

FY 15 QTR4 CONSTRUCTION

**PENNSYLVANIA APPRENTICESHIP AND TRAINING COUNCIL  
NEW PROGRAM INFORMATION**

Program #: PA006-15-844

SPONSOR INFORMATION

ATR: Steve Myers

Organization: DAVIDSON KEEN ELECTRICAL CONTRACTORS INC  
 Address: 733A EVANS ROAD  
 City, State, Zip Code: POTTSTOWN, PA 19464

PROGRAM INFORMATION

Registration Date: October 8, 2015  
 EIN: [REDACTED]  
 Program Type: Individual Non-Joint  
 Bargaining Agency: None  
 National Affiliation: NONE  
 Number of Employers: 1  
 Size of Workforce: 4  
 Waiver: No  
 NAICS Code: 238210  
 NAICS Category: Electrician  
 Prisoner Indicator: No

PROGRAM SPONSOR CONTACT INFORMATION

Name: BILL DAVIDSON JR  
 Phone: (610) 367-9720 Ext. Cell:  
 Fax: (484) 415-7183  
 E-Mail: BDAVIDSON@DAVIDSONKEEN.COM

*NEW PROGRAM --- Legal Working Age --- Regular PATC Ratio*

Occupation Information

First Occupation:	Type	Term (Hours)	Journey Wage	Journey Workers	Number of Apprentices Registrations
ELECTRICIAN (0159)	Time	8,000	\$24.00	5	2 (1) [initials]
Term (hours)	1,000	1,000	1,000	1,000	1,000
Percentage	59.0 %	64.0 %	69.0 %	74.0 %	79.0 %
RTI Provider Name:			Method:	Length of Instruction:	
BERKS CAREER & TECHNOLOGY CENTER			Vocational Education	780	
Contact: Annie Neuin			Phone: (610) 743-7630		

Second Occupation:	Type	Term (Hours)	Journey Wage	Journey Workers	Number of Apprentices Registrations
( )	Time				
Term (hours)					
Percentage	%	%	%	%	%
RTI Provider Name:			Method:	Length of Instruction:	
			Vocational Education		
Contact:			Phone:		

**STANDARDS OF APPRENTICESHIP**

**DAVIDSON KEEN ELECTRICAL CONTRACTORS  
INC**

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(EMPLOYER)

**733A EVANS ROAD**

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(ADDRESS)

**POTTSTOWN, PA 19464**

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Registered With

**Pennsylvania Apprenticeship and Training Council**

**Bureau of Apprenticeship and Training**

**United States Department of Labor Cooperating**

## 1. DEFINITIONS

"Employer means" DAVIDSON KEEN ELECTRICAL CONTRACTORS INC  
who is subscribing to and has signed these Standards of Apprenticeship.

"Council" means the Pennsylvania Apprenticeship and Training Council of the Department of Labor and Industry, Harrisburg, Pennsylvania.

"Apprenticeship Agreement" means an Agreement signed by the Employer and the Apprentice. The signature of a parent or guardian is required if the Apprentice is a minor.

"Apprentice" means an employee of the establishment who is engaged in learning a recognized apprenticeable trade; as defined in Title 34, Labor and Industry, Chapter 83, Welfare of Apprentices, Par. 83.2.

"Bureau" means the Bureau of Apprenticeship and Training of the United States Department of Labor.

## 2. POLICY

On and after the date these Standards of Apprenticeship are duly executed, it shall be the policy of the Employer that all Apprentices employed in the trades covered herein shall be governed by the terms of these Standards of Apprenticeship.

## 3. TERM OF APPRENTICESHIP

Apprentices will be given practical training, under supervision for the period set forth under "Work Training Schedule" of the designated apprenticeable trade. The first 1000 hours of apprenticeship will be a period of probation, during which time either party to the Apprenticeship Agreement may terminate the Agreement by notifying the other. However, notification of such cancellations, separations, or releases will be forwarded to the Council.

## 4. APPRENTICESHIP AGREEMENT

The Apprentices will be placed under a written Apprenticeship Agreement, executed in triplicate, and registered with the Council. After registration of this Agreement, the Employer and the Apprentice will each receive one copy and one copy will be retained by the Council.

## 5. QUALIFICATIONS FOR APPRENTICESHIP

Apprentices shall be of legal working age.

## 6. EQUAL OPPORTUNITY PLEDGE

"The recruitment, selection, employment and training of Apprentices during their apprenticeship, shall be without discrimination because of race, color, religion, national origin, or sex. The sponsor will take affirmative action to provide equal opportunity in apprenticeship and operate the apprenticeship program as required under Title 29 of the Code of Federal Regulations, Part 30," and Title 34, Labor and Industry, Chapter 81, Equal Opportunity in Apprenticeship Programs.

If and when more than four apprentices are to be employed at one time, affirmative action plans which include selection procedures will be developed in accordance with regulations.

## 7. CREDIT FOR PREVIOUS EXPERIENCE

An applicant for apprenticeship may be allowed credit on the term of apprenticeship for that portion of his/her experience, whether with the Employer or elsewhere, which is equivalent to any he/she would receive under these Standards of Apprenticeship. Previous experience, with commensurate wages, will be granted only after the record of the applicant has been checked and approved by the Committee. The Council shall be advised of the source and content of such experience.

