SOLAR HOUSE:
Collects 75% of needed heat energy

Heat is gathered by a solar collector on roof or drawn in from outside air by a pair of heat pumps to supply heat energy.

Sunlight and fresh air supply 75 percent of the heat energy required by a unique house recently constructed outside Poughkeepsie, N.Y.

Designed by nationally known architect Harry Wenning, partner in Solar Structures, Inc., the energy-saving dwelling is equipped with a special heating system engineered at the General Electric Research and Development Center in Schenectady, N.Y.

Most of the heat for the Wenning House, located in LaGrangeville, N.Y., is gathered by a solar collector on its roof or drawn from outside air by a pair of heat pumps. Electrical-resistance heating units furnish the remainder.

The next effect is that the heating bill for the large 4,000-square-foot structure should be no higher than that for a small cottage only one quarter as large.

The solar collector was installed on the southern slope of the roof, where exposure to the sun’s rays is greatest. First, 1,200 square feet of heat-absorbing copper sheathing were laid down. Next, a network of hollow, one-inch by one-half-inch copper conduits, running at six-inch intervals from peak to eaves, were placed on top of the sheathing.

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When the sun is shining, water treated with anti-corrosion additives is pumped through the solar collector at a rate of 40 gallons per minute. As the water flows through the conduits, solar energy heats it to temperatures as high as 180°F. The heated water is then piped down to a 4,000-gallon underground storage tank.

By means of a heat exchanger, heat is extracted from the water in the storage tank and circulated as warm air throughout the house. In addition, water en route to the household’s electric hot-water heater is pre-heated by piping it through the storage tank.

When the temperature of the solar collector becomes at least 20°F higher than the water in the storage tank, the collector begins to collect heat. Once the temperature of the roof collector falls to within three degrees of the water in the storage tank, the copper conduits drain automatically, and a thermostat switches on the two GE heat pumps.

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from the owner. In effect, billings from the subcontractor are ignored, and the quantities allowed by the owner are used as the basis for paying the subcontractor. In this way, the general contractor is paying only the applicable portion of cash received from the owner.

Much of today's construction involves the purchase and installation of sophisticated and expensive equipment as part of the construction process. The contractor should understand the terms of the contract relating to payment for purchased, but uninstalled, material or equipment. Contractors have incurred significant cash obligations to have equipment available for installation when needed; they have had to make cash purchases early in the job, yet, under the contract, wait for payment following installation near the end of the job. Successful cash and project management requires a thorough understanding the contract's billing requirements. If the contract does not permit the billing of material as acquired, the contractor should build in a factor for the interest or the carrying cost of holding that equipment for an extended period.

Another area often overlooked by contractors in maximizing the cash position is collecting retainage on previously completed jobs. Retainage is frequently withheld pending the completion of several minor "punch list" items related to the construction. An aggressive position must be taken in completing these items. Often, when a job is completed, the project manager is assigned to another job and company management becomes heavily involved with jobs in progress and new bids. Retainage can represent an unconverted cash asset for a number of years unless a follow-up monitoring system is developed and contact with the owner is scheduled on a periodic basis.

Summary

Cash management for contractors involves not only the day-to-day monitoring of cash balances but also encompasses a wide range of management techniques. It requires a comprehensive understanding of billing techniques as well as the projection and monitoring of cash activities.

Construction is a cash business which can be profitable for the contractor who understands the total business and not merely the estimate, bid and build activity.

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The pair of heat pumps—one for the second floor and one for the first—operate like refrigerators in reverse. In cold weather, they extract heat from the outside air and pump it into the house's hot air ducts. In warm weather, by contrast, the heat pumps can be reversed to provide central air conditioning for the house.

On the few extremely cold, cloudy days, when neither the solar collector nor the heat pumps can supply enough heat, electrical resistance heating is turned on automatically to assist in the heating effort.

According to Dr. James B. Comly, manager of the Thermal Branch at the GE Research and Development Center, "The heating system for the Wenning House was designed to be constructed from off-the-shelf components readily available from GE and other manufacturers."

The GE research manager predicted that the energy saved annually by this special heating system will be roughly equivalent to 1,600 gallons of fuel oil or 31,000 kilowatt hours of electricity.

The installation cost of the heating system was nearly $20,000 greater than that for a conventional heating and air-conditioning system for the same-sized house. However, depending on prices, the savings in fuel and electricity will make up the cost differential in 10 to 25 years, while helping to realize the nation's energy-conservation goals.

Construction of the Wenning House was supported in part by the U.S. Department of Housing and Urban Development, which is providing $15,000 to Solar Structures, Inc., to cover the incremental costs of the solar energy heating system. In addition, the house is equipped with an instrument room with outside access so that the performance of the heating system can be scientifically monitored and evaluated. The finished cost of the house is approximately $150,000. 

20 Construction DIMENSIONS