

N A B C E P



Photovoltaic Installer *Job Task Analysis*

October 2011

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North American Board of
NABCEP
Certified Energy Practitioners®

NABCEP PV Installer Job Task Analysis

Introduction

This document presents a comprehensive Job Task Analysis (JTA) for individuals who install photovoltaic 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 a system design package, complete with major components, manufacturer installation manuals, system schematics, and assembly and troubleshooting instructions. While the certified installer may not design the system, 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.

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.

This document is a revision of the JTA that was released by NABCEP in July of 2010. The intent and purpose of these revisions is to offer greater focus and clarity to candidates, educators, and the exam committee. The major revisions in this document are the categorization of the task steps by level of criticality and the organization of the knowledge statements. A minor number of task steps were deleted from the JTA during the revision process. The job description was restated to be consistent with the original description of a NABCEP Certified PV Installer.



Job Description

for NABCEP Certified PV Installer

Given a potential site for a solar photovoltaic system installation and given basic instructions, major components, schematics, and drawings, the PV Installer will: specify, adapt, implement, configure, install, inspect, and maintain any type of photovoltaic system, including grid-connected and stand-alone systems with or without battery storage, that meet the performance and reliability needs of customers in the United States and Canada, by incorporating quality craftsmanship and complying with all applicable codes, standards, and safety requirements.

Task Steps and Knowledge in each Category Level

CATEGORY / LEVEL	DESCRIPTION
● Critical	Absolutely essential for a PV installer. Installers do these tasks most frequently.
● Important	Very important, but not of the highest level of criticality. These tasks are done with less frequency by installers yet have been identified as important to the knowledge base of installers.
● Useful	Might be useful; can inform education and training to add richness and depth. Installers do these tasks infrequently.

Scope of Job Task Analysis

NABCEP Certified PV Installers work in responsible roles on PV installation jobs. He or she is the person with ultimate responsibility for the quality and serviceability of the PV installation. Within this role they fill a wide range of job positions within the industry, taking responsibility for installations of varying size and complexity. As such, the scope of their duties may vary considerably. Due to the range of responsibilities and skills that may fall within the scope of a NABCEP Certified PV Installer’s job duties, this Job Task Analysis is very broad in scope: not all installers will perform all the tasks described herein.

It is expected that all individuals who achieve NABCEP PV Installer Certification will be familiar with and capable of executing all the tasks described as “critical” and that these tasks will be common to most if not all PV installations. It is further expected that all individuals who achieve

NABCEP PV Installer Certification will be familiar with all the tasks described as “important.” These tasks may not be performed on all installations but are an important part of the certified installer’s body of knowledge. Those tasks that are described as “useful” are performed more infrequently by the certified installer and are listed in the Job Task Analysis primarily for the benefit of those wishing to ensure they have the broadest possible knowledge of the tasks associated with PV Installations.

Candidates preparing for examination and educators developing curriculum should be aware that those questions regarding tasks described as “critical” are most likely to be included in examinations; tasks described as “important” may be on the examination; and those described as “useful” are least likely to be included as examination questions.

Content Domains and Examination Specifications

Content Domain	Percentage of Examination
Verify System Design	30%
Managing the Project	17%
Installing Electrical Components	22%
Installing Mechanical Components	8%
Completing System Installation	12%
Conducting Maintenance and Troubleshooting Activities	11%



Categorization/Prioritization of Task Steps Used by Photovoltaic Installers

TASK STEP CATEGORY

A: VERIFY SYSTEM DESIGN

1. Verify Client Needs

● Confirm desired location of equipment	Critical
● Address aesthetic concerns	Critical
● Address legal concerns	Important
● Confirm loads assessment	Useful *
● Confirm critical loads	Useful *
● Confirm system matches client expectation	Useful

2. Review Site Survey

● Evaluate roof conditions	Critical
● Evaluate desired array and equipment locations	Critical
● Locate solar equipment	Critical
● Locate conduit paths	Critical
● Evaluate roof structure	Critical
● Determine obstructions	Critical
● Conduct site hazard assessment (existing hazards)	Critical
● Identify staging/lifting/access locations	Critical
● Confirm accuracy of shading analysis	Important
● Evaluate existing electrical equipment	Important
● Determine true south	Important
● Evaluate wall structure	Important
● Confirm existing roof tilt and orientation (pitch and azimuth)	Important
● Confirm accuracy of site drawings	Important
● Evaluate wind exposure	Useful
● Evaluate soil conditions	Useful
● Confirm solar resource	Useful

