

**STP 5-21Q14-SM-TG**

**Soldier's Manual  
and  
Trainer's Guide**

**MOS 21Q**

**Power Line Distribution  
Specialist**

**Skill Levels 1/2/3/4**

**May 2007**

**DISTRIBUTION RESTRICTION:** Approved for public release; distribution is unlimited.

**HEADQUARTERS  
DEPARTMENT OF THE ARMY**

**This publication is available at Army  
Knowledge Online <[www.us.army.mil](http://www.us.army.mil)>  
and the General Dennis J. Reimer Training and  
Doctrine Digital Library at <[www.train.army.mil](http://www.train.army.mil)>.**

# Soldier's Manual and Trainer's Guide

## MOS 21Q

### Power Line Distribution Specialist

#### Skill Levels 1/2/3/4

#### TABLE OF CONTENTS

	<u>PAGE</u>
<b>Table of Contents</b> .....	i
<b>Preface</b> .....	iv
<b>Chapter 1. Introduction</b> .....	1-1
<b>Chapter 2. Trainer's Guide</b> .....	2-1
<b>Chapter 3. MOS/Skill Level Tasks</b> .....	3-1
<b>Skill Level 1</b>	
<b>Subject Area 1: Safety Operations</b>	
052-204-1108 Inspect Safety Equipment.....	3-1
052-204-1113 Prepare a Manhole for Safe Entry .....	3-3
052-204-1114 Rescue an Injured Victim From a Utility Pole .....	3-6
052-204-1115 Rescue an Injured Victim From a Manhole .....	3-8
052-204-1116 Rescue an Injured Victim From an Aerial-Bucket Truck .....	3-10
<b>Subject Area 2: Maintenance of Equipment and Electrical Systems</b>	
052-204-1117 Inspect Hot-Line Equipment .....	3-12
052-204-1118 Maintain Climbing and Rigging Equipment .....	3-14
052-204-1119 Perform Operator Preventive-Maintenance Checks and Services (PMCS) on a Line Truck With Auxiliary Equipment .....	3-18

**DISTRIBUTION RESTRICTION:** Approved for public release; distribution is unlimited.

\*This publication supersedes STP 5-52G14-SM-TG, 27 December 1988.

**Subject Area 3: Installation of Electrical Equipment**

052-204-1120 Install a Grounding Set..... 3-21  
 052-204-1121 Install High-Intensity Lights and Ballasts..... 3-24  
 052-204-1122 Install Distribution Equipment (De-energized)..... 3-27  
 052-204-1123 Secure Conductor to Insulator (De-energized) ..... 3-30

**Subject Area 4: Electrical Service Calls**

052-204-1124 Climb a Utility Pole ..... 3-32  
 052-204-1125 Operate a Line Truck With Auxiliary Equipment ..... 3-35  
 052-204-1126 Perform a Crossarm Change Out..... 3-38  
 052-204-1127 Perform Groundman Duties ..... 3-40  
 052-204-1128 Interpret an Electrical One-Line Diagram ..... 3-42  
 052-204-1129 Splice a Medium-Voltage Power Cable..... 3-43  
 052-204-1130 Terminate a Medium-Voltage Power Cable ..... 3-47

**Skill Level 2**

**Subject Area 1: Safety Operations**

052-204-2207 Conduct a Safety Briefing..... 3-50  
 052-204-2208 Conduct a Safety Inspection ..... 3-51  
 052-244-2112 Perform Lockout and Tagout Procedures ..... 3-53

**Subject Area 3: Installation of Electrical Equipment**

052-204-2209 Install Distribution Equipment (Energized) ..... 3-58  
 052-204-2210 Secure Conductor to Insulator (Energized)..... 3-61

**Subject Area 4: Electrical Service Calls**

052-204-2211 Develop a Bill of Materials (BOM) List..... 3-63  
 052-204-2212 Energize an Electrical Distribution System..... 3-65  
 052-204-2213 Locate an Underground Cable and/or a Fault..... 3-67  
 052-204-2214 Perform Live-Line Testing ..... 3-70  
 052-204-2215 Perform an Insulation-Resistance Test ..... 3-72  
 052-204-2216 Perform Maintenance on Electrical Distribution Equipment ..... 3-75

**Subject Area 5: Supervision and Management of Electrical Projects**

052-204-2217 Manage a Power Line Crew ..... 3-78  
 052-204-2218 Supervise the Installation of Underground Cable..... 3-81  
 052-204-2219 Supervise the Loading and Unloading of Utility Poles ..... 3-84  
 052-204-2220 Supervise the Mechanical Erection of a Utility Pole ..... 3-86

**Skill Level 3**

**Subject Area 5: Supervision and Management of Electrical Projects**

052-204-3014 Supervise the Manual Erection of a Utility Pole ..... 3-89  
 052-204-3015 Supervise the Sagging of Overhead Conductors..... 3-92  
 052-204-3016 Supervise the Stringing of Overhead Conductors..... 3-94

**Skill Level 4**

**Subject Area 5: Supervision and Management of Electrical Projects**

052-204-4003 Supervise Risk-Management Procedures..... 3-96  
 052-244-4205 Perform Electrical Project Management..... 3-98  
 052-244-4206 Perform Quality Assurance (QA) and/or Quality Control (QC) Responsibilities.... 3-103

**Appendix A - Metric Conversion Chart ..... A-1**  
**Glossary ..... Glossary-1**  
**References ..... References -1**

## PREFACE

This Soldier training publication (STP) contains standardized training objectives (in the form of task summaries) to train and evaluate Soldiers on critical tasks that support unit missions during wartime. Trainers and leaders should actively plan for Soldiers holding this military occupational specialty (MOS) to have access to this publication.

This publication applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the United States Army Reserve (USAR) unless otherwise stated.

The proponent for this publication is the United States Army Training and Doctrine Command (TRADOC). Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commandant, United States Army Engineer School, ATTN: ATSE-DT, Individual Training Division, 320 MANSCEN Loop, Fort Leonard Wood, MO 65473-8929. Comments should be keyed to a specific page, paragraph, and line of text in which the change is recommended. Provide reasons for each comment to ensure understanding and complete evaluation.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

## CHAPTER 1

### Introduction

1-1. General. This manual identifies the individual MOS training requirements for Soldiers. It is designed to be used by commanders, trainers, and Soldiers to plan, conduct, and evaluate individual training in units. This manual is the primary reference for supporting self-development, evaluating MOS proficiency, and training Soldiers. Commanders employ the following two primary methods to evaluate Soldier proficiency:

- **Commander's evaluation.** Commander's evaluations are local tests or assessments of Soldier performance of MOS-specific and common tasks critical to the unit mission. They may be conducted year-round.
- **Common task test (CTT).** CTTs are hands-on tests used to evaluate proficiency on common tasks.

1-2. Integration of Individual and Collective Tasks. This manual should be used along with STP 21-1-SMCT, STP 21-24-SMCT, Field Manual (FM) 7-0, FM 7-1, FM 25-4, FM 25-5, and any related combined arms training strategies (CATS) and drills to establish effective training plans and programs that integrate individual and collective tasks.

1-3. Task Summaries. Task summaries contain information necessary to conduct training and evaluate Soldier proficiency on tasks critical to the MOS. A separate task summary is provided for each critical task. These task summaries are, in effect, standardized training objectives which ensure that Soldiers do not have to relearn a task on reassignment to a new unit. The format for the task summaries included in this manual is as follows:

- **Task title.** The task title identifies the action to be performed.
- **Task number.** The 10-digit task number identifies each task or skill. Include this task number, along with the task title, in any correspondence relating to the task.
- **Conditions.** The task conditions identify all the equipment, tools, references, job aids, and supporting personnel that the Soldier needs to perform the task in wartime. This section identifies any environmental conditions that could alter task performance, such as visibility, temperature, and wind. This section also identifies any specific cues or events (a chemical attack or identification of a threat vehicle) that trigger task performance.
- **Standards.** The task standards describe how well and to what level a task must be performed under wartime conditions. Standards are typically described in terms of accuracy, completeness, and speed.
- **Training and evaluation.** This section may contain a training information outline, an evaluation preparation, and/or an evaluation guide. The training information outline includes detailed training information. The evaluation preparation subsection indicates the necessary modifications to the task performance in order to train and evaluate a task that cannot be trained to the wartime standard under wartime conditions. The evaluation preparation may also include special training and evaluation preparation instructions to accommodate these modifications and any instruction that should be given to the Soldier before evaluation. The evaluation guide identifies the specific actions, known as performance measures, that the Soldier must do to successfully complete the task. These actions are listed in a *pass/fail* format for easy evaluation. Each evaluation guide contains a feedback statement that indicates the requirements for receiving a GO on the evaluation.

- **References.** This section identifies references that provide more detailed and thorough explanations of task performance requirements than that given in the task summary description.

1-4. Safety. Additionally, some task summaries include safety statements and notes. Safety statements (danger, warning, and caution) alert users to the possibility of immediate death, personal injury, or damage to equipment. Notes provide an explanation or hint relative to the performance measures. These are not all-inclusive; refer to the related and/or required references of each individual task for more details.

1-5. Soldier's Responsibilities. Each Soldier is responsible for performing individual tasks that the first-line supervisor identifies based on the unit mission-essential task list (METL). The Soldier must perform the task to the standards listed in the Soldier's manual (SM). If a Soldier has a question about how to do a task or which tasks in this manual he must perform, it is the Soldier's responsibility to ask the first-line supervisor for clarification. The first-line supervisor knows how to perform each task or can direct the Soldier to the appropriate training materials.

1-6. Noncommissioned Officer Self-Development and the Soldier's Manual. Self-development is one of the key components of the leader development program. It is a planned, progressive, and sequential program followed by leaders to enhance and sustain their military competency. It consists of individual study, research, professional reading, practice, and self-assessment. Under the self-development concept, the noncommissioned officer (NCO), as an Army professional, has the responsibility to remain current in all phases of the MOS. The SM is the primary source for the NCO to use in maintaining MOS proficiency.

1-7. Army Correspondence Course Program. Another important resource for NCO self-development is the Army Correspondence Course Program (ACCP). See DA Pamphlet 350-59 for information on enrolling in this program and for a list of courses, or write to: Army Institute for Professional Development, United States Army Training Support Center, ATTN: ATIC-IPS, Newport News, VA 23628-0001.

