National Craft Assessment and Certification Program
S P E C I F I C A T I O N S

POWER LINE WORKER TRANSMISSION
PLWTRA81
Released March 2013

Focus Statement
A Power Line Transmission Worker must be able to demonstrate an understanding of personnel and equipment safety, have a basic understanding of electricity, transmission, and distribution systems, be able to interpret diagrams, comply with proper safety standards, procedures, and work practices, make repairs to energized electrical transmission systems, interpret verbal and written communication including hand signals, perform transmission heavy rigging, and skillfully troubleshoot transmission systems.

A Power Line Transmission Worker can climb and work comfortably at high elevations and over obstructions, operate basic hand tools and transmission work-specific tools, and equipment such as bucket trucks, digger derricks, cranes, and specialized pulling equipment, as well as various meters and test equipment, install and maintain structures, power lines, and assorted auxiliary equipment.

Overview
- Two-hour closed-book examination
- May use a basic function, non-printing calculator
- No extra papers, books, notes or study materials are allowed
- The minimum passing score is 70
- A corresponding hands-on Performance Verification is available

NCCER Curriculum
All NCCER knowledge assessments are referenced to NCCER's curriculum listed in the content. You may order modules from Pearson (800.922.0579) or from NCCER's Online Catalog at www.nccer.org

Assessment Development
All questions are developed and approved by subject matter experts under the direction of NCCER.

Credentials
Upon successful completion of the knowledge assessment, NCCER will send applicable credentials to the assessment center.

Score Report and Training Prescription
Each candidate will have access to their assessment results including their overall score and recommended training.

NCCER Registry
Knowledge assessment results are recorded in NCCER's Registry and become a part of the portable record of an individual's NCCER credentials.

Knowledge Assessment Contents:

Content Domain	On test
Safety *[49102-11]*	7
Electrical Circuits & Theory *[49103-11, 49104-11, 80201-11]*	6
Climbing Poles *[49105-11, 49106-11]*	6
Tools and Test Equipment *[49107-11, 49113-11]*	6
Poles, Excavation, Framing, and Erection *[49108-11, 49111-11, 49112-11, 81202-11]*	9
Rigging *[49110-11, 81201-11, 38302-11]*	16
Equipment Installation and Re-conductoring *[81203-11, 81302-12]*	10
System Maintenance *[81204-11]*	6
Live-line Bare-hand Maintenance & Repair *[81301-12]*	4
Hot Stick Maintenance & Repair *[81303-12]*	5
Total Number of Questions	**75**

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Learning Objectives related to Assessment:

	Safety
Registry ID Number:	**Module Title and Objectives:**
49102-11	**Power Line Worker Safety**
	Inspect rubber insulating blankets, line hoses, covers, and guards.
	Describe the safety practices associated with high-voltage work, including: Step and touch potential, Minimum approach distance, Protection from arc flash and arc blast. Procedures for entering substations
	Describe traffic control methods.
	Electrical Circuits & Theory
Registry ID Number:	**Module Title and Objectives:**
49103-11	**Introduction to Electrical Circuits**
	Explain the difference between conductors and insulators.
	Define voltage and identify the ways that it can be produced.
	Explain the basic characteristics of series and parallel circuits.
49104-11	**Introduction to Electrical Theory**
	Explain the basic characteristics of series, parallel, and combination circuits.
	Using Ohm's law, find the unknown values in series, parallel, and series-parallel circuits.
	Explain the purpose of bonding and grounding.
80201-11	**Alternating Current & Three-Phase Systems**
	Describe the operating principles and functions of capacitors.
	Explain the principles and functions of transformers.
	Climbing Poles
Registry ID Number:	**Module Title and Objectives:**
49105-11	**Climbing Wooden Poles**
	Identify all required and recommended safety equipment
	Demonstrate the knowledge and proper use of required climbing equipment.
	Demonstrate the ability to inspect climbing equipment prior to climbing.
	Identify the hazards associated with climbing wooden poles.
	Demonstrate the ability to inspect a wooden pole for defects prior to climbing.
	Identify and demonstrate proper climbing ascent, descent, and lateral positioning techniques.
	Demonstrate the ability to safely climb over obstructions.
	Demonstrate the ability to withstand working at heights above 32 feet.
	Demonstrate the ability to perform pole-top rescue with and without the presence of a cross arm.
49106-11	**Climbing Structures Other Than Wood**
	Identify the required safety equipment for proper climbing.
	Demonstrate the ability to inspect required safety equipment before use.
	Identify the various environmental hazards requiring consistent attention from the worker.
	Conduct a proper pre-climb inspection of steel poles and towers and the surrounding area.
	Identify the appropriate climbing routes of various structures.

