COMPETENCY-BASED OCCUPATIONAL FRAMEWORK FOR REGISTERED APPRENTICESHIP

Transmission Line Worker

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For more information, contact:

Diana Elliott, PhD, Senior Research Associate, Urban Institute: delliott@urban.org

Robert Lerman, PhD, Institute Fellow, Urban Institute: rlerman@urban.org

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The nonprofit Urban Institute is dedicated to elevating the debate on social and economic policy. For nearly five decades, Urban scholars have conducted research and offered evidence-based solutions that improve lives and strengthen communities across a rapidly urbanizing world. Their objective research helps expand opportunities for all, reduce hardship among the most vulnerable, and strengthen the effectiveness of the public sector.

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Jeff Allen
Tri-State Generation and Transmission

John Bolger
U.S. Department of Labor, Office of Apprenticeship (South Dakota)

Maria Brady
U.S. Department of Labor

Michael Ann Broad
U.S. Department of Labor, Office of Apprenticeship (Wyoming)

Christine Carpenter
Energy Providers Coalition for Education (EPCE)

Kathy Fulks
Arkansas Construction Education Foundation

David Gaither
U.S. Department of Labor, Office of Apprenticeship

Patricia Garcia
U.S. Department of Labor, Office of Apprenticeship

Dean Guido
U.S. Department of Labor, Office of Apprenticeship

Linda Head
Lone Star College

James Kynor
Community College of Denver

Nicholas Lalpuis
U.S. Department of Labor, Employment & Training Administration

Scottie LeBlanc
Adaptive Construction Solutions, Inc.

Tandra Lemay
Fletcher Technical Community College

Dudley Light
U.S. Department of Labor, Office of Apprenticeship (Region 4)

Jerry Peek
MidAmerican Energy Company

Mark Pepper
Wyoming Rural Water

Brent Petersen
HollyFrontier Cheyenne Refinery

Dale Pierson
Rural Water Association of Utah

Michael Preston
National Rural Water Association

Jacob Sones
Laramie County Community College

Connie Stevens
Alliance of Indiana Rural Water

Jose Velazquez
U.S. Department of Labor, Office of Apprenticeship

Patrina Walker
U.S. Department of Labor, Office of Apprenticeship

Tom Wall
Colorado Rural Water Association

Allison Cossio
Cedar Valley College

Bob Couse
U.S. Department of Labor, Office of Apprenticeship (Utah)

Frank Dunmire
Illinois Rural Water Association

Bruce Emmil
Bismarck State College

Jim Foti
U.S. Department of Labor, Office of Apprenticeship

Matthew Holmes
National Rural Water Association

David Hraha
Iowa Association of Municipal Utilities

Carmenza Jaramillo-Akers
Devry WORKS

Jennifer Jirous-Rapp
Colorado Department of Labor and Employment

Seth Kamarad
UA Local 192

Cynthia McLain
U.S. Department of Labor, Office of Apprenticeship (Colorado)

Nicholas Morgan
Adaptive Construction Solutions, Inc.

Derrick Morgan
American Fuel & Petrochemical Manufacturers

Debbie Nobles
American Electric Power

Bill O'Connell
National Rural Water Association

Lee Price
U.S. Department of Labor, Office of Apprenticeship (Arkansas)

David Risser
U.S. Department of Labor, Office of Apprenticeship

Jeff Rodenberg
The Industrial Company

Esmeralda Silva
Trident University International

Tracy Smith
GEODynamics

Shannan Walton
U.S. Department of Labor, Office of Apprenticeship

Kathy Williamson
PLH Group, Inc.

Mandi Wimer
Great River Energy

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Competency-Based Occupational Frameworks

The Urban Institute, under contract by the U.S. Department of Labor, worked with employers, subject matter experts, labor unions, trade associations, credentialing organizations and academics to develop Competency-Based Occupational Frameworks (CBOF) for Registered Apprenticeship programs. These frameworks defined the **purpose** of an occupation, the **job functions** that are carried out to fulfill that purpose, the **competencies** that enable the apprentice to execute those job functions well, and the **performance criteria** that define the specific knowledge, skills and personal attributes associated with high performance in the workplace. This organizational hierarchy – Job Purpose – Job Functions – Competencies – Performance Criteria – is designed to illustrate that performing work well requires more than just acquiring discrete knowledge elements or developing a series of manual skills. To perform a job well, the employee must be able to assimilate knowledge and skills learned in various settings, recall and apply that information to the present situation, and carry out work activities using sound professional judgement, demonstrating an appropriate attitude or disposition, and achieving a level of speed and accuracy necessary to meet the employer's business need.

The table below compares the terminology of Functional Analysis with that of traditional Occupational Task Analysis to illustrate the important similarities and differences. While both identify the key technical elements of an occupation, Functional Analysis includes the identification of behaviors, attributes and characteristics of workers necessary to meet an employer's expectations.

Framework Terminology	Traditional Task Analysis Terminology
Job Function – the work activities that are carried out to fulfill the job purpose	Job Duties – roles and responsibilities associated with an occupation
Competency – the actions an individual takes and the attitudes he/she displays to complete those activities	Task – a unit of work or set of activities needed to produce some result
Performance Criteria – the specific knowledge, skills, dispositions, attributes, speed and accuracy associated with meeting the employer's expectations	Sub Task – the independent actions taken to perform a unit of work or a work activity

Although designed for use in competency-based apprenticeship, these Competency-Based Occupational Frameworks also support time-based apprenticeship by defining more clearly and precisely what an apprentice is expected to learn and do during the allocated time-period.

CBOFs are comprehensive to encompass the full range of jobs that may be performed by individuals in the same occupation. As employers or sponsors develop their individual apprenticeship programs, they can extract from or add to the framework to meet their unique organizational needs.

Components of the Competency-Based Occupational Framework

Occupational Overview: This section of the framework provides a description of the occupation including its purpose, the setting in which the job is performed and unique features of the occupation.

Work Process Schedule: This section includes the job functions and competencies that would likely be included in an apprenticeship sponsor's application for registration. These frameworks provide a point of reference that has already been vetted by industry leaders so sponsors can develop new programs knowing that they will meet or exceed the consensus expectations of peers. Sponsors maintain the ability to customize their programs to meet their unique needs, but omission of a significant number of job functions or competencies should raise questions about whether or not the program has correctly identified the occupation of interest.

Cross-cutting Competencies: These competencies are common among all workers, and focus on the underlying knowledge, attitudes, personal attributes and interpersonal skills that are important regardless of the occupation. That said, while these competencies are important to all occupations, the relative importance of some versus others may change from one occupation to the next. These relative differences are illustrated in this part of the CBOF and can be used to design pre-apprenticeship programs or design effective screening tools when recruiting apprentices to the program.