1-8. Unit Learning Centers. Unit learning centers are valuable resources for planning self-development programs. They can help access enlisted career maps, training support products, and extension training materials.

1-9. Training Support.

a. This manual includes the following appendixes and information that provide additional training support information:

- **Appendix A, Metric Conversion Chart.** This appendix provides a metric measurement conversion chart.
- **Glossary.** The glossary is a comprehensive list of acronyms, abbreviations, definitions, and letter symbols used in this SM.
- **References.** This section contains two lists of references, required and related, that support the training of all tasks in this SM. Required references are listed in the conditions statement and are required for the Soldier to do the task. Related references are materials that provide more detailed information and a more thorough explanation of task performance.



b. The NCO trainer can use DA Form 5164-R (Hands-on Evaluation) to set up the leader book as described in FM 7-1. The use of this form may help preclude writing the Soldier tasks associated with the unit METL and can become a part of the leader book. The use of this form is optional, but highly encouraged. This evaluation allows you to maintain and track the Soldier's proficiency at the performance level. This form can be obtained electronically and may be reproduced locally on 8 1/2- by 11-inch paper. Follow these instructions when completing this form:

- Enter the title and number of the task to be evaluated at the top of the form.
- Enter in column a the number of each performance step from the evaluation guide.
- Enter in column b each performance step from the evaluation guide that corresponds to the number in column a. Abbreviate the information, if necessary.
- Locally reproduce the partially completed form if more than one Soldier will be evaluated on the specific task or the same Soldier will be evaluated more than once.
- Enter the date, the evaluator's name, and the Soldier's name and unit before starting the evaluation.
- Enter a check in column c or column d for each performance step evaluated, as appropriate.
- Check the status block GO or NO-GO.

**NOTE TO THE TRAINING MANAGER: The training status of groups (such as teams, squads, or platoons) can be maintained in key critical MOSs at any level by entering the level (such as 1st platoon, 2d platoon, or 3d platoon) in the column headings. Simply have the trainers report the percentage of their Soldiers who have (GO blocks) and have not (NO-GO blocks) demonstrated proficiency on each task, and record this information for each level.**

1-10. Enlisted Personnel Management System. The Enlisted Personnel Management System (EPMS) (Army Regulation [AR] 614-200) is the Army's overall system to improve the professionalism of the enlisted force. It integrates policies relating to training, evaluation, classification, and promotion into an overall system. It provides the Soldier with a means to look to the future and see a realistic, clear, and viable career progression path from private (PVT) to sergeant major (SGM). However, the EPMS is useless if the Soldier does not understand and use it. Part of the trainer's job is to ensure that the Soldier understands and uses the EPMS. As an aid, Figure 1-1 (page 1-4) provides the trainer with a career management field (CMF) map for the Soldier. Along with information contained in AR 614-200, the Soldier can use the career map to develop goals early in his career and plan accordingly.

NCOES	PLDC	BNCOC	ANCOC	USASMA		
Civilian schools	High school, GED diploma	College*				
		1 year	2 years	3 years		
		A goal: Troop assignments often preclude off-duty education.				
Other schools	Drill sergeant school Recruiting school Battle staff course 1SG course					
Encouraged assignments	Retention, recruiter Drill sergeant Instructor Operations/intelligence/reconnaissance sergeant *Construction sergeant Inspector/foreman RC advisor CMF 21 staff assignments					
Key leadership assignments	Junior Lineman	Junior Lineman	Lineman	Senior Lineman	1SG	CSM
Grades	PVT, PFC, SPC, CPL	SGT	SSG	SFC	1SG/MSG	SGM/CSM
Years of service	1-4	3-8	6-14	10-18	16-22	20+

**Figure 1-1. CMF Map**

1-11. Skill Progression Chart. Similar or related education, training, and experience are grouped into CMFs. The career progression path for MOS 21Q, CMF 21, engineer, is shown in Figure 1-2.

SL 5 (E9)	00X50 Command Sergeant Major
SL 5 (E8)	21X50 First Sergeant
SL 4 (E7)	21Q40 Senior Lineman
SL 3 (E6)	21Q30 Lineman
SL 2 (E5)	21Q20 Junior Lineman
SL 1 (E1 through E4)	21Q10 Junior Lineman
	Trainee

**Figure 1-2. Career Progression Sequence**

## CHAPTER 2

### Trainer's Guide

2-1 General. The trainer's guide (TG) identifies the essential components of a unit training plan for individual training. Units have different training needs and requirements based on differences in environment, location, equipment, dispersion, and similar factors. Therefore, the TG should be used as a guide for conducting unit training and not a rigid standard. It provides information necessary for planning training requirements for the MOS. The TG—

- Identifies subject areas in which Soldiers must be trained.
- Identifies the individual tasks for each subject area.
- Specifies where Soldiers are initially trained on each task.
- Recommends how often to train each task to sustain proficiency.

2-2. MOS 21Q14 Critical Tasks. This list identifies, by general subject areas, the critical tasks to be trained in an MOS and the type of training required (resident, integration, or sustainment).

- **Task Number Column.** This column lists the task numbers for all tasks included in the subject area.
- **Title Column.** This column lists the task title for each task in the subject area.
- **Training Location Column.** This column identifies the training location where the task is first trained to STP standards. If the task is first trained to standard in the unit, the word "Unit" will be in this column. If the task is first trained to standard in the resident course, it will be identified by brevity code (such as AIT, BNCOC, or ANCOC). Figure 2-1 contains a list of training locations and their corresponding brevity codes.

<b>ASI/SD</b>	Additional Skill Identifier/Special Duty
<b>AIT</b>	Advanced Individual Training
<b>UNIT</b>	Trained in the Unit

**Figure 2-1. Training Locations**

- **Sustainment Training Frequency Column.** This column indicates the recommended frequency at which the tasks should be trained to ensure that the Soldiers maintain task proficiency. Figure 2-2 identifies the frequency codes used in this column.

<b>BA</b>	Biannually
<b>AN</b>	Annually
<b>SA</b>	Semiannually
<b>QT</b>	Quarterly
<b>MO</b>	Monthly
<b>BW</b>	Biweekly
<b>WK</b>	Weekly

**Figure 2-2. Sustainment Training Frequency Codes**

- **Sustainment Training Skill Level Column.** This column lists the skill levels of the MOS for which Soldiers must receive sustainment training to ensure that they maintain proficiency to SM standards.
- **Subject Area Codes.** Tasks are grouped into numbered areas. See Figure 2-3.

<b>Skill Level 1</b>	
1	Safety Operations
2	Maintenance of Equipment and Electrical Systems
3	Installation of Electrical Equipment
4	Electrical Service Calls
<b>Skill Level 2</b>	
1	Safety Operations
3	Installation of Electrical Equipment
4	Electrical Service Calls
5	Supervision and Management of Electrical Projects
<b>Skill Level 3</b>	
5	Supervision and Management of Electrical Projects
<b>Skill Level 4</b>	
5	Supervision and Management of Electrical Projects

**Figure 2-3. Subject Area Codes**

2-3 Critical Tasks List.

**MOS 21Q14 CRITICAL TASKS**

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
<b>Skill Level 1</b>				
<b>Subject Area 1. Safety Operations</b>				
052-204-1108	Inspect Safety Equipment	AIT	AN	1-4
052-204-1113	Prepare a Manhole for Safe Entry	AIT	AN	1-4
052-204-1114	Rescue an Injured Victim From a Utility Pole	AIT	AN	1-4
052-204-1115	Rescue an Injured Victim From a Manhole	AIT	AN	1-4
052-204-1116	Rescue an Injured Victim From an Aerial-Bucket Truck	AIT	AN	1-4

<b>Subject Area 2. Maintenance of Equipment and Electrical Systems</b>				
052-204-1117	Inspect Hot-Line Equipment	AIT	AN	1-4
052-204-1118	Maintain Climbing and Rigging Equipment	AIT	AN	1-4
052-204-1119	Perform Operator Preventive-Maintenance Checks and Services (PMCS) on a Line Truck With Auxiliary Equipment	AIT	AN	1-4
<b>Subject Area 3. Installation of Electrical Equipment</b>				
052-204-1120	Install a Grounding Set	AIT	AN	1-4
052-204-1121	Install High-Intensity Lights and Ballasts	AIT	AN	1-4
052-204-1122	Install Distribution Equipment (De-energized)	AIT	AN	1-4
052-204-1123	Secure Conductor to Insulator (De-energized)	AIT	AN	1-4
<b>Subject Area 4. Electrical Service Calls</b>				
052-204-1124	Climb a Utility Pole	AIT	AN	1-4
052-204-1125	Operate a Line Truck With Auxiliary Equipment	AIT	AN	1-4
052-204-1126	Perform a Crossarm Change Out	AIT	AN	1-4
052-204-1127	Perform Groundman Duties	AIT	AN	1-4
052-204-1128	Interpret an Electrical One-Line Diagram	AIT	AN	1-4
052-204-1129	Splice a Medium-Voltage Power Cable	AIT	AN	1-4
052-204-1130	Terminate a Medium-Voltage Power Cable	AIT	AN	1-4
<b>Skill Level 2</b>				
<b>Subject Area 1. Safety Operations</b>				
052-204-2207	Conduct a Safety Briefing	UNIT	AN	2-4
052-204-2208	Conduct a Safety Inspection	UNIT	AN	2-4
052-244-2112	Perform Lockout and Tagout Procedures	AIT	AN	2-4
<b>Subject Area 3. Installation of Electrical Equipment</b>				
052-204-2209	Install Distribution Equipment (Energized)	UNIT	AN	2-4
052-204-2210	Secure Conductor to Insulator (Energized)	UNIT	AN	2-4
<b>Subject Area 4. Electrical Service Calls</b>				
052-204-2211	Develop a Bill of Materials (BOM) List	UNIT	AN	2-4
052-204-2212	Energize an Electrical Distribution System	UNIT	AN	2-4
052-204-2213	Locate an Underground Cable and/or a Fault	UNIT	AN	2-4
052-204-2214	Perform Live-Line Testing	UNIT	AN	2-4
052-204-2215	Perform an Insulation-Resistance Test	UNIT	AN	2-4
052-204-2216	Perform Maintenance on Electrical Distribution Equipment	UNIT	AN	2-4
<b>Subject Area 5. Supervision and Management of Electrical Projects</b>				
052-204-2217	Manage a Power Line Crew	UNIT	AN	2-4
052-204-2218	Supervise the Installation of Underground Cable	UNIT	AN	2-4
052-204-2219	Supervise the Loading and Unloading of Utility Poles	UNIT	AN	2-4
052-204-2220	Supervise the Mechanical Erection of a Utility Pole	UNIT	AN	2-4

