2. CONSTRUCTION

The best designs yield the expected energy savings when the construction plans and specifications are correctly designed and executed. This section outlines what actions the project team can perform to assist in meeting the energy goals. (See Table 2-2 to identify the appropriate time in the process to apply specific recommendations from this Guide.)

During construction, the independent CxA conducts site visits to verify the building envelope construction and that the rough-in of the HVAC and electrical systems meet the OPRs. The purposes of these site visits are as follows:

- **Observations for Operability and Maintainability.** Participate in an ongoing review of the building envelope, mechanical systems, and electrical systems. Prepare field notes and deficiency lists and distribute to the owner, designer, and GC.
- **Verify Access Requirements.** Review shop drawings and perform construction observations to verify that the required access to systems and equipment has been provided.
- **Review Test and Balance (TAB) Plan.** Meet with the construction team to review the TAB plan and schedule required.
- **Random Spot Verification.** Randomly verify installation checklists completed by contractors.

A written report on the site visit that documents issues requiring resolution by the design and/or construction team should be provided. The estimated level effort for the CxA's written report is two to four hours during the construction phase for the size of small retail buildings covered by this Guide.

3. ACCEPTANCE

At this final stage of construction, the project team and the independent CxA verify that systems are operating as intended. When the team is satisfied that all systems are performing as intended, the QA effort of the design and construction team is complete. (See Table 2-3 to identify the appropriate time in the process to apply specific recommendations from this Guide.)

4. OCCUPANCY

During the first year of operation, the building owner needs to review the overall operation and performance of the building. Building systems not performing as expected should be discussed with the design and construction team with issues resolved during the warranty period. The CxA may be brought in to help resolve any Cx/warranty issues. (See Table 2-4 to identify the appropriate time in the process to apply specific recommendations from this Guide.)

5. OPERATION

Energy use and additions of energy-consuming equipment need to be documented and compared against previous data to determine if the building and its systems are operating at peak performance for the life of the building. The CxA needs to provide the ongoing method for monitoring the energy consumption of the building.

Reducing the actual energy use of small retail buildings will be enhanced when advisory energy-tracking information is conveyed to the owner or owner's staff as part of the design package. This information should be developed in simple language and format. This will allow the end-user to track and benchmark the facility's utility bills and take corrective action to maintain the intended efficiency of the original design. This ongoing Cx will require some additional cost but will typically save substantially more by preventing efficiency degradation in the facilities' energy systems. Additional information on energy-effective operation and ongoing energy management is available in *ASHRAE Handbook—HVAC Applications*.

Table 2-2. Energy Goals in the Context of the Bidding and Construction Process

Activities	Responsibilities	Where to Find Information
1. Pre-Bid Conference Discuss importance of energy systems to contractors/subcontractors Define quality control/Cx role	Owner, Designer, CxA, GC	Chapter 5, QA7
2. Progress Meetings Regular updates on energy-efficiency-related measures Scheduling/update QA	Owner, Designer, GC	
3. Envelope/Energy Systems QA QA building envelope construction QA HVAC systems QA lighting systems	CxA	Chapter 5, QA8 and QA9

Table 2-3. Energy Goals in the Context of the Acceptance Phase

Activities	Responsibilities	Where to Find Information
1. Assemble punch list of required items to be completed	GC	
2. Performance testing, as required of GC and subcontractors	GC, Subcontractors	Chapter 5, QA10
3. Building is identified as substantially complete	Owner, Designer, CxA	Chapter 5, QA11
4. Maintenance manual submitted and accepted	Owner, Designer, CxA	Chapter 5, QA12
5. Resolve quality control issues identified throughout the construction phase	Owner, Designer, CxA	Chapter 5, QA13
6. Final acceptance	Owner, Designer	Chapter 5, QA14

Table 2-4. Energy Goals in the Context of the Occupancy Phase

Activities	Responsibilities	Where to Find Information
1. Establish building maintenance program	Owner and staff, CxA	Chapter 5, QA15
2. Create post-occupancy punch list	Owner and staff	
3. Monitor post-occupancy performance	Owner and CxA	Chapter 5, QA16

ENERGY GOALS AND STRATEGIES

Numerous goals, listed in Table 2-5, provide detailed strategies and recommendations to meet the 30% energy use reduction target. The related how-to information in this Guide identifies selected energy-saving measures to meet major energy design goals.