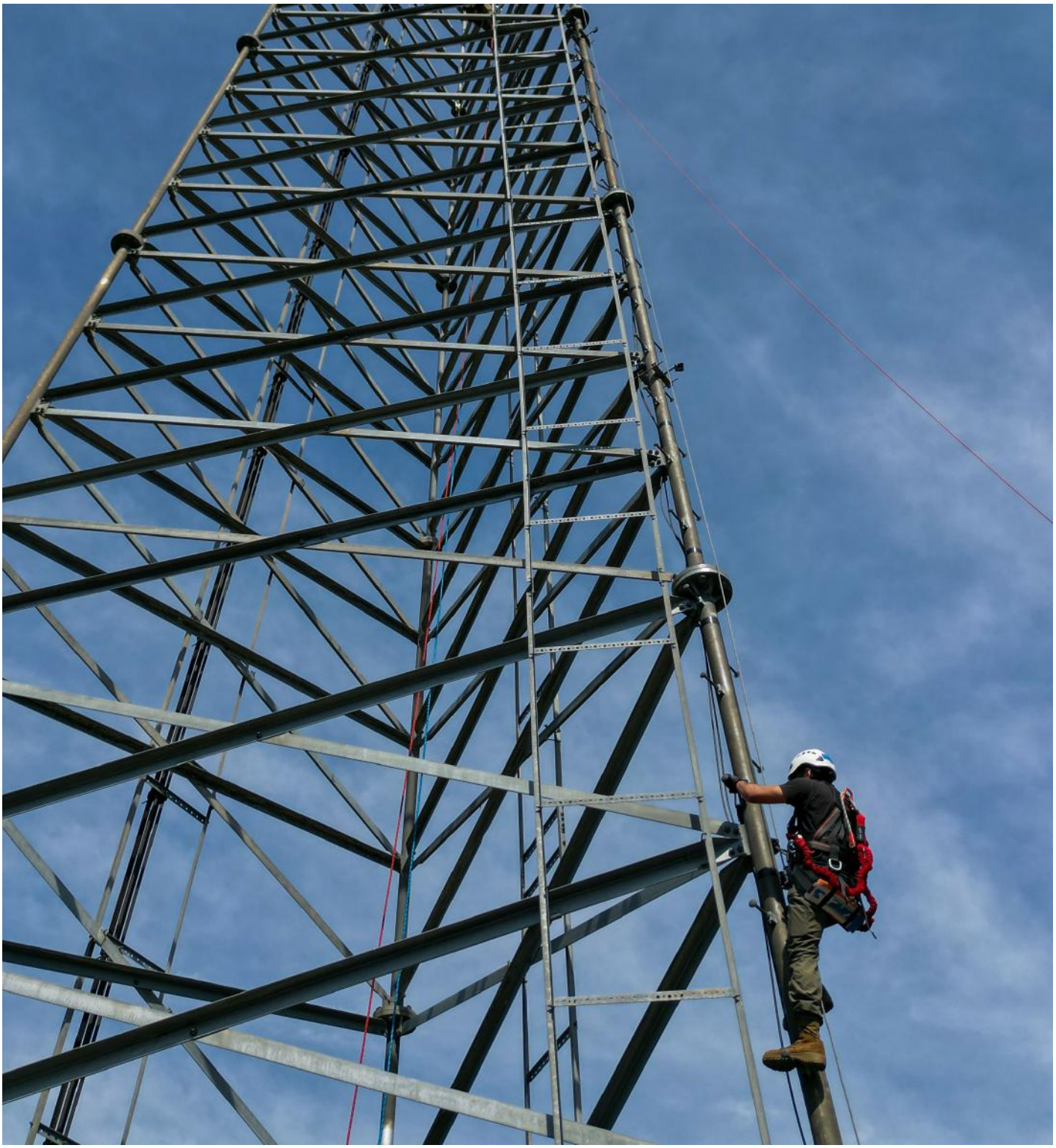
PCCA

E-BOOK



Apprenticeship Program Sponsor:

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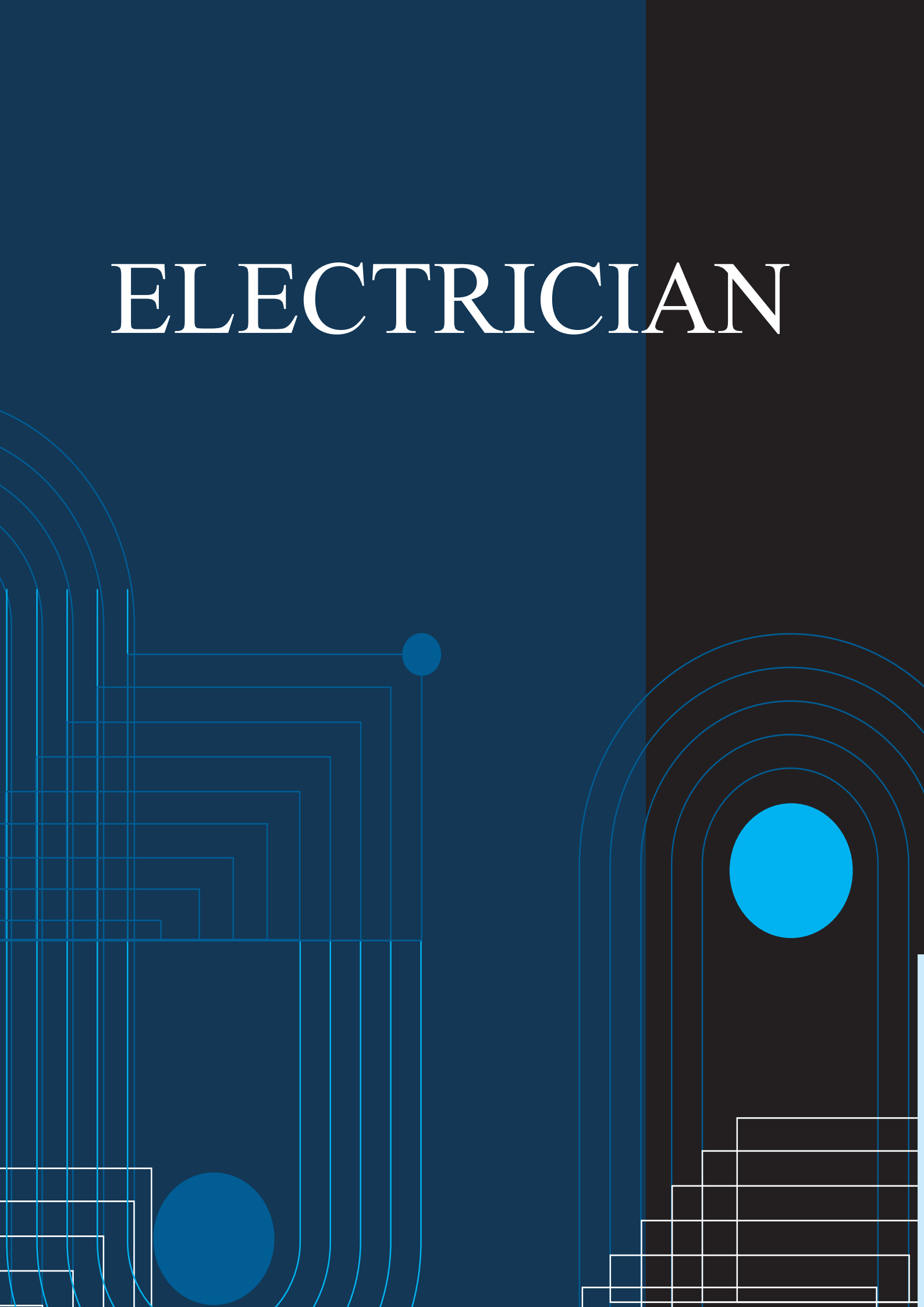
Department of Labor Approved Registered Apprenticeship Program, Occupations

ELECTRICIAN



WORK PROCESS SCHEDULE

Electrician

O*NET-SOC CODE: 47-2111.00 RAPIDS CODE: 0159 TB

Work Process Schedule:

Competency Checklist – Electrician

Work Process Schedule:	Approximate hours:
A. RESIDENTIAL WIRING	2250
B. COMMERCIAL WIRING	2250
C. INDUSTRIAL LIGHTING INSTALLATION/SERVICE	1500
D. GENERAL MAINTENANCE	1500
E. SIGNAL SYSTEMS & INTER-COMMUNICATIONS PHONES	150
F. AIR CONDITIONING & REFRIGERATION CONTROLS	200
G. SAFETY PRACTICES/INCLUDING SAFETY MEETINGS	150
TOTAL MAXIMUM HOURS:	8000

RELATED INSTRUCTION OUTLINE

Electrician

O*NET-SOC CODE: 47-2111.00 RAPIDS CODE: 0159 TB

Related Instruction Description:

Electrical, Year 1

Electrical hazards and safe working practices

OSHA Construction Safety - Electrical Safety, PPE, Falls, Ladders, Stairs and Scaffolds

Electrical Fundamentals: Matter, Electron Theory, Magnetism, Electricity, Uses of

Electromagnetism, The Electrical Circuit, Math, Electrical Formulas, Series Circuits, Parallel

Circuits, Series-Parallel Circuits, Multiwire Circuits, The Electrical System, Protection

Devices, Alternating Current, Capacitance, Inductance, Power Factor and Efficiency, Motors,

Generators, and Transformers

Introduction to the NEC - How to Use the NEC

AC/DC Fundamentals - Grounding and Bonding, Conductor Ampacity

Digital Multimeter Principles

Approximate Hours:

Hours: 160

Electrical, Year 2

National Electrical Code, NEC:

NEC - Article 90

NEC—Article 100, Definitions

NEC—Article 110, Requirements for Electrical Installations 1

NEC—Article 110, Requirements for Electrical Installations 2

NEC—Article 200, Use and Identification of Grounded [Neutral] Conductors

NEC—Article 210, Branch Circuits 1

NEC—Article 210, Branch Circuits 2

NEC—Article 210 - Branch Circuits 3

NEC—Article 215, Feeders

NEC—Article 220, Branch-Circuit, Feeder, and Service Calculations 1 and 2

NEC—Article 225, Outside Branch Circuits and Feeders

NEC—Article 230, Services 1 and 2

NEC—Article 240, Overcurrent Protection 1 and 2

Apprenticeship Supplement–Article 250, Grounding and Bonding

Lab - GFCI Devices

NEC—Article 242, Surge-Protective Devices (SPDs)

NEC—Article 300, General Requirements for Wiring Methods and Materials 1 and 2

NEC—Article 310, Conductors for General Wiring 1 and 2

NEC—Article 312, Cabinets, Cutout Boxes, and Meter Socket Enclosures

NEC—Article 314, Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; and Handhole Enclosures 1 and 2