Detailed Job Function Analysis: This portion of the framework includes considerable detail and is designed to support curriculum designers and trainers in developing and administering the program. There is considerable detail in this section, which may be confusing to those seeking a more succinct, higher-level view of the program. For this reason, we recommend that the Work Process Schedule be the focus of program planning activities, leaving the detailed job function analysis sections to instructional designers as they engage in their development work.

a. Related Technical Instruction: Under each job function appears a list of foundational knowledge, skills, tools and technologies that would likely be taught in the classroom to enable the apprentice's on-the-job training safety and success.

b. Performance Criteria: Under each competency, we provide recommended performance criteria that could be used to differentiate between minimally, moderately and highly competent apprentices. These performance criteria are generally skills-based rather than knowledge-based, but may also include dispositional and behavioral competencies.

Using the Competency-Based Occupational Framework to Develop a Registered Apprenticeship Program

When developing a registered apprenticeship program, the Work Process Schedule included in this CBOF provides an overview of the job functions and competencies an expert peer group deemed to be important to this occupation. The Work Process Schedule in this document can be used directly, or modified and used to describe your program content and design as part of your registration application.

When designing the curriculum to support the apprenticeship program – including on the job training and related technical instruction – the more detailed information in the "Detailed Job Functions" section could be helpful. These more detailed job function documents include recommendations for the key knowledge and skill elements that might be included in the classroom instruction designed to support a given job function, and the performance criteria provided under each competency could be helpful to trainers and mentors in evaluating apprentice performance and insuring inter-rater reliability when multiple mentors are involved.

Transmission Line Worker Occupational Overview

Occupational Purpose and Context

Transmission Line Workers are employed by or on behalf of public utilities companies and engineering contracting firms and in industries requiring a service to be transmitted through a network of cables. Line workers/linesmen are in many ways the backbone of the electricity and telecommunication industries. Line workers work outdoors in most weather conditions, at heights and in confined spaces underground, and at times with extremely high voltage electricity lines.

Line workers install, remove, maintain, and repair sub-transmission and distribution lines and associated equipment and facilities, as well as maintain safety for the public and for work crews during repair and construction work. Line workers must effectively execute many tasks to help deliver electrical power from generating stations into homes, businesses, factories, and other facilities.

In order to minimize the danger, they must follow strict safety requirements and protocols. They are typically the first responders to power outages and other emergencies, and often work irregular hours in response to emergency events.

Potential Job Titles

Installer, Repairer, Electricians, Electrical Line Mechanic (Distribution), Electrical Line Mechanic (Transmission), Electrical Line Worker (Distribution), Electrical Line Worker (Transmission), Railway Traction Line Worker, Electrical and Electronics Engineers, Electric Powerline Examiner, Electrical High Tension Tester

Attitudes and Behaviors

Line workers must possess strong mathematical skills, critical thinking, manual dexterity, good judgement and problem solving ability, time management, clear verbal communication, coordination, and physical strength.

Line workers also have physical requirements. They must be able to ascend and descend poles, structures, manholes, etc.; work in confined spaces; and climb poles 35+ tall or work in a truck-mounted bucket. They must be able to see details at close range and discriminate between visual details at distances beyond arm's length (e.g., scanning a control panel, looking for surface flaws, spotting circuit breakers, etc.) and be able to recognize colors, for instance in distinguishing wires, resistors, containers or light signals. Line workers must be able to quickly move hands to grasp, manipulate, or assemble objects, and identify attributes of objects such as size, shape, temperature, or texture, principally by means of the fingertips. Line workers are likely to work in situations involving physical danger or discomfort and must be willing to work in all types of weather conditions. They must also be able to lift, push, pull, or carry objects greater than 50 lbs.

Apprenticeship Prerequisites

Some employers or sponsors may require individuals to have a personal and/or a class A commercial driver's license prior to beginning the apprenticeship. Utility companies may require pre-employment physical examinations or drug testing prior to hiring an apprentice. Apprentices may be required to climb, lift heavy objects, pass vision and hearing tests, exhibit manual dexterity, and fit into confined spaces.

Occupational Pathways

Transmission line workers have opportunities to move into supervisory roles, planning and procurement roles, safety and inspection occupations, and utility management positions.

Certifications, Licensure and Other Credential Requirements

CREDENTIAL	Offered By	Before, During or After Apprenticeship
OSHA ET&D Certification	Various courses available nationwide.	During
Crane Certification	Various courses available nationwide.	Before, During, or After
First Aid Certification	Various courses available nationwide.	Before, During, or After
Flagging Certification	Various courses available nationwide.	Before, During, or After

Job Functions

JOB FUNCTIONS		Core or Optional
1.	Prepares for work at job site with proper tools and equipment and a work plan that is sound, clearly communicated, and employs safety precautions	Core
2.	Abides by workplace health and safety rules, regulations, policies and best practices in carrying out job duties	Core
3.	Installs electrical systems and related structures	Core
4.	Constructs, maintains, and repairs overhead and underground distribution assets	Core
5.	Operates, maintains, and repairs distribution and transmission systems	Core
6.	Finds and repairs power outages and performs emergency repairs	Core

Stackable Programs

This occupational framework is designed to link to the following additional framework(s) as part of a career laddering pathway.

Stackable Programs		Base or Higher Level	Stacks on top of
1.		Base Program	
2.			
3.			
4.			

Options and Specializations

The following options and specializations have been identified for this occupation. The Work Process Schedule and individual job function outlines indicate which job functions and competencies were deemed by industry advisors to be optional. Work Process Schedules for Specializations are included at the end of this document.

Options and Specializations	Option	Specialization
N/A		

Levels

Industry advisors have indicated that individuals in this occupation may function at different levels, based on the nature of their work, the amount of time spent in an apprenticeship, the level of skills or knowledge mastery, the degree of independence in performing the job or supervisory/management responsibilities.

