SOURCE–SENSIBLE keywords.

This keyword is not operative unless SOURCE–SCHEDULE is defined.

Note: Do not use the code-word ELECTRIC for specifying electrically heated hot water. Also, do not use the code-word GAS to specify gas heated hot water. In both cases, specify SOURCE–TYPE = HOT–WATER. This will pass a demand for hot water to PLANT, where the hot water heater is specified along with its fuel type. The first approach will pass the wrong type of demand to PLANT.

SOURCE–BTU/HR

is the maximum amount of energy supplied by the source defined by SOURCE–TYPE. This is the maximum amount of energy required to operate devices, other than lighting and equipment, within the space and is *not necessarily* the sensible and/or latent heat added by the source(s) to the load on the space (see SOURCE–SENSIBLE and SOURCE–LATENT). The default is 0.0, and the allowable range is from −10000000.0 to 1000000.0 Btu/hr. A negative value represents heat *removed* from the space.

The actual source energy required by the space, during any given hour, is the value assigned to this keyword multiplied by the fractional value assigned to that hour (see SOURCE–SCHEDULE). This amount of SOURCE–BTU/HR energy added to the load of the space, if any, may be specified by SOURCE–LATENT and SOURCE–SENSIBLE.

SOURCE–SCHEDULE

is the u-name of the schedule for any source of internal energy (such as process equipment *within* a space) other than people, lights, or electrical equipment. Schedule inputs are fractions of SOURCE–BTU/HR. If the SOURCE–SCHEDULE is not entered, the schedule value will default to zero and no SOURCE loads will be simulated.

SOURCE–SENSIBLE

is the fraction of SOURCE–BTU/HR (after being multiplied by the hourly fractional value in SOURCE–SCHEDULE) that is added to the space energy balance in the form of sensible heat. The sum of SOURCE–SENSIBLE and SOURCE–LATENT must not exceed 1.0 and is likely to be less than 1.0 since all such energy is not necessarily added to the space load. The default is 1.0, and it can range from -1.0 to 1.0.

SOURCE–LATENT

is the fraction of SOURCE–BTU/HR (after being multiplied by the hourly fractional values in SOURCE–SCHEDULE), if

Note that the italicized words in the left column are *code-words*, not keywords.

any, that is added to the space energy balance in the form of latent heat. The sum of SOURCE–LATENT and SOURCE–SENSIBLE must not exceed 1.0 and is likely to be less than 1.0 since all such energy is not necessarily added to the space load. The default is 0.0.

INF–METHOD — equals a code-word that identifies the method used to calculate infiltration for the space. The possible code-words (italicized) are as follows (the default is NONE).

NONE — No infiltration is calculated.

AIR–CHANGE — The infiltration rate is calculated using the air-change method as described below for keywords AIR–CHANGES/HR and INF–CFM/SQFT. One of these keywords should be specified if INF–METHOD=AIR–CHANGE. AIR–CHANGES/HR will give a windspeed-*dependent* infiltration rate. INF–CFM/SQFT will give a windspeed-*independent* infiltration rate.

RESIDENTIAL — The infiltration rate will depend on both windspeed and inside-outside temperature differences as described below for keyword RES–INF–COEF.

RES–INF–COEF — is a list of 3 values which are coefficients in the following formula:

$$\text{Infiltration} = \text{value1} + (\text{value2} \times \text{windspeed}) + (\text{value3} \times \Delta T)$$

where infiltration is measured in air changes/hr, windspeed is in knots (taken from the weather tape) and ΔT (absolute value of outdoor-indoor temperature differential) is in °F. The keyword RES–INF–COEF is appropriate only if INF–METHOD = RESIDENTIAL. The default coefficients are 0.252, 0.0251, and 0.0084. The range is from 0.0 to 20.0 for each coefficient.

AIR–CHANGES/HR* — is the number of infiltration-caused air changes per hour at a windspeed of 10 mph for a space with INF–METHOD=AIR–CHANGE. The default is 0.0 and range is from 0.0 to 30.0. If this keyword is specified, the program will make a windspeed correction each hour to the infiltration rate, so that:

Actual air changes per hour =
(AIR–CHANGES/HR) x (windspeed)/(10 mph)
(This keyword should not to be confused with a keyword of the same name in SYSTEMS.)