NEC—Articles 320 and 330, Armored Cable (Type AC) and Metal-Clad Cable (Type MC)

NEC—Articles 334, 336, and 338, Cables Types NM, NMC, TC, SE, and USE

NEC—Articles 340, 342, and 348, Cable Type UF, Conduits Types IMC and FMC

NEC— Articles 350, 352, and 356, Conduits Types LFMC, PVC, and LFNC

NEC—Articles 344 and 358, Conduits Types RMC and EMT

NEC—Articles 362 and 376, Conduit Type ENT and Metal Wireways

NEC—Articles 380, 386, and 392, Multioutlet Assemblies, Surface Metal Raceways, and Cable Trays

Hours: 160

Electrical, Year 3

OSHA Construction Safety, Excavation/Motor Vehicles/Tool Safety

National Electrical Code, NEC - Article 90

NEC—Articles 400 and 402, Flexible Cords and Cables, and Fixture Wires

NEC—Articles 404 and 406, Switches and Receptacles

NEC—Article 408, Switchboards, Switchgear, and Panelboards

NEC—Articles 410 and 411, Luminaires and Low-Voltage Lighting Systems

NEC—Article 422, Appliances

NEC—Article 424, Fixed Electric Space-Heating Equipment

NEC—Article 430, Motors, Motor Circuits, and Controllers 1 and 2

Lab/Activity - Lighting—Ballasts and Transformers

NEC—Articles 440, 445, and 450: Air-Conditioning/Refrigeration Equipment and Transformers

Bonding and Grounding–Fundamentals

Bonding and Grounding–NEC, Articles, 90, 100, 110, 250

NEC—Articles 500-503, 511, and 514: Hazardous Locations, Commercial Garages, and Motor Fuel Dispensing

NEC—Articles 517, 518, 550, and 590: Health Care Facilities, Assembly Occupancies, Mobile/Manufactured Homes, and Temporary Installations

NEC—Articles 600, 604, and 6206: Electric Signs, Manufactured Wiring Systems, and Elevators

NEC—Articles 625 and 630: Electric Vehicle Charging System and Electric Welders

NEC—Articles 640 and 645: Audio Signal Processing and Information Technology Equipment

NEC—Article 680: Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations

NEC—Articles 700, 701, and 702 Emergency, Legally Required, and Optional Standby Systems

NEC—Article 7256/4/2024 Remote-Control, Signaling, and Power-Limited Circuits

NEC—Articles 760, 770, 800, 810, and 8206/4/2024 Fire Alarm Systems, Optical Fiber

Cables and Raceways, Communications Circuits, Radio and Television Equipment, and CATV

and Radio Distribution Systems.

NEC—Article 6906/4/2024 Solar Photovoltaic (PV) Systems 1

NEC—Article 6906/4/2024 Solar Photovoltaic (PV) Systems 2

NEC—Articles 480, 691, and 705 Storage Batteries, Large-Scale Solar Photovoltaic (PV)

Electric Supply Stations, and Interconnected Electric Power Production Sources (IEPPS)

NEC—Articles 705 and 706: Interconnected Electric Power Production Sources (IEPPS)

and Energy Storage Systems

NEC—Articles 706 and 710: Energy Storage and Stand-Alone Systems

Motor Controls–Units 1–36: Introduction to Motor Controls

Motor Controls– Units 4–8: Motor Controls and Schematics 1

Motor Controls–Units 9–10: Motor Controls and Schematics 2

Motor Controls– Units 11–12: Reversing Controls 1

Motor Controls–Units 13–14: Reversing Controls 2

Motor Controls–Units 15–20: Interconnected Electric Power Production Sources (IEPPS)

and Energy Storage Systems

Hours: 160

Electrical, Year 4

OSHA Construction Safety: Hazard Communication/Jobsite Exposures/ Work Zone Safety

Electrical Estimating–Chapters 1 and 2: Introduction and About Estimating

Electrical Estimating–Chapter 3: Understanding Labor Units

Electrical Estimating–Chapter 46/4/2024 Understanding Labor Units

Electrical Estimating–Chapter 56/4/2024 Determining Break-Even Cost

Electrical Estimating–Chapters 6 and 7: The Bid Process and Unit Pricing

Lab/Activity

Leadership Training, Part 1 and 2:

Code Review: Articles 90 through 110 and 200 through 240

Code Review: Articles 300 through 314

Code Review: Articles 400 through 480

Fundamentals Review–Unit 1 Electrician's Math and Basic Electrical Formulas

Fundamentals Review–Unit 2 Series, Parallel, and Multiwire Circuits

Fundamentals Review–Unit 3 Understanding Alternating Current

Fundamentals Review–Unit 4 Motor Basics

Fundamentals Review–Unit 4 Transformers

Fundamentals Final Review Units 1–4

NEC Calculations: Raceway and Box Calculations

NEC Calculations–Unit 6, Part A6/4/2024 Conductor Sizing and Protection Calculations 1

NEC Calculations–Unit 6, Part B6/4/2024 Conductor Sizing and Protection Calculations 2

NEC Calculations–Unit 7, Parts A and B: Motor and Air-Conditioning Calculations 1

NEC Calculations–Unit 7, Parts B and C: Air-Conditioning Calculations–Transformers 2

NEC Calculations–Unit 8, Parts A and B: Voltage-Drop Calculations

NEC Calculations–Unit 9, Parts A and B6/4/2024Dwelling Unit Calculations 1

NEC Calculations–Unit 9, Parts B and C6/4/2024Dwelling Unit Calculations 2

Lab/Activity: Dwelling Unit Calculations

NEC Calculations–Unit 10, Parts A and B: Multifamily Dwelling Calculations 1

NEC Calculations–Unit 10 Parts B and C: Multifamily Dwelling Calculations 2

Lab/Activity, Fire Alarm Systems

NEC Calculations–Unit 11, Parts A and B: Commercial Calculations 1

NEC Calculations–Unit 11, Parts B and C: Commercial Calculations 2

NEC Practice Quiz 166/4/2024Sections 90.1–680.25

NEC Practice Quiz 176/4/2024Sections 680.26–701.12

OSHA Construction Safety Handbook - Review safety rules and practices

Electrical Theory - Review

Level 4 Final Exam Part 1 - Journeyman Practice Exam, Electrical Theory

National Electrical Code - Review

Level 4 Final Exam Part 2 - Air-Conditioning Calculations–Transformers 2

Electrical Calculations - Review

Level 4 Final Exam Part 3 Journeyman Practice Exam, Electrical Calculations

Year 4-Hours: 180

Total Hours: 660

LINE ERECTOR

Suggested On-the-Job Learning Outline

Drive trucks or other vehicles to or at work sites.

A. Drive vehicles equipped with tools and materials to job sites.

Approximate Hour 100

Monitor work areas or procedures to ensure compliance with safety procedures

B. Adhere to safety practices and procedures, such as checking equipment regularly and erecting barriers around work areas.

Approximate Hour 100

Control power supply connections.

C. Open switches or attach grounding devices to remove electrical hazards from disturbed or fallen lines or to facilitate repairs.

Approximate Hour 100

Climb equipment or structures to access work areas.

D. Climb poles or use truck-mounted buckets to access equipment.

Approximate Hour 200

Inspect electrical or electronic systems for defects.

E. Identify defective sectionalizing devices, circuit breakers, fuses, voltage regulators, transformers, switches, relays, or wiring, using wiring diagrams and electrical-testing instruments.

F. Inspect and test power lines and auxiliary equipment to locate and identify problems, using reading and testing instruments.

Approximate Hour 500

Assemble electrical components, subsystems, or systems.

G. Install, maintain, and repair electrical distribution and transmission systems, including conduits, cables, wires, and related equipment, such as transformers, circuit breakers, and switches.

Approximate Hour 500

Repair electrical circuits or wiring.

H. Install, maintain, and repair electrical distribution and transmission systems, including conduits, cables, wires, and related equipment, such as transformers, circuit breakers, and switches.

Approximate Hour 100

Test electrical equipment or systems to ensure proper functioning.

I. Inspect and test power lines and auxiliary equipment to locate and identify problems, using reading and testing instruments.

Approximate Hour 300

Confer with coworkers to coordinate work activities.

J. Coordinate work assignment preparation and completion with other workers.

Approximate Hour 200

Align equipment or machinery.

K. Replace or straighten damaged poles.

Approximate Hour 200

Run wiring to connect equipment.

L. String wire conductors and cables between poles, towers, trenches, pylons, and buildings, setting lines in place and using winches to adjust tension.

Approximate Hour 500

Dig holes or trenches.

M. Dig holes, using augers, and set poles, using power equipment

N. Cut trenches for laying underground cables, using trenchers and cable plows.

Approximate Hour 500 - 250

Assemble mechanical components or machine parts

O. Attach cross-arms, insulators, and auxiliary equipment to poles prior to installing them.

Approximate Hour 200

Operate moving or lifting equipment.

P. Dig holes, using augers, and set poles, using power equipment.

Approximate Hour

Travel to work sites to perform installation, repair or maintenance work.

Q. Travel in trucks, helicopters, and airplanes to inspect lines for freedom from obstruction and adequacy of insulation.

Approximate Hour 300

Connect electrical components or equipment.

R. Install watt-hour meters and connect service drops between power lines and consumers&apos

facilities.

S. Splice or solder cables together or to overhead transmission lines, customer service lines, or street light lines, using hand tools, epoxies, or specialized equipment.

T. Clean, tin, and splice corresponding conductors by twisting ends together or by joining ends with metal clamps and soldering connections

Approximate Hour 300 - 500 - 100

Install metering equipment

U. Install watt-hour meters and connect service drops between power lines and consumers&apos
facilities.

Approximate Hour

Test electrical circuits or components for proper functioning.

V. Test conductors, according to electrical diagrams and specifications, to identify corresponding conductors and to prevent incorrect connections.

Approximate Hour 200

Solder parts or connections between parts.

W. Splice or solder cables together or to overhead transmission lines, customer service lines, or street light lines, using hand tools, epoxies, or specialized equipment.

X. Clean, tin, and splice corresponding conductors by twisting ends together or by joining ends with metal clamps and soldering connections.

Approximate Hour

Install insulation in equipment or structures.