Level	Distinguishing Features	Added Competencies	Added Time Requirements
N/A			

Work Process Schedule

Job Functions and Competencies

WORK PROCESS SCHEDULE Transmission Line Worker		ONET Code: 49-9051 RAPIDS Code: 0282
JOB TITLE:		
LEVEL:	**SPECIALIZATION:**	
STACKABLE PROGRAM ___yes _____no **BASE OCCUPATION NAME:**		
Company Contact: Name		
Address:	**Phone**	**Email**
Apprenticeship Type: **_____Competency-Based** **_____Time-Based _____Hybrid**	**Prerequisites**	

JOB FUNCTION 1: Prepares for work at job site with proper tools and equipment and a work plan that is sound, clearly communicated, and employs safety precautions

Competencies	Core or Optional	RTI	OJT
A. Properly uses and maintains tools and equipment including saws, digging equipment, drills, wrenches, compressors, presses, crimpers and dies	Core		
B. Properly uses and maintains electrical measuring and testing equipment such as voltage meters, multi-meters, phase sequence indicators, etc.	Core		
C. Properly assembles and uses ropes and rigging (handlines, hoisting equipment, slings, shackles, etc.) to ensure personal safety and to move equipment and materials	Core		

D. Operates vehicular equipment properly, including trucks, diggers, and aerial lifts	Core		
E. Plans job tasks and prepares work sites properly including communicating plan to crew and identifying hazards	Core		
F. Adheres to safety requirements including safety of the site, personal safety and the safety of other workers and the community	Core		
JOB FUNCTION 2: Abides by workplace health and safety rules, regulations, policies and best practices in carrying out job duties			
Competencies	Core or Optional	RTI	OJT
A. Provides job site protection for the general public	Core		
B. Performs hazard assessment and controls powerline hazards	Core		
C. Controls environmental hazards	Core		
D. Participates in workplace safety activities	Core		
E. Utilizes personal protective devices and safety equipment properly and consistently (body harness, lanyard, anchor sling, etc.)	Core		
F. Utilizes positioning devices and equipment properly (gaff, body belt, pole-choker, secondary lanyard, etc.)	Core		
JOB FUNCTION 3: Installs electrical systems and related structures			
Competencies	Core or Optional	RTI	OJT
A. Frames and sets power poles properly	Core		
B. Installs pole guys and anchors; attachments; breakers/rods; etc.	Core		
C. Installs and assembles steel structures	Core		
D. Installs steel structure guy wires and anchors	Core		
JOB FUNCTION 4: Constructs, maintains, and repairs overhead and underground distribution assets			
Competencies	Core or Optional	RTI	OJT
Overhead			
A. Strings overhead conductors properly and safely	Core		
B. Sags overhead conductors	Core		

C. Ties-in overhead conductors	Core		
D. Splices overhead conductors	Core		
Underground			
E. Digs trenches appropriately, using correct equipment and safety precautions – direct buried cables, ducted method, surface troughs, deep bore tunnels, cut and cover tunnels	Core		
F. Selects appropriate components, cable sealants and compounds, joint bays, stop joints, water cooling systems (if applicable), using correct methods for insulating components and wires	Core		
G. Identifies environmental hazards and barriers and plans/carries out appropriate mitigation strategies	Core		
H. Identifies and mitigates land use restrictions	Optional		
I. Inspects, replaces and maintains cables and cable insulation at appropriate intervals and using correct materials and procedures	Core		
JOB FUNCTION 5: Operates, maintains, and repairs distribution and transmission systems			
Competencies	Core or Optional	RTI	OJT
A. Operates overhead and/or underground transmission systems	Core		
B. Operates overhead and/or underground distribution systems	Core		
C. Performs station switching	Core		
D. Inspects distribution and transmission systems	Core		
E. Maintains poles and steel structures	Core		
F. Maintains system components	Core		
G. Identifies and mitigates environmental hazards (i.e. tree trimming, rodent infestations, erosion, etc.)	Core		
H. Repairs overhead and/or underground distribution systems	Core		
I. Repairs overhead and/or underground transmission systems including components (cross arms, conductors, poles and insulators), switches, terminations and other devices	Core		

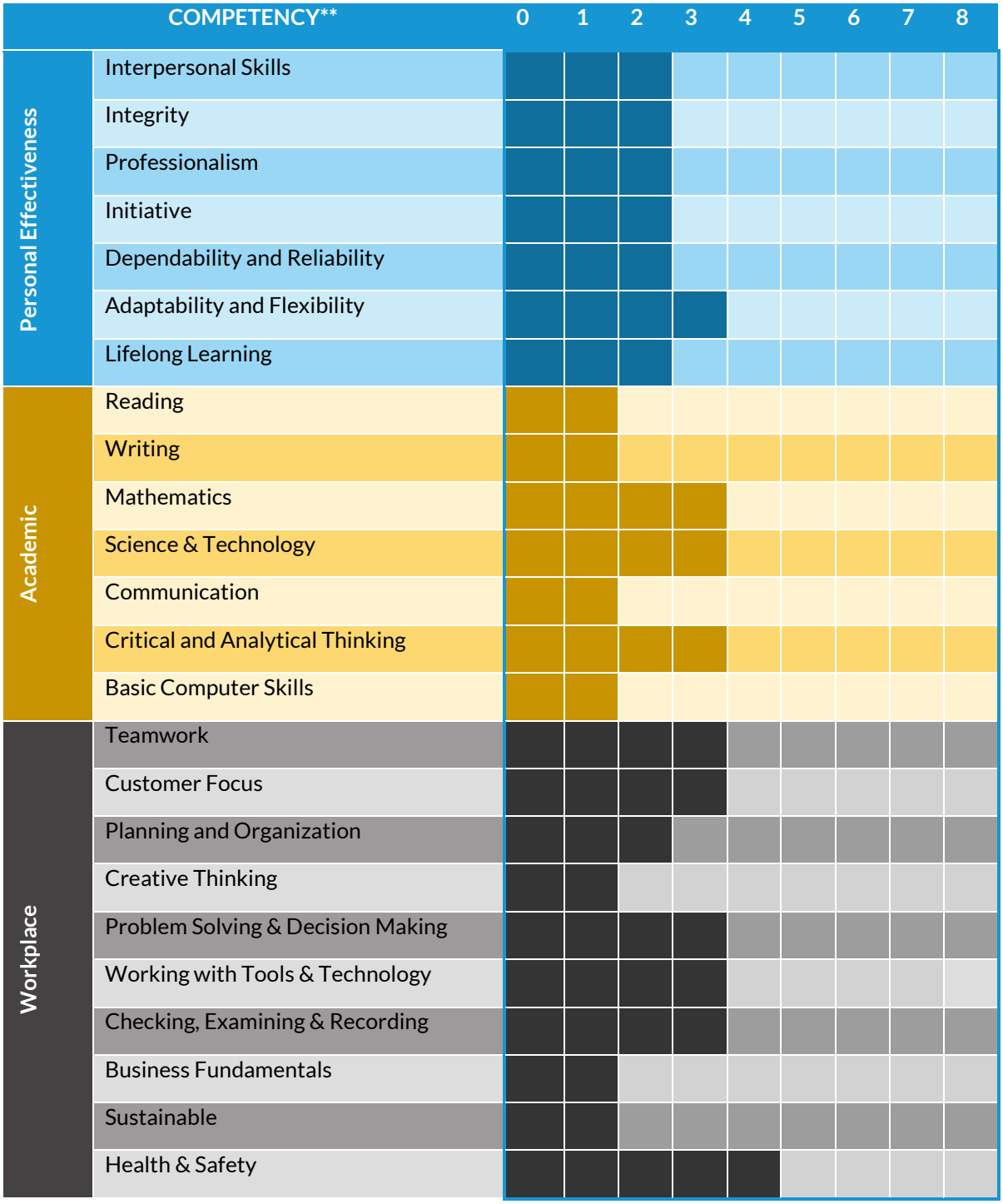
JOB FUNCTION 6: Finds and repairs power outages and performs emergency repairs			
Competencies	Core or Optional	RTI	OJT
A. Uses appropriate personal and environmental protective devices and techniques to secure the work area and protect human safety	Core		
B. Identifies and reviews appropriate repair manuals or policies and procedures based on observed or reported fault	Optional		
C. Applies diagnostic tools and skills to identify and repair sources of fault; installs updated equipment or components; or performs preventive maintenance	Core		
D. Confirms power restoration after repairs	Core		
E. Communicates effectively with first responders, dispatchers and members of the public to coordinate activities appropriately	Optional		
F. Accurately documents work performed, equipment or parts used and notes deferred maintenance needs	Optional		

