



FACING THE RISING COST OF ENERGY

Wall System Science Can Help Beat Commercial Owners' Rising Cost of Energy

AS ENERGY PRICES CONTINUE TO RISE, the efficiency of commercial buildings becomes increasingly critical for owners. Heating and cooling costs typically represent about 32 percent of a building's operating budget. As this cost is multiplied over the 10- to 20-year ownership period, energy expenses rank as a high-priority lifecycle issue.

As a result, owners, developers, architects, property managers and appraisers are looking more closely at construction methods and materials that can reduce life cycle costs.

Wall-system options comprise one category that has energy efficiency ramifications. For those looking at a concrete wall construction method, there are four options that have varying "R-value" (or insulation) characteristics when it comes to heat loss, heat gain and storing energy. The wall options include: masonry, tilt-up wall panels, composite, and non-composite precast wall panels. Composite wall panels are those that combine two separate layers of concrete with steel ties and solid areas of concrete to achieve one "composite" panel.

The Department of Energy (DOE) labs examined the thermal efficiency of "common, insulated, concrete sandwich wall systems," the composite method of wall construction. The DOE interim report indicated that 5 percent solid concrete and steel ties resulted in a 60.59 percent loss of the claimed heat-flow resistance (or R-value) of 10.14, reducing it to only 4.13.

In addition to poor thermal performance, these efforts to make a composite panel do not seem to be effective. A recent, privately funded study conducted at Lehigh University indicates the composite method of wall construction, both tilt-up and precast, typically a sandwich wall panel with 9% solid concrete layer plus steel ties, achieved only 59% composite action. Panels with fiber-composite ties provided a predicted R-value of 10.41, but achieved minor composite action.

Unfortunately, with composite or tilt-up sandwich wall panels, either strength or energy efficiency can be achieved, but not both. Sandwich panel construction uses either ties, which may not create acceptable composite action, or solid concrete blockouts, which negatively impact the effective R-value.

The alternative to masonry, composite wall panels, and the tilt-up method of wall construction — are non-composite precast concrete wall panels. Precast expert Fabcon Inc. produces non-composite pre-cast sandwich wall panels composed of an 8-inch layer of concrete, a 2.5-inch layer of foam, and a 1.5-inch layer of concrete. Composite wall panels, by comparison, are constructed with a 3-inch layer of concrete, a 2-inch layer of foam, and a 3-inch layer of concrete (or solid tilt-up concrete panels). A Fabcon wall panel has an R-value of 16.4 whereas a composite wall panel of the construction described above, with 9 percent solid concrete, could have an R-value as low as 2.34.

Non-composite panels combine a unique structural core, a rigid insulation layer and a nonstructural façade for exceptional strength without a thermal bridge. Besides energy efficiency, non-composite wall panels improve the livability due to thermal mass effects which increase the R-value and eliminate cold spots. They also increase the aesthetic options available for commercial buildings.

Commercial building owners recognize that improving energy-efficiency can lower operating expense and improve tenant comfort. The economic and environmental benefits also make a property more competitive, resulting in better tenant retention and attracting. Lower expenses, in turn, produce higher net-operating income, resulting in increased property value.