



OFFICE FOR ASSESSMENT OF PROFESSIONAL AND
WORKPLACE LEARNING

ACADEMIC PROGRAM REVIEW

of

NORTH AMERICAN BOARD OF CERTIFIED ENERGY
PRACTITIONERS (NABCEP)

SOLAR CERTIFICATIONS

REVIEW DATES:
NOVEMBER 9 & NOVEMBER 30, 2012

Table of Contents

NABCEP Profile.....	3
Academic Program Review Team Members.....	4
Index of Certificate/Credit Recommendations	5
Individual Certificate Sheets.....	6-11
Review Summary.....	12

**NORTH AMERICAN BOARD OF CERTIFIED ENERGY
PRACTITIONERS (NABCEP)
SOLAR CERTIFICATIONS**

PROFILE

The North American Board of Certified Energy Practitioners (NABCEP) is the “gold standard” for PV and solar heating installation certification. Designed to raise industry standards and promote consumer confidence, NABCEP offers certification and certificate programs to renewable energy professionals throughout North America.

The North American Board of Certified Energy Practitioners (NABCEP) is a volunteer board of renewable energy stakeholder representatives that includes representatives of the solar industry, NABCEP certificants, renewable energy organizations, state policy makers, educational institutions, and the trades. Each member of the board was chosen because of his or her experience and involvement in the solar energy industry. NABCEP’s mission—to support, and work with, the renewable energy and energy efficiency industries, professionals, and stakeholders—is intended to develop and implement quality credentialing and certification programs for practitioners.

NABCEP’s goal is to develop voluntary national certification programs that will:

- Promote renewable energy;
- Provide value to practitioners;
- Promote worker safety and skill; and
- Promote consumer confidence.

NABCEP is committed to providing a certification program of quality and integrity for the professionals and consumer/public it is designed to serve. Professionals who choose to become certified demonstrate their competence in the field and their commitment to upholding high standards of ethical and professional practice.

Source of Official Student Records: *(Fill in student contact information at organization).*

For further information about the review, contact: Office for Assessment of Professional and Workplace Learning, Thomas Edison State College, 101 West State Street; Trenton, New Jersey 08608-1176, (609) 633-6271; apr@tesc.edu.

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Certification Sheet

Name of Certification: PV Entry Level

Certification Description: Achievement of the NABCEP Entry Level Exam is a way for candidates to demonstrate that they have achieved a basic knowledge of the fundamental principles of the application, design, installation and operation of PV and Solar Heating systems.

Effective Date: January 2005 – November 2017

Learning Outcomes: Upon successful completion of this certification, the student will be able to:

- Identify the various safety hazards associated with both operating and nonoperating PV systems and components.
- Define basic terminology.
- Differentiate between solar irradiance (power) and solar irradiation (energy).
- Understand the consequences of array shading and best practices for minimizing shading and preserving array output.
- Identify key electrical output parameters for PV modules using manufacturers' literature.
- Understand the effects of varying incident solar irradiance and cell temperature on PV module electrical output.
- Understand the effects of connecting similar and dissimilar PV modules in series and in parallel on electrical output, and diagram the resulting I-V curves.
- Define performance rating and measurement conditions for PV modules and arrays.
- Describe the purpose and principles of operation for major PV system components.
- Beginning with PV module DC nameplate output, list the de-rating factors and other system losses, and their typical values.
- Given a stand-alone application with a defined electrical load and available solar energy resource, along with PV module specifications, size and configure the PV array, battery subsystem, and other equipment.
- Draw and prepare simple one-line electrical diagrams for interactive and standalone PV systems.
- Understand how PV modules are configured in series and parallel to build voltage, current and power output.
- Identify basic properties of electrical conductors.
- Understand the basic principles of PV system grounding.
- Identify the requirements for plan review, permitting, inspections, construction contracts.
- Understand the requirements for roofing systems expertise.
- Review and recognize the importance of PV equipment manufacturers' instructions.