3. Confirm System Sizing

● Arrange modules in mounting area	Critical
● Determine topography of mounting area	Important
● Confirm utility/authority having jurisdiction (AHJ) restrictions	Important

** The items noted were deemed to be useful or important primarily because most installations do not involve batteries and as such installers do not frequently perform the tasks. Each of these tasks becomes critical when installing battery systems and should be so noted.*

TASK STEP	CATEGORY
4. Review Design of Energy Storage Systems	
● Verify appropriate energy storage system location	Important
● Verify ventilation requirements	Important *
● Verify circuit design for critical loads	Important
● Verify access requirements	Important
● Verify load analysis	Useful
● Inspect existing wiring	Useful
● Identify multi-wire branch circuits	Useful *
● Confirm that battery bank is appropriate to inverter requirements	Useful
● Confirm that battery bank is appropriate to other charging sources	Useful
● Confirm that battery technology is appropriate to usage	Useful
5. Confirm String Size Calculations	
● Confirm highest and lowest design temperature	Important
● Confirm module Voc at lowest design temperature	Important
● Confirm temperature corrected voltage	Important
● Confirm voltage limits of system	Important
● Confirm appropriate string diagram	Important
● Confirm Vpmax at highest design temperature	Important
6. Review System Component Selection	
● Confirm component compatibility	Critical
● Confirm the selected module mounting system is appropriate for the application	Important
● Confirm the selected grounding method is appropriate for the application	Important
● Confirm the selected combiner boxes are appropriate for the application	Useful
● Confirm the number and type of inverters are appropriate for the application	Useful
● Confirm the number and type of charge controllers are appropriate for the application	Useful
● Confirm that all overcurrent protection devices are appropriate for the application	Useful
● Confirm the DC disconnect(s) are appropriate for the application	Useful
● Confirm the AC disconnect(s) are appropriate for the application	Useful
● Confirm maximum allowable number of unprotected parallel strings	Useful
● Confirm GFP devices are appropriate for the application	Useful
7. Review Wiring and Conduit Size Calculations	
● Confirm conductor ampacity calculations	Critical
● Confirm conduit fill calculations	Critical

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TASK STEP	CATEGORY
● Confirm conductor run distance	Critical
● Confirm appropriate conduit type(s)	Critical
● Confirm appropriate conductor insulation type(s)	Critical
● Confirm continuous current calculations	Important
● Confirm continuous load calculations	Important
● Confirm conditions of use calculations	Important
● Confirm temperature de-rate calculations	Important
● Confirm conductor de-rate calculations	Important
● Confirm voltage drop calculations	Important
● Confirm power loss calculations	Important
● Confirm appropriate grounding conductor type(s)	Important
● Confirm circuit current calculations	Important
● Confirm conduit size calculations	Important
● Confirm grounding conductor sizing calculations	Important
● Confirm thermal expansion calculations	Useful
8. Review Overcurrent Protection Selection	
● Confirm voltage specifications	Important
● Confirm compatibility with conductor size and type	Important
● Confirm circuit current calculations	Useful
● Confirm characteristics of existing electrical distribution system	Useful
● Confirm selection of overcurrent protection device enclosures	Useful
● Confirm equipment limits of overcurrent protection	Useful
● Confirm available fault currents	Useful
● Confirm voltage compatibility	Useful
● Confirm disconnecting means type	Useful
● Confirm disconnecting means amperage rating	Useful
● Confirm temperature rating of device	Useful
● Confirm terminal temperature limits of device	Useful
● Confirm enclosure rating of device	Useful
● Confirm wire size limitations of device	Useful
9. Review Fastener Selection	
● Confirm fastener sizes	Critical
● Confirm environmental conditions assessment	Critical
● Confirm compatibility of fasteners to system	Critical
● Confirm fastener types	Critical
● Confirm pilot hole specifications	Critical
● Confirm fastener assembly	Critical
● Confirm structural characteristics of substrate	Important
● Confirm fastener pull-out strengths	Important
● Confirm fastener removal	Important