## 8. RESPONSIBILITIES OF THE APPRENTICE

Each Apprentice employed under this Program is expected to apply himself/herself with diligence and care to the various tasks assigned to him/her; to protect the property and interests of the Employer in a proper manner; to respect and to obey the rules of the Employer, realizing that much time, money and effort is expended in affording him/her the opportunity to become a skilled craftsman.

**9. SUPERVISION OF APPRENTICES**

The Employer will designate a qualified person with the authority to supervise the training of apprentices. The supervisor will arrange the training under this Program, and keep a simplified but practical report on the shop progress and classroom activities. He/she will be further authorized to adjust any differences with the Apprentices which may arise from time to time, subject however to the Employer's approval.

**10. WORK TRAINING SCHEDULE**

Each Apprentice will be given work experience in the major basic trade elements as set forth in the schedule for the designate trade which is attached to these Standards of Apprenticeship, and made a part hereof. The Apprentice shall be trained in safety practices related to operations performed.

**11. SAFETY AND HEALTH TRAINING**

The Employer shall instruct the Apprentice in safe and healthful work practices and shall insure that the Apprentice is trained in facilities and other environments that are in compliance with either the Occupational Safety and Health Standards promulgated by the Secretary of Labor under Public Law 91-596, dated December 29, 1970, or State standards that have been found to be at least as effective as the Federal Standards.

**12. RELATED INSTRUCTION**

The Apprentice shall attend classes of theoretical instruction related to his/her trade for a minimum of 144 hours per year for each year of his/her apprenticeship. Where classes are not available through the local school, other trade, industrial or correspondence courses of equal value may be substituted. Time spent at related trade studies is not to be considered hours of work, nor is the Employer required to pay wages for time spent at related studies, except if required during regular working hours.

Related instructions are to be conducted at

**BERKS CAREER & TECHNOLOGY CENTER**  
**3307 FRIEDENSBURG ROAD**  
**OLEY, PA**

**13. PERIODIC REVIEW OF PROGRESS**

The progress of the Apprentice shall be subject to review by the Employer. Failure to make satisfactory progress by the Apprentice may result in suspension or cancellation of the Apprenticeship Agreement.

**14. HOURS OF WORK**

Hours of work for Apprentices shall be the same as for Journeyperson's designated trade; except that no apprentice shall be required to work such hours as would interfere with his or her required related studies.

**15. NUMBER OF APPRENTICES**

The following ratio will be adhered to:

1 - 4 Journeypersons	:	1 Apprentice
5 - 9 Journeypersons	:	2 Apprentices
10-14 Journeypersons	:	3 Apprentices

For each additional unit of five journeypersons regularly employed, one additional apprentice may be employed

**16. CERTIFICATE OF COMPLETION OF APPRENTICESHIP**

Upon satisfactory completion of training in both practical and related phases, the Employer shall request from the Council a Certificate of Completion. The letter from the Employer will certify where and when related training was obtained and that the Apprentice(s) has demonstrated competency in all phases of the trade.

**17. INTERPRETATION**

If a difference of opinion should arise in the interpretation of these Standards of Apprenticeship which cannot be adjusted satisfactorily by the Committee, either party to the Apprenticeship Agreement may consult with the Council for clarification.

**18. MODIFICATION**

These Standards of Apprenticeship may be modified jointly by the Employer upon approval by the Council. Modification shall not alter effective Apprenticeship Agreements without the consent of all parties concerned. The Council shall be notified of all such modifications.

**19. COMPLIANCE**

The sponsors of these Standards of Apprenticeship certify that they are in full compliance with all applicable Federal, State, and Local laws and regulations.

**20. PROCESSING OF ALL PAPERS PERTINENT TO STANDARDS**

All materials pertinent to these Standards of Apprenticeship shall be forwarded to the Council through the local office of the Bureau of Apprenticeship and Training, United States Department of Labor.

**21. DISTRIBUTION OF OFFICIALLY SIGNED STANDARDS OF APPRENTICESHIP**

The following parties shall receive a copy of the officially signed and properly executed Standards of Apprenticeship:

- 1 - The Employer
- 2 - The Council
- 3 - The Bureau of Apprenticeship and Training

**22. APPRENTICE WAGE SCALE – ELECTRICIAN**

This employer is covered by the Fair Labor Standards Act; therefore, overtime will be paid at the required rates. The minimum wages to be paid apprentices will be the following rates:

Step	Hours	Rate	% of	Journeyman's Rate
1st	1000 Hours	59	%	"
2nd	1000 Hours	64	%	"
3rd	1000 Hours	69	%	"
4th	1000 Hours	74	%	"
5th	1000 Hours	79	%	"
6th	1000 Hours	84	%	"
7th	1000 Hours	89	%	"
8th	1000 Hours	94	%	"
9th			%	"
10th			%	"

Journeyman's Rate as of (Date) 07-07-2015 is \$24.00 per hour

APPROVED:

\_\_\_\_\_  
 DAVIDSON KEEN ELECTRICAL CONTRACTORS INC  
*W. G. Davidson Jr.* WILLIAM G. DAVIDSON JR.  
 \_\_\_\_\_  
 (Signature)

