

Administration of Apprenticeship
Agreements
&
Schedule of Training Hours &
Courses

6100 Neil Road Reno, Nevada 89511

Sierra Pacific Power Company
(d/b/a NV Energy)

Foreword

The material contained in these standards has been developed jointly by representatives of Sierra Pacific Power Company d/b/a NV Energy ("Company") and the International Brotherhood of Electrical Workers Local 1245 ("Union") in accordance with contractual provisions of a Collective Bargaining Agreement (CBA-1245) between the two parties.

The following outline of training programs, courses, and study requirements, shall constitute an obligation on the part of the Company to provide on-the-job training, study courses as outlined and to keep records (thereof) for all employees assigned to the classification of apprenticeship and shall constitute an obligation on the part of the employees so assigned to participate in the training program and in the keeping of records of progress as herein outlined.

It is not the intent of either party to set standards that conflict with any State or Federal law or regulation. Should any such conflict arise, the law will supersede these standards.

The Joint Apprenticeship Training Committee (JATC-1245) has dedicated it's time to develop an efficient program of apprenticeship to ensure that the apprentice of today, through a systematic program of on-the-job training and related classroom instruction to become a qualified well-rounded journeyman employee of tomorrow.

All actions taken by the JATC-1245 shall be in the best interest of the apprentice, management, labor, and the public.

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SECTION I: DEFINITIONS

1. **Apprentice:**
A person who has entered into a written Apprenticeship Agreement providing for employment and training under the terms and conditions of these Standards.
2. **Apprenticeship Agreement:**
This term, which is synonymous with the word "indenture" as sometimes used, means the written document between the apprentice and the Joint Apprenticeship Training Committee (JATC-1245) stating the responsibilities and obligations of the parties in connection with the apprentice's employment and training under these standards.
3. **Collective Bargaining Agreement:**
Refers to the agreement entered into by the Company and International Brotherhood of Electrical Workers (IBEW) Local 1245 that provides for employer-sponsored training. May be referred to as "CBA" or "CBA-1245."
4. **Company:**
For the purposes of this agreement it means Sierra Pacific Power Company d/b/a NV Energy. Note this agreement is for the entity bound by the Collective Bargaining Agreement between IBEW Local 1245 and NV Energy (Northern Nevada service territory). May also be referred to as the "Employer."
5. **Joint Apprenticeship Training Committee (JATC-1245):**
The Committee responsible for operating the programs described in these standards; hereinafter referred to as the "Apprenticeship Committee," "Committee," "JATC," or "JATC-1245." Only one Committee will have jurisdiction over each apprentice.
6. **Journeyman:**
A qualified craft worker in the skilled trade classification covered in these Standards.
7. **Project Administrator:**
The Company shall appoint a Project Administrator to oversee the Joint Apprenticeship Training Committee. May also be referred to as the "Committee Chairperson" or "Chairperson." The Project Administrator shall serve as the JATC-1245 Chairperson.
8. **Registration Agency:**
Shall mean the Nevada State Apprenticeship Council (NSAC).

9. Standards:

Shall mean this entire document, including supplementary agreements and attachments.

10. Supplementary Training:

This includes, but is not limited to, home study and classroom training.

11. Union:

For the purposes of this agreement it means International Brotherhood of Electrical Workers (IBEW) Local Union 1245. May also be referred to as the "IBEW Local 1245," "IBEW 1245," "Local 1245" or "Union."

Savings Clause: As used in this agreement, pronouns imparting the masculine gender shall be considered applicable to both sexes.

SECTION II: APPRENTICESHIP COMMITTEE (JATC-1245)

Scope and Authority

- A. The Union and Company shall establish a Committee, known as the Joint Apprenticeship Training Committee (JATC-1245), to select, review, and address apprenticeship matters including the administration of apprenticeship training and concerns.
- B. All Committee members will have an equal vote. The Committee shall be comprised of four (4) members appointed by the Company and four (4) members appointed by the Union. In the event of a tie vote situation, the IBEW Business Representative and Chairperson shall meet and confer. Following the meeting, the Committee Chairperson, who is normally a non-voting member, will have the tie-breaking vote.
- C. The Committee members shall serve from the date of their appointment until their successors are duly selected.
- D. The JATC-1245 shall have the responsibility of selecting apprentices, developing new apprenticeship programs, amending existing apprenticeship programs, and investigating problems related to such areas as entrance requirements, standards of progress, methods of testing and scoring, apprenticeship working conditions, and procedures for removal or freezing when apprentices fail to meet established requirements.

In case of failure on the part of any apprentice to fulfill the obligations of the apprenticeship, the Committee shall have the authority to extend or revoke his/her Apprenticeship Agreement. If an Apprenticeship Agreement is revoked, the Committee will follow the guidelines established by the Nevada State Apprenticeship Council (NSAC) or as otherwise required by statute.
- E. The apprentice agrees to abide by decisions made by the JATC-1245, but retains the right of appeal to the Nevada State Apprenticeship Council (NSAC) as outlined in statute.
- F. The JATC-1245 is authorized to extend the term of apprenticeship no more than six (6) months (cumulatively) over the scheduled term of the apprenticeship.
- G. Committee meetings shall be held once a month or as designated by the Committee Chairperson.

Procedures

- A. The Chairperson will be responsible for an agenda of, and presiding over scheduled meetings. The Secretary shall record the minutes of each meeting and distribute them to JATC-1245 members. The Chairperson, or their designee, shall be responsible for apprentice files, the registration of apprenticeship agreements, and all other records and reports of the Committee.
- B. A quorum shall consist of at least five (5) of the members, at least two (2) members appointed by the Company and two (2) members appointed by the Union.
 - o A majority of those members constituting the quorum must vote in favor of any affirmative action of the Committee, unless otherwise required by applicable law.

Duties

- A. To conduct surveys and studies to determine industry training needs and skill requirements and to develop other data essential to establishing adequate and effective plans and programs of training.
- B. To periodically review these standards and keep them consistent with industry, national and state standards.
- C. To indenture, under a written agreement, all apprentices accepted for training under the provisions of these standards.
- D. To determine the kind and amount of on-the-job training and experience to be required of apprentices and to arrange for such experience and training.
- E. To determine the kind and amount of supplemental instruction to be required of apprentices and to arrange for such instruction to be provided.
- F. To ensure adequate and safe equipment and facilities, as well as, provisions for training in safety and related instruction.
- G. To ensure each apprentice learns from qualified training personnel and has adequate supervision to perform tasks.
- H. To establish a system of records, reports, and examinations that will provide means of determining the progress and conduct of each apprentice in both the on-the-job training and related instruction requirements throughout their apprenticeship.
- I. To determine when apprentices have satisfactorily met all requirements of their apprenticeship, to recommend their acceptance as Journeymen, and to obtain and award an appropriate "Certificate of Completion of Apprenticeship."
- J. To register all apprenticeship agreements with the Registration Agency and notify the Registration Agency of all cancellations and completions of apprenticeship in compliance with statute.
- K. To uniformly apply regulations concerning apprentices, including those which govern equality of wages, periodic advancement, promotion, assignment of work, the performance of a job, rotation among all of the different types of work involved in the trade, imposition of penalties or other disciplinary action, and all other administrative aspects of the program of apprenticeship without discrimination because of race, color, religion or belief, sex, sexual orientation, gender identify or expression, age, marital status, covered veteran status, physical or mental disability, national origin, or ancestry.

SECTION III: DEFINITION OF APPRENTICESHIP

Under this agreement, an apprentice is defined as a person who meets the "Qualification for Apprentices" as set forth in Section IV, and who:

- A. As their principal occupation, is engaged in learning and assisting in the particular craft.
- B. Has entered into a written apprenticeship agreement with the Company which subscribes to the craft standards contained in the individual apprenticeship program agreement. The apprentice is required to participate in an approved program of training in manual skills and related general and technical subjects as prescribed by the minimum requirements of the apprenticeship agreement.

SECTION IV: QUALIFICATION OF APPRENTICES

- A. Must be at least 18 years of age.
- B. Must have a high school diploma or equivalency (HSE).
- C. Must have a valid driver's license at the time of selection.
- D. Must be physically able to perform all work of the trade with or without reasonable accommodation.
- E. Apprentices shall be recruited and selected in accordance with the current CBA-1245 provisions.
 - In order to be awarded an apprenticeship, an internal applicant must successfully complete education and/or training requirements as determined by the JATC-1245. (*see Attachment #1*)
 - Any person from outside the Company who is being considered to fill an apprenticeship vacancy will have to meet the same pre-qualification standards as an internal applicant.
- F. A Journeyman, regardless of his/her present classification, will not be permitted to bid back into an apprenticeship they have successfully completed.
- G. If an employee's apprenticeship is terminated by the Committee or the apprentice voluntarily quits an apprenticeship, the employee must wait one (1) year to re-apply to any apprenticeship program.
- H. If an employee voluntarily drops out of an apprenticeship, they may not re-enter the program in which they withdrew from, without review and approval by the JATC-1245.
- I. The recruitment, employment, and training of apprentices shall be without discrimination because of race, color, age, marital status, covered veteran status, religion or belief, national origin, ancestry, physical or mental disability, sex, sexual orientation, gender identity or expression, or any other basis made unlawful by any applicable law, ordinance, or regulation. The Company will take affirmative action to provide equal opportunity in apprenticeships and will operate the apprenticeship program as required under Title 29 of the Code of Federal Regulations, Part 30, and the most current Nevada EEO plan.

SECTION V: RESPONSIBILITIES OF APPRENTICES

The Joint Apprenticeship Training Committee (JATC-1245) impresses upon all apprentices that in signing the Apprentice Agreement they have voluntarily agreed to abide by the provisions of these standards. Each apprentice is informed of the following responsibilities and obligations under the apprenticeship system:

- A. To respect the property of the Company and abide by the working rules and regulations of the employer and the Registration Agency.
- B. To attend and satisfactorily complete the required supplementary training.
- C. To develop safe working habits and conduct themselves in their work in such a manner as to assure their own safety as well as that of their fellow workers.
- D. Under normal circumstances, the apprentice will be expected to complete the apprenticeship program in the prescribed manner. If an apprentice decides he does not want to complete the apprenticeship, the Company may reassign the employee in accordance with the CBA-1245.
- E. Upon satisfactory completion of the requirements of the apprenticeship program, the apprentice will be reclassified to Journeyman in accordance with the CBA-1245.

SECTION VI: TERMS OF APPRENTICESHIP

- A. The Company's apprenticeship programs will be operated in accordance with the rules and regulations set forth by the Nevada State Apprentices Council and applicable statute.
- B. The Company shall provide adequate and safe equipment and facilities for the training of apprentices in accordance with departmental and Company safe work practices and the CBA-1245.
- C. All apprentices shall be paid progressively increasing, reasonable schedule of wages in accordance with the CBA-1245, federal, and state laws.
- D. The workday, workweek, and working conditions shall be the same for the apprentices as the Journeymen, with the exception of overtime.
- E. The term of apprenticeship shall be specified in the Apprentice Agreement-Approved Programs Schedule of Training Hours and Courses appendix. The length of the term shall depend on the craft involved. These hours are based on a forty-hour (40) workweek.
- F. The term of the apprenticeship shall be divided into six (6) month training periods and any time lost during a period, as determined by the JATC-1245, must be made up before an apprentice may advance to the next period or to the Journeymen classification. If an apprentice should suffer an injury resulting in short term disability or time that the apprentice is unable to physically perform the duties required in his/her apprenticeship, the lost time will be considered a temporary medical suspension ("medical freeze"). The apprenticeship will be given a medical suspension until such time that the employee is able to resume his/her physical duties. The apprentice will be required to keep the JATC-1245 informed of his/her status and to appear before the Committee upon request. A medical freeze is not subject to the provisions of Section II F of this agreement.
- G. The Committee will obtain from the Registration Agency and issue to the apprentice all applicable Certificates of Completion.

- H. With the approval of the JATC-1245, an apprentice who does not show reasonable and normal performance in on-the-job training or related supplemental training may be granted additional time. This time will be counted as extra time over and above the standard time requirements of the agreement and is subject to Section II F. of this agreement.
- I. Any apprentice found to have stolen, cheated, or having gained access to testing answers, or testing questions or testing reference materials may be immediately removed from the program and will not be allowed to re-enter the same program.
- J. All apprentices are expected to follow the Company's values and ethics. Each apprentice will be supplied with a copy of the Company's code of ethics. Failure to abide by these may be grounds for immediate removal from the program without the ability to re-enter any apprenticeship program in accordance with the CBA-1245.
- K. The JATC-1245 is authorized, with the approval of the Company, to extend the term of apprenticeship no more than six (6) months (cumulatively) over the scheduled term of the apprenticeship when the apprentice fails to successfully complete the requirement for the current six (6) month period or to attain Journeyman status.

SECTION VII: APPRENTICESHIP TRAINING STANDARDS

- A. A "Schedule of Training Hours and Courses" will be developed for each apprenticeship program. This Standard will indicate the training time for each phase of training or work process.
- B. The training time indicated will be indicative, not restrictive, of the emphasis or amount of time that should be spent on each phase. It must be emphasized that the total time spent on any work phase during any one-progression period may vary with the individual, workload, and amount of related instruction. The assignment of work phases to progression periods may be varied, but the minimum assignments should be met during the term of the apprenticeship.
- C. Each apprenticeship training standard shall contain the following information:
 - 1. The trade or craft involved;
 - 2. The processes in the trade or craft in which the apprentice shall be given work experience and the approximate amount of hours to be spent on each process;
 - 3. The number of hours to be spent in related or supplementary instruction which will total at least 144 hours per year;
 - If instruction is given during normal working hours, the apprentice will be paid pursuant to the contract rate.
 - If instruction, home study work or exams take place outside of regular working hours, the apprentice will not be paid.
 - 4. Minimum standards for progression.

Each new apprentice will receive a copy of and acknowledge reading and receipt of the "Administration of Apprenticeship Supplementary Agreement and Schedule of Training Hours and Courses".
- D. The Company will register the "Administration of Apprenticeship Programs Supplementary Agreement" and the "Schedule of Training Hours and Courses" for each trade, with the Registration Agency. Modifications, amendments, and revisions will also be submitted to the Registration Agency for approval. This is

done after obtaining approval from the Committee, Company, and the Union. Cancellation and de-registration of programs are subject to the provisions of NRS/NAC Chapter 610.

SECTION VIII: RATIO OF APPRENTICES TO JOURNEYMAN

Whenever more Journeymen are employed, additional apprentices may be employed. The ratio of apprentice to Journeymen will not exceed one (1) apprentice to one (1) Journeyman.

SECTION IX: APPRENTICES PREVIOUS EXPERIENCE

- A. Applicants who have been employed in a related trade or craft as an apprentice or have completed previous training programs in a related field may be granted advanced standing not to exceed one (1) six (6) month training period upon the recommendation of their Supervisor and approval of the JATC-1245. The department sponsoring the advancement shall furnish evidence of proficiency to the JATC-1245.
- B. Returning Reservists and National Guard members have thirty (30) days to submit documentation of related training or classroom training they received while on active duty. The JATC-1245 may, at its sole discretion, extend this period of time if the reason for the delay is due to difficulty acquiring the necessary documentation from the Department of Defense.
 - Upon evaluation, the JATC-1245 may grant all or part of the request for additional credit.
- C. An applicant approved for an advanced standing shall be paid the appropriate wage of the training period to which they are advanced. If the advanced standing is granted, it will be for wages only. The time limits outlined in the Apprenticeship Agreement will be adhered to, and the completion date ("top out date") for the apprentice will remain the same.
- D. The term of the apprenticeship shall not be less than 2,000 hours of work experience, or otherwise required by statute.

SECTION X: APPRENTICE PROBATIONARY PERIOD

- A. The first six (6) months of the term of the apprenticeship shall be a probationary period. Either party without stated cause can cancel Apprenticeship Agreements during the probationary period without the formality of a hearing.
- B. After the probationary period (first six (6) months), the Apprenticeship Agreement may be cancelled at the request of the apprentice, or suspended or terminated by the JATC-1245 with a formal hearing.
- C. If an apprentice or the JATC-1245, determines the apprentice does not want to complete the apprenticeship, the Company is not required to reassign the employee unless it is in accordance with the CBA-1245.
- D. The Company shall notify the Registration Agency of all apprentice terminations including temporary layoff caused by reduction in workload or other unforeseen conditions.
- E. Individuals whose apprenticeship has been terminated by the JATC-1245 will be given written notice of their rights of appeal in accordance with statute.

SECTION XI: ADJUSTMENT OF DIFFERENCES

- A. The Company and the apprentice shall have the right and privilege of appeal to the JATC-1245 in the event of dispute or controversy arising over interpretations of the provisions of this document. The JATC-1245 shall hear all affected parties and make such adjustments as it considers necessary. Persons wishing the JATC-1245 to hear such matters should make a request in writing to the JATC-1245 Chairperson five (5) business days prior to the regular scheduled JATC-1245 meeting, to have the request placed on the regular meeting agenda.
- B. Either of the parties may appeal the decision of the JATC-1245. Appeals will be directed to the Nevada State Apprenticeship Council (NSAC) in accordance with the guidelines and timeframes outlined in statute.

SECTION XII: APPRENTICE DISCIPLINARY ACTION

- A. The JATC-1245 retains authority to discipline an apprentice who fails to comply with the Apprenticeship Agreement or rules and instructions of the JATC-1245.
- B. The JATC-1245 shall notify the apprentice to appear before the Committee for a hearing before such disciplinary action shall be invoked. Should the apprentice fail to appear before the Committee disciplinary action may be invoked without a hearing.
- C. An apprentice who does not show acceptable performance in on-the-job training or related supplementary training may be granted additional time to show improved performance in accordance with Section II F. of this agreement. This extension ("freeze") time will be added to the standard apprenticeship time requirements and shall extend the term of his apprenticeship by that of the freeze.
- D. Failure to meet class attendance obligations is cause for disciplinary action by the Company and JATC-1245. Therefore, if apprentices are unable to attend training sessions due to illness or other just cause, they shall be expected to obtain an official excuse from the appropriate individual prior to class and will be responsible to arrange a time for a make-up class. Apprentices should not accept overtime work which could jeopardize their scheduled classes.
- E. Any apprentice found to have cheated in any manner may be immediately removed from the program and will not be allowed to re-enter the same program.
- F. Some of the reasons considered as just cause for disciplinary action include, but are not limited to, the following:
 - 1. Failure to meet related class attendance and progress requirements;
 - 2. Lack of interest, application to, or satisfactory progress in the work and/or on-the-job training;
 - 3. Failure to properly prepare and submit required reports;
 - 4. Undesirable conduct;
 - 5. Failure to demonstrate safe work habits; or
 - 6. Lack of respect for Company property;

SECTION XIII: APPRENTICE PROGRESS EVALUATION & REPORTING

- A. The Company will establish a system of individual records, reports and examinations that will provide a means of recording the progress and conduct of each apprentice in both on-the-job training and supplementary training.
- B. Record of Training Hours:
 - 1. Each apprentice will complete a monthly record of training hours. The hours worked will be recorded and a new card, indicating the cumulative hours worked in each type of work, will be issued for each new month. This card will become part of the apprentice's permanent record.
 - 2. The training hour card will be filled out daily and turned in monthly.
 - 3. Apprentices will fill out their training hour cards as follows:
 - a. Each day enter hours worked in each category.
 - b. Obtain Foremen's/Journeyman approval for each day worked.
 - c. At the end of each month, give completed card to the Journeyman /Foreman and Supervisor who will add their own comments on the card.
 - 4. Foreman and/or Journeyman will fill out the apprentice's training hour card as follows:
 - a. Review and initial a card for each apprentice that worked on the crew each day.
 - b. At the end of the month, fill out the Foreman's remarks section; make any necessary comments about the apprentice's work performance.
 - 5. Supervisors will fill out the apprentice's training hour card as follows:
 - a. At the end of each month, review the training hour card with the Foreman/Journeyman.
 - b. Fill out the Supervisor's remarks section with a supervisory evaluation of the apprentice's progress.
 - c. Review the completed card with the apprentice.
 - d. Have the apprentice sign and make any comments on the completed card.
 - e. All training cards should be turned into the JATC-1245 by the Supervisor or designee and retained by the Company in accordance with records management standards.
 - f. Monthly evaluation cards will not be accepted without all signatures.

SECTION XIV: PROGRESSION & TESTING

- A. To progress through the apprenticeship program, the apprentice will be required to pass tests for each step of the program. These tests may consist of written questions, electronic, or actual performance of specific work processes, or a combination of all, under test conditions. All progression tests and the manner in which they are scored will be evaluated and agreed to by the JATC-1245.
- B. Progression tests will be closed book, unless otherwise deemed necessary to be open book.
- C. A grade of 75% or above will be considered a passing grade on any test or performance of specific work processes.
- D. An apprentice who fails two (2) tests within the same six (6) month period will have his/her performance referred to the JATC-1245 to determine whether the apprentice should be disqualified from the program.
- E. In the event an apprentice has not passed the required tests for the current six (6) month training period, additional training time may be granted by the JATC-1245, in accordance with Section II F. of this agreement.
During this period, the apprentice will not be permitted to do the work or receive the pay of the next higher wage step of his apprenticeship. Upon completion of this additional training period, the apprentice will be given another opportunity to pass the required test(s). An apprentice who fails a test cannot re-take the test before 30 calendar days from the date of their previous test unless approved by the JATC-1245 or at the request of the apprentice.
- F. To progress through the apprenticeship, the apprentice must show satisfactory performance in both on-the-job training and the supplementary training.
- G. The apprentice will be expected to exhibit knowledge of, and to perform in an efficient manner in all areas in which the apprentice has been trained.

Final Exam ("Top Out Test")

- A. All apprentices are required to take and pass a final exam ("top out test") by the end of the last month of which they are indentured.
- B. This exam will consist of multiple tests including written and demonstrated work processes.
- C. The tests will be administered and graded by the Trainer, Supervisor or designee, or a panel of Journeyman from the trade.
- D. An apprentice is required to achieve a minimum score of 75% on all final exams to pass.
- E. A failing grade on any portion of the final exam will require the apprentice to be placed in a three (3) month hold ("freeze") in which he can re-take the final exam. The apprentice will be provided this extension as long as the apprentice has not reached the maximum amount of extensions allowed by the JATC-1245 per Section II F. of this agreement.
- F. A failing grade on the re-test will result in the apprentice being removed from the apprenticeship program.

SECTION XV: SUPPLEMENTAL TRAINING & RELATED INSTRUCTION

- A. All apprentices shall receive instruction and experience in areas of the craft in order to develop a practical, all-around journeyman level of skill and proficiency.
- B. Related classroom instruction, as agreed to by the JATC-1245, may be given to the apprentice during regular working hours or after working hours on the apprentice's own time.
- C. Each apprentice shall pursue related supplemental studies for at least 144 hours per year. This training shall be approved by the JATC-1245 and may be on the apprentice's own time and without pay from the Company.
- D. If instruction is given during normal working hours, the apprentice will be paid pursuant to the contract rate. If instruction or home study work or exams take place outside of regular working hours, the apprentice will not be paid.

SECTION XVI: ON-THE-JOB TRAINING & EXPERIENCE

Under the supervision of a qualified Journeyman in the same classification/line of progression, each apprentice shall be given such practical experience and training in the various branches and job processes of the trade as is necessary to develop proficiency. Only hours actually worked on-the-job will be credited toward the term of apprenticeship.

SECTION XVII: APPRENTICE EXAMINATION AND COUNSEL

- A. Apprentices may be called before the JATC-1245 at anytime for examination or consultation regarding their apprenticeship.
- B. Examination and review of the apprentice's progress and conduct, both on-the-job and in the related instruction will be conducted by or under the direction of the JATC-1245.
- C. Apprentices not showing satisfactory progress may be held in their current step at any time during their apprenticeship. The apprentice may be subject to any corrective action deemed necessary by the JATC-1245.
- D. The JATC-1245 may suspend or freeze an apprentice before advancing him to the next step or to Journeyman status.

SECTION XVIII: REVISION OF STANDARDS

The action of the JATC-1245 and approval of the sponsoring parties may revise these Standards at any time. Copies of any revisions must be registered and approved by the Registration Agency before becoming effective. Revision of these standards shall not alter apprenticeship agreements already in effect without consent of all parties to the agreement. As used in these standards, the masculine, feminine or neutral gender, and the singular or plural number, shall each be deemed to include the others whenever the context so indicates. No section of these standards shall be in conflict with the CBA-1245, and terms of the current working agreement shall supersede any section or sections of these standards, but must meet the minimum requirement of N.R.S. 610, Apprenticeship Councils Rules and Regulations Part 29 CFR 29 and Part 29 CFR 30.

SECTION XIX: CANCELLATION/DE-REGISTRATION OF STANDARDS

De-registration of a program may be effected upon the voluntary action of the JATC-1245 by request for cancellation of the registration, or upon reasonable cause by the Registration Agency instituting formal de-registration procedures in accordance with statute including the provisions of Part 29 CFR 30 E.E.O. Upon de-registration or voluntary cancellation of the program, the Company will inform each apprentice, within fifteen (15) days of de-registration or cancellation and the effect of such action.

SECTION XX: TRANSFER OF TRAINING OBLIGATION

If the Company is unable to fulfill its training obligation (due to lack of work or failure to conform to these Standards), or upon request of the apprentice, the JATC-1245 may transfer an apprentice, with his/her consent, to another employer under the same or similar program to provide continuous employment and to assure the apprentice a more complete on-the-job learning experience in all aspects of the occupation.

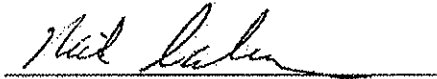
SECTION XXI: TERMS OF AGREEMENT

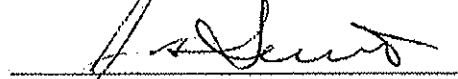
This Supplemental Agreement became effective on the 20th day of December, 2016.

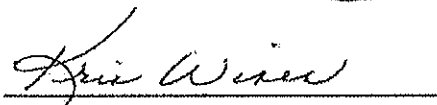
JOINT APPRENTICE TRAINING COMMITTEE APPROVAL:



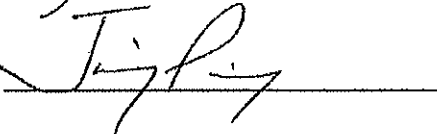


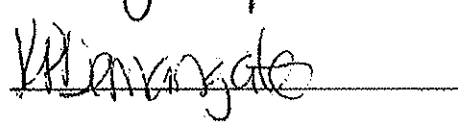




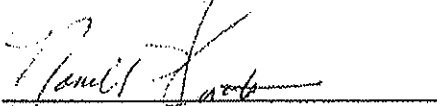




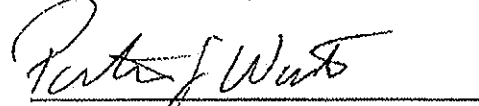




APPROVED AND ACCEPTED BY THE COMPANY & UNION:



Labor Relations Manager
NV Energy



Business Representative
IBEW Local 1245

ATTACHMENT 1

The Company is committed to employ, in its best judgment, the best qualified candidates for approved positions while engaging in recruitment and selection practices that are in compliance with all applicable federal and state laws. It is the policy of Company to provide equal employment opportunity to all applicants.

Individuals interested in an apprenticeship, may submit an employment application when a vacancy is posted. Apprenticeship awards are awarded first as outlined by the NV Energy/IBEW Local 1245 Collective Bargaining Agreement and then, should the number of qualified candidates not fill the vacancy need, by consideration of qualified non-Local 1245 represented personal (both internal employees and external candidates).

Internal NV Energy Local 1245 Applicants

Applicants to be accepted for apprenticeship must meet the following requirements and comply with all requirements in statute:

1. Any employee interested in applying to a posted apprenticeship in the future will need to successfully satisfy the pre-qualification testing requirements outlined below for the desired program.
2. Selection of internal applicants will be governed by the CBA-1245
 - a. It is the policy of the Company to post vacancies internally for ten (10) calendar days.
 - b. Pre-Qualification Testing
The Company utilizes the ACT Work Keys exams in order to establish pre-qualification criteria as outlined below. ACT Work Keys assessments have been used for more than two decades to measure essential workplace skills and build career pathways.

Apprenticeship	WorkKeys Applied Mathematics	WorkKeys Applied Technology	WorkKeys Locating Information	WorkKeys Reading for Information	WorkKeys Workplace Observations
Customer Serviceman	5	4	4	5	2
Fitter	5	4	4	5	2
Fitter/Welder	5	4	4	5	2
Gas Pressure Operator	5	4	4	5	2
Lineman	5	4	4	5	2
Meter Technician	5	4	4	5	2
Substation Electrician	5	4	4	5	2
Communications (Telecom) Technician	5	4	4	5	2

The JATC-1245 reserves the right to modify the pre-qualification testing criteria to enforce its duty to the Apprenticeship Programs.

c. The JATC-1245 may also choose to review:

i. Applicable Driver's License

1. If the selected applicant does not have the required driving licenses upon hire, the candidate will have thirty (30) days in which to acquire it or shall be removed from the apprenticeship. (Some apprenticeships may require a commercial driver's license CDL.)

2. If the applicant loses his/her license during their apprenticeship and is unable to perform his/her work duties, he/she may receive disciplinary action up to and including discharge from the program.
- ii. If the program's job duties require a current drug test on record; the applicant shall be scheduled for one prior to being awarded the position.
- iii. Upon accepting the apprenticeship, the employee may be scheduled for a physical exam. This will be scheduled if the successful candidate is not currently in a job with comparable physical requirements. The doctor will be provided with the essential job functions and demands. The purpose of the physical is to determine if the employee is physically capable of performing the essential functions of the apprenticeship.
 1. An exam will be given by one of the company-selected doctors or an applicant may go to his/her own doctor.
 - a. If an applicant goes to his/her own doctor, the Company will reimburse the standard fee that would have been paid to the Company doctor to do the exam. The applicant will pay the remainder.
 - b. The results of this physical may also be used to satisfy the DOT requirements for their driver's qualification

Non-NV Energy Local 1245 Candidates

Any person who is being considered to fill an apprenticeship vacancy will have to meet the same pre-qualification standards as an internal employee as outlined above.

Applicants will be required to meet all pre-qualification testing, skills demonstration, interview along with completing the required NV Energy pre-employment qualification requirements such as pre-employment background check, post-offer drug test, etc.

To learn more about the Work Keys pre-qualification testing, visit <https://www.act.org/products/workforce-act-workkeys/>. Locally, the Work Keys Test Battery is administered by:

Northern Nevada Area:
Truckee Meadows Community College (TMCC) Testing Center
located at 5270 Neil Road, Suite 319 Reno, Nevada. To schedule the Work Keys exams, contact the TMCC Testing Center directly at (775) 824-3838.