Y. Place insulating or fireproofing materials over conductors and joints.

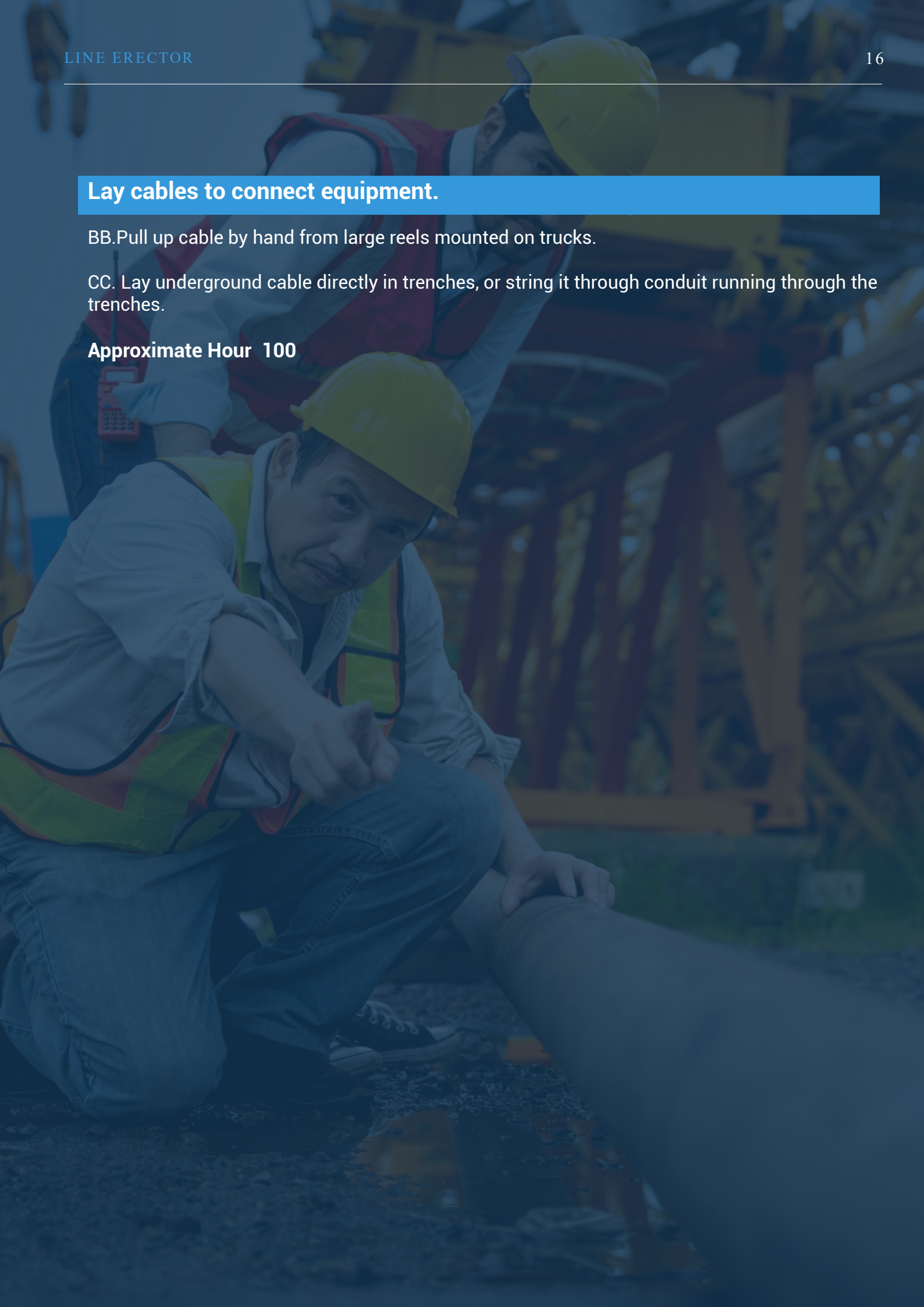
Approximate Hour

Cut materials according to specifications or needs.

Z. Trim trees that could be hazardous to the functioning of cables or wires.

AA.Cut and peel lead sheathing and insulation from defective or newly installed cables and conduits prior to splicing.

Approximate Hour 100



Lay cables to connect equipment.

BB.Pull up cable by hand from large reels mounted on trucks.

CC. Lay underground cable directly in trenches, or string it through conduit running through the trenches.

Approximate Hour 100

LINE ERECTOR CURRICULUM

Level 1

49102-11 Power Line Worker Safety (15 Hours)

Covers the safety equipment and safety practices associated with the special hazards of power line work, including electrical and arc flash hazards; traffic control; trenching; horizontal directional drilling; working in confined spaces; and safe entry into a substation.

49103-11 Introduction to Electrical Circuits (7.5 Hours)

Provides a general introduction to electricity and DC circuits, including theory of voltage, current and resistance, basic DC circuits, and Ohm's law. Also introduces the test equipment used in power line work.

49104-11 Introduction to Electrical Theory (7.5 Hours)

Describes how to calculate voltage, current, and resistance values in series, parallel, and combination DC circuits using Ohm's law. Also includes a basic description of grounding and bonding.

49105-11 Climbing Wooden Poles (80 Hours)

Describes how to safely climb a wooden utility pole. Covers climbing equipment, inspection of equipment, pole inspection, climbing techniques, and pole-top rescue.

49106-11 Climbing Structures Other Than Wood (40 Hours)

Explains the equipment, safety practices, and climbing techniques required to climb towers. Hazards associated with the environment, such as snakes, birds, insects, and weather hazards, are also covered.

49107-11 Tools of the Trade (10 Hours)

Covers the specialized tools used by line workers, including hot sticks, as well as universal tool accessories. Also covers ladders and work platforms; crimpers; cable cutters; pneumatic tools; and powder-actuated tools.

49108-11 Aerial Framing (80 Hours)

Explains how to install guys to support a utility pole, as well as how to install the equipment on the pole to support conductors. Includes the installation of cross-arms, transformers, and conductors.

49109-11 Utility Service Equipment (15 Hours)

Covers descriptions and operations instructions for use of the digger derrick, bucket truck, crane truck, and aerial lift. Also covers safety requirements; inspection and maintenance; driving and setup operations; and emergency procedures.

49110-11 Rigging (12.5 Hours)

Explains how to select and use rigging equipment. Covers common rigging equipment and rigging methods that are likely to be used by power line workers. Also covers hand signals and other methods of communication between the rigger and the crane operator.

49111-11 Setting and Pulling Poles (20 Hours)

Provides instructions for the storage, loading, and transport of wooden utility poles. Includes use of the digger derrick to dig the hole and install the pole. Also covers pole removal using a hydraulic jacking device.

49112-11 Trenching, Excavating, and Boring Equipment (7.5 Hours)

Covers the use and maintenance of trenching equipment, backhoe/loaders, and horizontal directional drilling equipment for the installation of direct-buried power lines. Includes a review of safety guidelines related to buried utilities.

49113-11 Introduction to Electrical Test Equipment (7.5 Hours)

Introduces the basic test equipment used by electrical workers to test and troubleshoot electrical circuits. Also covers specialized line worker test equipment, including the highvoltage detector, phase rotation tester, megohmmeter, phasing stick, and hipot tester.

Level 2

(Total Level Hours: 157.5)

Alternating Current and Three-Phase Systems (17.5 Hours)

Introduces the development of both single- and three-phase alternating current. Analyzes the relationship of AC phases and introduces key components used to refine AC power. Discusses the operation of transformers and introduces trainees to advanced AC concepts such as reactive power and the power factor. (Module ID 80201-11)

Aerial Distribution Equipment (25 Hours)

Identifies the various equipment components found on overhead distribution system poles and describes the function of each, including transformers, reclosers, fuses, sectionalizers, capacitor banks, and voltage regulators. (Module ID 80202-11)

Cable and Conductor Installation and Removal (20 Hours)

Describes the types of conductors and cables used in overhead and underground residential distribution systems and the equipment and procedures used to install and remove them. Includes methods used to splice conductors. (Module ID 80203-11)

Underground Residential Distribution (URD) Systems (30 Hours)

Describes the methods used to distribute power in residential and commercial subdivisions, including the equipment used in the process, such as pad-mount transformers and switchgear. The module covers the components and methods used to connect primary and secondary power, as well as the protective devices used in URD systems and methods used to locate and repair buried cables. (Module ID 80204-11)

Overhead and URD Service Installations (15 Hours)

Describes the methods and procedures used in terminating single-phase and three-phase aerial and URD systems at residential and commercial customer locations. Includes coverage of revenue meters and street light connections. (Module ID 80205-11)

Distribution Line Maintenance (50 Hours)

Describes the inspection process and the methods and procedures used to inspect and maintain poles, conductors, and equipment used in aerial and URD systems. Includes coverage of transformer testing; location and correction of faults in URD systems; load management systems; and protective device coordination. (Module ID 80206-11)

Level 3

(Total Level Hours: 145)

Introduction to Substations (10 Hours)

Provides an overview of the different types and functions of substations, identifies the various voltage classes, and introduces the primary equipment and components found in substations. Safe work practices and access issues related to substations are presented, as well as an introduction to oneline diagrams. (Module ID 82201-12)

Live Line Work (40 Hours)

This module covers the tools such as hot sticks, shotgun sticks, and wire tongs, along with the PPE and safe work practices that are critical elements of live line and bare hand work. The module includes coverage of the various live line tasks such as different methods of moving conductors and replacing insulators, cross-arms, and poles. (Module ID 80301-12)

Three-Phase URD Systems (25 Hours)

This module covers safety practices associated with threephase URD systems, describes vault and manhole applications, and describes different transformer configurations and sectionalizing equipment used in three-phase URD systems. It also covers three-0phase cables and how cable is pulled through conduit. (Module ID 80302-12)

System Protection and Monitoring (7.5 Hours)

Presents an overview of monitoring and protection systems and reviews the key components that make them work. Feeder diagrams and their use in locating and identifying components is also covered. (Module ID 80303- 12)

Troubleshooting (40 Hours)

This module focuses on the methods used to safely locate and correct faults in aerial and URD systems. It includes troubleshooting methods as well as work site preparation. (Module ID 80304-12)

Introduction to Smart Grid (2.5 Hours)

This module describes the network of transmission and distribution lines that delivers electricity between generating sources and consumers and explains how the smart grid overlays this network to maintain a balance between power availability and demand. (Module ID 80305-12)

Fundamental Skills for the Crew Leader (20 Hours)

While this module has been designed to assist the recently promoted crew leader, it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Job-site safety and the crew leader's role in safety are also discussed. This edition goes into detail on project planning, scheduling, and estimating with new performance tasks to assist the learning process. (Module ID 46101-11)

On the Job Practical Learning Categories

A. Overhead Systems

Includes all construction and maintenance of overhead electrical systems operating at or designated as distribution voltage levels, such as framing, setting poles, guys and anchors, installation and maintenance of equipment, cross-arms, transformers, protective and metering devices, stringing, sagging, tieing-clipping in primary and secondary conductors.

2000

B. Underground Systems

Includes all construction and maintenance of underground distribution and transmission systems, such as excavating trenches for the installation of direct buried cables, construction of duct bank systems and installing cable. Pulling in, splicing terminating cables, installing underground and pad mounted transformers, switch gear and protective equipment. Locating, troubleshooting and repairing defective cables and equipment.