* One or both of the keywords AIR–CHANGES/HR and INF–CFM/SQFT should be entered. If both are entered their effects are summed.
Choice should be based on whether or not a windspeed correction is desired.

INF-CFM/SQFT* is the amount of infiltration into a space with INF-METHOD=AIR-CHANGE. It is expressed as the ratio

(infiltration cfm)/(floor area).

There is no correction for windspeed. The default is 0.0 and the range is from 0.0 to 20.0 cfm/ft^2.

INF-SCHEDULE is the u-name of a schedule that specifies a multiplier on the amount of air infiltration into a space as a function of time. The schedule should contain values that modify the calculated infiltration values. A value of 1.0 would leave the infiltration values unmodified night and day, year round. Any value below 1.0 would represent reduction of infiltration such as that caused by pressurization from a supply fan. Any value above 1.0 would represent an increase in infiltration such as that caused by an exhaust fan, open window, or open door. If INF-SCHEDULE is not input the schedule will default to one for all hours.

Ordinarily, INF-SCHEDULE should not be used with INF-METHOD=RESIDENTIAL method of infiltration because the schedule will distort wind information from the weather tape.

FLOOR-WEIGHT is used to specify the composite weight of the floor, furnishings, and interior walls of a space divided by the floor area of the space. The value input by you will determine the weighting factors associated with the space. Higher values give a longer time lag between heat gains and resultant cooling loads, and greater damping of peak loads. The default is 70.0, and the range is from 0.0 to 200.0 lb/ft^2.

Example:

```
OFFICE-ENV = SPACE-CONDITIONS
             PEOPLE-SCHEDULE    = OCCUPY-1
             LIGHTING-SCHEDULE  = LIGHTS-1
             EQUIP-SCHEDULE     = EQUIP-1
             LIGHTING-TYPE      = REC-FLUOR-NV
             LIGHTING-W/SQFT    = 1.5
             EQUIPMENT-W/SQFT   = 1
             AREA/PERSON        = 110
             INF-METHOD         = AIR-CHANGE
             INF-SCHEDULE       = INFIL-1
             AIR-CHANGES/HR     = 0.6
             PEOPLE-HEAT-GAIN   = 450   ..
```

* * One or both of the keywords AIR-CHANGES/HR and INF-CFM/SQFT should be entered. If both are entered their effects are summed.
Choice should be based on whether or not a windspeed correction is desired.

SPACE

The SPACE instruction is used to specify all the information that is associated with a space. SPACE tells LOADS that the data to follow specify the characteristics of a space.

u-name	must be specified for this instruction as the u-name is referenced in SYSTEMS.
LIKE	may be used to copy data from a previously u-named SPACE instruction. This does *not* include walls and windows belonging to that SPACE.
FLOOR–MULTIPLIER	is used to simplify the input for a multistory building. This keyword equals the number of the floors that are thermodynamically identical and where there is negligible heat transfer from floor-to-floor. The default is 1.0 and the range is from 1.0 to 200.0.
AREA	is the floor area of the space. This keyword is required and its range is from 0.0+ to 100000.0 ft^2.
VOLUME	is the space air volume, used to calculate the infiltration rate by the air-change method. This keyword is required and its range is from 0.0+ to $10^6 ft^3$.
SPACE–CONDITIONS	identifies a previously u-named SPACE–CONDITIONS instruction and associates all of the data in it with the space. Any or all of the keywords associated with a SPACE–CONDITION instruction may also be directly input in a SPACE instruction.

Rules:

1. The SPACE–CONDITIONS default values are assumed if the SPACE–CONDITIONS keyword is not given an entry.
2. The u-name of a SPACE in the LOADS program must be identical to the u-name of a ZONE in the SYSTEMS input.
3. Only SPACE and SPACE–CONDITIONS keywords data are transferred by the LIKE keyword used in SPACE. The keyword data for EXTERIOR–WALL, WINDOW, etc. are not transferred.