Related Technical Instruction Plan

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours

LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

Cross-Cutting Competencies



**Cross-cutting competencies are defined in the Competency Model Clearinghouse:

https://www.careeronestop.org/CompetencyModel/competency-models/buidling-blocks-model.aspx

Cross-Cutting Competencies identify transferable skills – sometimes called "soft skills" or "employability skills" – that are important for workplace success, regardless of a person's occupation. Still, the relative importance of specific cross-cutting competencies differs from occupation to occupation. The Cross-Cutting Competencies table, above, provides information about which of these competencies is most important to be successful in a particular occupation. This information can be useful to employers or intermediaries in screening and selecting candidates for apprenticeship programs, or to pre-apprenticeship providers that seek to prepare individuals for successful entry into an apprenticeship program.

The names of the cross-cutting competencies come from the U.S. Department of Labor's Competency Model Clearinghouse and definitions for each can be viewed at https://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx.

The scoring system utilized to evaluate the level of competency required in each cross cutting skill aligns with the recommendations of the Lumina Foundation's Connecting Credentials Framework. The framework can be found at: http://connectingcredentials.org/wp-content/uploads/2015/05/ConnectingCredentials-4-29-30.

Detailed Job Functions

JOB FUNCTION 1: Prepares for work at job site with proper tools and equipment and a work plan that is sound, clearly communicated, and employs safety precautions

Related Technical Instruction		
KNOWLEDGE	**SKILLS**	**TOOLS & TECHNOLOGIES**
• OSHA requirements for personal and workplace safety • Employer policies and procedures for document job activities • Configuration of transmission and distribution system • Use of Material Safety Data sheets • Laws and principles of electricity, such as Ohm's law, Kirchhoff's voltage and current laws, electrical circuitry concepts • Movement of electrical current through a circuit • Safety hazards associated with electrical current and powered devices • Employer's and jurisdictional work and safety requirements and standards	• Use of personal protective devices, gear and techniques • Communicating clearly both verbally and in writing • Planning and organization • Operation of commercial vehicles • Operation of heavy equipment including diggers and lifts • Reading maps, site plans, and technical drawings • Climbing and rescue skills • Proper lifting techniques	• Hoists • Lifts • Ropes/Rigging • Multi-meters • Voltage testing devices • Presses/crimpers • Drills • Cutters • Wrenches • Diggers • Splicers • Safety gear – eye protection, rubber gloves, hard hat, steel-toed shoes, etc. • GPS devices • Power tools • Fire extinguishers • First aid kits • Fall arrest, rescue and escape equipment

Competency A: Properly uses and maintains tools and equipment including saws, digging equipment, drills, wrenches, compressors, presses, crimpers and dies	Core or Optional
PERFORMANCE CRITERIA	
1. Correctly identifies tools and equipment necessary for the job at hand	Core
2. Maintains equipment and tools properly, including cleaning them, testing their operation and accuracy, replacing batteries as necessary and storing them properly	Core
3. Inspects equipment and tools to ensure that they are functioning properly and in working order	Core
4. Follows regular maintenance schedule for heavy equipment, documenting when the maintenance was performed and any findings or concerns	Core
5. Communicates to supervisor when tools or equipment are not functioning properly or need to be replaced	Core
Competency B: Properly uses and maintains electrical measuring and testing equipment such as voltage meters, multi-meters, phase sequence indicators, etc.	**Core or Optional**
PERFORMANCE CRITERIA	
1. Inspects meters and calibrates against standards, if necessary	Core
2. Distinguishes between normal and abnormal readings	Core
3. Traces source of fault when abnormal readings occur	Core
4. Conducts tests of voltage and current and records results	Core
5. Communicates abnormal readings with appropriate personnel	Core

Competency C: Properly assembles and uses ropes and rigging (handlines, hoisting equipment, slings, shackles, etc.) to ensure personal safety and to move equipment and materials	Core or Optional
PERFORMANCE CRITERIA	
1. Collects, inspects and maintains positioning device equipment (gaffs, body belt, pole choker)	Core
2. Ties knots based on planned use of lines and rigging	Core
3. Inspects and uses fall arrest equipment such as body harnesses, lanyards and anchor slings	Core
4. Climbs properly using appropriate safety devices and following safety procedures	Core
5. Inspects and uses slings, shackles and hoists	Core
6. Properly assembles and uses handlines, including the use of appropriate knots and splices and line handling techniques	Core
7. Utilizes appropriate body mechanics when lifting to avoid injury	Core
Competency D: Operates vehicular equipment properly, including trucks, diggers, and aerial lifts	**Core or Optional**
PERFORMANCE CRITERIA	
1. Checks vehicles for fitness of operation, including fuel levels, tire pressure, etc.	Core
2. Uses seat belts and safety harnesses when operating vehicular equipment	Core
3. Uses proper braking and blocking techniques to prevent unintentional movement of vehicular equipment	Core
4. Operates vehicles within the legal speed limit and following all traffic rules and laws	Core
5. Cordons off work areas, inspects the worksite for potential hazards (ie. underground cables, etc.) and clears the site or humans and animals before utilizing digging equipment	Core
6. Never operates vehicular equipment while taking medications that reduce cognitive function	Core

