## REPORT LS-K
## SPACE INPUT FUELS SUMMARY

This report gives monthly summaries of the fuel inputs required by each space for lighting, equipment, and processes. Following the reports for each space is a separate building level report that gives the sum of the input fuels for the building as a whole.

Lighting, equipment, and process are the three major sections of this report, which is printed once for each space and once for the building as a whole.

1. TASK LIGHTING
   (kilowatt hours) is the electricity used by the space for all task lighting.

2. TOTAL LIGHTING
   (kilowatt hours) is the electricity used by the space for all lighting including task and overhead.

3. GENERAL EQUIPMENT
   (kilowatt hours) is the electricity used by the space for running all equipment (i.e., computers, typewriters, etc.). For the building report, this includes building equipment such as elevators which may not be included in any space.

4. PROCESS ELECTRIC
   (kilowatt hours) is all electricity used to maintain any of the processes in the space.

5. PROCESS GAS
   (millions of Btu) is all gas used to maintain any of the processes in the space.

6. PROCESS HOT WATER
   (millions of Btu) is the total hot water used in all processes in the space.

SPACE SPACE1-1

| | ----LIGHTING---- | | EQUIPMENT | ----------PROCESS---------- | | |
|---|---|---|---|---|---|---|
| MONTH | TASK LIGHTING (KWH) | TOTAL LIGHTING (KWH) | GENERAL EQUIPMENT (KWH) | PROCESS ELECTRIC (KWH) | PROCESS GAS (MBTU) | PROCESS HOT WATER (MBTU) |
| JAN | 0.00 | 402.18 | 193.67 | 0.00 | 0.0000 | 0.0000 |
| FEB | 0.00 | 349.67 | 167.88 | 0.00 | 0.0000 | 0.0000 |
| MAR | 0.00 | 386.57 | 185.58 | 0.00 | 0.0000 | 0.0000 |
| APR | 0.00 | 400.28 | 193.16 | 0.00 | 0.0000 | 0.0000 |
| MAY | 0.00 | 402.18 | 193.67 | 0.00 | 0.0000 | 0.0000 |
| JUN | 0.00 | 369.07 | 176.99 | 0.00 | 0.0000 | 0.0000 |
| JUL | 0.00 | 402.18 | 193.67 | 0.00 | 0.0000 | 0.0000 |
| [illegible]G | 0.00 | 402.18 | 193.67 | 0.00 | 0.0000 | 0.0000 |
| SEP | 0.00 | 369.07 | 176.99 | 0.00 | 0.0000 | 0.0000 |
| OCT | 0.00 | 402.18 | 193.67 | 0.00 | 0.0000 | 0.0000 |
| NOV | 0.00 | 353.47 | 168.90 | 0.00 | 0.0000 | 0.0000 |
| DEC | 0.00 | 386.57 | 185.58 | 0.00 | 0.0000 | 0.0000 |
| ANNUAL | 0.00 | 4625.43 | 2223.36 | 0.00 | 0.0000 | 0.0000 |

## REPORT SV–A
## SYSTEM DESIGN PARAMETERS

This report echoes your input to the program as interpreted by the SYSTEMS design routines. See Section IV.D of the *Reference Manual (2.1A)* and "System Sizing", p.3.130. for a discussion of SYSTEMS design calculations. The report is divided into two sections: System-Level Design Values and Zone-Level Design Values.

Note: the quantities in this report have been adjusted for altitude even though DOE-2 requires that any CFMs you enter in SYSTEMS be at sea level.

### System-Level Design Values

1. SYSTEM NAME
   is the u-name of the system.

2. SYSTEM TYPE
   is the code-word identifying the type of system. See "Applicability of Commands and Keywords to System Types" in the *BDL Summary (2.1E)* for a list of allowed system types.

3. ALTITUDE MULTIPLIER
   is the altitude adjustment factor for air flows; it multiplies air flows at sea level to get air flows at the actual altitude of the building.

4. FLOOR AREA
   is the total floor area of all zones served by the system that have ZONE–TYPE = CONDITIONED or UNCONDITIONED, or, for ZONE–TYPE = PLENUM, have non-zero occupancy.

