

Guidelines for the Substation Construction Electrician Apprenticeship

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Substation Construction Electrician Apprenticeship

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Substation Construction Electrician Apprenticeship

1.0 - Introduction

1.1 Objective

The need for trained and qualified employees to accomplish the duties of a journeyman Construction Electrician in a manner consistent with the company's safety and performance standards has resulted in this apprenticeship. This apprenticeship consists of extensive on-the-job and related academic training which provides the apprentice with a systematic approach to acquire the required knowledge and skill. The training offers the apprentice a vehicle to attain competence, self-confidence, and satisfaction in performing the work of a Substation Construction Electrician.

1.2 Overview

- The General Construction Master Apprenticeship Agreement (MAA) governs this apprenticeship program.
 - The apprenticeship is divided into six step levels and each step level is to be completed within a six month time period.
 - The first five steps of the apprenticeship have required on-the-job-training (OJT) that is tracked in hours by the apprentice.
 - At the sixth step level there is no specific OJT or course to attend. The purpose of this step is for "rounding-out" the apprentice's learning and experience.
 - An apprentice at the sixth step level, who has completed all required training, may bid a journeyman position. If the apprentice is the successful bidder, he/she will be promoted to journeyman and still receive a state apprenticeship certificate.
 - An apprentice not meeting the standards of achievement for a given step can be delayed progression until the cause is remedied. If the cause is not remedied within the allotted time, the apprentice may be removed from the apprenticeship in accordance with the MAA.
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2.0 – Orientation and Enrollment

2.1 - Orientation and enrollment meeting Soon after entering the apprenticeship, the training coordinator schedules a meeting with the apprentice and apprentice’s supervisor to review the details of the apprenticeship and to enroll the apprentice in this state certified apprenticeship.

2.2 - Apprentice Agreement The apprentice completes and signs the Apprenticeship Agreement, which is an agreement with the apprentice, PG&E, and the state Division of Apprenticeship Standards. After all required parties sign the agreement the apprentice and supervisor receive a copy for their records. Upon completion of the apprenticeship the apprentice receives a certificate issued by the state.

2.3 – Veterans benefits An apprentice who is a veteran and is interested using his/her benefits through the apprenticeship can contact Labor Relations at company number 270-2914 or outside line at 925-270-2914 or on-line at <http://edu.military.com/gibill/>.

2.4 – Materials received During the orientation meeting the apprentice receives the following:

- A copy of the Master Apprenticeship Agreement (MAA)
- Apprenticeship Standard of the PG&E Joint Apprenticeship Committee.
- Individual Program Standard
- Substation Construction Electrician Apprenticeship Training Guidelines
- Exhibit X
- An Apprenticeship Course and OJT Record

3.0 – Apprenticeship Administrative Roles

3.1 - Overview To have a successful training program it is essential to have an effective administration system. The following lists the roles identified to administer this training program

3.1 – Joint Apprenticeship and Training Committee (JATC) The JATC consists of company management and union representatives that oversee all apprenticeships and other training programs within the company. This committee is responsible for ensuring the apprenticeships are in compliance with state mandates and laws.

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3.0 – Apprenticeship Administrative Roles, Continued

3.2 – Substation Electrician Apprenticeship (SEA) Committee

The SEA Committee consists of equal numbers of management employees and journeyman electricians. This committee is a sub-committee to the JATC that meets regularly to address substation construction electrician apprenticeship issues. Duties of this committee include:

- Ensuring the apprenticeship provides adequate training.
 - Reviewing and updating training requirements.
 - Developing the apprenticeship guidelines and OJT record.
 - May perform evaluations of apprentices who are on action plans.
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3.3 – Construction Supervisor

The supervisor plays a major role in the apprentice’s training by ensuring the apprentice is exposed to all elements required of the job. Listed are the responsibilities for this role:

- Assigns work that aligns with the apprentice’s training.
 - Ensures the apprentice has adequate on-the-job-training (OJT) by an OJT Trainer.
 - Maintains the master copy of the apprentice’s Course and OJT Record.
 - Conducts 90-day progress reviews with the apprentice.
 - Does sign-offs on the apprentice’s Course and OJT Record when the apprentice is qualified.
 - Coordinates with the Training Coordinator.
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3.4 – Training Coordinator