2000

C. Live Line Maintenance

Includes all maintenance activities performed on overhead or underground energized equipment, structures and circuits using hot line tools and equipment or rubber gloving techniques. Includes inspection, cleaning and testing tools and equipment, working from structures, platforms and aerial lifts, changing out insulators, conductors, ties, switches, transformers and other equipment.

500

D. Substations

Includes all construction and maintenance activities associated with substations and switchyards, preparing grades and surfaces, constructing foundations, installing: maintaining perimeter fencing, installing-maintaining transformers, switch gear, metering, protective and control devices, capacitors, voltage regulators, and grounding systems.

500

E. Transmission Systems

Includes all constriction and maintenance of overhead electrical systems operating at or designated as transmission or sub-transmission systems. Includes site and right of way clearing or maintenance. Construction of tower and structure foundations, erecting poles, towers, and structures. Installing insulators and equipment, stringing, sagging, clipping or tieing in conductors. Installation of control or protective devices and equipment.

500

F. Line Constriction Vehicle-Equipment

Includes those duties associated with the actual operation of line vehicle and equipment such as operator pre-inspection, maintenance and/or repairs, positioning and setting up line trucks, aerial lifts, augers, digger derricks, air compressors, back hoes, trenchers, cable pulling as well as wire stringing and tensioning equipment, graders, bull dozers, etc. Time reflects actual equipment operating hours, not driving time.

500

Total Hours 6000

ENERGY TECHNICIAN I

RELATED INSTRUCTION OUTLINE

Energy Technician I

Alternate Name: Energy Specialist

O*NET-SOC CODE: 47-4011.01 RAPIDS CODE: 2005CB

Related Instruction Description:	Approximate Hours:
Introduction to Hand and Power Tools	12
Basic AC/DC Electrical Theory	25
Electrical Safety for Energy Systems	25
Job Safety and Hazard Analysis	10
Installation and Maintenance of Energy Systems	50
Fall Protection and Rescue Training	8
Roofing Deployment Rigging Methodologies	20
At Height Work Safety Standards and Regulations	15

Total Hours 165

WORK PROCESS SCHEDULE

Energy Technician I

Alternate Name: Energy Specialist

O*NET-SOC CODE: 47-4011.01 RAPIDS CODE: 2005CB

Apprentices will be assessed on these competencies by their instructors, mentors, and/or supervisors over the course of the apprenticeship using the following rating scale:

Project Layout

Competencies

A. Determine construction project layouts

Materials

Competencies

A. Select construction materials

Inspect and Install

Competencies

A. Inspect electrical or electronic systems for defects

B. Install electrical components, equipment, or systems

C. Install energy systems

D. Test green technology installations to verify performance

Analyze risks related to investments in green technology.

Competencies

A. Identify any health or safety issues related to planned weatherization projects.

Assess the cost effectiveness of products, projects, or services.

Competencies

A. Using knowledge of energy use, construction, maintenance, system operation, or process systems, analyze technical feasibility

Evaluate condition of properties.

Competencies

A. Determine appropriate locations for operations or installations

Advise others on business or operational matters.

Competencies

A. Recommend energy-efficient technologies or alternate energy sources.

Correspond with customers to answer questions or resolve complaints.

Competencies

A. Educate customers on energy efficiency or answer questions on topics such as the costs of running household appliances or the selection of energy-efficient appliances.

Maintenance

Competencies

A. Maintain mechanical equipment

Total Hours: 2000

TELECOMMUNICATIONS TECHNICIAN

RELATED INSTRUCTION OUTLINE

Telecommunications Technician

(Alternate Name: Broadband Technician)

O*NET-SOC CODE: 49-2022.01 RAPIDS CODE: 0618HY

Related Instruction Description:	Approximate Hours:
NCTI HSD Installation Certification Preparation	8
NCTI IP Voice Certification Preparation	8
NCTI Installing SMB Telecom Certification Preparation	18
NCTI Techsellence Certification Preparation	2
NCTI Consumer Digital Electronics Certification Preparation	16
NCTI Installer Technician Certification Preparation	40
NCTI Master Installer Certification Preparation	68
TOTAL MINIMUM HOURS:	**160**

Upon successful completion of the RTI, the Apprentice will be eligible to sit for the corresponding exams.

WORK PROCESS SCHEDULE

Telecommunications Technician

(Alternate Name: Broadband Technician)

O*NET-SOC CODE: 49-2022.01 RAPIDS CODE: 0618HY

Work Process Schedule:

Competency Checklist – Telecommunications Technician (Alternate Name: Broadband Technician)

Work Process Schedule:

Basic Installer

- Installation of adapters that focus on delivering TV services
- Reliability of cable drop delivering cable services
- Techniques, precautions, standards, options, tools and materials used when installing unshielded twisted-pair cable
- Differences between underground and aerial cable
- MoCa installation with DVR service (if applicable)
- Troubleshooting cable systems

Approximate Minimum – Maximum Hours: 500 - 600

VOIP, HSD and TechSellence Installer

- Demonstrate an organized approach to solving problems
- Perform remote troubleshooting through diagnostic techniques and pertinent questions
- Troubleshoot problems with the motherboard, processor, and memory
- Troubleshoot storage devices and common problems with I/O devices

Approximate Minimum – Maximum Hours: 300 - 450

VOIP, SMB and Consumer Digital Electronics

- Installation of VoIP Systems and troubleshooting
- nstallation of internet/phone hybrid modems
- Reliability of cable drop delivering phone services for SMB
- Troubleshooting VoIP system for SMB
- Configuring consumer electronics with broadband services

Approximate Minimum – Maximum Hours: 600-700

Low Voltage Skills

- Perform all three broadband installations within required quality check metrics with limited degree of failure Understanding and identifying ingress
- Understanding and identifying egress
- Understanding and identifying leakage
- Understand and troubleshoot issues relating to ingress, egress and leakage

Approximate Minimum – Maximum Hours: 600-750

TOTAL MINIMUM - MAXIMUM HOURS: 2000 – 2500

FIBER OPTIC TECHNICIAN

RELATED INSTRUCTION OUTLINE

Fiber Optic Technician

O*NET-SOC CODE: 49-2021.00 RAPIDS CODE: 2064CB

Related Technical Instruction	Approximate Hours
Job Hazard Analysis, Statement of Work, and Traffic Control	8
Blueprint Reading	4
NFP. Electrical Fundamentals	40
OSHA-10	10
CPR, First Aid and AED	6
History and Principles of Fiber Optic Systems	10
Fiber Optic Characteristics, Safety Requirements, and Construction Theory	10
Fiber Optic Cables, Splicing, and Components	28
Bucket Truck, Pole Climbing, Fall Protection, and Lashing	20
Cable Installation, Hardware, and Design Considerations	10

TOTAL HOURS: 146

WORK PROCESS SCHEDULE

Fiber Optic Technician

O*NET-SOC CODE: 49-2021.00 RAPIDS CODE: 2064CB

Work Process Schedule:

Competency Checklist – Fiber Optic Technician

Job Function 1: Develop and maintain a safe and secure work environment

Competency Outcomes

1. Comply with the site-specific safety plan

2. Select, inspect, setup, secure, and use ladders, scaffolding, and construction lifts to access rooftop work

3. Select, inspect, use, and maintain personal protective equipment (PPE)

4. Select, inspect, use, and maintain electrical equipment

5. Visually inspect and maintain all tools and equipment

6. Conduct site hazard assessment

7. Follow lockout/tagout procedures

Job Function 2: Cabling and Termination

Competency Outcomes

1. Terminates copper ends

2. Install a work area outlet for floor, modular furniture, and wall (terminate CAT 3 & CAT 5 jacks. Mount face plates and surface mount boxes correctly. Adhere to IES COMMERCIAL labelling standards).

3. Build closets (Mount and install backboards, cross connects, racks, patch panels, fiber optic and hardware).

Install grounding for racks, equipment and cable as required. Complete all IDC connections (e.g., terminate 110/66 blocks and patch panels).

4. performs testing: continuity test horizontal and riser cable; use of volt-ohmmeter; troubleshoot opens, crosses, shorts, and transpose pairs on horizontal and riser cable; use a tone set.

5. Installs LC, SC, ST, FC, FDDI, SMA and MPO/MTP connectors, for both multi-mode & single-mode fiber

6. Terminate simplex & duplex jumper cord

7. Terminate & breakout outside plant (loose tube) fiber (e.g., Corning/CommScope)

8. Terminate & breakout outside plant (loose tube) fiber (e.g., 3DNX)

9. Terminate indoor tight buffered multimode and single-mode fiber

10. Install fan out kits including buffer tube

11. Calculate end to end loss budgets in accordance with TIA/EIA standards for multimode & single-mode fiber

12. Complete all IES paperwork accurately and on time specifically: timesheets, material transfers, work orders, change orders, Job Blog, tool transfers and others as required

Job Function 3: Testing

Competency Outcomes

1. Perform test using an OTDR, Fluke DTX 180 or equivalent

2. Troubleshoots using an OTDR to identify and correct problems end to end, and Network wide

3. Identify material absorption losses

4. Test and identify bending and/or insertion loss

Job Function 4: Splicing

Competency Outcomes

1. Perform mechanical splicing with all types of fiber cable

2. Perform fusion splicing with all types of fiber cable

3. prepare a splice closure and a fiber-optic splice tray

4. Perform fiber handling and cleaving

OVERHEAD UTILITY INSTALLER TECHNICIAN

RELATED INSTRUCTION OUTLINE

UNDERGROUND UTILITY INSTALLER TECHNICIAN

O*NET-SOC CODE: 49-9052.00 RAPIDS CODE: 3009CB

The following are courses to be completed during the term of apprentice and under direct supervision of a Journeyworker.

Core Skills:	Approximate Hours
1.0 Inspection, Care & Use of Personal Protection Equipment	1 hour
2.0 OSHA 10	10 hours
3.0 First Aid / CPR / Blood Borne Pathogens	4 hours
4.0 Hazard Assessment & Communication	10 hours
5.0 Radio Frequency (RF) Awareness & Safety	1 hour
6.0 Underground Utility Locate Process (One Call)	2 hours
7.0 CDL & Safe Driving Practices including successful operate of tractor and trailer	20 hours

8.0 DOT – Securement of Equipment or Load	2 hours
9.0 Reading Blueprint / Construction Drawings	8 hours
10.0 Job Site Management	8 hours
11.0 Excavation & Restoration	16 hours
12.0 Horizontal Directional Drilling (HDD) and Other Equipment Operation Best Practices	10 hours
13.0 Conduit / Duct Bank Installation	12 hours
14.0 Manhole / Hand Hole Installation	12 hours
15.0 Cable Handling, Installation, and Splicing	20 hours
16.0 Backfill, Compaction, Finish Grading	10 hours
17.0 Electrical Safety & Stray Voltage Detection	5 hours
18.0 Lock Out / Tag Out	2 hours
19.0 Material Handling & Storage	2 hours
20.0 Apprenticeship Program Overview	1 hour

TOTAL: 156 hours

WORK PROCESS SCHEDULE

OVERHEAD UTILITY INSTALLER TECHNICIAN

O*NET-SOC CODE : 49-9052.00 RAPIDS CODE : 3008CB

ON-THE-JOB LEARNING (OJL)

Description:

The Overhead Utility Installer Technician (OUIT) is a member of a crew with skills in the construction and maintenance of overhead telecom utility and broadband systems. Depending on the service provided, the OUIT will work with a wide variety of cabling, including fiber optic cable, as part of their daily work routine. In addition, the OUIT may be required to operate overhead equipment.