5. MAX PEOPLE
   is the maximum number of people in all of the zones served by the system that have ZONE–TYPE = CONDITIONED or UNCONDITIONED, or, for ZONE–TYPE = PLENUM, that have non-zero occupancy. (The maximum number of people in a zone is determined by the NUMBER–OF–PEOPLE or AREA/PERSON keywords in the SPACE–CONDITIONS command in LOADS; any variation in occupancy resulting from PEOPLE–SCHEDULE is ignored in calculating MAX PEOPLE.)

6. SUPPLY FAN (CFM)
   is the calculated system design air flow rate. It should be equal to the user-input SUPPLY–CFM multiplied by the value of ALTITUDE MULTIPLIER. If not user-specified, the value will be calculated from the peak loads. For a constant volume system or if SIZING–OPTION = NON–COINCIDENT, the number will be the sum of the design cfms for the zones on the system. If the system is a variable-air-volume system, SIZING–OPTION = COINCIDENT, and this is the only system in the PLANT–ASSIGNMENT, the value is calculated from the building coincident peak load.

7. ELEC (KW)
   is the electrical energy consumed by the central system supply fan at design flow. It will be calculated from the value in column 1 and the user input (or default) for SUPPLY–KW or from the ratio of SUPPLY–STATIC and SUPPLY–EFF.

8. DELTA-T (F)
is the value of SUPPLY-DELTA-T, the rise in temperature of the air caused by the supply fan.

9. The next three entries, RETURN FAN (CFM), ELEC (KW), AND DELTA-T (F) are the corresponding values for the return air fan. In the sample report these are all zero because no return fan has been specified.

10. OUTSIDE AIR RATIO
is the ratio of outside air flow to supply air flow at design conditions for central systems. Its value is either the user input value of MIN-OUTSIDE-AIR or is calculated by SYSTEMS from the ventilation or exhaust input at the zone level divided by the supply fan cfm in column 1. This is a design quantity and so does not reflect values entered through the MIN-AIR-SCH keyword. For zonal systems, this value will be zero.

When OUTSIDE AIR RATIO is determined from zone ventilation rates, it is the sum of the values under OUTSIDE AIR FLOW (in column 6 opposite the zone u-names) divided by the value under SUPPLY FAN. This outside air ratio is what the program will use as the minimum outside air ratio. It is assumed that the outside air is brought in at the main system fan and is distributed to the individual zones in proportion to the supply air to each zone.

Note: The SYSTEMS design routine does not examine the values entered in schedules. Consequently, if you specify the outside air ratio through MIN-AIR-SCH but want SYSTEMS to size the equipment, you should also specify MIN-OUTSIDE-AIR.

11. COOLING CAPACITY (KBTU/HR)
is either the value you enter for the keyword COOLING-CAPACITY at the system level or is computed by SYSTEMS from the peak (sensible plus latent) cooling load. If the cfm chosen for the system is different from the user-specified value of RATED-CFM, COOLING CAPACITY may reflect a correction for off-rated performance.

12. SENSIBLE (SHR)
is the sensible heat ratio, i.e., the fraction of the total cooling capacity that is sensible cooling capacity at the peak or design condition, adjusted for RATED-CFM. If you have not entered COOL-SH-CAP at the system level for a central system, this value is calculated from a simulation of the conditions at peak loads, adjusted for RATED-CFM.

13. HEATING CAPACITY (KBTU/HR)
is the maximum value for heating; it reflects either the user input or a calculation from peak loads. Like COOLING CAPACITY, this value will be zero for zonal systems, where the capacity is shown at the zone level.

14. COOLING EIR and HEATING EIR (BTU/BTU)
are the electric input ratios for cooling and heating, respectively. Values are taken from user input or are default values. Values may be modified if the supply cfm differs from the RATED-CFM.

**Zone-Level Design Values**
The following quantities 15-21 apply to the base zone and have *not* been multiplied by the number of identical zones (as given by the product of MULTIPLIER and FLOOR-MULTIPLIER).