Southern Nevada Area:
College of Southern Nevada (CSN) Division of Workforce &
Economic Development located at 2409 Las Verdes Street Las
Vegas, Nevada. To schedule the Work Keys exams, contact CSN
directly at (702) 651-4109.

Communications Technician

Program Duration: 4 Years (48 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
<i>I. Telecom Auxiliary Systems</i>	
DC Power Supplies	320
Batteries	80
Antenna Support Structures	80
Fuse and Alarm Panels	80
UPS Equipment	40
Automatic Transfer Switches	40
Standby Generators/Fuel Systems	120
Alarm Systems (DPS)	160
Timing Systems	100
Radio Frequency Interference Investigations	60
HVAC Equipment	40
<i>Total</i>	<i>1120</i>
 <i>II. Energy Management Systems</i>	
ESCC Computer Equipment	240
Communications Front End	240
SCADA RTUs	800
IED Interfaces/ION Meters	160
Transducers	160
Protocols/Analyzers	160
<i>Total</i>	<i>1760</i>
 <i>III. Telephone Systems</i>	
Switches (Nortel, IPC)	200
Ringdown Circuits	40
Voice Recorders (Wygant)	80
Trunk/FEX Lines	120
Station MACs	120
Line Protection (Position)	80
<i>Total</i>	<i>640</i>

**Approved Apprenticeship Programs
Schedule of Training Hours and Courses**

IV. Relay and Protection Systems/Transfer Trip

RAS	40
Power Line Carrier	80
Tone Equipment (9745, Type 40, TA 1/3)	160
Mirrored Bits Equipment	40
Direct/Permissive	80
<i>Total</i>	<i>400</i>

V. Mobile Radio Systems

Consoles	40
Subscriber Units (Mobiles, Portables)	320
EDACS Programming	160
CSD	160
IMC	160
Stargate	80
Repeaters	120
Base Stations	480
<i>Total</i>	<i>1520</i>

VI. Transport Systems

	<i>2560</i>
Microwave Radio (Harris, Alcatel)	600
Multiplexers (Access 60, IMUX)	640
DACS (Titan, Mainstreet)	140
Optical Fiber Systems (JMUX, Alcatel, Lucent)	620
LAN/WAN (Routers, Switches, RAD)	320
MAS Radio	160
Power Line CXR (SSB)	80
<i>Total</i>	<i>2560</i>

Total Program Hours 8,000

Supplemental Training Program Outline

Study Seq.	Telecommunications Apprenticeship-Instruction Text Title	Penn Foster Lesson Number	Penn Foster Manual ID	Course Duration (Hours)	Penn Foster Exam Number
	First 6 Months			83	
1	Learning Strategies	147008	14700803	5	14700803
2	Jobs, Companies, and the Economy-Basic	186034	18603400	5	18603400
3	Quality Concepts: Tools and Applications	186036	18603600	5	18603600
4	Trades Safety Getting Started	186001	18600100	5	18600100
5	Materials Handling Safety	186006	18600600	5	18600600
6	Introduction to Telecommunications	387001	38700100	10	38700100
7	Nature of Electricity	086001	08600101	5	08600101
8	Working Safely with Electricity	4400	4400-8	10	44008
9	Electrician's Tools	006026	00602600	10	602600
10	Linear & Distance Measurement	186021	18602101	5	18602101
11	Electrical Drawings and Circuits	186044	18604400	8	18604400
12	Reading Electrical Schematic Diagrams	006022	00602202	10	00602202
	Second 6 Months			78	
13	Problem Solving and Troubleshooting	186073	18607300	10	18607300
14	Fractions, Percents, Proportions, and Angles	186010	18601000	5	18601000
15	Formulas	186012	18601200	5	18601200
16	Circuit Analysis and Ohms Law	086002	08600200	5	08600200
		Block A23			
17	Basic Test Equipment	086025	08602500	5	08602500
18	Troubleshooting with Volt-Ohm-Milliamp Meters (VOMs)	086026	08602600	5	08602600
19	Using Basic Oscilloscopes	086027	08602701	5	08602701
20	Component Testers	086062	08606200	6	08606200
21	Digital Test Equipment	086063	08606300	6	08606300
22	Industrial Computer Networks	08606900	08606900	6	08606900
		086E16	<u>Data, Voice, and Video</u>		

			<u>Cabling 2nd Ed.</u> Hayes & Rosenberg, 08691600		
23	Communication Cabling Systems	086801	Lesson 1	5	08680100
24	Copper Wiring for Telephone, Video, and Network Systems	086802	Lesson 2	5	08680200
25	Terminating and Testing Communication Wiring	086083	Lesson 3	5	08680300
26	Working with Fiber Optics	086084	Lesson 4	5	08680400
	Third 6 Months			65	
27	Introduction to Algebra	186013	186013	5	18601300
		Block X02			
28	Algebra: Factoring	X0202	X0202-1	6	Omit
29	Algebra: Addition and Subtraction of Fractions	X0203	X0203-1	6	Omit
30	Algebra: Multiplication and Division of Fractions	X0204	X0204-1	6	Omit
31	Algebra: Monomials/Polynomials	X0201	X0201-1	6	Omit
	Algebra: Block X02 Introduction to Algebra, Geometry, and Trigonometry Exam	X0221			Exam Booklet X0221-1
32	Algebra: Linear Equations	X0205	X0205-1	6	Omit
33	Algebra: Quadratic Equations	X0208	X0208-1	6	Omit
	Introduction to Algebra, Geometry, and Trigonometry Exam	X0222			Exam Booklet X0222-1
34	Algebra: Exponents	X0209	X0209-1	6	Omit
35	Algebra: Radicals and Imaginary Numbers	X0210	X0210-1	6	Omit
	Introduction to Algebra, Geometry, and Trigonometry Exam	X0223			Exam Booklet X0223-1
36	Applied Geometry	X0211	X0211-1	6	Omit
37	Practical Trigonometry	X0212	X0212-2	6	Omit
	Trigonometric Tables-Supplement	5515			Omit
	Introduction to Algebra, Geometry, and Trigonometry Exam	X0224			Exam Booklet X0224-1
	Fourth 6 Months			83	
38	Electronics Hardware	086040	08604000	6	08604000

39	Basic Electronic Components and Schematic Symbols	2020	2020-4	10	2020-4 Ed. 2
40	Conductors, Insulators, and Batteries	086005	08600500	5	08600500
41	Capacitors and Inductors	086003	08600300	5	08600300
42	Magnetism and Electromagnetism	086004	08600400	5	08600400
43	Alternating Current	086007	08600701	5	08600701
44	Alternating Current Circuit AC Principles	086008	08600800	5	08600800
45	Inductors in AC Circuits	086009	08600900	5	08600900
46	Capacitors in AC Circuits	086010	08601000	5	08601000
47	Transformers	086011	08601101	5	08601101
		Block B22			
48	Reactance and Impedance	086037	08603700	5	08603700
49	Resonant Circuits	086038	08603800	5	08603800
50	Application and Troubleshooting of Resonant Circuits	086039	08603900	5	08603900
51	Oscillators	086043	08604300	6	08604300
52	Modulation and Detection Circuits	086044	08604401	6	08604401
	Fifth 6 Months			78	
53	Learning to Solder and Desolder	087042	08704200	3	08704200
54	Computer Applications in Telecommunications	387011	38701100	10	38701100

Study Seq.	Telecommunications Apprenticeship-Instruction Text Title	Penn Foster Lesson Number	Penn Foster Manual ID	Course Duration (Hours)	Penn Foster Exam Number
55	Electronics Drawings	186045	18604500	8	18604500
56	Understanding and Using Electronic Diagrams	2021	2021-1	10	2021-1 Ed. 2
57	Basic Semiconductor Components: Diodes	086019	08601900	6	08601900
58	Rectification and Basic Electronic Devices	086014	08601400	5	08601400
59	Rectifiers and Power Supplies	086041	08604100	6	08604100
60	Basic Semiconductor Components: Transistors	086020	08602000	6	08602000
61	Amplifiers	086042	08604200	6	08604200
62	Switching Devices	086021	08602101	6	08602101
63	Electronic Sensors	086022	08602200	6	08602200
64	Optoelectronic and Fiber Optic Components	086024	08602400	6	08602400
	Sixth 6 Months			66	
65	Switching Circuits	086054	08605400	6	08605400
66	Logic Circuits	086055	08605501	6	08605500
67	Gating and Counting Circuits	086056	08605600	6	08605600
68	Pulse and Digital Circuits	086057	08605700	6	08605700
69	Electronic Devices and Amplification	086045	08604500	6	08604500
70	Audio and RF Circuits	086046	08604600	6	08604600
71	Oscillators, Feedback, and Waveforms	086047	08604700	6	08604700
		Block B25	08604100		
72	Electronic Power Supply Systems	086048	08604800	6	08604800
73	Industrial Amplification Systems	086058	08605800	6	08605800
74	Servo and Control Systems	086059	08605900	6	08605900
75	Pulse and Logic Circuits	086060	08606000	6	08606000
	Seventh 6 Months			82	
	Modern Electronics Communication	TB0464	Modern Electronic Communication, 7th		

			Ed. Miller-Beasley		
	Telecommunications Technology Part 1	387904	38790400		
76	Introduction to Telecommunications Technology			5	38781900
77	Amplitude Modulation: Transmission			5	38782000
78	Amplitude Modulation: Reception			5	38782100
79	Single-Sideband Communications			5	38782200
80	Frequency Modulation: Transmission			5	38782300
	Telecommunications Technology Part 2	387905	38790500		
81	Frequency Modulation: Reception			5	38782400
82	Telephone Technology	387024	38702400	5	38702400
83	Communications Techniques			5	38782500
84	Digital Communications: Coding Techniques and Transmission			5	38782600
85	Network Communications			5	38782700
	Telecommunications Technology Part 3	387906	38790600		
86	Transmission Lines			8	38781000
87	Wave Propagation and Antennas			8	38781100
88	Waveguides and Radar			8	38781200
89	Microwaves and Lasers			8	38781300
	Eighth 6 Months			96	
		086E03	<u>Tech. Guide to F.O., 4th Ed.</u> Sterling, 08601802		
90	Fiber Optics Background Information	086950		5	08695002
91	Characteristics of Fiber Optics	086951		5	08695102
92	Sending and Receiving Over Fiber	086952		5	08695202
93	Fiber Optics Interconnections	086953		5	08695302
94	Fiber Optics Systems	086954		5	08695402

95	Fiber Optics Final Exam	086956		5	08695602
96	Troubleshooting Industrial Computer Systems and Software	086068	08606800	6	08606800
		086E18	Digital Electronics, 4th Ed. Miller, 08691800		
97	Digital Electronics- Number and Logic Systems	086813	Lesson 1	10	086918002
98	Digital Electronics- Boolean Algebra with OR Gates	086814	Lesson 2	10	086918102
99	Digital Electronics- Adders and Collection Gates	086815	Lesson 3	10	086918202
100	Digital Electronics-Flip- Flops and Shift Registers	086816	Lesson 4	10	086918302
101	Digital Electronics- Counting and Timing Circuits with D/A-A/D Conversions	086817	Lesson 5	10	086918402
102	Digital Electronics-Digital Electronic Applications	086818	Lesson 6	10	086918502
	Reconciliation			Course Hours	
			Year 1	161	
			Year 2	148	
			Year 3	144	
			Year 4	178	
			Total	631	

Program Hours 631

**Apprentice Telecommunications Technician (D805- Job Class 7653)
Supplemental Training Module Approximation Summaries**

1. Learning Strategies 5 hours
 - Features of the program
 - How to get help during studies
 - The program study materials and how they are obtained
 - Access to Penn Foster Web Site
 - Types of learners
 - How to establish a study schedule, organize materials, and choose appropriate study locations
 - The SQ3R study method
 - Proper procedure for building working vocabulary
 - Proper procedure for preparing and taking examinations

2. Jobs, Companies, and the Economy-Basic 5 hours
 - Conclude how the economy affects consumers and employees
 - Explain the concept of competition and how a business must react to market demands
 - Evaluate how government policies affect the amount of saving and investing within an economy
 - Defend the use of a flexible and empowered workforce in making a business more competitive
 - Explain various economic measuring tools such as the inflation rate, the unemployment rate, and the GDP
 - Appraise the current status of American labor in general and the status of American labor unions in particular
 - Recognize how an employee or employer must compete in an increasingly international marketplace

3. Quality Concepts: Tools and Applications 5 hours
 - How job roles change as a company evolves in its quality-consciousness
 - Several ways in which you can support TQM
 - Approaches, practices, and skills associated with positive organizational changes
 - The "change process" at the company level vs. "manufacturing processes" that require improvement
 - Major causes of process variation and examples of how they may affect the employee
 - Why and how the reduction of variability is a key factor in process improvement
 - Why and how quality and process improvement depend on data-driven decision making
 - Seven quality tools and how to use them

4. Trades Safety Getting Started 5 hours
- Physical hazards associated with chemicals and how to avoid those hazards
 - Electrical shock hazards
 - Steps in a lock-out and tag procedure
 - Importance of machine guarding and identifying types of machine guards
 - Four classes of fire and how to extinguish each of them
 - Proper technique used to lift a heavy load
 - How to avoid hand injuries when using hand tools and power tools
 - Some of the hazards involved in welding and hot cutting operations and how to prevent them
 - How job analysis and the science of ergonomics are used to improve the workplace
 - Types of personal protective equipment (PPE) and the importance of using PPE
5. Materials-Handling Safety 5 hours
- Recognizing the hazards associated with handling materials
 - Types of injuries that can be caused by such hazards
 - Understanding how to effectively use safe material-handling practices
 - Knowing how to avoid physical injury when handling loads
 - Knowing and following the rules for safe operation of powered industrial material-handling equipment
 - Understanding and respecting the limits and restrictions placed on powered material-handling mechanisms
6. Introduction to Telecommunications 10 hours
- Everyday applications of telecommunications
 - Differences between analog and digital signals
 - Mediums that are used to carry data communications
 - Bandwidth characteristics in a telecommunications link
 - Basic differences between active and passive communications satellites
 - Testing instruments used by telecommunications technicians
 - Potential employers of telecommunications technicians
 - Common electrical shock hazards
 - Steps in a lockout and tag procedure
 - Types and importance of personal protective equipment (PPE)
7. Nature of Electricity 5 hours
- Operation of a simple circuit
 - Conductors, insulators, and resistors
 - Electrical charge forces
 - Dangers and benefits of static electricity
 - Volts, amperes, and ohms
 - Common notations and prefixes used to identify electrical and electronic values
 - Types of resistors
 - Electrical symbols used in schematic diagrams
 - Series and parallel circuits

8. Working Safely with Electricity 10 hours
- Listing the major electrical classifications and describe the job functions associated with each
 - Influence of the National Electric Code on manufacturers, installers, and users of electrical equipment
 - Safe work habits that lessen the chances of serious electric shock by avoiding those conductive paths most dangerous to the human body
 - Safety equipment required to be worn when installing or repairing electrical equipment
9. Electrician's Tools 10 hours
- Explaining how various hand tools are used by an electrician
 - Discussing the safe use of hand tools and power tools
 - Performing basic calculations and measurement conversions using the metric system
 - Using Ohm's law to explain the relationship between current, voltage, and resistance in a circuit
 - Explaining how electrical measuring instruments are used to measure current, voltage, and resistance
 - Defining many of the basic electrical terms that electricians use everyday
 - Identifying the basic symbols used in electrical schematic drawings
10. Linear Distance and Measurement 5 hours
- Measurement using both English and metric units of length
 - Calculating the perimeters of rectangles, squares, and triangles
 - Calculating the areas of objects such as rooms or machine bases
 - Calculating the circumference of circular objects such as pipes or tanks
 - Measuring distances using rigid and flexible rules, thickness gauges, and screw pitch gauges
 - Making precise measurements using vernier calipers and micrometers
11. Electrical Drawings and Circuits 8 hours
- Identifying electrical construction drawings, schematics, and wiring diagrams
 - Interpreting various electrical symbols
 - Reading standard abbreviations used in electrical diagrams
 - Block diagrams, schematic diagrams, and wiring diagrams
 - Closed circuits, open circuits, grounded circuits, and short circuits
12. Reading Electrical Schematic Diagrams 10 hours
- Standard electrical symbols and their meanings
 - Parts of a schematic diagram
 - Flow of electrical current through devices
 - Interpreting electrical drawings, block diagrams, wiring diagrams, and electrical schematic diagrams
 - Characteristics of switched circuits
 - Ladder diagrams and their functions

13. Problem Solving and Troubleshooting 10 hours
- Problem solving, trouble shooting, and critical thinking
 - Applying logic to solving problems and troubleshooting systems
 - Tools used for problem solving and troubleshooting
 - Tools and measurement devices that help in troubleshooting common industrial systems
 - Collecting information related to problem solving
 - Improving personal meta-cognitive abilities to analyze complex systems
14. Fractions, Percentages, Proportions, and Angles 5 hours
- Defining the following terms: fraction, proper fraction, lowest common denominator, percent, ratio, and proportion
 - Adding, subtracting, multiplying, and dividing fractions
 - Changing fractions to decimals and decimals to fractions
 - Solving problems involving percentages
 - Working with ratios and equivalent ratios
 - Solving proportion problems
 - Using a protractor to measure angles
 - Laying out templates for checking angles
 - Using a calculator to solve percent problems, to convert fractions to decimals, and to calculate missing terms in proportions
15. Formulas 5 hours
- Explaining the use of variables in formulas
 - Preparing and using formulas to solve problems
 - Using formulas to calculate the perimeter of a triangle and a rectangle, and the areas of a triangle, a rectangle, and a circle
 - Using formulas to calculate the distance, current in a circuit, and the volume of a pyramid and a sphere
 - Using a calculator to find square roots and solve formulas
 - Substituting given numerical values for letters in a formula and finding the unknown quantity
 - Transforming and solving equations and formulas
16. Circuit Analysis and Ohm's Law 5 hours
- Total resistance in series, parallel, and series-parallel circuits
 - Using Ohm's law to calculate the amount of current, voltage, or resistance in circuits
 - Calculating the amount of power supplied and dissipated in a DC circuit
 - Reading current, voltage, and resistance with a meter

17. Basic Test Equipment 5 hours
- Identifying the schematic symbols used to represent various reactive devices
 - Relationships between voltage, current, and resistance in a circuit
 - Measuring voltage, current, and resistance with a multimeter
 - Features of analog and digital VOMs
 - Using analog and digital VOMs to measure voltage, resistance, and current in a circuit
 - Safety precautions when using a multimeter
18. Troubleshooting with Volt-Ohm Milliamp Meters (VOMs) 5 hours
- Safe practices when troubleshooting with a VOM
 - Continuity Testing
 - Short Circuit Testing
 - Resistance Testing on Electronic Components
 - Current Measurements
 - Measuring input and output voltages of DC power supplies
 - Measuring voltages on disconnect switches, circuit breakers, contactors, and transformers
 - Voltage tests on circuit boards, PLC systems and motor circuits
19. Using Basic Oscilloscopes 5 hours
- Oscilloscope controls and operation
 - Performing low-voltage measurements on circuit boards
 - Measuring the voltage output of a power supply and AC ripple
 - Measurements in SCR and TRIAC circuits
 - Testing AC and DC servo motor and heater controller circuits
 - Basic oscilloscope measurements on digital circuits
20. Component Testers 6 hours
- Identifying the type of component tester used in connection with resistors, capacitors, and inductors
 - Calculating turns ratio
 - Correct connection schemes for testing diodes, SCRs, and transistors
21. Digital Test Equipment 6 hours
- Converting between decimal, binary, octal, and hexadecimal numbering systems
 - Logic gate applications
 - Flip-flop storage applications
 - Using logic probes and IC logic clips
 - Troubleshooting digital systems using oscilloscopes and logic analyzers
22. Industrial Computer Networks 6 hours
- Methods of communications within networks
 - Configurations of various types of industrial network systems
 - Types of network cables
 - Network protocols
 - Troubleshooting methods for networks

23. Communication Cabling Systems 5 hours
- Precursor Technologies of Telecommunications
 - Evolution of Telecommunications Wiring
 - Planning Wiring Installations
 - Computer Network Standards
 - UTP cabling connections and terminations
24. Copper Wiring for Telephone, Video, and Network Systems 5 hours
- Basic methods of installing telephone, video and network cabling
 - Planning a cable installation
 - Factors affecting the quality of a cable installation
 - Media types for telephone, video and network cabling
 - Installation techniques
 - Workplace security and safety
25. Terminating and Testing Communication Wiring 5 hours
- Advantages and disadvantages of wireless networking
 - Selecting and Installing wireless access points
 - Basic cable testing tools
26. Working with Fiber Optics 5 hours
- Fundamental principles of fiber optic transmission
 - Different types of fiber-optic cabling
 - Common types of optical fiber connections, terminations, and splices
 - Pulling, cleaving, connecting, and polishing optical fiber cables
 - Types and methods of fiber-optic testing
27. Introduction to Algebra 5 hours
- Explain the difference between positive and negative numbers and their uses
 - Performing basic arithmetic operations with signed numbers
 - Raising a number to any power
 - Using the order of operations for solving problems involving multiple operations
 - Defining the following words: term, constant, coefficient, exponent, monomial, trinomial, and polynomial
 - Identifying and combining like terms in an expression
 - Performing basic arithmetic operations with signed terms
 - Multiplying and dividing terms containing exponents
 - Removing parentheses from an expression and simplifying the expression
28. Algebra: Factoring 6 hours
- Finding prime factors of certain binomials and trinomials
 - Factoring a given trinomial
 - Using the Factor Theorem to factor a given polynomial
 - Using factoring to find the roots of an equation
 - Dividing one polynomial by another polynomial of lower degree
 - Finding the lowest common multiple of several polynomials

29. Algebra: Addition and Subtraction of Fractions 6 hours
- Recognizing equivalent algebraic fractions
 - Performing additions and subtractions involving algebraic fractions
 - Finding the least common denominator for a group of algebraic fractions
 - Reducing an algebraic fraction to its lowest terms
30. Algebra: Multiplication and Division of Fractions 6 hours
- Performing multiplications and division involving algebraic fractions
 - Solving equations involving fractions and decimals
 - Simplifying complex fractions
31. Algebra: Monomials/Polynomials 6 hours
- Removing grouping symbols from algebraic expressions, dividing by a monomial when indicated
 - Multiplying binomials by monomials, trinomials, and other binomials
 - Calculating the square root and the third power of given monomials
 - Finding special products involving binomials
 - Dividing one polynomial by another polynomial of lower degree
32. Algebra: Linear Equations 6 hours
- Recognizing the graph of a linear equation, given the graph or a set of points
 - Recognizing equations expressing mixture problems and other word problems
 - Solving number problems, digit problems, and age problems.
33. Algebra: Quadratic Equations 6 hours
- Recognizing the graphical solution of two equations
 - Solving and recognizing steps in the solution of systems of quadratic equations and a system of a quadratic and a linear equation
 - Solving fourth degree polynomial equations in quadratic form
 - Using the quadratic formula to solve a quadratic equation, calculating the discriminant of a quadratic equation, and pointing out what can be known from a given discriminant
 - Writing a quadratic equation which has given roots
 - Solving word problems involving quadratic equations
34. Algebra: Exponents 6 hours
- Demonstrating an understanding of the meaning of a fractional exponent
 - Applying the rules for positive and negative exponents in multiplication, division, and raising to powers
 - Use radicals to convert fractional exponents, and use fractional exponents to convert radicals
 - Writing a given number in standard form

35. Algebra: Radicals and Imaginary Numbers 6 hours
- Simplifying several radicals and then add like terms
 - Rationalizing the denominator of a fraction and eliminate an imaginary number from the denominator of a fraction
 - Solving an equation containing several square roots
 - Multiplying, dividing, and raising to powers terms containing radicals
36. Applied Geometry 6 hours
- Recognizing characteristics of angles and closed plane figures
 - Distinguishing between common geometric solids
 - Applying the Pythagorean theorem
 - Calculating the perimeter and area of a polygon, circle, and ellipse
 - Applying the formula for area and volume of geometric solids
37. Practical Trigonometry 6 hours
- Defining trigonometric functions
 - Using trigonometric tables and applying interpolation
 - Solving right triangles
 - Applying the laws of sines and cosines in solving oblique triangles
38. Electronics Hardware 6 hours
- Connector and terminal types and their applications
 - Wire and Cable types and applications
 - Wire resistance
 - Wire resistance variables
 - Soldering equipment and materials selection
 - Soldering techniques for PC board and SMT applications
 - Special handling techniques for SMT components
39. Basic Electronic Components and Schematic Symbols 10 hours
- Electrical quantities
 - Common electronic components
 - Vacuum tubes and related devices
 - Semiconductor devices
40. Conductors, Insulators, and Batteries 5 hours
- Conductivity and types of conductors
 - American Wire Gauge standards
 - Applications in sizing conductors
 - Insulating materials and temperature ratings
 - Dry cells and storage batteries
 - Battery arrangements
 - Storage battery safety precautions
 - Storage battery maintenance
 - Storage battery testing
 - Special types of batteries – NiCad, lithium, and others

41. Capacitors and Inductors 5 hours
- Capacitor and Inductors definition
 - Capacitor and Inductor principles
 - Capacitor and Inductor types and ratings
 - Capacitors and Inductors in series and parallel
 - RC and RL time constants
 - Capacitor and Inductor applications
42. Magnetism and Electromagnetism 5 hours
- Magnetic poles
 - Magnetic and nonmagnetic materials
 - Induction magnetization
 - Simple, compound, and closed magnetic circuits
 - Magnetic lines of force around an energized conductor
 - Right-hand rule for solenoid poles
 - Electromagnetic relays, buzzers, and stepping switches
 - DC motor operation
 - Electromagnetic induction in generators and motors
43. Alternating Current 5 hours
- AC voltage waveforms
 - AC cycle terms
 - AC cycle time period
 - AC cycle characteristic values
 - Phase angles in reactive circuits
 - 220 VAC, single-phase circuit operation
 - Multiphase waveforms
 - Power factor meters
 - Delta and wye three phase circuit connections
44. Alternating Current Circuit-Principles 5 hours
- Electric circuit characteristics
 - Circuit load applications
 - Electrical components in series and parallel
 - Load control from multiple locations
 - Three-wire circuits
 - Current in delta and wye connected circuits
 - Line to line and line to neutral voltage in Y-connected circuits
45. Inductors in AC Circuits 5 hours
- Inductor operation in AC and DC circuits
 - Inductive reactance and impedance
 - AC frequency and inductive reactance
 - Ohm's law applied to inductors
 - Series RL circuit impedance
 - Parallel RL circuit impedance

- | | | |
|-----|---|---------|
| 46. | Capacitors in AC Circuits | 5 hours |
| | <ul style="list-style-type: none">• Series and parallel connected capacitance values• Capacitive reactance• Ohm's law applied to capacitors• Impedance in a series RC circuit• Impedance in a parallel RC circuit• AC frequency and capacitive reactance• Resonant RLC circuits | |
| 47. | Transformers | 5 hours |
| | <ul style="list-style-type: none">• Transformer construction• Transformer characteristics• Transformers in 3-phase circuits• Transformer types | |
| 48. | Reactance and Impedance | 5 hours |
| | <ul style="list-style-type: none">• Resistors, capacitors, and inductors in DC circuits• Timing circuits• Calculating reactance in circuits with capacitors and inductors• Impedance of series RLC circuits• Voltage-current phase angles in RC, RL and RLC circuits | |
| 49. | Resonant Circuits | 5 hours |
| | <ul style="list-style-type: none">• Time domain and frequency domain displays• Necessary conditions for series and parallel resonance circuits• Resonant frequency of an LC circuit• Quality factor Q• Q and bandwidth relationships• Tuned circuit applications in radios• Distributed components | |
| 50. | Applications and Troubleshooting of Resonant Circuits | 5 hours |
| | <ul style="list-style-type: none">• Estimating voltages in troubleshooting AC and DC circuits• Impedance matching considerations• AC circuit filters• Power supply filter designs• AC filter characteristic curve• Resonant circuits in waveguides and transmission lines• Transmission line applications | |

51.	Oscillators	6 hours
	<ul style="list-style-type: none"> • Types of oscillator circuits • Flywheel effect • Basic oscillator circuits • Complex RLC tuned circuits • Oscillators with LC feedback circuits • Oscillators with RC feedback circuits • Oscillator circuits applications • Frequency synthesizers 	
52.	Modulation and Detection Circuits	6 hours
	<ul style="list-style-type: none"> • Forms of modulation • Degree of amplitude and frequency modulation • Two signal mixing • Bandwidth of AM and FM signals • Pulse code modulation • Phase-locked loops • Types of modulation circuits and components • Types of pulse modulation 	
53.	Learning to Solder and Desolder	3 hours
	<ul style="list-style-type: none"> • Tools and materials used in soldering • Making good solder connections • Soldering practices • Desoldering connections • Desoldering practices 	
54.	Computer Applications in Telecommunications	10 hours
	<ul style="list-style-type: none"> • Four basic computer parts • Decimal to binary and binary to decimal conversion • Seven basic logic gates with Boolean expressions • Converting text, pictures, and audio to binary code • Data compression techniques • Data encryption techniques 	
55.	Electronics Drawings	8 hours
	<ul style="list-style-type: none"> • Identifying the various electronics symbols used on drawings • Explaining the various types of drawings used in the electronics field 	
56.	Understanding and Using Electronic Diagrams	10 hours
	<ul style="list-style-type: none"> • Fundamentals of electronic circuits • Vacuum tubes and transistors as circuit elements • Relays and switches as circuit elements • Electronic diagrams in preventive and corrective maintenance • Identifying electronic components 	

57. Basic Semiconductor Components: Diodes 6 hours
- How diodes work
 - Type and function of diodes
 - Diode applications
 - Diode characteristics
 - Diodes in electronic circuits
 - Diode replacement selection
58. Rectification and Basic Electronic Devices 5 hours
- Diodes and rectification
 - PN junction biasing
 - Transistors and amplifiers
 - Transistor input and output circuits
 - Rectifier outputs with and without filters
 - Reversing DC output voltage polarity on rectifier schematics
 - Calculating rectifier circuit ripple frequency
 - Triode tubes and amplifiers
59. Rectifiers and Power Supplies 6 hours
- Types of electronic rectifiers
 - Types of rectifier connections
 - Nonlinear component voltages and currents
 - Power supply filters
 - Voltage dividers in power supplies
 - Calculating voltage divider component values
 - Voltage-regulating devices and circuits
 - Voltage and current regulation in power supplies
60. Basic Semiconductor Components: Transistors 6 hours
- How transistors work
 - Transistor characteristics
 - Basic amplifier configurations
 - Linear and non-linear amplification
 - Junction Field-Effect Transistors
 - Metal Oxide Semiconductor Field-Effect Transistors
 - Transistors and static charges
 - Troubleshooting circuits with amplifications circuits
61. Amplifiers 6 hours
- Classes of transistor amplifiers
 - Calculating amplifier dB gain
 - Types of transistor amplifier circuits
 - Methods used to bias amplifiers
 - Simple troubleshooting operations on amplifiers
 - Distortion introduced by amplifiers

