

## 9.0 PERFORMANCE TESTING

A thermal performance test may also be required by the construction specification as a further condition of acceptance. If so, the following parameters for the test procedure should be clearly described in the construction specification:

- The instrumentation to be installed and/or used;
- The data to be recorded;
- The time of day, length of test, and operating conditions for running the test;
- The method of performance evaluation; and
- The level of thermal performance that must be met for the system to be acceptable.

If the test procedure as specified is not clear or complete, notify the designer (see Section 3) and resolve the problem before starting the test.

### 9.1 SYSTEM EFFICIENCY TEST

Even if performance testing is not required by the construction specification, consider doing a simple performance test to verify that the system is operating as designed and specified. Appendix F describes a standard performance test that can be run in one day to check out any active solar energy heating system by estimating the system's efficiency. The test can be run at any time of the year when insolation is above 200 Btu/ft<sup>2</sup>/h. The test requires measuring flow rates, temperatures, and insolation over one day's operation.

Procedures for measuring and recording the data and calculating performance are given in Appendix F.

### 9.2 ENERGY COLLECTION TEST

If it is only possible to measure the flow rate and temperatures, a simplified procedure can be used to calculate the solar energy collected and stored over one day's operation. Procedures for measuring and recording the data are given in Appendix G.

## 10.0 AS-BUILTS

The as-built drawings required for a solar heating system are similar to as-builts for other types of mechanical systems. They can be submitted as marked-up copies of the construction drawings, or they can be redrawn versions of these drawings if the markups are not legible and easily read.

One critical difference, however, is that service/maintenance personnel from nonsolar trades who are brought in to work on the system, and on-site building and maintenance personnel, may not understand the design, layout, and operation of the solar system. As their lack of understanding will not keep them from working on the solar system, it is critically important that the as-builts be complete and accurate.

The contract will specify which as-builts are required. As a minimum:

- Prepare a single-line piping and instrumentation diagram and a control schematic. Be sure that all components and piping/ducting are labeled and that their numbers match those on the P&ID and control schematic. Mount it under glass or plastic on the wall next to the system controls.
- Prepare a **legible** set of final marked-up construction drawings.
- Prepare a notebook containing:
  - All product literature, equipment specifications, manufacturers' installation and operation instructions, and equipment warranties and guarantees for all components and materials used in the system.
  - Any as-builts or other materials you are required to prepare for the O&M manual.
  - Any records of system operation and performance prepared during the preoperational checkout, operational testing, and/or performance testing.

**Note:** These records are essential for follow-on maintenance and operation checkouts – be sure they are put into the O&M manual.