Computational Algorithm

A general procedure for simulating three-dimensional effects in building envelopes using the equivalent wall approach in DOE-2.1 is outlined below.

(1) Specify each equivalent wall material (by thickness, conductivity, density, and specific heat) in a MATERIAL instruction. Repeat for each of the three equivalent wall materials.

Table 6.1 presents the parameters and associated units required by DOE-2.1 for each material.

Table 6.1 DOE-2.1 Required MATERIAL Units

Thickness, l_n	Conductivity, k_n	Density, ρ_n	Specific Heat, c_{pn}
feet	Btu-ft/hr-ft^2-°F	lb/ft^3	Btu/lb-°F

(2) Refer to all the MATERIAL instructions, by a list of their user specified names (U-names), in the MATERIAL keyword of a LAYERS instruction. With the equivalent wall approach there should be one layer, which refers to three specified materials. Note: in DOE-2.1, materials must be listed from outside to inside.

(3) Then refer to the LAYERS instruction, by its U-name, in the LAYERS keyword of a CONTRUCTION instruction.

(4) Finally refer to the CONSTRUCTION keyword of an EXTERIOR_WALL instruction. For corners, window headers and other building interfaces, one must specify the area that is to be simulated using equivalent wall model results. The simulated areas are as dimensioned on the graphical representations presented in the Wall Assembly Information Sheets (Appendix C). There are two options to incorporate building interfaces such as corners: (1) create two walls each facing in the same direction as the walls that make up the corner or (2) create one wall facing in-between the two corner walls with an exterior area equal to the total simulated area (see Sample 2). Option 2 is simpler than Option 1, with the one caveat that it compromises solar loading. All other building interfaces (window header, wall/floor, wall/roof) must follow Option 1. The user must be careful not to ‘double-count’ when specifying the exterior area of the building envelope (i.e. subtract the area simulated for interfaces).