Example:

```
OFFICE = SPACE
         SPACE-CONDITIONS = OFFICE-ENV
                     AREA = 5000
                   VOLUME = 40000   ..
```

EXTERIOR–WALL (or ROOF)

This instruction is used to specify the size, construction, and position of an exterior surface of a space such as an exterior wall, roof, or exterior floor (such as above a breezeway or carport). EXTERIOR–WALL and ROOF are synonymous within the program. Each EXTERIOR–WALL instruction is assigned to the SPACE instruction immediately preceding it and describes one of the exterior walls of that space.

u-name — may be used to identify a wall surface.

LIKE — may be used to copy data from a previously u-named EXTERIOR–WALL instruction.

GND–REFLECTANCE — is the solar reflectance of the ground; i.e., the fraction of sunlight incident on the ground that is reflected. The following table provides typical values for various surfaces. The default is 0.2.

Surface	GND–REFLECTANCE
Asphalt, paved	0.18
Concrete, bituminous	0.10
Concrete, light colored	0.32
Concrete, old	0.22
Field, green	0.12-0.25
Field, wheat	0.07
Grass, dry	0.24
Ocean	0.05
Rock, crushed surface	0.20
Soil, dark	0.08

MULTIPLIER — is used to specify the total number of identical (except for position) exterior wall panels located in the same plane. This reduces the amount of data input. It multiplies the net area of the exterior wall (exterior wall area minus window area minus door area). It also multiplies any WINDOW area and DOOR area associated with this exterior wall panel. The range is from 0.0 to 99.0, and default is 1.0.

AZIMUTH — is the azimuth of the exterior wall. The default is 0° (north-facing wall), and the range is from 0° to 360°; east-facing is 90°; south-facing is 180°; west-facing is 270°. Intermediate angles are acceptable.

CONSTRUCTION — identifies the u-name of a previously defined CONSTRUCTION instruction that describes the effective U-Value of this EXTERIOR–WALL (or ROOF). This keyword is mandatory.

HEIGHT	is the dimension of the exterior wall parallel to the Y axis. This is a required keyword, and the range is from 0.0 to 2000.0 feet.
WIDTH	is the dimension of the exterior wall parallel to the X axis. This is a required keyword, and the range is from 0.0 to 2000.0 feet.
TILT	is the inclination of the exterior wall from the horizontal plane. The default is 90.0°, which corresponds to a vertical surface. An upward facing horizontal surface has TILT = 0; a downward facing horizontal surface has TILT = 180. Note that if the command ROOF is used, then TILT will still default to 90° (vertical surface). Thus, for a horizontal ROOF, you would have to explicitly specify TILT = 0. The range of TILT is 0 to 180°.

Rules:

1. A SPACE instruction must precede any EXTERIOR-WALL or ROOF instructions.
2. An EXTERIOR-WALL or ROOF instruction must immediately precede the WINDOW and DOOR instructions that describe the windows and doors in the wall.
3. The area (HEIGHT times WIDTH) of the EXTERIOR-WALL or ROOF must be equal to or greater than the area entered for the WINDOW and DOOR instructions associated with the EXTERIOR-WALL or ROOF.

Example:

```
FRONT-1 = EXTERIOR-WALL
            HEIGHT       = 8
            WIDTH        = 100
            AZIMUTH      = 180
            CONSTRUCTION = WALL-1   ..
```

Note: If an exterior wall (or roof) is not shaded by obstructions such as neighboring buildings or trees, it is sufficient in DOE-2 to describe the wall geometrically by specifying only HEIGHT, WIDTH, AZIMUTH, and TILT. If shading is involved, the keywords X, Y, and Z (the origin of the wall in the space coordinate system) should also be entered. See *Reference Manual (2.1A)*, p.III.8.

WINDOW

This instruction is used to specify the size, position, and number of windows and the properties of the glass. Each WINDOW command applies to the EXTERIOR–WALL instruction preceding it and describes the windows on that exterior wall. *Note: Glass doors in exterior walls should be treated as windows rather than doors.*

