# PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION

**Career Cluster: Architecture and Construction**

**Program Name:** Electrician  **CIP:** 460302  
**National Standard:** National Fire Protection Association – 70: National Electric Code  
**Effective:** 6/2012

## Competencies

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<th>Rating Scale -Sample Performance Assessments</th>
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### Understand workplace practices, use of tools, materials, and codes and regulations of the trade in order to foster a safe work environment.

1. Identify and follow necessary safety precautions with operations and materials according to federal, state, and local regulations (normal/hazardous).  
   **AAI 8. Health, Safety, and Environment:** Explain the health and safety laws and practices affecting the employee, the surrounding community, and the environment in this industry.

2. Discuss and explain NO LIVE WORK in accordance with sections in 70-E and OSHA by demonstrating Lockout-Tagout process.

3. Identify the different categories and types of meters and demonstrate appropriate use.

### Understand the concepts and procedures in the use the four categories and other types of meters in order to provide safe and accurate electrical measurements.

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<td><strong>Understand the concepts, theory, and basic principles in order to solve Ohm’s law and equations for circuits.</strong></td>
<td>4. Discuss and explain the fundamental concepts and theory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Solve problems for an unknown voltage, an unknown amperage, an unknown resistance, and an unknown wattage.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>AAI 5. Underlying Principles of Technology:</strong> Explain through discussion the technological systems used within this industry.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Understand and use manufacturer’s designations in conductor and cable specifications, use, and installation in order to install new circuits and extend existing circuits.</strong></td>
<td>7. Match letter type designations for conductors to their correct description and identify use.</td>
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<tr>
<td>9. Install cable in open stud work during new construction. <strong>AAI 4. Technical and Production Skills:</strong> Identify specific production and technical skills required for this industry.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Install cable from main panel to new outlets and install cable between an existing box and a new box.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
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<tr>
<td>11. Recognize wiring techniques required for old work through attic or basement space considering NFPA70E.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
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<tr>
<td><strong>Understand concepts in blueprint reading and specifications in order to develop basic electrical circuit drawings.</strong></td>
<td><strong>AAI 4. Technical and Production Skills:</strong> Identify specific production and technical skills required for this industry.</td>
<td>1 2 3 4</td>
<td></td>
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<tr>
<td>12. Create basic electrical drawings.</td>
<td>As an apprentice your foreman has asked you to derive a list of materials from a set of electrical drawings. Cont. to #13.</td>
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Mathematics: M  
Science: S  
Art: A | |
| 13. Analyze blueprints and project specifications.  
**AAI 5. Underlying Principles of Technology:** Explain through discussion the technological systems used within this industry. | | | 1 2 3 4 |
| 14. Identify boxes and cover plate and determine size, location and type. | | | As an apprentice your foreman has required you to select and install the correct boxes for a new dwelling. Cont. to #15 |
| 15. Install a device box to a given height and wall thickness and install a luminaire box. | | | 1 2 3 4 |
| 16. Wire a single pole switch controlling a lighting outlet with the supply entering the switch and with the supply entering the light.  
**AAI 4. Technical and Production Skills:** Identify specific production and technical skills required for this industry. | | | As an apprentice your foreman has asked you to rough in a dwelling unit. Cont. to # 20 and, 41, 42, & 43. |

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|                                                                              | 17. Wire two three-way switches controlling a lighting outlet with the supply entering the switches and with the supply entering the light. | English/Language Arts/Literacy: E  
Mathematics: M  
Science: S  
Art: A                                                                  | Student will:                                                                                     |
|                                                                              | 18. Wire two three-way and one four-way switch controlling a lighting outlet with the supply entering the four-way and entering the light. |                                                                                                            | 1 2 3 4                                                                                                                          |
| **Understand the concepts, safety, and procedures in installing and wiring electrical device outlets in order to provide 120V/208V/240V circuits.** | 19. Wire various receptacles (duplex, split-wired duplex, switched controlled duplex, GFCI) and wire a multi-wire branch circuit connected to a duplex receptacle. |                                                                                                            | 1 2 3 4                                                                                                                          |
|                                                                              | 20. Wire a 50 amp range outlet and a 30 amp dryer outlet.                                      |                                                                                                            | 1 2 3 4                                                                                                                          |

