6   SYSTEMS INPUT

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6.1 Introduction

The systems input segment of ASEAM3.0 is an interactive program that asks for all the data needed to characterize the mechanical system(s) supplying the building zones with heating and cooling. The energy requirement of the HVAC system(s) is calculated and then passed to the plant segment, boilers, chillers, etc. which calculates the energy consumption necessary to satisfy the system energy requirements.

ASEAM3.0 can model many different types of systems:

    A. Heating and Cooling Systems
        1.   Double Duct or Multizone (DDMZ)
        2.   Constant Volume Reheat (CVRH)
        3.   Variable Air Volume Reheat (VAVR)
        4.   Ceiling Bypass Variable Air Volume (CBVAV)
        5.   Single Zone Reheat (SZRH)
        6.   Fan Coil Unit (FCU)
        7.   Water Source Heat Pump (WSHP)
        8.   Air-to-Air Heat Pump (AAHP)

    B. Heating Only Systems
        9.   Baseboard (BB)
        10.   Furnace (FURN)
        11.   Unitary Heater (UH)
        12.   Heating and Ventilation Unit (HV)

    C. Cooling Only System
        13.   Window Air Conditioner (WAC)

Enter the data for the input questions in the same manner as in the loads input segment. (See also Chapter 3 for ASEAM3.0 editing conventions.) However, in the loads input segment, the questions are "universal" (i.e., all buildings have walls and lights), whereas in the systems input segment they are "conditional" (i.e., not all questions are appropriate for all system types). The input screens are as general as possible because they are used for all system types. Not all questions are applicable to your system type. Therefore, the cursor will skip over some questions, or entire input screens may not be used. You should enter responses at all places where the cursor stops. Leaving an answer blank is sometimes interpreted as a default response; this is stated explicitly in the input question.

6.2 Entering Systems Input Data

6.2.1 Creating a New Systems Input File

To create a new systems input file, you must first access the systems input program from either the "Exit" menu of any program or from the Main Menu program. The procedure for doing this is discussed in detail in Chapter 3. Once within this program, you should then use the "Enter New Data" command from the main loads input bar menu (shown in 5.3.1).

All of the input screens will then appear sequentially in the order shown below. Note that many input screens are "conditional"; that is, they will appear only if previously entered data dictates. For example, the heat pump questions will be accessed only if you are entering data for a heat pump system.

> *Note*: If you begin entering systems data but do not complete the input process in one sitting, you should *always* save the input file, even if incomplete. Later, when you are ready to complete the data entry, you should retrieve (Get) this file and edit the unfinished portions. "Enter New Data" is used only when there are no existing data for the building.

6.2.2 Editing an Existing Systems Input File

To modify an existing systems input file stored in the data subdirectory, you first need to access the systems input program and then retrieve the existing data with the "Get Systems File" command. The procedure for doing this is discussed in detail in Chapter 3. Briefly, you should follow these steps:

1.   Access the systems input program from the "Exit" menu of any program or from the Main Menu program.

2.   Choose "Get Systems Data" from the Systems Input menu.

3.   Choose the file you wish to edit from the list. This will copy the systems input data from the subdirectory into memory.

4.   Choose "Edit Systems Data."

When editing an existing file, you have a choice of editing all data or only a particular subset of data in which you are interested.

6.2.3 Selecting Screens and Systems for Editing

After you choose "Edit Systems Data," you will first select the system components (input screens) to edit. Move the highlighted box using the right and left cursor control keys, and then press CR to select your option. A pull-down menu of individual screens is accessed by pressing CR at the "Screen Menu" command. You may select a particular screen from this menu.

```
┌─────────────────────────────────────────────────────┐
│ All Data    Zone-System Assignment    Screen Menu    Exit │
└──────────────────────────────────┐         ┌──────┘
                          │ Heating             │
                          │ Cooling             │
                          │ Preheat             │
                          │ Humidification      │
                          │ Baseboard           │
                          │ Fan                 │
                          │ Outside Air         │
                          │ Heat Pump Cooling   │
                          │ Heat Pump Heating   │
                          │ Furnace             │
                          │ Air Flow            │
                          │ DX Cooling          │
                          │ Zone CFM            │
                          │ Zone Fan KW         │
                          │ Zone Total Cooling  │
                          │ Zone Sensible Cooling │
                          │ Zone Heat Pump Heating │
                          │ Zone Backup Heating │
                          │ Exit                │
                          └─────────────────────┘
```
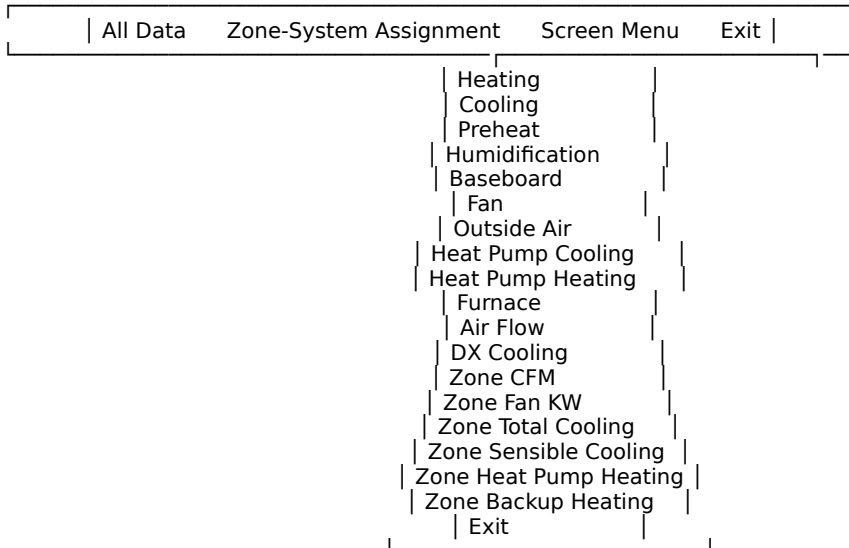
You must then indicate which systems you want to edit. A list of systems (as specified in the first system screen) will appear. Mark those systems for which you want to edit data by pressing CR. The CR is a toggle switch, which will mark unmarked systems and unmark marked systems. Move up and down the list with the cursor control keys. When you have marked all the systems you want to edit, press the Escape (ESC) key. The Systems Input screen(s) selected will now appear.

6.2.4 Copying Systems Data

There may be times when you want to enter the same data for more than one system. Data can be copied from one system to another by pressing Alt-`x' simultaneously, where `x' is the system number you want copied. The input data will then be copied from system `x' to the screen you are currently editing.  If `x' is a system that has not been defined, a screen full of blanks will be copied onto this screen. Only the current screen data are copied with this command.

6.3   Using Default Data and Autosizing

6.3.1 Using Default Data

There may be many input questions in both the systems and plant input programs that are unfamiliar to you. Use the default key (F8) when you are unsure of the answer to these questions. ASEAM3.0 uses the same typical default values as the DOE-2 program.

6.3.2 Autosizing

ASEAM3.0 can autosize the zone air flow, fan power requirement, and capacities of the equipment in both the systems and plant calculations.

The zone air required is autosized based on the peak loads calculated in the loads program and the space and design discharge temperatures. There are also data entries that will allow you to "oversize" the equipment.

> *Warning: Please review the warning message in Section 4.4 concerning peak versus diversified leads and equipment sizing*.

The fan power requirements are autosized based on default values (KW per 1000 CFM). The default values are system specific; that is, central systems will require more fan KW than unitary systems to deliver the same air flow rate.

Autosized plant equipment capacities are determined by first finding the maximum hourly load on the equipment. Again, you may "oversize" the equipment if desired.

Autosizing equipment has several potential disadvantages:

1.   Unrealistic equipment sizes will occur, instead of the nominal values that equipment manufacturers make. In many cases, present equipment could be substantially oversized (allowing for building expansion, changes in building loads through energy conservation, etc.). This oversizing, depending on the amount, can significantly affect the efficiency.

2.   If, during an ASEAM analysis, an alteration is investigated involving a large change in the building load, the primary equipment capacities, if autosized, will change between analyses. The fact that existing equipment whose capacity remains constant could be greatly oversized (and operating less efficiently) would not be considered in the analysis when autosizing is selected.

3.   As outlined in Chapters 4 and 5, only the diversified loads (from the loads calculations) are satisfied by the systems. The peak loads are used only to determine the "autosizing" air flow rates for the systems. The systems will *never* experience the peak load. Once the system coil loads are determined for all systems, these diversified loads are then totaled and passed to the plant calculations. Therefore, the plant capacities, if autosized, are based on worst-case diversified system loads. *Do not use ASEAM3.0 to size your plant equipment; doing so will result in undersized equipment*.

The difference between the peak and diversified loads is determined not only by the diversity factors entered in loads input but also by the fraction percent sunshine values in your solar file. Therefore, for buildings with a large percentage of glass, the average or diversified loads may be substantially less than the peak cooling loads.

6.4 Systems Modeled by ASEAM3.0

The 13 system types modeled by ASEAM3.0 are described in this section. The input data requirements for each system type can be found in Section 6.5.

6.4.1 Double Duct or Multizone (DDMZ)

System Description: A Double Duct System is also referred to as a dual duct system. This air system has a central fan system, a hot deck, and a cold deck. Two sets of supply air ducts transfer heated and cooled air from the central air-handling unit to

individual zones. The hot and cold air streams are mixed in a terminal mixing box located in or near the zone to be conditioned, in order to supply the required temperature as indicated by a thermostat in the zone.

A Multizone System is similar to a dual duct system. However, the mixing of hot and cold air streams is done at the air-handling unit by thermostatically controlled dampers. The discharge air is then distributed to each zone through a single duct system.

For both systems, if there is no hot deck discriminator, the hot deck temperature will be reset according to the outdoor air temperature, assuming a linear relationship. You specify the maximum and minimum hot deck temperatures, and the outdoor air temperatures at which they occur, and these two points determine the linear reset schedule. Then, for any outdoor air temperature, the hot deck temperature is uniquely determined. A discriminator control is superior because it will reset the hot deck to the lowest temperature required to satisfy the worst-case zone.

Comment: These systems may require simultaneous heating and cooling to control space conditions. Therefore, it may be necessary to allow the heating plant to operate during the cooling mode. This is done by two user-defined parameters on the Heating Screen. These two parameters are the months during which heat is available and the outside temperature above which heating is off. Note that for the heating to be on, *both* of the conditions must be met; that is, it must be a month during which heating is available, and the outside air temperature must be below the temperature at which heating is turned off. During warmer outside temperatures, the mixed air temperature in DDMZ systems will be warmer than room air temperature, thereby providing control without the need for heating plant operation.

6.4.2 Constant Volume Reheat (CVRH)

System Description: A Constant Volume Reheat (CVRH) System is also known as a Terminal Reheat system. It is simulated in ASEAM3.0 as a constant volume, variable temperature system which may be equipped with preheating and cooling coils located at the central fan location. The system is equipped with thermostatically controlled terminal reheat coils located in or near the zones they serve. A CVRH system can also have a discriminator, in which case the cool discharge air from the central fan would be reset to the temperature needed to satisfy the zone with the lowest discharge temperature requirement. The CVRH would then perform the same way as a Single Zone Reheat system.