The OUIT typically performs their job duties in outdoor environments, in all weather conditions, and includes some travel. The OUIT must have the ability to lift and/or pull 50-75 pounds several times each day and can endure long periods of standing, sitting or walking. The ability to bend, twist, and reach overhead is required along with the continuous use of both hands to operate hand tools and perform other duties.

The following outlines the OJL for the occupation of OUIT. The suggested related instruction, which supplements the OJL, follows the OJL process.

Directions: Evaluate the apprentice's competency and skill level using the rating scale below. The numerical ratings of 4, 3, 2 and 1 are not intended to represent the traditional school grading system of A, B, C and D. Ratings should reflect job readiness for each of the competencies rather than a grade given in the class.

Rating Scale:

4 - Skilled can work independently with no supervision

3 - Moderately skilled can perform job completely with limited supervision

2 - Limited Skill– required instruction and close supervision

1 - No Exposure–No Experience or knowledge in this area

This is a competency-based apprenticeship. OJL competencies are identified within the tables below.

The competencies listed below may be completed in any order.

On-The-Job Learning, Compentecies Tasklist:

OVERHEAD UTILITY INSTALLER TECHNICIAN

Pole climbing

Install communication support strands

Lash communication lines

Perform line tensioning

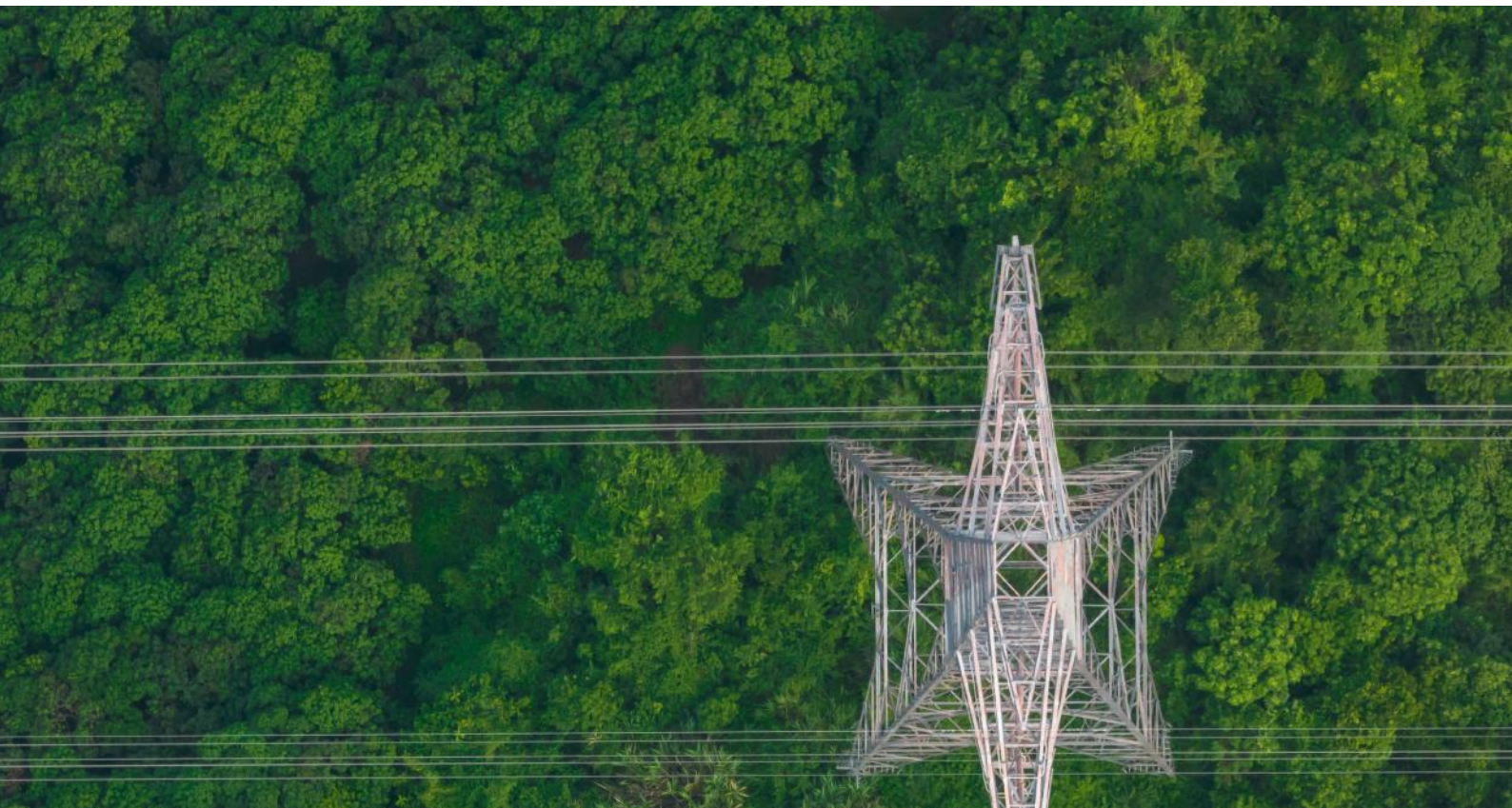
Terminate aerial lines (e.g., clipping, dead ending)

Install overhead pole mounted equipment

MAINTAIN AERIAL UTILITIES

Perform pole inspections

Identify vegetation encroachment



On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

PROFESSIONAL DEVELOPMENT ACTIVITIES

Occupational Safety and Health

Administration (OSHA) 10

Traffic Flagger

Cardiopulmonary resuscitation (CPR)/First Aid

ADMINISTRATIVE TASKS

Finalize as-built documents

Complete daily timesheets and detailed recording of work activity

Maintain equipment documentation

Maintain job-site report

Manage jobsite or truckinventory

Complete accident/incident/outage reports

Maintain certifications and endorsements as required by employer such as:

- Commercial driver's license (CDL)
- Operator Department of Transportation (DOT) qualifications
- OSHA (10, 30)
- Confined Space
- Shoring/Trenching
- Hazard communication (HAZCOM)
- Traffic Flagger

On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

OFFICE TOOLS

Effective use of office PC software when applicable. Products such as MS Word, Excel, PowerPoint

Manages email

Demonstrates proper use and maintenance/care for Laptop, Tablet, or cell phone

USE OF HAND TOOLS & HEAVY EQUIPMENT

Demonstrates proper use of common hand tools such as:

- Air Compressor
- Air & Hydraulic Tools
- Block & Tackle
- Dynometer (tension)
- Fall Restraint Equipment
- Fusion Machines
- Gas / Manhole Monitors
- Hand tools
- Hot Line Electrical Tools
- Lasers / Transits
- Multi-Meter
- OTDR (Optical
- Time Domain Reflectometer)
- Pipe Threading Equipment
- Power Tools
- Pumps
- Root Saws
- Slings / Harnesses
- Tape Measure
- Traffic Control Tools
- Underground Utility Locator
- Voltage Indicator

Demonstrates proper use of common heavy equipment such as:

Backhoe or Mini Excavator

Directional Boring Machine

Dozer

- Dump Truck
- Hydrovac / Flusher Truck
- Plow – Mainline and drop
- Tractor and Trailer
- Winch

Related Instruction Descriptions – Overhead Utility Installer Technician

1.0 Inspection, Care & Use of Personal Protection Equipment (PPE): Each apprentice must be trained in the inspection, care and use of PPE for the particular scope of work (SOW) and hazards addressed through their use. While the apprentice is being trained in PPE inspection, care and use, they are to be under direct supervision of a Journeyworker at all times, enabling them to draw on the competencies of the Journeyworker as they grow in experience in the inspection care, and proper use of PPE. Examples of PPE used by an apprentice include hardhat, proper footwear, eye/face protection, hearing protection, high voltage gloves and glove testing, high voltage blankets and blanket testing, high voltage overshoes and fall protection equipment. This list is not exclusive or exhaustive as the SOW may require the supervisory, Journeyworker to engage other types of engineering controls or safety measures. (This topic is part of OSHA 30 course content.)

2.0 OSHA 10 Hour: This is a version of the OSHA 10-hour course that is provided by a trainer that has been authorized to perform instruction from OSHA. Topics covered can include hazard identification, exit routes, electrical safety, personal protective equipment, hazard communication, ergonomics, recordkeeping, and reporting, etc. This course does not include confined space training.

3.0 First Aid/CPR/Blood borne Pathogens: Must be properly trained and able to render First Aid, Cardiopulmonary Resuscitation and protect against infection from Blood Borne Pathogens. These courses follow the agendas established by Red Cross, American Heart Association, National Safety Council, or other like organizations. (This topic is part of OSHA 30 course content.)

4.0 Hazard Assessment & Communication: An introduction to the various environments and/or structures that work will be performed on. Based upon the SOW and the type of structure it is being applied to the hazards may change and this requires the ability to understand that there is a hazard, and it must be communicated to the rest of the team. (This topic is part of OSHA 30 course content.)

5.0 Radio Frequency (RF) Awareness & Safety: Overhead Utility Installer Technician (OUIT's) could be exposed to radiofrequency radiation every day and not be aware of it. It is important for there to be an understanding of the hazard associated with RF and the ability to work as part of a team to communicate the hazard and means of abatement or use of PPE for protection.

6.0 Underground Utility Locate Process & One Call Requirement: This course will prepare the apprentice to assist the UUIT to ensure all utilities are located and marked prior to digging/excavation per 29 CFR 1926.651(b) (2). This includes hand digging and pot holing.

7.0 Commercial Driver's License (CDL) & Safe Driving Practices: Travel from one site to another is one of the greatest risks that face workers in this industry. This course will take the apprentice through the DOT rules and regulations for the industry. Specific emphasis is placed upon proper rest, vehicle inspection, trailer inspection and backing, merging in and out of traffic, and what to do in the event of an emergency. CDL instruction provided off site and by a third-party instructor.