15. SUPPLY FLOW
is the calculated or user-specified supply cfm for each zone. Only if you have specified a value for the ASSIGNED-CFM keyword in the ZONE-AIR command will the value here correspond to your input. The ZONE-AIR keywords AIR-CHANGES/HR and CFM/SQFT will be accepted by SYSTEMS only if they are consistent with the user-supplied HEATING-CAPACITY and COOLING-CAPACITY, and are equivalent to a cfm larger than that of the exhaust from or the ventilation to the zone. The ALTITUDE MULTIPLIER will be applied.

16. FAN (KW)
is the total of the zone supply and exhaust fan electrical consumption at design conditions. This is zero in the example because there are no zone fans.

17. MINIMUM FLOW RATIO
reflects the your input for MIN-CFM-RATIO, unless that input is in conflict with exhaust or ventilation requirements. In the absence of user input, SYSTEMS will calculate the minimum cfm ratio for VAV systems from the minimum cfm needed to meet the the minimum ventilation requirements and the required heating capacity.

18. OUTSIDE AIR FLOW
reflects the user-specified outside air quantity entered at the zone level. If OUTSIDE-AIR-CFM is specified, its value is multiplied by the ALTITUDE MULTIPLIER and reported here. Otherwise the reported value is the maximum of the cfm-equivalent values of OA-CHANGES and OA-CFM/PER, multiplied by ALTITUDE MULTIPLIER. For the actual amount of outside air delivered to the zone for central systems, see OUTSIDE AIR RATIO above.

19. COOLING CAPACITY (KBTU/HR),
at the zone level, will be zero for central systems. For zonal systems it will either be the value you specify for COOLING-CAPACITY or it will be calculated by SYSTEMS to meet the peak loads at the rated conditions for HP, PTAC, TPFC, and FPFC systems or at any conditions for FPIU and TPIU systems. This is done similarly for HEATING CAPACITY for the above-mentioned systems and for UVT and UHT systems.

20. SENSIBLE (SHR)
is the sensible part of the cooling capacity for zonal systems.

21. EXTRACTION RATE (KBTU/HR)
is the extraction rate (cooling) at design conditions. This is not the value used in the simulation; that value is recalculated hourly and depends upon the loads, the conditions, the thermostat type, and the thermostatic throttling range. ADDITION RATE (heating) is treated similarly.

22. MULTIPLIER
is the user-specified number of identical zones (product of MULTIPLIER and FLOOR-MULTIPLIER for the zone).

| SYSTEM NAME | SYSTEM TYPE | ALTITUDE MULTIPLIER | FLOOR AREA (SQFT ) | MAX PEOPLE |
|---|---|---|---|---|
| SYST-1 | VAVS | 1.020 | 5000.0 | 52. |

| SUPPLY FAN (CFM ) | ELEC (KW) | DELTA-T (F) | RETURN FAN (CFM ) | ELEC (KW) | DELTA-T (F) | OUTSIDE AIR RATIO | COOLING CAPACITY (KBTU/HR) | SENSIBLE (SHR) | HEATING CAPACITY (KBTU/HR) | COOLING EIR (BTU/BTU) | HEATING EIR (BTU/BTU) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6354. | 7.311 | 3.6 | 0. | 0.000 | 0.0 | 0.167 | 195.964 | 0.770 | -44.161 | 0.00 | 0.37 |