TASK STEP	CATEGORY
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● Confirm mounting method	Important
● Confirm torque values	Important
● Confirm usage of appropriate auxiliary materials	Important
● Confirm weatherproofing materials for building penetrations	Important
● Confirm pull-out loads	Useful
● Confirm wind loading	Useful
● Confirm shear loads	Useful
● Confirm shear strengths	Useful
● Confirm types of loads	Useful
● Confirm accuracy of bill of materials	Useful

10. Review Plan Sets

● Confirm AHJ requirements	Important
● Confirm accuracy of electrical one- or three-line diagram	Useful
● Confirm accuracy of site plan	Useful
● Confirm accuracy of system design	Useful
● Generate a safety plan	Useful
● Assemble manufacturer’s data sheets	Useful
● Create labeling schedule	Useful
● Assemble manufacturer’s instructions	Useful
● Note and address structural concerns	Useful
● Complete commissioning forms	Useful
● Generate string diagram	Useful

B: Managing the Project

1. Conduct Pre-Construction Meetings

● Plan weather contingencies	Critical
● Verify site conditions match design	Critical
● Assemble workforce, including other trades as appropriate	Important
● Determine daily construction goals	Important
● Communicate construction strategy to customer	Important
● Provide customer orientation	Important
● Communicate target pull-off time for crew	Important
● Document safety plan	Important
● Resolve scheduling conflicts	Important
● Ensure pre-construction commitments by customer are complete	Important
● Determine community issues	Important
● Determine customer requirements	Important

TASK STEP	CATEGORY
2. Secure Permits and Approvals	
● Coordinate inspections	Important
● Schedule inspections	Important
● Confirm job permits	Important
● Resolve AHJ conflicts	Important
● Submit plans to utilities	Useful
● Resolve utility conflicts	Useful
● Obtain sign-off on final building permit	Useful
● Determine additional agency permits (e.g. zoning, solar access, Homeowners' Association, historic district)	Useful
3. Manage Project Labor	
● Coordinate with subcontractors	Critical
● Determine order of tasks	Critical
● Allocate resources	Critical
● Supervise project crews	Critical
● Communicate aspects of safety plan	Critical
● Coordinate with other trades	Important
● Orient contractors to job site conditions	Important
● Track man hours	Important
● Conduct toolbox talks	Important
● Resolve disputes	Useful
4. Adapt System Design	
● Identify potential conflicts in design	Critical
● Document changes to proposed design	Critical
● Maintain as-built documentation	Critical
● Submit modification proposals	Important
● Acquire approvals to change design	Important
● Submit any change orders	Important
5. Manage Project Equipment	
● Take delivery of components	Important
● Schedule deliveries	Important
● Identify lifting and handling areas	Important
● Perform equipment inspection	Important
● Perform equipment maintenance	Important
● State site equipment	Useful
● Schedule machinery	Useful
● Ensure equipment operator certification	Useful
● Install pedestrian barriers	Useful

TASK STEP

CATEGORY

6. Implement a Site-Specific Safety Plan

● Perform hazard analysis	Critical
● Identify job site hazards	Critical
● Implement ladder safety	Critical
● Implement fall protection plan	Critical
● Execute electrical safety	Critical
● Select personal protective equipment (PPE)	Critical
● Develop site-specific safety plan	Important
● Implement vehicle safety	Important
● Install site safety barriers	Important
● Identify access points to site	Important
● Identify site evacuation points	Important
● Post hospital map routes	Important
● Post emergency contact numbers	Important
● Ensure material safety data sheets (MSDS) are on-site	Important
● Post contingency plan	Useful

C: Installing Electrical Components

1. Mitigate Electrical Hazards

● Implement the site safety plan	Critical
● Implement the lock-out, tag-out procedures	Critical
● Determine voltage levels of interconnections	Critical
● Maintain clear work area	Critical
● Clarify the maximum working voltage	Critical
● Select required PPE based on system design (arc flash, shock, burn, voltage, etc.)	Critical
● Disconnect all unnecessary live circuits	Critical
● Determine working clearances	Critical
● Demonstrate situational awareness	Critical
● Measure voltage on equipment before proceeding with work	Critical
● Inspect safety equipment	Critical
● Inspect test equipment	Critical
● Maintain safety equipment	Important
● Inspect hand and power tools	Important
● Measure current on equipment before proceeding with work	Useful
● Maintain hand and power tools	Useful

