NABCEP

Solar Heating Installer

Job Task Analysis

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Center pool photo courtesy of NREL

Job Description and Task Analysis

for NABCEP Certified Solar Heating Installers

Introduction

This document presents a comprehensive Job Task Analysis (JTA) for individuals who install solar water and pool heating systems on buildings. It is important to note that these tasks are applicable to installation personnel—not to the system designer. This task list assumes the certified installer starts with an approved solar system design package, complete with major components, manufacturer installation manual, system schematics, and assembly and troubleshooting instructions. While the certified installer may not design the system, in many cases he or she must be knowledgeable about many aspects of systems design, and may be required to adapt certain designs to fit a particular application or customer need.

In this JTA, tasks are categorized according to their priority or importance using three levels:

- ***Critical*** items are considered high priority tasks and are expected competencies for all installers. These include items involving safety and other tasks with a high chance of error that could lead to system failure, destruction of components to which the system is attached, etc.

- ***Very important*** items are medium priority tasks, and are generally expected of all quality installers.

- ***Important*** items are considered low priority tasks, but are usually performed by all installers.

This document is divided into two sections. The first section, on page 3 provides a high-level view of the JTA and lists the main tasks and their criticality. The second section, which begins on page 4, provides a detailed view of the sub topics for each of the tasks.

Job Description

for NABCEP Certified Solar Heating Installer

Given basic instructions, manufacturer installation manual, major components specifications, schematics, and drawings, the installer is required to install a solar water heating system that meets the performance and reliability needs of customers in the United States and Canada by incorporating quality craftsmanship and complying with all applicable codes and standards.

Fundamentally, this JTA assumes that the installer begins with adequate documentation for the system design and equipment, including manuals for major components, electrical and mechanical drawings, and instructions. While these tasks have been developed based on conventional designs, equipment, and practice used in the industry today, they do not seek to limit or restrict innovative equipment, designs, or installation practice in any manner. As with any developing technology, it is fully expected that the skills required of the practitioner will develop and change over time as new materials, techniques, codes, and standards evolve.

Solar Heating Installer Tasks

AREA AND TASK	LEVEL
A. PREPARE FOR PROJECT	
Task 1. Review the construction plans	Critical
Task 2. Assemble materials	Critical
Task 3. Assemble and inspect safety protection equipment	Very Important
Task 4. Assemble tools	Important
B. EVALUATE THE SITE	
Task 1. Compare design to site	Critical
Task 2. Inspect and document existing site conditions	Very Important
Task 3. Ensure OSHA compliance	Very Important
Task 4. Ensure code compliance	Important
C. PLAN SYSTEM INSTALLATION	
Task 1. Lay out collector(s) installation	Critical
Task 2. Plan solar loop pipe	Critical
Task 3. Plan mechanical room/area	Critical
D. INSTALL SYSTEM	
Task 1. Install solar collectors	Critical
Task 2. Install solar loop	Critical
Task 3. Install balance-of-system	Critical
Task 4. Wire the system	Critical
Task 5. Pressure test the system	Very Important
Task 6. Fill the system	Very Important
Task 7. Install insulation	Very Important
Task 8. Implement site safety plan	Very Important
E. COMMISSION THE SYSTEM	
Task 1. Verify system operations	Critical
Task 2. Program the controllers	Very Important
Task 3. Conduct customer walk-through	Very Important
Task 4. Request final inspection	Important
F. SERVICE AND MAINTAIN THE SYSTEM	
Task 1. Perform scheduled maintenance	Important
Task 2. Troubleshoot and repair system	Important
Task 3. Ensure OSHA compliance	Important

Solar Heating Installer Sub-Tasks

AREA, TASK, SUB-TASK	LEVEL

A: PREPARE FOR PROJECT

Task 1. **Review the construction plans**

Read the construction plans	Critical
Create the materials list	Critical
Identify exceptions or special materials needed	Critical
Identify special tools needed	Critical
Identify safety equipment needed	Critical
Prepare project schedule	Very Important

Task 2. **Assemble materials**

Acquire materials for job	Critical
Inspect materials	Critical
Compare material availability to project schedule	Critical
Prepare materials for transport	Very Important
Arrange for equipment delivery	Very Important

Task 3. **Assemble and inspect safety protection equipment**

Assemble required Personal Protection Equipment (PPE)	Critical
Assemble required site-specific safety equipment	Critical
Inspect required site-specific safety equipment	Critical
Inspect required PPE	Very Important

Task 4. **Assemble tools**

Acquire tools for job	Very Important
Inspect tools	Very Important
Arrange for tool delivery	Important
Prepare tools for transport	Important
Compare tool availability to project schedule	Important

AREA, TASK, SUB-TASK	LEVEL

B: EVALUATE THE SITE

Task 1. **Compare design to site**

Verify site address	Critical
Verify system type is appropriate for site	Critical
Measure the roof	Critical
Confirm collector location, tilt, and azimuth	Critical
Evaluate present and future collector shading	Critical
Verify tank storage size, location, and access	Critical
Verify balance-of-system equipment suitability	Critical