u-name	may be specified.
LIKE	may be used to copy data from a previously entered and u-named WINDOW instruction.
GLASS–TYPE	identifies the u-name of the GLASS–TYPE instruction that describes the glass in this window. This is a required keyword.
HEIGHT	is the height of the glazed part of the window. This keyword is required, and the range is from 0.0+ to 40.0 feet.
WIDTH	is the width of the glazed part of the window. This keyword is required, and the range is from 0.0+ to 1000.0 feet. Note: The window area (HEIGHT times WIDTH) is automatically removed from the associated wall area.
SETBACK	is the distance that the window is recessed into the wall. The range is from 0.0+ to 10 feet. It defaults to 0.0, that is, no setback.
SHADING–SCHEDULE	accepts as input the u-name of a schedule that defines hourly values of a multiplier on the glass shading coefficient (see SHADING–COEF keyword in GLASS–TYPE command). This represents the shading effect of movable devices such as blinds, or drapes. Note that items that change light transmission may also affect conductance. If so, a matching CONDUCT–SCHEDULE should be used. *Note: If the SHADING–SCHEDULE is not input, the schedule will default to 1 for all 24 hours.*
MAX–SOLAR–SCH	is the u-name of a schedule of direct solar gain values in Btu/ft^2-hr. The program will automatically deploy a shading device if the heat gain per ft^2 from direct (beam) solar radiation *transmitted* through the window exceeds the specified value. If MAX–SOLAR–SCH is specified, a corresponding SHADING–SCHEDULE (and CONDUCT–SCHEDULE, if desired) should be assigned to the window. The SHADING–SCHEDULE and CONDUCT–SCHEDULE values will only take effect during hours when the shading device is deployed.

CONDUCT-SCHEDULE — identifies the u-name of the schedule that describes any change in the heat conductance of the window relative to the GLASS-CONDUCTANCE. The factor in the schedule may be less than, equal to, or greater than 1.0. The factor is used as a multiplier against GLASS-CONDUCTANCE. This represents the change of conductance associated with storm windows, insulated shutters, etc.

Any accessories that are added to the window (such as a storm window) that change the conductance may also significantly change the light transmission properties of the window. If so, a matching SHADING-SCHEDULE should be used.

Note: If the CONDUCT-SCHEDULE is not input, the schedule value will default to 1 for all 24 hours.

CONDUCT-TMIN-SCH — is a schedule of values of outside dry-bulb temperature below which movable insulation will be deployed on a window. If this keyword is specified, a corresponding SHADING-SCHEDULE and CONDUCT-SCHEDULE should be assigned to the window.

Window overhangs and fins may be specified with the following keywords:

OVERHANG-A — Units are feet, 0.0 is the default, and there are no limits. See Fig. 2.1.

OVERHANG-B — Units are feet, 0.0 is the default, and there are no limits. See Fig. 2.1.

OVERHANG-W — Units are feet, 0.0 is the default, and the range is 0.0 to no limits. See Fig. 2.1.

OVERHANG-D — Units are feet, 0.0 is the default, and the range is 0.0 to no limits. See Fig. 2.1.

OVERHANG-ANGLE — is the angle between the overhang and the window. When set at 90°, the overhang is perpendicular to the window (the default); if $< 90°$, it is tilted down; if $> 90°$, it is tilted up. The range is 0.0 to 180.0°.

Note: For overhang shading calculations to be performed, both OVERHANG-W and OVERHANG-D **must** be specified. If either of them is specified, but not both, a WARNING message is printed and overhang shading is not performed.

