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Photovoltaic Training for the Electrical Industry:

1- Structure of Apprenticeship,
2- Core Curriculum,
3- Concentrated Photovoltaics Training - Apprenticeship, Journeyman.
Structure of Apprenticeship
(for the electrical industry)

• In 1941 the National Joint Apprenticeship and Training Committee (NJATC) was created to develop and standardize training for the International Brotherhood of Electrical Workers (IBEW) and the National Electrical Contractors Association (NECA).
  – Jointly run training program as a partnership.

• Apprenticeship:
  – Open Application for Apprenticeship.
    • Multiple entry paths.
  – Requires completion of On the Job Training (OJT) as well as classroom instruction and assessments with evaluation(s).
Structure of Apprenticeship

(for the electrical industry)

• 5 year program:
  – 8000 hours of OJT,
  – 900 hours of classroom instruction.
• OJT evaluations for each Apprentice,
• Classroom Assessments,
• Must Demonstrate Progression.
Core Curriculum

• A way to customize apprenticeship to deliver the best training and meet the needs of the local market.

• Defines what we teach, and that content is based on the work apprentices see and experience on-the-job, as identified by the Local JATC.
Each Course is Evaluated for Credits (not hours)
Each year requires a minimum number of credits
- The 1st Year Requires 30 Credits
Credits are determined through a scientific analysis of each course
- Learning Objectives
- References
- Questions
- Tests
Analysis was conducted using established criteria:
- Bloom’s Taxonomy
- Methodology created by Benjamin Bloom
- Designed to classify the Cognitive domain of learning
Core Curriculum: Applications are hands-on tasks which apprentices must learn, but which they may not learn on-the-job due to the type of work they are required to do. For Example (first year):

- There are currently 16 Applications:
  1. Installing a Duplex Receptacle
  2. Installing a Single Pole Switch
  3. Installing a Switched Duplex Receptacle
  4. Splicing Conductors
  5. Installing Flexible Metallic conduit
  6. Installing Armor clad and Metal Clad Cables
  7. Installing a Retrofit “Old Work” Electrical Box
  8. Cutting a Hole in a Metal Enclosure for an EMT Connector
  9. Using Anchors to Install a Metal Enclosure
  10. Installing a Raceway Support System (Trapeze)
  11. Installing a Luminaire (Recessed “Can” Fixture)
  12. Installing a Luminaire (2’ x 4’ Fluorescent)
  13. Wire Pulling Techniques
  15. Erecting an Extension Ladder
  16. Exothermic Welding of Copper Conductors
90 Credit Hours of Core

1st Year Core
30 Credits w/ Applications
- Orientation 1
  2 Credits
- Job Info. 1
  6 Credits
- Conduit 1
  3 Credits
- DC Theory 1
  10 Credits
- Code & Prac. 1
  4 Credits
- Boot Camp in the 1st Year
- Ind. Awareness in the 1st Year
- Application
  1/4 Credit

2nd Year Core
25 Credits w/ Applications
- Orientation 2
  1 Credit
- Test Inst. 1
  2.5 Credits
- Codeology 1
  3 Credits
- AC Theory 1
  7 Credits
- Blueprints 1
  2.5 Credits
- Electrical Safe Work Practices 1
  2 Credits
- Transformer 1
  2 Credits
- Fire Alarm 1
  2 Credits
- Blueprints 2
  2 Credits
- Grounding & Bonding 1
  2 Credits
- Code & Prac. 2
  4 Credits
- Code Calc. 1
  1 Credit
- Motor Ctrl. 1
  4 Credits
- Motor Ctrl. 2
  4 Credits
- Transformer 2
  2 Credits
- Motor 1
  2 Credits
- Electrical Safe Work Practices 2
  2 Credits
- Grounding & Bonding 2
  2.5 Credits
- Code Calc. 2
  1.5 Credits

3rd Year Core
15 Credits
- AC Theory 2
  3 Credits
- Transformer 2
  2 Credits
- Electrical Safe Work Practices 2
  2 Credits
- Code & Prac. 3
  2 Credits
- Blueprints 2
  2 Credits
- Code Calc. 1
  1 Credit
- Grounding & Bonding 1
  2 Credits
- Orientation 3
  1 Credit
- Code Calc. 2
  1.5 Credits
- Motor 1
  2 Credits
- Torque 1
  0.5 Credit
- Grounding & Bonding 2
  2.5 Credits
- Code & Prac. 4
  2 Credits

4th Year Core
10 Credits
- Blueprints 3
  1 Credit
- Code Calc. 1
  1 Credit
- Motor Ctrl. 1
  4 Credits
- Motor Ctrl. 2
  4 Credits
- Transformer 2
  2 Credits
- Grounding & Bonding 2
  2.5 Credits
- Grounding & Bonding 1
  2 Credits
- Motor 1
  2 Credits
- Torque 1
  0.5 Credit
- Code & Prac. 3
  2 Credits
- Blueprints 2
  2 Credits
- Code Calc. 2
  1.5 Credits
- Code & Prac. 4
  2 Credits

5th Year Core
10 Credits
- Code Calc. 1
  1 Credit
- Orientation 3
  1 Credit
- Code Calc. 2
  1.5 Credits
- Motor Ctrl. 2
  4 Credits
- Transformer 2
  2 Credits
- Motor 1
  2 Credits
- Torque 1
  0.5 Credit
- Code & Prac. 4
  2 Credits
- Blueprints 2
  2 Credits
- Code Calc. 2
  1.5 Credits
- Code & Prac. 3
  2 Credits

10 Credits of JATC Selected Advanced Courses
- 10 Credits of JATC Selected Advanced Courses
- 15 Credits of JATC Selected Advanced Courses
- 15 Credits of JATC Selected Advanced Courses

NOTES:
- 1st Year –
  - The DC Theory 1 Course includes 1 Test Instruments Lesson
- 2nd Year –
  - The Code and Practices 2 Course includes 2 Code Calculation Lessons
- 3rd Year –
  - The Grounding and Bonding 1 Course includes 4 Test Instruments Applications
- 4th Year
  - The Code Calculations 1 Course includes 5 Code & Practices Lessons

40 Credit Hours of Advanced

Optional Boot Camp (40-hr Design) Before Work
Optional Industry Awareness (40-hr Design) Before Work

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Core Curriculum- Advanced Training: Photovoltaics

• Before an apprentice begins classroom training in Photovoltaics, training must be completed for:
  – The National Electrical Code (17 credits)
  – Workplace safety (4 credits)
  – Electrical Theory (20 credits)
Photovoltaics Training
Apprenticeship and Journeyman

- Photovoltaics Systems Text,
- Instructor Guide,
- Student Workbook.
  - 19 lessons

Covers all learning objectives as applicable to installing a Photovoltaic System.
Curriculum Scope

Task Analysis for PV Systems

- Working Safely with PV Systems
- Conducting a Site Assessment
- Selecting a System Design
- Adapting the Mechanical Design
- Adapting the Electrical Design
- Installing Components and Subsystems
- Performing System Checkout and Inspection
- Maintaining and Troubleshooting Systems
NJATC Objectives for PV Training:

• To provide the necessary curriculum such that an Apprentice is trained on the performance of PV systems.
• To provide the necessary curriculum such that an apprentice is trained on the installation and safety of PV systems.
• To provide the necessary curriculum such that Journeymen are properly instructed into the installation requirements for PV systems.
• To provide all Apprentices and Journeymen equal access to standardized training for an electrical career.