TASK STEP	CATEGORY
2. Install Grounding Systems	
● Install module grounding	Critical
● Install inverter grounding	Critical
● Install mounting system grounding	Critical
● Ground all noncurrent-carrying metal parts	Critical
● Bond metallic raceways	Critical
● Install grounding electrode conductor	Critical
● Bond all electrical equipment	Critical
● Apply antioxidant material	Critical
● Prepare surfaces for electrical connections	Critical
● Make grounding electrode connection	Important
● Install grounding electrode(s)	Important
● Install supplementary ground electrode	Important
● Install system grounds	Important
● Determine grounding conductor size	Important
● Install DC ground-fault protection	Important
● Locate underground hazards	Useful
3. Install Conduit and Raceways	
● Plan conduit routing	Critical
● Penetrate building envelope	Critical
● Support and secure conduit	Critical
● Tighten all fittings	Critical
● Select fittings according to application	Critical
● Install above ground electrical raceways	Critical
● Install conduit bushings	Critical
● Make knockouts in electrical raceways	Critical
● Install underground electrical raceways	Important
● Remove sharp edges (deburr)	Important
● Install service entry mast	Useful
● Locate underground utilities	Useful
● Create underground trenches	Useful
● Backfill underground trenches	Useful
● Mark underground cables	Useful
● Mark underground trenches	Useful
4. Install Electrical Components	
● Select location of DC disconnect	Critical
● Mount electrical enclosures	Critical
● Install DC combiner	Critical
● Label equipment	Critical

TASK STEP	CATEGORY
● Install PV system disconnects	Critical
● Install inverter disconnects	Critical
● Install utility required disconnects	Critical
● Install array wiring transition box	Critical
● Install inverter	Critical
● Install underground electrical components	Important
● Install AC combiner	Important
● Install meter bases	Important
● Select label materials	Important
● Install junction boxes in the attic	Important
5. Install Circuit Conductors	
● Pull conductors	Critical
● Label conductors	Critical
● Terminate conductors	Critical
● Wire the inverter	Critical
● Wire modules	Critical
● Select the correct wire type, color, and gauge	Critical
● Secure conductors	Critical
● Measure wires	Critical
● Set up the wire installation (tugger, fish tape, rope)	Critical
● Test conductor installation	Critical
● Test DC source circuits	Critical
● Test DC currents	Critical
● Set up pull stations	Important
● Clear the electrical raceway	Important
● Splice electrical conductors	Important
6. Install Utility Interconnection	
● Install overcurrent protection device (OCPD)	Critical
● Install disconnects	Critical
● Test utility voltage	Critical
● Coordinate AHJ inspection	Critical
● Verify fill rates	Critical
● Terminate conductors	Critical
● Implement lock-out, tag-out procedures	Critical
● Evaluate existing service entrance equipment	Critical
● Install generation metering	Important
● Test conductor insulation	Important
● Select connection location	Important
● Coordinate utility shutdowns	Important

TASK STEP	CATEGORY
● Coordinate with customers and other regarding shutdowns	Important
● Move existing circuits	Important
7. Install System Instrumentation	
● Test system	Critical
● Install power and energy metering	Important
● Install data communication cables	Useful
● Install communication systems	Useful
● Install environmental sensors	Useful
● Install controllers	Useful
● Install electrical sensors	Useful
● Install inverter interface	Useful
● Install power supply	Useful
● Install battery temperature sensors	Useful
● Install outlet for monitoring system	Useful
8. Install Battery Components	
● Test each unit before placement (voltage, specific gravity, polarity)	Important
● Terminate fine stranded cables	Important
● Install maintenance disconnect	Important
● Confirm battery bank location	Important
● Install battery enclosure	Important
● Install battery enclosure venting	Important
● Install battery spill containment	Important
● Install batteries	Important
● Prepare battery terminals (e.g. clean)	Useful
● Install battery interconnection conductors	Useful
● Install battery units	Useful
● Apply antioxidant compounds	Useful
● Calculate ampacity	Useful
● Install charge controller	Useful *
● Seal conduit entry to battery box	Useful
● Label battery units	Useful
● Label battery enclosure	Useful
● Label battery room	Useful *
● Establish maintenance schedule	Useful
● Test final assembled battery polarity and voltage	Useful *
● Install safety station	Useful

** The items noted were deemed to be useful or important primarily because most installations do not involve batteries and as such installers do not frequently perform the tasks. Each of these tasks becomes critical when installing battery systems and should be so noted.*