Competency E: Plans job tasks and prepares work sites properly including communicating plan to crew and identifying hazards	Core or Optional
PERFORMANCE CRITERIA	
1. Ensures that necessary parts, equipment and protective gear is at hand prior to starting a job	Core
2. Ensures that appropriate number of workers are on the job to prevent injury and to enable completion of the work	Core
3. Perform a hazards assessment, record and communicate results	Core
4. Review material safety data sheets, instruction manuals and/or policies and procedures manual to be prepared for emergency situations, such as spills, environmental releases, fire or personal injury	Core
5. Ensure that appropriate ropes, rigging, harnesses and similar devices are on hand and in good working order prior to beginning the job	Core
6. Communicate clearly with supervisors, peers, emergency responders, dispatchers and the public	Core
Competency F: Adheres to safety requirements including safety of the site, personal safety and the safety of other workers and the community	**Core or Optional**
PERFORMANCE CRITERIA	
1. Uses personal protective gear consistently and properly	Core
2. Accurately identifies and marks “hot wires”	Core
3. Uses lock-out/ tag-out procedures when necessary	Core
4. Identifies sources of energy/power	Core

JOB FUNCTION 2: Abides by workplace health and safety rules, regulations, policies and best practices in carrying out job duties

Related Technical Instruction		
KNOWLEDGE	**SKILLS**	**TOOLS & TECHNOLOGIES**
• Knowledge of regulations regarding and protecting the local environment • Knowledge of all work protection and safety procedures • Identification of unsafe conditions/practices • Principles of induction and backfeed • Use of protective equipment such as reclosers, cover-up, potential indicators and fuses • Use of tools and equipment in compliance with user manuals and training • Understands potential threats created by deviation from safety procedures and improper use of tools and equipment	• Identification of all work protection procedures, and following established safety procedures at all times • Identification of surrounding safety risks and hazards, and potential environmental hazards • Calls attention to potential and actual hazardous conditions as they arise / Stopping work if there are unsafe working conditions • Awareness of: industry policies and procedures pertinent to environmental protection, confined space regulations and procedures, grounding and bonding requirements and switching procedures • Maintain appropriate professional certifications and is knowledgeable in first aid or first response procedures	• Uses personal protection equipment (PPE) including safety glasses, work boots and hard hats • Maintains personal safety equipment in good working order

Competency A: Provides job site protection for the general public	**Core or Optional**
PERFORMANCE CRITERIA	
1. Follows organizational procedures for setting up and maintaining a safe job-site	Core
2. Abides by applicable standards, regulations, laws, and safety practices	Core
3. Directs traffic flow safely around site, and ensures proper procedures are followed for placing flags, signs, cones, and flares	Core
Competency B: Performs hazard assessment and controls powerline hazards	**Core or Optional**

PERFORMANCE CRITERIA	
1. Identifies overhead work hazards such as foreign debris, broken poles, insulators, tie wires and crossarms	Core
2. Identifies underground work hazards such as gases, fumes, flooding and cave-ins	Core
3. Communicates hazard information to concerned parties such as co-workers, other work groups and the public	Core
4. Selects and uses rescue and monitoring equipment for confined spaces	Core
5. Eliminates hazards by using methods such as de-energizing, grounding and removing backfeed potential	Core
6. Minimizes hazards by using signage and protective barriers such as barricades	Core
7. Identifies and eliminates second points of contact (step and touch potential) by installing protective barriers	Core
8. Ventilates confined or restricted spaces such as tunnels, trenches and manholes	Core
Competency C: Controls environmental hazards	**Core or Optional**
PERFORMANCE CRITERIA	
1. Identifies potential environmental hazards such as oil spills, gas spills and fire conditions, and working in the vicinity of environmentally sensitive areas	Core
2. Minimizes hazards by installing protective barriers such as silt screens and sand bags according to environmental hazards and regulations	Core
3. Reports environmental hazards to emergency services to minimize or eliminate	Core
4. Adjusts work procedures such as the use of tools and equipment according to potential environmental hazards	Core
Competency D: Participates in workplace safety activities	**Core or Optional**
PERFORMANCE CRITERIA	
1. Ensures bucket and ground personnel work cooperatively to ensure safe installation procedures are followed during overheard installations	Core
2. Reports safety hazards per company procedures, and ensure ongoing safety concerns are tracked and reported until corrective action is taken	Core
3. Participate in mandated safety meetings	Core
4. Works with management to ensure organization procedures/standards are adequate and meet regulatory requirements, ensure worker feedback is solicited and used in suggestions on how to create a safe, more effective work environment	Core
5. Participate in organization policy/procedure development and information training	Core
6. Participates in special equipment training (e.g., encloser, regulator, co-pastors)	Core

7. Participates in required certification(s) and how to obtain them	Core
8. Ensures bucket and ground personnel work cooperatively to ensure safe installation procedures are followed during overheard installations	Core
Competency E: Utilizes personal protective devices and safety equipment properly and consistently (body harness, lanyard, anchor sling, etc.)	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects the correct personal protective devices and safety equipment to use in specific work environments	Core
2. Uses equipment that prevents free fall distances from exceeding 6 feet (per OSHA requirements)	Core
3. Demonstrates proper anchoring procedures and wears fall protection equipment, such as a harness, correctly	Core
4. Inspects and maintains fall protection equipment	Core
5. Replaces fall protection equipment upon signs of excessive wear or damage	Core
Competency F: Utilizes positioning devices and equipment properly (gaff, body belt, pole-choker, secondary lanyard, etc.)	**Core or Optional**
PERFORMANCE CRITERIA	
1. Demonstrates proper use of equipment, as appropriate for the work environment	Core
2. Inspects positioning devices and equipment for signs of wear or damage	Core
3. Maintains positioning devices and equipment and replaces those that are damaged	Core

JOB FUNCTION 3: Installs electrical systems and related structures

Related Technical Instruction		
KNOWLEDGE	**SKILLS**	**TOOLS & TECHNOLOGIES**
• Knowledge of standard tools, equipment and materials essential to assembly • Knowledge of transmission system construction materials and tools and their applications • Types of hardware such as crossarms and pole top pins • Types of equipment such as switches and transformers • Framing standards and specifications • Location of pole stamps • Types of treatments such as chromated copper arsenates (CCA) and creosote oil	• Ability to reads and interprets sketches, blueprints, technical manuals, and design specifications • Ability to uses appropriate materials and techniques as specified, understands technical words, follows written directions • Identification of pole weight, class and length • Identification of types of soil conditions and location of adjacent utilities such as gas, water and communication cabling • Identification and obtaining of relevant work permits required to access site(s) and perform work • Ensure completed installation is reviewed for adherence to work procedures and established construction standards and requirements • Climbing structures and working at heights	• Hoists • Lifts • Ropes/Rigging • Multi-meters • Voltage testing devices • Presses/crimpers • Drills • Cutters • Wrenches • Diggers • Splicers • Safety gear – eye protection, rubber gloves, hard hat, steel-toed shoes, etc. • GPS devices • Power tools • Fire extinguishers • First aid kits • Fall arrest, rescue and escape equipment