Comment: The cooling discharge temperature will either be constant at the temperature required to meet summer design conditions (typically 55 degrees F) or, if the system has a discriminator, reset at the lowest required discharge temperature for any zone. In either case, most of the zones will need air warmer than this, so the heating plant needs to be on for reheating. As in the DDMZ system, heat is available only during the months specified and when the outdoor temperature is below the maximum heat cutoff point.

6.4.3 Variable Air Volume Reheat (VAVR)

System Description: The Variable Air Volume system is an air system with a central air- handling unit consisting of a fan, cooling coils, and optional preheat coils and

humidifier, which distributes cool air to thermostatically controlled terminal air devices referred to as variable air volume (VAV) boxes. VAV boxes are controlled by zone thermostats to regulate the volume of supply air to meet zone requirements. When there are marginal cooling loads or heating loads, the VAV boxes are first throttled to minimum flow, and reheat coils are used to increase the discharge temperature. Three types of fan control are available: variable speed fan, variable position discharge dampers, and adjustable inlet vanes (also called vortex dampers). Discriminator controls can be used to reset the discharge temperature, but this will also affect the air volume required.

Comment: The minimum air flow fraction is entered on Screen H (Fans). This is the percent of design air flow that must be delivered to each zone with heating loads. Note also that ASEAM3.0 models the ventilation requirements as a percent of the design air flow. That is, the minimum percent outside air multiplied by the design air flow rate is always brought in through the outside air dampers.

6.4.4 Ceiling Bypass Variable Air Volume (CBVAV)

System Description: The Ceiling Bypass VAV system is like the VAV system discussed above in that the supply air volume delivered to any zone is controlled by a thermostat. In the ceiling bypass system, however, the VAV box diverts the air from the zone to the ceiling return air plenum. The supply fan pushes a constant volume of air, although only part of it goes to the conditioned spaces. Thus, this system does not take advantage of the fan power savings normally associated with VAV systems. The CBVAV boxes are sometimes referred to as dump boxes.

6.4.5 Single Zone Reheat (SZRH)

System Description: The Single Zone system maintains comfort conditions in the zone by providing a constant volume of air at temperatures that vary according to the load. This system is often referred to as a constant volume system or a variable temperature single zone system. Note that this system is modeled almost identically to a CVRH with a discriminator. SZRH systems also are generally much smaller (limited number of zones) than CVRH systems.

Simulation of the SZRH system assumes that the control thermostat is located in the space, not the return air duct. The availability of heating and cooling depends on the monthly schedules for availability and also on the outside air temperature cutoffs for heating and cooling.

Comment: The SZRH is a flexible building block for simulating many types of HVAC equipment. For example, a gas-fired, packaged rooftop unit with DX cooling can be "built-up" as follows:

> System: SZRH
> Heat type: furnace
> Cool type: direct expansion

See the discussion of heating and cooling plant equipment for additional options.

6.4.6 Fan Coil Unit (FCU)

System Description: Fan Coil Units are small unitary systems that condition spaces by passing air over heating and/or cooling coils. The coils can be electric resistance (for heating) or water coils (both heating and cooling). The fluids are generally conditioned at a central plant (boiler or chiller) and circulated through the coils by pumps. The units can be supplied with outdoor dampers for ventilation.

Fan Coil Units are usually of the two-pipe or four-pipe configuration. Two-pipe systems generally may be used only for heating or for cooling (but not both simultaneously), and seasonal changeover occurs at either preselected outdoor temperatures or by monthly schedules. Four-pipe systems can supply both heating and cooling simultaneously. ASEAM3.0 does not explicitly ask whether you have a two- or a four-pipe system, but you supply this information implicitly in the heating and cooling availability schedules (see comment, below).

Comment: Simulation of either a two-pipe or a four-pipe system is accomplished by appropriate selection of the heating and cooling availability schedules, as well as maximum outdoor temperature for heating and minimum outdoor temperature for cooling.

■ Two-pipe operation: Set the maximum outdoor temperature for heating and the minimum outdoor temperature for cooling to the same value (often this is 65 degrees F) to simulate changeover. You also may choose the heating and cooling availability based on monthly schedules.

■ Four-pipe operation: Set the maximum outdoor temperature for heating and the minimum outdoor temperature for cooling so that they overlap to provide heating and cooling as required. Doing so provides for both heating and cooling over a temperature range. Note that reheating energy is not used; the fan coil units will be either in a heating or cooling mode, but not in both at the same time.

6.4.7 Water Source Heat Pump (WSHP)

System Description: In water source heat pump systems, individual (i.e., "distributed") heat pumps are located in or near the zones they serve. They use marginally conditioned water from a water loop system supplied from the central plant (usually a boiler/heat rejection unit). The water loop is used both as a heat source during the heating mode and a heat sink during the cooling mode.

Individual units may be heating or cooling as required by zone conditions. They may either supply heat to or take heat from the zone and pass this load to the water loop. This system operates most efficiently when there is a match between the zones' heating and cooling requirements. That is, during the winter interior core zones add heat to the water loop, and exterior zones take heat from the water loop. Excess heat is generally removed by a cooling tower to provide a maximum water loop temperature for efficient heat pump operation. Likewise, boost heat is generally satisfied by a hot water boiler, in order to keep the water loop at a minimum temperature for safe and efficient operation of the zonal heat pumps.

6.4.8 Air-to-Air Heat Pump (AAHP)

System Description: Air-to-air heat pump systems are smaller unitary systems having integral heat pumps that can operate either in a heating mode or a cooling mode. When in a heating mode, a backup source of heating (e.g., furnace or electrical resistance) may be specified to operate at lower outside air temperatures.

Comment: Unlike most other system types, energy consumption of an air-to-air heat pump system is calculated directly in the systems segment (i.e., there is no coil load for boilers or chillers).

6.4.9 Baseboard (BB)

System Description: Baseboard heaters are located along the walls within a zone. They provide heating only and may be supplied by hot water or steam from the heating plant, or they may be electric resistance heaters. Note that baseboards may also be specified in combination with other systems (e.g., DDMZ). Where specified in combination, ASEAM3.0 assumes that the baseboard unit satisfies as much of the heating load as it has capacity, with the remaining (reduced) heating load satisfied by the primary system.

Comment: In ASEAM3.0, baseboard heat output may be controlled either thermostatically or by specifying a reset schedule relating heat output to outside air temperature.

6.4.10 Furnace (FURN)

System Description: A furnace system supplies heat only. Unlike most of the other system types, energy consumption of the furnace is computed directly in the systems segment (as gas or oil consumption), and the heating load is not passed on to the plants segment.

Comment: The furnace system may also be specified as a backup heating source for the AAHP system.

6.4.11 Unitary Heater (UH)

System Description: A unitary heater supplies heat only to a zone. This system cycles on the zone heating demand. No outside air is simulated with unit heaters.

6.4.12 Heating and Ventilating Unit (HV)

System Description: A heating and ventilating unit supplies heat only. This system is nearly identical to the single zone system except that cooling coils are not provided in this system.

6.4.13 Window Air Conditioner (WAC)

System Description: A window air conditioner consists of a direct expansion air conditioning system with an integral compressor, an evaporator section for cooling zone air, and a condenser section for rejecting heat. The unit can also be equipped

to introduce outside air for ventilation.

6.5 Systems Input Screen Guide

The following table is used to indicate the data that must be entered for each system type. Locate the systems type at the top of the page, and then read down the appropriate column to see which questions require responses, screen by screen. Note that the input screens are lettered A through N, and within each screen the questions are numbered.

Key to table:
X: answer required
Z#:   answer may be required depending on answer to question Z# (Z is the screen letter and # the question number)
`blank':   no entry indicates question not applicable to system
Xbd: an answer is required, but a blank will be interpreted as a default.

SCREEN A - SYSTEM DEFINITIONS   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

A1 Total number of systems ------------------------------------ X   X   X   X   X   X   X   X   X   X   X   X   X

A2 System #   System Label ---------------------------------- X   X   X   X   X   X   X   X   X   X   X   X   X

SCREEN B - ZONE - SYSTEM ASSIGNMENTS   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

B1 Zone Zone Heating   Heating   Cooling
   Number Label Cooling ONLY   ONLY --------------------- X   X   X   X   X   X   X   X   X   X   X   X   X
   from loads input Sys # System # System #

SCREEN C - HEATING   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
   Energy Source for Heating
C1   Heating coil plant type ---------------------------------- X   X   X   X   X   X   X   X   X   X
   Heating Availability
C2   Outside temperature above which heating is off ------------- X   X   X   X   X   X   X   X   X   X
C3   Heating available beginning month # ----------------------- X   X   X   X   X   X   X   X   X   X
C4   Heating available ending month # -------------------------- X   X   X   X   X   X   X   X   X   X
   Heating Discharge Conditions
C5   Design heating coil discharge temperature ------------------ X   X   X   X   X   X   X   X   X   X
   (Dual Duct System Only)
C6   Discriminator Control (Y/N) ------------------------------- X
C7   Outside temperature at maximum hot deck temperature -------- C6
C8   Maximum hot deck temperature ---------------------------- C6
C9   Outside temperature at minimum hot deck temperature -------- C6
C10   Minimum hot deck temperature ---------------------------- C6

SCREEN D - COOLING   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
   Energy Source for Cooling
D1   Cooling coil plant type ---------------------------------- X   X   X   X   X   X
   Cooling Availability
D2   Outside temperature below which cooling is off ------------- X   X   X   X   X   X   X   X   X
D3   Cooling available beginning month # ----------------------- X   X   X   X   X   X   X   X   X
D4   Cooling available ending month # -------------------------- X   X   X   X   X   X   X   X   X
   Cooling Discharge Conditions
D5   Design cooling coil discharge temperature ------------------ X   X   X   X   X   X   X   X   X
D6   Discriminator control (Y/N) ------------------------------- X   X   X   X
D7   Maximum cooling coil discharge temperature ---------------- D6   D6   D6   D6   X

SCREEN E - PREHEAT   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
   Energy Source for Preheat
E1   Preheat coil plant type ---------------------------------- X   X   X   X   X   X
   Preheat Availability
E2   Outside temperature above which preheat is off ------------- X   X   X   X   X   X
E3   Preheat available beginning month # ----------------------- X   X   X   X   X   X
E4   Preheat available ending month # -------------------------- X   X   X   X   X   X
   Preheat Discharge Conditions
E5   Design preheat coil discharge temperature ------------------ X   X   X   X   X   X

SCREEN F - HUMIDIFICATION   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
   Energy Source for Humidification
F1   Humidification plant type -------------------------------- X   X   X   X   X   X
   Humidification Availability
F2   Outside temperature above which humidification is off ------ X   X   X   X   X   X
F3   Humidification available beginning month # ---------------- X   X   X   X   X   X
F4   Humidification available ending month # -------------------- X   X   X   X   X   X
F5   Humidification available during unoccupied cycle (Y/N) ----- X   X   X   X   X   X
   Humidification Discharge Conditions
F6   Minimum relative humidity maintained (% RH) ---------------- X   X   X   X   X   X