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| Understand the process and procedure to install panel board and the concept of over-current protection in order to provide safe power distribution. | 21. Identify types of over-current protection. (AFCI-GFCI) | 1 2 3 4 | Today your foreman has asked you to tie in all the branch circuits into the panel board. Cont. to #23. |
| 22. Recognize ampere interrupting capacity rating, effective incident energy, ground fault and short circuit. | 1 2 3 4 |
| 23. Identify the parts and types of panel boards. | 1 2 3 4 |

| Understand the procedures and process to install a residential service in order to provide power to a service panel. | 24. Connect a utility meter socket to a main panel or main disconnect. | 1 2 3 4 | As an apprentice you will assist a journeyman electrician on a residential service change. Cont. to #27. |
| 25. Properly ground and bond a service. | 1 2 3 4 |
| 26. Install overhead service and underground service. | 1 2 3 4 |

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#### Competencies

- Understand fundamental concepts of alternative power supplies to provide a safe, compliant installation.
- Understand the concepts and safely troubleshoot electrical systems in order to repair circuits.
- Understand the process and procedure of electrical estimating to determine costs to the contractor and consumer.

#### Knowledge, Content and Skills

- 27. Create a panel board directory.
- 29. Trouble-shoot, diagnose, and repair electrical systems (70E).
- 30. Review cost and value of materials.

#### NH Common Core State Standards – Aligned

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- Mathematics: M
- Science: S
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#### Rating Scale - Sample Performance Assessments

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<td>As apprentice you have been tasked in detailing the components required in a residential generator installation.</td>
<td></td>
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<tr>
<td>As apprentice you will assist a journeyman electrician troubleshooting a faulty circuit.</td>
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<tr>
<td>As an apprentice you have to estimate the costs and materials for an addition on a dwelling. Cont. to #31.</td>
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<th>Understand the concepts, processes and techniques of raceway use and installation in order to meet the requirements of the National Electric Code.</th>
<th>32. Identify different types of raceways and the different types of supports and fittings used with raceways.</th>
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| | 33. Discuss, identify and Follow National Electrical Code (NEC) requirements for:  
- electrical metallic tubing (EMT)  
- ridged metallic conduit  
- PVC and  
- raceway fill |   |   |
| | 34. Create offsets using 3 degree settings (EMT) |   |   |
| | 35. Prepare ¾” box offset, 90º bend, and a back-to-back 90º bend (EMT) |   |   |
| | 36. Prepare a three-point saddle and a four-point saddle using EMT. |   |   |

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| **37. Bend PVC conduit with listed bender.** | **38. Wire a motor controlled by a single pushbutton station and a single contactor, and wire a motor controlled by two pushbutton stations and a single contactor.** | **NH Common Core State Standards – Aligned:**  
- English/Language Arts/Literacy: E  
- Mathematics: M  
- Science: S  
- Art: A | **1 2 3 4**  
- You have a job where you have to install a motor starter for a septic pump. Cont. to #43 |
| **39. Properly size motor overload protection, branch circuit protection and conductor size.** | | **1 2 3 4** | |
| **40. Identify different luminaire and lamp types and wire according to manufacturer’s instructions.** | | **1 2 3 4** | |

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| Understand the concepts and techniques used in branch circuits to provide branch circuits that meet the requirements of the National Electric Code. | 41. Identify and demonstrate (how, where and what size):  
- small appliance branch circuits  
- general lighting circuits  
- requirements for a single family dwelling  
- AFCI  
- GFCI | | |
| Understand the concepts and installation procedures to provide low voltage circuits and devices. | 42. Install:  
- chime circuits  
- telecommunications cabling  
- low voltage controls (class 2 & class 3) | | |
| Understand the National Electrical Code and practice in order to provide circuits free from electrical hazards. | 43. Recognize and discuss all relevant Articles of NEC | | As an apprentice you have to determine minimum burial depth of cable to a lamp post at a dwelling unit. |
| Understand municipalities’ ordinances, requirements, permits/inspections, and fee procedures in order to provide legal electrical installations. | 44. Apprentices will be aware of apprentice’s registration requirements and further licensing requirements. | | As an apprentice you have to keep track of your working hours in order to satisfy state requirements. |

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|              |                                                                                                 | **Mathematics:** M                      | **As an apprentice you will accompany the master electrician to pull the permit for the job.**  
|              |                                                                                                 | **Science:** S                         | **Cont. to # 47**  
|              |                                                                                                 | **Art:** A                              |                                                                     |

### 45. Identify and define electrical permitting process according to the authority having jurisdiction.

### 46. Identify and define rough inspection and finish inspection.

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### Understand the fundamental concepts of entrepreneurship and how entrepreneurship influences the economy.