Major topics covered on the certification exam are:

- PV Markets and Applications
- Safety Basics
- Electricity Basics
- Solar Energy Fundamentals
- PV Module Fundamentals
- System Components
- PV System Sizing Principles
- PV System Electrical Design
- PV System Mechanical Design
- Performance Analysis, Maintenance and Troubleshooting

Assessment criteria: Examination

Credit Recommendation: In the lower division associate degree category, three credits in Photovoltaic Systems.

Credit Rationale: The range of topics covered and the depth of knowledge required warrant this credit recommendation.

Certification Sheet

Name of Certification: PV Installer

Certification Description: 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.

Effective Date: January 2010 – November 2017

Learning Outcomes: Upon successful completion of this certification, the student will be able to:

- Verify System Design
- Manage the Project
- Install Electrical Components
- Install Mechanical Components
- Complete System Installation
- Conduct Maintenance and Troubleshooting Activities

For a complete list of outcomes, see www.nabcep.org

Major topics covered on the certification exam are:

- System Design
- Management of the Project
- Complete system installation including electrical and mechanical components
- Maintenance and Troubleshooting Activities

Assessment criteria: Examination

Credit Recommendation: In the lower division baccalaureate/associate degree category, six credits in Photovoltaic Installation.

Exam competencies as listed on the NABCEP website require familiarity with math including trigonometry as well as communication skills, understanding and applying electric concepts, basic understanding of physics including load analysis, planning, and basic design and presentation abilities. These, as measured on the exam, would demonstrate mastery of knowledge at a college level.

It should be noted that there are several ways that an individual may qualify to sit for the certification examination. For this exam, every applicant must demonstrate a minimum of 10 hours of OSHA approved Construction Industry safety training.

In addition the candidate must demonstrate training and experience such as completion of 58 cumulative hours of training, licensure as a contractor or four years as a licensed contractor. See the NABCO website for a complete listing of prerequisites.

Credit Rationale: Three credits in content knowledge and 3 credits in experiential mastery are recommended based on the depth and breadth of knowledge and mastery required. As the field continues to grow, credit at the upper level could also be considered as more analysis and range of knowledge is required.

Certification Sheet

Name of Certification: Solar Heating Installer

Certification Description: This certification defines a general body of knowledge, skills and abilities typically required of practitioners who install and maintain solar hot water or pool heating systems.

Effective Dates: January 2011 – November 2017

Learning Outcomes: Upon successful completion of this certification, the student will be able to:

- Conduct a site analysis, including load analysis.
- Identify Solar Heating (SH) safety practices, standards, codes, and certification.
- Identify systems for specific climates and applications.
- Identify proper operation and installation methods.
- Identify proper use of balance-of-system components and materials (e.g., controllers, tanks, pumps, valves, piping, etc.).
- Identify common SH maintenance items.

Major topics covered on the certification exam are:

- Site analysis
- SH Safety Practices
- SH Installation methods
- SH Systems
- SH Maintenance

Assessment criteria: Examination

Credit Recommendation: In the lower division baccalaureate/associate degree category, six credits in Solar Heat Installation.

Credit Rationale: Exam competencies as listed on the NABCEP website require familiarity with math including trigonometry, I believe, as well as communication skills, understanding and applying electric concepts, basic understanding of physics including load analysis, planning, and basic design and presentation abilities. These, as measured on the exam, would demonstrate mastery of knowledge at a college level.

It should be noted that there are several ways that an individual may qualify to sit for the exam. For example, the candidate must have a combination of training focusing on solar heating and experience ranging from two or more years depending on the field and level.

Finally, the NABCEP Solar Heating Installer Certification has been developed in accordance with the certification field's best practices. NABCEP is a member of the [National Organization for Competency Assurance](#) (NOCA) and has endeavored to follow the requirements of [ISO/IEC Standard 17024](#): General Requirements for Bodies Operating Certification Systems of Persons.

Review Summary:

The team includes the following comments based on their review of these three certifications:

1. The NABCEP Installer Certification is being renamed NABCEP Installation Professional. This change broadens the types of worker for whom the certification makes sense, including designers, analysts, even sales workers (for whom there is a separate certification) as well as project managers and installers.
2. The change in name will not result in any change in the content scope or difficulty level of the exam.
3. A fourth certification in Solar Thermal Entry Level should be included in a future academic program review.