| ZONE NAME | SUPPLY FLOW (CFM ) | EXHAUST FLOW (CFM ) | FAN (KW) | MINIMUM FLOW RATIO | OUTSIDE AIR FLOW (CFM ) | COOLING CAPACITY (KBTU/HR) | SENSIBLE (SHR) | EXTRACTION RATE (KBTU/HR) | HEATING CAPACITY (KBTU/HR) | ADDITION RATE (KBTU/HR) | MULTIPLIER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPACE5-1 | 1454. | 0. | 0.000 | 0.300 | 408. | 0.00 | 0.00 | 25.13 | -91.09 | -75.39 | 1.0 |
| SPACE1-1 | 1909. | 0. | 0.000 | 0.300 | 224. | 0.00 | 0.00 | 32.99 | -119.59 | -98.98 | 1.0 |
| SPACE2-1 | 887. | 0. | 0.000 | 0.300 | 102. | 0.00 | 0.00 | 15.33 | -55.58 | -46.00 | 1.0 |
| SPACE3-1 | 1268. | 0. | 0.000 | 0.300 | 224. | 0.00 | 0.00 | 21.92 | -79.45 | -65.75 | 1.0 |
| SPACE4-1 | 835. | 0. | 0.000 | 0.300 | 102. | 0.00 | 0.00 | 14.42 | -52.28 | -43.26 | 1.0 |
| PLENUM-1 | 0. | 0. | 0.000 | 0.000 | 0. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0 |

## REPORT SS–A
## SYSTEM MONTHLY LOADS SUMMARY

This report is always printed by the program for each HVAC system modeled. It shows monthly cooling, heating, and electrical loads. The loads shown are the sum of zone-level loads and central air-handling-unit loads. (Zone-level loads are shown separately in Report SS–G.). This report is for comparison of monthly cooling and heating needs for the HVAC system. DX cooling loads are reported here (for PSZ, PMZS, PVAVS, PTAC, PVVT, RESVVT and RESYS systems) but are not passed to the PLANT program.

1. The title of the report shows the user name of the HVAC system being summarized (SYST–1).

2. COOLING, HEATING, and ELEC are the three sections of this system-level report.

3. COOLING ENERGY
   (millions of Btu) is the monthly sum of energy (sensible and latent) extracted by the HVAC system during the operation hours of the system and passed as a load to PLANT.

4. MAXIMUM COOLING LOAD
   (thousands of Btu/hr) includes sensible and latent space cooling loads, ventilation air, and fan heat. The peak cooling load shown here is often the start-up load after the system has been shut down overnight. Notice, however, that when the system size is inadequate to meet the start-up load there is no indication of this problem on the report. You should first inspect the PLANT program BEPS report, which shows the "Percent of Hours Any System Zone Outside of Throttling Range", for a macro view, and Report SS–O or SS–F for a zonal report of where "Loads not met" conditions prevail.

   To the left of the MAXIMUM COOLING LOAD column are the day and hour of the peak cooling load along with the outside dry-bulb and wet-bulb temperatures at the time of the peak.

5. HEATING ENERGY
   (millions of Btu) is the monthly sum of heat delivered by the secondary HVAC system during the operation hours of the system and passed as a load to PLANT.

6. MAXIMUM HEATING LOAD
   (thousands of Btu/hr) includes space heating loads, ventilation, and humidification. Again, the peak heating load is often due to start-up conditions after the system has been shut down overnight. To the left of this column are the day and hour of the peak heating load along with the outside dry-bulb and wet-bulb temperatures at the time of the peak.

7. ELECTRICAL ENERGY (kWh)
   is the monthly electrical consumption for lights, convenience outlets, supply and return fans, and energy consumed by packaged HVAC units. The electrical consumption by the pumps is reported in the PLANT program.

8. MAXIMUM ELEC LOAD (kW)
   is the monthly peak electrical consumption in a one-hour period for lights, convenience outlets, energy consumed by packaged HVAC units, and fans for the zones served by the HVAC system.

SIMPLE STRUCTURE RUN 3, CHICAGO DIVIDE INTO ZONES; ADD PLENUM DOE-2.1E-001 Thu Nov 4 15:19:02 1993SDL RUN 1.
DESIGN-DAY SIZING OF VAV SYSTEM SHOW ALL REPORTS
REPORT- SS-A SYSTEM MONTHLY LOADS SUMMARY FOR SYST-1 WEATHER FILE- TRY CHICAGO