8.0 DOT Required Securement of Equipment or Load: Introduction to performance requirements concerning cargo deceleration in the forward direction, and acceleration in the rearward and lateral directions, that cargo securement systems must withstand per Federal Motor Carrier Safety Administration (FMCSA) requirements.

9.0 Reading Blueprint/Construction Drawings: In this course, the apprentice will learn to understand, navigate, and use blueprints/construction drawings to support pre-construction project planning, job site hazard assessment, scope of work assignment and job site management activities..

10.0 Job Site Management: This course will address best practices of job site management including coordination of multiple parties on site, monitoring project performance, managing quality and safety, and addressing issues that “go wrong."

11.0 Pole Climbing: This course teaches the proper care of climbing tools and climbing wood structures. The course will give actual hands-on experience for pole top operations that require dynamic action.

12.0 Bucket Truck (Aerial Lift): Bucket truck training teaches the skills necessary to safely operate a bucket truck. The course will give actual hands-on experience for bucket truck rescue operations that require dynamic action.

13.0 Cable Handling, Installation and Splicing: This course will provide instruction in fiber optic technology including theory, safety, installation, splicing and testing techniques. Upon successful completion, the student may receive Fiber Optic Technician Certification from the Fiber Optic Association.

14.0 Pole Excavation, Installation, Removal & Restoration: This course is designed to provide apprentices with a basic understanding of and the ability to identify existing and predictable hazards in the surroundings of the excavation process, the resulting pole installation, removal and restoration of the site as part of construction completion. Backfill and compaction methods will be discussed.

15.0 Electrical Safety & Stray Voltage Detection: Training in the identification and abatement of electrical hazards that may be encountered as a part of the SOW. Electrical Safety training to include Minimum Approach Distance (MAD) for telecom workers as per OSHA 29 CFR 1910.268 Table R-2, testing of rubber goods (Gloves booties, blankets), proper use of a Foreign Voltage detector, other volt and voltage detector equipment. Identification and basic understanding of electrical distribution overhead wiring systems and components, Telecom Worker safety (40") zone and distribution pole clearance requirements as per NESC, OSHA, State, Local and Electric Utility standards.

16.0 Lock Out/Tag Out: Must be trained in the identification and abatement of electrical hazards that may be encountered as a part of the SOW. Such training will address the proper use of monitors, lock out tag out, system turn down and client communication IAW 29 CFR 1926.4, sub part K. (This topic is part of OSHA 30 course content.)

17.0 Material Handling & Storage: This course provides basic information that apprentices should know before moving, handling, and storing materials; introduction of potential hazards for workers; discussion of precautions should workers take when moving materials manually or mechanically; precautions workers must take to avoid storage and stacking hazards. Training to include proper moving of wood poles and cable reels. (This topic is part of OSHA 30 course content.)

18.0 Responding to Emergency Situations: This course teaches the appropriate way to respond to emergency situations, keeping the public safe, identifying hazards, and what to do if an electrical hazard is found.

19.0 Apprenticeship Program Overview: This course will provide the apprentice with an overview of the apprenticeship program including information on the National Sponsor, employer's expectation, discussion of the Standards of Apprenticeship, etc.

SUBSURFACE UTILITY TECHNICIAN

WORK PROCESS SCHEDULE

SUBSURFACE UTILITY TECHNICIAN

(Alternative Title: Utility Locator/Locator Technician)

O*NET-SOC CODE: 47-4011.00 RAPIDS CODE: 2041CB

Competency Checklist – Subsurface Utility Technician

COMPETENCIES:

SAFE DRIVING

1. Demonstrates safe and courteous driving skills

2. Adheres to cell phone policy while driving requiring hands-free device and refrains from texting while driving

SAFETY MEETINGS

1. Attends and participates in Monthly Safety meetings

JOB SAFETY ANALYSIS (JSA)

1. Attends and actively participates in daily JSA meeting prior to starting project

2. Completes field tasks in accordance with hazards and mitigation practices identified on JSA for specific task

3. Actively participates in hazard recognition for associated field tasks

BACK SAFETY

1. Exercises back safety while performing tasks that may cause back injury such as use of vacuum hose, pogo tamper, jackhammer and vault cover removal tools, as well as lifting and moving.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Demonstrates consistent use of PPE to protect eyes, ears, feet, head, etc. from corresponding hazards

VAULT COVER REMOVAL Dated Completed Approved By, Initials:

1. Identifies and uses the proper tool to remove vault covers

2. Uses tool in a safe manner to remove and replace cover

3. Recognize the hazards associated with broken circular covers or non-circular covers.

4. Uses proper lifting techniques while removing vault covers

CONFINED SPACE AWARENESS

1. Recognizes a confined space, observes and understands the potential hazards contained within

2. Understands that entry into confined spaces is prohibited without proper OSHA training and equipment

3. Completes any required confined space entry forms or checklists

TRUCK SHEET

1. Completely and accurately accounts for completed daily activities on project.

2. Completes truck sheet to include the following:

- Date
- Mileage
- Office
- Truck/Trailer number
- Crew members
- Project costs
- Project effort
- Production Quantities
- Special notes

DAILY PRE-TRIP VEHICLE INSPECTION

1. Completes a walk around the vehicle to account for key mechanical and safety items prior to vehicle operations on a daily basis

DRIVER'S DAILY LOG

1. Federal Motor Carrier Safety Administration (FMCSA) daily log required to be completed by the driver of a Commercial Motor Vehicle (CMV) operating greater than a 100-mile radius from vehicle garaged location

2. Must be completed for the proceeding 7 days before driving CMV

3. Documents drivers' activities, (off duty, sleeper berth, driving, on duty not driving) for a 24-hour period completely and accurately

TEST HOLE DATA SHEET

1. Promptly, accurately and completely documents test hole data on Test Hole Data Sheet during vacuum excavation

DIESEL OPERATIONS

1. Properly turns the key to the "ON" position to allow glow plug to heat up before starting engine

2. Allows engine to warm up before shifting into gear

3. Always refuels diesel engines with diesel fuel

VEHICLE OPERATION & MAINTENANCE

1. Safely and properly hooks up, backs up, detaches, and secures any towed equipment, e.g., compressor, trailers, etc.

2. Possesses a working knowledge of the daily maintenance requirements for the vehicle driven

3. Properly checks all of the fluid levels associated with the vehicles and vacuum systems and adds fluids to safe levels as necessary.

4. Regularly refuels before tank reaches 1/4 of a tank

5. Maintains clean and tidy vehicles

GROUND GUIDING

1. Properly and safely acts as a ground guide for vehicles that are backing up

2. Properly and safely acts as a ground guide for vehicles that are pulling off of and on to paved surfaces

3. Properly and safely acts as a ground guide for vehicles that are backing up with trailers

4. Properly and safely acts as a ground guide for vehicles that are pulling into and out of various traffic control situations

VACUUM HOSE ASSEMBLY

1. Uses proper techniques in cutting rigid plastic pipe (PVC) and flexible vacuum hose

2. Uses proper techniques to attach rigid plastic pipe (PVC) to vacuum hose

3. Properly connects vacuum hose assembly to spoils tank

4. Demonstrates the ability to identify the location of blockage in vacuum hose assembly and to dislodge blockages in an efficient manner

VACUUM SYSTEM OPERATIONS & MAINTENANCE

1. Properly starts and shuts down the various vacuum system engines

2. Properly and completely cleans out all of the components of the various vacuum systems

3. Properly operate the hydraulically operated lifts for vacuum system spoils tank and checks for obstructions before lowering tank

4. Properly monitors when to clean and/or replace filters associated with vacuum systems

5. Properly checks all of the fluid levels associated with the various components of the vacuum systems and add fluids to the proper levels as necessary

6. Adheres to the lubrication and maintenance service interval chart-Standard Industrial Engines

7. Properly and accurately monitor the water levels inside of the various vacuum system holding hoppers

8. Accurately reads and interprets all of the gauges, lights and other indicators associated with the various vacuum systems

9. Effectively troubleshoots vacuum systems experiencing loss of vacuum

10. Maintains all grease fittings to manufactures specifications

11. Maintains clean and tidy vehicles and vacuum systems

12. Understands and complies with one-call statutes

13. Understands the American Public Works Association (APWA) utility color codes

SITE PREPARATION AND MANAGEMENT

1. Activates all flashing safety lighting on Vac truck and Designating vehicles including strobes, beacons and LED light bars

2. Positions vac truck and support vehicle safely and strategically around test hole location

3. Clears brush and debris from line of sight, vehicle paths and test hole sites as necessary

4. Establishes a safe work zone around test hole location through the use of safety cones and retractable cone bars

5. Properly assembles and prepares all equipment necessary for the test hole excavation and data gathering process

6. Maintains a clean job site free of trip and fall hazards

7. Requires all staff and visitors on site to read, understand and sign JSA

CONCRETE CUT SAW OPERATION

1. Uses proper oil to gas ratio for 2-cycle engine

2. Uses proper PPE including at minimum, a nuisance dust mask

3. Safely changes blades using required tools as detailed in JSA

4. Uses water during concrete cutting to eliminate or minimize concrete dust

5. Practices basic troubleshooting and maintenance

6. Has knowledge of the safety

AIR LANCES AND HOSES

1. Safely stores air lance in designated location on vac truck

2. Properly connects air lance to high pressure air supply along with safety strap

3. Changes or tightens the various air lance components safely, using pipe wrenches or vice

4. Understands the safety hazards associated with air lances and operates them accordingly

5. Safely unclogs air lance nipples

6. Safely replaces air hose couplings and clamps

7. Uses air lance safely and cautiously to expose utilities

8. Always has a fiberglass handle on air lance

COMPRESSED AIR SYSTEMS

1. Possesses a basic working knowledge of air compressor operation

2. Uses proper techniques in starting and shutting down the various types of compressors

3. Properly checks all of the fluid levels associated with the various air compressors and add fluids to the proper levels

4. Reads and properly interprets all gauges, lights and the indicators associated with the various air compressors

5. Troubleshoots basic air compressor issues and the preventative measures which can be applied

JACKHAMMERS

1. Safely stores jackhammer in the designated area on the vac truck

2. Properly connects jackhammer to air source along with safety strap

3. Properly and safely changes jackhammer bits

4. Has knowledge and understands the safety hazards associated with jackhammers

5. Properly lubricates Jackhammer

6. Identifies and uses proper jackhammer bit for concrete or asphalt application

PNEUMATIC TAMPERS

1. Safely store pneumatic tampers in the designated area.

2. Properly and safely connects a pneumatic tamper to air source along with safety strap

3. Has a knowledge and understands the safety hazards associated with pneumatic tampers

4. Proper lubricates pneumatic tamper

EXCAVATION PROCESS

1. Identifies proper method and necessary tools to begin test hole, i.e., jack hammer, concrete cut saw, or shovel

2. Cuts a neat test hole whether working on natural ground or asphalt/concrete

3. Uses a cone, cage or other device to block high velocity debris from air lance during first layer of the test hole excavation