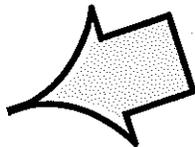
Date 8-11-2015

**REGISTERED WITH PENNSYLVANIA APPRENTICESHIP AND TRAINING COUNCIL**

\_\_\_\_\_  
Chairman

\_\_\_\_\_  
Secretary

Date \_\_\_\_\_



## ELECTRICIAN

WORK TASK	<u>Approx. Hrs.</u>
<b>A. <u>Project Layout and Planning</u></b>	<b>500</b>
1. Reading and interpreting blueprints and specifications	
2. Coordination between crafts, engineers and architects	
3. Laying out feeders, risers and branch circuits	
<b>B. <u>Underground Installations</u></b>	<b>500</b>
1. Trenching and ditch digging	
2. Direct burial	
3. Installing PVC/rigid conduit (including bender usage)	
4. Installing grounding electrode systems	
<b>C. <u>Thinwall Conduit Raceway Systems</u></b>	<b>500</b>
1. Selecting and installing fastening and support devices	
2. Conduit fabrication	
3. Installation of conduit, fittings and boxes	
<b>D. <u>Rigid Conduit Raceway Systems</u></b>	<b>100</b>
1. Selecting and installing fastening and supporting devices	
2. Bender machine setup and operation	
3. Conduit fabrication	
4. Installation of conduit, fittings and boxes	
<b>E. <u>Installing Services, Switchboards and Panels</u></b>	<b>1000</b>
1. Mounting devices	
2. Breaker installation	
3. Terminations	
<b>F. <u>Floor Duct Installation</u></b>	<b>50</b>
1. Shooting transit/grade establishment	
2. Installing duct and fittings	
3. Core drilling and outlet installation	
<b>G. <u>Motor Control Center Installation</u></b>	<b>50</b>
1. Rigging and mounting	
2. Terminating feeders, branch circuits and control wiring	
<b>H. <u>Installing, Splicing and Terminating Wires and Cables</u></b>	<b>1200</b>
1. Establishing temporary power	
2. Installing feeders and branch circuits	
3. Installing control wiring	
4. Performing splices, taps and terminations	

<b>I.</b>	<b><u>Cable Tray Installation</u></b>	<b>50</b>
1.	Fabrication	
2.	Installing support devices	
3.	Installing cable tray and covers	
<b>J.</b>	<b><u>Lighting System Installation</u></b>	<b>1200</b>
1.	Installing outlet boxes and conductors	
2.	Installing fixtures and lamps	
3.	Installing control devices	
<b>K.</b>	<b><u>Testing and Troubleshooting Feeders, Motors and Branch Circuits</u></b>	<b>300</b>
1.	Checking circuit continuity	
2.	Identifying fault current to ground	
3.	Meggering and Hi Potting	
4.	Certifying system operation	
5.	Repair and maintenance	
6.	Ground verification	
<b>L.</b>	<b><u>Fired Alarm Installation</u></b>	<b>300</b>
1.	Interpreting blueprints and specification	
2.	Layout and circuit installation	
3.	Control panel and device installation	
4.	Programming and testing	
<b>M.</b>	<b><u>Motor Installation</u></b>	<b>200</b>
1.	Rigging and setting	
2.	Alignment	
3.	Installing circuiting and terminations	
4.	Testing	
<b>N.</b>	<b><u>Control System Installation</u></b>	<b>100</b>
1.	Blueprint and specification interpretation	
2.	Layout and circuit installation	
3.	Installing and certifying distributed control system	
<b>O.</b>	<b><u>Installing and Programming Programmable Logic Controllers</u></b>	<b>50</b>
1.	Module installation	
2.	Installing control wiring and devices	
3.	Programming)	
<b>P.</b>	<b><u>Installing Instrumentation and Process Control Systems</u></b>	<b>50</b>
1.	Blueprint and specification interpretation	
2.	Layout and installation	
3.	Calibration	

<b>Q.</b>	<b><u>Security System Installation</u></b>	<b>100</b>
1.	Interpreting blueprints and specifications	
2.	Layout	
3.	Box and circuit installation	
4.	Terminations	
5.	Testing	
<b>R.</b>	<b><u>Installing Sound and Communications Systems</u></b>	<b>200</b>
1.	Blueprint and specification interpretation	
2.	Layout	
3.	Conduit and box installation	
4.	Installing panels and network devices	
5.	Circuit installation	
6.	Terminating and testing circuits	
<b>S.</b>	<b><u>Installing and Terminating Transformers</u></b>	<b>200</b>
1.	Rigging and mounting	
2.	Terminating primary and secondary cables	
3.	Testing and troubleshooting	
<b>T.</b>	<b><u>Installing Fiber Optic and Tele/Data Cable</u></b>	<b>300</b>
1.	Equipment layout	
2.	Installing cable	
3.	Polishing and terminating	
4.	Testing and verifying	
<b>U.</b>	<b><u>Welding and Brazing</u></b>	<b>50</b>
1.	Machine setup	
2.	Fabrication	
3.	Welding, grinding and finishing	
<b>V.</b>	<b><u>Service and Troubleshooting</u></b>	<b>300</b>
1.	Testing, analysis and repair of electrical/electronic components of: motors, transformers, electrical devices, electronic devices, magnetic devices, lighting and power circuits, equipment and machinery, control circuits and devices	
<b>W.</b>	<b><u>Material Handling and Pre-Fabrication</u></b>	<b>500</b>
1.	Awareness of materials and equipment of the trade	
2.	Handling materials of the trade	
3.	Fabrication for field installation	
<b>X.</b>	<b><u>Safety Awareness, Processing Required Paperwork and Other Specialized Areas</u></b>	<b>200</b>
1.	All apprentices will be trained in all safety facets as they relate to each task performed.	
2.	OSHA 10 Hour Course	