62.	Switching Devices	6 hours
	<ul style="list-style-type: none"> • Various switch types • Basic relay ladder logic diagrams • Diodes used as switches • Problems with diode switching • Rapid electronic switching • Mechanical switches vs. rapid electronic switches 	
63.	Electronic Sensors	6 hours
	<ul style="list-style-type: none"> • Thermoelectric effects • Bridge circuits in electronic instrumentation • Nonlinear resistors in circuits • Protection devices for circuits • Stress and strain 	
64.	Optoelectronic and Fiber-Optic Components	6 hours
	<ul style="list-style-type: none"> • Electronics and optics • Modern theories of light • Theory of light communication • Theory and application of barcodes • Using infrared light in security and video systems • Electron microscopes vs. optical microscopes • Fluorescent and other lighting sources 	
65.	Switching Circuits	6 hours
	<ul style="list-style-type: none"> • Output conditions for various gate circuits • Application of transistors in gate circuits • Operation of multi-vibrators and flip-flops • Various logic families • Application of Boolean algebra in logic circuitry 	
66.	Logic Circuits	6 hours
	<ul style="list-style-type: none"> • Binary vs. other numbering systems • Truth tables • Encoders, decoders, and converter circuits • Adders, subtracters, and comparators 	
67.	Gating and Counting Circuits	6 hours
	<ul style="list-style-type: none"> • Arithmetic logic gates • Half-adder and full-adder circuits • Use of half-adder circuits • Decade and binary counters • Modulus of a counter 	

68. Pulse and Digital Circuits 6 hours
- Characteristics of electronic pulses
 - Time constants in pulse-forming circuits
 - Waveforms for integrating and differentiating circuits using pulse inputs
69. Electronic Devices and Amplification 6 hours
- Passive and active devices
 - Voltage, current, and impedance relationships in transformers
 - Amplifier gain calculations
 - Converting voltage and power gains to decibels
 - Impedance-matching pad calculations
 - Interfacing single-ended amplifiers to balanced lines, sources, and loads
 - Amplifying device characteristics and applications
70. Audio and RF Circuits 6 hours
- Measuring sound intensity
 - AM vs. FM transmission
 - Narrow-band FM in industrial applications
 - Coaxial cable vs. copper wire transmission mediums
 - Tone frequencies used in control systems
 - Pushbutton dialing in industrial applications
 - Common-emitter amplifiers
71. Oscillators, Feedback, and Waveforms 6 hours
- Oscillator operating principles
 - Basic types of oscillators
 - Oscillator feedback techniques
 - Creating various waveforms
 - Phase-locked loop in frequency synthesizers
 - Square wave generation utilizing 555 IC circuit timer/oscillator
72. Electronic Power Supply Systems 6 hours
- Function of rectifiers
 - Half-wave and full-wave rectifier principles
 - Rectifier circuit output voltages
 - Percent of voltage regulation in a power supply
 - Function of filters and bleeder resistors in power supplies
 - Purpose of a voltage-divider network in a power supply
 - Electronic voltage regulators
 - Common industrial power supplies

73. Industrial Amplification Systems 6 hours
- Power amplifiers vs. voltage amplifiers
 - Calculating dB gain
 - Characteristics of VMOS, BiFET, Darlington, push-pull, and complementary amplifiers
 - Operational amplifier analysis
 - Amplifier induced noise and distortion
74. Servo and Control Systems 6 hours
- Functions and components of a servo system
 - Operation of servo systems
 - Applications for servo systems
 - Electronic circuits in servo applications
 - Servo system gain calculations
75. Pulse and Logic Circuits 6 hours
- Digital vs. analog circuits
 - Slow-speed vs. fast-speed digital circuits
 - Binary principles in electronic circuits
 - Types of logic gates
 - Latch and flip-flop circuits
 - Serial and parallel inputs/outputs
76. Telephone Technology 5 hours
- Components and functions of conventional and electronic telephones and facsimile machines
 - Modem modulation techniques
 - Components and signals of the local loop
 - Telephone system switching mechanisms and hierarchies
 - Telephony multiplexing techniques
 - Cellular and pager systems
77. Introduction to Telecommunications Technology 5 hours
- Basic communication system components
 - Effect of electrical noise on receivers
 - Thermal noise generated by resistors
 - Amplifier signal-to-noise ratios and noise figures
 - Noise measurement techniques
 - Information, bandwidth, and propagation speed relationships
 - Fourier analysis of non-sinusoidal repetitive waveforms
 - RLC circuit analysis
 - LC and crystal oscillators

78. Amplitude Modulation: Transmission 5 hours
- Process of modulation
 - AM waveforms and modulation indexes
 - Sideband vs. side frequency
 - Power, voltage, and current calculations in AM systems
 - Basic AM circuits
 - High and low level modulation systems
 - AM transmitter test and maintenance equipment
79. Amplitude Modulation: Reception 5 hours
- Receiver selectivity and sensitivity
 - AM receiver diode detectors
 - TRF and superheterodyne receivers
 - Image frequencies and how to suppress them
 - RF and IF amplifiers
 - Implementing Automatic Gain Control
 - Analysis of AM receiver systems
 - Analysis AM receiver stages
80. Single-Sideband Communications 5 hours
- Single sideband generation
 - Types of SSB and advantages over AM
 - SSB circuits and filters
 - SSB filter designs
 - Demodulation of SSB systems
 - SSB transmitter/receiver block diagrams
 - Frequency processing in SSB receivers
81. Frequency Modulation: Transmission 5 hours
- Categories of angle modulation
 - Capacitor microphone principles
 - FM signal modulation index, sidebands, and power
 - FM noise suppression, capture effect , and pre-emphasis
 - Generating FM signals
 - FM signal generation using phase locked-loop
 - Multiplexing techniques for FM stereo systems
82. Frequency Modulation: Reception 5 hours
- FM vs. AM receivers
 - Slope detector schematics
 - FM discriminator techniques and circuits
 - Utilizing PLL as an FM discriminator
 - Block diagrams for stereo broadcast band receivers
 - LIC applications in stereo decoders
 - FM receiver schematics

83. Communications Techniques 5 hours
- Double conversion and up-conversion
 - Delayed AGC and auxiliary AGC
 - High quality receivers vs. basic receivers
 - Relationships between noise, receiver sensitivity, dynamic range, and 3rd order intercept
 - Troubleshooting receivers with excessive IMD
 - Frequency synthesizers
 - DDS systems vs. analog synthesizers
84. Digital Comm.: Coding Techniques and Transmission 5 hours
- Digital transmission bit error rates
 - ASCII, EBCDIC, Baudot, and Gray codes
 - PCM system operation
 - PCM system quantization processes
 - PCM vs. delta modulation
 - Error detection and correction techniques
85. Network Communications 5 hours
- Telephone network terminology and operation
 - Cellular phone systems
 - Telephone circuit characteristics
 - UART principles of operation
 - Modem principles of operation
 - Network topologies
 - Network protocols
 - Ethernet principles of operation
 - Cellular and PCS phone system operations
86. Transmission Lines 8 hours
- Physical characteristics of standard transmission lines
 - Calculating characteristic impedance, delay factor, and velocity of propagation
 - Wave propagation and reflection analysis
 - Matching loads to transmission lines using a Smith Chart
 - Simulating discrete circuitry using short line sections
 - Troubleshooting line problems using a TDR

87. Wave Propagation and Antennas 8 hours
- Characteristics of electromagnetic waves and isotropic point sources
 - Processes of wave reflection, refraction, and diffraction
 - Ground and space wave propagation and ghosting phenomena
 - Affect of antenna height on effective radio horizon
 - Atmospheric effects upon sky-wave propagation
 - Skip zone and critical angle influences on sky-wave propagation
 - Important aspects of satellite communications
 - SATCOM power budget analysis
 - Hertz antenna development
 - Properties of antenna reciprocity and polarization
 - Antenna performance factors and characteristics
88. Waveguides and Radar 8 hours
- Considerations for ending signals via transmission lines, antennas, and waveguides
 - Basic modes of operation for rectangular waveguides
 - Calculating cutoff wavelength for dominant mode of operation
 - Affects of wavelength and velocity upon waveguide propagation
 - Various types of waveguides
 - Methods of coupling energy into and out of waveguides and cavity resonators
 - Basic components and characteristics of a radar system
 - Doppler radar system capabilities
 - Microstrip and stripline characteristic impedance calculation
89. Microwaves and Lasers 8 hours
- Common microwave antenna types
 - Parabolic antenna gain and beamwidth calculations
 - TWT and magnetron microwave tube operation
 - Common microwave semiconductor devices
 - Basic operation and uses of ferrites
 - Operation of parametric and maser low-noise amplifiers
 - Basic laser theory of operation
90. Fiber Optics Background Information 5 hours
- Major components of a fiber optic link
 - Electronics and fiber optics
 - Fiber optics in networks
 - Fiber optics vs. traditional transmission media
91. Characteristics of Fiber Optics 5 hours
- Types of fiber
 - Dispersion in optical fiber
 - Core diameter vs. performance
 - Optical fiber applications
 - Mode field diameter in single-mode fiber
 - Single-mode fiber profiles

92. Sending and Receiving over Fiber 5 hours
- Structure of the atom
 - Semiconductor properties
 - Electro-optic device principles of operation
 - LEDs in fiber optic systems
 - Lasers in fiber optic systems
 - Fiber optic system output patterns
 - Light velocity of propagation
 - DFB laser characteristics
 - VCSEL characteristics
93. Fiber Optics Interconnections 5 hours
- Optical fiber termination and splicing technology
 - Common causes of fiber optic link failures
 - Fiber alignment techniques
 - Techniques used to terminate optical fiber
94. Fiber Optics Systems 5 hours
- Optical link power budgets
 - Bandwidth/rise-time requirements in optical fiber links
95. Fiber Optics Final 5 hours
- Final exam covering fiber optics system hardware and cable
96. Troubleshooting Industrial Computer Systems and Software 6 hours
- Principal parts and types of memory found on a computer motherboard
 - Power supply components and ratings
 - Locate the main power supply fuse and identify the type of power supply by it's connectors
 - Various types of computer drive systems and their cables
 - Repair and troubleshooting procedures for computer hardware and software problems
 - Optical and RF identification systems-operation and troubleshooting
 - Purpose of vision system hardware and software and the troubleshooting for them

97. Number and Logic Systems 10 hours
- Decimal to binary and binary to decimal conversion
 - Binary to octal and octal to binary conversion
 - Binary to hexadecimal and hexadecimal to binary conversion
 - Decimal to BCD and BCD to decimal conversion
98. Boolean Algebra with OR Gate Application 10 hours
- Reducing Boolean expressions using a Karnaugh map
 - Identifying and using DeMorgan's theorems
 - Writing truth tables for exclusive-OR gates
99. Adders and Collection Gates 10 hours
- Defining half adders and full adders and drawing block diagrams and truth tables
 - Programming GAL devices
 - Identifying and calculating fan-out and noise margins
 - Using open-collector gates in applications
100. Flip-Flops and Shift Registers 10 hours
- Types of flip-flops (S-R, master-slave, JK and D)
 - Application of latches in control circuits
 - Configuration of typical IC flip-flops
 - Application of flip-flops in shift registers for serial communication devices
 - ASCII code and RS-232 standards
101. Counting and Timing Circuits and D/A and A/D Conversion 10 hours
- Understanding and explaining the operation of a variety of binary counters
 - Applications of synchronous and asynchronous counters in frequency dividing
 - Generation and application of clock pulses in computers and digital electronic equipment
102. Digital Electronic Applications 10 hours
- Operation and function of decoders, multiplexers, and de-multiplexers
 - Operation and application of LEDs and other digital displays
 - Operation and application of gates and other devices with tri-state outputs
 - Using digital outputs to drive high-current transistor interfaces
 - Devices that isolate circuits from each other
 - Applications of various types of memory
 - Basic concepts and structures of microcomputers and microcontrollers

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Wages

Wage Schedule for Apprentice Communications Technician – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7653	Apprentice, Communications Technician	1	Start	\$29.77
		2	6 Months	\$30.86
		3	1 Year	\$32.23
		4	18 Months	\$32.91
		5	2 Years	\$34.52
		6	30 Months	\$36.81
		7	3 Years	\$37.93
		8	42 Months	\$40.05

Customer Serviceman (Gas)

Program Duration: 2.5 Years (30 Months)

A. GENERAL

The following outline of training programs, courses and study requirements shall constitute an obligation on the part of the Company to provide job training, study materials and study courses as outlined, and to keep records thereon, for all apprentices assigned to the classification of Apprentice Customer Serviceman and shall constitute an obligation on the part of the employees so assigned to participate in the training programs and in the keeping of records of progress as herein outlined.

The Company will furnish a copy of the Supplementary Agreement for Administration of Apprenticeship Programs and this Schedule of Training Hours and Courses to all employees assigned to the classification of Apprentice Customer Serviceman subsequent to the date of this Supplementary Agreement. The Apprentice Customer Serviceman Training Program will consist of two basic parts.

- a. On-the-job training will be provided wherein the employee should learn the practical skills necessary for journeyman status.
- b. Supplementary classroom and home study training should provide the employee with basic knowledge of gas as well as a better understanding of the various types of equipment and procedures with which he/she will be working.

B. JOB TRAINING PROGRAM

Work Assignments: Journeymen are responsible for the on-the-job training and Supervision is responsible for the proper rotation of the apprentice's work assignments in order for him/her to get training in all phases of the craft. The responsibility for evaluating the work of the apprentice rests with the immediate Journeyman.

Each apprentice shall be assigned work that will provide him/her experience in all phases of Customer Serviceman field work and emergency response.

During all phases of the apprentice training programs, instruction of proper safety procedures and practices will be provided.

C. JOB STANDARDS

Minimum Requirements: In order to provide each apprentice with at least a minimum amount of experience on each of the various types of equipment, upon which the apprentice may be required to work as a Journeyman, he/she should be assigned work and given instructions in amounts meeting or exceeding those shown in the following tabulation:

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
Meter Sets	800
Meter Exchanges	700
Gas Meter Turn-On	600
Leak Investigations	500
Carbon Monoxide Investigation	200
Appliances Light – Adjust - Safety Check	900
Read/Turn – Off Meter	200
Smart Meter Module Install/Inspection	250
Other Gas – Revenue Protection, Dial/Lens Replacement	200
Corrosion Control - Coating inspection/repair	100
Customer Hi/Low Pressure Problems	100
<i>Safety</i>	
Safety / Training Meetings	60
CBT Safety Training Courses	30
<i>Equipment and Tools</i>	
Meter Valve Change-Out Tool	24
Locators	10
Combustible Gas Indicator (CGI)	50
Grunsky Bag/Meter Bypass Tool	70
<i>Miscellaneous</i>	
Company Standards	40
Completing Service Orders and Documentation	70
Complete Operator Qualification Evaluations	32
Gas Meter Shop	32
Ride Along with Gas Pressure Operator/ Leak Surveyor	16
Gas Operations Crew Ride Along	16
Total OJT Hours Recommended	5,000

First 6 Months

NGT 1001

3.75 Hours Home Study and Classroom

Identifying Procedures/Processes Basic to Producing, Transporting, and Distributing Natural Gas

COURSE DESCRIPTION:

This course presents the major components of a natural gas system from well head to burner. The action that each component has on the gas stream is presented in the context of the total system. Key terms and definitions are reviewed and applied to conditions common to the utilization of natural gas.

NGT 1002

3.75 Hours Home Study and Classroom

Identifying Basic Properties of Fuel Gases

COURSE DESCRIPTION:

This course relates to the chemical and physical properties of fuel gases basic to their unique characteristics. The physical properties of natural gas are discussed in relation to how it reacts to pressure and/or temperature changes and the condition under which fuel gas is measured to the customer. The chemical properties are discussed in relation to their value as a source of heat. Units of measurement for natural gas are defined.

Properties of Gas

3.75 Hours Home Study and Classroom – 3.5 Hours Lab

American Gas Association – Fundamentals of Gas Combustion – Chapters 1 & 2

COURSE DESCRIPTION:

These chapters deal with the history, use, and development of fuel gas, properties and general characteristics of gasses, chemical composition of fuel gasses, natural gasses, liquefied petroleum gasses, manufactured and mixed gasses, odorant added to gas, specific gravity, and heating value.

NGT 1004

7.5 Hours Home Study and Classroom – 15 Hours Lab

Measuring and Regulating Natural Gas in a Distribution System

COURSE DESCRIPTION:

This course reviews the principles of operation for direct volume measurement meters and rate-of-flow (inferential) type meters. The operating principles of service regulators are outlined and discussed. Emphasis is placed on the correct reading of dial type meter faces. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Customer Service

3.75 Hours Home Study and Classroom – 3.5 Hours Lab

American Gas Association Fundamentals of Customer Service

COURSE DESCRIPTION:

During this session the apprentice will be taught how to read a basic gas meter.

Customer Service will be dealt with and the following topics discussed: preparing for a day's work; at the customer's premises; telephone contacts; customer visits to company offices and writing to customers.

NGT 1005

7.5 Hours Home Study and Classroom

Performing Calculations Basic to Gas Distribution and Service

COURSE DESCRIPTION:

This course begins with instruction on the use of a calculator when working with dimensions given in decimal fractions. Basic calculations are performed for area and volume measurements. Practice problems include calculating the relationship between gas and heating measurements, calculating gas flow using meter index, and free air space. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1003

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Adjusting Gas Burners for Proper Combustion of Natural Gas

COURSE DESCRIPTION:

This course presents the science of gas burner design and factors affecting the proper combustion of fuel gas. Techniques used to measure gas input rates, gas flow and pressure are presented. Practice in troubleshooting causes of improper combustion is required. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Combustion of Gas

3.75 Hours Home Study and Classroom – 3.5 Hours Lab

Fundamentals of Gas Combustion by American Gas Association- Chapter 3

COURSE DESCRIPTION:

This chapter covers the following subjects: the meaning of combustion, requirements for combustion, basic chemistry for combustion, controlled combustion, explosive combustion, limits of flammability, burning speed, complete combustion, incomplete combustion (causes and effects), carbon monoxide and testing for carbon monoxide.

Fundamentals of Gas Controls

3.75 Hours Home Study and Classroom – 3.5 Hours Lab

American Gas Association – Chapter 1-4

COURSE DESCRIPTION:

These chapters cover the following subjects: controls and their functions, manual control of gas appliances, physical principles used in controls.

Fundamentals of Gas Controls

3.75 Hours Home Study and Classroom – 3.5 Hours Lab

American Gas Association – Chapter 5 & 6

COURSE DESCRIPTION:

These chapters cover sensing devices and actuation of controls.

Fundamentals of Gas Controls

3.75 Hours Home Study and Classroom – 3.5 Hours Lab American Gas Association – Chapter 7 & 8

COURSE DESCRIPTION:

These chapters cover automatic controls, thermostats, automatic gas valves, limit controls, gas pressure regulators, combination controls, accessories, and miscellaneous controls and ignition systems, automatic pilots, oxygen-depletion sensing, pilot relight systems and intermittent ignition devices.

Fundamentals of Gas Controls

3.75 Hours Home Study and Classroom – 3.5 Hours Lab American Gas Association – Chapter 9 & 10

COURSE DESCRIPTION:

These chapters deal with the following topics: application to appliances; ranges, automatic water heaters, central heating systems, in-space heating appliances, clothes dryers, refrigerators, incinerators, air conditioners, and special considerations for maintenance and repair of controls; preventative maintenance.

First Six Months Total Hours: 75

Second 6 Months**NGT 1601**

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Procedures to Consider When Establishing a Gas Service

COURSE DESCRIPTION:

This course presents the methods typically used when establishing a gas service. Topics include checking gas piping from the main to the customer's piping, checking gas piping inside buildings and checking gas operated equipment in service. Related skills performance is taught and documented by simulation or at a work site.

NGT 1701

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Placing Gas Operated Appliances into Operation

COURSE DESCRIPTION:

This course presents procedures for checking natural gas appliance systems to ensure proper installation and safe operation. Procedures for appliance checks include water heaters, central heating, space heating, cooking appliances and clothes dryers. Pre-lighting and operation check on gas fired equipment after light-up is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Water Heating Appliances

3.75 Hours Home Study and Classroom – 3.5 Hours Lab

Fundamentals of Gas Appliances – American Gas Association Chapter 3

COURSE DESCRIPTION:

This chapter covers the following topics: water heating appliances, storage heaters and instantaneous water heaters, and swimming pool heaters.

Introduction and Cooking Appliances

3.75 Hours Home Study and Classroom – 3 Hours Lab

Fundamentals of Gas Appliances – American Gas Association Chapters 1 & 2

COURSE DESCRIPTION:

These chapters deal with the following topics: use of heat, use of gas, different kinds of fuel, appliance standards and cooking appliances, domestic cooking and commercial cooking appliances.

Space Heating

3.75 Hours Home Study and Classroom – 3 Hours Lab

Fundamentals of Gas Appliances – American Gas Association Chapter 4

COURSE DESCRIPTION:

This chapter discusses the following topics dealing with space heating: room heaters, floor furnaces, wall furnaces, direct vent heaters, central heating equipment, conversion burners, unit heaters, duct heaters, direct-fired make-up air heaters, infrared heaters, construction heaters.

Clothes Dryers, Incinerators, Gas Air Conditioning, Misc. Appliances

3.75 Hours Home Study and Classroom – 3 Hours Lab

Fundamentals of Gas Appliances – American Gas Association Chapters 5 - 8

COURSE DESCRIPTION:

These chapters discuss and explain clothes dryers, incinerators, domestic incinerators, commercial incinerators, and special purpose incinerators; gas air conditioning and refrigeration; the absorption cycle, gas refrigerators; miscellaneous appliances; outdoor gas grills, decorative appliances, gas lights, recreational vehicle and mobile home appliances, fuel cells.

NGT 1702

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Inspecting and Servicing Gas Operated Equipment to Ensure Proper Venting and Ventilation Air

COURSE DESCRIPTION:

This course presents the theory and operation of natural draft venting and ventilation air systems. Focus is placed on the standards that are listed in the National Fuel Gas Code ANSI 223 (NFPA #54). Inspection of gas operated equipment to ensure proper ventilation is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Fundamentals of Gas Appliance Venting and Ventilation

3.75 Hours Home Study and Classroom – 3 Hours Lab

American Gas Association

COURSE DESCRIPTION:

This section covers the history of venting and ventilation, the purpose of gas appliance venting and ventilation, basic theory of venting system operation, types of gas vents, venting systems, code requirements for venting, vent sizing and design, air for combustion and ventilation, installation of vents, venting high efficiency gas appliances and troubleshooting.

NGT 1703

3.75 Hours Home Study and Classroom – 15 Hours Lab

Venting High Efficiency Gas Operated Equipment Proper Venting and Ventilation Air

COURSE DESCRIPTION:

Venting requirements for Categories I through IV gas operated appliances are presented based on their unique designs. The features and benefits of high efficiency gas operated equipment are identified. Practice in the sizing of vents for fan assisted appliances is provided. Practice in inspecting venting systems is required. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1006

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Maintaining Records and Filing Reports of Compliance

COURSE DESCRIPTION:

This course focuses on accuracy and complete information in field reports which document company-wide summary reports. Practice on company map reading, sketching of piping installations and above-ground piping facilities is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1603

3.75 Hours Home Study and Classroom – 3 Hours Lab

Installing and Maintaining Domestic Gas Meters and Regulator Sets and Service Lines

COURSE DESCRIPTION:

This course presents U.S. Department of Transportation (D.O.T.) standards and industry recognized procedures for installing domestic gas service lines, and meter and regulator sets. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Second Six Months Total Hours: 112.25

Third 6 Months

NGT 1101

3.75 Hours Home Study and Classroom – 30 Hours Lab

Controlling/Preventing Fires Fueled by Natural Gas

COURSE DESCRIPTION:

Factors are identified relating to extinguishing fires fueled by natural gas. Emphasis is placed on ways to prevent natural gas fires by eliminating ignition sources. Various classifications of fire extinguishing agents and their intended use are presented. Techniques used to extinguish natural gas fires are demonstrated on a fire ground and practiced by the participants in the course. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1102

3.75 Hours Home Study and Classroom – 15 Hours Lab

Maintaining a Safe Working Environment

COURSE DESCRIPTION:

This course is an overview of safety practices that prevent personal injury as well as property damage at the worksite. Proper use of major equipment is stressed. Hazards resulting from escaping gas are emphasized. Also, the basis for the drug testing and alcohol misuse program is explained. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1103

7.5 Hours Home Study and Classroom – 7.5 Hours Lab

Prevent Accidental Ignition

COURSE DESCRIPTION:

This course presents safety practices and procedures used to prevent accidental ignition of natural gas. Areas of emphasis are electrical arcing, welding, cutting, and other hot work, isolating pipeline segments, and isolating gas-handling facilities.

NGT 1104

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying the Fundamental Guidelines for Traffic Control in Work Zones

COURSE DESCRIPTION:

This course presents the basic standard for traffic control as described in the manual on Uniform Traffic Control Devices, Part VI According to the U.S. Department of Transportation.

NGT 1501

7.25 Hours Home Study and Classroom

Detecting the Presence and Measuring the Percent of Gas in a Gas-in-Air Mixture

COURSE DESCRIPTION:

This course focuses on the principles of operations and application of combustible gas indicators. Covered is the application CGIs equipped with catalytic and thermal conductor sensors, semiconductor sensors and flame ionization sensors.

NGT 1502

3.75 Hours Home Study and Classroom – 7.5 Hours Lab
Investigating Reported Gas Leaks and Odors in Buildings

COURSE DESCRIPTION:

This course provides information and practice on the techniques of gas pipeline patrolling and leakage survey. The proper use of gas detectors and line locators are emphasized and practiced in the field. Accepted methods of leak survey are presented with emphasis on field practices. Hazards and symptoms of the presence of gas in the atmosphere are identified and safety precautions emphasized. Field practice doing patrol and leakage surveys is required.

NGT 1504

3.75 Hours Home Study and Classroom – 7.5 Hours Lab
Investigating and Pinpointing Underground Natural Gas Leaks

COURSE DESCRIPTION:

This course presents the theory and practice for using proper techniques and procedures when investigating and pinpointing natural gas leaks.

NGT 1251

15 Hours Home Study and Classroom
Maintaining Compliance with the National Fuel Gas Code NFPA 54

COURSE DESCRIPTION:

This course presents information contained in the National Fuel Gas Code ANSI Z223.1. This code is a safety code that applies to the installation of fuel gas piping systems. The interpretation and application of this code in situations common to the natural gas industry is emphasized. Exercises involving the application of code references are a major part of the course.

NGT 1301

15 Hours Home Study and Classroom
Maintaining Compliance with 49 Code of Federal Regulations (CFR), Part 192

COURSE DESCRIPTION:

This course is a survey of the criteria for the installation, maintenance and inspection of gas pipelines up to the outlet of the customer's meter. Key terms and definitions are reviewed and applied to issues common to the installation, maintenance and inspection of gas transportation pipelines. Emphasis is given to the identification of content contained in each subpart of 49 CFR. 192 identifying general provisions of the regulations. Identifying selected requirement basis to the operations of natural gas distribution systems.

NGT 1404

3.75 Hours Home Study and Classroom – 7.5 Hours Lab
Communicating Potential Hazards in the Workplace

COURSE DESCRIPTION:

A study of health related and explosive hazards associated with the natural gas industry are examined. The use of material safety data sheets (MSDS) is emphasized to protect persons against toxic chemical and hazardous materials.

NGT 1506

3.75 Hours Home Study and Classroom

Investigating for Carbon Monoxide

COURSE DESCRIPTION:

This course provides information and practice on the techniques of gas pipeline patrolling and leakage survey. The proper use of gas detectors and line locators are emphasized and practiced in the field. Accepted methods of leak survey are presented with emphasis on field practices. Hazards and symptoms of the presence of gas in the atmosphere are identified and safety precautions emphasized. Field practice doing patrol and leakage surveys is required.

Third Six Months Total Hours: 153.5

Fourth 6 Months**NGT 1803**

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Join Plastic Pipe with Mechanical Fittings

COURSE DESCRIPTION:

This course presents the theory and practice of joining plastic pipe with mechanical fittings; referencing the fitting manufacturer's installation procedures when installing mechanical fittings is emphasized. Controlling static charges on plastic pipe is discussed and methods of controlling static charges are demonstrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1804

7.5 Hours Home Study and Classroom

Join Plastic Pipe with Heat Fusion

COURSE DESCRIPTION:

This course presents the theory of heat fusing polyethylene pipe and the specification and conditions required to produce an acceptable joint. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2051

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Processes and Procedures Basic to Corrosion Control

COURSE DESCRIPTION:

This course presents the electrochemical process that causes corrosion on buried metals, and the conditions that support this process. Methods used to control the corrosion process are described and illustrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1602

3.75 Hours Home Study and Classroom – 1 Hour Lab

Monitoring Odorant Levels

COURSE DESCRIPTION:

This course presents the federal standards for proper odorant levels. Operating instruction for an odorometer and odorator are discussed. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1604

3.75 Hours Home Study and Classroom

Identifying Techniques Common to Purging Natural Gas Distribution Pipelines

COURSE DESCRIPTION:

This course presents the theory and techniques common to purging natural gas lines. Topics include the isolation of equipment during the purging operation and procedures for purging air or gas from a section of pipeline. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1704

3.75 Hours Home Study and Classroom

Identifying Electrical Concepts Basic to Appliance Service

COURSE DESCRIPTION:

This course presents the basics for troubleshooting electrical control circuits in gas operated appliances. Circuit components and their function in an electrical circuit are identified. The reading of electrical circuit diagram (ladder diagram) is practiced and their physical arrangements in the appliance are identified. Troubleshooting techniques are emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Historical Background of Electricity

3.75 Hours Home Study and Classroom

Fundamentals of Electricity – American Gas Association Chapters 1 - 3

COURSE DESCRIPTION:

This class will provide the apprentice with a basic historical background about the discovery of electricity and how it is used to improve everyday life.

