

EET-1920: DIRECTED PRACTICE ELECTRICAL UTILITY TECHNOLOGY II

Cuyahoga Community College

Viewing: EET-1920 : Directed Practice Electrical Utility Technology II

Board of Trustees:

December 2022

Academic Term:

Fall 2023

Subject Code

EET - Electrical/Electronic Engineer

Course Number:

1920

Title:

Directed Practice Electrical Utility Technology II

Catalog Description:

Supervised practical applications of electrical overhead line worker job duties in a setting under personal supervision of FirstEnergy personnel. Emphasis on skills required to perform work on secondary voltage circuits. Emphasis on the installation of services, street lighting, and secondary circuits, bucket truck familiarization and bucket rescue. Overview of distribution electrical systems, and Occupational Safety and Health Administration (OSHA) rules. Safety topics include: Work Zone Traffic Control; Minimum Approach Distances; Rubber Protective Equipment; and Knowledge of UD Excavation/Trenching/Shoring.

Credit Hour(s):

4

Other Hour(s):

300

Other Hour Details:

Directed Practice: 20 hours per week (300 hours per semester)

Requisites

Prerequisite and Corequisite

EET-1910 Directed Practice Electric Utility Technology I, and EET-1210 AC Electric Circuits, or concurrent enrollment; or departmental approval.

Outcomes

Course Outcome(s):

Perform installation of residential electrical services at house, pole, street lighting, and secondary circuits, in accordance with OSHA regulations and electric company policy and procedures.

Objective(s):

- Given various types of ladders and a pre-determined location, inspect the ladder for use. Position and set up the ladder. Tie off the ladder at ground level, climb, and belt off and tie off the ladder at the top.
- Identify meters and their associated meter numbers and read and record proper meter readings.
- Inspect the meter socket, test for the proper voltage, and set a three-wire and/or four-wire meter.
- Remove customer kWh meter from cabinet, install the Beast of Burden in the meter cabinet, operate the device and determine which leg or legs of the service installation has a problem.
- Remove Beast of Burden and replace the customer's kWh meter.
- Identify, locate, and repair problems with single-phase and three-phase meter installation.
- Test voltage for the correct phasing of the service and connect the service.
- Install secondary current transformers or inspect previously-installed current transformers (all polarity marks will be facing the same direction on the CTs and all CTs will be shunted).

- i. Given a UD service with one faulted leg, connect the Servisavor to the customer's meter socket and restore temporary service to the customer.
- j. Adjust a MD-6 Hytool with a 3/16" Allen wrench.
- k. Install and connect one end of the service cable to the weatherhead.
- l. Install and connect one end of the service cable at the weatherhead, climb pole, sag service cable, and connect service to the energized secondaries.
- m. Splice two pieces of three-conductor, #4 aluminum service cable together.
- n. Use the proper die and tools to correctly splice two pieces of conductor together with a compression sleeve, and an automatic sleeve.
- o. Test material for continuity.
- p. Connect the voltmeter leads to the energized secondary, test the secondary voltage (phase to ground and phase to phase), read the indicator on the voltmeter, record the reading, and recall the reading.

Course Outcome(s):

Perform installation of streetlights in accordance with OSHA regulations and electric company policies and procedures.

Objective(s):

- a. Identify each light, select the proper material and make up the OAL light on a 30" aluminum upsweep bracket for a 120 V/100 W streetlight. You will also make up the luminaire light on a 8" bracket for a 120 V/70 W streetlight.
- b. Assemble lights to brackets, wired up, lamp and photo controls selected, and material ready to hang lights on two separate poles.
- c. Install correctly the made-up OAL light on the pole, install the 8' mast on the pole, and attach the luminaire on the end of the mast, in accordance with safe work practices and procedures.
- d. Troubleshoot several types of streetlights that were reported as not working. Examine, repair or determine the need to replace in accordance with safe work practices and procedures.

Course Outcome(s):

Transport, install, operate, and troubleshoot various transformers in accordance with OSHA regulations and electric company policies and procedures.

Objective(s):

