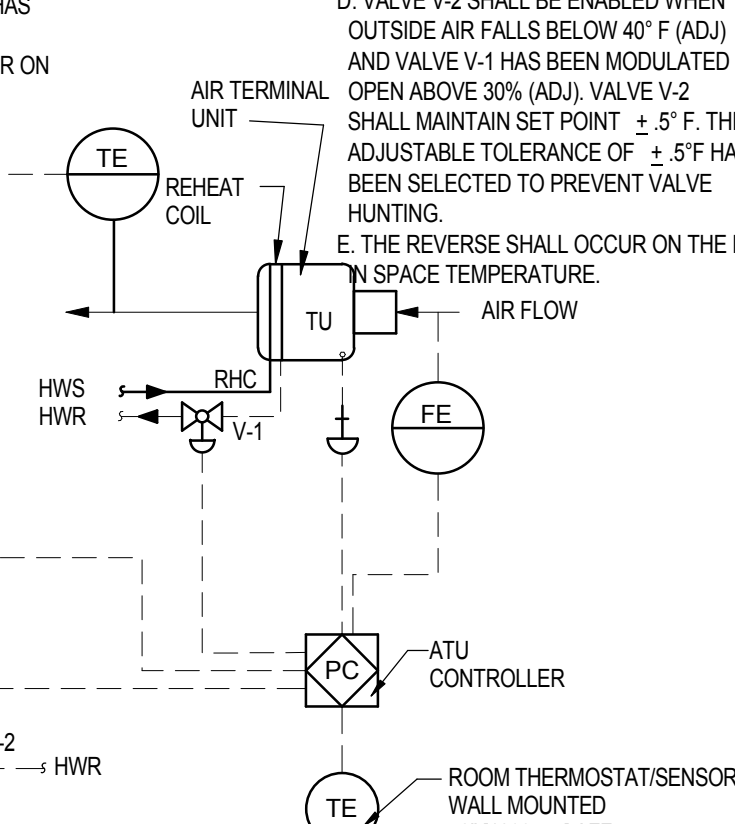
A. SET POINTS SHALL BE SET AS FOLLOWS: COOLING  $75^\circ\text{F}$  (ADJ) HEATING  $70^\circ\text{F}$  (ADJ) DEADBAND OF  $5^\circ\text{F}$  BETWEEN HEATING AND COOLING SET POINTS WILL BE MAINTAINED.

B. UPON FALL IN SPACE TEMPERATURE THE VAV DAMPER WILL MODULATE TO MINIMUM POSITION.

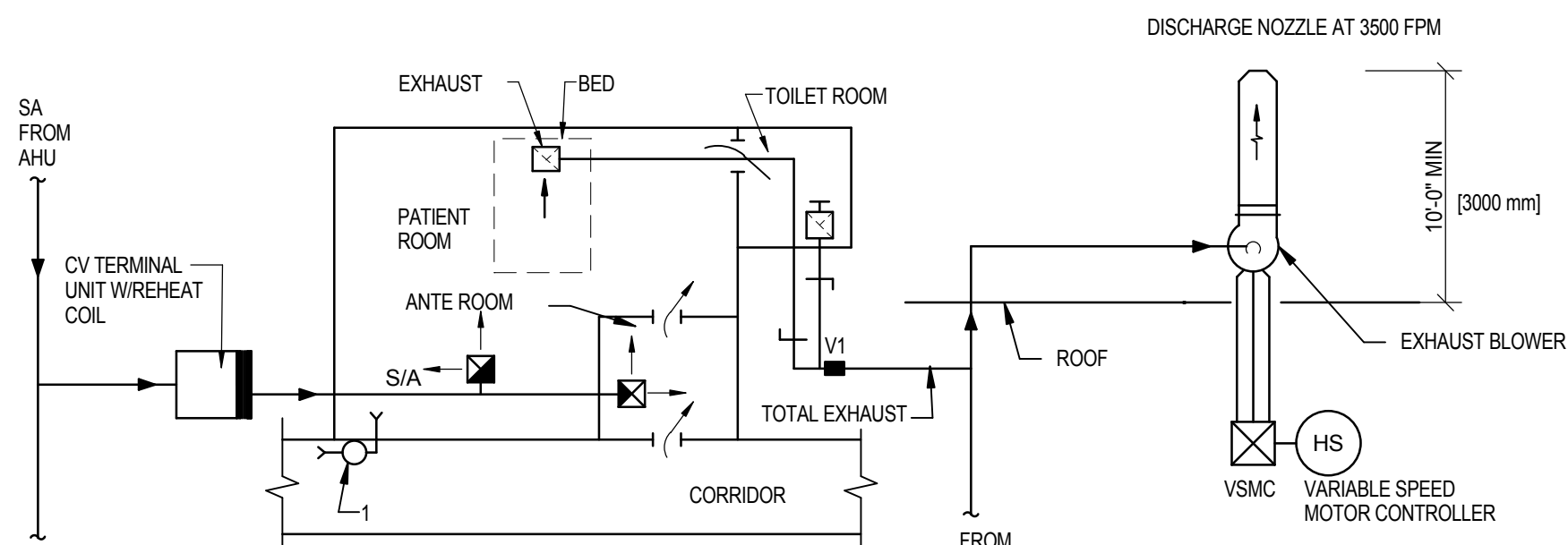
C. UPON FURTHER DROP IN SPACE TEMPERATURE VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