# **BERKS CAREER & TECHNOLOGY CENTER**

## **ELECTRICAL APPRENTICESHIP PROGRAM**

**Year One: 180 Hours**

**Instructor: Tim Moll**

### **LEARNING OBJECTIVES:**

- To teach the fundamentals of math used in electrical applications, types of fasteners and conduits, and basic installation techniques, as well as blueprint reading.
- To provide education in the safety concerns of OSHA and the correct use of tools and equipment.
- To cover both residential and commercial wiring basics.
- To foster an appreciation for the role of the apprentice.
- To encourage responsible, ethical behavior of an electrical employee.

### **TEXTBOOK/MATERIALS:**

NCCER *Core Curriculum: Introductory Craft Skills*

Basic Safety-15 hours; Introduction to Construction Mathy-15 hours; Basic Employability Skills-15 hours

NCCER *Electrical Level One*

### **METHODS:**

- Classroom Lecture with Audio-Visual Supplements
- Student Discussion Groups
- Modular Testing
- Guest Speakers
- Field trips

### **COMPETENCIES:**

Students completing Electrical Level One will be able to:

- Explain safety issues concerning lockout/tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems.
- Identify the methods of hand bending conduit.
- Cut, ream, and thread conduit.
- Demonstrate the correct applications for fasteners and anchors.
- Installation of fasteners and anchors, raceways in boxes, conductors.
- Using the formula for Ohm's law, calculate an unknown value.
- Use Kirchhoff's voltage law.
- Find the total amount of resistance in a series circuit.
- Explain the difference between digital and analog meters.
- Understand and explain the purpose and history of the National Electrical Code.

- Understand and explain the different types of conductors and conduit systems.
- Identify common symbols used in blueprints and the architect's and engineer's scales.
- Explain commercial and industrial wiring: switches, relays, circuits.
- Understand residential wiring equipment, circuitry and systems.

Students will demonstrate proficiencies in the required skills areas that follow. This is measured through demonstration and written tests with each of the following NCCER modules:

- 00101-4 to 00108-4 Core Competencies (72.5 hours)
- 26101-05 Safety (12.5 hours)
- 26102-05 Hand Bending (7.5 hours)
- 26103-05 Fasteners & Anchors (7.5 hours)
- 26104-05 Electrical Theory One (7.5 hours)
- 26105-05 Electrical Theory Two (7.5 hours)
- 26106-05 Electrical Test Equipment (7.5 hours)
- 26107-05 Introduction To The National Electrical Code (2.5 hours)
- 26108-05 Raceways, Boxes, and Fittings (12.5 hours)
- 26109-05 Conductors (15 hours)
- 26110-05 Introduction to Electrical Blueprints (7.5 hours)
- 26111-05 Wiring: Commercial & Industrial (7.5 hours)
- 26112-05 Wiring: Residential (15 hours)

## COURSE OUTLINE:

### I. Electrical Wiring-Residential

- Unit 1 General Information for Electrical Installations
- Unit 2 Electrical Symbols and Outlets
- Unit 3 Determining the Number of Circuits Required
- Unit 4 Conductor Sizes and Types
- Unit 5 Switch Control of Lighting Circuits
- Unit 6 Lighting Branch Circuit for Bedroom #2
- Unit 7 Lighting Branch Circuit for Bedroom #1
- Unit 8 Lighting Branch Circuit for Bathroom and Passage
- Unit 9 Lighting Branch Circuit for the Hall and Front Entrance
- Unit 10 Lighting Branch Circuits of the Kitchen and Rear Entry and Small Appliance Circuits for Kitchen
- Unit 11 Lighting Branch Circuit for the Living Room
- Unit 12 Lighting Branch Circuit for the Dining Area, Porch and Cornice Garage Storage Area and Attic
- Unit 13 Lighting Branch Circuit for the Garage
- Unit 14 Lighting and Receptacle Branch Circuits of the Terrace Recreation Room and Utility Room
- Unit 15 Lighting and Convenience Receptacle Branch Circuits for the Lavatory, Workshop and Storage Room
- Unit 16 Special-Purpose Outlets for Portable Heating Units
- Unit 17 Special-Purpose Outlets for a Water Pump and a Water Heater for Residential Use
- Unit 18 Special-Purpose Outlets for a Dryer and the Overhead Garage Door Openers

- Unit 19 Special-purpose Outlets for the Refrigerator-Freezer, Counter-Mounted Cooking Unit and Wall-Mounted Oven Circuits
- Unit 20 Special-Purpose Outlets for a Food Waste Disposer and a Dishwasher
- Unit 21 Special-Purpose Outlets for the Bathroom Ceiling Heater and Attic Exhaust Fan
- Unit 22 Television, Telephone and Signal Systems
- Unit 23 Electric Heating and Air Conditioning
- Unit 24 Oil Burner Hot Water Heating System
- Unit 25 Gas Burner Heating Systems
- Unit 26 Heat and Smoke Detectors
- Unit 27 Service Entrances and Equipment
- Unit 28 Service-Entrance Calculations
- Unit 29 Remote-Control Systems for Lighting Circuits
- Unit 30 Swimming Pools, Spas and Hot Tubs