- a. Load transformer on vehicle for transporting.
- b. Select transformers by kVA rating, primary and secondary voltage.
- c. Properly list the correct size and number of riser wire(s) needed.
- d. Properly read conventional transformer nameplates and select the correct transformer.
- e. Prepare transformer for single-phase installation.
- f. Identify and interpret a variety of nameplates.
- g. Change the secondary leads to make a straight 120 V transformer.
- h. Change the tap setting on the transformer to raise or lower the secondary voltage.
 - i. Inspect and assemble Loadbuster to both a universal stick and a Grip-all clampstick and prepare Loadbuster for use.
 - j. Attach loadbreak tool to a universal pole, position tool on a fused cutout, disconnect or pad-mounted gear and open the device using the loadbreak tool.
- k. Read conventional transformer nameplate and select the correct transformer for wiring a delta-delta and a delta-wye system.
 - l. Read conventional transformer nameplate and select the correct transformers for a wye-wye. Install and make the proper connections.
- m. Read conventional transformer nameplate and select the correct transformers for an open wye-open delta. Install and make the proper connection for an open wye-open delta bank.
- n. Read conventional transformer nameplate and select the correct transformer for a wye-delta closed bank. Install and make the proper connection for a wye-delta closed bank.
- o. Install a CSP transformer on an existing pole, tap to the pole ground, tie in risers, tap neutral riser to system neutral, install primary tap, and test for proper voltage on the secondary side.
- p. Use a voltmeter, a phase sequence indicator, energized bank and a bank to phase with it, phase banks together and separate phased banks.
- q. Use an ammeter, an energized one-phase 120/240 V transformer, check the load on the secondary side of the transformer.
- r. On a transformer trouble call, take the necessary steps to identify, locate, and repair the trouble.
- s. Given several cutout fuseholders that can be refused and fuse links, fuse or correctly refuse the cutout fuseholder(s) so that it is ready to be put into service.
- t. Assemble "L" bracket with cutout, arrester, fuse, bolts, washers, and hot-line clamp.

- u. Assemble and correctly install the crossarm brackets on the crossarm for a three-phase cutout and arrester.
- v. Given a portable generator and a 120 V tool, identify the controls, perform a pre-operations check, start the generator, operate the tool, and shut the generator down.
- w. Given a wood pole, transformer, capstan hoist, install capstan on pole and operate capstan hoist to raise transformer to the desired level on the pole and lower transformer back to the ground.
- x. Identify, inspect, and clean all parts of the Ampact tool with 100% accuracy.
- y. Using an Ampact tool, a supply of shells, various sizes of taps, an Ampact stirrup, a take-off clip, and a series of different size wires, make two connections and install the stirrup, then remove one of the taps.

Course Outcome(s):

Operate bucket trucks, perform bucket rescues, and perform pole-top rescues in accordance with OSHA regulations and electric company policies and procedures.

Objective(s):

- a. Given a bucket truck, you will set up a bucket truck, perform the items on the “pre-flight” checklist, and secure the bucket truck for travel.
- b. Given a bucket truck and all necessary equipment, engage the hydraulic system and set up bucket truck for operation in an energized area.
- c. Given a vehicle with a two-way radio, communicate with another vehicle from vehicle to station and from vehicle to Dispatch.
- d. Follow all FCC and electric company rules and regulations.
- e. Inspect, set up and drive truck, operate both the lower and upper bucket controls, and operate the jib of the material handler.
- f. Complete a Driver’s Inspection Report on a vehicle.
- g. Given an Altec material handler, transformer, and lifting sling, adjust jib to different working positions and use winch to raise and lower a transformer.
- h. Given a bucket truck with a simulated victim (mannequin) in the working area, evaluate the situation, call for help and operate ground controls of the bucket truck to bring victim to ground level without contacting any additional wires or the structure.
- i. Using a simulated victim (mannequin) in the bucket, and all the necessary rescue equipment, bring the victim to the ground using the lower boom controls, and remove the victim from the bucket using the rescue blocks attached to the boom.
- j. Using a bucket truck in an elevated position, a hand line, an emergency lowering device (ELD), and a direction altering device (DAD, used in some regions), fasten the ELD to the boom’s manufacturer’s attachment point, attach the DAD (if available) to the bucket, and descend to the ground.
- k. With a simulated victim (mannequin) on a pole (minimum of 15 feet from the ground) and all necessary tools and equipment, evaluate the situation, call for help, don climbers/body belt/tools provided for your protection, climb to the rescue position and lower the victim.
- l. Provide CPR, first-aid (if needed), and provide follow-up care until emergency assistance arrives.

Course Outcome(s):

Install underground electrical services.

Objective(s):

- a. Drive a ground rod by hand at a distance of 12” minimum away from the pole in undisturbed soil and at a depth of 6” below ground level.
- b. Send one end of ground wire up to line worker, pull and staple ground wire to the pole, make connections to the ground rod, and install one section of molding.
- c. Identify and state the use of all 25 UD related tools.
- d. Given 15 items of conduit and related material, name all conduit and related materials and state each item’s use.
- e. Given 18 items of UD related materials, name each piece of material and state its purpose.
- f. Given a Greenlee 690 blower/vacuum fish tape system, hand fish tape, ¼” or ¾” rope, and a section of conduit, install pull rope in conduit section using pneumatic and hand fish tape system.
- g. Properly prepare conductor, align equipment, pull through conduit, pull rope through conduit, install Kellem Grip, and pull in conductor using hand feed fish tape system without damage.
- h. Excavate hole to correct dimensions for a secondary handhole enclosure, install to specified level, and backfill according to installation instructions.
- i. Install an underground service in existing conduit from either an enclosure/handhole or pole riser to a meter riser and make all connections.
- j. Complete a splice on a single-phase underground service.