	State the practices for safely ascending and descending steel poles and towers.
	Demonstrate the physical and mental ability to endure the unique stresses of working at high elevations.
	Safely ascend and descend a steel tower.
	Tools and Test Equipment
Registry ID Number:	**Module Title and Objectives:**
49107-11	**Tools of the Trade**
	Identify and explain the use of common insulated hand tools.
	Identify and explain the use of line workers' ladders.
	Identify and explain the use of line workers' specialty tools.
	Demonstrate the ability to use line workers' tools specified by the instructor.
49113-11	**Introduction to Electrical Test Equipment**
	Describe the following pieces of test equipment and explain their purpose: voltmeter , ohmmeter, clamp-on ammeter, multimeter, megohmmeter, hi-pot tester (dielectric strength tester), motor and phase rotation testers, recording instruments, high-voltage detector, phasing sticks
	Select the appropriate meter for a given work environment based on category ratings.
	Identify the safety hazards associated with various types of test equipment.
	Poles, Excavating, Framing, and Erection
Registry ID Number:	**Module Title and Objectives:**
49108-11	**Aerial Framing and Associated Hardware**
	Describe the difference between single-phase and three-phase construction.
	Identify the hardware used in aerial framing.
	Using the standards manual, identify materials, assorted pole hardware, and support arms needed to perform aerial framing on: single cross-arm, double cross-arm, dead triple cross-arm set, an outrig arm, an alley arm
	Describe, assemble, and install guys.
	Perform an aerial framing procedure as defined by the instructor.
	Hand-pull single-phase and three-phase primary conductors, dead end, and sag.
	Explain how to install a transformer and connect conductors.
49111-11	**Setting and Pulling Poles**
	Describe and demonstrate how to load and unload wood poles in preparation for installation.
	Explain and demonstrate the importance of using the proper hand signals when setting a pole
	Describe and demonstrate how to set a wood utility pole using a digger derrick.
	Describe and demonstrate how to set a wood utility pole by hand.
	Describe and demonstrate how to pull a wood utility pole from the ground.
49112-11	**Trenching, Excavating, and Boring Equipment**
	Identify the trenching, excavating, and boring safety guidelines
	Identify and explain the use and operation of compact and pedestrian trenchers.
	Identify and explain the use and operation of a backhoe.
	Identify and explain the use and operation of a horizontal directional drilling machine.
	Rigging
Registry ID Number:	**Module Title and Objectives:**
49110-11	**Rigging**
	Describe and demonstrate hand signals and other communication methods used in rigging work.
	Describe safety hazards and safety practices associated with rigging work.
	Identify safety procedures associated with the use of cranes in rigging work.
	Describe how cranes are used to lift and move loads.

	Tie knots used in rigging: square, figure 8, clove hitch, double half hitch, bowline, bowline on a bight, timber hitch, sheet bend, running bowline, back splice, sheep shank
	Reeve a set of blocks.
81201-11	**Transmission Structure Rigging**
	Explain lift planning and rigging system planning.
	Explain the strength calculations for various type of rigging including any derating for D/d ratios.
	Explain crane stability as well as personnel platform requirements and operational considerations.
	Demonstrate the determination of a load's weight and center of gravity.
	Demonstrate the selection of an appropriate lifting device for a particular load.
	Demonstrate hand signaling requirements for a blind lift.
38302-11	**Lift Planning**
	Reference available material that will assist in a safe lifting operation.
	Describe the importance of following and adhering to a lift plan.
	Define the terms on a load/capacity chart to indicate boom angle, load radius, and boom length.
	Calculate crane capacity using a load/capacity chart.
	Identify the differences between on-rubber and on-outrigger charts.
	Provide the necessary information requested on a lift plan.
	Calculate additions and deductions involved in lifting operations.
	Identify existing operations that need special approval.
	Identify engineering considerations in a lift plan.
	Identify the various types of lift plans and their differences.
	Identify the importance of lift plan implementation.
	Equipment Installation and Re-conductoring
Registry ID Number:	**Module Title and Objectives:**
81203-11	**Transmission Equipment Installation**
	Describe the effects of electrostatic and electromagnetic induction.
	Use Kellems grips socks and double Kellems grips to install: phase conductors, overhead shield conductors and optical ground wire
	Operate single- and multiple-conductor pulling and tensioning machines.
	Splice conductors using compression sleeves.
	Sag an installed conductor using: sag scope or transit, dynamometer, return wave timing
81302-12	**Re-conductoring Transmission Lines**
	Prepare for a re-conductoring project, including: performing a pre-job briefing, equipment setup, setting up guard structures
	Describe how to pull conductors by alleying-out existing conductors.
	Describe how to pull conductors using the existing conductors.
	System Maintenance
Registry ID Number:	**Module Title and Objectives:**
81204-11	**Transmission System Maintenance**
	State the safety guidelines for working on transmission lines.
	State the requirements for performing inspection and maintenance on insulators.
	State the requirements for performing inspection and maintenance on conductors and conductor hardware, including switching, tagging, and clearance procedures.
	State the requirements for performing inspection and maintenance on transmission structures and guys.
	Explain the environmental issues that affect transmission line maintenance.
	Perform inspection and maintenance on poles, transmission structures, and guys.

	Live-line Bare-hand Maintenance & Repair
Registry ID Number:	**Module Title and Objectives:**
81301-12	**Live-line Barehand Maintenance & Repair**
	Identify safety practices associated with live-line bare-hand work.
	Identify the required personal protective equipment (PPE) used specifically in live-line bare-hand work.
	Identify the required personal protective equipment (PPE) used specifically in live-line bare-hand work.
	Describe basic procedures for initiating live-line bare-hand tasks, such as: bonding to an energized line, care and preparation of a bucket truck boom, donning the required PPE.
	Hot Stick Maintenance & Repair
Registry ID Number:	**Module Title and Objectives:**
81303-12	**Hot Stick Maintenance & Repair**
	Identify safe practices and PPE associated with live-line hot stick work.
	Identify and maintain tools and accessories used in live-line hot stick work.
	Describe the procedures for performing various live-line hot stick tasks: moving energized conductors, removing and replacing insulators, replacing crossarms, installing vibration dampers, installing line spacers