Competency A: Frames and sets power poles properly	Core or Optional
PERFORMANCE CRITERIA	
1. Determines pole location and ensure holes are dug, poles set to proper depth, and properly aligned	Core
2. Checks pole stamp information such as length, class, treatment type and pole type to ensure the pole meets job requirements	Core
3. Installs ground wire on wood poles based on industry standards and regulations to provide a path to ground for electrical surges	Core

4. Measures distances for placement of hardware and equipment based on industry standards using tools such as folding rulers	Core
5. Attaches hardware and equipment such as guy hooks, pole top pins, crossarms, switches and transformers according to standards	Core
6. Drills holes straight and level at required spacing based on industry standards	Core
7. Digs hole to required depth according to industry standard using equipment such as digger derricks, hydro-vacuums, excavators and shovels	Core
8. Installs pole setting devices such as pole cribbing and rock mounts according to soil condition	Core
9. Places pole in hole using equipment such as digger derricks and cranes, plumb pole, backfill and tamp hole	Core
Competency B: Installs pole guys and anchors; attachments; breakers/rods; etc.	**Core or Optional**
PERFORMANCE CRITERIA	
1. Installs anchors such as helix anchors, rock anchors, cross plates and expansion anchors, according to soil conditions	Core
2. Installs attachments, insulated breakers/rods and guy wires according to industry standards	Core
3. Secures and tensions guy wires using chain/cable hoists and grips	Core
4. Bonds guy wires according to industry standards	Core
Competency C: Installs and assembles steel structures	**Core or Optional**
PERFORMANCE CRITERIA	
1. Oversees assembly and placing of footings in ground according to engineering standards	Optional
2. Installs grounding systems such as counterpoise and bonds using techniques such as thermal welding and mechanical bonding	Optional
3. Lays out steel structure components verifying that all components are present	Optional
4. Assembles components and hardware on the ground using lifting equipment as required according to specifications, roadway and rail protection and adjacent live-lines	Optional
5. Places and secures base of structure on footing using equipment such as cranes	Optional
6. Connects remaining structure sections as required in sequence aloft using equipment such as cranes, helicopters or gin poles	Optional
7. Uses temporary guy wires depending on type of structure to ensure stability during erection	Optional

8. Tightens torque and ping bolts according to manufacturers' specifications	Optional
Competency D: Installs steel structure guy wires and anchors	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects anchor type according to soil condition	Optional
2. Selects guy wire size and guy attachments according to company standards	Optional
3. Positions and install anchors for structures such as dead-end or corner to add stability	Optional
4. Installs strain insulators and fiber rods to prevent a difference in potential	Optional
5. Assembles, secures, and tensions guy wires using tools such as hoists, grips and dynamometers while ensuring the structure is plumb	Optional

JOB FUNCTION 4: Constructs, maintains, and repairs overhead and underground distribution assets

Related Technical Instruction		
KNOWLEDGE	**SKILLS**	**TOOLS & TECHNOLOGIES**
• Types and sizes of conductors such as aluminum conductor steel reinforced (ACSR), aluminum and copper • Types and sizes of pulling equipment such as tensioning machines • Types and sizes of conductor clamps and ties • Grounding and bonding procedures / roadway protection and adjacent live-lines • Effect of sag on conductor tension • Understands schematics	• Stringing procedures such as conventional and tension • Structure loading such as weight and tension techniques • Splicing and termination techniques • Climbing structures and working at heights • Ensure completed installation adheres to work procedures and established construction standards/ requirements • Spatial understanding of maps and schematics • Customer service	• Conductor components such as anti-vibration dampers, spacers and armor rods • Types of insulators such as suspension, stack and pole top • Types and sizes of sleeves such as compression and automatic • Types of presses and sizes of dies • Heavy equipment for digging trenches as needed • Multimeters • Splicing equipment (prefabricated splices; tape; hand tools)

Competency A: (Overhead) Strings overhead conductors properly and safely	**Core or Optional**
PERFORMANCE CRITERIA	
1. Installs travelers on poles or insulators	Optional
2. Temporarily runs conductor/rope through travelers to reduce friction when sagging	Optional
3. Sets up and operates stringing equipment when using tension stringing method	Optional
4. Attaches pulling equipment to conductor/rope	Optional
Competency B: (Overhead) Sags overhead conductors	**Core or Optional**
PERFORMANCE CRITERIA	
1. Adjusts conductor tension based on information on sag charts	Optional
2. Achieves even sag between spans using tools and equipment such as dynamometers, sag boards, pullers, transits and grips	Optional
3. Secures conductors to dead-end fixtures depending on type and size of conductor	Optional
4. Ensures proper sag on the wire is set, transformer is secured and new wire is pulled	Optional

Competency C: (Overhead) Ties in overhead conductors	Core or Optional
PERFORMANCE CRITERIA	
1. Transfers conductor from travelers to insulators	Optional
2. Installs dampers, spacers, aerial markers and armor rods according to industry standards	Optional
3. Secures conductor using clamps or ties	Optional
4. Removes travelers	Optional
Competency D: (Overhead) Splices overhead conductors	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects and applies sleeves (such as automatic, compression, powder-actuated) on ends of conductors to be spliced according to type and size	Optional
2. Completes connection by using compression tools and equipment such as hydraulic, battery-operated, powder-actuated and hand-operated compression tools	Optional
3. Follows splicing techniques such as rotation or overlap according to manufacturers' instructions	Optional
4. Uses hoists to adjust sag when splicing under tension	Optional
Competency E: (Underground) Digs trenches appropriately, using correct equipment and safety precautions – direct buried cables, ducted method, surface troughs, deep bore tunnels, cut and cover tunnels	**Core or Optional**
PERFORMANCE CRITERIA	
1. Accurately identifies and interprets civil engineering drawings or plans to locate existing underground power lines or to install new ones	Optional
2. Uses multimeters and other equipment to locate underground power lines	Optional
3. Uses heavy plant and/or portable equipment to dig trenches, access underground power lines, rig manholes, or pull cable in conduit, appropriate to the location of the lines and other site considerations	Optional