4. Uses various tools in standard configurations to safely and effectively excavate test holes to expose utilities

5. Applies proper techniques by using air lance to break up soil during test hole excavations without unnecessarily inhibiting the activities of other crew members

6. Applies proper techniques in using vacuum hose assemblies to vacuum up soil during test hole excavations without unnecessarily inhibiting the activities of other crew members

7. Applies proper techniques in dislodging jackhammers which have become lodged in pavement or concrete

8. Applies proper techniques in dislodging air lances which have become lodged in the test hole

9. Applies proper techniques in dislodging vacuum hose assemblies which have become lodged in the test hole

10. Applies proper techniques in using jackhammers to loosen tightly compacted soils and paving sub-bases

11. Applies proper techniques in using air lances to excavate test holes to expose utilities at depths greater than 6'

ELECTRIC TEST HOLE PROCESS

1. Wears proper Flame Resistant (FR) and rubber insulating gear before any excavation is started on an electric facility

2. Verifies designated horizontal location and electronic depth estimate before beginning any excavation

3. Observes the mandatory 12" buffer zone between the ground level and the estimated electronic depth before engaging destructive tools

4. Excavates an offset test hole when a 12" buffer zone is not able to be obtained

5. Completes all test holes over electric facilities as per electric test hole policy.

REFERENCE POINT INSTALLATION

1. Properly installs reference point in natural ground to accurately delineate utility lines

* Installs 3/8" rebar flush with ground and installs plastic cap over rebar in alignment over utility

* Or installs a wood hub with a reference point nailed safely into wood hub in alignment over utility

* Installs wood lathe depicting test hole information accurately and completely within 2" of the rod and cap or hub

2. Properly installs reference point in asphalt to accurately delineate utility lines

* Installs 1" PK nail and aluminium disk safely to avoid smashing fingers in alignment over utility

* records test hole information neatly and accurately on ground next to nail and disk

3. Properly installs reference point in concrete to accurately delineate utility lines

* Uses a chisel to place "X" on surface in alignment over utility

* Or safely operates a concrete cut saw to make an "X" in concrete in alignment over utility

* Or uses a drill with a concrete bit to install a PK nail and aluminium KCI disk if one is available

* records test hole information neatly and accurately on the ground next to chisel "X"

DEPTH MEASUREMENTS

1. Employs tripod and construction level to accurately calculate depth from reference point to top of utility

2. Possesses basic knowledge of hand levels and their applications

3. Understands the various types of hand levels associated with locating operations

* Bulls eye level

* Torpedo level

* Masons/carpenters level

4. Uses bulls eye level to assist in holding grade and range rod plumb/vertical during measurements

5. When construction level is not available, uses grade rod held vertical, a rigid retractable measuring tape, or a carpenter's level to manually measure depth below reference point

6. Carries out redundant depth measurements for whichever method is used

UTILITY IDENTIFICATION

1. Uses a magnet to determine if metal utilities are ferrous or non-ferrous material

2. Uses water and/or air to clean off utility for maximum visibility during identification

3. Recognizes the most common compositions of utilities associated with each of the five major utility groups. To be used for certification purposes, all identifications must be made on lines which are exposed in test hole excavations

UTILITY SIZE DETERMINATION

1. Determines approximate nominal utility size in a test hole using a combination of the following:

* Folding Carpenter ruler

* Callipers

* Measuring distance between two vertical references placed on either side of the facility on the ground surface, then measured

TEST HOLE INFORMATION BOARDS

1. Accurately and completely records test hole data on Test Hole Information Board for every test hole excavated

2. Places Test Hole Information Board next to grade rod that is positioned directly over utility

3. Ensures that crew member takes a photo capturing grade rod, Test Hole Information Board and test hole reference point

BACKFILL PROCESS

1. Employs manual techniques and pneumatic tampers to properly backfill test holes of varying depths and diameters

2. Adequately protects utility from damage during the backfilling process by exercising due care and placing 1 foot of select material over the utility before beginning compaction

3. Properly employs the "Lift" method by compacting material in 6-inch layers in order to achieve proper compaction

4. Reinstates all excavated material into test hole, ensuring proper pre-excavation compaction has been achieved

5. Leaves adequate portion of test hole open (1.5x original thickness for asphalt/concrete) allowing for placement of asphalt or concrete patch, not to exceed 8"

6. Recognizes and reports to their supervisor conditions which may not allow acceptable levels of compaction to be achieved

GROUND SURFACE RESTORATION

1. Employs pneumatic tamper to properly patch test holes in asphalt

2. Inspects test hole to ensure 1.5x the original thickness of original pavement will be installed, not to exceed 8"

3. Cleans area in and around test hole in preparation for patching operations, to ensure adhesion between materials

4. Uses proper amount of asphalt patch and compacts material with a pneumatic tamper until a smooth surface and a smooth transition between roadway and patch is achieved

5. Ensures proper crowning of asphalt patch to prevent collection of moisture and to allow for minor settling

6. Applies proper techniques in using concrete mixes to make acceptable patches in concrete surfaces

SITE RESTORATION

1. Demonstrates ability to restore sites to their original condition following vacuum excavation

2. Properly uses hand tools and compressed air to clean paving of dirt and debris

3. Restores sod, gravel and other landscape materials to their original condition

4. Replaces signs, fencing, barricades and other objects that were moved to allow for excavation to their original positions

5. Removes all debris introduced as a result of vacuum excavation operations

6. Places all equipment and tools back into their designated locations on Vac/Des truck

INTRODUCTION TO SUE (FHWA TAPE)

1. Administer Federal Highway Association (FHWA) video that introduces the engineering practice of Subsurface Utility Engineering

UTILITY IDENTIFICATION Dated Completed Approved By, Initials:

1. Utility material identification and introduction to utility types

TEST HOLE PRACTICES AND PROCEDURES

1. Completes KCI Utilities training module that illustrates KCI's vacuum excavation test whole process (QL-A)

ELECTRIC PPE POLICY AND PROCEDURES TRAINING MODULE

1. Completes Utilities training module that illustrates Policy and Procedures for wearing proper PPE while working around electric facilities

FIELD SAFETY COURSE

1. Completes self-study Utilities training module illustrating Policy and Procedures highlighting basic field safety concepts, as well as applicable OSHA-required standards

SUN SAFETY

1. Completes self-study Utilities Power Point course highlighting the damage to skin that is caused by the sun and how to prevent it

ELECTRIC TEST HOLE EXCAVATION

1. Completes Utilities training module that ensures everyone adheres to the Electric Test Hole (To Be Developed) policy every time the possibility of an electric line is encountered while performing an excavation

DESIGNATING POINT LABELING CONVENTION

1. Uses pink paint or pink flags when labelling designating points behind a utility designator

2. Identifies designating points with alphanumeric convention

* Utility Type - Utility String - Point #

* 2 parallel buried telephone lines might be labelled as follows:

* BTA-1, BTA-2, BTA-3

* BAB-1, BTB-2, BTB-3

INDEPENDENT WORKER

1. Demonstrates ability to work productively without constant supervision

2. Performs job skills to a high level with minimal supervision

3. Generates field notes to document conditions or problems

4. Accepts responsibility for completed work

Related Technical Instruction	Hours
OSHA 10	10
OSHA 30 Hazwoper	30
First Aid/CPR	8
Confined Space Entry	8
Defensive Driver	10
Flagger	5
eRailSafe	10
TWIC - Transportation Workers Identification Cridentials	8
Subsurface Utility Engineering	15
Pipe and Cable Locating	15
Ground Penetrating Radar	5
Vacuum Excavated Test Holes	5
Software (Microsoft Suite, ie: PointMan or equal)	16
TOTAL HOURS 145	

UNDERGROUND UTILITY INSTALLER TECHNICIAN

On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

INSTALL BURIED UTILITIES

Demonstrates proper use of common hand tools such as:

Review job design sheets

Gather job materials

Locate existing underground utilities

Pothole existing utilities by hand

Excavate trenches by hand

Perform soil type testing

Bed trenches with select fill

Install conduit / cable

Pull or blow utility wire / cable through conduit

Install utility hand hole / pedestals

Install ground rods

Backfill trenches

Perform site restoration

INSTALL BURIED UTILITIES

Perform manhole / hand hole rehabilitation

On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

MANAGE JOB SITE

Notify public / landowner of pending work

Conduct safety meeting

Verify permitting documents

Assess job site hazards

Set-up safe work zone

Conduct job briefing

Perform vehicle & equipment

inspections (walk around)

Ability to communicate professionally

with co-workers, property owners, and customers

One call knowledge & responsibility

ADMINISTRATIVE TASKS

Finalize as-built documents

Complete daily timesheets and detailed recording of work activity

Maintain equipment documentation

Maintain job-site report

Manage jobsite or truckinventory

Complete accident/incident/outage reports

On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

PROFESSIONAL DEVELOPMENT ACTIVITIES

Occupational Safety and Health

Administration (OSHA) 10

Traffic Flagger

Cardiopulmonary resuscitation (CPR)/First Aid

ADMINISTRATIVE TASKS

Finalize as-built documents

Complete daily timesheets and detailed recording of work activity

Maintain equipment documentation

Maintain job-site report

Manage jobsite or truckinventory

Complete accident/incident/outage reports

Maintain certifications and endorsements as required by employer such as:

- Commercial driver's license (CDL)
- Operator Department of Transportation (DOT) qualifications
- OSHA (10, 30)
- Confined Space
- Shoring/Trenching
- Hazard communication (HAZCOM)
- Traffic Flagger

On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

OFFICE TOOLS

Effective use of office PC software when applicable. Products such as MS Word, Excel, PowerPoint

Manages email

Demonstrates proper use and maintenance/care for Laptop, Tablet, or cell phone

On-the-Job Learning Competencies

Determine by written and/or practical demonstration.