| | COOLING | | | | | HEATING | | | | | ELEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | COOLING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM COOLING LOAD (KBTU/HR) | HEATING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM HEATING LOAD (KBTU/HR) | ELEC-TRICAL ENERGY (KWH) | MAXIMUM ELEC LOAD (KW) |
| JAN | 0.00000 | | | | | 0.000 | -32.540 | 7 | 8 | -1.F | -1.F | -441.109 | 3078. | 12.721 |
| FEB | 0.00000 | | | | | 0.000 | -25.221 | 4 | 8 | 7.F | 6.F | -419.194 | 2665. | 12.701 |
| MAR | 0.00000 | | | | | 0.000 | -15.190 | 25 | 8 | 14.F | 12.F | -377.563 | 2904. | 12.371 |
| APR | 1.52664 | 29 | 18 | 69.F | 65.F | 68.311 | -3.705 | 8 | 8 | 30.F | 27.F | -246.024 | 2992. | 13.298 |
| MAY | 5.10064 | 21 | 14 | 85.F | 75.F | 132.661 | -0.420 | 9 | 9 | 43.F | 39.F | -40.320 | 3085. | 14.424 |
| JUN | 14.55954 | 20 | 16 | 90.F | 77.F | 178.041 | 0.000 | | | | | 0.000 | 3054. | 15.339 |
| JUL | 28.78266 | 8 | 16 | 92.F | 74.F | 214.902 | 0.000 | | | | | 0.000 | 3779. | 18.322 |
| AUG | 23.67940 | 19 | 16 | 90.F | 71.F | 183.011 | 0.000 | | | | | 0.000 | 3545. | 17.242 |
| SEP | 9.23581 | 11 | 16 | 86.F | 72.F | 138.083 | -0.227 | 23 | 8 | 36.F | 34.F | -99.033 | 2932. | 15.530 |
| OCT | 2.26933 | 4 | 17 | 78.F | 61.F | 49.778 | -2.190 | 21 | 8 | 30.F | 29.F | -258.277 | 2994. | 12.617 |
| NOV | 0.35773 | 1 | 16 | 72.F | 59.F | 54.561 | -12.995 | 25 | 8 | 27.F | 25.F | -325.673 | 2644. | 13.017 |
| DEC | 0.00000 | | | | | 0.000 | -25.768 | 26 | 8 | 15.F | 15.F | -393.064 | 2940. | 12.345 |
| TOTAL | 85.512 | | | | | | -118.258 | | | | | | 36610. | |
| MAX | | | | | | 214.902 | | | | | | -441.109 | | 18.322 |

## REPORT SS-D

## PLANT MONTHLY LOADS SUMMARY

Multiple central plants that serve the building's HVAC systems can be simulated. The PLANT-ASSIGNMENT command assigns HVAC systems to central plants. The name of the plant is reported in the title line. In this example, no u-name was specified, and so a default name (DEFAULT-PLANT) is printed. The cooling, heating, and electrical energy required by the systems and zones served by the plant are reported monthly along with the peak cooling, heating, and electrical loads for the combined systems, and the time of occurrence. Note that these peak loads may result from startup after the building has been shut down overnight. Cooling done in SYSTEMS by DX units is not included here in cooling loads but in electrical loads.

1. COOLING ENERGY
   (millions of Btu) is the sensible and latent monthly cooling required by the HVAC systems from the central plant specified in the PLANT-ASSIGNMENT command. For water loop heat pump systems the value reported here is the heat rejected to the plant's cooling tower.

2. TIME OF MAX
   gives the day and hour that the maximum cooling load occurs.

3. DRY-BULB TEMP and WET-BULB TEMP
   are the outside dry-bulb wet-bulb temperatures during the peak cooling load.

4. MAXIMUM COOLING LOAD
   (thousands of Btu/hr) gives the peak cooling load for each month and for the year.

5. HEATING ENERGY
   (millions of Btu) is the total monthly heating required by the HVAC systems from the specified central plant. For water loop heat pump systems the value reported here is the supplementary heat from the plant's hot water boiler.