## II. Electrical Wiring-Commercial

- Unit 1 Commercial Building Plans and Specifications
- Unit 2 The Electric Service
- Unit 3 Reading Electrical Drawings (prints)-Drugstore
- Unit 4 Branch Circuit Requirements
- Unit 5 Low-Voltage Remote-Control Lighting
- Unit 6 Reading Electrical Drawings-Bakers
- Unit 7 Switch Control of Lighting Circuits
- Unit 8 Branch-Circuit Installation
- Unit 9 Appliance Circuits
- Unit 10 Reading Electrical Drawings-Insurance Office
- Unit 11 The Cooling System
- Unit 12 Special Systems
- Unit 13 Reading Electrical Drawings- Beauty Salon
- Unit 14 Lamps for Lighting
- Unit 15 Luminaries
- Unit 16 Special Circuits (Owner's Circuits)
- Unit 17 Emergency Power Systems
- Unit 18 Overcurrent Protection: Fuses and Circuit Breakers
- Unit 19 Short-Circuit Calculations and Coordination of Overcurrent Protective Devices
- Unit 20 Panelboard Selection and Installation

**Year Two: 180 Hours**

**Instructor: Richard Linderman**

**LEARNING OBJECTIVES:**

- To provide a thorough background in AC and DC motors, circuit breakers, fuses, grounding and conductors of all types.
- To focus on NEMA and NEC installation requirements for cable installations.
- To reinforce the overall objectives of apprenticeship.
- To continue to expand the work ethic and soft skills areas of electrical apprenticeship.

**TEXTBOOK/MATERIALS:**

- NCCER *Electrical Level Two*
- *Electrical Grounding and Bonding*, Thompson

**METHODS:**

- Classroom Lecture
- Group Discussion
- Modular Testing
- Overheads and other audio-visual materials
- Field trips

**COMPETENCIES:**

Basically, each student by the end of Electrical Year Two will be able to:

- Describe the voltage and current transients that occur in a capacitive circuit.
- Define inductive reactance and state how it is affected by frequency.
- Explain alternating and direct current systems.
- Understand motor theory and application.
- Explain the purpose of grounding and the scope of *NEC Article 250*.
- Explain the *NEC* requirements for grounding and bonding.
- Identify all parts of popular electric and hydraulic benders.
- Understand the purpose, requirements and installation of boxes.
- Identify *NEMA* standards for cable tray installations.
- Describe how to make good Conductor terminations.
- Explain how to use hand and power tools for crimping.
- Select the most suitable overcurrent device for the application.
- Describe troubleshooting and maintenance techniques for overcurrent devices.

Students will be tested at the end of each NCCER study module to demonstrate their proficiency in the areas covered in the following outline:

- 26201-05 Alternating Current (15 hours)
- 26202-05 Motors: Theory and Application (20 hours)
- 26203-05 Grounding (12.5 hours)
- 26204-05 Conduit Bending (15 hours)
- 26205-05 Boxes and Fittings (10 hours)
- 26206-05 Conductor Installations (10 hours)
- 26207-05 Cable Tray (15 hours)
- 26208-05 Conductor Terminations & Splices (7.5 hours)
- 26209-05 Installation of Electric Services (15 hours)
- 26210-05 Circuit Breakers and Fuses (12.5 hours)
- 26211-05 Contactors and Relays (10 hours)
- 26212-05 Electric Lighting (10 hours)

### **COURSE OUTLINE:**

#### I. Electricity I

- Unit 1 Introduction
- Unit 2 Electron Theory and Ohm's Law
- Unit 3 Series Circuits
- Unit 4 Parallel Circuits
- Unit 5 Series-Parallel Circuits
- Unit 6 Electrical Energy and Power
- Unit 7 Batteries
- Unit 8 Electrical Conductors and Wire Sizes
- Unit 9 Voltage Drop Across Conductors
- Unit 10 Summary Review of Units 1-9
- Unit 11 Magnets and Magnetic Fields
- Unit 12 Electromagnetism
- Unit 13 Generation of Electromotive Force
- Unit 14 Direct-Current Motor Principles
- Unit 15 Summary Review of Units 11-14
- Unit 16 Typical Bell Circuits
- Unit 17 Switch Control of Lighting Circuits
- Unit 18 Wiring Materials
- Unit 19 Remote Control Systems for Lighting Circuits

## II. Electricity II

- Unit 1 Alternating-Current Principles
- Unit 2 Inductance and Inductive Reactance
- Unit 3 Capacitance and Capacitive
- Unit 4 Series Circuit: Resistance and Inductance
- Unit 5 Series Circuit: Resistance and Capacitance
- Unit 6 Series Circuit: Resistance, Inductance and Capacitance
- Unit 7 AC Parallel Circuits Containing Inductance
- Unit 8 AC Parallel Circuits Containing Inductance and Capacitance
- Unit 9 AC Power, Power Factor and Power Factor Correction
- Unit 10 Summary Review of Units 1-9
- Unit 11 Single-Phase, Three-Wire Service Entrance
- Unit 12 Installation of a Single-Phase, Three-Wire Service  
Entrance for an Apartment Building
- Unit 13 Installation of a Three-Phase, Three Wire Service Entrance
- Unit 14 Introduction to Fluorescent Lighting
- Unit 15 Installation of Fluorescent Lighting