USE OF HAND TOOLS & HEAVY EQUIPMENT

Demonstrates proper use of common hand tools such as:

- Air Compressor
- Air & Hydraulic Tools
- Block & Tackle
- Dynometer (tension)
- Fall Restraint Equipment
- Fusion Machines
- Gas / Manhole Monitors
- Hand tools
- Hot Line Electrical Tools
- Lasers / Transits
- Multi-Meter
- OTDR (Optical
- Time Domain Reflectometer)
- Pipe Threading Equipment
- Power Tools
- Pumps
- Root Saws
- Slings / Harnesses
- Tape Measure
- Traffic Control Tools
- Underground Utility Locator
- Voltage Indicator

Demonstrates proper use of common heavy equipment such as:

Backhoe or Mini Excavator

Directional Boring Machine

Dozer

- Dump Truck
- Hydrovac / Flusher Truck
- Plow – Mainline and drop
- Tractor and Trailer
- Winch

Core Skills:	Approximate Hours
1.0 Inspection, Care & Use of Personal Protection Equipment	1 hour
2.0 OSHA 10	10 hours
3.0 First Aid / CPR / Blood Borne Pathogens	4 hours
4.0 Hazard Assessment & Communication	10 hours
5.0 Radio Frequency (RF) Awareness & Safety	1 hour
6.0 Underground Utility Locate Process (One Call)	2 hours
7.0 CDL & Safe Driving Practices including successful operate of tractor and trailer	20 hours
8.0 DOT – Securement of Equipment or Load	2 hours
9.0 Reading Blueprint / Construction Drawings	8 hours
10.0 Job Site Management	8 hours
11.0 Excavation & Restoration	16 hours
12.0 Horizontal Directional Drilling (HDD) and Other Equipment Operation Best Practices	10 hours
13.0 Conduit / Duct Bank Installation	12 hours
14.0 Manhole / Hand Hole Installation	12 hours
15.0 Cable Handling, Installation, and Splicing	20 hours
16.0 Backfill, Compaction, Finish Grading	10 hours

17.0 Electrical Safety & Stray Voltage Detection	5 hours
18.0 Lock Out / Tag Out	2 hours
19.0 Material Handling & Storage	2 hours
20.0 Apprenticeship Program Overview	1 hour

TOTAL: 156 hours

Related Instruction Descriptions – Underground Utility Installer Technician

1.0 Inspection, Care & Use of Personal Protection Equipment (PPE): Each apprentice must be trained in the inspection, care and use of PPE for the particular scope of work (SOW) and hazards addressed through their use. While the apprentice is being trained in PPE inspection, care and use, they are to be under direct supervision of a Journeyworker at all times, enabling them to draw on the competencies of the Journeyworker as they grow in experience in the inspection care, and proper use of PPE. Examples of PPE used by an apprentice include hard hat, proper footwear, eye/face protection, hearing protection, and fall protection equipment. This list is not exclusive or exhaustive as the SOW may require the supervisory, Journeyworker to engage other types of engineering controls or safety measures. (This topic is part of OSHA 30 course content.)

2.0 OSHA 10 Hour: This is a version of the OSHA 10-hour course that is provided by a trainer that has been authorized to perform instruction from OSHA. Topics covered can include hazard identification, exit routes, electrical safety, personal protective equipment, hazard communication, ergonomics, recordkeeping, and reporting, etc. This course does not include confined space training.

3.0 First Aid/CPR/Blood borne Pathogens: Must be properly trained and able to render First Aid, Cardiopulmonary Resuscitation and protect against infection from Blood Borne Pathogens. These courses follow the agendas established by Red Cross, American Heart Association, National Safety Council, or other like organizations. (This topic is part of OSHA 30 course content.)

4.0 Hazard Assessment & Communication: An introduction to the various environments and / or structures that work will be performed on. Based upon the SOW and the type of structure it is being applied to the hazards may change and this requires the ability to understand that there is a hazard and it must be communicated to the rest of the team. (This topic is part of OSHA 30 course content.)

5.0 Radio Frequency (RF) Awareness & Safety: Underground Utility Installer Technician

CENTRAL OFFICE INSTALLER

WORK PROCESS SCHEDULE

Central Office Installer

O*NET-SOC CODE: 49-2022.00 RAPIDS CODE: 3071CB

The competencies listed below may be completed in any order. Foundations & Simulated Central Office

Competencies

A. Level 1 Safety on the Worksite

B. Introduction to Telecommunications environments and technical terminology

C. Level 1 Installation Technology & Components

D. Level 1 Outage Prevention

E. Asbestos Awareness/Negative Exposure Assessment (NEA) Floor Drilling Certification

F. Addition & Removal of Non-Powered or Passive Equipment/Hardware

G Running & Securing Power, Switchboard and Fiber Optic Cables

H. Switchboard Cable: Color Code, Butting, Stripping/Prepping for Termination

I. Fiber Cable: Color Code, Handling Precautions, Prepping for Termination

J. Iron work basics: Cutting, Filling, Painting T-rod, Auxiliary framing, and Cable Racks

K. Introduction to Job Documentation

L. Basic knowledge of codes, standards, and regulations

M. Effective use of office PC software when applicable. Products such as MS Word, Excel, PowerPoint

N. Demonstrates proper use and maintenance/care for Laptop, Tablet, or cell phone

O. Manages email

P. Fire Stopping

Customer & Installation Standards

A. Level 2 Safety on the Worksite

B. In depth overview of Telecommunications environments and technical terminology

C. Level 2 Installation Technology & Components

D. Level 2 Outage Prevention

E. Advanced addition and removal of non-powered or passive equipment/hardware

F. Advanced Running & Securing Power, Switchboard and Fiber Optic Cables

G. Advanced Switchboard Cable: Color Code, Butting, Stripping/Prepping for Termination

H. Advanced Fiber Cable: Color Code, Handling Precautions, Prepping for Termination

I. Crimping large gauge power cables, 4awg and smaller

J. Wire wrapping switchboard cable

K. Advanced Iron work basics: Cutting, Filling, Painting T-rod, Auxiliary framing, and Cable Racks

L. Lead verification/Continuity Testing

M. Advanced Job Documentation

N. Advanced knowledge of codes, standards, and regulations

O. Advanced Fire Stopping Wall and floor holes

P. Installing CAT 5/6 Connectors

Level 3 – Advanced Installation

Competencies

A. Level 3 Outage Prevention

B. Labeling of various types of equipment and cabling designations

C. Addition or removal of common systems equipment/hardware

D. Addition or removal of wiring and connections (on non-working equipment only)

E. Analysis of job specifications and drawings

F. Accessing Customer Standards

G. Provide work assignments to crew

H. Preparation and submittal of various types of job documentation close out packages

I. Resolve job specification and/or drawing problems

J. Correct office record drawings

K. Conduct in-process and final quality inspections

L. Communicates with customer on all aspects of the job

Level 4 – Complex Installation

Competencies

A. Level 4 Outage Prevention

B. Advanced labeling of various types of equipment and cabling designations

C. Utilizing Customer Waiver process

D. Power down process for equipment/system removals

E. Advanced preparation and submittal of job documentation close out packages including the completion of the overall test record

F. Advanced Accessing Customer standards

G. Other applications as specified by employer

Professional Development

Competencies

A. OSHA 10/OSHA 30

B. CPR/First Aid

C. Equipment vendor training as specified by employer (e.g. Telcordia, AT&T, Verizon)

RELATED INSTRUCTION OUTLINE

Central Office Installer

O*NET-SOC CODE: 49-2022.00 RAPIDS CODE: 3071CB

Related Technical Instruction – Method of Delivery: in-house training, classroom, and/or online.

Course Title Contact	Hours
A. Apprentice Program Overview	2
B. Machines, Tools & Technology	10
C. Job Site Management	20
D. Understanding Bill of Material (BOM), Blueprints, Equipment Diagrams and Wire Diagrams	8
E. Site Walk, Build Process, Battery Systems & Pre-Installation Site Survey	2
F. Reports and Closeout Package Preparation	4
G. Regulatory and Compliance – Applicable Codes &amp Standards	12
H. Hazard Assessment and Communication	10
I. First Aid/CPR	4
J. OSHA	20
K. Electrical Safety	16
L. Cable Installation	30
M. Broadband Fiber Service Part 1	10
N. Broadband Fiber Service Part 2	10
O. Passive Cable Installation and Connectorization Techniques	16
P. Defensive Driving, Maneuvering a Large Vehicle	2

Total: 176

PROJECT MANAGER

WORK PROCESS SCHEDULE

Project Manager

O*NET-SOC CODE: 13-1082.00 RAPIDS CODE: 3019CB

Work Process Schedule:

Competency Checklist – Construction Project Management

Develop detailed project plans.

Competencies

A. Develop or update project plans including information such as objectives, technologies, schedules, funding, and staffing.

B. Propose, review, or approve modifications to project plans.

Manage information technology projects or system activities.

Competencies

A. Monitor project milestones and deliverables.

B. Schedule or facilitate project meetings.

Participate in staffing decisions.

Competencies

A. Identify, review, or select vendors or consultants to meet project needs.

B. Recruit or hire project personnel.

Assign duties or work schedules to employees.

Competencies

A. Assign duties or responsibilities to project personnel.

Collaborate with others to resolve information technology issues.

Competencies

A. Confer with project personnel to identify and resolve problems.

Coordinate resource procurement activities.

Competencies

A. Negotiate with project stakeholders or suppliers to obtain resources or materials.

Develop operating strategies, plans, or procedures.

Competencies

A. Plan, schedule, or coordinate project activities to meet deadlines.

Discuss business strategies, practices, or policies with managers.

Competencies

A. Communicate with key stakeholders to determine project requirements and objectives.

Gather organizational performance information.

Competencies

A. Request and review project updates to ensure deadlines are met.

Manage construction activities.

Competencies

A. Plan, schedule, or coordinate project activities to meet deadlines.

Manage operations, research, or logistics projects.

Competencies

A. Monitor project milestones and deliverables.

Monitor flow of cash or other resources.

Competencies

A. Monitor costs incurred by project staff to identify budget issues.

Prepare financial documents, reports, or budgets.

Competencies

A. Prepare and submit budget estimates, progress reports, or cost tracking reports.

Prepare operational reports or records.

Competencies

A. Produce and distribute project documents.

Prepare scientific or technical reports or presentations.

Competencies

A. Create project status presentations for delivery to customers or project personnel.

Present work to clients for approval.

Competencies

A. Submit project deliverables to clients, ensuring adherence to quality standards.

Report information to managers or other personnel.

Competencies

A. Report project status, such as budget, resources, technical issues, or customer satisfaction, to managers.

Select resources needed to accomplish tasks.

Competencies

A. Identify project needs such as resources, staff, or finances by reviewing project objectives and schedules.

Supervise information technology personnel.

Competencies

A. Monitor the performance of project team members to provide performance feedback.

RELATED INSTRUCTION OUTLINE

Project Manager

O*NET-SOC CODE: 13-1082.00 RAPIDS CODE: 3019CB

Related Technical Instruction	Approximate Hours
OSHA 30	**40**
Project Management	**110**

- Communications
- PMP Exam Prep
- Project Cost
- Project Management
- Project Procurement
- Project Quality
- Project Risk
- Project Schedule
- Project Scope
- Project Stakeholders
- Resource Management

Principles of Project Management, its structure, and critical significance of executing projects

- Project Performance
- Business Analysis Framework and Domains
- Life Cycles, Development Approaches, and Common Elements
- Predictive and Adaptive Methodologies
- Managing Uncertainties

Leadership/Business Skills

Team Building

MicroSoft Office

Intro to Project Management Software

PCCA

E-BOOK