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SCREEN G - BASEBOARD   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

  Energy Source for Baseboard

```
G1  Baseboard plant type ------------------------------------- X   X   X   X   X   X   X   X X       X
    Baseboard Availability
G2  Outside temperature above which baseboard is off ----------- X   X   X   X   X   X   X   X X       X
G3  Baseboard available beginning month # --------------------- X   X   X   X   X   X   X   X X       X
G4  Baseboard available ending month # ------------------------ X   X   X   X   X   X   X   X X       X
    Baseboard Control and Capacity
G5  Baseboard control type ------------------------------------- X   X   X   X   X   X   X   X X       X
G6 Percent of design heating load satisfied at design winter ---- X   X   X   X   X   X   X   X X       X
G7 Percent of design heating load satisfied at balance temp ----- G5  G5  G5  G5  G5  G5  G5  G5 G5      G5
```

SCREEN H - FAN   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

  Supply Fans

```
H1  Total supply fan power required (blank=default) ------------ Xbd Xbd Xbd Xbd Xbd                Xbd   Xbd
H2    (or) Supply fan power per 1000 CFM ----------------------- H1  H1  H1  H1  H1                 H1    H1
H3  Supply fan temperature rise (blank=default) ---------------- Xbd Xbd Xbd Xbd Xbd                Xbd   Xbd
    Return Fans
H4  Total return fan power required (blank=default) ------------ Xbd Xbd Xbd Xbd Xbd                Xbd   Xbd
H5    (or) Return fan power per 1000 CFM ---------------------- H4  H4  H4  H4  H4                  H4    H4
H6  Return fan temperature rise (blank=default) ---------------- Xbd Xbd Xbd Xbd Xbd                Xbd   Xbd
H7  (VAV) Minimum percent of design air volume when heating ----         X   X
H8  (VAV) Air volume control method ----------------------------         X   X
    Fan Control Methods
H9  Occupied cycle fan control method -------------------------              X   X   X            X
H10  Unoccupied cycle fan control method ----------------------- X   X   X   X   X   X   X   X        X X
```

SCREEN I - OUTSIDE AIR CONTROLS   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

  Occupied Cycle Only

```
I1  Outside air damper control method ------------------------- X   X   X   X   X   X   X   X         X X
I2  Minimum percent outside air intake ------------------------ I1  I1  I1  I1  I1  I1  I1  I1        I1 I1
I3  Dry bulb switchover temperature --------------------------- I1  I1  I1  I1  I1  I1  I1  I1        I1 I1
    Unoccupied Cycle Only
I4  Outside air damper control method ------------------------- X   X   X   X   X   X   X   X         X X
I5  Minimum percent outside air intake ------------------------ I4  I4  I4  I4  I4  I4  I4  I4        I4 I4
I6  Dry bulb switchover temperature --------------------------- I4  I4  I4  I4  I4  I4  I4  I4        I4 I4
```

SCREEN J - HEAT PUMP COOLING   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

  Heat Pump Cooling Capacity (Total Cooling)

```
J1  Zonal total cooling capacity method ------------------------              X   X           X
J2    (if autosized)  Percent of design total load met ---------              J1  J1          J1
    Heat Pump Cooling Capacity (Sensible Cooling)
J3  Zonal sensible cooling capacity method ---------------------              X   X            X
J4    (if autosized)  Percent of design sensible load met ------              J3  J3          J3
    Cooling Performance
J5  Design coefficient of performance --------------------------              X   X           X
    Water Source Heat Pump Only
J6  Outside temperature at minimum fluid loop temperature ------                  X
J7    Minimum fluid loop temperature ---------------------------              X
J8  Outside temperature at maximum fluid loop temperature ------                  X
J9    Maximum fluid loop temperature ---------------------------              X
```

SCREEN K - HEAT PUMP HEATING   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**

  Heat Pump Heating Capacity

```
K1  Zonal heating capacity method -------------------------------              X   X
K2    (if autosized)  Percent of max heat pump load met --------               K1  K1
    Air/Air Heat Pump Backup
K3  AAHP backup heating source ----------------------------------                   X
K4  Outside temperature below which backup heating is on -------                    X
K5  Zonal electric resistance backup heating capacity meth. ----                    X
K6    (if autosized)  Percent of design heating load met -------                    K5
    Heating Performance
```

K7   Design heating coefficient of performance ------------------   X   X

SCREEN L - FURNACE   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
  Furnace Energy Source
L1 Furnace fuel source -------------------------------------- C1 C1 C1 C1 C1   K3   X   C1
  Furnace Heat Output
L2 Furnace capacity (blank=autosize) --------------------------- Xbd Xbd Xbd Xbd Xbd   Xbd   Xbd Xbd
L3   (if autosized) Percent of design load satisfied ---------- L2 L2 L2 L2 L2   L2   L2   L2
  Furnace Efficiency
L4 Furnace efficiency at design load ------------------------- X   X   X   X   X   X   X   X
  Furnace Losses
L5 Losses as percent of design load (at design load) ---------- X   X   X   X   X   X   X   X
L6 Losses as percent of design load (at no load) -------------- X   X   X   X   X   X   X   X
L7 Pilot gas annual consumption ------------------------------ L1 L1 L1 L1 L1   L1   L1   L1

SCREEN M - ZONE AIR   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
  Zone Air Flow Sizing
M1 Zonal air volume method ----------------------------------- X   X   X   X   X   X   X   X   X X X X
M2   (if autosized) Percent of design default air flow ------- M1   M1   M1   M1   M1   M1   M1   M1   M1 M1 M1 M1
  Zone Fan Power
M3 Zonal fan power method ------------------------------------   X   X   X   X X X X
M4   (if autosized) Percent of design default fan KW ---------   M3   M3   M3   M3 M3 M3 M3

SCREEN N - DX COOLING   **DDMZ CVRH VAVR CBVAV SZRH FCU WSHP AAHP BB FURN UH HV WAC**
  DX Cooling Capacity (Total Cooling)
N1 DX total cooling capacity (blank=autosized) ---------------- Xbd Xbd Xbd Xbd Xbd
N2   (if autosized) Percent of design total load met --------- N1   N1   N1   N1   N1
  Cooling Performance
N3 Design coefficient of performance -------------------------- X   X   X   X   X
N4 Minimum unloading ratio (% of capacity) -------------------- X   X   X   X   X
N5 Minimum hot gas bypass ratio (% of capacity) --------------- X   X   X   X   X
  DX Condenser
N6 Condenser fan KW (blank=default) --------------------------- Xbd Xbd Xbd Xbd Xbd
N7 Outside temperature below which condenser fan is off ------- X   X   X   X   X

Note: Screens `O' through `T' allow you to enter zone capacities for several parameters. These screens will repeat the zone names assigned to this system, and you will enter the zone value for each zone at the right side of the screen.

Screen O: Zone CFM. Allows you to enter the design CFM delivered to each zone assigned to this system. This screen will appear only if you do not "autosize" the zone air on question M1.

Screen P: Zone Fan KW. Allows you to enter the fan KW required for each zone assigned to this unitary system. This screen will appear only if you do not "autosize" the zone fan power method on question M3. This screen only applies to unitary systems (FCU, WSHP, AAHP, UH, WAC).

Screen Q: Zone Total Cooling. Allows you to enter the total cooling capacity of the zonal heat pumps and window air conditioners for each zone assigned to this system. This screen will appear only if you do not "autosize" the zonal total cooling capacity method on question J1. This screen only applies to unitary heat pump systems (WSHP, AAHP, WAC).

Screen R: Zone Sensible Cooling.   Allows you to enter the sensible cooling capacity of the zonal heat pumps and window air conditioners for each zone assigned to this system. This screen will appear only if you do not "autosize" the zonal sensible cooling capacity method on question J3. This screen only applies to unitary heat pump systems (WSHP, AAHP, WAC).

Screen S: Zone Heat Pump Heating. Allows you to enter the heating capacity of the zonal heat pumps for each zone assigned to this system. This screen will appear only if you do not "autosize" the zonal heating capacity method on question K1. This screen only applies to unitary heat pump systems (WSHP, AAHP).

Screen T: Zone Backup Heating. Allows you to enter the electric resistance backup heating capacity of the air-to-air heat pumps for each zone assigned to this system. This screen only applies to air-to-air heat pump systems (AAHP).

6.6 Systems Input Screens

The following discussion focuses on the systems input screens. Each screen is shown exactly as it will appear on your computer. Above each screen display is a seven- or eight-letter name that identifies the .SIS file that creates the screen. Should you wish to change the default values or limits, this is the file you would need to access. See Appendix C for a discussion of how to change the input screen appearance and input parameters.

6.6.1 Screen A: System Definitions

On the first screen you identify how many systems there are in the building and the types of systems. Only one heating and cooling (Types 1-8) system can serve a given zone, but many zones can be conditioned by one system. Two systems can be entered for a zone provided one system is heating only (Types 9-12) and the other system is a window air conditioner (Type 13). Baseboard heating can be added to any system type (except the window air conditioner) and need not constitute a system in itself. *This screen is accessed only once*.

```
                              SISYSDAT
 ┌──────────────────────────────────────────────────────────────────────┐
 │        │SYSTEM DEFINITIONS                                │           │
 │        │                                         │                    │
 │        |------------------------------------------------------------| │
 │        │Total number of systems  __                        │         │
 │        │                                         │                    │
 │        │System #    System Label                   System Type  │     │
 │        │                                    (Use Codes Below)    │    │
 │        │      1  _____   __            │    │
 │        │      2  _____   __            │    │
 │        │      3  _____   __            │    │
 │        │      4  _____   __            │    │
 │        │      5  _____   __            │    │
 │        │      6  _____   __            │    │
 │        │      7  _____   __            │    │
 │        │      8  _____   __            │    │
 │        │      9  _____   __            │    │
 │        │     10  _____   __            │    │
 │        │                                                   │          │
 │        │----------------------------------------------------------│   │
 │        │             Heating and Cooling System Types           │     │
 │  │1=DDMZ   2=CVRH   3=VAVR   4=CBVAV   5=SZRH   6=FCU   7=WSHP   8=AAHP │
 │        │   Heating Only  Systems           Cooling Only Systems     │ │
 │        │9=BB     10=FURN  11=UH    12=HV            13=WAC          │  │
 └──────────────────────────────────────────────────────────────────────┘
```

Total number of systems

Enter number 1-0. This is the number of systems conditioning the entire building.

System #

The systems are numbered sequentially, one through however many system types you have specified above. This is done automatically.

System label

For your reference only. The label, or user-defined name, will be used when you are asked which systems you want to edit, and will also be printed on some output reports.