- 47. Discuss and assess business/venture creation possibilities and identify the steps in planning the business/venture (growth, development, demise) – (traits and behaviors of an entrepreneur)
- **AAI 1. Planning:** Explain the key elements of a long-term plan for a successful company.
- **AAI 2. Management:** Discuss the different forms of management and ownership within this industry.
- **AAI 3. Finance:** Explain the key components of financial management of a company.
- **AAI 6. Labor Issues:** Explain the employees’ and employers’ rights and responsibilities in this industry.
- **AAI 7. Community Issues:** Discuss the ways a company can impact its community and the ways a community can impact a company.

### Understand the importance of personal growth and leadership to enhance career success.

- 48. Demonstrate personal growth, community leadership, democratic principles, and social responsibility by participating in activities/events offered through student organizations.

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| --- | --- |
| As an apprentice you are required to attend the company’s monthly business meeting to gain awareness of current business issues. |
| Your company is involved in a community service project, and you have been asked to participate. |

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| Understand the necessary employability skills in order to achieve success in today’s workplace. | 49. Decision-Making & Problem-Solving: Demonstrate and apply good decision-making and problem-solving skills by outlining issues in situations/problems and determining, collecting, and organizing information needed in order to formulate a solution. | ▶ English/Language Arts/Literacy: E  
▶ Mathematics: M  
▶ Science: S  
▶ Art: A | ▪ 1  
▪ 2  
▪ 3  
▪ 4  
For Example:  
As a 4th year apprentice your employer is training you to be a project foreman. Cont. to #53 |
| 50. Self –Management: Demonstrate and apply self-management skills by adhering to regulations, being responsible, and following through on commitments. | | ▪ 1  
▪ 2  
▪ 3  
▪ 4 |
| AAI 9. Personal Work Habits: Explain the work habits an employer looks for in an employee in this industry. | | |
| 51. Communication Skills: Demonstrate and apply effective communication skills: verbal (oral/written), visual, and listening. | | ▪ 1  
▪ 2  
▪ 3  
▪ 4 |
| 52. Ability to Work with Others: Demonstrate and apply the necessary skills in order to work effectively with others. | | ▪ 1  
▪ 2  
▪ 3  
▪ 4 |
| 53. Information Use - Research, Analysis, Technology: Demonstrate and apply the use of information through research, analysis, and technology. | | ▪ 1  
▪ 2  
▪ 3  
▪ 4  
For Example:  
As an apprentice you have been asked by a customer to estimate their energy use. |

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<th>Knowledge, Content and Skills (what a student needs to know and be able to do and upon which they will be assessed)</th>
<th><strong>NH Common Core State Standards</strong> – Aligned</th>
<th><strong>Rating Scale - Sample Performance Assessments</strong> (Performance tasks the student needs to demonstrate in order to be rated proficient in meeting the competency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student will:</td>
<td><strong>Student will:</strong></td>
<td><strong>English/Language Arts/Literacy:</strong> E</td>
<td><strong>Student will:</strong></td>
</tr>
<tr>
<td><strong>Student will:</strong></td>
<td><strong>Mathematics:</strong> M</td>
<td><strong>Science:</strong> S</td>
<td><strong>Art:</strong> A</td>
</tr>
<tr>
<td><strong>Student will:</strong></td>
<td></td>
<td></td>
<td><strong>Rating Scale:</strong> 1 = NO EXPOSURE; 2 = NOVICE (Information was covered in class, but student cannot demonstrate skill or knowledge without significant supervision); 3 = PROFICIENT (Student regularly demonstrates the knowledge or skill); 4 = MASTERY (Student demonstrates successful completion of this skill numerous times without supervision.)</td>
</tr>
<tr>
<td><strong>Student will:</strong></td>
<td></td>
<td></td>
<td><strong>For Example:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>54. <strong>Mathematical Concepts:</strong> Demonstrate mathematical and computation skills as applied to real world situations.</th>
<th></th>
<th>1 2 3 4</th>
<th><strong>For Example:</strong> You are on the job site and do not have a tape measure. You have to do a rough estimate of a room by using another method of measuring.</th>
</tr>
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<td><strong>Student will:</strong></td>
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<td><strong>Student will:</strong></td>
<td></td>
<td></td>
<td><strong>For Example:</strong> As a new employee you are required to complete the safety training required by the company by viewing the video and completing an assessment.</td>
</tr>
<tr>
<td><strong>Student will:</strong></td>
<td></td>
<td></td>
<td><strong>For Example:</strong> Your employer has asked you to develop a five-year plan to achieve a master’s license.</td>
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