- k. Identify and install the marking system on pad-mount equipment, underground cables, and wood poles.
 - l. Prepare the running ground for use and install.
 - m. Using an A. B. Chance Tester, a set of overhead grounds, and a set of underground grounds, set up the test equipment and perform the necessary tests on both overhead and underground grounds to determine if they possess a satisfactory resistance level for use.
 - n. Using a White Safety Line Tester, a set of overhead grounds, and a set of underground grounds, set up the test equipment and perform the necessary tests on both overhead and underground grounds to determine if they possess a satisfactory resistance level for use.
 - o. Identify various types of grounds and potential testers and each type of ground and potential tester.
 - p. Inspect, prepare for use, and send up a pole on a hand line.
 - q. Identify, inspect, and prepare each ground and potential tester correctly as stated in the manufacturer's instructions.
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Methods of Evaluation:

- a. Industry required certification exams
- b. Demonstration of compliance with onsite site policies
- c. Evaluation by faculty based upon site visitations and written and oral feedback provided by directed practice supervisors
- d. Final Exam

Course Content Outline:

- a. Ladders
 - i. Inspection of
 - ii. Position and set-up
 - iii. Proper tie-off and climbing techniques
- b. Use and Operation of Tools and Equipment
 - i. MD-6 Hytool
 - ii. Voltmeter
 - iii. Loadbuster
 - iv. Loadbreak (S&C)
 - v. Portable generator
 - vi. Capstan hoist
 - vii. Ground rod
 - viii. Ampact Tool
 - ix. Various underground tools and materials
 - x. Various conduit materials
 - xi. Greenlee blower/vacuum
 - xii. Continuity tester
 - xiii. Beast of Burden
 - xiv. Von Servisavor
 - xv. Ground wire and moulding
- c. Service Installation
 - i. To house
 - ii. Install service at pole and service at house
 - iii. Splice overhead service cable
 - iv. Splice conductor on ground with compression sleeve
 - v. Read a kWh meter
 - vi. Set three-wire and four-wire meter
 - vii. Rotation of three-phase service
 - viii. Troubleshoot single and three-phase meter installation
 - ix. Match phases on service conductors
- d. Mobile Radio
 - i. Operation
 - ii. Use
- e. Rescue Operations
 - i. Pole top
 - ii. Bucket

- iii. Hurt man bucket truck
- iv. Self
- f. Transformers
 - i. Load and secure
 - ii. Selection of
 - iii. Selection of secondary risers
 - iv. Preparation
 - v. Nameplate
 - vi. Change secondary leads and tap settings
 - vii. Connect delta-delta and delta-wye
 - viii. Connect transformer wye-wye
 - ix. Connect transformer open wye-open delta
 - x. Connect transformer wye-delta closed
 - xi. Install and operate a CSP transformer
 - xii. Parallel transformer bank
 - xiii. Check load
 - xiv. Troubleshooting
- g. Cutouts
 - i. Re-fuse cutout door
 - ii. Assemble bracket for pole-mounted cutout and arrester
 - iii. Assemble three-phase cutout and arrester arm (wood) with crossarm brackets and braces
- h. Underground
 - i. Install underground conductor in conduit
 - ii. Install underground 600 V pedestal enclosure
 - iii. Install direct buried underground service
 - iv. Splice underground service
 - v. Install underground cable, pad-mount equipment, and wood pole marking system
- i. Streetlights
 - i. Make up
 - ii. Install
 - iii. Troubleshoot
- j. Grounds
 - i. Install traveling grounds
 - ii. A. B. Chance temporary ground testing (regional specific training)
 - iii. White temporary ground testing (regional specific training)
 - iv. Prepare grounds and potential tester for use
- k. Vehicles
 - i. Pre-flight bucket truck
 - ii. Set up and operate a bucket truck
 - iii. Operate a single-bucket material handler
 - iv. Operate a jib winch on an Altec material handler
- l. Safety
 - i. Work zone traffic control
 - ii. Minimum approach distances
 - iii. Rubber protective equipment
 - iv. Knowledge of underground excavation trenching & shoring

Resources

Herman, Stephen L. *Delmar's Standard Textbook of Electricity*. 7th ed. Clifton Park, NY: Delmar Cengage Learning, 2020.

Herman, Stephen L. *Electrical Transformers and Rotating Machines*. 4th ed. Clifton Park, NY: Delmar Cengage Learning, 2017.

National Fire Protection Association. *NFPA 70 National Electrical Code*. 2020. Quincy, MA: National Fire Protection Association, 2020.

Resources Other

- a. Company training materials.

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