<b>Skill Level 3</b>				
052-204-3014	Supervise the Manual Erection of a Utility Pole	UNIT	AN	3-4
052-204-3015	Supervise the Sagging of Overhead Conductors	UNIT	AN	3-4
052-204-3016	Supervise the Stringing of Overhead Conductors	UNIT	AN	3-4
<b>Skill Level 4</b>				
052-204-4003	Supervise Risk-Management Procedures	UNIT	AN	4
052-244-4205	Perform Electrical Project Management	ANCOC	AN	4
052-244-4206	Perform Quality Assurance (QA) and/or Quality Control (QC) Responsibilities	ANCOC	AN	4

**CHAPTER 3**

**MOS/Skill Level Tasks**

Skill Level 1

Subject Area 1: Safety Operations

**Inspect Safety Equipment**

**052-204-1108**

**Conditions:** As a power line distribution specialist in a tactical or nontactical dry, well-lit environment (during scheduled or unscheduled maintenance and when safety equipment needs to be inspected), you are given the applicable equipment technical manuals, the manufacturer's literature, Department of the Army (DA) Form 2404 (Equipment Inspection and Maintenance Worksheet), and the applicable safety standing operating procedures (SOPs).

**DANGER: ALL SAFETY EQUIPMENT MUST BE INSPECTED AS SPECIFIED IN THE APPLICABLE EQUIPMENT TECHNICAL MANUAL OR THE MANUFACTURER'S LITERATURE. FAILURE TO PERFORM A REQUIRED INSPECTION MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**NOTE: All safety equipment will be inspected before each use as specified in the applicable equipment technical manual or the manufacturer's literature.**

**Standards:** Inspect safety equipment using the manufacturer's literature, the applicable equipment technical manuals, and the applicable SOPs, and record all deficiencies found on DA Form 2404. Remove all unsafe equipment from the inventory.

**Performance Steps**

1. Determine which personal protective equipment (PPE) is required for each specific job.
2. Inspect the equipment visually for cracks, rips, tears, and excessive wear.
3. Inspect the equipment manually for cracks, rips, tears, and excessive wear.
4. Check for valid calibration stamps (if applicable).
5. Record all deficiencies on DA Form 2404.
6. Remove all unsafe equipment from the inventory.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to inspect safety equipment.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Determined which PPE was required for each specific job.	—	—
2. Inspected the equipment visually for cracks, rips, tears, and excessive wear.	—	—
3. Inspected the equipment manually for cracks, rips, tears, and excessive wear.	—	—

**Performance Measures**

- 4. Checked for valid calibration stamps (if applicable).
- 5. Recorded all deficiencies on DA Form 2404.
- 6. Removed all unsafe equipment from the inventory.

**GO**    **NO-GO**

\_\_\_\_    \_\_\_\_  
\_\_\_\_    \_\_\_\_  
\_\_\_\_    \_\_\_\_

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
DA FORM 2404

**Related**  
EM 385-1-1  
LCH  
TM 5-682  
TM 5-684



## Prepare a Manhole for Safe Entry

052-204-1113

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when a manhole needs to be prepared for safe entry), you are given a three-person team consisting of an entry supervisor, an attendant, and an entrant). You are also given traffic control equipment, a manhole lid removal device, an extraction system for confined space entry and rescue, a manhole ventilator, a submersible water pump with a hose, a power source for a submersible pump, an air-quality tester with the manufacturer's instructions, and applicable personal protective equipment (PPE).

**DANGER: IF A MANHOLE COVER IS ENCASED IN ICE, DO NOT STRIKE IT WITH STEEL OR IRON. THE STRIKING OF STEEL OR IRON AGAINST A STEEL COVER MAY RESULT IN AN EXPLOSION IF A COMBUSTABLE GAS IS PRESENT IN THE MANHOLE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER ENTER A MANHOLE UNTIL THE ATMOSPHERIC CONDITIONS HAVE BEEN TESTED AND ARE FOUND TO BE IN COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER ENTER A MANHOLE WITHOUT AN ASSISTANT LOCATED OUTSIDE THE MANHOLE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT ENTER A MANHOLE TO PUMP OUT THE WATER. LOWER THE PUMP OR HOSE INTO THE HOLE, AND REMOVE ANY STANDING WATER. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**CAUTION: USE PROPER LIFTING PROCEDURES. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY AND RESULT IN THE MISSION NOT BEING COMPLETED.**

**NOTE: Failure to verify whether the manhole is a permit or nonpermit confined space may cause personnel to be subject to fines or legal action.**

**Standards:** Prepare a manhole for safe entry by ensuring that the traffic barriers are strategically placed, the cover is properly removed, all water is removed, gas detection is performed, ventilation procedures are performed, and the extraction system for confined space entry and rescue is in the correct position to allow for extraction in the event of an injury.

### Performance Steps

1. Ensure that all of the tools and equipment are in proper working condition.
2. Conduct a safety briefing.
3. Set up the traffic control equipment.
4. Remove the manhole cover.

**DANGER: IF THE MANHOLE COVER IS ENCASED IN ICE, DO NOT STRIKE IT WITH STEEL OR IRON. THE STRIKING OF STEEL OR IRON AGAINST A STEEL MANHOLE COVER MAY CAUSE AN EXPLOSION IF A COMBUSTABLE GAS IS PRESENT IN THE MANHOLE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

5. Test the air-quality tester for proper operation.
6. Test the following atmospheric conditions using the air-quality tester:
  - a. Combustible gases.
  - b. Toxic gases.

**Performance Steps**

- c. Oxygen deficiency.

**NOTE: Due to many different manufacturers, it is essential that the manufacturer's instructions for the air-quality tester being used are referenced for the proper inspection of the detector and for the proper performance of the tests.**

**NOTE: Different levels of the manhole should be tested. The sampling tube should not come into contact with the ground or any other foreign object.**

**NOTE: While work is being performed in the manhole, constantly use the air-quality tester to monitor for gasses.**

- 7. Pump out any water.

**DANGER: DO NOT ENTER THE MANHOLE TO PUMP OUT THE WATER. LOWER THE PUMP OR HOSE INTO THE MANHOLE, AND REMOVE ANY STANDING WATER. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

- 8. Ventilate the manhole using one of the following methods:

- a. Forced air.
- b. Natural.
- c. Sail.

- 9. Install the extraction system for confined space entry and rescue.

- 10. Suit the entrant with the safety harness, and attach it to the extraction system for confined space entry and rescue.

- 11. Assist the entrant into the manhole.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to prepare a manhole for safe entry.

**Performance Measures**

- 1. Ensured that all of the tools and equipment were in proper working condition.
- 2. Conducted a safety briefing.
- 3. Set up the traffic control equipment.
- 4. Removed the manhole cover.
- 5. Tested the air-quality tester for proper operation.
- 6. Tested the following atmospheric conditions using the air-quality tester:
  - a. Combustible gases.
  - b. Toxic gases.
  - c. Oxygen deficiency.
- 7. Pumped out any water.
- 8. Ventilated the manhole.
- 9. Installed the extraction system for confined space entry and rescue.

**GO      NO-GO**

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**Performance Measures**

10. Suited the entrant with the safety harness, and attached it to the extraction system for confined space entry and rescue.

**GO****NO-GO**

—

—

11. Assisted the entrant into the manhole.

—

—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References****Required****Related**

AR 385-55

LCH

TM 5-682

TM 5-684

TM 5-811-1

## Rescue an Injured Victim From a Utility Pole

052-204-1114

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when an individual is either responsive or unresponsive and unable to descend a pole on his own), you are given a two-way radio or telephone communication equipment, personal climbing equipment, 1/2-inch-diameter rope (rescue line) that is twice the length of the height from the ground to the highest cross arm plus 10 feet, a sharp skinning knife, hotline tools, and the applicable personal protective equipment (PPE).

**DANGER: TIME IS EXTREMELY CRITICAL THROUGHOUT THIS ENTIRE TASK. FAILURE TO RESCUE A VICTIM IN A TIMELY MANNER MAY RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Rescue an injured victim from a utility pole by lowering the victim to ground level within 1 minute of reaching the victim on the pole. Administer first aid and continue until the victim is in stable condition or qualified medical personnel arrive.

### Performance Steps

1. Evaluate the situation by calling to the victim.
  - a. Determine the victim's level of injury or illness before climbing the utility pole. If the victim is conscious and responds in an understanding voice, attempt to talk him down the utility pole.
  - b. Prepare to climb the utility pole and aid the victim if he is unconscious, does not respond, or appears to be stunned or dazed.
2. Ensure your own protection.
  - a. Contact emergency response personnel.
  - b. De-energize the circuit, if necessary or practical.
  - c. Ensure that the rescue line and all of the tools, the hot sticks, and the rubber gloves are properly rated.
  - d. Ensure that the utility pole is not energized.
  - e. Ensure that the utility pole is not on fire and that there are no damaged conductors or damaged equipment.
3. Climb to the rescue position.
  - a. Leap onto the utility pole, and ensure that no part of your body touches the pole and the ground at the same time.
  - b. Belt in slightly above and to one side of the victim.
  - c. Clear the victim and yourself from any energized conductors or equipment using rubber gloves and/or hot sticks.
4. Determine the condition of the victim.
  - a. Check him for responsiveness and, if he is responsive—
    - (1) Ask him what the problem is.
    - (2) Reassure him.
    - (3) Assist him in descending the utility pole, if possible.
    - (4) Prepare to lower him to the ground if he cannot descend the utility pole without your assistance.
    - (5) Administer first aid, as needed.
  - b. Check him for breathing if he is unresponsive.
    - (1) Provide an open airway and administer two short breaths if he is not breathing.
    - (2) Prepare to lower him to the ground if he is breathing.
5. Lower the victim to the ground.
  - a. Position the rescue line over the crossarm for a clear path to the ground, and wrap the short end of the line around the fall line two or more times so that you have a mechanical advantage.