The Training Coordinator is responsible for the overall performance of the apprenticeship. Responsibilities of the coordinator are as follows:

- Reports monthly to the JATC on the apprenticeship status, SCEAC updates, and individual apprentice issues.
 - Schedules and conducts SEA Committee meetings.
 - Produces an apprenticeship progress report for the director, superintendents, and supervisors.
 - Verifies 90-day progress reviews are accurate and stored in a central location.
 - Ensures apprentices attend mandated apprenticeship courses.
 - Issues letters and develops action plans for apprentices who do not meet the Standards of Achievement.
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3.0 – Apprenticeship Administrative Roles, Continued

3.5 – Apprentice Electrician

Although the main concern of the apprentice is learning the job, there are administrative responsibilities as well.

- The apprentice is responsible for an accurate Course and OJT Record.
 - The apprentice is responsible for communicating to the supervisor areas where training is needed.
 - Acquires sign-offs by a supervisor when he/she becomes qualified to perform a task unsupervised.
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3.6 – OJT Trainer

Most often the OJT Trainer role is fulfilled by a Journeyman Electrician, but an OJT Trainer could be any person who by the nature of the work is deemed qualified to perform a given task. The main role of the OJT Trainer is to provide OJT for the apprentice.

3.7 – Course Trainer

The main role of the Course Trainer is to provide classroom and lab training. Administrative duties include:

- Signs the apprentice’s Course and OJT Record when the apprentice passes a course.
 - When an apprentice fails a course, the trainer provides counseling; identifying areas the apprentice needs to study and practice in order to pass the course.
 - Notifies the Training Coordinator of class status for all apprentices attending a course.
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4.0 – Course and OJT Record System

4.1 – Course and OJT Record

Each apprentice has a personal Course and OJT Record. The apprentice uses this record for the following:

- Recording OJT hours daily.
 - Tracks tasks and courses “signed-off” by a supervisor or course trainer.
 - Presents the Course and OJT Record to the supervisor during 90-day reviews for updates.
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4.0 – Course and OJT Record System, Continued

4.2 – Record layout On the cover page the apprentice’s name and position date are listed. On page 2 are all the courses required for the apprenticeship. Pages 3 through 11 contain the OJT tasks with the required hours and sign-offs. The remaining 2 pages are for the 90-day progress review.

4.3 – Course completion records The apprentice brings the Course and OJT Record to all apprenticeship courses. Providing the apprentice passes the course, the trainer will sign-off on the course. The apprentice signs-off as well acknowledging he/she passed the course. There are 8 courses with a total of 304 hours within the apprenticeship.

4.4 – OJT hours There are 2,820 OJT hours required of the total 6,000 hours of the apprenticeship. One box on the record represents one OJT hour. While some tasks require the hours be completed within a certain step other tasks are spread across more than one step. The combined course and OJT total 3,124 hours. To stay on track the apprentice needs to average 625 OJT hours for each step over five steps. For each hour an apprentice practices performing the task, the apprentice fills a box on the record. The apprentice is expected to fill the OJT boxes daily, but at a minimum of once each week. It is not imperative that 40 hours are recorded each week as some job activities may not have a place on the OJT card.

4.5 – OJT Tasks and task sign-offs There are 20 OJT sections with a total of 65 tasks. Section 21 is for tracking specialized equipment certification. Section 21 training is not mandated for the apprenticeship, but is used to track additional skills. The apprentice fills the boxes in completing the OJT hours while becoming qualified to perform a task. When the apprentice is qualified, both the apprentice and supervisor sign-off on the task. The sign-offs normally occur during the 90-day review meetings. After both sign-offs are recorded for a task, the apprentice is deemed qualified and allowed to perform the task without supervision.