Electrical Relationships

3.75 Hours Home Study and Classroom

Fundamentals of Electricity – American Gas Association Chapters 4 - 6

COURSE DESCRIPTION:

This class will provide the apprentice with a basic background about Ohm's Law, Watt's Law and various circuits

Electrical Relationships

3.75 Hours Home Study and Classroom

Fundamentals of Electricity – American Gas Association Chapters 7 - 10

COURSE DESCRIPTION:

This class will provide the apprentice with a basic background about Circuit Diagrams and Test Equipment

Gas Burners, Design, and Operation

3.75 Hours Home Study and Classroom

Fundamentals of Gas Combustion by American Gas Association – Chapter 4

COURSE DESCRIPTION:

This chapter deals with luminous or yellow flame burners, blue flame burners, primary air, secondary air, excess air, flame appearance and stability, lifting burner flames, flashback, yellow tipping of flames, effects of combustion air flow rates on appliance efficiency, control of combustion air flow, calculation of excess air percentage, impingement of burner flames on cool surfaces, typical appliance burners, gas orifice, air shutter, venturi throat mixing, tube, burner head, burner ports, operations of burners, atmospheric burners, power burners, force and induced draft burners, premixing and pressure power burners, appliance burner designs, drilled port burners, slotted port burners, ribbon port burners, single port or monoport burners, infrared radiant burners, jet burners, impingement target burners, pilot burners, primary aerated pilot burners, non-primary aerated pilot burners.

Burner Orifices

3.75 Hours Home Study and Classroom

Fundamentals of Gas Combustion by American Gas Association – Chapter 5

COURSE DESCRIPTION:

This chapter illustrates the types of orifices; fixed, adjustable, universal, office discharge; coefficient, measuring gas input rates, measuring gas flow, measuring gas pressure, sizing for orifices for desired gas flow rates, sizing inputs by flame spread method and compensation for altitude on setting inputs.

Burner Problems

3.75 Hours Home Study and Classroom

Fundamentals of Gas Combustion – American Gas Association Chapter 7

COURSE DESCRIPTION:

This chapter discusses burner problems, lifting flames, flashback, extinction pop, yellow tipping, fluctuating flames, unstable or wavering flames, floating flames, flame rollout, gas odor at primary air openings and corrosion of appliances.

Fourth Six Months Hours: 64.75

Fifth 6 Months

High Efficiency Appliances

3.75 Hours Home Study and Classroom – 3 Hours Lab

Fundamentals of Gas Appliances – American Gas Association Chapter 9

COURSE DESCRIPTION:

This chapter deals with high efficiency appliances categorization, vent materials, and condensate disposal.

Customer Serviceman Procedures Manual Chapters 1-6

3.75 Hours Home Study and Classroom

COURSE DESCRIPTION:

This class will utilize the customer serviceman procedures manual and will discuss the subjects in chapters 1 – 6.

Customer Serviceman Procedures Manual Chapters 7-12

3.75 Hours Home Study and Classroom

COURSE DESCRIPTION:

This class will utilize the customer serviceman procedures manual and will discuss the subjects in chapters 7 – 12.

Customer Serviceman Procedures Manual Chapters 13-21

3.75 Hours Home Study and Classroom

COURSE DESCRIPTION:

This class will utilize the customer serviceman procedures manual and will discuss the subjects in chapters 13 – 21.

NGT 2052

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Installing Cathodic Protection Systems

COURSE DESCRIPTION:

This course presents construction procedures associated with pipeline corrosion control. Installation procedures for test pints, cased installation, insulated joints, galvanic anodes and rectifiers. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2053

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Monitoring/Testing Corrosion Control Systems

COURSE DESCRIPTION:

This course presents factors basic to monitoring/testing cathodically protected pipelines, testing procedures for pipe-to-soil surveys, testing for shorted insulating joints, shorted casings, and evidence of atmospheric corrosion. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2054

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Monitoring Corrosion Control Methods Used on Buried Metal Pipelines

COURSE DESCRIPTION:

This course presents information and techniques for monitoring corrosion control methods. The focus is on the application of techniques used to monitor corrosion control methods in the field. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2401

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Regulating Gas Pressure in Piping Systems with Self Operating Regulators

COURSE DESCRIPTION:

This course presents the concepts and principals basic to the operation of pressure regulator installations. The content focuses on the operating characteristics of self-operating pressure regulator installations. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2402

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Controlling Gas Pressure with Pilot Loaded Regulators

COURSE DESCRIPTION:

This course presents the concepts and principals basic to the operation of pressure regulator installations. The content focuses on the operating characteristics of pilot loaded regulators.

NGT 2403

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Inspect and Test Pressure Limit Stations, Relief Devices and Pressure Regulating Stations

COURSE DESCRIPTION:

This course presents the concepts and principals basic to operating pressure limiting and regulating stations. Procedures for inspecting and testing above ground structures are reviewed. Relief valve testing is demonstrated.

Standards Volume 15, Section 6 (NV Energy)

4 hours Home Study and Classroom

COURSE DESCRIPTION:

This class will discuss and review NV Energy's' Volume 15, Section 6. Areas that will be discussed are gas-metering guidelines, gas metering locations, gas meter capacity table, gas service capacity table, gas meter guard post detail, and mobile home service requirements.

Operations and Maintenance Manual, Sections A-M (excluding K) (NV Energy)

16 hours Home Study and Classroom

COURSE DESCRIPTION:

This class will discuss and review NV Energy's Gas Operations and Maintenance Manual, Sections A-M (excluding K). Areas that will be discussed include reporting safety-related conditions, petroleum gas systems, conversion to service, material and manufacturing requirements, pipe design, pipeline component design, welding steel pipelines, joining non-steel pipelines, general construction, meter and service facilities, corrosion control, test requirements, operations and maintenance.

Fifth Six Months Total Hours: 105.5

Approximate Total Program Hours: 511

Note: The Lab Hours for the above Modules will be accomplished as the Process OJT hours are completed and through Classroom training.

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Wages

Wage Schedule for Apprentice Customer Serviceman – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7684	Apprentice, Customer Serviceman	1	Start	\$29.61
		2	6 Months	\$30.56
		3	1 Year	\$31.97
		4	18 Months	\$32.75
		5	2 Years	\$34.25

Electrician - Substation
Program Duration: 4 Years (48 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
<i>Maintenance/Repairs</i>	
Breakers	1200
Transformers	850
Regulators	300
Relays	100
Batteries	250
Motor Operators	150
Transformer Shop	160
Misc. Repair & Maintenance	740
Training	250
<i>Maintenance/Repair</i>	<i>Total 4000</i>
 <i>Construction</i>	
General	600
Breakers	800
Transformers	550
Regulators	150
Switches/Motor Operators	500
Wiring	1000
Misc. Construction	400
<i>Construction</i>	<i>Total 4000</i>
 Classroom Training & Home Study	800

Total OJT Hours Recommended: 8,000

Step 1 (Months 1 thru 6)
Safety, Math, & Tools
Total Hours for Step 1 = 100

Topic	Material	Hours
Introduction to Substations and 1 line drawings	Company drawings	16

Lesson: Student will be given an overview of substations, the purpose and major equipment in a substation. The student will also be made familiar with a substation 1 line drawing.

Topic	Material	Hours
Substation Safety	Safety in Substations, NUS Workbook and Video	16

Lesson: Students will be instructed on how to apply the NV Energy Safety Rules to work in substations. This will include identifying energized and de-energized equipment, minimum approach distances, different voltage levels, proper switching practices, hot stick usage and care, grounding practices, and other topics on substation safety.

Topic	Material	Hours
Tool and Material Identification	Electrical Industry Boot Camp NJATC-Textbook & Workbook	16

Lesson: The student will learn to identify tools, material, and equipment used in the construction and maintenance of substations. Students will also be instructed on safe operation and proper PPE for the use of these tools and materials.

Topic	Material	Hours
Mathematics Units and Measurements	Mathematics Essential For the Electrical Trades Chapter 6 Building a Foundation in Mathematics Chapter 8 NJATC- Textbooks and Workbook	16

Lesson: Compare, calculate, and convert English and Metric units of measurements.

Topic	Material	Hours
Mathematics Algebra	Mathematics Essential For the Electrical Trades Chapters 7,8 Building a Foundation in Mathematics Chapters 9,10 NJATC- Textbooks and Workbook	16

Lesson: Basic Algebra functions including, terminology, order of operations, formulas, equations, plane coordinates, and word problems.

Topic	Material	Hours
Mathematics Geometry	Mathematics Essential For the Electrical Trades Chapter 12 Building a Foundation in Mathematics Chapter 15 NJATC- Textbooks and Workbook	16

Lesson: Basic concepts of Geometry including: - Measuring and Drawing Angles - Angles, Angle Pairs, and Parallel Lines - Polygons and Their Properties - Finding Perimeter - Finding Area - Finding Circumference and Area of Circles - Congruent and Similar Triangles

Topic	Material	Hours
Step 1 Progression Test	All material used in months 1-6	4

Lesson: Preparation for Step 1 Progression test.

Step 2 (Months 7 thru 12)
Math, DC Theory
Total Hours for Step 2 = 105

Topic	Material	Hours
Mathematics Trigonometry	Mathematics Essential For the Electrical Trades Chapter 13 Building a Foundation in Mathematics Chapter 17 NJATC-Textbook & Workbook	20

Lesson: Basic Trigonometry. Topics will include: Using the Pythagorean Theorem - Finding Trigonometric Function - Values of Acute Angles - Values of Any Angle - Using Inverse Trigonometric Functions - Solving Right Triangles - Solving Word Problems with Trigonometric Functions.

Topic	Material	Hours
DC Electrical Theory 1	DC Theory Chapters 1-3 NJATC-Textbook & Workbook	20

Lesson: Sources and Effects of Electricity—The Electron Theory - Mathematical Concepts for Solving Electrical Problems - Using Ohm's Law and Associated Electrical Units - The Properties of Power in an Electrical Circuit.

Understanding and Calculating Resistance in a DC Series Circuit - How Current Reacts in a DC Circuit -
How Voltage Functions in a DC Series Circuit - How Voltage Dividers Work in a DC Series Circuit - How to Calculate Power in a DC Series Circuit.

Topic	Material	Hours
DC Electrical Theory 2	DC Theory Chapters 4-18 NJATC-Textbook & Workbook	24

Lesson: How Voltage Functions in a DC Parallel Circuit - Understanding Resistance in a DC Parallel Circuit - How Current Reacts in a DC Parallel Circuit - How Current Dividers Work in a DC Parallel Circuit - How to Calculate Power in a DC Parallel Circuit. Understanding Resistance in Combination Circuits - How current reacts in a DC Combination Circuit - How Voltage Functions in DC Combination Circuits - How to Calculate Power in DC Combination Circuits.

Topic	Material	Hours
DC electrical Theory 3	DC Theory Chapters 20-21 AC/DC Principles Chapter 9 NJATC-Textbook and Workbook	16

Lesson: Principles of Magnetism and Electromagnetism- How electrical generators work

Topic	Material	Hours
Substation Batteries and Chargers	Substation Batteries NUS Workbook and Video Substation Battery Chargers NUS Workbook and Video	20

Lesson: Substation DC Control System Overview – Defines a battery and describes its purpose in a typical substation. Identifies the main components of a substation DC control system. Describes a basic DC control system arrangement. Describes the principles of operation for a typical DC control system.

Cell Components and Electrochemical Action – Lists the basic components of a lead-acid cell. Describes the electrochemical action in a cell that is charging, and a cell that is discharging. Identifies specific physical indications of problems in a cell and explains their causes.

Cell and Battery Ratings – Describes the voltage rating for a typical cell at full charge and at full discharge. Identifies the voltage for a given fully charged battery. Explains a cell's capacity rating. Identifies the capacity rating for a given fully charged battery. Defines specific gravity and identifies the specific gravity for a typical fully charged cell. Briefly describes the relationship of cell capacity, voltage, and specific gravity during discharge and during recharge.

Battery Inspection – Lists the protective equipment and safety precautions typically associated with working on substation batteries. Describes typical visual battery inspection checks. Explains why it is important to keep good battery maintenance records. Describes a typical station battery report form.

Lesson: Charger Functions and Components – Describes the functions of a typical substation battery charger. Lists the common components of battery chargers and describe the function of each.

DC Control System – Describes the layout of a typical DC control system. Describes the principles of how a DC control system works.

Freshening Charge – Defines freshening charge and describes the basic steps for applying a freshening charge. Explains when a freshening charge is applied to a battery.

Float and Equalizing Charges – Defines float charge and equalizing charge. Explains when each of the two charges is applied to a battery. Describes the basic steps for applying each of the two charges.

Charger Inspection and Adjustment – Describes common charger inspection and adjustment steps.

Topic	Material	Hours
Step 2 Progression Test	All material used in months 7-12	5

Lesson: Preparation for Step 2 Progression test.

Step 3 (Months 13 thru 18)
AC Theory, Electric Motors
Total Hours Step 3 = 97

Topic	Material	Hours
AC Electrical Theory 1	AC/DC Principles Chapter 12-13 NJATC Textbook and Workbook	20

Lesson: Introduction to AC Theory- Alternating current, Single phase AC generators, Vectors and Phase Relationships

Topic	Material	Hours
AC Electrical Theory 2	AC/DC Principles Chapter 14-16 NJATC Textbook and Workbook	20

Lesson: Resistive, Inductive, and Capacitive AC circuits

Topic	Material	Hours
AC Electrical Theory 3	AC/DC Principles Chapter 19-20 NJATC Textbook and Workbook	20

Lesson: Three phase AC, Delta and Wye connections, Transformers

Topic	Material	Hours
Motors	AC/DC Principles Chapter 21 NJATC-Textbook & Workbook	16

Lesson: AC Motors

Topic	Material	Hours
Electrical Test Equipment	Using Electrical Test Equipment NUS Workbook and Video	16

Lesson: Using a Voltage Tester – States the main purpose of a voltage tester. Names the parts of a voltage tester and explains how a voltage tester works. Lists the steps required to check out a voltage tester and explains why it is necessary to check out a voltage tester before each use. Shows how to use a voltage tester.

Meter Principles – Lists the two general ways in which meters are classified. Describes the functions of a multimeter, a clamp-on ammeter, and a megohmmeter. Explains how a permanent magnet moving coil (PMMC) meter movement works. Shows how a current measuring device can also be used to measure voltage and resistance.

Using a Multimeter, Part 1 – Identifies the switches, jacks, and scales on a typical multimeter. Demonstrates how to measure resistance and DC voltage using a multimeter.

Using a Multimeter, Part 2 – Demonstrates how a multimeter is used to measure DC current and AC voltage.

Using a Clamp-On Ammeter – Identifies the parts and features of a clamp-on ammeter. Explains how the scales on a clamp-on ammeter are read. Demonstrates how to use a clamp-on ammeter to measure current.

Using a Megohmmeter – Demonstrates how to operate a megohmmeter. Identifies some of the factors that affect how much resistance insulation has.

Topic	Material	Hours
Step Three Progression Test	All materials used in months 13-18	5

Lesson: Preparation for Step 3 progression test.

Step 4 (Months 19 thru 24)
Circuit Breakers, Reclosers
Total Hours Step 4 = 109

Topic	Material	Hours
Circuit breakers 1	Circuit Breakers 1 NUS Workbook and Video	16

Lesson: Introduction to Circuit Breakers – Describes the main functions of a circuit breaker. Explains why arcs must be extinguished quickly. Describes the role of each of the following factors in extinguishing an arc in a circuit breaker: speed, distance, cooling, dielectric strength, zero current. Identifies four mediums commonly used in circuit breakers to help extinguish arcs.

Air-Magnetic and Air-Blast Circuit Breakers – Identifies the main arc extinguishing features of a typical air-magnetic circuit breaker. Explains how the arc extinguishing features in an air-magnetic circuit breaker work to extinguish arcs. Identifies the main arc extinguishing features of a typical air-blast circuit breaker. Describes how the arc extinguishing features in an air-blast circuit breaker work to extinguish arcs.

Oil and Vacuum Circuit Breakers – Identifies the main arc extinguishing features of a typical oil circuit breaker. Explains how the arc extinguishing features in an oil circuit breaker work to extinguish arcs. Identifies the main arc extinguishing features of a typical vacuum circuit breaker. Shows how the arc extinguishing features in a vacuum circuit breaker work to extinguish arcs.

Gas-Blast and Gas-Puffer Breakers – Identifies the main arc extinguishing features of a typical gas-blast circuit breaker. Explains how the arc extinguishing features in a gas-blast circuit breaker work to extinguish arcs. Identifies the main arc extinguishing features of a typical gas-puffer circuit breaker. Shows how the arc extinguishing features in a gas-puffer circuit breaker work to extinguish arcs.

Solenoid and Motor/Spring Operating Mechanisms – Identifies the main features of a typical solenoid circuit breaker operating mechanism. Explains how a solenoid operating mechanism works to operate a breaker. Identifies the main features of a typical motor/spring circuit breaker operating mechanism. Shows how a motor/spring operating mechanism works to operate a breaker.

Pneumatic and Hydraulic Operating Mechanisms – Identifies the main features of a typical pneumatic circuit breaker operating mechanism. Explains how a pneumatic operating mechanism works to operate a breaker. Identifies the main features of a typical hydraulic circuit breaker operating mechanism. Shows how a hydraulic operating mechanism works to operate a breaker.

Topic	Material	Hours
Circuit breakers 2	Circuit Breakers 2 NUS Workbook and Video	24

Lesson: General Circuit Breaker Maintenance – Describes routine circuit breaker status checks. Describes the purpose of isolating a breaker from its operating mechanism. Shows how to service circuit breaker components.

Operating Mechanism Maintenance, Part 1 – Describes general maintenance checks for circuit breaker operating mechanisms. Describes maintenance checks for solenoid and motor/spring operating mechanisms.

Operating Mechanism Maintenance, Part 2 – Describes maintenance checks for pneumatic and hydraulic operating mechanisms.

Air-Magnetic and Vacuum Breaker Maintenance – Describes maintenance tasks that apply specifically to air-magnetic breakers. Describes maintenance tasks that apply to vacuum breakers.

Oil Circuit Breaker Maintenance – Describes maintenance tasks specific to oil circuit breakers.

Gas-Blast and Air-Blast Breaker Maintenance – Describes maintenance tasks that apply specifically to gas-blast breakers. Describes maintenance tasks that apply to air-blast breakers.

Properties of SF6 – Describes the physical characteristics of SF6. Describes the effects of heat and moisture on SF6. Describes the potential hazards associated with SF6 and its decomposition products.

Personal Protection – Describes methods for minimizing the creation of SF6 decomposition products. Describes equipment that may protect personnel from exposure to SF6 and its decomposition products. Describes the treatment recommended for personnel exposed to SF6 or its decomposition products.

Handling SF6 Gas and its Decomposition Products – Describes the generally recommended procedures for removing SF6 gas and solid decomposition products from gas-insulated equipment during routine maintenance or access. Describes generally recommended procedures for removing SF6 gas and solid decomposition products after a fault.

Topic	Material	Hours
Circuit breaker print reading, ANSI device numbers	NV Energy Manufacturer's Schematics, Wiring Diagrams, Nameplates, and Assembly Drawings	16

Lesson: Students will be instructed on how to read NV Energy manufacture's schematics, wiring diagrams, nameplates and assembly drawings. Students will also review ANSI device numbers.

Topic	Material	Hours
Reclosers	Manufacturer's Instruction Books	16

Lesson: Students will be instructed on the operation of reclosers and their controls. Recloser classes will include all types of reclosers and controls used at NV Energy (North). Manufacturers' manuals and videos will be utilized for this training

Topic	Material	Hours
Circuit breaker test equipment	Manufacture's Instruction Books	16

Lesson: Students will learn the function and use of various circuit breaker test equipment. This will include motion analyzers, contact resistance meters, oil testers, trip profile testers, dew point testers.

Topic	Material	Hours
Knot Tying and Rigging	Rigging and Lift Principles NJATC Textbook and Workbook IBEW –Knot Tying and Rigging	16

Lesson: The student is introduced to the fundamental concepts involved in preparing and lifting loads and how to properly tie common knots used in the electrical trades.

Topic	Material	Hours
Step Four Progression Test	All materials used in months 19-24	5

Lesson: Preparation for Step 4 progression test.

Step 5 (Months 25 thru 30)
Transformers, voltage regulators
Total Hours Step 5 = 117

Topic	Material	Hours
Transformers 1	Transformers 1 NUS Workbook and Video NJATC	24

Lesson: Transformer Principles – Lists the main parts of a transformer. Explains how a transformer fulfills the three requirements for electromagnetic induction. Describes the relationships between primary and secondary voltages and transformer turns ratio.

Power Transformers, Current Transformers, and Potential Transformers – Covers how to recognize and identify: power transformers, current transformers, and potential transformers.

Power Transformer Cooling Systems, Part 1 – Describes the purpose of power transformer cooling systems. Identifies a self-cooled power transformer and describes how the cooling system works. Identifies a self-cooled/forced-air-cooled power transformer and describes how the cooling system works.

Topic	Material	Hours
Transformers 2	Transformers 2 NUS Workbook and Video NJATC	24

Lesson: Power Transformer Cooling Systems, Part 2 – Identifies a forced-oil/forced-air-cooled power transformer and describes how the cooling system works. Describes the functions of temperature gauges and level gauges on a power transformer.

Power Transformer Sealing Systems, Part 1 – States the purpose of a power transformer sealing system. Identifies a gas-sealed power transformer and describes how the sealing system works. Identifies a conservator-type sealed power transformer and describes how the sealing system works.

Power Transformer Sealing Systems, Part 2 – Identifies a conservator-type sealed power transformer that has an air bag in the conservator and describes how the sealing system works. Identifies a gas/oil-sealed power transformer and describes how the sealing system works.

Visual Inspection – Lists the typical items checked during an inspection of a transformer's exterior condition, sealing system, and cooling system.

Gas and Oil Testing – Shows how to test: the gas in a power transformer for combustible gas, the gas in a power transformer for oxygen, and the insulating strength of the oil in a power transformer.

Tap Changers – Explains what a tap changer is. States the function of a no-load tap changer and briefly describes how a typical no-load tap changer works. States the function of a load tap changer and briefly describes how a typical load tap changer works.

Tap Changer Maintenance – Identifies the steps for de-energizing, isolating, and grounding a power transformer. Lists the items typically included in a maintenance check of the physical condition of a load tap changer. Lists the items typically included in a maintenance check of the mechanical operation of a load tap changer. Lists the items typically included in a maintenance check of the electrical operation of a load tap changer.

Turns Ratio Test – Explains how to test a transformer's turns ratio.

Insulation Resistance Test – Explains how to test a transformer's insulation resistance.

Topic	Material	Hours
Transformer test equipment	Manufactures Instruction Books	16

Lesson: Students will learn the proper use of transformer test equipment including: turns ratio tester, megger, winding resistance testers, power factor, hot well testers, DGA testers

Topic	Material	Hours
Transformer print reading ANSI Device Numbers	NV Energy – Manufacture's Schematics, Wiring Diagrams, Nameplates, and Assembly Drawings	16

Lesson: Students will be instructed on how to read manufacture's schematics, wiring diagrams, nameplates and assembly drawings. Students will review ANSI device numbers as it relates to transformers.

Topic	Material	Hours
Transformer installation practices	Transformer Principles and Application NJATC-Textbook & Workbook	16

Lesson: Introduction to Vacuum Filling – Functions of Transformer Oil – Basic Concepts of Vacuum Filling.

Topic	Material	Hours
Voltage regulators	Voltage Regulators NUS Workbook and Video	16

Lesson: Voltage Regulator Operation, Part 1 – Describes the function of a voltage regulator. Identifies the main components that enable an induction voltage regulator to adjust voltage.

Voltage Regulator Operation, Part 2 – Describes how a step voltage regulator adjusts voltage.

Voltage Regulator Control, Part 1 – Describes the function of a voltage detector and explains how it works. Describes the function of a line drop compensator and explains how it works.

Voltage Regulator Control, Part 2 – Describes the function of these components of a voltage regulator: time delay, limit switches, voltage reduction control, and first-house voltage protector.

Field Inspection – Describes common inspection steps typically performed on a voltage regulator.

Field Control Checks – Describes control checks for a voltage regulator with solid-state control.

Regulator Replacement – Describes how to safely remove a voltage regulator from service, and how to safely put a voltage regulator back into service.

Topic	Material	Hours
Step 5 Progression Test	All materials used in months 24-30	5

Lesson: Preparation for Step 5 Progression test

Current transformers, Capacitors, Reactors, Phase Shifters, Circuit switchers
Step 6 (Months 31 thru 36)
Total Hours for Step 6 = 103

Topic	Material	Hours
Phase Shifters	Manufacture's Instruction Book	10

Lesson: Describes the function of a phase shifter.

Topic	Material	Hours
Capacitors & Reactors	Capacitors & Reactors NUS Workbook and Video	24

Lesson: Function of Capacitors and Reactors – Defines the following terms: working power, non-working power, capacitive power, inductive power, power factor, unity power factor. Describes how the relationship between working and non-working power determines the efficiency of the power produced in a T&D system. Explains how capacitor banks and shunt reactors are used to improve power factor.

Clearing Capacitor Banks – Describes how to safely de-energize, isolate, and test a substation capacitor bank. Describes how to safely ground a substation capacitor bank using portable grounds. Describes how to safely ground a substation capacitor bank that is equipped with switches.

Capacitor Bank Maintenance – Describes maintenance tasks commonly performed on substation capacitor banks. Identifies common problems to look for when inspecting substation capacitor banks. Describes how to safely remove individual capacitors and capacitor fuses. Describes special precautions required when handling capacitors containing PCBs.

Capacitor Resistor and Insulator Testing – Describes how to test the integrity of the internal resistance of a substation capacitor. Describes how to test the integrity of the insulators of a substation capacitor.

Capacitor Capacitance Testing – Describes several methods for checking the capacitance of substation capacitors. Describes how to check the balance of a substation capacitor bank.

Shunt Reactors – Identifies and describes two basic types of substation shunt reactors. Identifies common problems to look for when visually inspecting a substation oil-insulated shunt reactor and an air-core shunt reactor. Describes how to safely de-energize, isolate, test, and ground a substation shunt reactor. Describes how to test the insulation resistance of a substation shunt reactor.

Series Reactors – States the function of a substation series reactor and describes how a series reactor operates. Shows how to safely de-energize, isolate, test, and ground a substation series reactor. Identifies common problems to look for when visually inspecting a substation series reactor.

Topic	Material	Hours
Current Transformers (Part 1)	Current Transformer Testing 1 NUS Workbook and Video	16

Lesson: CT Application and Construction – States the functions of a current transformer. Describes common current transformer applications in a substation. Describes the construction of common substation current transformers.

CT Accuracy Class and Operation – Explains the meanings of CT accuracy class ratings. Describes the basic operation of a current transformer. Explains saturation in a CT core. Describes a CT's turns ratio and current ratio as they relate to the CT's current and voltage output.

Polarity Testing: DC Kick Method – Explains why the polarity of a current transformer is checked. Describes the DC kick method of checking the polarity of a current transformer.

Polarity Testing: Current Method – Describes the current method of checking the polarity of a current transformer.

Topic	Material	Hours
Current Transformers (Part 2)	Current Transformer Testing 2 NUS Workbook and Video	16

Lesson: Demagnetizing a Current Transformer – Explains why it may be necessary to demagnetize a current transformer. Describes the basic steps for demagnetizing a current transformer.

Ratio Testing: Current Method – States the purpose of current transformer ratio testing. Describes the current method of checking the ratio of a current transformer.

Ratio Testing: Voltage Method – Describes the voltage method of checking the full winding ratio of a CT. Describes the voltage method of checking the tapped winding ratios of a CT.

Insulation Resistance Testing – Explains the purpose of testing current transformer insulation resistance. Describes the basic steps for testing the insulation resistance of a current transformer. Describes how to correct insulation resistance readings for temperature.

Topic	Material	Hours
Conduit bending	NJATC Textbook and Workbook	16

Lesson: The student will learn the basic concepts of conduit bending. This includes simple 90° stubs as well as offsets and kicks. Students will learn to use an angle finder, protractor, level, and a calculator to make accurate bends.

Topic	Material	Hours
Circuit switchers	Manufacturer's instruction books	16

Lesson: Understanding circuit switchers: their use, functions, maintenance and installation practices.

Topic	Material	Hours
Step 6 Progression Test	All materials used in months 30-36	5

Lesson: Preparation for Step 6 Progression test

Step 7 (Months 37 thru 42)
System Protection, Relays & Switching Procedures
Total Hours for Step 7 = 125

Topic	Material	Hours
System Protection	System Protection and Monitoring NUS Workbook and Video	16

Lesson: Introduction – Explains in general terms how system grounds, arresters, and fuses protect a T&D system. Briefly describes three types of monitoring and control equipment used in T&D systems.

System Grounds – Describes factors that affect the resistance of earth to current flow. Describes one method for installing a ground rod. Describes how substations, distribution systems, and transmission systems are typically grounded.

Arresters – Explains the principles of arrester operation. Describes the basic operation of a valve type arrester, a pellet type arrester, and an expulsion type arrester. Describes one method for replacing a damaged arrester.

Fuses and Fuse Cutouts – Describes the operation of an open-type fuse cutout and a door-type fuse cutout. Describes the operation of a fuse link. Explains how fuses are rated. Describes one method for replacing a fuse link in an open-type fuse cutout.

Monitoring and Control Systems – Describes the functions of a monitoring and control system. Describes some of the important features offered by most monitoring and control systems. Explains the functions of the major components in a SCADA system.

Distribution Automation and Load Management – Describes the functions of a distribution automation system and a load management system. Describes some of the important features offered by most distribution automation systems and load management systems. Explains in general terms how most distribution automation systems and load management systems operate. Describes the functions of the controllers in a distribution automation system and a load management system.

Control Functions, Modes, and Equipment – States two basic reasons why control is needed in a substation. Describes how control is provided. Identifies the equipment typically used to provide control.

Voltage Control – States why it is necessary to control voltage. Describes how a simple voltage control system works.

Distribution Feeder Fault Control – States why it is necessary to control the effects of faults. Describes how the effects of distribution feeder faults can be controlled using an overcurrent relay protective system and a feeder reclosing relay control system.

Transmission and Sub-Transmission Feeder Fault Control – Describes how the effects of feeder faults can be controlled using an impedance relay protective system. Identifies the difference between controlling the effects of feeder faults with an impedance system and controlling the effects of feeder faults with an overcurrent system.