**Performance Steps**

**NOTE: It is best to anchor the rescue line 2 to 3 feet out on the crossarm to help maintain the victim's clearance from the utility pole upon descent. Also, if no crossarm is available, place the rescue line over any other substantial piece of equipment that is strong enough to support the weight of the victim.**

- b. Pass the free end of the rescue line around the chest of the victim. Tie three half hitches with the knot in the front near one armpit, and snug the knot.
- c. Remove the slack in the rescue line.
- d. Grip the rescue line firmly and securely.

**NOTE: If the victim is not breathing, give two more quick breaths.**

- e. Cut the victim's safety strap on the opposite side of the desired swing.

**DANGER: DO NOT CUT YOUR OWN SAFETY STRAP OR RESCUE LINE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

- f. Lower the victim to the ground.

- 6. Continue administering first aid until qualified medical personnel arrive.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to rescue an injured victim for a pole.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Evaluated the situation by calling to the victim.	—	—
2. Ensured your own protection.	—	—
3. Climbed to the rescue position.	—	—
4. Determined the condition of the victim.	—	—
5. Lowered the victim to the ground.	—	—
6. Continued administering first aid until qualified medical personnel arrived.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- EM 385-1-1
- FM 4-25.11
- LCH
- TM 5-682
- TM 5-684

## Rescue an Injured Victim From a Manhole

052-204-1115

**Conditions:** As a power line distribution specialist (in a tactical or nontactical environment when an individual is responsive or unresponsive and unable to exit the manhole on his own), you are given a two-way radio or telephone communication equipment, an extraction system for confined space entry and rescue, a safety harness, and the applicable personal protective equipment (PPE).

**DANGER: TIME IS EXTREMELY CRITICAL THROUGHOUT THIS ENTIRE TASK. FAILURE TO RESCUE A VICTIM IN A TIMELY MANNER MAY RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: CARE SHOULD BE TAKEN WHEN RAISING THE VICTIM OUT OF THE MANHOLE. ENSURE THAT YOU DO NOT INCREASE OR CAUSE FURTHER INJURIES TO THE VICTIM. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**Standards:** Rescue an injured victim from a manhole by raising the victim up and out of the manhole using an extraction system for confined space entry and rescue. Administer first aid and continue until the victim is in stable condition or qualified medical personnel arrive.

### Performance Steps

1. Evaluate the situation by calling to the victim.
  - a. Determine the victim's level of injury or illness before rescuing him from the manhole. If the victim is conscious and responds in an understanding voice, attempt to talk him out of the manhole.
  - b. Prepare to rescue the victim from a manhole and aid the victim if the victim is unconscious, does not respond, or appears to be stunned or dazed.
2. Ensure your own protection.
  - a. Contact emergency response personnel.
  - b. De-energize the circuit, if necessary or practical.
3. Attempt to raise the victim out of the manhole using the extraction system for confined space entry and rescue.
  - a. Remove any obstructions that could interfere with the removal of the victim.
  - b. Raise the victim until his buttocks clear the rim of the manhole.
4. Assist the victim out of the manhole.
  - a. Position the victim on his back.
  - b. Administer first aid.
5. Continue administering first aid until qualified medical personnel arrive.

### Evaluation Preparation:

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to rescue an injured victim from a manhole.

### Performance Measures

1. Evaluate the situation by calling to the victim.
2. Ensured your own protection.

GO      NO-GO

—      —  
—      —

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
3. Attempted to raise the victim out of the manhole using the extraction system for confined space entry and rescue.	—	—
4. Assisted the victim out of the manhole.	—	—
5. Continued administering first aid until qualified medical personnel arrived.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

#### **References**

##### **Required**

##### **Related**

EM 385-1-1  
 FM 4-25.11  
 LCH  
 TM 5-682  
 TM 5-684

**Rescue an Injured Victim From an Aerial-Bucket Truck**  
**052-204-1116**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when an individual is either responsive or unresponsive and unable to descend from a bucket truck without assistance), you are given a two-way radio or telephone communication equipment, a bucket truck with lower controls, a winch line, and the applicable personal protective equipment (PPE).

**NOTE: Before using the bucket truck near energized lines, the truck chassis must be grounded for safety.**

**NOTE: Rescue procedures may vary when using a nonorganic bucket truck.**

**Standards:** Rescue an injured victim from a bucket truck by using the lower controls to lower the bucket to the proper rescue position. Remove the victim from the bucket. Administer first aid and continue until the victim is in stable condition or qualified medical personnel arrive.

**Performance Steps**

1. Evaluate the situation by calling to the victim.
  - a. Determine the level of injury or illness before attempting rescue procedures. If the victim is conscious and responds in an understanding voice, use self-recovery procedures to talk him down.
  - b. Prepare to perform a bucket truck rescue if the victim is unconscious, does not respond, or appears to be stunned or dazed.
2. Ensure your own protection.
  - a. Contact emergency response personnel.
  - b. De-energize the circuit, if necessary or practical.
3. Lower the bucket until it is 1 foot off the ground.
  - a. Leap onto the truck, and ensure that no part of your body touches the truck and the ground at the same time.

**DANGER: THE TRUCK MAY BECOME ENERGIZED AND MUST BE MOUNTED PROPERLY. FAILURE TO ENSURE THAT CONTACT IS NOT MADE BETWEEN YOU, THE TRUCK, AND THE GROUND AT THE SAME TIME MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

- b. Switch the bucket control mode to the lower controls.
- c. Lower the bucket to the ground using the most direct route until it is 1 foot off the ground.

**NOTE: Rescue procedures may vary when using a nonorganic bucket truck.**

**DANGER: OBSTACLES IN THE PATH OF THE BUCKET MUST BE AVOIDED. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

4. Remove the victim from the bucket, and lower him to the ground.
  - a. Tilt the bucket with the victim to the side at approximately a 90° angle.
  - b. Detach the victim's safety lanyard, and remove him from the bucket.
  - c. Pull the victim clear of any hazards.
  - d. Administer first aid, as required.
5. Continue first aid, as required, until proper medical assistance arrives.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.



Brief Soldier: Give the Soldier a requirement to rescue an injured victim from a bucket truck.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Evaluated the situation by calling to the victim.	—	—
2. Ensured your own protection.	—	—
3. Lowered the bucket until it was 1 foot off the ground.	—	—
4. Removed the victim from the bucket, and lowered him to the ground.	—	—
5. Continued first aid, as required, until proper medical assistance arrived.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**  
**Required**

- Related**  
 EM 385-1-1  
 FM 4-25.11  
 LCH  
 TM 5-682  
 TM 5-684

Subject Area 2: Maintenance of Equipment and Electrical Systems

**Inspect Hot-Line Equipment**

**052-204-1117**

**Conditions:** As a power line distribution specialist in a tactical or nontactical dry, well-lit environment (during scheduled or unscheduled maintenance when hot-line equipment needs to be inspected), you are given the applicable manufacturer's literature with maintenance instructions, Department of the Army (DA) Form 2404 (Equipment Inspection and Maintenance Worksheet), and the applicable safety standing operating procedures (SOPs).

**DANGER: ALL HOT-LINE EQUIPMENT MUST BE MAINTAINED AS SPECIFIED IN THE APPLICABLE MANUFACTURER'S MAINTENANCE INSTRUCTIONS. FAILURE TO PERFORM REQUIRED MAINTENANCE MAY CAUSE DAMAGE TO EQUIPMENT AND RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**NOTE: All hot-line equipment (whether or not specifically addressed in this task) will be inspected and maintained as specified in the applicable manufacturer's literature and/or maintenance instructions.**

**Standards:** Inspect hot-line equipment to include ensuring that maintenance has been performed using the applicable manufacturer's literature and/or maintenance instructions, DA Form 2404, and applicable SOPs. Record all deficiencies found on DA Form 2404. Remove all unsafe equipment from the inventory.

**Performance Steps**

1. Inspect the hot sticks.
  - a. Check for valid calibration stamps.
  - b. Inspect for excessive wear to the fiberglass.
2. Inspect the grounding sticks.
  - a. Check for valid calibration stamps.
  - b. Inspect for excessive wear to the fiberglass.
  - c. Check for good electrical connections to the grounding cables.
3. Inspect the ground clusters.
  - a. Check for valid calibration stamps.
  - b. Inspect for excessive wear.
  - c. Inspect for obvious damage.
  - d. Check for good electrical connections on the interconnecting cables.
4. Inspect the rubber gloves.
  - a. Check for valid calibration stamps.
  - b. Perform user tests by filling the gloves with air, and then rolling them while feeling them for air leaks and cracks.
  - c. Ensure that the leather liners are serviceable and free of any holes.
5. Inspect the rubber sleeves.
  - a. Check for valid calibration stamps.
  - b. Perform user tests by rolling the rubber sleeves while looking for any holes or cracks.
6. Inspect the rubber blankets and mats.
  - a. Check for valid calibration stamps.
  - b. Perform user tests by rolling the rubber blankets and mats while looking for any holes or cracks.

**Performance Steps**

7. Inspect the flash suits.
  - a. Check for valid calibration stamps.
  - b. Inspect for any holes.
  - c. Check for any damage to the face shields.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to inspect hot-line equipment.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Inspected the hot sticks.	—	—
2. Inspected the grounding sticks.	—	—
3. Inspected the ground clusters.	—	—
4. Inspected the rubber gloves.	—	—
5. Inspected the rubber sleeves.	—	—
6. Inspected the rubber blankets and mats.	—	—
7. Inspected the flash suits.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
DA FORM 2404

**Related**  
LCH  
TM 5-682  
TM 5-684

## Maintain Climbing and Rigging Equipment

052-204-1118

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (during scheduled or unscheduled maintenance when climbing and rigging equipment needs maintenance), you are given the applicable cleaning and maintenance supplies as stated in the manufacturer's literature, the applicable manufacturer's literature, and the applicable personal protective equipment (PPE).