4.8 – Required OJT hours and task sign-offs For the first step, the minimum OJT the apprentice must complete is 500 hours and the minimum number of tasks is 10. Included in the 500 hours, are 152 course hours. By the end of the second step the apprentice’s accumulative OJT hours must be a minimum of 1063 hours, which includes 96 course hours and another 11 tasks.

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4.0 – Course and OJT Record System, Continued

Required OJT hours and task sign-offs
(continued)

The table below shows the average and minimum required hours and task qualifications required for each step.

OJT hours per step requirements	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Average Hours/Step	625	625	625	625	624	
Minimum Accumulative Hours	500	1063	1688	2375	3124	
Percent of Average Total Hours	80%	85%	90%	95%	100%	
Task Qualifications						
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Average Tasks /Step	13	13	13	13	13	
Minimum Accumulative Tasks	11	21	33	47	62	65
Percent of Average Total Tasks	85%	80%	85%	90%	95%	100%

Note: Refer to “Step Requirements” beginning on page 12 for the specific tasks to become qualified performed during each step.

5.0 – OJT Progress and 90-Day Reviews

5.1 - Initial meeting

Soon after the apprentice is enrolled, the apprentice and the supervisor meet to discuss expectations for the apprentice in regards to completing the Course and OJT Record. The supervisor’s copy is the master record and the apprentice’s copy becomes the working copy. During this initial meeting the supervisor assigns the apprentice OJT tasks to begin tracking hours. Accuracy of the information on the Course and OJT Record is the responsibility of the apprentice.

5.2 – 90-day reviews

After the initial meeting and approximately every 90 days thereafter, the supervisor meets with the apprentice to review the apprentice’s progress, do sign-offs, and to plan training for the next 90-days. This review is documented on the 90-Day Apprentice Performance Review on the last two pages of the Course and OJT Record.

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5.0 – OJT Progress and 90-Day Reviews, Continued

5.3 – OJT Task sign- offs

During the 90-day review meeting, the apprentice and the supervisor discuss the training and work experience the apprentice accomplished during the previous 90 days. The apprentice indicates on the Course and OJT Record the completed OJT hours and which tasks he/she has become qualified. The apprentice indicates he/she is qualified by signing-off for the task.

“Qualified” means the apprentice is fully proficient and can accomplish the task at a journeyman level with no assistance from others.

When the supervisor, through first hand observations or reliable sources agrees that the apprentice is qualified, then the supervisor signs-off on the record and dates the entry.

It is not required that all of the OJT boxes be filled, in order for an apprentice to be deemed qualified. However, the OJT hours must still be completed even though the apprentice is signed-off and qualified to perform a task.

5.4 – review conclusion

At the conclusion of the 90-day review meeting, the supervisor completes progress review form on the last 2 pages of the record. The apprentice and supervisor both sign the review and date it.

Copies of the Course and OJT Record are made for (1) the supervisor’s master copy, (2) the apprentice’s working copy, (3) the training coordinator’s second master, and if the apprentice is a veteran, (4) a copy for Labor Relations.

The apprentice uses the updated OJT record as the working copy until the next review.

The training coordinator’s copy is reviewed for accuracy and apprenticeship compliance. The copy is then stored in a central location for audit purposes.

The copy for Labor Relations is to ensure compliance with the Veterans Administration and that participating veterans receive their benefits.

6.0 – Apprenticeship Courses

6.1 – Course Enrollment

The Training Coordinator arranges for courses to be available for the apprentice at the appropriate step and that the apprentice is enrolled. The apprentice and supervisor are notified of the enrollment by e-mail. Approximately a week in advance of the course the apprentice and supervisor receive another e-mail reconfirming the enrollment and other information such as class hours, materials to bring, and clothing requirements.

6.2 – Out of step Enrollments

When a situation arises where the apprentice is not enrolled into a course for the required step and the apprentice is not at fault, the apprentice’s step progression is not delayed.

6.3 – Changing enrollments

The apprentice is normally given adequate notification of upcoming courses and is expected to attend. When circumstances arise, such as a family emergency or illness, the Training Coordinator will reschedule the apprentice for the next available course. If the next available course is beyond the required step, the apprentice is not held a step progression.