**YEAR THREE:** 180 Hours

**INSTRUCTOR:** Kyle Kintner

**LEARNING OBJECTIVES:**

- To develop good work ethics and reaffirm the benefits of Apprenticeships.
- To provide a thorough understanding of the principles of motors, generators and motor controls, relays, switches and drives.
- To continue developing mastery of codes related to Level 3 course content.

**TEXTBOOKS/MATERIALS:**

- NCCER *Electrical Level 3*
- Ugly's *Electrical References*

**METHODS:**

- Classroom Instruction
- Demonstration of Techniques
- Group Discussions
- Field trips to industry
- Guest Speakers
- Modular Testing

**COMPETENCIES:**

Students completing Electrical Year 3 will be able to:  
(Fill in)

Students will demonstrate their proficiency at the end of each NCCER study module in the following outline:

- 26301-05 Load Calculations-Branch Feeders and Circuits (12.5 hours)
- 26302-05 Conductor Selection and Calculations (15 hours)
- 26303-05 Overcurrent Protection (12.5 hours)
- 26304-05 Raceway, Box and Fitting Fill Requirements (12.5 hours)
- 26305-05 Wiring Devices (10 hours)
- 26306-05 Distribution Equipment (12.5 hours)
- 26307-05 Distribution System Transformers (15 hours)
- 26308-05 Lamps, Ballasts, and Components (5 hours)
- 26309-05 Motor Calculations (12.5 hours)
- 26310-05 Motor Maintenance, Part 1 (12.5 hours)
- 26311-05 Motor Controls (20 hours)
- 25312-05 Hazardous Locations (15 hours)

## COURSE OUTLINE:

### I. Electricity

- Unit 1 Operating Principles of DC Generators
- Unit 2 The Separately-Excited DC Generators
- Unit 3 The Self-Excited Shunt Generator
- Unit 4 Compound-Wound DC Generator
- Unit 5 The DC Shunt Motor
- Unit 6 The DC Series Motor
- Unit 7 DC Compound Motors
- Unit 8 Summary Review of Units 1-7
- Unit 9 Manual Starting Rheostats for DC Motors
- Unit 10 Special DC Starting Rheostats and Controllers
- Unit 11 Basic Principles of Automatic Motor Control
- Unit 12 The DC Counter EMF Motor Controller and DC Variable Speed Motor Drives
- Unit 13 The DC Voltage Drop Accelerator Controller
- Unit 14 The DC Series Lockout Relay Accelerator Controller
- Unit 15 Dynamic Braking with a DC Motor Reversal Control
- Unit 16 Summary Review of Units 9-15
- Unit 17 Introduction to Polyphase Circuits
- Unit 18 The Three-Phase Wye Connections
- Unit 19 The Three-Phase Delta Connections
- Unit 20 Summary Review of Units 17-19
- Unit 21 Basic Principles of Transformers
- Unit 22 Single-Phase Transformers
- Unit 23 Single-Phase, Three-Wire Secondary System
- Unit 24 Single-Phase Transformers Connected in Delta
- Unit 25 Single-Phase Transformers in a Wye Installation
- Unit 26 Wye and Delta Connections of Single-Phase Transformers
- Unit 27 Instrument Transformers
- Unit 28 National Electric Code Requirements for Transformer Installations
- Unit 29 Summary Review of Units 21-28

### II. Electric Motor Control

- Unit 1 General Principles of Electric Motor Control
- Unit 2 Fractional and Integral Horsepower Manual Motor Starters
- Unit 3 Magnetic Line Voltage Starters
- Unit 4 Symbols
- Unit 5 Interpretation and Application of Simple Wiring and Elementary Diagrams
- Unit 6 Push Buttons and Control Stations
- Unit 7 Relays and Contactors
- Unit 8 Timing Relays
- Unit 9 Pressure Switches and Regulators
- Unit 10 Float Switches
- Unit 11 Flow Switches
- Unit 12 Limit Switches and Proximity Controls
- Unit 13 Phase Failure Relays
- Unit 14 Solenoid Valves