System type

Enter number 1-13. This number, corresponding to the list at the bottom of the input screen, indicates the type of system:

1. Dual duct or multizone (DDMZ)
2. Constant volume reheat (CVRH)
3. Variable air volume reheat (VAVR)
4. Ceiling bypass variable air volume (CBVAV)
5. Single zone reheat (SZRH)
6. Fan coil unit (FCU)
7. Water source heat pump (WSHP)
8. Air-to-air heat pump (AAHP)
9. Baseboard (BB)
10. Furnace (FURN)
11. Unitary heater (UH)
12. Heating and ventilating unit (HV)
13. Window air conditioner (WAC)

6.6.2 Screen B: Zone-System Assignments

This screen is used to indicate which zones (as defined in loads) are served by which systems. No more than one system may serve a particular zone, but many zones may be conditioned by the same system. Two systems can be entered for a zone provided one system is heating only (Types 9-12) and the other system is a window air conditioner (Type 13). Baseboard heating may be included as a part of any system except for a window air conditioner. *This screen is accessed only once*.

```
                              SIZONDAT
 _____
|ZONE - SYSTEM ASSIGNMENTS                           |         |
|                                                 |            |
|---------------------------------------------------------|    |
|                                                 |            |
| Zone   Zone                       Heating  Heating  Cooling |
|Number  Label                       Cooling   ONLY     ONLY  |
|                               System #  System #  System #|  |
|---------------------------------------------------------|    |
|                                                  __    __    __   |   |
|  NOTE - THE ZONE NUMBERS AND LABELS|          __    __   __   |   |
|      (AS DEFINED IN LOADS INPUT)|       __    __    __   |       |
|         WILL BE PRINTED HERE      |   __    __    __   |           |
|_____|  __    __      __   |         |
|                                                __    __   __   |   |
|     __    __     __  |                                       |
```

Zone number
>   Zones are numbered 1 through as many zones as you defined in the loads segment of the program. ASEAM3.0 automatically inserts these numbers on the input screen.

Zone label
>   Zone labels, corresponding to zone numbers, that you defined in the loads segment of the program are automatically inserted on the input screen by ASEAM3.0.

Heating/cooling system #
>   Enter number 1-10. This is the system number from the previous screen (*not* the system type number). Enter the system number in this column if the system type provides both heating and cooling.

Heating ONLY system #
>   Enter number 1-10. This is the system number from the previous screen (*not* the system type number). Enter the system number in this column if the system type provides heating only.

Cooling ONLY system #
>   Enter number 1-10. This is the system number from the previous screen (*not* the system type number). Enter the system number in this column if the system type provides cooling only.

6.6.3 Screen C: Heating (one screen per system)

On this screen you define the heating energy source, when heating is available, and the heating discharge temperatures.

This screen appears once for each system for the following system types: DDMZ, CVRH, VAVR, CBVAV, SZRH, FCU, WSHP, FURN, UH, HV.

SIHTGDAT

```
|SYSTEMS DATA:  HEATING PARAMETERS FOR SYSTEM:                    |
    |System Label:                          File:        |
    |---------------------------------------------------------------
    |Energy Source for Heating                           |
  |  Heating coil plant type (see codes below)        _   |      |
    |                                                       |
    |Heating Availability                               |
  | Outside temperature above which heating is off      ___ °F    |
  |  Heating available beginning month #                _        |
   |  Heating available ending month #                 _        |
    |                                                       |
    |Heating Discharge Conditions                       |
  |  Design heating coil discharge temperature         ___ °F    |
```

```
                    │                                          │
                │(Dual Duct System Only)                       │
                │  Discriminator Control (Y/N)      _          │
             │  Outside temperature at maximum hot deck temperature    ___  °F    │
             │    Maximum hot deck temperature          ___  °F    │
             │ Outside temperature at minimum hot deck temperature    ___  °F    │
                │   Minimum hot deck temperature         ___  °F    │
                   │----------------------------------------------------------------------│
                   │             Heating Coil Plant Types               │
             │0=None  1=Boiler   2=Elect Resist   3=District Heat   4=DB Chiller   5=Furnace│
                   │----------------------------------------------------------------------│
       └─────────────────────────────────────────────────────────────────────────┘
```

Heating coil plant type
> Enter number 0-5. These numbers define the energy source for heating:
>> 0 - none
>> 1 - boiler
>> 2 - electric resistance
>> 3 - district heat
>> 4 - double bundle chiller
>> 5 - furnace
>
> If you enter `0', there is no heating, and the remainder of this screen does not apply. If you do have heating, you should enter values for the following questions.

The next four questions are asked for any system with heating capability:

Outside temperature above which heating is off
> Enter in degrees F. This is the maximum outdoor temperature at which heating is available. With this input question, you can avoid the simultaneous use of both heating and cooling in reheat and fan coil systems. See the note below.

Heating available - beginning month #
> Enter number 1-12. Month number when heating first available, inclusive (e.g., 9 means that heating is available beginning Sept. 1). See note below.

Heating available - ending month #
> Enter number 1-12. Month number when heating last available, inclusive (e.g., 5 means that heating is available until May 31).
>
> *Note*: For heating to be available, both the month availability and the outside temperature criteria must be satisfied.

Design heating coil discharge temperature
> Enter degrees F. Expresses the temperature of the heated air that satisfies the winter design load. When units are cycling to satisfy a space heating load, this discharge temperature is assumed for determination of the equipment run time.

The following questions apply *only* to dual duct and multizone systems:

Discriminator control

Enter `Y' for Yes or `N' for No. A discriminator determines which zone has the greatest heating temperature requirement and resets the hot deck temperature so that this load is met (but not exceeded) at full hot deck flow. When reset in this manner, the hot deck temperature is typically cooler than that for design winter conditions, and so zones with smaller heating loads require less mixing to lower the temperature.

If your system has discriminator control, the hot deck temperature is reset to meet the highest heating load sensed in the zones, as defined above. If your system does not have discriminator control, the hot deck temperature is controlled by outdoor air reset. You enter the maximum and minimum hot deck temperatures and the outdoor air temperatures at which they occur. For any given outdoor air temperature, the hot deck temperature can be reset linearly between these two values. Note that for outdoor air temperatures above the maximum or below the minimum you specified, the hot deck temperature remains at its maximum or minimum value, respectively.

The following questions apply *only* to systems *without* discriminator control:

Outside temperature at maximum hot deck temperature
Enter degrees F. This is the outside temperature at which the maximum hot deck temperature occurs.

Maximum hot deck temperature
Enter degrees F. This is the maximum hot deck temperature, which occurs when the outside temperature is at (or below) the temperature entered above. Note that this temperature is also used for determining the amount of unoccupied cycling required.

Outside temperature at minimum hot deck temperature
Enter degrees F. This is the outside temperature at which the minimum hot deck temperature occurs.

Minimum hot deck temperature
Enter degrees F. This is the minimum hot deck temperature, which occurs when the outside temperature is at (or above) the temperature entered above.

6.6.4 Screen D: Cooling (one screen per system)

On this screen you define the cooling energy source, when cooling is available, and the cooling discharge temperature. Note that if you specify autosizing for the zone air flow (which is done on a subsequent screen), ASEAM3.0 uses the peak zone cooling load (determined in the loads calculations) and the design cooling discharge and space temperatures to calculate the zone air volume.

This screen appears once per system for the following system types: DDMZ, CVRH, VAVR, CBVAV, SZRH, FCU, WSHP, AAHP, WAC.

```
                              SICLGDAT

        ┌─────────────────────────────────────────────────────────────┐
        │SYSTEMS DATA:  COOLING PARAMETERS FOR SYSTEM:          │
        │System Label:                        File:             │
        │---------------------------------------------------------------│
        │Energy Source for Cooling                              │
```

```
                      │ Cooling coil plant type (see codes below)          _    │         │
                      │                                                          │
                          │Cooling Availability                               │
                      │ Outside temperature below which cooling is off     ___ °F       │
                        │ Cooling available beginning month #               _         │
                        │ Cooling available ending month #                  _         │
                        │                                                        │
                          │Cooling Discharge Conditions                          │
                      │ Design cooling coil discharge temperature          ___ °F      │
                           │ Discriminator control (Y/N)                   _            │
                      │ Maximum cooling coil discharge temperature         ___ °F      │
                          │                                                     │
                          │                                                     │
                          │-----------------------------------------------------------------│
                          │                    Cooling Coil Plant Types                    │
                        │ 0=None     1=DX     2=Centrifugal     3=Absorption     4=District Cooling │
                        │ 5=Double Bundle     6=Cooling Tower (WSHP only)        7=Reciprocating   │
                          │-----------------------------------------------------------------│
```

Coiling coil plant type
>   Enter number 0-7. These numbers define the energy source for cooling.
>   Choose from the following:
>>   0 - none
>>   1 - direct expansion (DX)
>>   2 - centrifugal chiller
>>   3 - absorption chiller
>>   4 - district cooling
>>   5 - double bundle chiller
>>   6 - cooling tower (WSHP only)
>>   7 - reciprocating chiller

If you specify `0' there is no cooling, and the remainder of this screen does not apply. If you specify any type of cooling, you should answer the following questions. Note that cooling towers can be used only with WSHP systems.

The next four questions are asked for any system type with cooling capability:

Outside temperature below which cooling is off
>   Enter degrees F. This is the lowest outdoor temperature at which mechanical cooling is supplied. The use of operable windows for natural ventilation could be modeled by entering a value of, for example, 70 degrees F, implying that, if the outdoor temperature is less than 70 degrees F, no mechanical cooling is available regardless of the cooling load. See Note below.

Cooling available - beginning month #
>   Enter number 1-12. Month number when cooling first available, inclusive (e.g., 5 means that cooling is available beginning May 1). See Note below.

Cooling available - ending month #
>   Enter number 1-12. Month number when cooling last available, inclusive (e.g., 9 means that cooling is available until September 30).

>   *Note*: For cooling to be on, both the outside temperature and the month availability criteria must be satisfied.

Design cooling coil discharge temperature

Enter degrees F. Enter the cooling discharge temperature required to satisfy the summer design load. The cooling discharge temperature is generally set to this value unless the system has discriminator control. The design cooling coil discharge temperature input (usually about 55 degrees F), along with the maximum calculated zone load and summer thermostat setpoint, is used to "autosize" the air flow to individual zones. A discriminator determines the lowest discharge temperature required for any zone and resets the discharge temperature to this value. When reset in this manner, the cooling discharge temperature is typically warmer than for design summer conditions, and the air flow to the zones with smaller cooling loads requires less reheating or mixing.

The next two questions concerning discriminator control are asked for the central fan system types (DDMZ, CVRH, VAVR, CBVAV). It is assumed that the cooling discharge temperature for single zone systems is already reset so as to satisfy the load of the worst-case zone. Unitary or "zonal" systems, such as window air conditioners, are modeled as separate systems in each zone. With unitary system, each system has a different discharge temperature based on the zone load.

Discriminator control
`Y' for Yes, `N' for No. With discriminator control, the cooling discharge temperature required for the worst-case zone is used to reset the system cold deck discharge temperature. For unitary systems, ASEAM3.0 assumes each zone has a separate system, and therefore, a different discharge temperature. If the unit is cycling, the discharge temperature is assumed to be constant. If the unit runs continuously, the cooling capacity is adjusted by changing the discharge temperature.