6.4 – Attending courses

Courses are held on consecutive days and attendance is required for all days. If an apprentice fails to show for a course and cannot be rescheduled to attend for the required step, the apprentice’s step progression is delayed.

For most courses, if the apprentice is absent a day the apprentice is dropped from the course and rescheduled. If the absence is an excused absence, the apprentice is rescheduled and not held a step progression. If the absence is an unexcused absence, the step progression will be delayed.

6.5 – Passing a course

All courses have written tests and most have a significant amount of lab work. In order to pass, the apprentice must pass the written tests and complete all lab work.

6.4 – Course failure

The apprentice can fail a course by not passing the written test or by not completing all lab work. When an apprentice fails a course, the apprentice and trainer will review the test and lab work identifying areas the apprentice needs to improve. Notification of the failure, along with an action plan that includes areas to study and tasks to practice, will be e-mailed to the supervisor, the apprentice, and the JATC.

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6.0 – Apprenticeship Courses, Continued

6.5 – Making up a course failure

An apprentice who fails a course is scheduled by the Training Coordinator to repeat the course. If a course cannot be scheduled within the apprentice's current step the apprentice is deemed to have not met the Standards of Achievement (See section 7.0 regarding the Standards of Achievement).

The apprentice who fails a course on the second attempt can expect to be removed from the apprenticeship. The final decision for removal is the responsibility the JATC.

After a course failure the apprentice continues his/her OJT, but is not allowed to bypass the apprenticeship course sequence. Refer to the Step Requirements beginning with Section 8, on page 12 for course sequencing. After the apprentice attends and passes the previously failed course the apprentice continues the apprenticeship course sequence.

7.0 – Standards of Achievement

7.1 – Overview

Section E. of the General Construction Master Apprenticeship Agreement (MAA) spells out the consequences for not meeting Standards of Achievement (SOA). The apprentice is recommended to read the MAA for general knowledge and in the event he/she does not meet the SOA.

7.2 – Not meeting Standards of Achievement (SOA)

If the apprentice is not given the opportunity to acquire OJT hours for the required tasks, the apprentice is not at fault and is not held for not meeting the standards.

The Apprentice is deemed to have not met the Standards of Achievement for a given step when one or more of the following occurs:

- The minimum number of OJT hours was not achieved for the step.
 - The required OJT hours are completed for a task, but a sign-off to perform the task is not achieved.
 - The minimum task sign-offs for a given step are not achieved.
 - A required task for a given step is not signed-off.
 - The apprentice fails a course and cannot make-up the course before a step change.
 - The apprentice fails to show for a scheduled course.
 - The apprentice is dropped from a course due to an unexcused absence.
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7.0 – Standards of Achievement, Continued

7.3 – Standards of Achievement notification

When the apprentice has not met the Standards of Achievement the Training Coordinator provides written notification to the apprentice. The notification is also given to the supervisor, JATC, and union business representative. The apprentice is allowed a maximum of three months to remedy the cause and is held at the current step. If during the three months extension the apprentice meets the standards, he/she receives the next higher step effective the date the standards are met.

7.4 – Action plans

An apprentice who is delayed step progression is placed on an action plan. The plan details the areas for study, tasks to be accomplished, the time frames for completion, the task evaluation method, and other pertinent information in order for the apprentice to meet the Standards of Achievement.

7.5 – Step progression after a delay

When the apprentice meets the Standards of Achievement after a step delay the apprentice is given a new step start date. The apprentice is eligible for the next step progression in six months providing he/she meets the standards for the next step.

7.6 – Failure to progress after step delay

Section E.6 of the MAA provides procedures for the apprentice who does not meet the Standards of Achievement after the apprentice has been held for three months.

8.0 – Requirements for Step 1 (0 – 6 Months)

8.1 – Step 1 OJT hours and tasks

For the first five steps the apprentice should average 625 OJT hours to complete the 3,124 hours required for the apprenticeship. However, the minimum required OJT hours that must be completed during step 1 is 500, which include 152 course hours. Included in these hours the apprentice must complete the OJT hours for section 1, section 2, and tasks 18.1 and 18.2.