**DANGER: FAILURE TO FOLLOW PROPER MAINTENANCE PROCEDURES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: ONLY APPROVED CLEANING MATERIALS SHOULD BE USED TO CLEAN LEATHER PRODUCTS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY OR DAMAGE TO EQUIPMENT RESULTING IN DEFECTIVE EQUIPMENT.**

**WARNING: INCORRECT MAINTENANCE OF RIGGING EQUIPMENT MAY CAUSE IMMEDIATE PERSONAL INJURY AND/OR POSSIBLE DAMAGE TO EQUIPMENT.**

**CAUTION: CARE SHOULD BE TAKEN WHILE SHARPENING THE GAFFS TO AVOID PERSONAL INJURY.**

**NOTE: Defective equipment should be repaired or replaced immediately and not used until correctly repaired or replaced.**

**NOTE: There are several different manufacturers of climbing equipment. Ensure that the appropriate manufacturer's literature is referenced before maintaining the equipment.**

**Standards:** Maintain climbing and rigging equipment by inspecting, performing maintenance, and storing equipment as stated in the applicable manufacturer's literature.

### Performance Steps

1. Inventory the climbing and rigging equipment.
2. Ensure that the following items are included in the inventory:
  - a. Climbers with gaffs (one pair).
  - b. A safety strap.
  - c. A body belt.
  - d. A hard hat.
  - e. A pair of gloves.
  - f. Safety glasses.
  - g. A climbing storage bag.
  - h. A handline.
  - i. A block and tackle.
3. Inspect all the leather products.
  - a. Check the leather products for the following faults:
    - (1) Tears.
    - (2) Cracks.
    - (3) Enlarged eyelet holes.
    - (4) Stretching.
    - (5) Hard or dry leather.
  - b. Check all the stitched areas of the leather products for broken, ragged, or rotted threads.

## Performance Steps

4. Inspect all the metal products.
  - a. Check the metal products for the following faults:
    - (1) Rust.
    - (2) Cracks.
    - (3) Breaks.
    - (4) Loose attachments.
    - (5) Any wear that might affect the overall strength of the product.
  - b. Check the gaffs to determine if the cutting edges have been sharpened and shaped.
5. Inspect the hard hat.
  - a. Check the hard hat for cracks, burns, and overall cleanliness.
  - b. Inspect the suspension system for fraying and broken suspension components.
  - c. Inspect the chin strap for elasticity.
  - d. Check the expiration date.
6. Inspect the protective eyewear.
7. Maintain the leather products.
  - a. Clean all of the leather surfaces.
    - (1) Wipe off any surface dirt using a neutral soap and moist sponge.
    - (2) Wipe the soap off with a clean cloth.
  - b. Rub the leather with saddle soap.
    - (1) Work up a good lather.
    - (2) Clean the surface with a sponge.
    - (3) Thoroughly penetrate all of the surface areas.
    - (4) Wipe off the excess saddle soap with a clean cloth.
  - c. Apply neat's-foot oil into all of the leather parts using your hands.
    - (1) Ensure that all of the leather parts are oiled sufficiently.
    - (2) Allow the leather to dry in a cool, shady area for 24 hours.
    - (3) Remove any excess oils by rubbing vigorously with a clean cloth.
8. Maintain the gaffs.
  - a. Use the TH slots on the gaff gauge to measure the thickness of the gaff.
  - b. Use the W slots on the gaff gauge to measure the width of the gaff.
  - c. Shape the gaffs into the correct thickness according to the applicable manufacturer's literature, if required.
9. Test the climbers (with gaffs).
  - a. Check the climbers (with gaffs) using the plane test.
  - b. Check the climbers (with gaffs) using the cutout test.
10. Store the climbing equipment.
  - a. Ensure that the gaffs are covered with gaff guards to prevent damage to the climbing bag.
  - b. Ensure that all items are returned to the climbing bag in a neat and orderly manner.
  - c. Store the climbing gear in a dry area.
11. Maintain the handline.
  - a. Uncoil the handline.
    - (1) Secure one end of the handline to a stationary object.
    - (2) Stretch the handline taut to remove twists and kinks; and center the hook, splice, or knot at the free end of the rope.
  - b. Check the handline for the following:
    - (1) Cuts.
    - (2) Frays.
    - (3) Cracks.
    - (4) Continuous smooth movement of the rope through the block sheave.

**Performance Steps**

- c. Recoil the handline for storage.
  - (1) Ensure that the loops are all the same length (about 3 feet).
  - (2) Wrap the last 6 to 8 feet of rope around the coil.
    - (a) Place the coil of the rope around your wrist.
    - (b) Turn the coil, with your arm held horizontally at your elbow, away from your body.
    - (c) Guide the remaining rope around the coil until there is 2 feet remaining.
    - (d) Grasp the secured rope with your hand that is holding the coil, and pull the rope through the coil making a loop.
    - (e) Give the loop a twist, and place it over the top of the coil.
    - (f) Snug the loop around the coil.
    - (g) Hang the handline in a clean, dry environment.

12. Maintain the block and tackle.

- a. Check the rope and blocks for the following:
  - (1) Cuts.
  - (2) Frays.
  - (3) Breaks.
  - (4) Cracks.
  - (5) Continuous smooth movement of the rope through the block sheaves.
- b. Wipe all the wooden parts with linseed oil.
- c. Wipe all the metal parts with machine oil.
- d. Hang the chain hoist in a clean, dry environment.

13. Maintain the chain hoist.

- a. Check the chain hoist for the following:
  - (1) A slipping brake mechanism.
  - (2) A crack.
  - (3) Chemical damage.
  - (4) Deformation.
  - (5) A worn chain.
  - (6) Proper lubrication.
  - (7) Free movement of the hooks.
- b. Wipe the chain hoist with a light coat of machine oil.
- c. Hang the chain hoist in a clean, dry environment.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to maintain the climbing and rigging equipment.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Inventoried the climbing and rigging equipment.	_____	_____
2. Ensured that the following items were included in the inventory:	_____	_____
a. Climber gaffs (two each).		
b. A safety strap.		
c. A body belt.		
d. A hard hat.		
e. A pair of gloves.		
f. Safety glasses.		
g. A climbing storage bag.		

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
h. A handline.		
i. A block and tackle.		
3. Inspected all the leather products.	—	—
4. Inspected all the metal products.	—	—
5. Inspected the hard hat.	—	—
6. Inspected the protective eyewear.	—	—
7. Maintained the leather products.	—	—
8. Maintained the climber gaffs.	—	—
9. Tested the climber gaffs.	—	—
10. Stored the climbing equipment.	—	—
11. Maintained the handline.	—	—
12. Maintained the block and tackle.	—	—
13. Maintained the chain hoist.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

FM 5-125  
LCH  
TM 5-682  
TM 5-684

**Perform Operator Preventive-Maintenance Checks and Services (PMCS) on a Line Truck With  
Auxiliary Equipment  
052-204-1119**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (performing before, during, after, and weekly line truck operations or when PMCS on a line truck with auxiliary equipment needs to be done), you are given the technical or service manual for the truck that is being inspected and a Department of the Army (DA) Form 5988-E (Equipment Inspection Maintenance Worksheet) or DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

**CAUTION: VEHICLES WITH A CLASS III LEAK SHOULD NOT BE OPERATED AND MUST BE SENT FOR REPAIR IMMEDIATELY. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE EQUIPMENT THAT MAY CAUSE LONG-TERM FAILURE.**

**NOTE: For different line trucks, consult the user manual for correct preventative maintenance checks.**

**Standards:** Perform operator PMCS on a line truck with auxiliary equipment before, during, and after operation or when directed to do so. Record all deficiencies on DA Form 5988-E or DA Form 2404.

**Performance Steps**

1. Conduct before operational checks and services.
  - a. Inspect the exterior of the vehicle for damage and deficiencies by walking around it, looking for deficiencies, and annotating any of the following:
    - (1) Cracked or broken windshield.
    - (2) Cracked or broken windshield wipers (ensure that they are operational).
    - (3) Cracked or damaged hood of the cab.
    - (4) Cracked or broken headlights (ensure that they are operational).
    - (5) Cracked or broken marker and directional lights (ensure that they are operational).
    - (6) Cracked or broken reverse lights (ensure that they are operational, and listen for the operation of the alarm).
    - (7) Cracked, torn, or missing hood latches.
    - (8) Leaks, spills, or drips underneath the vehicle.
    - (9) Cracked or broken side windows.
    - (10) Cracked or broken side mirrors.
    - (11) Cracked, sliced, or torn tires (inside and outside).
    - (12) Broken handles, dents, or other damage on the side tool bin door that may prevent the bins from opening, closing, or locking properly.
    - (13) Cracked or frayed cable steps.
  - b. Inspect the engine and engine components for damage and deficiencies, and annotate the deficiencies.
    - (1) Check all of the following fluids for the correct levels:
      - (a) Engine oil.
      - (b) Coolant.
      - (c) Power steering fluid.
      - (d) Windshield washer fluid.
    - (2) Check for any leaks or spills.
    - (3) Check all wiring for cracks, frays, and broken wires.
    - (4) Check all hoses for cracks, tears, breaks, and signs of dry rot.
    - (5) Check all belts for cracks, frays, missing teeth, and signs of dry rot.