The next question is asked only if the system has a discriminator control:

Maximum cooling coil discharge temperature
Enter degrees F. This question is asked only if a discriminator is indicated in the previous question. You can limit how high the cooling discharge temperature is permitted to rise above the design supply temperature, thus somewhat limiting excessive space humidity levels. ASEAM3.0 does not explicitly model cooling discharge temperatures reset by space or return humidity levels.

6.6.5 Screen E: Preheat (one screen per system)

On this screen, you define the preheat energy source, when preheating is available, and the design discharge conditions. Preheat coils are assumed to be located after the mixed air plenum, if return air is used.

This screen appears once per system for the following system types: DDMZ, CVRH, VAVR, CBVAV, SZRH, HV.

SIPRHDAT

```
 |SYSTEMS DATA: PREHEAT PARAMETERS FOR SYSTEM:                    |
      |System Label:                            File:          |
      |--------------------------------------------------------------|
      |Energy Source for Preheat                              |
```

```
            │ Preheat coil plant type (see codes below)        _   │         │
            │                                                      │         │
            │ │Preheat Availability                                │         │
          │  Outside temperature above which preheat is off     ___ °F       │
            │  Preheat available beginning month #                _         │
            │  Preheat available ending month #                   _         │
            │                                                          │         │
            │ │Preheat Discharge Conditions                            │
          │  Design preheat coil discharge temperature          ___ °F       │
               │                                                       │
               │----------------------------------------------------------│
               │             Preheat Coil Plant Types               │
          │    0=None     1=Boiler     2=Electric Resistance     3=District Heat   │
               │----------------------------------------------------------│
```

Preheat coil plant type
> Enter number 0-3 to define the energy source for preheat. Choose from the following:
>> 0 - none
>> 1 - boiler
>> 2 - electric resistance
>> 3 - district heat
>
> Entering `0' indicates that your system has no preheating, and therefore the rest of the questions on this screen do not apply. Otherwise, answer the following questions.

Outside temperature above which preheat is off
> Enter degrees F. This is the maximum outside temperature at which preheating is available. See Note below.

Preheat available - beginning month #
> Enter number 1-12. Month number when preheating first available, inclusive (e.g., 9 means that preheating is available beginning Sept. 1). See Note below.

Preheat available - ending month #
> Enter number 1-12. Month number when preheating last available, inclusive (e.g., 3 means that preheating is available until March 31).
>
> *Note*: For preheating to be available, both the outside temperature and the monthly availability criteria must be satisfied.

Design preheat coil discharge temperature
> Enter degrees F. When the calculated mixed air temperature is lower than this value, and preheat energy is available (specified above), preheat coil energy will be used to raise the mixed air temperature to the preheat coil discharge temperature.

6.6.6 Screen F: Humidification (one screen per system)

On this screen you enter the humidification plant type, monthly availability, and design conditions.
This screen appears once per system for the following system types: DDMZ, CVRH,

SIHUMDAT

```
┌──────────────────────────────────────────────────────────────────────────────┐
│ │SYSTEMS DATA: HUMIDIFICATION PARAMETERS FOR SYSTEM:                        │  │
│    │System Label:                                    File:               │     │
│    │----------------------------------------------------------------------│    │
│    │Energy Source for Humidification                          │           │    │
│   │  Humidification plant type (see codes below)           _  │          │     │
│   │                                                           │         │      │
│       │Humidification Availability                             │        │      │
│  │  Outside temperature above which humidification is off   ___ °F    │        │
│    │  Humidification available beginning month #             __       │        │
│     │  Humidification available ending month #                __      │         │
│    │  Humidification available during unoccupied cycle (Y/N)  _       │         │
│        │                                                      ⌐         │       │
│        │Humidification Discharge Conditions                   │         │       │
│  │  Minimum relative humidity maintained (% RH)            __  % RH    │        │
│          │                                                  │          │        │
│          │------------------------------------------------------------│         │
│          │             Humidification Plant Types                     │         │
│  │ 0=None    1=Boiler      2=Electric Resistance     3=District Heat   │        │
│          │------------------------------------------------------------│         │
└──────────────────────────────────────────────────────────────────────────────┘
```

Humidification plant type
        Enter number 0-3. Enter the energy source for humidification, using numbers
        from the following list:
                0 - none
                1 - boiler
                2 - electric resistance
                3 - district heat

        Entering `0' indicates that you have no humidification, and therefore the rest
        of the questions on this screen do not apply. Otherwise, answer the next five
        questions.

Outside temperature above which humidification if off
        Enter degrees F. This is the maximum outside temperature at which
        humidification is available. See Note below.

Humidification available - beginning month #
        Enter number 1-12. Month number when humidification first available,
        inclusive (e.g., 10 means humidification is available beginning Oct 1). See
        Note below.

Humidification available - ending month #
        Enter number 1-12. Month number when humidification last available,
        inclusive (e.g., 4 means humidification is available through April 30).

        Note: For humidification to be available, both the outside temperature and the
        monthly availability criteria must be satisfied.

Minimum relative humidity maintained
        Enter percent. When the calculated return air humidity, without
        humidification, would result in return air humidity levels below this value, and
        humidification is available, energy will be used to raise the discharge air

humidity so that the return air humidity is maintained at this level.

Note that ASEAM3.0 performs a moisture balance on the system. That is, the space or zone humidity level and, therefore, return air humidity level, are determined by considering the effects of moisture gains in the space (through people and miscellaneous sources), infiltration latent load, ventilation air flow, outside air humidity level, and discharge humidity (when latent cooling). ASEAM3.0 uses return air humidity, not individual zone humidity, to activate humidification.

6.6.7 Screen G: Baseboard (one screen per system)

On this screen you define the baseboard plant type, when baseboard heating is available, and the control type and capacity for the heaters.

This screen appears once per system for the following system types: DDMZ, CVRH, VAVR, CBVAV, SZRH, FCU, WSHP, AAHP, BB, HV.

```
                                SIBBDAT
   ┌──────────────────────────────────────────────────────────────────────┐
   │   │SYSTEMS DATA: BASEBOARD PARAMETERS FOR SYSTEM:              │      │
   │       │System Label:                            File:          │      │
   │       ----------------------------------------------------------------│
   │       │Energy Source for Baseboard                        │          │
   │       │ Baseboard plant type (see codes below)        _  │          │
   │       │                                                   │          │
   │          │Baseboard Availability                          │          │
   │       │ Outside temperature above which baseboard is off    ___ °F   │ │
   │          │ Baseboard available beginning month #       _     │      │
   │          │ Baseboard available ending month #          _     │      │
   │          │                                                   │      │
   │          │Baseboard Control and Capacity                     │      │
   │             │ Baseboard control type                  _     │      │
   │       │   (1 = thermostatic   2 = reset by outside temperature)  │  │
   │          │                                                   │      │
   │       │Percent of design heating load satisfied at design winter  ___ %  │ │
   │       │Percent of design heating load satisfied at balance temp    __ %  │ │
   │          │                                                       │  │
   │          │----------------------------------------------------------│
   │          │               Baseboard Plant Types                      │
   │       │  0=None     1=Boiler     2=Electric Resistance    3=District Heat │
   │          │----------------------------------------------------------│
   └──────────────────────────────────────────────────────────────────────┘
```

Baseboard plant type
        Enter number 0-3. This defines the energy source for the baseboard heaters. Choose from the following list:
                0 - none
                1 - boiler
                2 - electric resistance
                3 - district heat

        Entering `0' indicates that you have no baseboard heaters, and therefore the rest of the questions on this screen do not apply. Otherwise, answer the following questions.

Outside temperature above which baseboard if off
> Enter degrees F. This is the maximum temperature at which baseboard heating is available. See Note below.

Baseboard available - beginning month #
> Enter number 1-12. Month number when baseboard heating is first available, inclusive (e.g., 9 means that baseboard heating is available beginning Sept. 1). See Note below.

Baseboard available - ending month #
> Enter number 1-12. Month number when baseboard heating is last available, inclusive (e.g., 4 means that baseboard heating is available until Apr. 30).

> *Note*: For baseboard heating to be available, both the outside temperature and the monthly availability criteria must be satisfied.

Baseboard control type
> Enter `1' for thermostatic baseboard control; `2' for outdoor air reset baseboard control. When baseboard heating is combined with another primary system, ASEAM3.0 can simulate two different methods of controlling the baseboard output:

> 1. *Thermostatic*: In this case, the heating output of the baseboard follows the load profile. That is, the baseboard will attempt to satisfy the zone heating load, if it can. Three cases may occur:

>> (a) If the zone heating load is greater than the baseboard capacity, the baseboard heating system will be at full capacity. The zone heating load on the heating system (e.g., dual duct) will be reduced by the amount of the baseboard output. The primary, therefore, makes up the difference between the zone heating load and the baseboard output.

>> (b) If the zone heating load is less than or equal to the baseboard capacity, the baseboard system is assumed to satisfy the complete heating load, and the main heating system load is set at zero. Depending on the system type (unitary or central) and the ventilation requirements, the main unit may still be operating continuously and consuming heating energy for the outside air intake.

>> (c) If the zone has a cooling load, ASEAM3.0 will simulate that the thermostatic baseboard will be off, and there will be no effect on the main heating or cooling system.

> 2. *Reset on outdoor air temperature*: The baseboard's heating output is reset on the outside air temperature. In this case, the baseboard heating output is solely dependent on outside air temperature, *not* the space heating load.

> Although the thermostatic baseboard method will never "overheat" the zone by adding more heat than necessary, the reset baseboard method can be used to simulate "wild" baseboard (such as hot water temperature reset controls for the baseboard supply water) or overheating by baseboard. As with the thermostatic method, the zone load on the primary heating system (e.g., dual duct) will be adjusted according to the amount of the baseboard

output. If the baseboard heating output is *more* than the space heating load, the primary system will experience a cooling load.

Percent of design heating load satisfied at design winter
>   Enter percent. This is the percent of the design heating load satisfied by the baseboard units at design winter conditions.

The following data are needed only for systems with outdoor air reset control:

Percent of design heating load satisfied at balance temperature
>   Enter percent. This is the percent of the design heating load satisfied at the balance temperature, which is defined to be the outdoor air temperature at which the building experiences no net heating load. Note that the temperature cutoff availability criteria may be used to turn off the baseboard.

6.6.8 Screen H: Fans (one screen per system)

On this screen you define the central fan sizes, fan temperature rises, and fan control methods. If you do not know these values, leave the spaces blank, and ASEAM3.0 will autosize the fans.