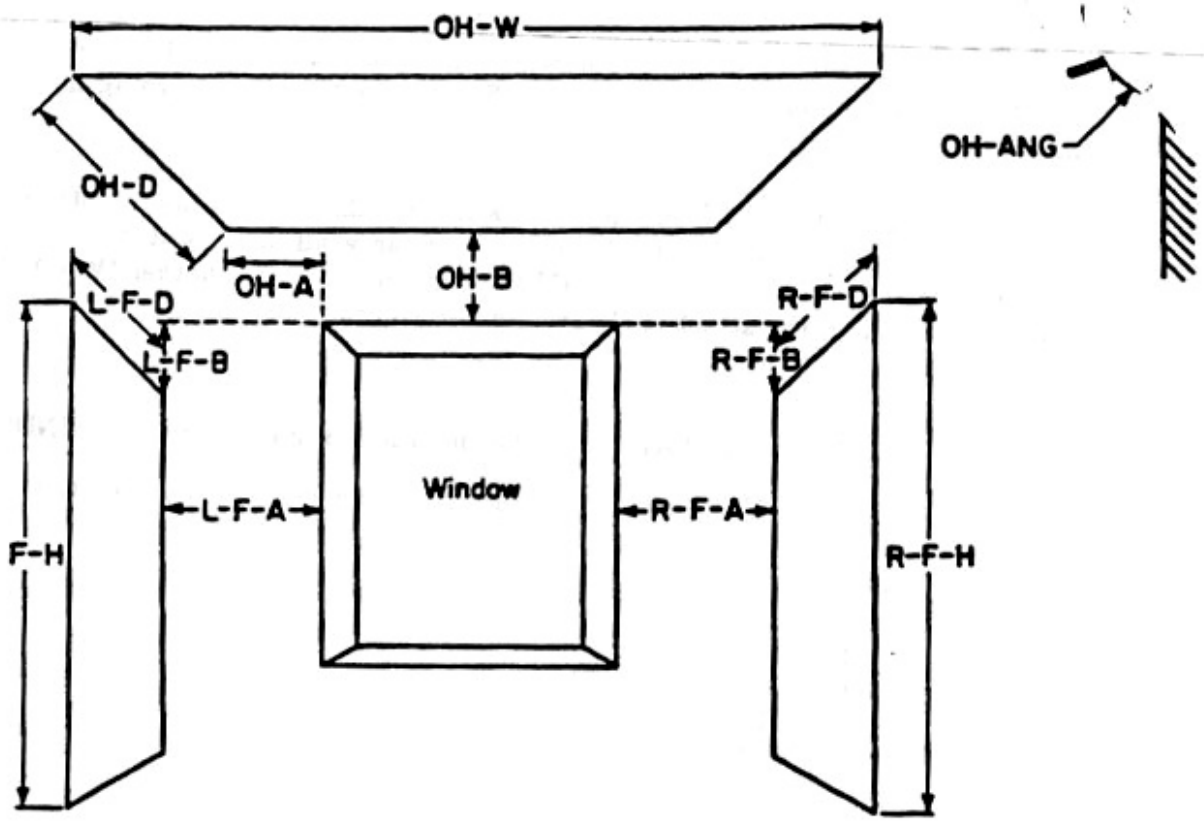

Figure 2.1: Positioning of overhang and fins with respect to a window. The values in this figure are all positive. If the value for L–F–B is input as negative, then the left fin will originate at a point above the top edge of the window, and similarly for R–F–B.

LEFT–FIN–A — Units are feet, 0.0 is the default, and there are no limits. See Fig. 2.1.

LEFT–FIN–B — Units are feet, 0.0 is the default, and there are no limits. See Fig. 2.1.

LEFT–FIN–H — Units are feet, 0.0 is the default, and the range is 0.0 to no limits. See Fig. 2.1.

LEFT–FIN–D — Units are feet, 0.0 is the default, and the range is 0.0 to no limits. See Fig. 2.1.

RIGHT–FIN–A — Units are feet, 0.0 is the default, and there are no limits. See Fig. 2.1.

RIGHT–FIN–B — Units are feet, 0.0 is the default, and there are no limits. See Fig. 2.1.

RIGHT–FIN–H	Units are feet, 0.0 is the default, and the range is 0.0 to no limits. See Fig. 2.1.
RIGHT–FIN–D	Units are feet, 0.0 is the default, and the range is 0.0 to no limits. See Fig. 2.1.

For fin shading calculations to be performed, both of the pair, —FIN–H and —FIN–D, **must** be specified. If either one of the pair is specified, but not both, a warning message is printed and fin shading is not performed.

Note: Even though overhangs and/or fins are specified under the WINDOW command, these shading surfaces are attached to the wall where the window is located and thus shade both the window *and* the wall. Also, if this WINDOW is referred to in another WINDOW command with the LIKE keyword, the attached shades are also copied.

Rules:

1. An EXTERIOR–WALL or ROOF instruction must precede a WINDOW instruction.
2. A GLASS–TYPE instruction must precede a WINDOW instruction.

Example:

```
WF-1 = WINDOW
       WIDTH      = 45
       HEIGHT     = 4
       GLASS-TYPE = WINDOW-1     ..
```