**Performance Steps**

- c. Inspect the interior of the cab for damage and deficiencies, and annotate the deficiencies.
    - (1) Check all of the gauges for correct operation.
    - (2) Check all of the interior lights for cracks, breaks, and correct operation.
    - (3) Check the horn for operation.
    - (4) Check to ensure that you have all basic issue items.
    - (5) Inspect the seat belts for cracks, frays, rips, and tears ensuring that they lock correctly.
    - (6) Inspect the bench seat for cracks, rips, and tears.
  - d. Check the hydraulic fluid for the correct level.
2. Conduct during operational checks and services.
    - a. Check the boom for correct operation, and annotate any deficiencies.
    - b. Check the digger/auger for correct operation, and annotate any deficiencies.
    - c. Check the outriggers for correct operation, and annotate any deficiencies.
    - d. Check the engine and transmission for correct operation, and annotate any deficiencies.
    - e. Check the electrical system for correct operation, and annotate any deficiencies.
    - f. Repair any deficiencies (when possible), and record all deficiencies that cannot be corrected on a DA Form 5988-E or DA Form 2404.
  3. Conduct after operational checks and services.
    - a. Ensure that all tools are placed back in the correct tool bins.
    - b. Ensure that the fuel tank is full.
    - c. Ensure that all trash, limbs, and/or scrap is removed and correctly disposed.
    - d. Ensure that all personal gear is removed from the vehicle.
    - e. Ensure that all stock is placed back into the stock bins.
  4. Conduct weekly operational checks and services.
    - a. Remove and blow out the air filters.
    - b. Wash and clean all windows and mirrors.
    - c. Wash the fully extended upper boom (3d stage) with water.
    - d. Wash and clean the top of the hydraulic tank.
    - e. Sweep the back of the truck bed.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to perform operator PMCS on a line truck with auxiliary equipment.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Conducted before operational checks and services.	—	—
2. Conducted during operational checks and services.	—	—
3. Conducted after operational checks and services.	—	—
4. Conducted weekly operational checks and services.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 2404

**Related**

EM 385-1-1

LCH

TM 5-684

## Subject Area 3: Installation of Electrical Equipment

**Install a Grounding Set****052-204-1120**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when a grounding set needs to be installed), you are given electrical construction prints, applicable climbing and rigging equipment, hot-line tools, a voltage detector, a lockout and tagout kit, the Lineman's and Cableman's Handbook (LCH), and the applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF MEDIUM-VOLTAGE ELECTRICAL POWER GENERATION EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: ALL SYSTEMS WILL BE CONSIDERED ENERGIZED UNTIL THE SOURCE OF ENERGY IS REMOVED, LOCKED OUT (WHEN POSSIBLE), TAGGED OUT, AND GROUNDED. WHEN ENERGY-ISOLATING DEVICES CANNOT BE PHYSICALLY LOCKED OUT, USE TAGOUT PROCEDURES. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Install a grounding set by electrically connecting all conductors to the ground ensuring that they are all at the same electrical potential using the provided grounding and test equipment.

**Performance Steps**

1. Inspect all tools and equipment for serviceability.
2. Perform lockout and tagout procedures.
3. Test all phases to ensure that they are isolated and that there is no voltage present on any of the phases.
4. Connect one end of the grounding conductor to an established ground (usually the grounded neutral conductor).

**NOTE: A driven ground rod at the work site connected to the neutral conductor provides additional protection.**

5. Install a grounding-cluster block on the pole below the work area, if work is to be performed on a wooden pole.

**NOTE: Ensure that the grounding cluster is physically and electrically connected to the established ground before moving to the next step.**

6. Connect the other end of the grounding conductor, using a hot-line tool, to the bottom conductor on the vertical constructions or the closest conductor on the horizontal constructions.
7. Install the grounds or the jumpers from a grounded conductor to the ungrounded conductor in sequence until all conductors are grounded and short-circuited together.
8. Double-check to ensure that all connections are clean and tight.
9. Ensure that all parts of the grounding circuit have adequate current-carrying capacity for the distribution system to be grounded.

**Performance Steps**

10. Remove the grounds, when all work is completed, in the exact reverse sequence of the installation, ensuring that the removal of the established ground connection is last.

**WARNING: BEFORE THE LOCKOUT OR TAGOUT DEVICES ARE REMOVED AND ELECTRIC CIRCUITS OR EQUIPMENT ARE REENERGIZED, APPROPRIATE TESTS AND VISUAL INSPECTIONS WILL BE CONDUCTED BY AUTHORIZED PERSONNEL (THE INSTALLER). THE INSTALLER WILL VERIFY THAT ALL TOOLS; MECHANICAL RESTRAINTS; AND ELECTRICAL JUMPERS, SHORTS, AND GROUNDS HAVE BEEN REMOVED. THE ENTIRE WORK AREA WILL BE INSPECTED AND ALL NONESSENTIAL ITEMS WILL BE REMOVED FROM THE SYSTEM. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT.**

11. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.
12. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to install a grounding set.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Inspected all tools and equipment for serviceability.	—	—
2. Performed lockout and tagout procedures.	—	—
3. Tested all phases to ensure that they were isolated and that there was no voltage present on any of the phases.	—	—
4. Connected one end of the grounding conductor to an established ground (usually the grounded neutral conductor).	—	—
5. Installed a grounding-cluster block on the pole below the work area, if work was to be performed on a wooden pole.	—	—
6. Connected the other end of the grounding conductor, using a hot-line tool, to the bottom conductor on the vertical constructions or the closest conductor on the horizontal constructions.	—	—
7. Installed the grounds or the jumpers from a grounded conductor to the ungrounded conductor in sequence until all conductors were grounded and short-circuited together.	—	—
8. Double-checked to ensure that all connections were clean and tight.	—	—
9. Ensured that all parts of the grounding circuit had adequate current-carrying capacity for the distribution system to be grounded.	—	—
10. Removed the grounds, when all work was completed, in the exact reverse sequence of the installation ensuring that the removal of the established ground connection was last.	—	—
11. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—

**Performance Measures****GO**    **NO-GO**

12. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.

—      —

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References****Required**

LCH

**Related**

EM 385-1-1

TM 5-684

TM 5-811-3

## **Install High-Intensity Lights and Ballasts**

**052-204-1121**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment at a site needing illumination, you are given electrical construction prints, poles, mounting brackets, high-intensity lights, ballasts and wiring as specified in the electrical construction prints, an electrician's tool kit, a voltage detector, applicable climbing and rigging equipment, a multimeter, the applicable manufacturer's literature, wiring diagrams, the Lineman's and Cableman's Handbook (LCH), and applicable personal protective equipment (PPE).

**DANGER: FOLLOW ALL ELECTRICAL SAFETY PRACTICES AND WEAR APPLICABLE PPE, AS REQUIRED. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: ENSURE THAT YOU LIFT WITH YOUR LEGS. BE AWARE OF THE POSITION OF YOUR HANDS AND FINGERS AND WEAR EYE PROTECTION, IF NEEDED. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY OR DAMAGE TO EQUIPMENT.**

**Standards:** Install high-intensity lights and ballasts on a pre-positioned pole to fully illuminate the designated area.

### **Performance Steps**

1. Review all of the applicable manufacturer's literature, electrical construction prints, and wiring diagrams.
2. Perform lockout and tagout procedures.
3. Ensure that correct safety clearances around the area are followed by all personnel.
4. Ascend the pole, if necessary.
5. Wear the correct PPE, to include—
  - a. A hard hat.
  - b. Leather work gloves.
  - c. Insulated protective equipment if working near live circuits.
  - d. Steel-toed safety boots.
  - e. Safety glasses.
6. Install the mounting bracket on the pole.
7. Mount the lighting fixture and ballast onto the bracket.
8. Ensure that the mounted equipment is secured to the pole for safety purposes.
9. Install the distribution and control wiring.
10. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.
11. Energize the circuit.
12. Verify that the lamp illuminates the designated area.

**Performance Steps**

13. Adjust the lamp, if necessary, to illuminate the designated area.
14. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to install high-intensity lights and ballasts.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all of the applicable manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
2. Performed lockout and tagout procedures.	—	—
3. Ensured that correct safety clearances around the area were followed by all personnel.	—	—
4. Ascended the pole, if necessary.	—	—
5. Wore the correct PPE.	—	—
6. Installed the mounting bracket on the pole.	—	—
7. Mounted the lighting fixture and ballast onto the bracket.	—	—
8. Ensured that the mounted equipment was secured to the pole for safety purposes.	—	—
9. Installed the distribution and control wiring.	—	—
10. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—
11. Energized the circuit.	—	—
12. Verified that the lamp illuminated the designated area.	—	—
13. Adjusted the lamp, if necessary, to illuminate the designated area.	—	—
14. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
AEH  
EM 385-1-1  
ER 385-1-31  
FM 5-125  
FM 5-412  
NEC™ HANDBOOK

**References  
Required**

**Related**  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3



## **Install Distribution Equipment (De-energized)**

**052-204-1122**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when distribution equipment needs to be installed or replaced [de-energized]), you are given electrical construction prints, applicable distribution equipment as specified in the electrical construction prints, wiring diagrams, applicable climbing and rigging equipment, an electrician's tool kit, a voltage detector, a lockout and tagout kit, grounding equipment, safety standing operating procedures (SOPs), applicable manufacturer's literature, the Lineman's and Cableman's Handbook (LCH), and applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: IT IS VITAL TO ENSURE THAT THE CIRCUIT IS COMPLETELY DE-ENERGIZED AND CORRECTLY GROUNDED BEFORE PERFORMING ANY WORK. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER POSITION YOURSELF UNDER A SUSPENDED LOAD. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**NOTE: All distribution equipment is not the same and may function differently depending on make, model, or manufacturer. The application of the installation steps are similar but may vary. Always consult the applicable manufacturer's literature for each piece of equipment.**

**Standards:** Install distribution equipment (de-energized) as specified in the applicable manufacturer's literature. Ensure that all hardware is mechanically tight and electrically connected.

### **Performance Steps**

1. Review all the safety SOPs including all DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all applicable manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been properly tested and is fully mission capable.
4. Inspect all tools and climbing and rigging equipment for serviceability.
5. Perform lockout and tagout procedures.
6. Ascend the pole to the desired height, if necessary.
7. Test all phases to ensure that there is no voltage present.
8. Install personal protective grounds.
9. Install rigging equipment, as necessary.

**Performance Steps**

10. Raise and position the distribution equipment (safely) to be installed.
11. Install all mounting hardware as stated in the applicable manufacturer's literature.
12. Remove all rigging equipment.
13. Connect the distribution equipment electrically as stated in the applicable manufacturer's literature.
14. Verify the correct phase sequence.
15. Position or sag the conductors to the appropriate clearance as stated in the applicable manufacturer's literature.
16. Remove the personal protective grounds.
17. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.
18. Perform a functions check on the electrical distribution system.
19. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to install distribution equipment (de-energized).