- Unit 15 Temperature Switches
- Unit 16 Two-Wire Controls
- Unit 17 Three -ire and Separate Controls
- Unit 18 Hands-off Automatic Controls
- Unit 19 Multiple Push-Button Stations
- Unit 20 Interlocking Methods for Reversing Control
- Unit 21 Sequence Control
- Unit 22 Time-Delay, Low Voltage Release Relay
- Unit 23 The Motor and Starting Methods
- Unit 24 Primary Resistor-Type Starters
- Unit 25 Autotransformer Starters
- Unit 26 Part Winding Motor Starters
- Unit 27 Automatic Starters for Star-Delta Motors
- Unit 28 AC Solid-State Reduced Voltage Controller
- Unit 29 Controllers for Two-Speed, Two Winding (Separate Winding) Motors
- Unit 30 Two-Speed, One-Winding (Consequent Pole) Motor Controller
- Unit 31 Four-Speed, Two-Winding (Consequent Pole) Motor Controller
- Unit 32 Wound Rotor Motors and Manual Speed Control
- Unit 33 Push-Button Speed Selection
- Unit 34 Automatic Acceleration for Wound Rotor Motors
- Unit 35 Automatic Speed Control for Wound Rotor Motors
- Unit 36 Solid-State Adjustable Speed Controller for AC Wound Rotor Motors
- Unit 37 Synchronous Motor Operations
- Unit 38 Push-Button Synchronizing
- Unit 39 Time Semiautomatic Synchronizing
- Unit 40 Synchronous Automatic Motor Starter
- Unit 41 About DC Motors
- Unit 42 Across-the Line Starting
- Unit 43 Use of Series Starting Resistance
- Unit 44 Manual Faceplate Starters
- Unit 45 Compensating and Definite Time Control Starting
- Unit 46 Solid-State Adjustable Speed Control
- Unit 47 Jogging (inching) Control Circuits
- Unit 48 Plugging
- Unit 49 Electric Brakes
- Unit 50 Dynamic and Regenerative Braking
- Unit 51 Electric and Electronic Braking
- Unit 52 Direct Drives and Pulley Drives
- Unit 53 Gear Motors
- Unit 54 Variable Frequency Mechanical Drives
- Unit 55 AC Adjustable Frequency Solid-State Drives
- Unit 56 Magnetic Clutch and Magnetic Drive
- Unit 57 DC Variable Speed Control-Motor Drives
- Unit 58 Programmable and Motion Control
- Unit 59 Motor Startup and Troubleshooting Basics

**YEAR FOUR:** 180 Hours

**INSTRUCTOR:** Michael Grainger

**LEARNING OBJECTIVES:**

- To prepare students thoroughly for successful completion of the Electric License Exam.
- To review all texts allowed in the testing area.
- To reinforce the positive attitude of students to the Apprenticeship Program in general and the electric trade, specifically.

**TEXTS/MATERIALS:**

- *NEC 2008 Code*
- *Mike Holt's NEC Exam Preparation*
- *Soares, Electrical Grounding and Bonding, IAEI*
- *Tom Henry's Key Word Index*
- *Ugly's Electrical References*

**METHODS:**

- Class lecture
- Group discussions
- Testing of competencies
- Field trip
- Guest speaker

**COMPETENCIES:**

Students at the end of Electrical-Year 4 will demonstrate proficiency in the *NEC 2005 Code* and be ready to sit for their license exam for the City of Reading, etc. They will understand the purpose, the history and the applications of the code.

**COURSE OUTLINE:**

- I. National Electric Code
  - Unit 1 General Wiring and Fundamentals
  - Unit 2 Wire, Conduit and Box Sizing
  - Unit 3 Outlets, Lighting, Appliances and Heating
  - Unit 4 Services and Feeder Calculations
  - Unit 5 Grounding and Bonding
  - Unit 6 Overcurrent Protection
  - Unit 7 Motor Circuit Wiring
  - Unit 8 Transformers
  - Unit 9 Hazardous Location Wiring
  - Unit 10 Health Care Facilities

- Unit 11 Emergency and Alternate Power Systems
- Unit 12 Industrial Electric applications
- Unit 13 Commercial Wiring Applications
- Unit 14 Special Applications Wiring
- Unit 15 Review

II. Review of Years 1, 2, and 3

**REGISTRATION AGENCY  
PENNSYLVANIA APPRENTICESHIP AND TRAINING COUNCIL  
APPRENTICESHIP AGREEMENT  
BETWEEN APPRENTICE AND SPONSOR**

<p><i>This AGREEMENT may be terminated by either of the parties, citing cause(s) with notification to the registration agency, in compliance with Title 34, Part IV, Chapter 83.</i></p>	<p align="center"><small>PRIVACY ACT STATEMENT</small>  <i>The information requested herein is used for apprenticeship program statistical purposes and may not be otherwise disclosed without the express permission of the undersigned apprentice.</i>  <small>Privacy Act of 1974 - P.L. 93-519</small></p>
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<b>1. AGREEMENT BETWEEN APPRENTICE AND:- ("X" one)</b> a. <input checked="" type="checkbox"/> Employer b. <input type="checkbox"/> Joint Committee c. <input type="checkbox"/> Non-Joint Committee	<b>2. PROGRAM NUMBER</b>  <p align="center" style="font-size: 1.2em;">PA 006158449</p>	<b>3. NAME OF APPRENTICESHIP STANDARDS (Name &amp; Address of Sponsor)</b>  <b>DAVIDSON KEEN ELECTRICAL CONTRACTORS INC</b> <b>733A EVANS ROAD</b> <b>POTTSTOWN, PA 19464</b>
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The program sponsor and apprentice agree to the terms of the apprenticeship standards as incorporated as part of this agreement. The sponsor will not discriminate in the selection and training of the apprentice in accordance with the Equal Opportunity Standards in Section 30.3, Title 29, Code of Federal Regulation, Part 30.