D. VALVE V-2 SHALL BE ENABLED WHEN OUTSIDE AIR FALLS BELOW  $40^\circ\text{F}$  (ADJ) AND VALVE V-1 HAS BEEN MODULATED OPEN ABOVE 30% (ADJ) VALVE V-2 SHALL MAINTAIN SET POINT  $\pm 5^\circ\text{F}$ . THE ADJUSTABLE TOLERANCE OF  $\pm 5^\circ\text{F}$  HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

E. THE REVERSE SHALL OCCUR ON THE RISE IN SPACE TEMPERATURE.



C7 VARIABLE VOLUME AIR TERMINAL UNIT CONTROL DIAGRAM



GENERAL NOTES:

1. MAINTAIN NEGATIVE AIR PRESSURE (0.01 INCH WATER COLUMN [2.5 PASCAL]) BETWEEN THE AIR ROOM AND THE ANTEROOM AND THE CORRIDOR BY MODULATING VALVE V1. AIR 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.

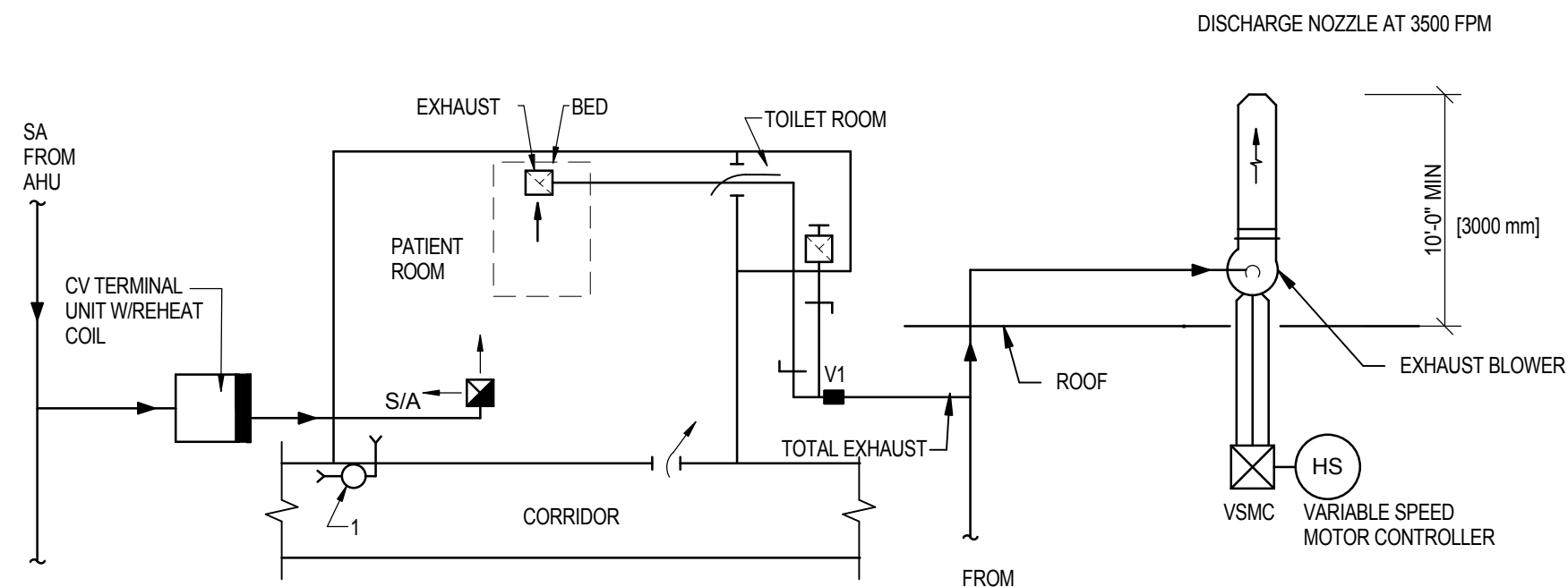
PROVIDE A DEDICATED EXHAUST SYSTEM FOR THE AIR ROOMS WITHOUT MIXING IT WITH ANY OTHER EXHAUST.

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 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) OR MINIMUM 40 CFM [19 L/S] SUPPLY + 100 CFM [47 L/S] INFILTRATED INTO ANTE ROOM FROM CORRIDOR FOR A TOTAL OF 140 CFM [66 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 ACPH 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) - 60 CFM [28 L/S] (TOILET) + 40 CFM [19 L/S] SUPPLY AIR TO ANTE ROOM + 100 CFM [47 L/S] INFILTRATED FROM CORRIDOR INTO ANTE ROOM THEN 140 CFM [66 L/S] INTO AIR ROOM + 480 CFM [227 L/S] (EXHAUST), TOTAL EXHAUST 540 CFM [250 L/S]
  - B - ANTE ROOM 100 CFM [47 L/S] (SUPPLY) + 100 CFM [47 L/S] (EXHAUST) = 200 CFM [94 L/S]
  - C - PATIENT TOILET 60 CFM [28 L/S] (EXHAUST)