Competency F: (Underground) Selects appropriate components, cable sealants and compounds, joint bays, top joints, water cooling systems (if applicable), using correct methods for insulating components and wires	Core or Optional
PERFORMANCE CRITERIA	
1. Determines the appropriate way to terminate cables at connection points to ensure proper functioning and avoiding voltage stress	Optional
2. Follows correct use of prefabricated cable splices – either cold or heat shrink jackets – to appropriately seal the splice; performs nonfabricated splices as needed	Optional
3. Inspects cable ends before finishing splicing, removes any contaminants, and seals cable ends to protect from moisture and dirt when splice is completed	Optional
4. Determines the best choice for a connector given the splice and the conditions of the underground system (voltage, heat, cold weather)	Optional
5. Applies fireproofing tape, if needed, to protect splice from damage from weakened cables in manhole	Optional
6. Tags the cable with detailed information upon completion of the work	Optional
Competency G: (Underground) Identifies environmental hazards and barriers and plans/carries out appropriate mitigation strategies	**Core or Optional**
PERFORMANCE CRITERIA	
1. Observes places where natural environmental hazards (for example, plant growth or tree roots) limit access to underground lines	Optional
2. Where possible, addresses natural environmental hazards by using appropriate excavation and clearing tools	Optional
3. Mitigates environmental hazards from ongoing work (such as vibrations, noise, and dust) with the use of appropriate equipment and clean-up procedures	Optional
Competency H: (Underground) Identifies and mitigates land use restrictions	**Core or Optional**
PERFORMANCE CRITERIA	
1. Communicates with property owners or others affected, as needed, about the nature of the work	Optional
2. Provides good customer service, including answering questions and communicating clearly, and showing proper identification	Optional
3. Identifies and then notifies supervisors of land use limitations that prevent work and/or affect the public (for example, traffic or road obstructions)	Optional

4. Provides input as to whether additional land use restrictions are necessary upon completion of the project	Optional
Competency I: (Underground) Inspects, replaces, and maintains cables and cable insulation at appropriate intervals and using correct materials and procedures	**Core or Optional**
PERFORMANCE CRITERIA	
1. Reviews maps to correctly identify circuit direction and source	Optional
2. Inspects and locates faults in primary and secondary lines using tools such as capacitor discharge or voltage gradient equipment	Optional
3. Uses appropriate procedures to troubleshoot transformer or cable faults	Optional
4. Implements methods appropriate to the site (direct burying line in an open trench; pulling cable in conduit)	Optional
5. Performs switching procedures (single-phase and three-phase) appropriate to the situation	Optional
6. Exercises procedures, such as isolation and grounding, to ensure personal safety of self and others	Optional

JOB FUNCTION 5: Operates, maintains, and repairs distribution and transmission systems

Related Technical Instruction		
KNOWLEDGE	**SKILLS**	**TOOLS & TECHNOLOGIES**
• Types of structures, systems and operating voltages • Impact on transmission and distribution systems such as overloading, outages and power quality • Jurisdictional and company regulations regarding system authority and switching orders • Types of overhead and underground transmission and distribution equipment • Types of inline schematics (single line diagrams) and symbols for stations, and transmission and distribution systems • Load breaking capabilities and methods • Distribution and transmission standards • Pole and steel structure maintenance programs • Inspection procedures and standards	• Documentation of electrical work to jurisdictional power authority • System components such as transformers, reclosers, regulators, switches and fuses, right-of-ways and easements, safe limits of approach and safe work procedures • Document completed maintenance work according to company policies • Document switching procedures • Ability to identify sight-specific cable	• FRP tools (sticks) • Grounds • Rubber gloves • Load break tools • Voltage indicators • Infrared and thermal equipment • Core samplers • Hi-pot testers • Meggers • Voltmeters • Ladders • Chain saws • Gin poles

Competency A: Operates overhead and/or underground transmission systems	Core or Optional
PERFORMANCE CRITERIA	
1. Selects and uses tools and equipment such as FRP tools (sticks), grounds and rubber gloves	Core
2. Identifies circuits on-site to avoid switching errors and to ensure that work is being performed at correct location	Core
3. Operates equipment and devices such as switches according to switching orders from system authority	Core
4. Tests, commissions, and energizes new transmission systems according to jurisdictional regulations	Core
5. Confirms completion of operation to system authority	Core

6. Visually inspects and tests completion of operation steps	Core
Competency B: Operates overhead and/or underground distribution systems	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects and uses tools and equipment such as rubber gloves, load break tools, FRP tools (sticks), grounds and voltage indicators	Core
2. Identifies circuits on-site to avoid switching errors and to ensure that work is being performed at correct location	Core
3. Operates equipment such as switches, tie points, reclosers, elbows, capacitors and regulators according to switching orders and work procedures	Core
4. Changes circuit status by switching according to order given by system authority	Core
5. Tests, commissions and energizes new distribution systems according to jurisdictional regulations	Core
6. Confirms completion of operation to system authority	Core
7. Visually inspects and tests completion of operation steps	Core
8. Operates cable pulling equipment to install and repair underground services	Core
9. Operates padmount and associated equipment (e.g., junction boxes, switches)	Core
Competency C: Performs station switching	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects and uses tools and equipment such as rubber gloves, FRP tools (sticks) and grounds	Core
2. Identifies circuits to avoid switching errors and to ensure that work is being performed on correct switching apparatus	Core
3. Changes circuit status by switching according to order given by system authority	Core
4. Performs switch and lock-out procedures according to system authority policy	Core
5. Confirms completion of operation to system authority	Core
6. Visually inspects and tests completion of operation steps	Core
Competency D: Inspects distribution and transmission systems	**Core or Optional**
PERFORMANCE CRITERIA	
1. Visually inspects poles, structures, footings and apparatus such as transformers, disconnects and capacitors to maintain system's integrity	Core

2. Selects and uses test equipment such as infrared and thermal equipment, and core samplers	Core
3. Recognizes deficiencies such as loose connections, broken insulators and grounds	Core
4. Performs load checks to identify imbalanced and overloaded circuits	Core
5. Reports findings of inspection to prioritize repair	Core
Competency E: Maintains poles and steel structures	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects and uses tools and equipment such as torque and spud wrenches	Core
2. Stubs or tops and caps poles to stabilize and extend life	Core
3. Straightens poles by using equipment such as RBD, chain hoists and plumb bob	Core
4. Removes and replaces poles depending on conditions such as rotten, infested, fallen and damaged poles, and according to pole type	Core
5. Inserts pole top extensions or replace for roadway clearances	Core
6. Paints towers to prevent rusting and for aerial visibility	Core
7. Tightens hardware and change steel bracing to ensure structural integrity	Core
8. Repairs concrete and wrap footings to ensure structural integrity	Core
9. Documents completed maintenance work according to company policy	Core
Competency F: Maintains system components	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects and uses tools and equipment such as rubber gloves, test equipment, and live-line and hand tools	Core
2. Replaces system components such as insulators, transformers and guy wires according to jurisdictional requirements	Core
3. Replaces pole grounds and moldings	Core
4. Removes contaminants from contacts of disconnect switches and insulators to ensure safe operation	Core
5. Manually operates equipment and apparatus periodically to ensure safe operation according to jurisdictional requirements	Core