6. TIME OF MAX
   shows the day and hour of maximum heating load.

7. DRY-BULB TEMP and WET-BULB TEMP
   are the outside dry-bulb wet-bulb temperatures during the peak heating load.

8. MAXIMUM HEATING LOAD
   (thousands of Btu/hr) gives the peak heating load for each month and for the year.

9. ELECTRICAL ENERGY
   (kWh) is the monthly electrical requirement for lights and convenience outlets for the building *zones* served by the plant. In addition, the electrical energy contains the fan energy requirement for the HVAC systems and electric energy for cooling and heating in packaged units. It does *not* include the electrical energy associated with pumps, cooling towers and chillers. These are reported in the PLANT program.

10. MAXIMUM ELEC LOAD
    (kW) gives the monthly peak electrical consumption in a one-hour period for the items in 9 (ELECTRICAL ENERGY).

11. Bottom of Report
    At the bottom of SS-D are shown the integrated cooling loads for the peak day for both the design day run (if any) and the annual run. These numbers are used by PLANT to size cold storage systems.

SIMPLE STRUCTURE RUN 3, CHICAGO  DIVIDE INTO ZONES: ADD PLENUM  DOE-2.1E-001 Thu Nov 4 15:19:02 1993SDL RUN 1
DESIGN-DAY SIZING OF VAV SYSTEM  SHOW ALL REPORTS
REPORT- SS-D PLANT MONTHLY LOADS SUMMARY FOR  DEFAULT-PLANT  WEATHER FILE- TRY CHICAGO

| | COOLING | | | | | | HEATING | | | | | | ELEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | COOLING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM COOLING LOAD (KBTU/HR) | HEATING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM HEATING LOAD (KBTU/HR) | ELEC-TRICAL ENERGY (KWH) | MAXIMUM ELEC LOAD (KW) |
| JAN | 0.00000 | | | | | 0.000 | -32.540 | 7 | 8 | -1.F | -1.F | -441.109 | 3078. | 12.721 |
| FEB | 0.00000 | | | | | 0.000 | -25.221 | 4 | 8 | 7.F | 6.F | -419.194 | 2665. | 12.701 |
| MAR | 0.00000 | | | | | 0.000 | -15.190 | 25 | 8 | 14.F | 12.F | -377.563 | 2904. | 12.371 |
| APR | 1.52664 | 29 | 18 | 69.F | 65.F | 68.311 | -3.705 | 8 | 8 | 30.F | 27.F | -246.024 | 2992. | 13.298 |
| MAY | 5.10064 | 21 | 14 | 85.F | 75.F | 132.661 | -0.420 | 9 | 9 | 43.F | 39.F | -40.320 | 3085. | 14.424 |
| JUN | 14.55954 | 20 | 16 | 90.F | 77.F | 178.041 | 0.000 | | | | | 0.000 | 3054. | 15.339 |
| JUL | 28.78266 | 8 | 16 | 92.F | 74.F | 214.902 | 0.000 | | | | | 0.000 | 3779. | 18.322 |
| AUG | 23.67940 | 19 | 16 | 90.F | 71.F | 183.011 | 0.000 | | | | | 0.000 | 3545. | 17.242 |
| SEP | 9.23581 | 11 | 16 | 86.F | 72.F | 138.083 | -0.227 | 21 | 8 | 36.F | 34.F | -99.033 | 2932. | 15.530 |
| OCT | 2.26933 | 4 | 17 | 78.F | 61.F | 49.778 | -2.190 | 21 | 8 | 30.F | 29.F | -258.277 | 2994. | 12.617 |
| NOV | 0.35773 | 1 | 16 | 72.F | 59.F | 54.561 | -12.995 | 25 | 8 | 27.F | 25.F | -325.673 | 2644. | 13.017 |
| DEC | 0.00000 | | | | | 0.000 | -25.768 | 26 | 8 | 15.F | 15.F | -393.064 | 2940. | 12.345 |
| TOTAL | 85.512 | | | | | | -118.258 | | | | | | 36610. | |
| MAX | | | | | | 214.902 | | | | | | -441.109 | | 18.322 |

MAXIMUM DAILY INTEGRATED COOLING LOAD (DES DAY )  2274.994 (KBTU)
MAXIMUM DAILY INTEGRATED COOLING LOAD (WTH FILE)  2147.572 (KBTU)