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all the safety SOPs including all DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Reviewed all applicable manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE had been properly tested and was fully mission capable.	—	—
4. Inspected all tools and climbing and rigging equipment for serviceability.	—	—
5. Performed lockout and tagout procedures.	—	—
6. Ascended the pole to the desired height, if necessary.	—	—
7. Tested all phases to ensure that there was no voltage present.	—	—
8. Installed personal protective grounds.	—	—
9. Installed rigging equipment, as necessary.	—	—
10. Raised and positioned the distribution equipment (safely) to be installed.	—	—
11. Installed all mounting hardware as stated in the applicable manufacturer's literature.	—	—
12. Removed all rigging equipment.	—	—
13. Connected the distribution equipment electrically as stated in the applicable manufacturer's literature.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
14. Verified the correct phase sequence.	—	—
15. Positioned or sagged the conductors to the appropriate clearance as stated in the applicable manufacturer's literature.	—	—
16. Removed the personal protective grounds.	—	—
17. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—
18. Performed a functions check on the electrical distribution system.	—	—
19. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

### References

#### Required

LCH

#### Related

EM 385-1-1

ER 385-1-31

FM 5-125

FM 5-412

FM 5-422

FM 5-424

NESC™

NETA™

TM 5-682

TM 5-684

TM 5-686

TM 5-811-1

TM 5-811-3

## Secure Conductor to Insulator (De-energized)

052-204-1123

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when a conductor needs to be secured to an insulator after the lines have been properly sagged [de-energized]), you are given a conductor, appropriately sized clips and/or ties for the conductors, applicable climbing and rigging equipment, safety standing operating procedures (SOPs), the Lineman's and Cableman's Handbook (LCH), hot-line tools, a voltage detector, grounding equipment, and applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: IT IS VITAL TO ENSURE THAT THE CIRCUIT IS COMPLETELY DE-ENERGIZED AND CORRECTLY GROUNDED BEFORE PERFORMING ANY WORK. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Secure the conductor to the insulator (de-energized) ensuring that all phases are level and that the conductors are not stressed.

### Performance Steps

1. Perform lockout and tagout procedures.
2. Ascend the pole to the desired height, if necessary.
3. Test all phases to ensure that there is no voltage present.
4. Install personal protective grounds.
5. Determine the best tie method for each location.
  - a. Use preformed tie wires, if available.

**NOTE: Preformed tie wires are not one size fits all. They must match the application and the conductor size.**

- b. Use armor rod ties, when applicable.

**NOTE: Armor rod ties are used to protect the conductors from damage due to vibration and are placed on the conductors the same way as preformed tie wires.**

**NOTE: Never cross the tie wires.**

- c. Use a top tie when the conductor is in the top groove of the insulator.
  - (1) Center the tie wire on the top of the insulator, pulling one end toward you and one end away from you. Both sides of the wire should be of equal length and positioned under the conductor. Wrap both ends half way around the insulator.
  - (2) Tighten both wire ties against the insulator and wrap 2 close wraps, 3 spaced wraps, and 2 more close wraps around the conductor.
  - (3) Bend the ends back, and cut off the excess tie wire.

**Performance Steps**

- d. Use a side tie when the conductor pulls against the side of the insulator.
  - (1) Center the tie wire on the back side of the insulator, pulling the ends toward you and forming a U. Both sides of the wire should be of equal length and positioned under the conductor.
  - (2) Tighten the wire ties against the insulator and wrap 2 close wraps, 3 spaced wraps, and 2 more close wraps around the conductor.
  - (3) Bend the ends back, and cut off the excess tie wire.
- 6. Inspect the ties to ensure that the conductors will remain secure.
- 7. Ensure that all PPE and hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to secure a conductor to an insulator (de-energized).

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Performed lockout and tagout procedures.	___	___
2. Ascended the pole to the desired height, if necessary.	___	___
3. Tested all phases to ensure that there was no voltage present.	___	___
4. Installed personal protective grounds.	___	___
5. Determined the best tie method for each location. <ul style="list-style-type: none"> <li>a. Used preformed ties, if available.</li> <li>b. Used armor rod ties, when applicable.</li> <li>c. Used a top tie when the conductor was in the top groove of the insulator.</li> <li>d. Used a side tie when the conductor pulled against the side of the insulator.</li> </ul>	___	___
6. Inspected the ties to ensure that the conductors would remain secure.	___	___
7. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	___	___

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

Subject Area 4: Electrical Service Calls

**Climb a Utility Pole**

**052-204-1124**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when installation, maintenance, or repairs to an overhead distribution system is needed at a minimum height of 25 feet), you are given applicable climbing and rigging equipment, a 2-pound hammer, a brace and a 3/8-inch bit, a 3/8-inch wooden dowel (1 foot long), a shovel, and applicable personal protective equipment (PPE).

**WARNING: IF A POLE IS FOUND TO BE DEFECTIVE, IT SHOULD BE SCHEDULED FOR RELACEMENT AS SOON AS POSSIBLE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY OR DAMAGE TO EQUIPMENT.**

**WARNING: WHEN POSSIBLE, INDIVIDUALS NOT ASCENDING THE POLE MUST MAINTAIN A MINIMUM DISTANCE OF AT LEAST 10 FEET FROM THE BASE OF THE POLE TO ENSURE THAT THEY ARE NOT STRUCK BY ANY INADVERTENTLY DROPPED OBJECTS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**WARNING: USE PROPER CLIMBING TECHNIQUES TO AVOID SLIPPING OR FALLING, WEAR LONG SLEEVES AND GLOVES TO AVOID SPLINTERS. WEAR PROTECTIVE EYEWEAR WHENEVER METAL IS USED TO STRIKE METAL. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**Standards:** Climb a utility pole to a minimum height of 35 feet, belt in, hitchhike down 5 feet, hitchhike back up to eye level, circle right and assume a good working position, circle left and assume a good working position, hitchhike down 5 feet, unbelt, and then descend the pole without falling.

**Performance Steps**

1. Perform a utility pole serviceability inspection.
  - a. Visually inspect the pole for the following conditions:
    - (1) Shell rot.
    - (2) Large cracks or splits.
    - (3) Signs of soil erosion around the base of the pole.
    - (4) Hollow spots.
    - (5) Woodpecker holes.
    - (6) Burned spots.

- b. Perform a sound test with a 2-pound hammer, and check for butt rot, shell rot, and heart rot.

**WARNING: ALWAYS BE AWARE OF OBJECTS THAT ARE OVERHEAD WHEN SOUNDING THE POLE. LOOSE OR ROTTED ITEMS MAY FALL AND CAUSE IMMEDIATE PERSONAL INJURY OR DAMAGE TO EQUIPMENT.**

**NOTE: Strike the pole in several different locations and at different heights. A good pole will sound solid when struck with a hammer. A decayed pole will sound hollow or will sound like a drum.**

- c. Perform a probe test with the brace and bit, if necessary.
      - (1) Remove the dirt around the pole to a depth of 12 to 18 inches and wide enough to operate the brace and bit.
      - (2) Drill a 3/8-inch hole below the ground line into the butt of the pole at a downward angle of 30° to 45°.
      - (3) Ensure that you drill deep enough to reach the center of the pole.
      - (4) Check the wood shavings for decay.
      - (5) Plug the drilled hole with a 3/8-inch wooden dowel to prevent further decay.

**Performance Steps**

- (6) Fill the hole back in with dirt and tamp.
- d. Mark the pole(s) that do not pass the tests so that they are easily identified.
- 2. Inspect all equipment, to include the following:
  - a. PPE.
  - b. Climbing equipment.
  - c. Tools.
  - d. Handline.
- 3. Lay out the handline, and attach it to the body belt.
- 4. Ascend the utility pole until you are eye level with the lag screw, and then belt in.

**NOTE: When performing this task, ensure that the proper climbing technique is used. Start 6 inches above the ground with subsequent steps being 8 to 10 inches. Your feet should not be directly above one another. Maintain adequate spacing between your heels. The toes of your feet should be pointing up and out with your weight on your heels. Use your legs to climb, not your arms. Keep your body straight and your knees away from the pole at all times. Ensure that you use the inverted-J method when inserting the gaff into the pole, and always lock your weight-supporting leg.**

- 5. Hitchhike down 5 feet, and then hitchhike back up until you are eye level with the lag screw.
- 6. Circle to the right until you are positioned directly below the crossarm.
- 7. Assume a good working position that allows you to reach the end of the crossarm, and then return to the start position.
- 8. Circle to the left until you are positioned directly below the crossarm.
- 9. Assume a good working position that allows you to reach the end of the crossarm, and then return to the start position.
- 10. Hitchhike down the pole 5 feet.
- 11. Unbelt and descend the pole.

**NOTE: When descending the pole, ensure that the proper procedures are followed. Keep your body straight, your knees away from the pole, and lock your weight-supporting leg. Ensure that your weight remains on the heel of your foot, aim your gaff towards the heart of the pole below your body, and let your body weight aid you in your descent as the gaff penetrates the pole. Ensure that your uppermost leg is horizontal with the ground each time you drop. Remove the upper gaff by moving your upper knee away from the pole, and ensure that your last step is approximately 6 inches above the ground.**

**Evaluation Preparation:**

Setup: Provide the Soldier with the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to climb a utility pole.

**Performance Measures**

- 1. Performed a utility pole serviceability inspection.
- 2. Inspected all equipment.
- 3. Laid out the handline, and attached it to the body belt.

<u>GO</u>	<u>NO-GO</u>
—	—
—	—
—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
4. Ascended the utility pole until he was eye level with the lag screw, and then belted in.	—	—
5. Hitchhiked down 5 feet, and then hitchhiked back up until he was eye level with the lag screw.	—	—
6. Circled to the right until he was positioned directly below the crossarm.	—	—
7. Assumed a good working position that allowed him to reach the end of the crossarm, and then returned to the start position.	—	—
8. Circled to the left until he was positioned directly below the crossarm.	—	—
9. Assumed a good working position that allowed him to reach the end of the crossarm, and then returned to the start position.	—	—
10. Hitchhiked down the pole 5 feet.	—	—
11. Unbelted and descended the pole.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References  
Required**

- Related**  
 EM 385-1-1  
 FM 5-125  
 LCH  
 TM 5-682  
 TM 5-684



## Operate a Line Truck With Auxiliary Equipment

052-204-1125

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when maintenance, repairs, or new installation is needed for either an overhead or underground electrical-distribution system), you are given a line truck with auxiliary equipment, ground guides, a safety harness, the applicable technical or service manual for the particular truck with auxiliary equipment that is being operated, and applicable personal protective equipment (PPE).