Competency G: Identifies and mitigates environmental hazards (i.e. tree trimming, rodent infestations, erosion, etc.)	Core or Optional
PERFORMANCE CRITERIA	
1. Patrols circuit to identify obvious damage such as fallen trees, damaged poles and downed lines, and/or underground damage	Core
2. Reports required actions related to environmental hazards to system authority, as needed	Core
Competency H: Repairs overhead and/or underground distribution systems	**Core or Optional**
PERFORMANCE CRITERIA	
1. Selects and uses test equipment such as potential indicators, fault indicators and voltmeters	Core
2. Sectionalizes circuit to determine location of fault	Core
3. Isolates fault, damage or hazard and restores power to customers using equipment such as switches and jumpers	Core
4. Documents switching procedures	Core
5. Reports trouble and required actions such as repairs or replacements, and estimated repair time to system authority	Core
6. Selects and use tools and equipment such as rubber gloves, grounds and potential indicators	Core
7. Tests equipment and cables using tools such as hi-pot testers, meggers and voltmeters to verify fault and integrity	Core
8. Exposes faulted cables using methods such as mechanical digging, manual digging and using hydro-vacuums	Core
9. Replaces components such as transformers, switches, conductors, elbows and terminations	Core
10. Repairs conductor by splicing	Core
11. Follows work procedures such as grounding, bonding and retesting cable restore system to normal operating status by using switching procedures	Core

Competency I: Repairs overhead and/or underground transmission systems including components (cross arms, conductors, poles, and insulators), switches, terminations, and other devices	Core or Optional
PERFORMANCE CRITERIA	
1. (Overhead) Patrols circuit to identify defective equipment and components, and fault location	Core
2. (Overhead) Reports trouble and required actions such as repairs or replacements, and estimated repair time to system authority	Core
3. (Overhead) Operates equipment and devices such as switches to isolate section of transmission lines according to switching orders from system authority	Core
4. (Overhead) Selects and uses tools and equipment such as ladders, chainsaws, grounds and gin poles	Core
5. (Overhead) Follows work methods such as grounding and bonding	Core
6. (Overhead) Replaces components such as cross arms, conductors, poles and insulators	Core
7. (Overhead) Repairs conductor by splicing	Core
8. (Overhead) Reports completed repairs or replacement of components and restoration of system to system authority	Core
9. (Underground) Pinpoints faults by selecting and using test equipment such as potential indicators, hi-pot testers and high voltage test units	Core
10. (Underground) Isolates fault, damage or hazard and restore power to customers using equipment such as switches according to switching order from system authority	Core
11. (Underground) Visually recognizes defective components such as terminations	Core
12. (Underground) Reports trouble and required actions such as repairs or replacements, and estimated repair time to system authority	Core
13. (Underground) Selects and uses tools and equipment such as FRP tools (sticks), grounds, potential indicators and rubber gloves	Core
14. (Underground) Follows work methods such as grounding, bonding and retesting cable	Core
15. (Underground) Exposes faulted cables using methods such as mechanical digging, manual digging and using hydro-vacuums	Core
16. (Underground) Repairs conductor by splicing	Core
17. (Underground) Replaces faulted terminations	Core
18. (Underground) Reports completed repairs or replacement of components and restoration of system to system authority	Core

JOB FUNCTION 6: Finds and repairs power outages and performs emergency repairs

Related Technical Instruction		
KNOWLEDGE	**SKILLS**	**TOOLS & TECHNOLOGIES**
• Identifying accurate sources of relevant information (prints, OEM manuals, process diagrams etc.) • Translates and interprets blueprints, drawings, diagrams, etc. • Knowledge of transmission system components and function • Knowledge of causes of outages such as flashed insulators, broken arms, worn hardware, etc. • Knowledge of switches and switch procedures • Knowledge of transmission system construction and maintenance materials and tools • Knowledge of current and typical environmental activities near the system	• Analyze the problem, identify possible causes/reasons, evaluate solutions and devise action plan • Recognizes system strengths/limitations • Communicate all requirements, quality and performance expectations to team/crew before work is started	• Grounds • Rubber gloves • Load break tools • Voltage indicators • Ladders • Chain saws • Gin poles • Safety gear – eye protection, rubber gloves, hard hat, steel-toed shoes, etc. • Fire extinguishers • First aid kits • Fall arrest, rescue and escape equipment

Competency A: Uses appropriate personal and environmental protective devices and techniques to secure the work area and protect human safety	**Core or Optional**
PERFORMANCE CRITERIA	
1. Assembles all required tools for the repair prior to initiating the work	Core
2. Checks tools to ensure they are in safe and proper working order	Core
3. Uses proper personal protective equipment	Core

Competency B: Identifies and reviews appropriate repair manuals or policies and procedures based on observed or reported fault	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies and reviews appropriate reference material	Optional
2. Follows existing repair procedures in accordance with OEM manuals or employer's procedures and uses correct disassembly, repair and reassembly procedures	Optional
Competency C: Applies diagnostic tools and skills to identify and repair sources of fault; installs updated equipment or components; or performs preventative maintenance	**Core or Optional**
PERFORMANCE CRITERIA	
1. Identifies normal and abnormal system functionality	Core
2. Identifies and explains function of transmission system components	Core
3. Identifies access to lines, historic line conditions, gun/animal areas, current activities around the line, contractor activity around the line, ice loading	Core
4. Checks sources of typical faults to initiate troubleshooting	Core
5. Follows a logical troubleshooting process	Core
6. Assesses and controls damage	Core
7. Performs troubleshooting with no adverse impact on transmission system	Core
8. Properly maintains emergency stock, tools, and rolling stock	Core
9. Identifies and selects proper equipment specific to each line	Core
10. Completes repairs within specified time frames	Core

Competency D: Confirms power restoration after repairs	Core or Optional
PERFORMANCE CRITERIA	
1. Performs inspection and verification procedures regarding equipment reliability and proper operation	Core
2. Performs safety checks and test runs	Core
3. Adheres to organization/employer's procedures regarding release/return to service	Core
4. Operates system according to established procedures	Core
Competency E: Communicates effectively with first responders, dispatchers, and members of the public to coordinate activities appropriately	**Core or Optional**
PERFORMANCE CRITERIA	
1. Clearly communicates corrective actions to appropriate personnel and makes recommendations for changes in preventive maintenance	Optional
2. Uses radio equipment properly	Optional
3. Uses proper call out procedure and follows the procedures outlined in the APM (Accident Prevention Manual)	Optional
Competency F: Accurately documents work performed, equipment or parts used, and notes deferred maintenance needs	**Core or Optional**
PERFORMANCE CRITERIA	
1. Documents the repair completely and accurately	Optional
2. Informs maintenance personnel about repair and required follow-up	Optional

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2100 M Street NW
Washington, DC 20037

www.urban.org