Task 2. **Inspect and document existing site conditions**

Walk the site and note hazards	Critical
Document collector placement and location	Very Important
Document deficiencies in existing roof conditions	Very Important
Locate existing utility interconnections	Very Important
Document existing damage in the planned work area	Very Important
Document existing equipment deficiencies	Very Important
Identify staging area	Very Important

Task 3. **Ensure OSHA compliance**

Devise the site safety plan	Very Important
Begin implementation of site safety plan	Very Important
Mark hazards	Very Important

Task 4. **Ensure code compliance**

Inform customer of any code violations	Critical
Post permit (if necessary)	Important
Document existing code violations	Important

AREA, TASK, SUB-TASK	LEVEL

C: PLAN SYSTEM INSTALLATION

Task 1. **Layout collector(s) installation**

Locate and mark structural members	Critical
Lay out attachment hardware	Critical
Lay out structural modifications	Important

Task 2. **Plan solar loop pipe**

Determine pipe layout from collector to balance-of-system	Critical
Locate and mark building penetrations	Very Important

Task 3. **Plan mechanical room/area**

Plan system interconnections	Critical
Verify storage tank location	Critical
Inform customer of utility service interruptions	Very Important
Determine layout for balance-of-system	Very Important

D: INSTALL SYSTEM

Task 1. **Install solar collectors**

Install safety equipment	Critical
Install mounting hardware	Critical
Seal and flash penetrations	Critical
Attach panels to mounting hardware	Critical
Place panels on roof	Very Important

Task 2. **Install solar loop**

Seal and flash pipe penetrations	Critical
Install pipe	Very Important
Drill pipe penetrations	Very Important
Install pipe supports	Very Important
Pressure test collector loop	Very Important
Insulate pipe	Very Important

AREA, TASK, SUB-TASK	LEVEL
Task 3. **Install balance-of-system**	
Install valves	Critical
Install pumps	Critical
Install system safety devices	Critical
Place storage tanks	Very Important
Install heat exchangers	Very Important
Install meters	Important
Task 4. **Wire the system**	
Install controller(s)	Critical
Connect sensors	Very Important
Install sensor wires	Very Important
Wire the pump(s)	Very Important
Make final AC connections	Very Important
Protect wires	Very Important
Task 5. **Pressure test the system**	
Inspect for leaks	Critical
Isolate the expansion tank	Very Important
Attach pressure test fittings	Very Important
Pressurize the system	Very Important
Monitor pressure	Very Important
Task 6. **Fill the system**	
Verify valve positions for filling	Very Important
Close all drains	Very Important
Connect charging systems	Very Important
Fill system with heat transfer fluid and label	Very Important
Flush system	Important
Task 7. **Install insulation**	
Wrap the pipes with insulation	Critical
Install labels	Critical
Install UV protection	Very Important
Cut and seal corners	Very Important
Seal edges	Very Important
Insulate required components	Very Important

AREA, TASK, SUB-TASK	LEVEL
Task 8. **Implement site safety plan**	
Identify unsafe practices	Very Important
Correct unsafe practices	Very Important
Check safety equipment for defects	Very Important

E: COMMISSION THE SYSTEM

Task 1. **Verify system operations**	
Verify valve positions, orientations, and functions	Critical
Check pump operation	Critical
Check temperature difference	Very Important
Verify flow rates	Very Important
Bleed air vents	Very Important
Check system temperatures	Very Important
Check collector flow direction	Important
Task 2. **Program the controllers**	
Verify sensor connections	Critical
Verify functions	Critical
Read the manual	Very Important
Set temperature parameters	Very Important
Set flow rates	Very Important
Task 3. **Conduct customer walk-through**	
Deliver and review owner's manual	Very Important
Document baseline settings (normal readings)	Very Important
Explain emergency procedures	Very Important
Record model and serial numbers	Important
Task 4. **Request final inspection**	
Verify system meets code	Important
Request inspection(s)	Important
Coordinate inspection(s)	Important

AREA, TASK, SUB-TASK	LEVEL

F: SERVICE AND MAINTAIN THE SYSTEM

Task 1. **Perform scheduled maintenance**

Test freeze protection method	Important
Drain and flush the system	Important
Perform visual degradation check	Important
Check controls and sensors	Important
Check and replace anodes	Important

Task 2. **Troubleshoot and repair system**

Identify problem	Very Important
Solve the problem	Very Important

Task 3. **Ensure OSHA compliance**

Use site safety	Critical
Use PPE	Critical
Observe OSHA standards	Very Important

Exam Blueprint

The table below shows the blueprint (test specifications) for the NABCEP Certified Solar Heating Installer Examination. It is provided for candidates' and educators' use to determine which specific knowledge areas to focus on when preparing for the examination.

NABCEP Certified Solar Heating Installer Exam Blueprint

	% of exam	# of items
A. Prepare for project	12%	7
B. Evaluate the site	13%	8
C. Plan system installation	19%	11–12
D. Install the system	30%	18
E. Commission the system	14%	8–9
F. Service and maintain the system	12%	7
TOTAL	100%	60

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