<b>4. NAME OF APPRENTICE (Last, First, Middle)</b> <div style="background-color: black; width: 100%; height: 20px;"></div>	<b>5. DATE OF BIRTH (Mo., Day, Year)</b> <div style="background-color: black; width: 100%; height: 20px;"></div>	<b>6. SEX ("X" one)</b> a. <input checked="" type="checkbox"/> Male b. <input type="checkbox"/> Female
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<b>7. SOCIAL SECURITY NO.</b> <div style="background-color: black; width: 100%; height: 20px;"></div>	<b>8. APPRENTICE'S ADDRESS (No., Street, City, County, State, ZIP Code)</b> <div style="background-color: black; width: 100%; height: 20px;"></div>
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<b>9a. RACE ("X" one or more)</b> a. <input type="checkbox"/> Am. Indian or Alaskan Nat. b. <input type="checkbox"/> Asian c. <input type="checkbox"/> Black or African American d. <input type="checkbox"/> Native Hawaiian or other Pacific Islander e. <input checked="" type="checkbox"/> White	<b>9b. ETHNIC GROUP ("X" one)</b> a. <input type="checkbox"/> Hispanic or Latino b. <input checked="" type="checkbox"/> Not Hispanic or Latino	<b>10. VETERAN STATUS ("X" one)</b> a. <input checked="" type="checkbox"/> Non-Veteran b. <input type="checkbox"/> Veteran	<b>11. HIGHEST EDUCATION LEVEL ("X" one)</b> a. <input type="checkbox"/> 8th grade or less b. <input type="checkbox"/> 9th to 12th grade c. <input type="checkbox"/> GED d. <input checked="" type="checkbox"/> High School or greater
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<b>12. CAREER LINKAGE OR DIRECT ENTRY ("X" one)</b> <input checked="" type="checkbox"/> None <input type="checkbox"/> Adult <input type="checkbox"/> Youth <input type="checkbox"/> HUD/STEP-UP <input type="checkbox"/> School-to-Registered-Apprenticeship <input type="checkbox"/> Incumbent Worker <input type="checkbox"/> Job Corps <input type="checkbox"/> Dislocated Worker <input type="checkbox"/> Direct Entry: _____
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<b>13. SIGNATURE OF APPRENTICE</b> 	<b>DATE</b> 08/11/15	<b>14. SIGNATURE OF PARENT/GUARDIAN (if minor)</b> 	<b>DATE</b> 
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<b>15a. TRADE</b>  <p align="center" style="font-weight: bold;">ELECTRICIAN</p>	<b>15b. RAIS Code</b>  <p align="center" style="font-weight: bold;">0159</p>	<b>16. TERM (Hours, Months, Years)</b>  <p align="center" style="font-weight: bold;">8,000 Hours</p>	<b>17. PROBATIONARY PERIOD (Hours, Months, Years)</b>  <p align="center" style="font-weight: bold;">1,000 Hours</p>
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<b>18. CREDIT FOR PREVIOUS EXPERIENCE (Hrs., Mos., Yrs.)</b> <p align="center" style="font-size: 1.5em;">0</p>	<b>19. TERM REMAINING (Hrs., Mos., Yrs.)</b> <p align="center" style="font-size: 1.5em;">8000</p>	<b>20. DATE APPRENTICESHIP BEGINS (Indenture Date)</b> <p align="center" style="font-size: 1.5em;">9-3-2015</p>	<b>21. RELATED INSTRUCTION TRAINING (No. Hrs. per Yr.)</b> <p align="center" style="font-weight: bold;">144 hours per year</p>
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<b>22. RELATED INSTRUCTION SOURCE</b> BERKS CAREER & TECHNOLOGY CENTER 3307 FRIEDENSBURG ROAD OLEY, PA	<b>23. APPRENTICE WAGES FOR RELATED INSTRUCTION TRAINING ("X" one)</b> a. <input type="checkbox"/> will be paid b. <input checked="" type="checkbox"/> will not be paid	<b>24. PRESENT JOURNEYMAN'S HOURLY WAGE RATE</b>  <p align="center" style="font-weight: bold;">\$24.00</p>
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**25. APPRENTICE WAGES:** *The apprentice schedule of pay shall be listed for each advancement period. The work processes listed in the standards (item 3 above) are a part of this agreement.*

PERIOD	TERM (Mo./Yr.)	%	DOLLAR AMOUNT (in dollars & cents)	PERIOD	TERM (Mo./Yr.)	%	DOLLAR AMOUNT (in dollars & cents)
a.	b.	c.	d.	a.	b.	c.	d.
1	1000 Hours	59%	\$14.16	6	1000 Hours	84%	\$20.16
2	1000 Hours	64%	\$15.36	7	1000 Hours	89%	\$21.36
3	1000 Hours	69%	\$16.56	8	1000 Hours	94%	\$22.56
4	1000 Hours	74%	\$17.76	9		%	\$0.00
5	1000 Hours	79%	\$18.96	10		%	\$0.00

<b>26. SIGNATURE OF SPONSOR REPRESENTATIVE</b> a.	<b>DATE SIGNED</b> 8-11-2015	<b>27.</b>
<b>SIGNATURE OF SPONSOR REPRESENTATIVE</b> b.	<b>DATE SIGNED</b>	<b>28. SIGNATURE (Director, Pennsylvania Apprenticeship &amp; Training Council)</b> 

**DATE REGISTERED**  
10-8-15