On average, the apprentice ought to become qualified for 13 tasks for each step in order to complete the apprenticeship's 65 tasks. For step 1, there are a minimum of 11 tasks. The required tasks are:

- 6 tasks in section 1 – Tools and Ladders
 - 3 tasks in section 2 – Hardware
 - Task 18.1 – Install and Remove Vehicle and Equipment Grounds
 - Task 18.2 – Perform Protective Ground Inspections
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8.2 – Step 1 Courses

During step 1 the apprentice is expected to attend and pass the following courses:

- Tower Climbing (ELEC-0201) – 16 hours
After completing this course, the apprentice will be able to properly dress themselves with their Personal Protection Equipment as required by the Safety at Heights Program and move about a steel structure in a manner that allows safe movement and good working practice.
 - Electrician Math (PSOS-0072) – 16 hours
The apprentice will be able to pass a written test with a score of 80% or better on common fractions, decimal fractions, ratios and proportions, powers and roots, geometry, algebra, and trigonometry.
This course is prerequisite to the Electricity and Electronics Course.
 - Electricity and Electronics (PSOS-0064) – 120 hours
The apprentice will be able to construct dc circuits, ac circuits, electromagnets, transformer banks, rectifiers and logic gates. The apprentice will measure DC and AC, voltage, DC and AC current, and resistance. The apprentice will solve for electrical circuit values, such as voltage, resistance, impedance, current, power, apparent power, reactive power, and power factor. The apprentice will analyze open and short circuits, magnetomotive force, the effects of adding capacitance to an inductive circuit, and AC to DC rectification.
This course is prerequisite to the Introduction to Schematics Course.
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9.0 – Requirements for Step 2 (6 – 12 Months)

9.1 – Step 2 OJT hours and tasks

During step 2 the apprentice must complete a minimum of another 563 OJT hours or accumulative total of 1,063 hours, of which 96 hours are course hours. The apprentice must complete the OJT hours for tasks 8.3, 8.4, and 19.1.

The apprentice must be qualified for another 10 tasks or an accumulative total of 21 tasks. Of these tasks the following 3 tasks must be included:

- Task 8.3 – PVC Conduit Installation
 - Task 8.4 – Flex Conduit Installation
 - Task 19.1 – Perform Ground Grid Installation and Repair
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9.2 – Step 2 Courses

During step 2 the apprentice is expected to attend and pass the following courses:

- Introduction to Schematics (PSOS-0080) – 40 hours
After completing this course, the apprentice will be able to: interpret electrical schemes, wire a project board from a schematic, and perform electrical troubleshooting.
This course is prerequisite to the Power Circuit Breaker Course.
 - Power Circuit Breakers (PSOS-0066) – 40 hours
The apprentice will be able to explain each type of interrupting device according to its function, application, and limitations in the power system. The apprentice will be able to describe the procedures required for the installation of power circuit breakers.
This course is prerequisite to the Power Transformers Course.
 - Substation Grounding Fundamentals (PSOS-5000) – 16 hours
The apprentice will be able to describe the importance and benefits of following grounding safety rules, policies, and procedures. The apprentice will be able to describe the roles and responsibilities of the employees responsible for completing protective grounding; locate and apply documented policies, work procedures, rules, and information resources that support safe and effective protective grounding.
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10.0 – Requirements for Step 3 (12 – 18 Months)

10.1 – Step 3 OJT hours and tasks

During step 3 the apprentice must complete a minimum of another 625 OJT hours or an accumulative total of 1,688 hours, which includes 40 course hours. The apprentice must complete the OJT hours for section 4, section 5, and tasks 18.3 and 18.4.

The apprentice must be qualified for an additional 12 tasks or an accumulative total of 33 tasks. Of these tasks the following sections and tasks must be included:

- 5 tasks in section 4 – Rigging
 - 2 tasks in section 5 – Steel Structures
 - Task 18.3 – Test Circuits De-Energized
 - Task 18.4 – Install and Remove Protective Grounds
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10.2 – Step 3 Courses

During step 3 the apprentice is expected to attend and pass the Power Transformer Course (PSOS-0065) – 40 hours.