TASK STEP

CATEGORY

D: Installing Mechanical Components

1. Install Equipment Foundation

● Locate center points of holes	Important
● Place anchor hardware	Important
● Install grounding equipment conductor (GEC)	Important
● Excavate to design specifications	Useful
● Build concrete forms	Useful
● Coordinate foundation inspections	Useful
● Identify location of underground utilities	Useful
● Add structural reinforcement	Useful
● Install wire raceways	Useful
● Place concrete to design specifications	Useful
● Install driven posts	Useful
● Strip concrete forms	Useful
● Backfill excavation	Useful
● Place mounting posts	Useful

2. Install Mounting System

● Install roof attachments	Critical
● Weatherproof penetrations	Critical
● Locate structural roof members	Critical
● Determine array attachment locations	Critical
● Install structural attachments	Critical
● Install module support frame	Critical
● Install rack components	Critical
● Locate array footprint	Critical
● Confirm compatibility with existing roofing system	Critical
● Plumb array structure	Critical
● Level array structure	Critical
● Apply corrosion protection to cut surfaces	Critical
● Install tracking apparatus	Important
● Install actuator motors	Important
● Install supplementary structural supports	Important
● Confirm row spacing	Important
● Confirm structural analysis has been performed	Important
● Install structural members	Important
● Locate ballast for mounting system	Useful
● Install seismic and wind loading	Useful

TASK STEP	CATEGORY
3. Install PV Modules	
● Unpack PV modules	Critical
● Stage PV modules	Critical
● Secure module wiring	Critical
● Inspect module for physical damage	Critical
● Fasten modules to structure	Critical
● Torque module fasteners	Critical
● Confirm module frame grounding	Critical
● Align modules aesthetically	Critical
● Determine project workflow	Critical
● Test PV modules	Important
● Prep PV modules	Important

E: Complete System Installation

1. Test the System

● Verify mechanical connection integrity	Critical
● Verify system grounding	Critical
● Verify electrical connection torque	Critical
● Verify polarity	Critical
● Measure DC voltages (string, output)	Critical
● Verify inverter operation	Critical
● Measure DC currents	Critical
● Compare measured values with expected values	Critical
● Measure AC system values	Critical
● Perform physical inspection	Critical
● Verify conduit fitting tightness	Critical
● Verify conduit and wiring supports	Critical
● Verify workmanship	Critical
● Measure irradiance levels	Important
● Calculate expected electrical parameters	Important
● Verify anti-islanding system	Important
● Test for ground fault	Important
● Measure insulation resistance	Useful
● Measure environmental levels	Useful
● Confirm phase rotation	Useful

TASK STEP

CATEGORY

2. Commission the System

● Turn on system	Critical
● Initiate start-up procedures per manufacturer instructions	Critical
● Program variable set points	Critical
● Measure all electrical parameters	Critical
● Compare measured values to expected values	Critical
● Monitor start-up process	Critical
● Record anomalous conditions	Critical
● Document design changes	Critical
● Verify as-built documentation	Critical
● Verify labeling accuracy	Critical
● Note data and time of system start-up	Important
● Repair anomalous conditions	Important
● Record environmental conditions	Important
● Record prior values on inverter	Important
● Measure voltage of energy storage system	Important
● Verify calculation of Total Solar Resource Fraction	Important
● Verify polarity of energy storage system	Useful
● Verify anti-islanding performance	Useful
● Record voltage of energy storage system	Useful

3. Complete System Documentation

● File project photographs	Critical
● Record component serial numbers	Important
● Deliver as-built documents	Important
● File permits	Important
● Record certificates of inspection	Important
● File inspection forms	Important
● File commissioning forms	Important
● File data sheets	Important
● File proof of system test results	Important
● Complete equipment warranty registration	Useful
● Complete installation warranty registration	Useful

TASK STEP	CATEGORY
4. Orient Customer to System	
● Explain start-up and shutdown procedures	Critical
● Answer customer questions	Critical
● Explain safety procedures to customer	Critical
● Explain maintenance procedures	Critical
● Address customer concerns	Important
● Train customer on maintenance and operation procedures	Important
● Explain equipment clearance requirements	Important
● Perform customer walk-through	Important
● Provide contact information to customer	Important
● Explain normal operational performance	Important

