Embodied Energy

By Ed Dockter (with figures from Reed Construction)

If you're involved in the planning or commissioning of a new facility, chances are it's being designed to LEED™ specifications. LEED™ (**L**eadership in **E**nergy and **E**nvironmental **D**esign) is a driving force behind almost every infrastructure construction project. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

Embodied energy is one factor considered under the heading "*material selection*". Embodied energy is one way the approximate energy (per unit mass) required to produce a building product is measured. Frequently, statistics refer to the process energy requirement for raw-material acquisition and product manufacture, but not other energy factors associated with producing and installing the product.

Estimated embodied energy of some common materials (in MJ/kg) are:

- Concrete = 1.9
- Glass = 12.7
- Virgin steel = 32
- Recycled steel = 10
- Plastics (general) = 90
- Virgin aluminum = 180
- Recycled aluminum = 9

From these numbers you can see that it takes 9MJ of energy to manufacture a one-kilogram unit of recycled aluminum. Compare that to the 180MJ required to make that same unit out of virgin aluminum. The high embodied energy associated with producing products such as plastic and aluminum makes it all the more important to recycle these products—recycling saves most of the energy for certain plastics, and 95% of the energy for aluminum.