Station Fault Control – Describes how the effects of station faults can be controlled using a differential relay system. Identifies the differences between controlling the effects of station faults with a differential system and controlling the effects of station faults with an overcurrent protective system.

Source Circuit Fault Control – Describes how the effects of source circuit faults can be controlled using a directional relay protective system. Describes how the effects of opens on a source circuit can be controlled using a voltage relay protective system. Describes how the duration of a source circuit outage can be minimized by an auto closing relay protective system.

Routine Checks of Control Equipment – Lists items typically checked during a routine inspection of substation control equipment. Identifies what various fault indications mean.

Topic	Material	Hours
Relays (Part 1)	Relays 1 NUS Workbook and Video	16

Lesson: Introduction to Relays 1 – Explains the purpose of protective relays in a T&D system. Describes five common relay elements and explains how each works.

Overcurrent Relays – Describes the condition that causes an overcurrent relay to operate. Describes the basic operating principles of overcurrent relays.

Directional Overcurrent Relays – Identifies T&D equipment typically protected by directional overcurrent relays. Describes the basic operating principles of directional overcurrent relays and the conditions that cause them to operate.

Reclosing Relays – Describes the function and basic operating principles of reclosing relays.

Voltage Relays – Identifies the type of equipment that voltage relays typically protect. Describes the basic operating principles of voltage relays, and the conditions that cause them to operate.

Auxiliary Relays – Describes the basic functions and operating principles of auxiliary relays.

Solid-State Relays – Describes the basic operating principles of solid-state relays. Defines these terms: analog signal, digital signal, and logic circuit.

Topic	Material	Hours
Relays (Part 2)	Relays 2 NUS Workbook and Video	16

Lesson: Introduction to Relays 2 – Identifies five common relay elements. Identifies the functions of overcurrent, directional overcurrent, reclosing, voltage, and auxiliary relays.

Differential Relays – Identifies what differential relays typically protect. Describes the condition that causes a differential relay to operate. Describes the basic operating principles of differential relays.

Transfer Tripping – Describes the function of transfer tripping. Identifies the main components of a transfer tripping system. Identifies four communication channels used for transfer tripping and explains how they work. Identifies the main equipment associated with transfer tripping communication channels and describes the function of each type of equipment.

Distance Relays – Identifies what distance relays typically protect. Describes the basic operating principles of distance relays, and the conditions that cause them to operate.

Pilot Wire Relaying – Describes the function and operating principles of a pilot wire relaying system. Identifies the main components of a pilot wire relaying system.

Breaker Failure Relaying – Identifies the function and the main components of a breaker failure relaying system. Describes the basic operating principles of a breaker failure relay and of a timer relay in a breaker failure relaying system.

Topic	Material	Hours
Protection Scheme Print Reading ANSI Device Numbers	NV Energy One & Three Line Diagrams, Schematics, and Relay Manuals	16

Lesson: Students will be instructed on how to read and understand NV Energy (North) one & three line diagrams and schematics as well as relay manuals and how they relate to various protection schemes used in NV Energy (North) service territory. Students will also review ANSI device numbers.

Topic	Material	Hours
Hands on relay	Various Relays	16

Lesson: Students will be instructed on the proper use of the relay test sets. They will then be instructed on how to use these test sets to understand the relationships of voltage, current, and phase angle when applied to some of the relays covered in the Relays sections.

Topic	Material	Hours
Switching Procedures	NV Energy (North) Substation & Lines Switching Procedures	40

Lesson: Students will be instructed on the proper switching procedures contained in NV Energy (North) Substation & Lines Switching Procedures Manual. Switching class consists of four eight hour days.

Topic	Material	Hours
Step 7 Progression Test	All material used in Months 36-42	5

Lesson: Preparation for Step 7 Progression test.

Step 8 (Months 43 thru 48)
Circuit Building, TVPPA, & Top-Out Test
Total Hours for Step 8 = 124

Topic	Material	Hours
Intermediate Electricity Class	In House Training Boards	80

Lesson: Students will build an array of different circuit configurations using voltage transformers, current transformers, auxiliary relays, switches, lights, motors, relays, push buttons, control handles, lockouts, and many other electrical devices. Training will also be done on a transformer hookup simulator and a circuit breaker control panel simulator. Students will build an array of different circuit configurations using voltage transformers, current transformers, auxiliary relays, switches, lights, motors, relays, push buttons, control handles, lockouts, and many other electrical devices.

Topic	Material	Hours
TVPPA Substation Equipment and Maintenance	TVPPA Packet, Online Testing	32

Lesson: The TVPPA course is a correspondence course called Substation Equipment and Maintenance. Subject matter includes: Basic Power Transmission System Theory; Power System Standards, Drawing Conventions, and Equipment Rating

Terminology; Cutouts, Reclosers and Vacuum Circuit Breakers; Lightning Arresters and Over-Voltage Surge Protection; Transformer Theory and Operation; Distribution Transformers; and Instrument Transformers, Power Transformer Categories, Installation, and DC and AC Testing; DC Testing of Electrical Equipment; AC Testing of Electrical Equipment; Protective Relaying, Control Power, Maintenance and Testing of Switchgear; Insulating Liquids Maintenance and Testing; Electrical Power Systems Grounding and Ground Resistance Testing; and Electrical Safety Switching Practices and Precautions. The apprentice will be responsible for TVPPA packets on their own time. A weekly open forum class will be held to discuss TVPPA packets. Online tests will be taken at the end of each training section.

Topic	Material	Hours
Top Out Progression Test	All materials used in months 1-48	12

Lesson: A combination of home and classroom review of all material covered during the students 48 month apprenticeship.

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Approximate Total Program Hours 1,005

Wages

Wage Schedule for Apprentice Electrician – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7641	Apprentice, Electrician	1	Start	\$29.77
		2	6 Months	\$30.86
		3	1 Year	\$32.23
		4	18 Months	\$32.91
		5	2 Years	\$34.52
		6	30 Months	\$36.81
		7	3 Years	\$37.93
		8	42 Months	\$40.05

Fitter
Program Duration: 2 Years (24 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
<i>Gas</i>	
Valve Maintenance/Leak Repair	160
Main-Installation/Replacement	822
Main-Leak Repair and Maintenance	500
Main-Misc. Pipe Fittings (heat fusion/mechanical)	175
Service Installation/Replacement (insertion)	750
Service-Leak Repair and Maintenance	500
Service-Misc. Pipe Fittings (heat fusion/mechanical)	225
Corrosion Control (installing anodes, test stations, pipe jacking, coating inspection/repair)	38
<i>Total</i>	<i>3,170</i>
 <i>Equipment and Tools</i>	
Truck and Equipment	50
Tapping Machines	100
Stop-Off Machines	100
Locators	50
Hand Tools	50
Combustible Gas Indicator (CGI)	40
Potentiometer	24
Welding Preparation (includes grinding and cutting torch)	12
<i>Total</i>	<i>426</i>
 <i>Miscellaneous</i>	
Traffic Control	80
First Aid and Safety	80
Company Standards	24
Completing Documentation for Gas Facilities	70
Complete Operator Qualification Evaluations	70
49 CFR Parts 191 & 192	40
Ride Along with Serviceman	16
Ride Along with Gas Pressure Operator/ Leak Surveyor	8
Ride Along with Inspector	16
<i>Total</i>	<i>404</i>
 Total OJT Hours Recommended	 4,000

First Six Months:

- Identifying Procedures/Processes Basic to Producing, Transporting, and Distributing Natural Gas.
- Identifying Basic Properties of Fuel Gases.
- Controlling/Preventing Fires Fueled by Natural Gas.
- Maintaining a Safe Working Environment.
- Prevent Accidental Ignition.
- Identifying the Fundamental Guidelines for Traffic Control in Work Zones.
- Maintaining Records and Filing Reports of Compliance.
- Performing Calculations Basic to Gas Distribution and Service.
- Join Plastic Pipe with Heat Fusion.
- Join Plastic Pipe with Mechanical Fittings.
- Making Field Repairs in Natural Gas Pipelines.
- Inspecting the Installation of Pipelines.

Second Six Months:

- Joining Copper Pipe for Gas Distribution.
- Installing Mains and Gas Service Lines.
- Maintaining a Safe Working Environment While Excavating (Competent Person).
- Communicating Potential Hazards in the Workplace.
- Detecting the Presence and Measuring the Percent of Gas in a Gas-in-Air Mixture.
- Locating and Marking Underground Pipeline Facilities.
- Investigating and Pinpointing Underground Natural Gas Leaks.
- Investigating Reported Gas Leaks and Odors in Buildings.
- Perform Patrol and Leakage Surveys on Gas Pipeline Facilities.
- Investigating for Carbon Monoxide.
- Maintaining Compliance with 49 Code of Federal Regulations (CFR), Part 192.
- Volume 15, Section 5.
- Volume 15, Section 6.

Third Six Months:

- Operations & Maintenance (O&M) Manual, Sections A-M Excluding K.
- Identifying Safety Requirements for Working in Confined Spaces and Controlling Hazardous Energy.
- Operating Tractors/Loaders/Backhoes Safely.
- Maintaining Line Valves in Gas Transmission/Distribution Piping.
- Identifying Techniques Common to Purging Natural Gas Distribution Pipelines.
- Abandoning/Deactivating Gas Pipeline Facilities.
- Tapping/Stopping Pipelines Under Pressure.
- Inspecting Pipe Welds.
- Cutting Steel using Oxyacetylene Hand Held Cutting Torch.
- Identifying Processes, Materials, and Terms Basic to Welding.
- Performing Tie-In/Bypass Operations.

Fourth Six Months:

- Identifying Factors to Consider when Maintaining Overpressure Protection Using Pressure Relief Valves.
- Repair/Protect Cast Iron Pipe.
- Identifying Techniques Common to Pipeline Pigging.
- Identifying Processes and Procedures Basic to Corrosion Control.
- Installing Cathodic Protection Systems.
- Monitoring/Testing Corrosion Control Systems.
- Monitoring Corrosion Control Methods Used on Buried Metal Pipelines.
- Measuring and Regulating Natural Gas in a Distribution System.
- Adjusting Gas Burners for Proper Combustion of Natural Gas.

Monthly Work Processes**Month 1****NGT 1001 -- ITS Module GDS 1.1**

3.75 Hours Home Study and Classroom

Identifying Procedures/Processes Basic to Producing, Transporting, and Distributing Natural Gas

COURSE DESCRIPTION:

This course presents the major components of a natural gas system from well head to burner. The action that each component has on the gas stream is presented in the context of the total system. Key terms and definitions are reviewed and applied to conditions common to the utilization of natural gas.

NGT 1002 -- ITS Module GDS 1.2

3.75 Hours Home Study and Classroom

Identifying Basic Properties of Fuel Gases

COURSE DESCRIPTION:

This course relates to the chemical and physical properties of fuel gases basic to their unique characteristics. The physical properties of natural gas are discussed in relation to how it reacts to pressure and/or temperature changes and the condition under which fuel gas is measured to the customer. The chemical properties are discussed in relation to their value as a source of heat. Units of measurement for natural gas are defined.

NGT 1101 -- ITS Module GDS 1.6

3.75 Hours Home Study and Classroom – 30 Hours Lab

Controlling/Preventing Fires Fueled by Natural Gas

COURSE DESCRIPTION:

Factors are identified relating to extinguishing fires fueled by natural gas. Emphasis is placed on ways to prevent natural gas fires by eliminating ignition sources. Various classifications of fire extinguishing agents and their intended use are presented. Techniques used to extinguish natural gas fires are demonstrated on a fire ground and practiced by the participants in the course. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 2

NGT 1102 -- ITS Module GDS 1.8

3.75 Hours Home Study and Classroom – 15 Hours Lab

Maintaining a Safe Working Environment

COURSE DESCRIPTION:

This course is an overview of safety practices that prevent personal injury as well as property damage at the worksite. Proper use of major equipment is stressed. Hazards resulting from escaping gas are emphasized. Also, the basis for the drug testing and alcohol misuse program is explained. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1103 -- ITS Module GDS 1.11 (OQ M-7)

7.5 Hours Home Study and Classroom – 7.5 Hours Lab

Prevent Accidental Ignition

COURSE DESCRIPTION:

This course presents safety practices and procedures used to prevent accidental ignition of natural gas. Areas of emphasis are electrical arcing, welding, cutting, and other hot work, isolating pipeline segments, and isolating gas-handling facilities.

Month 3

NGT 1104 -- ITS Module GDS 10.3

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying the Fundamental Guidelines for Traffic Control in Work Zones

COURSE DESCRIPTION:

This course presents the basic standard for traffic control as described in the manual on Uniform Traffic Control Devices, Part VI According to the U.S. Department of Transportation.

NGT 1006 -- ITS Module GDS 1.7

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Maintaining Records and Filing Reports of Compliance

COURSE DESCRIPTION:

This course focuses on accuracy and complete information on field reports which document company-wide summary reports. Practice in company map reading, sketching of piping installations and above ground piping facilities is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 4

NGT 1005 -- ITS Module GDS 1.5

7.5 Hours Home Study and Classroom

Performing Calculations Basic to Gas Distribution and Service

COURSE DESCRIPTION:

This course begins with instruction on the use of a calculator when working with dimensions given in decimal fractions. Basic calculations are performed for area and volume measurements. Practice problems include calculating the relationship between gas and heating measurements, calculating gas flow using meter index, and free air apace. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 5

NGT 1804 -- ITS Module GDS 4.11 (OQ F-1)

7.5 Hours Home Study and Classroom

Join Plastic Pipe with Heat Fusion

COURSE DESCRIPTION:

This course presents the theory of heat fusing polyethylene pipe and the specification and conditions required to produce an acceptable joint. Meets D.O.T. operator qualification for ITS covered task F-1, Join Plastic Pipe with Heat Fusion. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1803 -- ITS Module GDS 4.10 (OQ F-2)

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Join Plastic Pipe with Mechanical Fittings

COURSE DESCRIPTION:

This course presents the theory and practice of joining plastic pipe with mechanical fittings; referencing the fitting manufacturer's installation procedures when installing mechanical fittings is emphasized. Controlling static charges on plastic pipe is discussed and methods of controlling static charges are demonstrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 6

NGT 1801 -- ITS Module GDS 4.5 (OQ M-8)

3.75 Hours Home Study and Classroom – 15 Hours Lab

Making Field Repairs on Natural Gas Pipelines

Article I. COURSE DESCRIPTION:

This course presents common methods and installation practices used to make field repairs on gas piping facilities. Emphasis is placed on D.O.T. standards according to 49 CFR 192. Meets operator qualification for ITS covered task M-8, Make Field Repairs on Gas Pipelines. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1802 -- ITS Module GDS 4.6

7.5 Hours Home Study and Classroom

Inspecting the Installation of Pipelines

Article II. COURSE DESCRIPTION:

Beginning with examining the preparation of the pipeline right-of-way and continuing through the completion of the construction operation, this course presents the major phases of the inspection process. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

First Six Months Total Hours: 150

Month 7**NGT 1806 -- ITS Module GDS 4.16 (OQ F-3)**

3.75 Hours Home Study and Classroom

Joining Copper Pipe for Gas Distribution

COURSE DESCRIPTION:

This course presents the materials and techniques for joining copper pipe/tubing. Joining methods include flared connection, soldered connection, silver brazed and "swag-lock" fittings. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1805 -- ITS Module GDS 4.13

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Installing Mains and Gas Service Lines

COURSE DESCRIPTION:

This course presents installation practices basic to installing gas mains and service lines. Topics include safety, installation standards, and line marking in accordance with D.O.T. 49 CFR, Part 102. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1401 -- ITS Module GDS 10.4

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Maintaining a Safe Working Environment While Excavating (Competent Person)

COURSE DESCRIPTION:

The content of this course focuses on the requirements for earth excavation and protection system according to OSHA 29 CFR Part 1026. The use of tables and specifications to design shoring protective systems are applied to typical excavations.

Month 8**NGT 1404 -- ITS Module GDS 10.7**

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Communicating Potential Hazards in the Workplace

COURSE DESCRIPTION:

A study of health-related and explosive hazards associated with the natural gas industry are examined. The use of material safety data sheets (MSDS) is emphasized to protect persons against toxic chemical and hazardous materials.

NGT 1501 -- ITS Module GDS 2.1

7.25 Hours Home Study and Classroom

Detecting the Presence and Measuring the Percent of Gas
in a Gas-in-Air Mixture

COURSE DESCRIPTION:

This course focuses on the principles of operations and application of combustible gas indicators. Covered is the application CGIs equipped with catalytic and thermal conductor sensors, semi-conductor sensors and flame ionization sensors.

Month 9**NGT 1503 -- ITS Module GDS 2.3 (OQ M-2)**

3.75 Hours Home Study and Classroom – 7.5 Hours lab

Locating and Marking Underground Pipeline Facilities

COURSE DESCRIPTION:

This course presents techniques and procedures basic to locating and marking pipeline facilities. Line locating will be included in the lab exercise.

NGT 1504 -- ITS Module GDS 2.4

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Investigating and Pinpointing Underground Natural Gas Leaks

COURSE DESCRIPTION:

This course presents the theory and practice for using proper techniques and procedures when investigating and pinpointing natural gas leaks.

NGT 1502 -- ITS Module GDS 2.2

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Investigating Reported Gas Leaks and Odors in Buildings

COURSE DESCRIPTION:

This course provides information and practice for investigating reported gas leaks and odors in buildings and how to check for carbon monoxide.

Month 10**NGT 1505 -- ITS Module GDS 2.5 (OQ M-1)**

7.5 Hours Home Study and Classroom – 7.5 Hours Home Study and Classroom

Perform Patrol and Leakage Surveys on Gas Pipeline Facilities

COURSE DESCRIPTION:

This course provides information and practice in patrol and leakage surveys in pipeline distribution and transmission facilities.

NGT 1506 -- ITS Module GDS 2.6

3.75 Hours Home Study and Classroom

Investigating for Carbon Monoxide

COURSE DESCRIPTION:

This course provides information and practice for investigating carbon monoxide contamination.

Month 11

NGT 1301 -- ITS Module GDS 10.2

15 Hours Home Study and Classroom

Maintaining Compliance with 49 Code of Federal Regulations (CFR), Part 192

COURSE DESCRIPTION:

This course is a survey of the criteria for the installation, maintenance and inspection of gas pipelines up to the outlet of the customer's meter. Key terms and definitions are reviewed and applied to issues common to the installation, maintenance and inspection of gas transportation pipelines. Emphasis is given to the identification of content contained in each subpart of 49 CFR. Identifying general provisions of the regulations. Identifying selected requirement basis to the operations of natural gas distribution systems.

Month 12

Standards Volume 15, Section 5 (NV Energy.)

4 hours Home Study and Classroom

COURSE DESCRIPTION:

This class will discuss and review NV Energy's Volume 15, Section 5. This volume deals with material standards, trench standards, gas services, gas mains, gas assemblies, gas fittings and shop fabrications.

Standards Volume 15, Section 6 (NV Energy.)

4 hours Home Study and Classroom

COURSE DESCRIPTION:

This class will discuss and review NV Energy's Volume 15, Section 6. areas that will be discussed are gas-metering guidelines, gas-metering locations, gas meter capacity table, gas service capacity table, Gas meter guard post detail, and mobile home service requirements.

Second Six Months Total Hours: 120.25

Month 13

Operations and Maintenance Manual, Sections A-M (excluding K) (NV Energy)

16 hours Home Study and Classroom

COURSE DESCRIPTION:

This class will discuss and review NV Energy's Gas Operations and Maintenance Manual, Sections A-M (excluding K). Areas that will be discussed include reporting safety related conditions, petroleum gas systems, conversion to service, material and manufacturing requirements, pipe design, pipeline component design, welding steel pipelines, joining non-steel pipelines, general construction, meter and service facilities, corrosion control, test requirements, operations and maintenance.

Month 14

NGT 1403 -- ITS Module GDS 10.6

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Safety Requirements for

Working in Confined Spaces and Controlling Hazardous Energy

COURSE DESCRIPTION:

Confined spaces are defined and classified. Atmospheric monitoring and entry procedures into confined spaces are included in the course. Controlling hazardous energy with the lock-out/tag-out method is emphasized.

NGT 1402 -- ITS Module GDS 10.5

3.75 Hours Home Study and Classroom – 30 Hours Lab

Operating Tractors/Loaders/Backhoes Safely

COURSE DESCRIPTION:

This course presents an overview of the operation of a tractor/loader/backhoe. Operating safety precautions and equipment maintenance is emphasized. Techniques on the proper control of the tractor/loader/backhoe are discussed and demonstrated. Operating skills are developed as a part of his/her laboratory experience.

Month 15

NGT 1901 -- ITS Module GDS 3.10 (OQ M-5)

7.5 Hours Home Study and Classroom

Maintaining Line Valves in Gas Transmission/Distribution Piping

COURSE DESCRIPTION:

This course presents the basic design characteristics and maintenance procedures for pipeline valves. The valve types included are plug, ball and gate. The proper use and care of high-pressure grease guns is explained. This course meets operator qualification as required by D.O.T. 49 CFR Part 192.745. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2003 -- ITS Module GDS 4.9

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Techniques Common to Purging Natural Gas Distribution Pipelines

COURSE DESCRIPTION:

This course presents the factors affecting the mechanical nature of displacing one gas with another gas by purging. Principles concerning the formation, analysis and control of gas mixtures is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 16

NGT 1903 -- ITS Module GDS 4.14 (OQ M-10)

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Abandoning/Deactivating Gas Pipeline Facilities

COURSE DESCRIPTION:

This course Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2001 -- ITS Module GDS 4.7 (OQ L-1)

3.75 Hours Home Study and Classroom – 15 Hours Lab

Tapping/Stopping Pipelines Under Pressure

COURSE DESCRIPTION:

This course presents the techniques used to safely tap pipelines under pressure. Tapping and stopping procedures are limited to 2" pipe or less. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 17**NGT 1905 -- ITS Module GDS 10.10**

7.5 Hours Home Study and Classroom – 15 Hour Lab

Inspecting Pipe Welds

COURSE DESCRIPTION:

This course presents the duties and responsibilities basic to the practice of inspecting pipe welds. Emphasis is given to the identification and evaluation of weld defects. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

P/SW 1.3

3 Hours Home Study and Classroom

Cutting Steel Using an Oxyacetylene Hand-Held Cutting Torch

COURSE DESCRIPTION:

This course is designed to provide information basic to setting up oxyacetylene welding equipment for the purpose of cutting steel using an oxyacetylene hand-held cutting torch. Complying with basic rules for oxyacetylene gas welding and cutting safety is emphasized.

Month 18**P/SW – 1.1**

Identifying Processes, Materials and Terms Basic to Welding

3 Hours Home Study and Classroom

COURSE DESCRIPTION:

This course presents an overview of four commonly used welding processes: Oxyacetylene welding (OAW), shielded metal arc welding (SMAW), gas tungsten arc welding (GTAW) and gas metal arc welding (GMAW). The course also includes information about standard steel shapes and ordering information.

NGT 2004 -- ITS Module GDS 4.12

3.75 Hours Home Study and Classroom – 15 Hours Lab

Performing Tie-In/Bypass Operations

COURSE DESCRIPTION:

This course presents procedures for performing tie-in/bypass operations. Emphasis is placed on factors that relate to personal safety and properly following procedures. The course includes tapping and stopping of pipelines. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Third Six Months Total Hours: 172

Month 19

NGT 1902 -- ITS Module GDS 3.11

7.5 Hours Home Study and Classroom

Identifying Factors to Consider when Maintaining
Overpressure Protection Using Pressure Relief Valves

COURSE DESCRIPTION:

This course presents the components and operating characteristics of typical pressure relief valve installations. The focus of the discussions is primarily on spring operated and pilot operated pressure relief valves. Emphasis is placed on factors to consider when installing pressure relief valves. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1904 -- ITS Module GDS 4.15 (OQ M-9)

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Repair/Protect Cast Iron Pipe

COURSE DESCRIPTION:

This course presents the materials and procedures for repairing cast iron pipe. The protection of cast iron pipe while excavating is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 20

NGT 2002 -- ITS Module GDS 4.8

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Techniques Common to Pipeline Pigging

COURSE DESCRIPTION:

This course presents the techniques factors basic to pigging pipelines. Emphasis is placed on the mechanics of pigging including safety precautions to consider. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2051 -- ITS Module LCC 1.1

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Processes and Procedures Basic to Corrosion Control

COURSE DESCRIPTION:

This course presents the electrochemical process that causes corrosion on buried metals, and the conditions that support this process. Methods used to control the corrosion process are described and illustrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 21

NGT 2052 -- ITS Module LCC 1.2

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Installing Cathodic Protection Systems

COURSE DESCRIPTION:

This course presents construction procedures associated with pipeline corrosion control. Installation procedures for test pints, cased installation, insulated joints, galvanic anodes and rectifiers. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2053 -- ITS Module LCC 1.3

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Monitoring/Testing Corrosion Control Systems

COURSE DESCRIPTION:

This course presents factors basic to monitoring/testing cathodically protected pipelines. Testing procedures for pipe-to-soil surveys, testing for shorted insulating joints, shorted casings, and evidence of atmospheric corrosion. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Month 22

NGT 2054 -- ITS Module LCC 1.4 (OQ I-1)

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Monitoring Corrosion Control Methods Used on Buried Metal Pipelines

COURSE DESCRIPTION:

This course presents information and techniques for monitoring corrosion control methods. The focus is on the application of techniques used to monitor corrosion control methods in the field. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1004 -- ITS Module GDS 1.4

7.5 Hours Home Study and Classroom – 15 Hours Lab

Measuring and Regulating Natural Gas in a Distribution System

COURSE DESCRIPTION:

This course reviews the principles of operation for direct volume measurement meters and rate-of-flow (inferential) type meters. The operating principles of service regulators are outlined and discussed. Emphasis is placed on the correct reading of dial type meter faces. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Fitter/Welder
Program Duration: 2 Years (24 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
Cutting Torch	100
Cutting Machines	30
Gas Welding of: $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ "	200
Pipe and Fittings	
Gas Welding of 2" Pipe	400
Arc Welding of $\frac{3}{4}$ " , 1", 1 $\frac{1}{4}$ "	200
Pipe and Fittings	
Arc Welding of 2" Pipe and Above	400
Arc Welding of 2" and above Fittings (elbow, tee's, reducers & valves)	400
Arc Welding of 2" and above Fittings (half pots, full pots, and full stop-offs)	400
Arc Welding of Patches on Live Gas Mains (with Blowing Gas)	200
Arc Welding of Patches of Live Water Mains (with Leaking Water)	100
Layout of Offsets	20
Layout of Metersets	20
Pipe Preparation	20
Certification Tests Preparations	430
Welding in Water	20
Cutting with Electric Arc	10
Welding with Mirrors	20
Welding in a Confined Space	20
Welding with Limited Space	20
Structural Welding	400
Welding Pressurized Pipe	400
Marking-Up Pups for Tapping Valves	20
2" Horizontal Taps	20
2" Half Fitting Taps and Stop-Offs	20
2" Split Pot and Stop Offs	20
2" Bottom-Out With Offset	20
2" Bottom-Out with By-Pass (through machines)	20
2" Stop-Off with By-Pass (around machines)	20
Maintenance of 2" Tapping Machines and Related Equipment	50
Total OJT Hours Recommended	4,000

Month 23

NGT 1003 -- ITS Module GDS 1.3

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Adjusting Gas Burners for Proper Combustion of Natural Gas

COURSE DESCRIPTION:

This course presents the science of gas burner design and factors affecting the proper combustion of fuel gas. Techniques used to measure gas input rates, gas flow and pressure are presented. Practice in troubleshooting causes of improper combustion is required. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Fourth Six Months Total Hours: 116.25

Approximate Total Program Hours 558.50

Note: The Lab Hours for the above Modules will be accomplished as the Process OJT hours are completed and through Classroom training.

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Wages

Wage Schedule for Apprentice Fitter – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7691	Apprentice, Fitter	1	Start	\$29.61
		2	6 Months	\$30.56
		3	1 Year	\$31.97
		4	18 Months	\$32.91

The following is an outline on the subjects to be covered in the supplementary classroom and home study training.

First Six Months:

- Health Risks of Welding
- Safety Equipment, Protective Clothing
- Oxy-Acetylene Safety
- Oxy-Acetylene Welding
- Oxy-Acetylene Cutting

Second Six Months:

- Welding Safety
- Introduction to Arc Welding
- Introduction to Basic Shop Metallurgy
- Lessons in Arc Welding

Third Six Months:

- Advanced Theory in Arc Welding
- Advanced Shop Drawings

Fourth Six Months:

- API 1194
- DOT 192
- NV Energy O&M Procedures

First Six Months

Health Risks of Welding

8 hours

(Film and Discussion with Hazmat Specialist – Safety Department
Industrial Training Systems ITS)

Personal Safety and Proper Attitude

The apprentice will have a knowledge of the risks and hazards associated with the welding occupation.

Safety Equipment, Protective Clothing

16 hours

(Film, Discussion and Home Study – ITS Video #250-02 Safe Use of Equipment-Skills Education Series Video – Welding Safety and the James F. Lincoln Arc Welding Foundation Manual – Principles of Industrial Welding)

The apprentice will have a working knowledge of the personal safety equipment needed and required to perform the various jobs in the welding field. Proper maintenance of welding equipment will be demonstrated.

Oxy-Acetylene Safety

16 hours

(Video, discussion and home study – NUS Maintenance Training Video Gas Welding – Lincoln Arc Welding Foundation Manual Principles of Industrial Welding)

This Unit introduces the concepts and steps of gas welding. The purpose of gas welding, welding equipment components and their use, regulator and torch adjustments, and safety during gas welding and cutting.

Oxy-Acetylene Welding

16 hours

(Video, discussion and home study – NUS Maintenance Training Video Gas Welding - Lincoln Arc Welding Foundation Manual – Principles of Industrial Welding)

This unit introduces the concepts and steps of gas welding. The purpose of gas welding, welding equipment components and their use, regulator and torch adjustments, and safety during gas welding and cutting.

Oxy-Acetylene Cutting

16 hours

(Home study and discussion. Lincoln Arc Welding Foundation Manuals – Arc Welding Instructions for the Beginners and Principles of Industrial Welding)

This lesson will enable the apprentice to master the fundamentals of the cutting process with the combination torch. They will learn plate cutting, pipe cutting, the safe operation and maintenance of the equipment.