The apprentice will be able to:

- Identify and describe the components of a power transformer.
 - Identify wye and delta connected transformers.
 - Identify and describe the function of transformer accessories.
 - Describe the function of typical transformer nameplate information.
 - Explain installation procedures.
 - Perform diagnostic tests.
-

11.0 – Requirements for Step 4 (18 – 24 Months)

11.1 – Step 4 OJT hours and tasks

For step 4 the apprentice must complete a minimum of an accumulative total of 2,375 hours. If the apprentice had the minimum number of OJT hours from step 3, a minimum of 687 OJT hours, including 16 course hours, will need to be completed for this step. Of the hours completed, the apprentice must complete the OJT hours for section 6, section 7, and section 20.

The apprentice must be qualified for an accumulative total of 47 tasks. If the minimum number of tasks were completed in step 3, the apprentice will need to be qualified for 14 tasks in this step. Of these tasks the following sections must be included:

- 5 tasks in section 6 – Drawings, Schedules, and Bill of Materials
- 2 tasks in section 7 – Wire Pulls
- 2 tasks in section 20 – Removal

11.2 – Step 4 Courses

For step 4 the apprentice is expected to attend and pass the Load Tap Changer Overview Course (PSOS-0082) – 16 hours. The apprentice will be able to:

- Identify components and their functions
 - Set controls on the Siemens MJ3A
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12.0 Requirements for Step 5 (24 – 30 Months)

12.1 – Step 5 – OJT hours and tasks

For step 5 the apprentice completes the remaining apprenticeship OJT hours. If the accumulative total from step 4 was the minimum hours, the apprentice will need to complete 749 OJT hours to have an accumulative total of 3,124 hours. If the minimum tasks were completed for the previous steps the following sections and tasks are to be completed: section 3, section 9 section 10, section 11, section 12, section 13, section 14, section 15, section 16, section 17, and tasks 8.1, 8.2, 18.5, and 18.6. The apprentice as a minimum must be qualified for 95% of all tasks.

The apprentice must be qualified for a minimum accumulative total of 62 tasks. If the minimum number of tasks were completed in step 4, the apprentice will need to be qualified for 15 tasks in this step. Of these tasks the following sections and tasks include:

- 2 tasks in section 3 – Excavation and Backfilling
- 5 tasks in section 9 – Control Wiring
- 2 tasks in section 10 – Air Switches
- 2 tasks in section 11 – Power Circuit Breakers
- 2 tasks in section 12 – Circuit Switchers
- 2 tasks in section 13 – Transformers, Regulators, Metering Pots and CCVT's
- 1 task in section 14 – Oil Sampling
- 2 tasks in section 15 – High Voltage Conductors
- 3 tasks in section 16 – Control Panels and Trays
- 1 task in section 17 – Station Batteries
- Task 8.1 – Thin Wall Conduit Installation
- Task 8.2 – Rigid Conduit Installation

Note: Tasks 18.5 and 18.6 cannot be completed until the apprentice becomes a Qualified Electrical Worker (QEW) at the 5th step.

- Task 18.5 – Perform as a Grounding Observer
- Task 18.6 – Plan and Perform Grounding Tailboards

12.2 – Step 5 Courses

There are no required courses for the 5th step Substation Construction Apprentice Electrician.

13.0 Requirements for Step 6 (31 – 36 Months)

13.1 – Meeting Standards of Achievement

Step 6 has no regular OJT hours or courses for the apprenticeship and as a minimum the apprentice has qualified for at least 95% of the OJT tasks. The apprentice may use this step to qualify for the remaining 3 tasks to reach 100% completion. The apprentice is not qualified to bid a journeyman position until he/she has qualified for all tasks.

13.2 – Rounding out

Step 6 is for the purpose of “rounding-out.” A term used when the apprentice has been signed-off and qualified for all tasks, passed all required courses and is practicing tasks for added experience before becoming a journeyman electrician. A 6th step apprentice who has completed all required training is eligible to bid a journeyman position.

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