2 Integrated Process for Achieving Energy Savings

This chapter of the AEDG-SR provides resources for those who want to understand and adopt an overall *process* for designing, constructing, and operating energy-efficient small retail buildings. The resources listed below are above and beyond the straightforward presentation of recommendations in Chapter 3 and the how-to tips in Chapter 5 that lead to energy savings of 30% beyond Standard 90.1-1999. The resources are:

- *A narrative discussion of the design and construction process that points out the opportunities for energy savings in each phase.* It further explains the steps that each team member or discipline should take to identify and implement energy savings concepts and strategies. It also includes a discussion on how the quality assurance (QA) measures are worked into the process at each phase and how some of these measures can be used by the owner to maintain energy performance for the life of the facility.
- *A reference table or matrix that leads the Guide's user through the process of identifying and selecting energy-saving measures to meet major energy design goals.* This information is presented in Table 2-5, which ties together detailed strategies, recommendations for meeting the 30% energy use reduction target, and related how-to information.

The following presentation of an integrated process for achieving energy savings in small retail buildings is valuable for designers and builders who want to augment and improve their practices so that energy efficiency is deliberately considered at each stage of the development process from project conception through building operation. Commissioning (Cx) begins in the early stage of design and continues through operation and is an integral part of each phase. These stages are shown in Figure 2-1.

The key benefits of following this integrated process include:

- Understanding the specific step-by-step activities that owners, designers, and construction team members need to follow in each phase of the project's delivery, including communication of management, design, construction, QA, Cx, operation and maintenance (O&M), and occupancy functional requirements an owner should follow to maintain the specified energy performance of the facility.
- Identifying energy efficiency goals and selecting design strategies to achieve those goals.

Figure 2-1. Stages of design.

- Incorporating QA, including building Cx procedures, into the building design and delivery process to ensure that energy savings of recommended strategies are actually achieved and that specific documentation needed to maintain energy performance is provided to the owner.
- Owner understanding of the ongoing activities needed to help ensure continued energy performance for the life of the facility, resulting in lower total cost of ownership.

Users of this Guide who follow the recommended process in their design and construction practice will benefit from achieving the goals of enhanced energy savings.

1. DESIGN PHASE (INCLUDING PLANNING AND PRE-DESIGN)

Documentation of the adopted energy goals and general strategies begin in the Design Phase. In small retail, this typically involves writing the Owner's Project Requirement (OPR) document, a brief, two-page description that includes the project's energy goals. The OPR document guides the team and provides a guide to be used during the design and construction of the project.

This Guide emphasizes goals that relate to the energy uses that can produce the largest savings. Interior lighting plays a major role in retail building energy use. Both Standard 90.1-1999 and the Guide recognize differences between general lighting and accent lighting. General lighting applies to the entire building. Accent lighting is additional interior lighting that is allowed provided it is specifically designed and directed to merchandise and is automatically controlled separately from the general lighting. Standard 90.1-1999 specifies lighting power densities (LPDs) for general lighting and two levels of accent lighting. The Guide specifies lower LPD for general lighting and has four levels of accent lighting. Comparisons of the LPDs between Standard 90.1-1999 and this Guide are presented in Figure 2-2 for five typical retail buildings with various merchandise and 70% display floor area.

In addition to lighting, differences in building application, climate, and even orientation will impact the selection of various energy goals and strategies. As an example, Figures 2-3 and 2-4 show energy use mixes for three stores in a 7,500 ft^2 strip mall in two locations, Phoenix and Chicago. Store 1 is 25 ft wide by 75 ft deep (1875 ft^2) for general merchandise with 100% general lighting (1.82 W/ft^2 baseline and 1.28 W/ft^2 advanced), store 2 is 50 ft wide by 75 ft deep (3750 ft^2) with 75% general lighting and 25% accent lighting (2.94 W/ft^2 baseline and 1.69 W/ft^2 advanced), and store 3 is 25 ft wide by 75 ft deep (1875 ft^2) with 50% general lighting and 50% accent lighting (4.55 W/ft^2 baseline and 2.33 W/ft^2 advanced). These figures show that cooling and lighting energy predominates in Phoenix; thus, in that climate zone, the goals and strategies relating to cooling and lighting should receive the highest priority. Conversely, in Chicago, the goals and strategies relating to heating and lighting should receive the highest priority. Also, in the "Bonus Savings" section of Chapter 5, specific examples provide methods to achieve savings above the Chapter 3 requirements.

In the Design Phase, the team integrates the energy goals into building plans, sections, details, and specifications. The sequence of many design decisions, such as building and glazing orientation as well as other strategies identified in this chapter, has a major impact on energy efficiency. These decisions must, therefore, be made much sooner in the process than is typically done. The steps listed in Table 2-1, presented in sequence, identify the appropriate time in the process to apply specific recommendations from this Guide.