TOTAL HOURS FIRST SIX MONTHS 72 hours

Second Six Months**Welding Safety**

4 hours

(Video, discussion and home study – Lincoln Arc Welding Foundation Video –Welding Safely the way the Pros Do It and Manual – The Procedure Handbook of Arc Welding)

This lesson covers the safety measures used in the personal protection of the welder when using the arc process. It also covers the steps taken to protect the welder's co-workers.

Introduction to Arc Welding

16 hours

(Video, discussion and home study – NUS Maintenance Training Video Arc Welding and – Lincoln Arc Welding Foundation Manuals - Arc Welding Instructions for the Beginner, New Lessons in Arc Welding and the Procedures Handbook of Arc Welding)

This lesson will introduce the apprentice to the why and how of arc welding.

Apprentice will be shown how to identify welding equipment, assemble these components for use and adjust current flow.

Introduction to Basic Shop Metallurgy

40 hours

(Video, discussion and home study – NUS Maintenance Training Video – Practical Shop Metallurgy and Lincoln Arc Welding Foundation Manual Metals and How to Weld Them)

This unit presents the concepts associated with shop metallurgy.

Apprentices are shown how to identify metals and their properties. This unit also demonstrates several types of heat-treating processes and teaches apprentices how to identify causes of metal failure.

Lessons in Arc Welding

40 hours

(Home study and discussion. Lincoln Arc Welding Foundation Manuals – The procedure Handbook of Arc Welding, New Lessons in Arc Welding and Principles of Industrial Welding).

This lesson teaches the theory and process of the electrode, striking an arc, polarity, arc blow, different positions of the weld, types of beads, different types of joints and a introduction to welding symbols.

TOTAL HOURS SECOND SIX MONTHS 100 hours

Third Six Months

Advanced Theory in Arc Welding

50 hours

(Home study and discussion – Lincoln Arc Welding Foundation Manuals; – Principles of Industrial Welding and the Procedure Handbook of Arc Welding)

During this section, the apprentice will gain a practical understanding of the problems encountered in the welding process and how to avoid or repair them. It will also teach the procedure in selecting the right welding process for any type of situation. It will also examine the different types and sizes of electrodes. The lesson will also include the information needed to select the correct materials for a particular application and types of fittings, pipe and steel.

Advanced Shop Drawings

22 hours

(Home Study, discussion – Lincoln Arc Welding Foundation Manuals – How to Read Shop Drawings)

This lesson addresses, in more detail, the skill of reading blueprints, shop drawings and welding symbols.

TOTAL HOURS THIRD SIX MONTHS 72 hours

Fourth Six Months

API 1104

25 hours

(Discussion and home study –American Petroleum Manual 1104)

The apprentice will learn to understand the contents of this regulation and what will govern their decision on a specific type of weld.

DOT 192

20 hours

(Home study and discussion. Department of Transportation Manual – Section 192)

The apprentice will be familiarized with the regulations that pertain to the welding sections.

NV Energy O&M Procedures

30 hours

(Home study and discussion. NVE Operations and Maintenance Procedure Manual)

The apprentice will understand the procedures in the welding of poplins and their components, set forth by the Company.

TOTAL HOURS FOURTH SIX MONTHS

75 hours

Approximate Total Program Hours 319

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Wages

Wage Schedule for Apprentice Fitter/Welder – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7692	Apprentice, Fitter/Welder	1	Start	\$29.61
		2	6 Months	\$30.56
		3	1 Year	\$31.97
		4	18 Months	\$32.91

Gas Pressure Operator

Program Duration: 2.5 Years (30 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
<i>Leak Survey:</i>	
Commercial	400
Transmission Line	40
Residential	400
Atmospheric Corrosion	200
Emergency Assistance	200
<i>Total</i>	<i>1,240</i>
<i>Equipment and Tools:</i>	
Leak Detection Equipment Calibration and Maintenance	67
Pressure Gauge Testing	40
Pressure Recorder Calibration and Maintenance	25
Hand Tools	25
<i>Total</i>	<i>157</i>
<i>System Operations:</i>	
Load Forecasting	740
System Monitoring (SCADA Alarms, PI)	836
CP Survey	200
Daily, Monthly System Usage Determination	600
Record Keeping/Documentation	200
City Gate/Regulator Station Inspection, Maintenance, Spin Test	300
System Patrolling and Pipeline Marker Inspection	300
Operator Qualification	200
Odorant Testing	25
Value Maintenance	50
<i>Total</i>	<i>3,451</i>
Miscellaneous (Safety Meeting/Training)	80
Gas Operations Crew Ride Along	24
Gas Serviceman Ride Along	24
Gas Meter Shop	24
<i>Total</i>	<i>152</i>

Total OJT Hours Recommended 5,000

First Six Months: Approximately 134.75 Hours

- Identifying Procedures/Processes Basic to Producing, Transporting, and Distributing Natural Gas
- Identifying Basic Properties of Fuel Gases
- Controlling/Preventing Fires Fueled by Natural Gas
- Maintaining a Safe Working Environment
- Preventing Accidental Ignition
- Identifying the Fundamental Guidelines for Traffic Control in Work Zones
- Maintaining Records and Filing Reports of Compliance
- Performing Calculations Basic to Gas Distribution and Service
- Maintaining A Safe Working Environment While Excavating (Competent Person)
- Communicating Potential Hazards in the Workplace
- Detecting the Presence and Measuring the Percent of Gas in a Gas-in-Air Mixture

Second Six Months: Approximately 119 Hours

- Investigating Reported Gas Leaks and Odors In Buildings
- Investigating and Pinpointing Underground Natural Gas Leaks
- Performing Patrol and Leakage Surveys on Gas Pipeline Facilities
- Locating and Marking Underground Pipeline Facilities
- Establishing and Maintaining Proper Odorant Levels in Natural Gas Systems
- Identifying Principles and Practices Basic to Gas Measurement
- Identifying Techniques Common to Purging Natural Gas Distribution Pipelines
- Regulating Gas Pressure in Piping Systems with Self-Operating Regulators
- Controlling Gas Pressure with Pilot Loaded Regulators
- Inspecting and Testing Pressure Limit Stations, Relief Devices and Pressure Regulating Stations

Third Six Months: Approximately 138 Hours

- Inspecting and Maintaining Pressure Relief Valve Installations
- Changing and Interpreting Recording Charts
- Reading Multiple Range Pressure Recording Charts
- Maintaining Line Valves in Gas Transmission/Distribution Piping
- Maintaining Line Valves in Gas Transmission/Distribution Piping
- Investigating for Carbon Monoxide
- Identifying Safety Requirements for Working in Confined Spaces and Controlling Hazardous Energy
- Measuring and Regulating Natural Gas in a Distribution System
- Propane System Operation
- Identifying Components and Operating Characteristics of Orifice Meter Settings
- Identifying Components and Operating Characteristics of Turbine Meter Settings

Fourth Six Months: Approximately 100.5 Hours

- Identifying Components and Operating Characteristics of Diaphragm Meter Settings
- Identifying Components and Operating Characteristics of Rotary Meter Settings
- Testing the Dew Point of Gas
- Proper Use and Maintenance of Differential Pressure Recorders to Ensure Accuracy
- Operating and Maintaining Pipeline Heaters
- Identifying Processes and Procedures Basic to Corrosion Control
- Installing Cathodic Protection Systems
- Monitoring/Testing Corrosion Control Systems
- Monitoring Corrosion Control Methods Used on Buried Metal Pipelines
- Operating and Maintaining Mercury Instruments, Gauges and Indexes

Fifth Six Months: Approximately 181 Hours

- Maintaining Compliance with 49 Code of Federal Regulations (CFR), Part 192
- Operations and Maintenance Manual Sections A-M excluding K
- Operator Qualification Evaluations

Approximate Total Program Hours 673.25

First Six Months

Training Titles and Descriptions:

NGT 1001 -- ITS Module GDS 1.1

3.75 Hours Home Study and Classroom

Identifying Procedures/Processes Basic to Producing, Transporting, and Distributing Natural Gas

COURSE DESCRIPTION:

This course presents the major components of a natural gas system from well head to burner. The action that each component has on the gas stream is presented in the context of the total system. Key terms and definitions are reviewed and applied to conditions common to the utilization of natural gas.

NGT 1002 -- ITS Module GDS 1.2 Identifying Basic Properties of Fuel Gases

3.75 Hours Home Study and Classroom

COURSE DESCRIPTION:

This course relates to the chemical and physical properties of fuel gases basic to their unique characteristics. The physical properties of natural gas are discussed in relation to how it reacts to pressure and/or temperature changes and the condition under which fuel gas is measured to the customer. The chemical properties are discussed in relation to their value as a source of heat. Units of measurement for natural gas are defined.

NGT 1101 -- ITS Module GDS 1.6

3.75 Hours Home Study and Classroom – 30 Hours Lab

Controlling/Preventing Fires Fueled by Natural Gas

COURSE DESCRIPTION:

Factors are identified relating to extinguishing fires fueled by natural gas. Emphasis is placed on ways to prevent natural gas fires by eliminating ignition sources. Various classifications of fire extinguishing agents and their intended use are presented. Techniques used to extinguish natural gas fires are demonstrated on a fire ground and practiced by the participants in the course. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1102 -- ITS Module GDS 1.8

3.75 Hours Home Study and Classroom – 15 Hours Lab

Maintaining a Safe Working Environment

COURSE DESCRIPTION:

This course is an overview of safety practices that prevent personal injury as well as property damage at the worksite. Proper use of major equipment is stressed. Hazards resulting from escaping gas are emphasized. Also, the basis for the drug testing and alcohol misuse program is explained. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1103 -- ITS Module GDS 1.11 (OQ M-7)

7.5 Hours Home Study and Classroom – 7.5 Hours Lab

Prevent Accidental Ignition

COURSE DESCRIPTION:

This course presents safety practices and procedures used to prevent accidental ignition of natural gas. Areas of emphasis are electrical arcing, welding, cutting, and other hot work, isolating pipeline segments, and isolating gas-handling facilities.

NGT 1104 -- ITS Module GDS 10.3

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying the Fundamental Guidelines for Traffic Control in Work Zones

COURSE DESCRIPTION:

This course presents the basic standard for traffic control as described in the manual on Uniform Traffic Control Devices, Part VI According to the U.S. Department of Transportation.

NGT 1006 -- ITS Module GDS 1.7

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Maintaining Records and Filing Reports of Compliance

COURSE DESCRIPTION:

This course focuses on accuracy and complete information on field reports which document company wide summary reports. Practice in company map reading, sketching of piping installations and above ground piping facilities is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1902 -- ITS Module GDS 3.11

7.5 Hours Home Study and Classroom

Identifying Factors to Consider when Maintaining
Overpressure Protection Using Pressure Relief Valves

COURSE DESCRIPTION:

This course presents the components and operating characteristics of typical pressure relief valve installations. The focus of the discussions is primarily on spring operated and pilot operated pressure relief valves. Emphasis is placed on factors to consider when installing pressure relief valves. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1005 -- ITS Module GDS 1.5

7.5 Hours Home Study and Classroom

Performing Calculations Basic to Gas Distribution and Service

COURSE DESCRIPTION:

This course begins with instruction on the use of a calculator when working with dimensions given in decimal fractions. Basic calculations are performed for area and volume measurements. Practice problems include calculating the relationship between gas and heating measurements, calculating gas flow using meter index, and free air apace. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1901 -- ITS Module GDS 3.10 (OQ M-5)

7.5 Hours Home Study and Classroom

Maintaining Line Valves in Gas Transmission/Distribution Piping

COURSE DESCRIPTION:

This course presents the basic design characteristics and maintenance procedures for pipeline valves. The valve types included are plug, ball and gate. The proper use and care of high-pressure grease guns is explained. This course meets operator qualification as required by D.O.T. 49 CFR Part 192.745. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1401 -- ITS Module GDS 10.4

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Maintaining a Safe Working Environment While Excavating (Competent Person)

COURSE DESCRIPTION:

The content of this course focuses on the requirements for earth excavation and protection system according to OSHA 29 CFR Part 1026. The use of tables and specifications to design shoring protective systems is applied to typical excavations.

NGT 1404 -- ITS Module GDS 10.7

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Communicating Potential Hazards in the Workplace

COURSE DESCRIPTION:

A study of health related and explosive hazards associated with the natural gas industry are examined. The use of material safety data sheets (MSDS) is emphasized to protect persons against toxic chemical and hazardous materials.

First Six Month Total Hours: 134.75

Second Six Months

NGT 1501 -- ITS Module GDS 2.1

7.25 Hours Home Study and Classroom

Detecting the Presence and Measuring the Percent of Gas in a Gas-in-Air Mixture

COURSE DESCRIPTION:

This course focuses on the principles of operations and application of combustible gas indicators. Covered is the application of CGIs equipped with catalytic and thermal conductor sensors, semi-conductor sensors and flame ionization sensors.

NGT 1502 -- ITS Module GDS 2.2

3.75 Hours Home Study and Classroom – 7.5 Hours La

Investigating Reported Gas Leaks and Odors In Buildings

COURSE DESCRIPTION:

This course provides information and practice on the techniques of gas pipeline patrolling and leakage survey. The proper use of gas detectors and line locators are emphasized and practiced in the field. Accepted methods of leak survey are presented with emphasis on field practices. Hazards and symptoms of the presence of gas in the atmosphere are identified and safety precautions emphasized. Field practice doing patrol and leakage surveys is required.

NGT 1504 -- ITS Module GDS 2.4

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Investigating and Pinpointing Underground Natural Gas Leaks

COURSE DESCRIPTION:

This course presents the theory and practice for using proper techniques and procedures when investigating and pinpointing natural gas leaks.

NGT 1505 -- ITS Module GDS 2.5 (OQ M-1)

7.5 Hours Home Study and Classroom – 7.5 Lab

Perform Patrol and Leakage Surveys on Gas Pipeline Facilities

COURSE DESCRIPTION:

This course provides information and practice on the techniques of gas pipeline patrolling and leakage survey. The proper use of gas detectors and line locators are emphasized and practiced in the field. Accepted methods of leak survey are presented with emphasis on field practices. Hazards and symptoms of the presence of gas in the atmosphere are identified and safety precautions emphasized. Field practice doing patrol and leakage surveys is required.

NGT 1503 -- ITS Module GDS 2.3 (OQ M-2)

3.75 Hours Home Study and Classroom – 7.5 Hours lab

Locating and Marking Underground Pipeline Facilities

COURSE DESCRIPTION:

This course presents techniques and procedures basic to locating and marking pipeline facilities. Line locating will be included in the lab exercise.

NGT 1602

3.75 Hours Home Study and Classroom – 1 Hour Lab

Monitoring Odorant Levels

COURSE DESCRIPTION:

This course presents the federal standards for proper odorant levels. Operating instruction for an odorometer and odorator are discussed. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2204 – ITS Module GMR 6.2

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Establishing and Maintaining Proper Odorant Levels in Natural Gas Systems

COURSE DESCRIPTION:

This course presents the industry standards and devices used to introduce odorants into a natural gas system. Emphasis is placed on testing for odorant levels and the proper handling of odorant.

NGT 1604 – ITS Module GDS 4.9

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Techniques Common to Purging Natural Gas Distribution Pipelines

COURSE DESCRIPTION:

This course presents the factors affecting the mechanical nature of displacing one gas with another gas by purging. Principles concerning the formation, analysis and control of gas mixtures is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2201 – ITS Module GMR 1.1

7.5 Hours Home Study and Classroom

Identifying Principals and Practices Basic to Basic Gas Measurement

COURSE DESCRIPTION:

This course presents concepts and principals basic to gas measurement. The effect of gas pressure and temperature on gas measurement is demonstrated using mathematical calculations based on gas laws. An overview of the operating principals of diaphragm, rotary and turbine meters used to measure gas is presented.

NGT 2003 -- ITS Module GDS 4.9

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Techniques Common to Purging Natural Gas Distribution Pipelines

COURSE DESCRIPTION:

This course presents the factors affecting the mechanical nature of displacing one gas with another gas by purging. Principles concerning the formation, analysis and control of gas mixtures is emphasized. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2401 – ITS Module GMR 3.1

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Inspecting and Maintaining Pressure Relief Valve Installations

COURSE DESCRIPTION:

This course presents the purpose and operating characteristics of pressure relief valves. Content focuses on inspecting, testing and maintenance of relief valve installations. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2402 – ITS Module GMR 3.4

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Controlling Gas Pressure with Pilot Loaded Regulators

COURSE DESCRIPTION:

This course presents concepts and principals basic to the operation of pressure regulator installations. The content focuses on the operating characteristics of pilot loaded regulators. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Second Six Month Total Hours: 119

Third Six Months**NGT 2403 – ITS Module GMR 3.5**

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Inspect and Test Pressure Limit Stations, Relief Devices and Pressure Regulating Stations

COURSE DESCRIPTION:

This course presents concepts and principals basic to operating pressure limiting and regulating stations. Procedures for inspecting and testing above ground structures are reviewed. Relief valve testing is demonstrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2305 – ITS Module GMR 3.3

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Regulating Gas Pressure in Piping Systems with Self-Operating Regulators

COURSE DESCRIPTION:

This course presents concepts and principals basic to the operation of pressure regulator installations. The content focuses on the operating characteristics of self-operating pressure regulator installations. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2306 – ITS Module GMR 4.3

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Changing and Interpreting Recording Charts

COURSE DESCRIPTION:

This course presents the basic technology used to transfer information to a recording chart. Emphasis is on: accurately reading and interpreting an index, change an orifice chart, change a meter driven chart, change a clock driven chart and interpret pressure charts. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2406 – ITS Module GMR 4.4

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Reading Multiple Range Pressure Recording Charts

COURSE DESCRIPTION:

This course presents concepts and principals basic to reading multiple range pressure recording charts. Emphasis is placed on the correct reading of pressure charts and recording pertinent information.

NGT 2202 – ITS Module GMR 3.2

7.5 Hours Home Study and Classroom – 15 Hours Lab

Maintain Line Valves in Gas Transmission/Distribution Piping

COURSE DESCRIPTION:

This course presents the basic operating principles and maintenance schedules of gas control flow valves. The proper use and handling of high pressure grease guns is demonstrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1506 -- ITS Module GDS 2.6

3.75 Hours Home Study and Classroom

Investigating for Carbon Monoxide

COURSE DESCRIPTION:

This course provides information and practice on the techniques of gas pipeline patrolling and leakage survey. The proper use of gas detectors and line locators are emphasized and practiced in the field. Accepted methods of leak survey are presented with emphasis on field practices. Hazards and symptoms of the presence of gas in the atmosphere are identified and safety precautions emphasized. Field practice doing patrol and leakage surveys is required.

NGT 1403 -- ITS Module GDS 10.6

3.75 Hours Home Study and Classroom – 15 Hours Lab

Identifying Safety Requirements for Working in Confined Spaces and Controlling Hazardous Energy

COURSE DESCRIPTION:

Confined spaces are defined and classified. Atmospheric monitoring and entry procedures into confined spaces are included in the course. Controlling hazardous energy with the lock-out/tag-out method is emphasized.

NGT 1004 -- ITS Module GDS 1.4

7.5 Hours Home Study and Classroom – 15 Hours Lab

Measuring and Regulating Natural Gas in a Distribution System

COURSE DESCRIPTION:

This course reviews the principles of operation for direct volume measurement meters and rate-of-flow (inferential) type meters. The operating principles of service regulators are outlined and discussed. Emphasis is placed on the correct reading of dial type meter faces. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

O1A-1P Operating and Maintaining Propane Vaporizers

7 Hours Home Study and Classroom – 4 Hours

COURSE DESCRIPTION:

Course objectives are to identify types and operating characteristics of propane vaporizers typically used in propane systems. Identify procedures and processes for operating and maintaining propane vaporizers.

Propane System Operations

7.5 Hours Home Study and Classroom – 8.0 Hours Lab

COURSE DESCRIPTION:

This course reviews the principles of operation of the propane system including: leak survey, tank and vaporizer operation/inspection and maintenance and properties of propane.

Third Six Months Hours: 138

Fourth Six Months**NGT 2301 – ITS Module GMR 2.1**

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Components and Operating Characteristics of Orifice Meter Settings

COURSE DESCRIPTION:

This course presents the operating principals of orifice meters. Emphasis is placed on the identification of the meter components and their function in the measurement process.

NGT 2302 – ITS Module GMR 2.2

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Components and Operating Characteristics of Turbine Meter Settings

COURSE DESCRIPTION:

This course presents the operating principals of turbine type meters. Emphasis is placed on the identification of the meter components and their function in the measurement process.

NGT 2303 – ITS Module GMR 2.3

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Components and Operating Characteristics of Diaphragm Meter Settings

COURSE DESCRIPTION:

This course presents the operating principals of diaphragm type meters. Emphasis is placed on the identification of the meter components and their function in the measurement process.

NGT 2304 – ITS Module GMR 2.4

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Components and Operating Characteristics of Rotary Meter Settings

COURSE DESCRIPTION:

This course presents the operating principals of rotary type meters. Emphasis is placed on the identification of the meter components and their function in the measurement process.

NGT 2205 – ITS Module GMR 6.4

3.5 Hours Home Study and Classroom – 7.5 Hours Lab

Testing the Dew Point of Gas

COURSE DESCRIPTION:

This course covers the theory and practice used to test the dew point of a gas. Methods used to test moisture in gas are discussed. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2404 – ITS Module GMR 4.1

7.5 Hours Home Study and Classroom

Proper Use and Maintenance of Differential Pressure Recorders to Ensure Accuracy

COURSE DESCRIPTION:

This course presents information and procedures for maintaining and calibrating differential pressure recorders. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2203 – ITS Module GMR 5.1

7.5 Hours Home Study and Classroom

Operating and Maintaining Pipeline Heaters

COURSE DESCRIPTION:

This course presents the design features and operation characteristics of catalytic type indirect and water bath type pipeline heaters. The operation, maintenance and troubleshooting procedures for pipeline heaters are explained.

NGT 2051 -- ITS Module LCC 1.1

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Identifying Processes and Procedures Basic to Corrosion Control

COURSE DESCRIPTION:

This course presents the electrochemical process that causes corrosion on buried metals, and the conditions that support this process. Methods used to control the corrosion process are described and illustrated. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2052 -- ITS Module LCC 1.2

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Installing Cathodic Protection Systems

COURSE DESCRIPTION:

This course presents construction procedures associated with pipeline corrosion control. Installation procedures for test pints, cased installation, insulated joints, galvanic anodes and rectifiers. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2053 -- ITS Module LCC 1.3

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Monitoring/Testing Corrosion Control Systems

COURSE DESCRIPTION:

This course presents factors basic to monitoring/testing cathodically protected pipelines, testing procedures for pipe-to-soil surveys, testing for shorted insulating joints, shorted casings, and evidence of atmospheric corrosion. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

Fourth Six Months Total Hours: 100.5

Fifth Six Months**NGT 2054 -- ITS Module LCC 1.4 (OQ I-1)**

3.75 Hours Home Study and Classroom – 7.5 Hours Lab

Monitoring Corrosion Control Methods Used on Buried Metal Pipelines

COURSE DESCRIPTION:

This course presents information and techniques for monitoring corrosion control methods. The focus is on the application of techniques used to monitor corrosion control methods in the field. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 2405 – ITS Module GMR 4.2

7.5 Hours Home Study and Classroom

Operating and Maintaining Mercury Instruments, Gauges and Indexes

COURSE DESCRIPTION:

This course presents the fundamental operating and maintenance procedures for Mercury instruments, gauges and indexes. Training is focused on maintaining Mercury gauges and volume recorders. Related skill performance is verified and documented by laboratory simulation exercises and/or on the job training.

NGT 1301 -- ITS Module GDS 10.2

15 Hours Home Study and Classroom

Maintaining Compliance with 49 Code of Federal Regulations (CFR), Part 192

COURSE DESCRIPTION:

This course is a survey of the criteria for the installation, maintenance and inspection of gas pipelines up to the outlet of the customer's meter. Key terms and definitions are reviewed and applied to issues common to the installation, maintenance and inspection of gas transportation pipelines. Emphasis is given to the identification of content contained in each subpart of 49 CFR. Identifying general provisions of the regulations. Identifying selected requirement basis to the operations of natural gas distribution systems.

Operations and Maintenance Manual, Sections A-M (excluding K) (NV Energy)

16 hours Home Study and Classroom

COURSE DESCRIPTION:

This class will discuss and review NV Energy's Gas Operations and Maintenance Manual, sections A-M (excluding K). Areas that will be discussed include reporting safety related conditions, petroleum gas systems, conversion to service, material and manufacturing requirements, pipe design, pipeline component design, welding steel pipelines, joining non-steel pipelines, general construction, meter and service facilities, corrosion control, test requirements, operations and maintenance

Operator Qualification CBT Evaluation Completion (NV Energy)

150 Hours Classroom and Lab

COURSE DESCRIPTION:

Complete approximately 28 Written and 7 Performance evaluations for "Operator Qualification Covered Tasks" associated with the Customer Serviceman Job to fulfill the requirements of 49 CFR 192 Subpart "N".

Fifth Six Months Total Hours: 181

Approximate Total Program Hours 673.25

Note: The Lab Hours for the above Modules will be accomplished as the Process OJT hours are completed and through Classroom training.

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Wages

Wage Schedule for Apprentice Gas Pressure Operator – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7693	Apprentice, Operator, Gas Pressure	1	Start	\$30.88
		2	6 Months	\$32.03
		3	1 Year	\$33.57
		4	18 Months	\$34.70
		5	2 Years	\$36.65

Lineman
Program Duration: 4 Years (48 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
<i>Overhead</i>	
Groundman	500
Framing, installation and removal of poles, arms guys, fixtures, conductors	1660
Repairing fixtures and conductors	700
Stringing and sagging conductors	380
Install Pole Mounted Switches, cutouts, special devices, installing pole-mounted switches and cutouts	320
OH transformers – install and connect	280
OH services – install and connect	180
Live line work:	
1. Hot Stick	280
2. Live Line work Rubber Goods	160
Transmission work experience	400
OH transformers – install and connect	
*Total Overhead Hours	4,940
* Special rigging for pole setting	
*Testing poles	
*Trimming trees	
*Line patrolling	
*Installing lightning arresters	
*Installing and maintenance of capacitor banks	
*Troubleshooting	

<i>Safety</i>	
Safety meetings, safety rule book, CPR, and first aid	56
Pole top and vault rescue	12
*Total Safety Hours	68
*Check and maintain personal climbing and safety equipment (check daily)	
*Tailboard briefings (daily)	
<i>General</i>	
Install and repair street lighting	40
Use and operation of line trucks and aerial lift equipment	320
Use of voltmeters, phase sequence indicators	80
Substation operation in the field	40
Substation Protection Rotation	10
Transformer Shop	10
Field switching (procedures and clearances)	120
Company standards (OH & UG line construction)	40
System Control Rotation	40
Assign with troublemen	200
Supplementary training	592
*Total General Hours	1,492
Total OJT Hours Recommended	8,000

First Six Months

Class A driver's license during his/her first six months. If he/she does not possess a Class A driver's license, he/she will be required to attend a Class A driver's training class administered by the Employee Development Department.

The apprentice should be assigned to an overhead crew and should be allowed to climb as much as possible. It is the responsibility of the foreman to ensure the apprentice receives this experience. The apprentice will be restricted to all types of line work on de-energized equipment, working with or under the direct supervision of a foreman or journeyman.

The apprentice will attend a ten-day class to learn and demonstrate proper climbing methods. This class will be scheduled within 6 weeks of the apprentice's effective date. He/she will also become familiar with hand lines, ropes, knots, materials, trucks, company procedures, rigging, safe equipment operation, proper use of tools, basic construction practices, safety practices, familiarization of crew and work procedures, and pole top rescue. This class is mandatory for the apprentice to attend. The climbing class will follow a written agenda with progressive mandatory functions listed. The apprentice will be required to accomplish all courses to be considered having successfully completed the class.

The apprentice will be evaluated at the end of this class. This evaluation will be in writing and will include observations and a recommendation from the instructor. If the apprentice did not complete the class to the satisfaction of the instructor, he/she will be required to repeat the class prior to his/her movement to the second step. The apprentice will not be allowed to progress to his/her second step without having successfully completed this climbing class.

After the first three months under direct supervision of a foreman or journeyman, he/she will be permitted to work on energized circuits, not to exceed 750 volts.

Second Six Months (1 Year)

Working with or under the direction of a foreman or journeyman, the apprentice will perform all types of line work on de-energized equipment and on energized lines and equipment not to exceed 750 volts.

The apprentice will attend a five-day class to study basic electricity, transformers, and basic metering. Part of this class will include a detailed and hands-on look at transformers; this class will be during months 10, 11, or 12. The apprentice will be provided with an agenda of the class material as well as what he/she are expected to know at the end of the class. The apprentice will be given a written test and evaluation by the instructor at the end of the class. The apprentice will be required to pass this test prior to his/her advancing any further in the program. If the apprentice doesn't pass the test, he/she may be held for up to six months in accordance with the Administration of Apprenticeship Programs Agreement.

The apprentice may be rotated among overhead and underground crews in order to gain a varied experience. During the first and second six months, the apprentice should be scheduled to attend two in-house courses; "Effective Listening Skills" and Field Ambassador Training."

Third Six Months (1.5 Years)

During the apprentice's third step, he/she should begin to work on energized primary lines in accordance with the Company's safety rules. The apprentice may begin to work on energized primary lines based upon a written recommendation from his/her foreman and supervisor and after having successfully passed a proficiency evaluation. This evaluation will cover only those areas the apprentice has been exposed to, had classes on, or is covered in the home study course.

Based upon the apprentice's ability, he/she may begin this work at any time during this third step. If, however, his/her ability has not reached this level by the end of his/her third step, he/she will be frozen until he/she is able to do so, but his/her freeze is limited to six months, per the Administration of Apprenticeship Programs Agreement.

The apprentice will be assigned to perform energized work with a foreman and/or journeyman. The apprentice's assignments shall be subject to the schedule of hours as assigned herein. During this step, the apprentice will attend a class conducted by his/her department which will cover construction standards, how to read work orders, and how to check materials.

During this step the apprentice will attend a class conducted by their department and scheduled by the apprentice's instructor. This class should include; construction standards, how to read work orders, how to check materials, and completion of time sheets.

The apprentice should be assigned to work with a journeyman and/or foreman on all types of overhead and underground line work. This shall include as much hot line work as possible, in accordance with the Company safety rules. During this period, the apprentice will become proficient in the use of live line tools, rubber goods, and all personal protective equipment. The apprentice will be scheduled to work with the Troublemaker in the field for five days.

The apprentice will attend a five-day switching class and will be required to successfully complete a written test at the end of class. This switching class should be scheduled during the Apprentice's 22, 23, or 24 month; the later part of the apprentice's fourth six months.

