14

Can we afford engineering?

Other chapters discuss energy economics, design parameters, and maintenance. In proper perspective, energy economics and maintenance are two design parameters relating to building systems. Still others address more parameters that should be considered and some of the manners in which they should be viewed. Few will disagree with these suggestions. However, it is anticipated that most system designers will pose the question: In-depth consideration of all these parameters will produce a better system design, but, realistically, does the present system of financial compensation for consulting engineering services in building systems allow for all these considerations?

To properly address this topic, let us review the events leading to the present situation and some of the marketplace adjustments that have evolved recently as an inevitable response.

Before World War II, most commercial and institutional buildings had only heating and ventilating systems. Heat was provided primarily by steam or two-pipe hot water, standing radiation; ventilation was by either gravity or fan motivated exhaust systems (in rare instances, heated makeup air was provided).

These systems were generally designed by manufacturers of steam specialty devices or their sales representatives. In an effort to aid the owner in selecting a system to best suit his particular application, the consulting mechanical engineering profession emerged. Many early consulting engineers came from manufacturers' design departments.

During this time, fees were established as a percentage of the architectural fee, which was based on a percentage of the construction cost, and they were equitable compensation for the work involved. Even after the consulting engineer assumed the added responsibilities of laying out the piping-radiator-boiler system and specifying the components and materials, this fee structure proved adequate for the time and skills involved.

After the war, a fantastic technological evolution in building environmental systems occurred. This technological boom through the 1950s was surpassed by no other nonsubsidized effort in history. This technology made it possible for architects and the building products industry to have almost complete freedom of design in building shapes, space functions, and materials. It also resulted in extreme complexity in, and dependence on, the mechanical systems.

Fee structure inadequate

In spite of these extensive changes and the resulting increased demand on the skills and time of the mechanical systems designer, the concept of the design fee as a relatively small percentage of the system construction cost has remained in most contracts. As a result, for financial survival, most design firms had to hold services to a level dictated by the available fees. Thus, standardized office practices that devoted the most time to layout rather than costly in-depth analysis became the rule rather than the exception.

Understandably, this has caused less than desirable results in satisfying many of the design parameters. Recognizing this, the building industry has sought other means of obtaining more thorough engineering considerations under such labels as turnkey, systems, package, etc. All of these are simply methods of providing the desired and needed engineering services as a component cost of the construction contract.

Fee specialist consultant

Another method that evolved from this is the specialist consultant, such as the value engineer (first cost specialist), energy specialist, corrosion engineer, water treatment consultant, acoustical consultant, etc. Generally, these specialists are employed by the owner outside of the architectural contract.

It cannot be denied that either approach provides; if properly executed and applied, a means of funding more adequate engineering fees. However, it should be recognized that the competent, independent professional with no profit motivation in a product, and with an equal interest in the balanced integration of *all* the design parameters, can best serve the owner's interests. One problem: How will he be compensated for his efforts?

Complexity increases cost

In summary, the cost of engineering building environmental systems has increased enormously due to increased complexity. Consider the cost burdens of computerized load analyses, life cycle cost studies, maintenance requirement analyses, energy studies, distribution systems analyses, and energy source analyses—all part of the analytical requirements before a line is drawn on a tracing. Consider further, that these aspects of the design process require the skills of highly educated and experienced professionals.

Add to all of this the inverse motivation built into the percentage fee contracts—increased engineering hours devoted to cost reduction, resulting in a reduction of compensation—and the question must be asked: Who is the beneficiary of this arrangement?

This essay does not propose answers, only the question. Properly engineered building systems require monetary investments in engineering. It is time the industry faced this fact and sought an answer!