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 (AII) WITH ANTE ROOM

F1 NTS NEGATIVE PRESSURE



GENERAL NOTES:

1. MAINTAIN NEGATIVE AIR PRESSURE (0.01 INCH WATER COLUMN [2.5 PASCAL]) BETWEEN THE AIR ROOM AND THE CORRIDOR BY MODULATING VALVE V1. AIR 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 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 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 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 - 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 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) - 60 CFM [28 L/S] (TOILET) + 100 CFM [47 L/S] INFILTRATED FROM CORRIDOR = 440 CFM [180 L/S] (EXHAUST), TOTAL EXHAUST 500 CFM [240 L/S]
  - B - PATIENT TOILET 60 CFM [28 L/S] (EXHAUST)

AIR SYSTEM FOR AIRBORNE INFECTION ISOLATION ROOM (AII) (WITHOUT ANTEROOM)

F4 NTS NEGATIVE PRESSURE

CONSULTANTS:

ARCHITECTS/ ENGINEERS:

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MECHANICAL DETAILS AND FLOW DIAGRAMS

Project Title  
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Acute Inpatient Medical Unit Addition  
and Renovation

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Building Number  
5

Office of  
Construction  
and Facilities  
Management

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2801 W. 22nd Street, PO Box 5046  
Sioux Falls, SD 57117-5046

Date  
08/06/2012

Checked  
BSW

Drawn  
JTC

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Department of  
Veterans Affairs

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