Fourth Six Months (2 Years)

The apprentice should be assigned to work with a journeyman and/or foreman on all types of overhead and underground line work. This shall include as much hot line work as possible, in accordance with the Company safety rules. During this period, the apprentice will become proficient in the use of live line tools, rubber goods, and all personal protective equipment.

The apprentice will attend a five-day switching class and will be required to successfully complete a written test at the end of class. This switching class should be scheduled during the Apprentice's 22, 23, or 24 month; the later part of the apprentice's fourth six months.

Fifth Six Months (2.5 Years)

The apprentice will attend a five-day class on transmission line maintenance and equipment. After attending the transmission class, the apprentice will work 120 hours (three weeks) in the field with the transmission crew. This experience will be scheduled and completed by the apprentice during his/her fifth, sixth, or seventh steps. The time with the transmission crew is to be coordinated with the Transmission Department to ensure the work being done is of a learning nature and will be of a benefit to the apprentice. The apprentice will be given a written evaluation at the end of the class and at the end of each work week with the transmission crew. This evaluation will be completed by the Transmission foreman/supervisor.

During this time the apprentice should attend a five day class on underground operating procedures; Washoe U/G I.

Sixth Six Months (3 Years)

The apprentice will attend a refresher course on transformers, hot sticks, and related equipment. This class will be five days in length. The apprentice will be given a written agenda prior to the beginning of the class, outlining what will be covered during the class and what he/she will be expected to know by the end of the class. At the end of the class, the apprentice will be given a hands-on test. If the apprentice does not pass this test, his/her progress will be reviewed by the JATC who will recommend freezing the apprentice and receiving further training or other action per the agreement.

Seventh Six Months (3.5 Years)

It is recommended that the apprentice complete the following classes during this seventh step. If the apprentice has been recommended to top out early, then he/she may complete these classes after becoming a journeyman. Not completing these classes will not hinder an apprentice from completing the program early. The apprentice will be scheduled to work in System Control for a period of 40 hours. The apprentice will be scheduled to work with the Troubleshooter in the field for a period of 200 hours.

The apprentice should attend a five-day overhead procedures class and a five-day Washoe U/G3 class.

The apprentice should also work in the transformer shop for 10 hours. This work time will be coordinated with the Substation Department to ensure the apprentice will benefit and learn from the work load scheduled. The apprentice, being in his/her seventh step, will be allowed to do hands-on work in the transformer shop including testing transformer with a qualified journeyman.

During the apprentice's last six months, he/she will be given the responsibility of job planning and leading the crew through completion of the job. This will be scheduled

and coordinated by the responsible supervisor and will be evaluated by the foreman and supervisor under the supervision of the foreman and will be evaluated by the foreman.

General

In conjunction with the performance of work assignments, instruction on the following safety practices will be included with the on-the-job and classroom training:

- Care and use of personal tools
- Care and use of crew tools and equipment, proper operation of aerial and line trucks
- Field switching and line clearance
- Clearing and grounding of lines and equipment
- Care and use of hot line tools
- Care and use of protective equipment, rubber goods, etc.
- Pole top and vault rescue
- Company electric construction standards
- Basic first aid and CPR
- Tailboard briefings
- Climbing instructions and practice

Apprentices should be encouraged to discuss their problems with the foreman and supervisors. Foremen and supervisors will assist and encourage the apprentice in their work.

Supplementary Classroom Training

There will be two kinds of supplementary training provided: (1) a supplementary study course to take place on the apprentice's own time and in an amount of equal to 144 hours per year, and (2) a supplementary training course on Company time in an amount equal to 80 hours per year.

1. The Supplementary Study Course

Shall be that course known as "the National Electrical Course for Apprentice Lineman," developed by the National Joint Apprenticeship and Training Committee for the Electrical Industry, as amended by Agreement between Union and Company members of the Joint Apprenticeship Training Committee.

A copy of the "National Electrical Course" and the reference textbooks needed will be supplied by the Company to each apprentice assigned to the apprentice lineman classification at no cost to the apprentice, but with the requirement that the books supplied shall remain the property of the Company until the apprenticeship is successfully completed. At that time, the books will become the property of the apprentice.

The Company will provide a classroom and instructor to meet with the apprentice and provide instruction and review for the course on a scheduled basis, such schedule to provide that classes will be held for three (3) hours per night, meeting one (1) night per month.

Apprentice shall study prepared lesson units and complete checkup questions on his/her own time; however, apprentice will be given the unit test on Company time at five (5) week intervals or ten (10) tests per year. Apprentice records, progress records, and records of examination grades will be made by the instructor and such records shall be kept on file in the Training Department and shall be available to the apprentice, the instructors, the union's business representative, and to the members of the Joint Apprenticeship Training Committee.

2. The Supplementary Training Course

The responsible supervisor will coordinate and ensure scheduling of specified training. Shall consist of either classroom training or "in-the-field" training on such subjects as climbing, use and care of hot line tools, rigging, basic electric theory, safety, first aid, pole top and vault rescue, CPR, care and inspection of tools and equipment, use and care of personal protective equipment, transformer hookups, reading and understanding system mapping, basic metering, switching procedures, overhead procedures, underground procedures, etc., and shall be made available to the apprentice on a scheduled basis of not less than ten work days per year with qualified instructors provided by the Company.

Records of instruction given to the apprentice shall be made by the instructors and shall become a part of the file maintained in the Employee Development Department, along with the records maintained for the Supplementary Study Course and available to the same persons.

Tests

1. Grading of tests shall be done by the instructor. The apprentice shall be notified of grades received Lesson Tests. Lesson tests determine the apprentice's progress in the Supplementary Study Course and shall be given upon completion of each lesson of the course and shall be prescribed for the course or as approved by the Lines Trainer and the record of grades shall be made a part of the apprentice's record.
2. In an effort for an apprentice to top out, the following guidelines may be used. The apprentice will be given a final test before topping out. A written test will be the Company's Journeyman Lineman test or its equivalent. This written test will be administered within his/her last six months and may be administered no later than 90 days prior to his/her completion date.

The apprentice will be instructed on the lessons contained in the NJATC Program. As part of the lessons, the following reference and study materials will be used to supplement the required lessons.

Building a Foundation in Mathematics
2nd ED. By NJATC/Delmar Cengage Learning

Promoting a Culture of Safety in the Electrical Industry
By NJATC

Underground Distribution
2nd ED. By NJATC/ Alexander Publishing

The Lineworkers Rigging Handbook
2nd ED. By NJATC/ Alexander Publishing

The Guidebook for Linemen and Cablemen
By Wayne Van Soelen

D.C. Theory
2nd ED. By NJATC/Delmar Cengage Learning

Transformation for Lineworkers
2nd ED. By NJATC/Delmar Cengage Learning

Test Instruments
By Glen Mazur

Terminations & Splicing Theory- Practice
4th ED. By NJATC Special Printing

Flaggers Certification Handbook
2005 ED. By Evergreen Safety Council

Distribution Transformer Theory for Line People
1983 ED. By Robert A. Billing/NJATC Special Printing

A.C. Theory
3rd ED. By NJATC/Delmar Cengage Learning

Substation Construction Guidelines
1st ED. By NJATC/ Alexander Publishing

Personal Protective Grounding for Worker Safety
By NJATC

Live Line Work Practices
2nd ED. By Alexander Publishing

"Hot Sticks" A Manual on High Voltage Line Maintenance
Rev. 9/95 By A.B. Chance

Distribution Capacitors, Regulators, Circuit Protection Vol. 2
1987 ED. By Robert A. Billing/NJATC Special Printing

The Guidebook for Linemen & Cablemen
2nd ED. By Wayne Van Soelen

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

First Year Apprentice

First Six Months

Lesson 1 30 hours

This lesson will cover how to use the course, tools, first aid, addition and subtraction, multiplication and division, wood poles, fractions, unloading poles, decimals, framing and hauling poles, and first aid and wounds.

Lesson 2 30 hours

This lesson will cover digging holes and trenches, setting poles, history of IBEW, the electric system, OSHA electricity and matter, climbing poles, electrical units, simple fractions, Ohm's Law, and shock and artificial respiration.

Lesson 3 30 hours

This lesson will cover ropes, blocks and slings, series circuits, mathematics for parallel circuits, parallel resistances, guy types, guy installation, parallel circuits, guy strength and sizes, combination circuits, anchors, and poisoning and injuries.

Climbing school 80 hours

This is a two week in-house climbing school. The purpose of this class is to assist the apprentice in the proper and safe methods of climbing and working on or about poles while engaged in performing line work. The apprentice will develop good muscle coordination between body and mind; will develop good climbing habits; a good understanding of tools, materials, and equipment as they relate to the job being done.

Total Hours 1st Six Months: 170

Second Six Months

Lesson 4 30 hours

This lesson will cover burns and emergencies, electrical power, percentage, line conductors, IBEW Constitution, cross-arms, and attachments, NECA heritage, climber cutouts, insulators, climbing equipment inspection and care, transportation, and basic skills.

Lesson 5 30 hours
This lesson will cover wire sizes and types, electrical units, ladders, local union bylaws, batteries, fuse principles, principles of magnetism, stringing wires, electricity and magnetism, typing in, hand signals, and the human body.

Lesson 6 30 hours
This lesson will cover magnet circuits, ratio and proportion, transformers, wire resistance, voltage drop, bleeding and its control, good housekeeping, NECA, tree trimming, principles of generation. Overhead services and special wounds.

Transformer Class 40 hours
At the end of this class, the apprentice will have an understanding of basic electricity, transformers, and basic metering. This class utilizes lecture room, videos, and hands-on implementation.

Hotstick Class 40 hours
At the end of this class, the apprentice will have an understanding of the use of live line tools, rubber goods, and personal protective equipment.

Effective Listening 8 hours
At the end of this course, the apprentice's listening skills should have improved. This will assist the apprentice to be more effective on the job and will assist him in taking directions from the journeyman. The course is designed to help the apprentice assess his/her personal listening habits and skills, identify difficult listening events in his/her job, and develop specific strategies for improved listening.

Field Ambassador 8 hours
At the end of this class, the apprentice will be able to convert difficult customer situations into positive experiences. This course covers customer relationship models, handling mistakes, handling requests, and responding to angry or upset customers.

Total Hours 2nd Six Months Hours: 186

TOTAL HOURS FIRST YEAR = 356 HOURS

Second Year Apprentice

Third Six Months

Lesson 1 30 hours
This lesson will cover powered equipment, fundamentals of AC, introduction to blueprints and specifications, transformers (types), principles of three-phase AC, parliamentary procedure, rubber gloves and sleeves, hot-line tools identification, underground systems, transformers constant current, tower footings, common emergencies, and lifting and digging operations.

Lesson 2

30 hours

This lesson will cover series streetlighting circuits, conductor joints, blueprint fundamentals, prone resuscitation, polarity of voltage across a load, grounding and protective grounds, square root, transformers-CSP, rubber protective devices, distribution circuits, introduction to hot-line tools, and excavating and shoring.

Lesson 3

30 hours

This lesson will cover cable types, symbols, conventions and abbreviations, transformer single-phase connections, electrical symbols, tower erection, streetlighting, introduction to inductance, the circle, film disc cutouts, installing transformers, transformer polarity, skeletal injuries, and planning and design for undergrounding.

Underground Procedures Class

40 hours

At the end of this class, the apprentice will be familiar with underground splicing, secondary cable, compression tools, and volt meters.

NV Energy Department Operating Procedures Class

2 hours

At the end of this class, the apprentice will be familiar with NV Energy's construction standards, how to read work orders, and how to check materials. The apprentice will be instructed in the proper way to handle the paperwork necessary to accomplish his/her job.

Total Hours 3rd Six Months Hours: 132

Fourth Six Months**Lesson 1**

30 hours

This lesson will cover dampers, hold-down weights and armor rods, power of numbers-exponents, transformers – three phase voltages, applying rubber protective devices, mouth-to mouth resuscitation, care of hot-line tools, theory of three phase connection, cable terminations, joining high-line conductors, transformers- three phase connection types, streetlight time control, care of hot-line tools, location faults, and restoring service.

Lesson 2

30 hours

This lesson will cover sagging conductors, transformer connections, light control angles, reading maps, plans and profiles, transportation rules and hazards, NEBF, staking sheets and stakes, hot-stick safe working load, shock, kits, supplies, skills, and aerial baskets.

Lesson 3

30 hours

This lesson will cover overvoltage protection, laying conduit, electric shock, pole top construction, street lamps-incandescent, reading electrical drawings and diagrams, conductor clearance, right triangles, street lamps – electric discharge, demand factors, explosives, aerial lifts.

Switching Class

40 hours

At the end of this class, the apprentice will have an understanding and working knowledge of the routine substation and overhead line switching tasks and how they are carried out in a safe consistent manner. Areas that will be addressed in this class are the scope and definitions, tagging rules, substation switching procedures, and overhead line switching procedures.

Total Hours 4th Six Months Hours: 130

TOTAL HOURS SECOND YEAR = 262 HOURS

Third Year Apprentice***Fifth Six Months*****Lesson 1**

30 hours

This lesson will cover two-way radios, testing ground resistance, use and care of hand tools, line sketching, flags, signs and barricades, transformer connections, testing for line faults, stewardship, maximeters, transformer connection, review of alternating currents.

Lesson 2

30 hours

This lesson will cover AC theory, inductance, live-line maintenance, capacitance, distribution capacitors, and transformer review.

Lesson 3

30 hours

This lesson will cover the megger, manhole construction, backfeed, troubleshooting series streetlight circuits, tailboard discussion, testing insulators, construction standards, reclosers and sectionalizers, foremanship, substations, and primary fusing.

Transmission Lines Class

40 hours

At the end of this class, the apprentice will have gained a working knowledge of the transmission line maintenance and equipment.

Underground Operating Procedures**(Washoe U/G 3)**

40 hours

At the end of this class, the apprentice will understand the safe and consistent work procedures and steps to be taken prior to and during work on underground distribution high voltage systems. The apprentice will be aware of the rules and procedures mandatory for all employees engaged in work on underground electric distribution systems. Some of the areas the apprentice will learn include basic rules, work preliminaries and preparations, general rules, general work operations, work procedures, new and existing installations, grounding a circuit, procedures to work on isolated cable, operating bayonet-type fuses, emergency repairs, good housekeeping, cable identification, protection from energized cables and equipment, separable connector devices, 600 Amp deadbreak separable connector devices, live-line tools, test instruments, procedures for handling underground energized

cables, underground cable identification system, and underground tools.

Total Hours 5th Six Months Hours: 170

Sixth Six Months

Lesson 1 30 hours

This lesson will cover safety and first aid equipment, pulling cable, taking a line out of service, insulator testing, aerial platforms, airbreak switches, economics, fault currents, phase sequence, capacitors, and capacitor switching and step regulators and tap changing transformers.

Lesson 2 30 hours

This lesson will cover oil circuit breakers, live-line maintenance, meters, cable splicing, safety meetings, induction regulators, overload capabilities of electrical equipment, labor management relations, primary metering, EHV, and phasing circuits.

Lesson 3 30 hours

This lesson will cover live-line maintenance, communications, cable splicing, pole top rescue, tying circuits, oil care and filtering, underground residential distribution, watt-hour meters, and reading watt-hour meters.

Transformer/Hotstick Review Class 40 hours

This class reemphasizes the use of hotsticks in the field and the theory and workings of transformers. This is a hands-on class designed to answer and address questions and situations the apprentice may have faced during his/her on-the-job training.

Total Hours 6th Six Months Hours: 130

TOTAL HOURS FOR THIRD YEAR = 300 HOURS

Seventh Six Months

Overhead Procedures Class 40 hours

During this class, the apprentice will learn through a hands-on approach about switching procedures and practices in the field. The apprentice will become familiar with tools and equipment found in their overhead work such as capacitor banks, regulator banks, transformer banks, and line reclosers. They will learn how to handle the mental and physical process of switching in the field, how to write switching procedures, and the proper use of the apparatus and tools.

Underground Operating Procedures

(Washoe U/G 2)

24 hours

During this class, the apprentice will review operating procedures, troubleshoot a metering board, make up splices and termination, and become familiar with various cable testing devices.

Total 7th Six Month Hours: 64

Approximate Total Program Hours 982

MONTH	UNIT	CONTENTS	EXAMS	PROGRESS EXAMS
One	1-1	How to use this course, tools, first aid, addition & subtraction, multiplication & division		
Two		Wood poles, fractions, unloading poles, decimals, framing and hauling poles, first aid and wounds	1	
Three	1-2	Attitudes, digging holes & trenches, setting poles, history of the IBEW, the electric system, OSHA		
Four		Electricity and matter, climbing poles, electrical units, simple tractions, Ohm's Law, shock & artificial respiration	1	
Five	1-3	Ropes, blocks & slings, series circuits, math for parallel circuits, parallel resistances, guy types		
Six		Guy installation, parallel circuits, guy strength and sizes, combination circuits, anchors, poisoning & injuries	1	6-Month Exam
During 1st six months, the apprentice will be required to receive Class A driver's license and attend a 10-day climbing class.				
During the first year, the apprentice should have completed in –house training courses: Effective Listening and Field Ambassador Training.				
Seven	1-4	Burns and emergencies, electrical power, percentage, line conductors, IBEW constitution, crossarms, & attachments		
Eight		NECA heritage, climber cutouts, insulators, climbing equip., inspection, & care, your employer, transportation & basic skills	1	
Nine	1-5	Wire sizes & types, electrical units, ladders, local Union bylaws, batteries, fuse principles		
Ten		Principles of magnetism, stringing wire, electricity & magnetism, tying in hand signals, the human body	1	
Eleven	1-6	Magnetic circuits, ratio and proportion, transformers, wire resistance, voltage drop, bleeding & its control		
Twelve		Good housekeeping, NECA, tree trimming, principles of generation, overhead services, special wounds.	1	12-Month Exam

During the 2nd six months, the apprentice will attend a five-day transformer class, five-day hotstick class.

MONTH	UNIT	CONTENTS	EXAMS	PROGRESS EXAMS
Thirteen	2-1	Powered equipment, fundamentals to AC, intro. Blueprint and spec., transformers- types, principles of 3-phase AC, parliamentary procedure		
Fourteen		Rubber gloves & sleeves, hot-line tools indent., underground systems, transformers – contact current, tower footings, common emergencies, lifting & digging operations	1	
Fifteen	2-2	Series streetlighting cir., conductor joints, blueprint fundamentals, prone resuscitation, polar. of volts, acrs. A load, grounding & protect grounds		
Sixteen		Square root, transformers- CSP, rubber protective devices, distribution circuits, intro. to hot-line tools, excavating & shoring	1	
Seventeen	2-3	Cables types, symb., convent. & abbrev., transformer – single phase connects, electrical symbols, tower erection, streetlighting		
Eighteen		Intro. to inductance, the circle, film, disc cutouts, installing transformers, transformers – polarity, skeletal injuries, plan & design for underground	1	18-Month Exam
The apprentice after passing an efficiency test and written approval from supervision, may begin to work on energized primary lines. During the apprentice's third six months, he/she will attend a five-day underground procedures class and a department class.				
Nineteen	2-4	Dampers, hold-down weights & armor rods, power of numbers – exponents, transformers – 3-phase volts, apply rubber prot. Devices, mouth-to-mouth resus., car of hot-line tools		

Twenty		Theory of 3-phase connect, cable terminations, joining high-line conductors, transformers 3-phase connect types, streetlight time control, care of hot-line tools, locate flts. & restore service	1	
Twenty One		Sagging conductors, transformer connections, light control, angles, reading maps, plans, an prof.		
Twenty Two		Transportation rules & haz., NEBF, staking sheets & stakes , hotstick safe working load, shock, kits, supplies, skills, aerial baskets	1	
Twenty Three		Overvoltage protection, laying conduit, electric shock, pole top construction, street lamps – incandescent, reading elec. Diagrams and drawings		
Twenty Four		Conductor clearance, rith triangles, street lamps= elecdisc., demand factors explosives, aerial lifts	1	24-Month Exam
During the apprentice's 4th six months, he/she will be assigned to work with a Troubleman for 5 days and will attend a 5 day switching class.				

MONTH	UNIT	CONTENTS	EXAMS	PROGRESS EXAMS
Twenty Five	3-1	Two-way radio, testing ground resistance, use & care of hand tools, line sketching, flags, signs & barricades, transformer connections		
Twenty Six		Testing for line faults, stewardship, maximeters, transformer connection, review of alternating current	1	
Twenty Seven	3-2	AC theory, inductance, live-line maintenance, capacitance, distribution capacitors		
Twenty Eight		Transformer review, live-line maintenance review	1	
Twenty Nine	3-3	The megger, manhole construction, backfeed, troubleshooting series streetlight circuits, tailboard discussion, testing insulators		

Thirty		Construction standards, reclosers * sectionalizers, foremanship, substations, primary fusing	1	30-Month Exam
During the apprentices' 5th six months, he/she will attend a 5 day class on transmission-line maintenance and equipment and will work 120 hours in the field with the Transmission crew and attend a 5 day class in underground operating procedures.				
Thirty One	3-4	Safety & first aid equip., pulling cable, taking a aline out of service, insulator testing, aerial platforms, air break switches		
Thirty Two		Economics, fault currents, phase sequence, capc., capc. switching, step reg. & tap chg. Trans.	1	
Thirty Three	3-5	Oil circuit breakers, live-line maintenance, meters, cable splicing, safety meetings, induction regulators		
Thirty Four		Overload cap of elec. Equip, labor management relations, primary metering, EHV, phasing circuits	1	
Thirty Five	3-6	Live-line maintenance, communications, cable splicing, pole top rescue, tying circuits, oil care and filtering		
Thirty Six		Underground resid. Distribution, wathour meters, reading wathour meters	1	36-Month Exam
During the apprentices 6th six months, he/she will attend a 5 day review course on transformers & hotsticks				
Thirty Seven Thru Forty Two		General review	1	Top Out Exam
During the apprentices 7th six months, he/she will complete a 5 day overhead class and a 5 day Washoe U/GPhase 3 class. The apprentice will work in the transformer shop for 10 hours.				

Wages

Wage Schedule for Apprentice Lineman – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:

Job Code	Job Title	Step	Progression	2016 (2%) Effective 10/3/16
7631	Apprentice, Lineman	1	Start	\$30.55
		2	6 Months	\$31.67
		3	1 Year	\$33.08
		4	18 Months	\$33.78
		5	2 Years	\$35.41
		6	30 Months	\$37.77
		7	3 Years	\$38.93
		8	42 Months	\$41.11

Meter Technician Program Duration: 4 Years (48 Months)

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

<u>Process</u>	<u>Hours</u>
<i>Shop Testing:</i>	
Meter Shop Safety	80
Single Phase Meter Testing	600
Polyphase Meter Testing	1000
Shop/Field Wiring Meter Sets	1680
Field Safety	80
Customer Service – High Bill Complaints	120
Field Metering – Mainlines	4000
Co-Gen and Generation Testing	320
Metering Trade School	120

Total OJT Hours Recommended: 8,000

Course Plan

First Six Months

Familiarize candidates by reviewing math courses that are focused on algebra, geometry, trigonometry, and expose candidates to basic electric safety practices.

Second Six Months

Acquaint candidates with D/C electrical principles, A/C circuitry and electromagnetism, both of which are essential for the successful operation of induction meters used mainly on residential and some commercial/industrial customers. Additional training will be provided in proper dealings with customers so they can present a good image of the Company to the public. Energy diversion classes are taught to arm the apprentice with the ability to help curtail power theft.

Third Six Months

Familiarization with electronic components and electronic measurements is emphasized. Self-contained metering and their proper installation are also taught during this period. Candidates are given an introductory course into computer hardware and how to use common computer applications.

Fourth Six Months

Transformers and instrument transformers that are used to supply power to commercial/industrial customers and facilitate metering of this power are introduced. Reading and understanding schematics as presented on blueprints is also given special attention.

Fifth Six Months

The apprentice will review substations, local distribution, and underground power systems. Electrical parameters and quantities measured in a power system are also introduced.

Sixth Six Months

Polyphase systems, polyphase metering, demand metering are discussed during this term.

Seventh Six Month

Specialized metering such as reactive, Q, V2H, and other metering quantities are treated in some detail. Mechanical and solid-state relaying transducers, and solid-state power supplies are studied. This will equip candidates with the knowledge of how load management and conservation information is provided to commercial/residential customers and to SCADA systems.

Eighth Six Months

Advanced metering is introduced to candidates to prepare them to perform independently in the shop and in the field. This includes totalizing meters, all solid-state meters, multi-tariff meters, electronic recorders, and other specialized instruments. During this period, candidates are expected to get the formal hands-on training through direct supervision and assisting meter technicians in the field.

The following is an outline of the subjects to be covered in the supplementary classroom and home study training:

Supplementary Classroom Training

First Six Months

Safety in Meter Work (NUS)
Safety in Sub/Switch Yards (NUS)
Fractions, Percents, Proportions, Angles (ICS)
Formulas (ICS)
Monomials and Polynomials
Algebra Factoring (ICS)
Addition and Subtraction of Fractions (ICS)
Multiplication and Division of Fractions (ICS)
Linear Equations (ICS)
Exponents (ICS)
Geometry (ICS)
Practical Trigonometry (ICS)

Second Six Months

Nature of Electricity (ICS)
Circuit Analysis and Ohms Law (ICS)
Capacitors and Inductors (ICS)
Magnetism and Electromagnetism (ICS)
Conductors, Insulators, and Batteries (ICS)
DC Motors and Generator Theory (ICS)
Alternating Current (ICS)
Alternating Current Circuits (ICS)
Inductors in AC Circuits (ICS)
Capacitors in AC Circuits (ICS)
Transformers (ICS)
Rectification and Basic Electronic Devices (ICS)
Electrical Energy Distribution (ICS)
Introduction to Metering (NUS)
Customer Relations & High Bill Complaints (NUS)

Third Six Months

Register Ratios and Constants
Single Phase Metering I (Northwest Meter School)
Introduction to PC's Series (online)
Installation Checks and Inspections (NUS)
Electrical Measuring Instruments A, B, C (ICS)
Energy Diversion 1 & 2 (NUS)

Fourth Six Months

Using Electrical Test Equipment (NUS)
Reading Electrical Schematic Diagrams (ICS)
Electrical Blueprint Reading (ICS)
Solid State Fundamentals Chapters 1 – 6
Transformers (ICS)
Transformer Operation (ICS)
Instrument Transformers (ICS)

Fifth Six Months

Electric Meters and Associated Devices (NUS)
Polyphase Metering II (Northwest Meter School)
Electric Power Measurements A & B (ICS)
Telemetry (ICS)
Local Distribution of Electrical Power (ICS)
Underground Power Systems (ICS)
Switchgear (ICS)
Electrical Power Substations A & B (ICS)

Sixth Six Months

Intro to Information Systems (TMCC)
Relays I (NUS)
Demand Metering Concepts and Applications (NUS)
Conservation and Load Management
Polyphase System 1 & 2 (NUS)
Polyphase Transformer Rated Applications (NUS)
Polyphase Transformer Rated Meter Testing (NUS)
Principles of Accuracy Testing (NUS)

Seventh Six Months

NEC Articles 90 – 285 (Mike Holt DVDs)
Electronic Metering III (Northwest Electric School)
NEC Articles 250 (Mike Holt DVDs)
NEC Articles 300 – 460 (Mike Holt DVDs)
Demand Metering Concepts (NUS)
Testing and Calibrating Demand Meters (NUS)
“Q” Metering Concepts and Testing (NUS)
Reactive Meter Testing (NUS)
Solid State Meters And Associated Devices (NUS)

Eighth Six Months

Testing Totalizing Techniques (NUS)
Totalizing
Metering Standards
Review

First Six Months:**Month 1:**

Meter Safety

Safety in Meter Work

6 hours

NUS Course + Test

This course points out some safety concerns associated with meter work and explains how safety hazards can be minimized. The unit examines single-phase and polyphase self-contained meter installations and points out where high fault current may be present. Also covered are safety practices relating to meter installations or exchanges, personal protective equipment and physical hazards.

Safety in Sub/Switch Yards 6 hours
NUS Course + Test
This unit describes electrical, chemical, and personal hazards that may be encountered, instructs trainees on how to recognize hazards and unsafe practices on the job, and presents a general procedure for responding to imminent dangers and accidents.

Algebra
Fractions, Percents, Proportions, Angles 5 hours
ICS 186010 + Test
The apprentice will understand the terms: fraction, proper fraction, improper fraction, lowest common denominator, percent, ratio, and proportion, how to add, subtract, multiply, and divide fractions and decimals, how to change fractions to decimals and decimals to fractions, how to solve problems involving percent, how to use a protractor to measure angles, how to layout templates for checking angles and how to use a calculator to solve percent problems and to convert fractions to decimals.

Month 2:

Algebra (continued)
Formulas 5 hours
ICS 186012 + Test
At the end of this unit the apprentice will understand the use of letters in formulas, how to prepare and use formulas to solve problems, how to use formulas to calculate the perimeter of a triangle and rectangle, distance, area of a triangle, rectangle, and circle, volume of a pyramid, current in a circuit, and volume of a sphere, how to use a calculator to find square root and solve formulas, how to transform and solve an equation, how to perform basic arithmetic operations with signed terms and how to substitute given numerical values for letters in a formula and find the unknown quantity.

Introduction to Algebra 5 hours
ICS 186013 + Test
This unit will teach the apprentice the definition of the terms: term, constant, coefficient, exponent, monomial, trinomial, and polynomial, how to identify and combine like terms in an expression, how to multiply and divide terms containing exponents, how to remove parentheses from an expression and simplify the expression and how to perform basic arithmetic operations with signed terms.

Month 3:

Algebra (continued)
Monomials and Polynomials 6 hours
ICS X0201
This unit will teach the apprentice to remove grouping symbols from algebraic expressions, multiply binomials, and divide on polynomial by another polynomial of lower degree.

Factoring 6 hours
ICS X0202

This unit will teach the apprentice to find the prime factors of certain binomials and trinomials, to factor a given trinomial, to use the Factor Theorem to factor a given polynomial, to use factoring to find the roots of an equation, to divide one polynomial by another polynomial of lower degree and how to find the lowest common multiple of several polynomials.

Month 4:

Algebra (continued)
Addition and Subtraction of Fractions 6 hours
ICS X0203

The apprentice will learn to recognize equivalent algebraic fractions, how to perform additions and subtractions involving algebraic fractions, how to reduce an algebraic fraction to its lowest terms and how to find the least common denominator for a group of algebraic fractions.