F: Conducting Maintenance and Troubleshooting Activities

1. Perform Visual Inspection

● Verify equipment grounding	Critical
● Inspect module mounting system	Critical
● Identify hazards	Critical
● Inspect weatherproofing systems	Critical
● Inspect for wiring damage	Critical
● Inspect module integrity	Critical
● Check inverter status	Critical
● Inspect electrical equipment	Critical
● Identify damage due to corrosion	Critical
● Identify array shading	Critical
● Identify array soiling	Critical
● Inspect cells for discoloration	Critical
● Verify grounding system integrity	Critical
● Look for unsupported wiring	Critical
● Identify damage to module glazing	Critical
● Document findings	Critical
● Identify mismatched equipment	Critical
● Inspect for working clearances	Important
● Identify electrical connections damage due to overheating	Important
● Confirm equipment serial numbers	Important
● Inspect module back skin	Important
● Check conduit fitting tightness	Important
● Inspect for evidence of animals	Important
● Identify vegetation growth	Important
● Identify water ponding	Important
● Identify ice damage	Important

TASK STEP

CATEGORY

2. Verify System Operation

● Measure system electrical parameters	Critical
● Document found electrical parameters	Critical
● Calculate expected electrical parameters	Critical
● Compare expected parameters with found parameters	Critical
● Note anomalous conditions	Critical
● Test system electrical equipment operations	Critical
● Recommend corrective actions	Critical
● Verify source circuits are connected	Critical
● Interview customer	Important
● Document customer's concerns	Important
● Compare historical kWh performance against expected kWh performance	Important
● Measure equipment temperatures	Important
● Note interannual weather variability	Important
● Measure terminal temperatures	Important
● Verify operation of battery venting systems	Important
● Verify battery auxiliary systems	Important

3. Perform Corrective Actions

● Replace defective modules	Important
● Check equipment variable set points	Important
● Perform scheduled maintenance	Important
● Replace frayed wires	Important
● Replace blown fuses	Important
● Replace faulty components	Important
● Locate ground faults	Important
● Repair ground faults	Important
● Mitigate negative local conditions	Important
● Locate line to line faults	Important
● Repair line to line faults	Important
● Document corrective actions	Important
● Clean arrays	Useful
● Service ventilation systems	Useful
● Clean batteries	Useful
● Recalibrate equipment at variable set points	Useful
● Wipe down power conditioning equipment	Useful
● Clean heat sinks	Useful
● Schedule manufacturer on-site service call	Useful
● Seal compromised weatherproofing systems	Useful
● Perform battery maintenance	Useful

TASK STEP	CATEGORY
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● Perform controlled overcharge	Useful
● Clean system labeling	Useful
● Replace system labeling	Useful

4. Verify Effectiveness of Corrective Actions

● Retest system operations	Critical
● Retest electrical parameters	Important
● Retest environmental conditions	Important
● Compare pre-maintenance values to post-maintenance values	Important
● Retest weatherproofing system	Useful
● Reorient customer to system	Useful



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Knowledge Groups for NABCEP 2011 Refocused Job Task Analysis

The topic list below provides the broad content areas from which the JTA was developed. The test items for the certification examination will be based upon the stated competencies in the JTA and not from general content in this topic list. Successful candidates will need to have knowledge in the topics listed below.

A detailed version of this list that includes subtopics is available on the NABCEP website (www.nabcep.org). This list is included as valuable information to help candidates evaluate their readiness for examination.

- Basic Electricity
- Building Codes
- Blueprint Reading
- Customer Relations
- Construction Processes
- Instrumentation and Measurements
- Mathematics
- National Electrical Code
- Occupational Safety and Health
- PV System Design
- PV System Installation
- Residential and Commercial Wiring
- Solar and PV Fundamentals

NABCEP wishes to acknowledge and thank the following individuals for their contribution in developing this JTA:

Ward Bower

Dave Click

Richard Dean

Jason Fisher

Geoff Greenfield

Marvin Hamon

Will Herendon

Ed Knaggs

Michael Kuhn

Matt Lafferty

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Scott McCalmont

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Dan Rice

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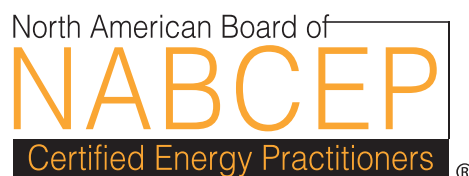
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