This screen appears once per system for the following central fan system types: DDMZ, CVRH, VAVR, CBVAV, SZRH, HV. The fan input data for the unitary systems are entered on Screen M. Unitary systems have a separate fan for each zone.

```
                            SIFANDAT
┌─────────────────────────────────────────────────────────────────────────┐
│        │SYSTEMS DATA: FAN PARAMETERS FOR SYSTEM:                      │    │
│        │System Label:                              File:         │         │
│        │-------------------------------------------------------------│     │
│        │Supply Fans                                             │         │
│    │  Total supply fan power required (blank=default)     ___   KW      │    │
│    │    (or) Supply fan power per 1000 CFM                ___  KW/1000 CFM│ │
│    │   Supply fan temperature rise (blank=default)         ___  °F     │    │
│        │                                                  ─┬─          │
│           │Return Fans                                   │         │
│    │  Total return fan power required (blank=default)     ___   KW      │    │
│    │    (or) Return fan power per 1000 CFM                ___  KW/1000 CFM│ │
│    │   Return fan temperature rise (blank=default)         ___  °F     │    │
│           │                                              ─┬─          │
│    │  (VAV) Minimum percent of design air volume when heating  ___  %    │ │
│        │    (VAV) Air volume control method              _      │         │
│    │  (1=Variable Speed   2=Discharge Dampers   3=Inlet Vanes)       │    │
│           │                                                  │         │
│        │Fan Control Methods  (See Codes Below)              │         │
│        │ Occupied cycle fan control method           _      │         │
│        │ Unoccupied cycle fan control method         _      │         │
│        │-----------------------------------------------------------│     │
│        │                Fan Control Methods              │         │
│    │         1=On Continuously     2=Cycles with load        │    │
│        │-----------------------------------------------------------│     │
└─────────────────────────────────────────────────────────────────────────┘
```

Total supply fan power required
>   Enter kilowatts. This is the total supply fan power required. If you do not know this value, leave the question blank, and a default value will be used.

Supply fan power per 1000 CFM
> Enter kilowatts per 1000 CFM. The supply fan power can also be specified this way. This input is not required if you have filled in a value or wish autosizing, above. A value entered here has precedence over the autosizing option, above.

Supply fan temperature rise
> Enter degrees F. This is the temperature rise in the air flow across the supply fan. If you leave this line blank, the temperature rise will be defaulted. ASEAM3.0 assumes that the coil location is blow through (i.e., fan is located upstream of the cooling coil).

Total return fan power required
> Enter kilowatts. This is the total return fan power required. If you do not know this value, leave the question blank, and a default value will be used. If you do not have a return fan, enter `0'.

Return fan power per 1000 CFM
> Enter kilowatts per 1000 cfm. The return fan power can also be specified this way. This input is not required if you have filled in a value or wish autosizing, above. A value entered here has precedence over the autosizing option, above.

Return fan temperature rise
> Degrees F. This is the temperature rise in the air flow across the return fan. If you leave this line blank, the return fan temperature rise will be defaulted.

The next two questions apply to variable air volume systems only.

Minimum percent of design air volume when heating
> Enter percent. During periods of minimal cooling loads or heating loads, variable air volume systems reduce the quantity of cool air delivered to the zone. Usually, in order to provide adequate air movement, and ventilation, the flow rate reduction is limited to around 50% of design air flow. If this reduced air flow still overcools the space, ASEAM3.0 assumes reheat energy is used to deliver the required discharge temperature.

Air volume control method
> `1'=variable speed; `2'=discharge dampers; `3'=inlet vanes.   One of these methods of regulating the volume of air delivered by the supply fan to the spaces must be entered. Note that ceiling bypass VAV systems (CBVAV) have constant flow through the supply fans, and, therefore, this question will not be asked.

The following questions refer to the method of fan control:

Occupied cycle fan control method
> `1'=on continuously; `2'=cycles with load. This question is not asked for central fan system types (DDMZ, CVRH, VAVR, CBVAV, SZRH), since ASEAM3.0 assumes that larger central fan systems serving multiple zone systems must stay on during occupied periods for ventilation requirements. Only unitary fan systems are permitted to cycle during the occupied cycle.
>
> You must choose one of these operating methods. It should be noted that the

energy consumption calculated, and the assumptions ASEAM3.0 uses for the calculations, are entirely different.

If the first option (continuous operation) is chosen, ASEAM3.0 calculates the discharge temperature that is needed for the hourly zone load assuming the unit operates for the full hour. With this method, ventilation air will also be introduced for the full hour.

If the second option (cycling operation) is chosen, ASEAM3.0 calculates the required operating time assuming that the discharge temperature is at the design cooling or heating temperature, depending on the load. With this method, ventilation air will only be introduced while the system is operating, which can be minimal during low-load conditions.

Unoccupied cycle fan control method
`1'=on continuously; `2'=cycles with load. This question is asked for all systems except baseboard.

6.6.9 Screen I: Outside Air Controls (one screen per system)

On this screen you define the parameters related to outside air intake.

This screen appears once per system for the following system types: DDMZ, CVRH, VAVR, CBVAV, SZRH, FCU, WSHP, AAHP, HV, WAC.

```
                              SIOACDAT
 ┌─────────────────────────────────────────────────────────────────────┐
 │  │SYSTEMS DATA: OUTSIDE AIR PARAMETERS FOR SYSTEM:              │    │
 │     │System Label:                              File:          │    │
 │     │----------------------------------------------------------│    │
 │      │Occupied Cycle Only                                      │    │
 │   │ Outside air damper control method (see codes below)   _    │    │
 │    │  Minimum percent outside air intake              ___ %     │    │
 │    │  Dry bulb switchover temperature                 ___ °F    │    │
 │         │                                                │           │
 │        │Unoccupied Cycle Only                            │          │
 │   │ Outside air damper control method (see codes below)   _    │    │
 │    │  Minimum percent outside air intake              ___ %     │    │
 │    │  Dry bulb switchover temperature                 ___ °F    │    │
 │         │                                       │                   │
 │         │------------------------------------------------------│    │
 │         │           Outside Air Damper Control Methods         │    │
 │   │  1=No Outside Air   2=Fixed Dampers    3=Dry Bulb    4=Enthalpy │ │
 │         │                              (Economizer)  (Economizer) │  │
 │         │------------------------------------------------------│    │
 └─────────────────────────────────────────────────────────────────────┘
```

The following questions are asked twice, once for the occupied cycle and once for the unoccupied cycle:

Outside air damper control method
Enter number 1-4. Choose the method of outside air damper control from the following list:
1 - no outside air
2 - fixed dampers

3 - dry-bulb (economizer)
4 - enthalpy (economizer)

While any of the above four options can be selected for any system, it should be noted that only options 1 and 2 are generally applicable to unitary systems.

Economizer cycle controls permit additional outside intake during cooler weather to eliminate or reduce mechanical cooling requirements. When the outside air temperature becomes warm or humid, possibly increasing the cooling requirement, two methods are generally used to switch the outside air dampers to minimum position:

> *Enthalpy Economizer*: Outside air dampers return to minimum position when the outside air enthalpy is larger than the return air enthalpy. Thus, both temperature and humidity levels (enthalpy) are used in determining the proper damper position.

> *Dry-Bulb Economizer*: When outside air temperature exceeds the "switchover" temperature, the outside dampers return to minimum position.   Generally this value is slightly lower than the return air temperature.

A mixed air controller (without a true "switchover" to minimum outside air) can be simulated by using the dry-bulb economizer option and setting the dry-bulb switchover temperature to 120 degrees.

Note that economizer cycles are assumed to be "sequenced" with the cooling discharge temperature. For example, if ASEAM3.0 calculates that a 60 degree cooling temperature is necessary, and this temperature could be achieved through the correct mixture of return and cool outside air, the outside dampers will be opened the proper amount.

Minimum percent outside air intake
Enter percent. This input data will be required except when no outside air intake is indicated above. For variable air volume systems (VAVR), where the system total air flow varies with the load, a minimum amount (not percent) of outside air intake is used. For example, if 20% is indicated as the minimum percent outside air, and the design air flow is 50,000 CFM, then at least 10,000 CFM (20% of 50,000) of outside air will be introduced through the outside air dampers, regardless of the system air flow volume and loads.

Dry-bulb switchover temperature
Enter degrees F. If a dry-bulb economizer is indicated as the outside air damper control method, this question is asked. When the outside air temperature exceeds this value, the outside air dampers will return to their minimum position value as defined above.

6.6.10 Screen J: Heat Pump Cooling (one screen per system)

On this screen you define the heat pump cooling parameters. This screen appears once per system for the following system types: WSHP, AAHP, WAC.

SIHPCDAT

```
┌─────────────────────────────────────────────────────────────────────────┐
│  │SYSTEMS DATA: HEAT PUMP COOLING PARAMETERS FOR SYSTEM:              │   │
│     │System Label:                            File:             │        │
│     │----------------------------------------------------------------│    │
│       │Heat Pump Cooling Capacity (Total Cooling)            │          │
│       │ Zonal total cooling capacity method              _    │          │
│       │  (1=Capacities Entered by Zone  2=Autosized)          │         │
│       │  (if autosized)  Percent of design total load satisfied    %   │ │
│          │                                              ┬            │    │
│       │Heat Pump Cooling Capacity (Sensible Cooling)        │          │
│       │ Zonal sensible cooling capacity method           _    │         │
│       │  (1=Capacities Entered by Zone  2=Autosized)          │        │
│       │  (if autosized)  Percent of design sensible load satisfied  %  ││
│          │                                              ┬            │    │
│          │Cooling Performance                              │         │   │
│       │  Design coefficient of performance              ┬─┬          │   │
│          │                                              ┴            │   │
│          │Water Source Heat Pump Only                      │         │   │
│       │  Outside temperature at minimum fluid loop temperature    °F  │ │
│          │    Minimum fluid loop temperature          __   °F    │       │
│       │  Outside temperature at maximum fluid loop temperature    °F  │ │
│          │     Maximum fluid loop temperature          __  °F    │       │
│          │                                              ┴            │   │
└─────────────────────────────────────────────────────────────────────────┘
```

Zonal total cooling capacity method
>   Enter `1' for capacities entered by zone; `2' for autosizing. You must choose one of these methods for entering *total* (sensible plus latent) cooling capacity. If you select the first option, a separate input screen will appear later on which you will specify each zone's *total* cooling capacity. If you choose to "autosize" the total cooling capacity, the next question is asked.

Percent of design total load satisfied
>   Enter percent. When autosizing is selected, you can specify the equipment's total cooling capacity as a percent of the calculated peak cooling load. A value of 100 (%) for this input indicates "perfect" sizing. Values greater than 100(%) indicate oversizing. Note that *all* zones assigned to this system would be sized by this input question.

Zonal sensible cooling capacity method
>   Enter `1' for capacities entered by zone; `2' for autosizing. You must choose one of these methods for entering the *sensible* cooling capacity *only*. If you select the first option, a separate input screen will appear later on which you specify each zone's sensible cooling capacity. If you choose to "autosize" the total cooling capacity, the next question is asked.

Percent of design sensible load satisfied
>   Enter percent. When autosizing is selected, this question allows you to specify the equipment's sensible cooling capacity as a percent of the peak cooling load. A value of 100(%) for this input indicates "perfect" sizing. Values greater than 100(%) indicate oversizing. Note that *all* zones assigned to this system would be sized by this input question.

Design coefficient of performance
>   Dimensionless. Note that the COP under ARI rating conditions is requested. ASEAM3.0 calculates the bin efficiency or COP using algorithms found in DOE

systems and plant programs.

The next four questions are asked for water-source heat pump systems only. They define the water loop reset schedule (as a function of outside air temperature).

Outside temperature at minimum fluid loop temperature
> Enter degrees F. When the outside temperature is below this value, ASEAM3.0 assumes that the fluid temperature remains constant at the minimum fluid temperature (next question). This is accomplished by adding heat to the water loop through the heating energy source specified on the heating screen.