Multiplication and Division of Fractions 6 hours
ICS X0204

At the end of this unit the apprentice will be able to perform multiplications and divisions involving algebraic fractions, reduce an algebraic fraction to its lowest terms, find the least common denominator for a group of algebraic fractions, solve equations involving fractions or decimals and simplify complex fractions.

Progress Exam
ICS X0221
Covers courses X0201, X0202, X0203, and X0204.

Month 5:

Algebra (continued)
Linear Equations 6 hours
ICS X0205

In this unit the apprentice will learn to recognize equations expressing mixture problems and other word problems, to solve number problems, digit problems, and age problems and how to recognize the graph of a linear equation, given the graph or a set of points.

Progress Exam
ICS X0222
Covers course X0205.
Excludes courses X0206, X0207, and X0208.

Exponents 6 hours
ICS X0209

At the end of this unit the apprentice will be able to demonstrate an understanding of the meaning of a fractional exponent, apply the rules for positive and negative exponents in multiplication, division, and raising to powers, use radicals to convert fractional exponents and use fractional exponents to convert radicals and write a given number in standard form.

Progress Exam
ICS X0223
Covers course X0209.
Excludes course X0210.

Month 6:

Geometry 6 hours
ICS X0211

At the end of this unit the apprentice will be able to recognize characteristics of angles and closed plane figures, to distinguish between common geometric solids, to apply the Pythagorean Theorem, to calculate perimeters and areas of a polygon, circle, and ellipse and to apply the formula for area and volume of geometric solids.

Practical Trigonometry 6 hours
ICS X0212

This unit will teach the apprentice how to define trigonometric functions, how to use trigonometric tables and apply interpolation, how to solve right triangles and how to apply the laws of sines and cosines in solving oblique triangles.

Progress Exam 0 hours
ICS X0224
Covers courses X0211, and X0212.

Total Hours First Six Months: 75

Second Six Months

Month 7:

Basic DC Electricity
Nature of Electricity 5 hours
ICS 086001 + Test

At the end of this unit the apprentice will understand the operation of a simple circuit, the terms: conductor, insulator, and resistor, understand that unlike charges attract and like charges repel, the dangers and benefits of static electricity, the terms volt, ampere, and ohm, common notations and prefixes used to identify electrical and electronic values, carbon resistors, potentiometers, and rheostats, and explain how they work and how to identify the common electrical symbols used in schematic diagrams.

Circuit Analysis and Ohms Law 5 hours
ICS 086002 + Test

At the end of this unit the apprentice will understand total resistance in series, parallel, and series-parallel circuits, how to use Ohm's law to calculate the current, voltage, or resistance in circuits and how to calculate the amount of power supplied and dissipated in a DC circuit and the steps for finding current, voltage, and resistance with a digital or analog meter.

Capacitors and Inductors

5 hours

ICS 086003 + Test

At the end of this course apprentices will understand how capacitors hold a charge, describe common type of capacitors, calculate total capacitance of circuit containing capacitors in series or parallel, explain how inductors are constructed, describe how inductors regulate the flow of current, and calculate the total inductance of series or parallel connected inductors.

Month 8:

Basic DC Electricity (continued)

Magnetism and Electromagnetism

5 hours

ICS 086004 + Test

At the end of this unit the apprentice will understand the north and south poles of permanent magnets and electromagnets, magnetic and nonmagnetic materials, how to magnetize a piece of steel by induction, the difference between simple, compound, and closed magnetic circuits, the direction of magnetic lines of force around a conductor (if the direction of current is known), how to use the right-hand rule to locate the poles of a solenoid, the operation of simple electromagnetic relays, buzzers, and stepping switches and how a DC motor operates.

Conductors, Insulators and Batteries

5 hours

ICS 086005 + Test

This unit will teach the apprentice the various types of conductors and discuss their conductivity, the American Wire Gage System of sizing copper conductors, the size of conductor needed for an application, the various types of insulating materials and their temperature ratings, the difference between a dry cell and a storage battery, how to connect cells together to obtain more voltage, more current, or more of both voltage and current, the proper safety precautions used when working with storage batteries, how to properly clean and care for storage batteries, and the instruments used for testing storage batteries.

DC Motors and Generator Theory

5 hours

ICS 086006 + Test

In this unit the apprentice will learn to identify a series-, shunt-, and compound-wound motor and discuss their application, how a permanent-magnet and stepper motor operate, the steps to reversing a DC motor's direction, how the speed of a DC motor can be controlled, the basic principle for generating a direct current, the factors that affect the strength of the induced voltage, the purpose of a commutator and brush assembly, the difference between the field connections of series-, shunt-, and compound-wound machines, the reason for shifting brushes, the use of commutating poles and compensating windings for better generator operation.

Month 9:

Basic AC Electricity

Alternating Current

5 hours

ICS 086007 + Test

This unit will teach the apprentice to draw a graph of an AC voltage and describe how AC voltage is created, explains AC cycle terms: "alternation," "peak," "positive," and "negative", the time period of an AC voltage as expressed in degrees, the characteristic values of an AC cycle and describe the relationship between the values, phase angle and describe how it relates to reactive circuits, how to calculate power for single-phase and three-phase circuits, how a 220 VAC single-phase circuit operates, the phase relationship of three-phase wave forms, how to determine real power by reading a power factor meter and delta and wye three-phase circuit connections.

Alternating Current Circuits

5 hours

ICS 086008 + Test

At the end of this unit the apprentice will be able to identify electric circuits in terms of their circuit characteristics, list several circuit characteristics that are used to describe a circuit for a particular load application, connect electrical components in series and parallel circuits, control loads from one or two switch points, understand how delta-and wye-connected three phase circuits are different and understand how grounding a circuit increases its safety.

Inductors in AC Circuits

5 hours

ICS 086009 + Test

In this unit the apprentice will learn how an inductor is made and how it operates in a DC and AC circuit, inductive reactance and impedance, and how AC frequency affects inductance. How to use Ohm's law in an AC circuit that includes an inductor, how to calculate the impedance of a series RL circuit and how to calculate the impedance of a parallel RL circuit.

Month 10:

Basic AC Electricity (continued)

Capacitors in AC Circuits

5 hours

ICS 086010 + Test

At the end of this unit the apprentice will understand how a capacitor stores a charge and how series connected and parallel connected capacitance values are calculated, capacitive reactance and using Ohm's Law in AC circuits that contain a capacitor, how to calculate the impedance of a series RC circuit and how changing the frequency of an AC signal changes capacitive reactance.

Transformers

5 hours

ICS 086011 + Test

This unit will explain what the main components of a transformer are, how mutual inductance makes it possible to change an AC voltage from one value to another when using a transformer, how to determine the turns ratio of a transformer when the primary and secondary voltages are known, how to calculate primary or secondary voltages or current when either one of these and the turns ratio are known, why transformers are laminated, how to connect three single-phase transformers for three phase operation, how to calculate line current (if phase current is known) in delta-connected transformers and the operating principles of an auto transformer.

Month 11:

Basic AC Electricity (continued)

Alternators

5 hours

ICS 086012 + Test

At the end of this unit the apprentice will understand how single- and three-phase alternators operate, list and describe the major components of an alternator, discuss alternator ratings in terms of power, voltage, speed and temperature, state the steps required for starting, stopping and operating alternators.

Rectification and Basic Electronic Devices

5 hours

ICS 086014 + Test

At the end of this unit the apprentice will understand how diodes are used as rectifiers, the basic operation of a diode and a triode electron tube, how to connect a PN junction for forward and reverse bias, how a transistor operates as an amplifier, recognize transistor input and output circuits, rectifier circuits with and without filter circuits, the operation of an SCR and a triac and how to calculate the ripple frequency of a half-wave and full-wave single-phase and three-phase rectifier.

Electrical Energy Distribution

5 hours

ICS 08613 + Test

This unit will explain the difference between feeder and branch circuits, describe the different types of systems available for distributing power within a plant, teach the apprentice to recognize and identify utilization equipment, discuss the use of transformers in energy distribution, identify by name and describe the uses of various types of raceways, teach the apprentice how to distinguish between panel boards and switchboards, describe the electrical system of a power utility and describe how electricity is generated at a power station or utility.

Month 12:

Introduction to Metering
NUS Course + Test

6 hours

This unit teaches the apprentice basic concepts of metering by identifying several early types of electro-mechanical watt-hour meters and the basic parts and describe the operating principles of a modern electro-mechanical watt-hour meter. The unit discusses self-contained meter application by explaining the difference between self-contained meters and transformer-rated meters, listing and explaining some of the information typically found on watt-hour meter nameplates and identifying the characteristics of a typical three-phase delta service and a typical three-phase wye service. Transformer-rated meter application is explained by how an instrument transformer is connected to a transformer-rated meter, identifies the two main classifications of instrument transformers and states the function of a test switch. Meter Testing is discussed including the basic steps for conducting a comparison test on a single-phase watt-hour meter, and the function of a standard and describe how a standard is used to conduct accuracy tests. Meterman responsibilities are reviewed with some of the tasks and responsibilities commonly associated with being a meterman, identifying some typical installation checks performed by meterman and explains how they are done, and identifying several forms of power theft.

Customer Relations & High Bill Complaints
NUS Course + Test

6 hours

The apprentice will learn ways in which a meter technician can achieve a proper on-the-job appearance, some of the ways that a meter technician can help ensure a proper level of job preparedness, what job awareness is and why it is important for meter technicians, what is a proper attitude for a meter technician, why it is important to be knowledgeable about the causes of high electrical bills, explain how to use the watt-load check method to determine if a meter reading is accurate, describe a procedure for troubleshooting a high bill complaint at a single-phase residential meter installation.

Total Hours Second Six Months: 82

Third Six Months**Month 13:**

Register Ratios and Constants
Course + Test

6 hours

Deals with the many ratios and constants that are essential in interpreting meter reads, setting the pulse output of meters, and determining the pulse value of pulses stored in solid-state recorders or passed on to computerized load management systems. Solid-state meters can display reads in primary terms – determinants of the transformer factors needed by solid-state meters to display reads in primary terms are discussed.

Single Phase Metering - Group I

30 hours

Northwest Electric Meter School (September)

This class is taught off site. The topics covered include: metering math, basic electricity, single phase meter components, meter constants and ratios, loads and meter applications, supplier display, current diversion, instrument transformer basics, phantom load boxes, test jacks and standards, safety, automatic meter reading, single phase meter testing, effects of harmonics on customer equipment, interpreting measurements. This class will involve classroom as well as lab.

Month 14 & 15:

Introduction to PCs Series

35 hours

<http://www.e-learningcenter.com>

This online class is composed of ten lessons. These are as follows: *Introducing the PC*; during this lesson the apprentice will be introduced to basic computer concepts and instructs apprentices on how to start the PC. *Using Your PC* teaches apprentices how to navigate within the windows operating system and use the drives in a PC. *Working with Folders and Files* teaches the apprentices the concepts of folders and files and explains how they are used within the windows operating system. *Inside your PC* explains the components within a PC and how they are used. *Basic Peripherals* describes the function and uses of typical peripherals that are used with PCs. *Other Peripheral* describes the functions and uses of other peripherals available for a PC including modems, sound cards, scanners, digital camera, and external disk drives and explains how to install these peripherals. *Understanding Software* introduces apprentices to typical software available for PCs and how to install and update the software, *Introducing the Internet* introduces apprentices to the internet and explains how to use a Web browser and e-mail. *Troubleshooting and Tips* provides the apprentice with information on how to protect data on their computer and overcome potential problems in addition to offering tips on how to maximize the efficient of their PC.

Month 16:

Installation Checks and Inspections

6 hours

NUS Course + Test

This unit discusses general non-electrical checks and inspections that can be made to a meter installation, non-electrical checks and inspections that can be made inside a transformer cabinet and inside a meter box, how voltage checks may be made on a polyphase, transformer-rated meter installation, how circuit continuity checks may be made on a polyphase, transformer-rated meter installation, how circuit continuity can be checked on a meter installation that has a connected customer load, how a phase check can be performed on a polyphase, transformer-rated meter installation, and how the accuracy and balance of a meter in a polyphase, transformer-rated meter installation can be checked.

Electrical Measuring Instruments

10 hours

ICS 4146 A + Test

The apprentice will learn principles of electrical measurements, instrument movements, measuring current, measuring voltage, measuring power, measuring resistance and frequency and instrument errors and faults.

Month 17:

Electrical Measuring Instruments
ICS 4146 B + Test

10 hours

In the second part of this lesson, the apprentice will learn about bridge measurements; DC bridge measurements; AC bridge measurements; calibration of instruments and telemetering.

Electrical Measuring Instruments
ICS 4146 C + Test

10 hours

In this final section the apprentice will learn about multimeters, volt-ohm multiammeters, vacuum-tube voltmeters, transistor volt-ohm-milliammeters, field effect transistor volt-ohm-milliammeters, digital meters and oscilloscopes.

Month 18:

Energy Diversion
NUS 1 & 2 Course + Test

12 hours

This course will examine some common methods that have been used to divert energy and show how energy diversion can be minimized or prevented. Apprentices first will look at energy diversion on single-phase residential customers and then focus on diversion on polyphase self-contained and instrument-rated installations.

Total Hours Third Six Months: 119

Fourth Six Months**Month 19:**

Using Electrical Test Equipment
NUS Course + Test

6 hours

This unit teaches the purpose and operation of voltage tests, multimeter, clamp-on ammeters, and megohmmeters. The unit demonstrates how electrical test equipment is used to measure current, voltage, and resistance and give appropriate safety precautions.

Reading Electrical Schematic Diagrams
ICS 006022 (No Test)

10 hours

This lesson will teach the apprentice about electrical diagrams; meaning of schematic diagrams; schematic diagrams of basic electric equipment and connections, such as types of circuits; sources of DC power; sources of AC power; transformers; rectifiers; motors; measuring devices; protection and control devices. Also discussed are schematic diagrams of lighting circuits and various types of motor control circuits; typical schematics used in generating systems, transmission systems, and distribution systems.

Month 20:

Electrical Blueprint Reading
ICS 006036 + Test

10 hours

In this study unit, the apprentice will learn to read several different types of electrical blueprints. The general principles for preparing blueprints will be covered. The skills the apprentice learns can be applied to reading blueprints for residential, commercial, manufacturing, and electric utility projects. When apprentices complete this study unit they will be able to: explain how blueprints are prepared, discuss how and why blueprints are copies of original drawings, read and understand the information presented on blueprints, be able to identify the different methods of presenting information, understand and interpret common symbols and abbreviations used on electrical blueprints and trace a wiring diagram and understand it.

Month 21:

Solid State Fundamentals
Chapter 1
Chapter 2
Chapter 3

9 hours

Month 22:

Solid State Fundamentals
Course + Test
Chapter 4
Chapter 5
Chapter 6

9 hours

Month 23:

Transformers
ICS 4040 + Test

10 hours

In this unit the apprentice will learn essential transformer properties; operation under load and without load; losses; voltage regulation; rating; types of core and windings; insulation; bushings; tap changers; polarity; single-phase and polyphase transformers; delta, star, open-delta, and scott connections; special transformers, autotransformers, reactors, step-voltage regulators; instrument transformers; maintenance of transformers; design of small low-voltage transformers.

Transformer Operation
ICS 4041 + Test

10 hours

In this unit the apprentice will learn calculations pertaining to transformer operation; phasor diagrams; equivalent circuits; losses; efficiency; three-phase transformer connections; harmonic currents and voltages; parallel operation of transformers; phase transformation; regulation of voltage with tap changers and separate units; and operation of autotransformers and three-winding transformers; testing of transformers.

Month 24:

Instrument Transformers
ICS 6793 + Test

10 hours

In this unit the apprentice will learn fundamentals of current and potential transformers; types of instrument transformers; instrument transformer construction standards, such as ratings and insulation classes; instrument transformer performance standards as to burden, accuracy, and correction factors; practical application of instrument transformers with regard to grounding, rating, connections, and burden; and polarity and accuracy testing of instrument transformers utilizing various methods and procedures.

Total Hours Fourth Six Months: 74

Fifth Six Months**Month 25:**

Electric Meters and Associated Devices
NUS Course + Test

6 hours

This unit examines some of the electronic devices used in or in conjunction with electric metering. These devices are explained and their functions demonstrated.

Polyphase Metering

30 hours

Northwest Meter School Group II (September)

This class is taught offsite. The topics covered include: Operation of three-phase meters, meters in three-phase circuits, graphic and phasor analysis, introduction to three-phase meter, instrument transformer basics, "B" system vector, electronic demand, reactive, KVA metering, system vector, introduction to pulse metering, verification of meter connection, and distribution transformer connections, This class will also have labs covering reactive meters, testing watt-hour meter, and three phase metering.

Month 26:

Electric Power Measurements
ICS 4019 A & B + 2 Tests

20 hours

Part 1 discusses: principles of electrical measurements; instrument movements; measuring current; measuring voltage; measuring power, measuring resistance and frequency; and instrument errors and faults.

Part 2 discusses: bridge measurements; DC bridge measurements; AC bridge measurements; calibration of instruments; and telemetering.

Month 27:

Telemetering
ICS 4048 + Test

10 hours

This unit discusses: definition and classification of telemetering; analog telemetering systems; frequency telemetering system; impulse duration telemetering system; digital telemetering system; transmission of data signals; telemetering channels; computations in telemetering; telemetering for automatic control; and electric-power-system control.

Month 28:

Local Distribution of Electrical Power
ICS 006038 + Test

10 hours

In this study unit, apprentices take a tour of the distribution of electrical energy, starting with the various methods of generation, through transmission systems, into the rural and urban substations, and ending at the customer's service entrance. When apprentices complete this study unit, they will be able to: identify the three classes of power demands and the trends associated with them, identify the various methods used in the production of electricity, understand the generation, transmission, subtransmission, distribution, and secondary voltage levels, understand the conductors used in primary distribution systems, the components used in the protection of primary distribution systems, the clearance requirements associated with secondary distribution, methods of metering consumer usage of electricity, and NEC minimum requirements associated with installing services.

Month 29:

Underground Power Systems
ICS 006039 + Test

10 hours

This study unit examines methods and equipment associated with the underground primary transmission and distribution, and the secondary distribution, of electricity to the customer. When apprentices complete this study unit, they will be able to: understand some advantages and disadvantages of underground electrical installations, identify, cables, ducts, enclosures, and equipment used in underground primary systems, understand some of the requirements and methods used in the installation of underground secondary electrical service and understand some of the methods used in the secondary distribution of power in high rise buildings.

Month 30:

Switchgear
ICS 6613 + Test

10 hours

In this lesson the apprentice will learn about switchgear and the power system; flow of power; protection of the power system; overlapping protective zones; differential protection schemes; automatic and manual control of generating stations; minimum protection for generators and transformers; protection of distribution systems; circuit breaker ratings and designs; operation of circuit breakers; interruption of AC and DC circuits; AC reclosing service; station-type cubicle switchgear; metal-clad switchgear; low-voltage metal-enclosed switchgear; supervisory and control switchboards; and switchgear devices.

Electric Power Substation
ICS 6590A + Test

10 hours

This unit focuses on the types, purpose, location, and rating of transmission and subtransmission substations, protection of substations, switching systems, switchgear ratings, types of circuit breakers, disconnecting switches, transformation in substations, voltage control in substations, control and operation of substations, and construction of substations.

Electric Power Substation 10 hours
ICS 6590B + Test

This unit focuses on the distribution systems and arrangement of primary and secondary feeders, subtransmission-supply arrangement, high-voltage and low-voltage structures, transformers, voltage-control equipment, metering devices, control instruments, and protective relays, rural substations, industrial substations, direct-current substations, and types of rectifiers used in substations.

Total Hours Fifth Six Months: 116

Sixth Six Months

Month 31:

Intro to Information Systems 44 hours

IS 101 TMCC

This course presents the apprentice an introduction to computer terminology, hardware and application programs for management information systems. Students are introduced to business, industry and education applications of popular software using spreadsheets, word processors, and data bases. "Hands on" experience is provided through student use of open lab

Relays 1 6 hours

NUS Course + Test

This course presents the basic theory of protective relays, a description of commonly used types of relays, and a brief explanation of how these relays are used. Additional details and examples of the applications of directional and non-directional relays are provided.

Demand Metering Concepts and Applications 6 hours

NUS Course + Test

This unit focuses on the need for demand metering and on basic demand metering concepts. Examples of mechanical, thermal, and solid-state types of demand registers are examined and explained.

Month 32:

Conservation and Load Management 6 hours

SPPC Course + Test

Defines what conservation and load management are and the purpose of their implementation. Typical conservation and load management programs briefly describes with special emphasis on how they relate to electric metering. This includes the following:

- a) Time-of-use metering.
- b) Real-time billing and peak indication alarms.
- c) Automated load management systems.
- d) Other conservation programs.

Month 33:

Polyphase Systems 1
NUS Course + Test

6 hours

In this unit the apprentice will learn about polyphase systems, primary and secondary delta connections, primary and secondary wye connections and polyphase banks.

Polyphase Systems 2
NUS Course + Test

6 hours

The second part of this unit discusses when and where various meters should be used. Blondel's theorem will be used to show how a polyphase system is accurately metered. The power measured in both balanced and unbalanced polyphase circuits will be examined.

Month 34:

Polyphase Transformer Rated Application
NUS Course + Test

6 hours

Apprentices examine transformer-rated installations and learn when and why instrument transformers are used. Apprentices also examine transformer basic, polyphase connections, and the most common polyphase transformer-rated installations. Installation procedures are discussed as well as the sizing and proper selection of CTs and VTs.

Month 35:

Polyphase Transformer Rated Meter Testing
NUS Course + Test

6 hours

This unit shows how to test three and four-wire polyphase transformer-rated meters. Close attention will be given to verifying correct disk rotation and matching current and voltage phases before testing. Calibration of typical three and four-wire polyphase transformer-rated meters will be demonstrated.

Month 36:

Principles of Accuracy Testing
NUS Course + Test

6 hours

This unit will present the apprentice with the basic theory of watthour meter accuracy testing. Apprentices will be introduced to typical test equipment and how that test equipment is connected to simulate in-service operating conditions for accuracy testing. In addition, apprentices are shown how to interpret test results. Finally, apprentices are shown test connection diagrams for some typical watthour meters. The areas to be discussed will include principles of meter operation, meter in-service connections, test equipment, test connections and comparisons, and test connection diagrams.

Total Hours Sixth Six Months: 92

Seventh Six Months

Month 37:

NEC Articles 90-285 (excl. 250)

8 hours

General Requirements

Mike Holt DVD Course + Test

The two DVDs cover electrical installations such as splices, terminals, working space, interruption rating, mechanical execution of work access, and guarding. Also the use and identification of the grounded (neutral) conductor and branch circuits, such as current rating, location of receptacles, switches and lights, branch circuits, feeders, outside wiring services, conductor sizing and protection, equipment and disconnecting means, overcurrent protection general rules, location, and enclosures.

Electronic Metering Group III

30 hours

Northwest Electric Metering School (September)

This class is taught off site. The topics covered include: design feature of solid state meters, electronic meter calculations, phasors, field test instruments, computer hardware, primary metering, current diversion, basic programming concepts, testing solid state metering, safety, and installation planning. There will also be labs dealing with phase angle metering and application of electronic metering programs lab.

Month 38:

NEC Article 250

9 hours

Grounding and Bonding

Mike Holt DVD Course + Test

The two DVDs will cover the purpose of grounding vs. circuit grounding, location of grounding connection, and enclosure grounding.

Self-Contained Polyphase Meter Testing

6 hours

NUS Course + Test

This unit demonstrates accuracy tests on a three stator self-contained polyphase meter and a two-and-a-half stator (split element) self-contained polyphase meter in the field. At the end of this unit the apprentice will understand accuracy tests typically performed on a self-contained, polyphase meter, the basic test equipment used for testing a self-contained, polyphase meter, how a self-contained, polyphase meter and the appropriate test equipment are connected to perform each type of accuracy test. The unit also explains basic preparations for testing a polyphase meter, how series element tests may be performed on a three-phase, four-wire, three-stator meter, how individual element tests may be performed on a three-phase, four-wire, three-stator meter, the basic layout of a three-phase, four-wire, two-and-a-half-stator meter (text only), how series element tests may be performed on a three-phase, four-wire, two-and-a-half-stator meter (text only), how individual element tests may be performed on a three-phase, four-wire, two-and-a-half-stator meter (text only). In addition the apprentice will learn preliminary steps that are often taken before adjustments are made to a polyphase meter and how adjustments can be made to a three-phase, four-wire, three-stator meter.

Month 39:

NEC Articles 300-392

8 hours

Wiring Methods

Mike Holt DVD Course + Test

The two DVDs will cover wiring methods, temporary wiring, conductor properties such as circular mils, insulation, ampacity and overcurrent protection, and Articles which contain the specific requirements for the installation of cables. Also covered are raceways, outlet boxes, and other enclosures such as cabinets, cutout boxes, switch-boards, and panelboards.

NEC Articles 400 - 460

3 hours

Equipment for General Use

Mike Holt DVD Course + Test

The DVD explains the general NEC rules that apply to appliances, electric space heating, motors, air-conditioning and transformers such as disconnects, conductor sizing, overcurrent, and overload sizing.

Month 40:

Demand Metering Concepts

6 hours

NUS Course + Test

This unit focuses on the need for demand metering and on basic demand metering concepts. Examples of mechanical, thermal, and solid state types of demand registers are examined and explained.

Testing and Calibrating Demand Meters

6 hours

NUS Course + Test

This unit will demonstrate a method of performing accuracy tests on kilowatt-hour meters equipped with various types of demand registers. Accuracy testing of single-phase and polyphase meters will be shown with emphasis on demand register test procedures.

Month 41:

"Q" Metering Concepts and Testing

6 hours

NUS Course + Test

This unit examines the concepts and theories of Q meters including how they work and how they are tested. Tests are shown in detail including connections and calibration techniques.

Reactive Meter Testing

6 hours

NUS Course + Test

This unit demonstrates accuracy testing on typical three and four wire reactive meter installations. Test procedures for three and four wire reactive meter installations are shown.

Month 42:

Solid State Meters and Associated Devices 6 hours
 NUS Course + Test

This unit examines many of the solid-state devices used in, or in conjunction with, electric metering. The devices are identified and described and their functions demonstrated. In addition, an example of a totally solid-state metering system is presented and its associated components identified.

Total Hours Seventh Six Months: 94

Eighth Six Months

Month 43:

Testing Totalizing Techniques 6 hours
 NUS Course + Test

This unit examines the principles of operation of four-element and six-element electromechanical totalizing meters. Test equipment connections for accuracy tests on both types of meters and test procedures are covered.

Month 44:

Totalizing 6 hours
 Internally Developed

Describes totalized billing and explains the benefits of its implementation and the class of customers that this billing method applies to. The three most common totalizing methods are described together with the reason for determining which method to select. This class also describes the most common hardware and software used in totalized billing.

Month 45-46:

Metering Standards 30 hours
 Regional Standards – North
 Volume 2

Month 47-48:

Review 32 hours

Total Hours Eighth Six Months: 74

First Six Months

075 hrs

- Safety 012 hrs
- Algebra 051 hrs
- Geometry 006 hrs
- Trigonometry 006 hrs

Second Six Months

082 hrs

- Basic Electricity 070 hrs
- Introduction to Metering 006 hrs
- Customer Relations and High Bill 006 hrs

1st Year Total: 157 hours

Third Six Months **119 hrs**

- Single Phase Metering 036 hrs
- Computers 035 hrs
- Installation Checks and Inspections 006 hrs
- Electrical Measuring Instruments 030 hrs
- Energy Diversion 012 hrs

Fourth Six Months **074 hrs**

- Using Electrical Test Equipment 006 hrs
- Reading Electrical Schematic Diagrams 010 hrs
- Reading Electrical Blueprints 010 hrs
- Solid State Fundamentals 018 hrs
- Transformers 010 hrs
- Transformer Operation 010 hrs
- Instrument Transformers 010 hrs

2nd Year Total 193 hours

Fifth Six Months **116 hrs**

- Electrical Meters and Associated Devices 006 hrs
- Poly Phase Metering 030 hrs
- Electric Power Measurements 020 hrs
- Telemetry 010 hrs
- Local Distribution of Electrical Power 010 hrs
- Underground Power Systems 010 hrs
- Switchgear 010 hrs
- Electric Power Substation 020 hrs

Sixth Six Months **092 hrs**

- Introduction to Computer Applications 044 hrs
- Relays I 006 hrs
- Demand Metering Concepts and Applications 006 hrs
- Conservation and Load Management 006 hrs
- Polyphase Systems I & II 012 hrs
- Polyphase Transformer Rated Application 006 hrs
- Polyphase Transformer Rated Meter Testing 006 hrs
- Principles of Accuracy Testing 006 hrs

3rd Year Total 208 hours

Seventh Six Months**094 hrs**

- NEC Articles 90 – 460 028 hrs
- Electronic Metering 030 hrs
- Self-Contained Polyphase Meter Testing 006 hrs
- Demand Metering Concepts 006 hrs
- Testing and Calibrating Demand Meters 006 hrs
- "Q" Metering Concepts and Testing 006 hrs
- Reactive Meter Testing 006 hrs
- Solid State Meters Associated Devices 006 hrs

Eighth Six Months**074 hrs**

- Testing Totalizing Techniques 006 hrs
- Totalizing 006 hrs
- Metering Standards 030 hrs
- Review 032 hrs

*4th Year Total 168 hours***Approximate Total Program Hours 726 hours**

Subsequent edition/volume changes of textbooks are approved for use through the discretion of the program.

Wages

Wage Schedule for Apprentice Meter Technician – See Collective Bargaining Agreement, but should be reflected of prorated portions of the Journeyman Wage. The current wage scale (on the check) outlined in the Collective Bargaining Agreement is as follows and should be updated through the Registration Agency Form 5910:


Job Code	Job Title	Step	Progression	2016 Effective 10/3/16
7673	Apprentice, Technician, Meter	1	Start	\$29.77
		2	6 Months	\$30.86
		3	1 Year	\$32.23
		4	18 Months	\$32.91
		5	2 Years	\$34.52
		6	30 Months	\$36.81
		7	3 Years	\$37.93
		8	42 Months	\$40.05



The foregoing Apprenticeship Standards, being in conformity with the rules, regulations and laws, and applicable federal regulations are hereby approved by the Nevada State Apprenticeship Council for SIERRA PACIFIC POWER COMPANY DBA NV ENERGY

Approved at registered with the Nevada State Apprenticeship Council

this 22ND day of May, 2017


Shannon Chambers, Secretary Director

MAY 22 2017
Date

PROGRAM # NV002700001