Minimum fluid loop temperature
> Enter degrees F. This is the minimum fluid loop temperature maintained at or below the outside temperature specified above.

Outside temperature at maximum fluid loop temperature
> Enter degrees F. When the outside temperature is above this value, the water loop temperature is assumed to be controlled at the maximum fluid temperature (next question). The plant type for this cooling requirement (usually a cooling tower) is specified earlier on the cooling screen.

Maximum fluid loop temperature
> Enter degrees F. This is the maximum fluid loop temperature maintained at or above the outside temperature specified above.

By answering all the fluid temperature inputs, a reset schedule is generated that can model earth-coupled as well as groundwater heat pumps. While the dynamic hour-by-hour calculation methods can use previously calculated hourly water temperature values to more accurately simulate the water loop, the modified bin method will not permit this dynamic modeling.

6.6.11 Screen K: Heat Pump Heating (one screen per system)

On this screen you enter the parameters for a heat pump heating system. This screen appears only for water-source or air-to-air heat pumps.

```
                                    SIHPHDAT

 ┌───────────────────────────────────────────────────────────────────────┐
 │SYSTEMS DATA: HEAT PUMP HEATING PARAMETERS FOR SYSTEM:            │
 │      System Label:                          File:               │
 │      ----------------------------------------------------------------│
 │      Heat Pump Heating Capacity                              │
 │       Zonal heating capacity method                    _    │
 │  │    (1=Capacities Entered by Zone  2=Autosized)           │
 │  │    (if autosized)  Percent of max heat pump load satisfied    ___ %   │
 │  │                                                    │
 │      Air/Air Heat Pump Backup                           │
 │  │   AAHP backup heating source                    _    │
 │  │     (1=Furnace     2=Electric Resistance)               │
 │  │                                                    │
 │  │ Outside temperature below which backup heating is on        ___ °F   │
 │  │                                                    │
 │  │ Zonal electric resistance backup heating capacity method    _     │
 │  │      (1=Capacities Entered by Zone  2=Autosized)           │
 │  │      (if autosized)  Percent of design heating load satisfied   ___ %   │
 │  │                                                  │
 └───────────────────────────────────────────────────────────────────────┘
```

│Heating Performance |
│ Design heating coefficient of performance |

Zonal heating capacity method
>Enter `1' for capacities entered by zone; `2' for autosizing. You must choose one of these methods for entering the heating capacity of the heat pump.
>
>*Note*: Only the *heat pump* capacity is requested. Do *not* include any auxiliary backup heating capacity. If you select the first option, a separate input screen will appear later on which you will specify each zone's heat pump heating capacity. If you choose to autosize the zone capacity, the next question is asked.

Percent of max. heat pump load satisfied
>Enter percent. When autosizing is selected, this question allows you to specify the equipment's total heat pump heating capacity as a percent of calculated maximum heat pump load. If an air-to-air heat pump has been specified, normally a backup source of heating is used during colder weather when air source heat pumps cannot extract heat efficiently. For this reason, the backup heating source and changeover temperature questions are asked next. For purposes of sizing the heat pump capacity, however, the design heating load on the heat pump is the calculated load at the changeover temperature (while heating is still provided by the heat pump). A value of 100(%) for this input indicates "perfect" sizing. Values greater than 100(%) indicate oversizing. Note that *all* zones assigned to the system would be used in sizing this input.

The following four questions are asked for air-to-air heat pumps only:

AAHP backup heating source
>Enter `1' for furnace; `2' for electric resistance. This defines the source of backup heating for the heat pump. If you select a furnace (e.g., an add-on heat pump), questions pertaining to furnaces will be asked on a different screen.

Outside temperature below which backup heating is on
>Enter degrees F. This is the minimum outdoor temperature at which the heat pump operates. ASEAM3.0 assumes that the air-to-air heat pump is heating either in the heat pump mode (with no supplemental backup) or heating completely with the backup source (no heat provided by the heat pump).

Zonal electric resistance backup heating capacity method
>`1' for capacities entered by zone; `2' for autosizing. This question defines the method of backup heating capacity, if the backup heating source for the AAHP is electric. The capacity of the backup source determines the amount of cycling by the unit.

Percent of design heating load satisfied
>Enter percent. If autosizing is selected for the above, this question is asked. Enter the percent of the design zone heating load. A value of 100% represents perfect sizing.

Design heating coefficient of performance
> Dimensionless. Since ASEAM3.0 uses algorithms from the DOE program, the calculated heating efficiency changes in each bin. Note that the heating COP under ARI rating conditions is requested (47 degrees F).

6.6.12 Screen L: Furnace (one screen per system)

On this screen you define the furnace parameters, such as fuel source, capacity, efficiency, and losses.

This screen appears once for each system that uses a furnace as the heating energy source, or if the backup heating source for an air-to-air heat pump system is a furnace.

```
                          SIFURNDAT
 ┌──────────────────────────────────────────────────────────────────┐
 │  │SYSTEMS DATA: FURNACE PARAMETERS FOR SYSTEM:                 │   │
 │  │  System Label:                            File:            │   │
 │  │  ----------------------------------------------------------│   │
 │  │ Furnace Energy Source                                      │   │
 │  │  Furnace fuel source (see codes below)          _         │   │
 │  │     │                                                      │   │
 │  │ │Furnace Heat Output                                       │   │
 │  │  Furnace capacity (blank=autosize)       _____  KBTUH    │   │
 │  │    (if autosized) Percent of design load satisfied  ___  % │   │
 │  │     │                                                      │   │
 │  │  │Furnace Efficiency                                       │   │
 │  │  Furnace efficiency at design load           ___  %       │   │
 │  │     │                                                      │   │
 │  │  │Furnace Losses                                           │   │
 │  │  Losses as percent of design load (at design load)  ___  % │   │
 │  │  Losses as percent of design load (at no load)   ___  %   │   │
 │  │   Pilot gas annual consumption           ___  therms     │   │
 │  │     │                                                      │   │
 │  │  ----------------------------------------------------------│   │
 │  │                    Furnace Fuel Codes                      │   │
 │  │   1=Electric   2=Natural Gas   3=#2 Oil   4=#4 Oil   5=#6 Oil │ │
 │  │  ----------------------------------------------------------│   │
 └──────────────────────────────────────────────────────────────────┘
```

Furnace fuel source
> Enter number 1-5. Define the fuel source of the furnace from the following:
> > 1 - electric
> > 2 - natural gas
> > 3 - #2 oil
> > 4 - #4 oil
> > 5 - #6 oil

Furnace capacity
> Enter KBTUH. Enter the furnace capacity here, if known. Note that the requested input value is in *output* heating energy, not input energy rate. If you do not know the capacity, leave this line blank, and the furnace will be autosized.

Percent of design load satisfied
> Enter percent. When autosizing is selected for the furnace capacity, you will be asked for the percent of the calculated maximum heating load that the

furnace can satisfy. A furnace that can just satisfy the calculated maximum heating load, but no more, would have a value of 100(%). You can undersize the heating capacity (values less than 100%) or substantially oversize it.

If the furnace (or any other equipment) is undersized for the load under consideration, ASEAM3.0 will not calculate any additional energy that is required. Thus, a 50,000 BTUH furnace under a 60,000 BTUH load will still only consume 50,000 BTUH. If the furnace or other equipment is oversized for the load, ASEAM3.0 will calculate the decrease in efficiency that results from lower part-load operation.

Furnace efficiency at design load
Enter Percent. ASEAM3.0 uses efficiency and COP algorithms used by the DOE systems and plant programs, and, therefore, the actual bin efficiency or COP is a function of several variables:

■ Load on equipment: includes actual space loads or system requirements and any inefficiencies specified.

■ Equipment capacities: In many cases, the equipment heating or cooling capacity is adjusted on a bin-by-bin basis. For example, window air conditioners and heat pump cooling capacities are increased in moderate weather conditions.

■ Curve fit equations: In general, the operating efficiency is adjusted via curve fit coefficients that may use part-load ratio as the independent variable.

■ Design efficiencies: Based upon the operating efficiency at design conditions, the operating efficiency at other conditions is calculated.

Losses as percent of design load (at design load)
Enter percent of capacity. For the furnace heating systems, as well as other heating equipment, additional loads besides the space or system load can occur. Examples include keeping a boiler operating under minimal load conditions, uninsulated heating ducts, and steam trap losses. See Note below.

Losses as percent of design load (at no load)
Enter percent of design load.

Note: To allow you to enter these losses, the above two questions are asked. Furnace system losses are represented via a reset schedule, with losses (in percent of design load) calculated as a linear function of the outside air temperature.

These losses are considered the same as a load, and not as direct additional consumption. Thus a 1 BTUH loss entered in this manner, with an operating efficiency of 50%, will result in a 2 BTUH increase in consumption.

Pilot gas annual consumption
Enter therms. When gas furnaces are specified, the annual consumption of the pilot should be entered.

6.6.13 Screen M: Zone Air (one screen per system)

On this screen you define the zone air flow parameters. This screen is displayed for both unitary and central air systems, and is used to determine the amount of air flowing in each assigned zone. The fan power input questions apply only to unitary systems.

```
                            SIAIRDAT
┌──────────────────────────────────────────────────────────────────────┐
│       │SYSTEMS DATA: ZONE AIR PARAMETERS FOR SYSTEM:          │       │
│            │System Label:                        File:     │          │
│            │------------------------------------------------------│    │
│            │Zone Air Flow Sizing                          │          │
│            │  Zonal air volume method                _    │          │
│            │ (1=Air Flows Entered by Zone    2=Autosized)  │          │
│            │ (if autosized)  Percent of design default air flow   __ %  │
│            │                                          │               │
│            │Zone Fan Power                            │               │
│            │  Zonal fan power method                  _    │          │
│            │ (1=Zone Fan KW Entered by Zone    2=Autosized)  │        │
│            │ (if autosized)  Percent of design default fan KW    __ %  │
│            │                                          │               │
└──────────────────────────────────────────────────────────────────────┘
```

Zonal air volume method
        `1' for air flows entered by zone; `2' for autosizing. You must choose one of these methods for entering the zone air flow. If you select the first option, a separate input screen will appear later on which you will specify the air flow of each assigned zone. If you choose autosizing, the next question is asked.

Percent of design default air flow
        Enter percent. When autosizing is selected, you can specify the air flow of each zone as a percent of required air flow, as calculated using the peak cooling load along with space and minimum cooling supply temperatures entered previously. A value of 100% indicates perfect sizing. Values greater than 100% indicate oversizing. All zones assigned to this system will be sized in the same manner by this input.

The following two questions pertain only to unitary systems:

Zonal fan power method
        `1' for zone fan KW entered by zone; `2' for autosizing. You must choose one of these methods for entering the zone fan power requirements (in KW). If you choose the first option, a separate input screen will appear later on which you will specify the fan power requirements of each assigned zone. If you choose to autosize the fan KW, the next question will be asked.

Percent of design default fan KW
        Enter percent. If you autosize the fan KW, you can specify the fan power of each zone, as a percent of the DOE program default values for KW per CFM air flow. A value of 100% here will utilize the DOE default values for KW per CFM. Values greater than 100% indicate proportionately more power for the air flow of this zone. All zones assigned to this system will be sized the same by this input.

6.6.14 Screen N: Direct Expansion Cooling (one screen per system)

On this screen you define the direct expansion input parameters. This screen is accessed only if you choose DX as the cooling source on screen D.

SIDXDAT

```
┌──────────────────────────────────────────────────────────────────────┐
│ │SYSTEMS DATA: DIRECT EXPANSION COOLING PARAMETERS FOR SYSTEM:      │  │
│         │System Label:                             File:         │     │
│         │------------------------------------------------------- │     │
│         │DX Cooling Capacity (Total Cooling)              │            │
│      │  DX total cooling capacity (blank=autosized)         ____  tons │ │
│      │   (if autosized)  Percent of design total load satisfied   %  │ │
│         │                                            ⊤          │     │
│         │Cooling Performance                         │            │
│      │  Design coefficient of performance          ___         │     │
│      │  Minimum unloading ratio (% of capacity)     _    %     │     │
│      │  Minimum hot gas bypass ratio (% of capacity)    _    %     │     │
│         │                                            ⊤          │     │
│         │DX Condenser                               │            │
│      │  Condenser fan KW (blank=default)          __   KW      │     │
│      │ Outside temperature below which condenser fan is off  __   °F  │ │
│         │                                            │            │     │
└──────────────────────────────────────────────────────────────────────┘
```

DX total cooling capacity
> Enter in tons if capacity is entered. Leave `Blank' for autosizing. You must choose one of these methods for entering the total capacity. If you choose to autosize the total cooling capacity, the next question is asked.

Percent of design total load satisfied
> Enter percent. When autosizing is selected, this question allows you to specify the equipment's total cooling capacity as a percent of the calculated peak load. A value of 100 (%) for this input indicates perfect sizing. Values more than 100 (%) would indicate oversizing.

Design coefficient of performance
> Dimensionless. Note that the COP under ARI rating conditions is requested. ASEAM3.0 calculates the bin efficiency or COP using algorithms found in the DOE systems and plant programs.

Minimum unloading ratio (% of capacity)
> Enter percent. When the calculated part-load operating ratio is less than this value, the compressor unloading stops and hot gas bypass begins, palse loading itself to this minimum part load ratio.

Minimum hot gas bypass ratio (% of capacity)
> Enter percent. When the calculated part load operating ratio is less than this value, the hot gas bypass stops and the eqipment cycles on an off to meet the load. The minimum hot gas bypass ratio should be equal to or less than the minimum unloading ratio. If these values are equal, there is no hot gas bypass capability, and the equipment moves from the unloading immediately to cycling. If both values are 100 (70) the unit does not unload and cycles from full load down to zero load.

Condenser fan KW
> Enter KW or leave blank for autosizing. If the condenser fan KW is known, enter the fan KW; otherwise leave this entry blank, and ASEAM3.0 will use a default value.

Outside temperature below which condenser fan is off
> Enter degrees F. When the outside temperature falls below this value, the condenser fan is assumed to be off.

6.6.15 Screen O: Zone CFM (one screen per system)

This screen allows you to enter the air flow rates to each zone assigned to a system. This screen is accessed only if you chose "Air Flows Entered by Zone" (not autosizing) on Screen M.

The input screen is self-explanatory. The zone numbers and labels (from the loads input) are printed at the left side of the screen, and you enter the zone CFM for each zone on the right side of the screen.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│       │SYSTEMS DATA: ZONE CFM FOR SYSTEM:                            │        │
│       │   System Label:                                  File:       │        │
│       │   ----------------------------------------------------------------    │
│       │Loads     Zone Name                          Zone    │                 │
│       │Zone #    or Label                           CFM     │                 │
│       │     │                                      _____    │                │
│   │   ┌──────────────────────────────────────────────┐   _____   │         │
│   │   │ NOTE - THE ZONE NUMBER AND LABEL FOR EACH ZONE │           │         │
│   │ │ │      ASSIGNED TO THIS SYSTEM IS PRINTED HERE │    _____   │         │
│   │ │ └──────────────────────────────────────────────┘   _____   │         │
│       │                                             │                        │
│       │                                             │                        │
└─────────────────────────────────────────────────────────────────────────────┘
```


6.6.16 Screen P: Zone Fan KW (one screen per system)

This screen allows you to enter the fan KW required for each zone of a unitary system. This screen is accessed only if you chose "Zone Fan KW Entered by Zone" (not autosizing) on Screen M.

The input screen is self-explanatory. The zone numbers and labels (from the loads input) are printed at the left side of the screen, and you enter the zone Fan KW for each zone on the right side of the screen.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│       │SYSTEMS DATA: ZONE FAN KW FOR SYSTEM:                         │        │
│       │   System Label:                                  File:       │        │
│       │   ----------------------------------------------------------------    │
│       │Loads     Zone Name                          Zone    │                 │
│       │Zone #    or Label                           Fan KW  │                 │
│       │     │                                      _____    │                │
│   │   ┌──────────────────────────────────────────────┐   _____   │         │
│   │   │ NOTE - THE ZONE NUMBER AND LABEL FOR EACH ZONE │           │         │
│   │ │ │      ASSIGNED TO THIS SYSTEM IS PRINTED HERE │    _____   │         │
│   │ │ └──────────────────────────────────────────────┘   _____   │         │
│       │                                             │                        │
│       │                                             │                        │
└─────────────────────────────────────────────────────────────────────────────┘
```

6.6.17 Screen Q: Zone Total Cooling Capacity (one screen per system)

This screen allows you to enter the total cooling capacity (both sensible and latent) for each zone of a unitary system. This screen is accessed only if you chose "Capacities Entered by Zone" (not autosizing) on Screen J, and applies only to WSHP, AAHP, and WAC systems.

The input screen is self-explanatory. The zone numbers and labels (from the loads input) are printed at the left side of the screen, and you enter the total cooling capacity in tons, for each zone on the right side of the screen.

```
 ┌─────────────────────────────────────────────────────────────────────────┐
 │  │SYSTEMS DATA: ZONE TOTAL CLG FOR SYSTEM:                     │         │
 │        │System Label:                             File:       │          │
 │        │-----------------------------------------------------------------│
 │      │Loads      Zone Name                        Zone Total Clg │       │
 │      │Zone #     or Label                         Capacity (Tons) │      │
 │           │                                          _____    │          │
 │ │  ┌──────────────────────────────────────────┐               │    │     │
 │ │  │ NOTE - THE ZONE NUMBER AND LABEL FOR EACH ZONE │     _____     │    │
 │ │  │     ASSIGNED TO THIS SYSTEM IS PRINTED HERE │   _____      │  │      │
 │ └──└──────────────────────────────────────────┘           _____   │    │
 │           │                                                 │         │
 │           │                                                 │         │
 └─────────────────────────────────────────────────────────────────────────┘
```

6.6.18 Screen R: Zone Sensible Cooling Capacity (one screen per system)

This screen allows you to enter the total sensible cooling capacity for each zone of a unitary system. This screen is accessed only if you chose "Capacities Entered by Zone" (not autosizing) on Screen J, and applies only to WSHP, AAHP, and WAC systems.

The input screen is self-explanatory. The zone numbers and labels (from the loads input) are printed at the left side of the screen, and you enter the total sensible capacity in tons, for each zone on the right side of the screen.

```
 ┌─────────────────────────────────────────────────────────────────────────┐
 │  │SYSTEMS DATA: ZONE SENS CLG CAPACITY FOR SYSTEM:             │         │
 │        │System Label:                             File:       │          │
 │        │-----------------------------------------------------------------│
 │      │Loads      Zone Name                        Zone Sens Clg │        │
 │      │Zone #     or Label                         Capacity (Tons) │      │
 │           │                                          _____    │          │
 │ │  ┌──────────────────────────────────────────┐               │    │     │
 │ │  │ NOTE - THE ZONE NUMBER AND LABEL FOR EACH ZONE │     _____     │    │
 │ │  │     ASSIGNED TO THIS SYSTEM IS PRINTED HERE │   _____      │  │      │
 │ └──└──────────────────────────────────────────┘           _____   │    │
 │           │                                                 │         │
 │           │                                                 │         │
 └─────────────────────────────────────────────────────────────────────────┘
```

6.6.19 Screen S: Zone Heat Pump Heating Capacity (one screen per system)

This screen allows you to enter the total heat pump heating capacity for each zone of a unitary system. This screen is accessed only if you chose "Capacities Entered by Zone" (not autosizing) on Screen K, and applies only to WSHP and AAHP systems.

The input screen is self-explanatory. The zone numbers and labels (from the loads input) are printed at the left side of the screen, and you enter the total heat pump heating capacity in tons, for each zone on the right side of the screen.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ │SYSTEMS DATA: ZONE HP HEATING CAPACITY FOR SYSTEM:              │        │
│ │System Label:                                   File:       │           │
│ │----------------------------------------------------------------------│  │
│ │Loads      Zone Name                            Zone HP Htg  │          │
│ │Zone #     or Label                             Capacity (Tons) │       │
│ │         │                                       _____      │         │
│ │ ┌───────────────────────────────────────────────┐      _____    │    │
│ │ │ NOTE - THE ZONE NUMBER AND LABEL FOR EACH ZONE │      _____    │    │
│ │ │     ASSIGNED TO THIS SYSTEM IS PRINTED HERE    │      _____    │    │
│ │ └───────────────────────────────────────────────┘                 │   │
│ │         │                                       │                     │
└─────────────────────────────────────────────────────────────────────────┘
```

6.6.20 Screen T: Zone Backup Heating Capacity (one screen per system)

This screen allows you to enter the total backup electric resistance heating capacity for each zone of an air-to-air heat pump system. This screen is accessed only if you chose "Capacities Entered by Zone" (not autosizing) on Screen K, and only applies to AAHP systems.

The input screen is self-explanatory. The zone numbers and labels (from the loads input) are printed at the left side of the screen, and you enter the total backup electric resistance heating capacity in kw, for each zone on the right side of the screen.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ │SYSTEMS DATA: ZONE BACKUP HTG KW FOR SYSTEM:                   │        │
│ │System Label:                                   File:       │           │
│ │----------------------------------------------------------------------│  │
│ │Loads      Zone Name                            Zone Electric │         │
│ │Zone #     or Label                             Backup Heating KW│      │
│ │         │                                       _____      │         │
│ │ ┌───────────────────────────────────────────────┐      _____    │    │
│ │ │ NOTE - THE ZONE NUMBER AND LABEL FOR EACH ZONE │      _____    │    │
│ │ │     ASSIGNED TO THIS SYSTEM IS PRINTED HERE    │      _____    │    │
│ │ └───────────────────────────────────────────────┘                 │   │
│ │         │                                       │                     │
└─────────────────────────────────────────────────────────────────────────┘
```

This concludes the discussion of the Systems Input screens. After you have entered information for the system type(s) for your building, save your data file and exit from this segment of the program. You are now ready to input plant data.