**DANGER: NEVER LIFT ANY OBJECTS WITHOUT A GROUND GUIDE TO ASSIST IN FINDING THE LOCATION OF THE ITEMS BEING LIFTED AND ANOTHER GROUND GUIDE TO HELP ENSURE THAT THE OBJECT DOES NOT BEGIN TO SWAY OUT OF CONTROL. FAILURE TO COMPLY MAY CAUSE DAMAGE TO EQUIPMENT AND RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: BEFORE MOVING ANY BUCKET AND/OR LINE TRUCK, THE OPERATOR MUST PERFORM ALL PREVENTIVE-MAINTENANCE CHECKS AND SERVICES (PMCS) AND BE LICENSED ON THE EQUIPMENT OR HAVE A LICENSED DRIVER IN THE VEHICLE CAB TO ENSURE THAT CORRECT OPERATING PROCEDURES ARE FOLLOWED. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY OR SEVERE DAMAGE TO EQUIPMENT.**

**Standards:** Operate a line truck with auxiliary equipment by using the primary and secondary controls to move the bucket, winch line, and auger to predetermined areas and by operating the auxiliary equipment as specified in the applicable technical or service manual.

### Performance Steps

1. Prepare a bucket and/or a line truck for operation.

**NOTE: For different bucket trucks or line trucks, consult the applicable technical or service manual for correct operation of the controls. Before using any bucket and/or line truck near energized lines, ground the truck chassis for safety.**

- a. Position the truck.
  - (1) Park the truck as close as possible to the location of the work being performed.
  - (2) Perform the work on the uphill side of the truck, if parked on a slope.
- b. Set up the truck for operation.
  - (1) Engage the emergency brake.
  - (2) Engage the power take-off (PTO).
  - (3) Transfer the controls from the truck to the machine.
  - (4) Lower the outriggers.
  - (5) Free the boom for movement.
  - (6) Don the proper safety gear.

2. Operate the bucket truck boom using the primary and secondary controls, paying close attention to the ground guide's hand-and-arm signals.

- a. Raise to a height of 30 feet.
- b. Rotate to the left.
- c. Rotate to the right.
- d. Descend and store the boom in the cradles.

3. Operate the line truck boom, paying close attention to the ground guide's hand-and-arm signals.

**WARNING: WHEN EXTENDING THE SECOND STAGE OF THE BOOM OR WHEN WINCHING UP, ENSURE THAT THE WINCH HOOK DOES NOT GET PULLED INTO THE WINCH LINE GUIDE. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT.**

- a. Raise the boom straight up ensuring that it does not exceed an 80° angle above the horizontal position.
- b. Rotate the boom so that it is in line with the desired location of the winch hook.

**Performance Steps**

- c. Extend the second stage of the boom so, when the winch is lowered, the hook will fall within 1 foot of the desired area.
- d. Lower the winch line.
- e. Return the boom to its original state.

4. Operate the digger and/or auger on a line truck, paying close attention to the ground guide's hand-and-arm signals.

**WARNING: THE FOLLOWING PROCEDURES SHOULD BE FOLLOWED AS CLOSE AS POSSIBLE. FAILURE TO COMPLY MAY CAUSE DAMAGE TO EQUIPMENT AND RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

- a. Raise the boom to about 45° above the horizontal position.
- b. Rotate the boom to about 90° to the side of the truck.
- c. Check to verify that the second stage of the boom is fully retracted.
- d. Place the two-speed digger button in the low-speed position.
- e. Move the digger control slightly towards the dig position and, as it rises, hold the auger release switch in the release position.
- f. Move the digger control towards the clean position to slowly lower the auger.
- g. Move the auger to the desired dig location, and dig a hole to a depth of 8 feet.
- h. Return the auger and boom back into their cradles.

5. Operate the auxiliary line truck equipment.

- a. Operate the capstan.
- b. Operate the take-up reel.
- c. Operate the hydraulic tools.

6. Secure the line truck with the auxiliary equipment.

- a. Secure all the loose gear.
- b. Raise and store the outriggers.
- c. Secure the boom.
- d. Turn the truck and machine switch to the truck position.
- e. Disengage the PTO.
- f. Release the emergency brake before moving the truck.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to operate a line truck with auxiliary equipment.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Prepared a bucket and/or a line truck for operation.	—	—
2. Operated the bucket truck boom using the primary and secondary controls, paying close attention to ground guide's hand-and-arm signals.	—	—
3. Operated the line truck boom, paying close attention to the ground guide's hand-and-arm signals.	—	—
4. Operated the digger and/or auger on a line truck, paying close attention to the ground guide's hand-and-arm signals.	—	—
5. Operated the auxiliary line truck equipment.	—	—
6. Secured the line truck with the auxiliary equipment.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

AR 385-55

EM 385-1-1

LCH

TM 5-684

TM 5-811-1

## Perform a Crossarm Change Out

052-204-1126

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (when a crossarm needs to be replaced due to deterioration or upgrades), you are given applicable climbing and rigging equipment, a groundman, the required hand tools, and applicable personal protective equipment (PPE).

**WARNING: WHEN POSSIBLE, INDIVIDUALS NOT ASCENDING THE POLE MUST MAINTAIN A MINIMUM DISTANCE OF AT LEAST 10 FEET FROM THE BASE OF THE POLE TO ENSURE THAT THEY ARE NOT STRUCK BY ANY INADVERTENTLY DROPPED OBJECTS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**WARNING: USE PROPER CLIMBING TECHNIQUES TO AVOID SLIPPING OR FALLING, WEAR LONG SLEEVES AND GLOVES TO AVOID SPLINTERS, AND WEAR PROTECTIVE EYEWEAR WHEN USING METAL TO STRIKE METAL. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**Standards:** Perform a crossarm change out from a minimum height of 35 feet and in less than 30 minutes by removing the old crossarm, lowering it to the ground, and raising and installing the new crossarm.

### Performance Steps

1. Inspect the climbing equipment, tools, and handline for defects.
2. Perform lockout and tagout procedures.
3. Lay out the handline, and attach it to your body belt.
4. Ascend the pole until you are eye level with the lag screw, and then belt in.
5. Remove the crossarm.
  - a. Remove the lag screw.
  - b. Hitchhike up and attach the handline to the pole using the collar rope with the hook facing down.
  - c. Tie the clove hitch to the end of the crossarm.
  - d. Remove the through-bolt nut.
  - e. Remove the crossarm, and place it on the safety strap.
  - f. Lower one end of the crossarm to allow hanging it on your safety strap using the insulator pin.
  - g. Tie a half-hitch loop below the insulator pin.
  - h. Communicate your intentions with the groundman, guide the crossarm down, and allow the groundman to lower the crossarm to the ground.
6. Install the new crossarm.
  - a. Place the safety strap over the head of the through bolt.
  - b. Tell the groundman to raise the crossarm by using the insulator pin end of the crossarm being sent up first to just below your feet.
  - c. Correctly communicate your intentions with the groundman, and then guide the crossarm up until you are able to rest the insulator pin on your belt.
  - d. Remove the half hitch.
  - e. Tell the groundman to raise the crossarm to allow you to set the crossarm across your safety strap.
  - f. Install the crossarm onto the through bolt.
  - g. Tighten the through-bolt nut.
  - h. Remove the clove hitch.
  - i. Level the crossarm.

**Performance Steps**

- j. Drive in the lag screw.
  - k. Lower the handline.
7. Unbelt and descend the pole.
  8. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to perform a crossarm change out.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Inspected the climbing equipment, tools, and handline for defects.	—	—
2. Performed lockout and tagout procedures.	—	—
3. Laid out the handline, and attached it to his body belt.	—	—
4. Ascended the pole until he was eye level with the lag screw, and then belted in.	—	—
5. Removed the crossarm.	—	—
6. Installed the new crossarm.	—	—
7. Unbelted and descended the pole.	—	—
8. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- EM 385-1-1
- FM 5-125
- LCH
- TM 5-684
- TM 5-811-1

**Perform Groundman Duties**

**052-204-1127**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment when a lineman needs assistance from a groundman, you are given applicable climbing and rigging equipment, the required hand tools, and applicable personal protective equipment (PPE).

**DANGER: A GROUNDMAN MUST ALWAYS BE PREPARED TO RESCUE A VICTIM FROM A UTILITY POLE AND/OR TO ADMINISTER FIRST AID. TIME IS EXTREMELY CRITICAL. THE TIME IT TAKES TO RESCUE AN INJURED VICTIM AND THE EXTENT OF HIS INJURIES COULD BE THE DIFFERENCE BETWEEN PERMANENT DISABILITIES OR EVEN DEATH FOR THE VICTIM.**

**WARNING: WHEN POSSIBLE, INDIVIDUALS NOT ACSENDING THE POLE MUST MAINTAIN A MINIMUM DISTANCE OF AT LEAST 10 FEET FROM THE BASE OF THE POLE TO ENSURE THAT THEY ARE NOT STRUCK BY ANY INADVERTENTLY DROPPED OBJECTS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**Standards:** Perform groundman duties by ensuring that all safety precautions are followed, supporting the lineman, and raising or lowering the equipment and tools as directed by the lineman who is performing tasks on the utility pole.

**Performance Steps**

1. Set up a safety zone with at least a 10-foot radius from the base of the pole.
2. Inspect the climbing equipment, rigging equipment, tools, and handline(s) for defects.
3. Observe and assist the lineman from the ground as he performs his tasks.
4. Communicate properly with the lineman during each task performed.
5. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to perform groundman duties.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Set up a safety zone with at least a 10-foot radius from the base of the pole.	—	—
2. Inspected the climbing equipment, rigging equipment, tools, and handline(s) for defects.	—	—
3. Observed and assisted the lineman from the ground as he performed his tasks.	—	—
4. Communicated properly with the lineman during each task performed.	—	—
5. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References  
Required**

**Related**  
EM 385-1-1  
FM 5-125  
LCH  
TM 5-684

**Interpret an Electrical One-Line Diagram**

**052-204-1128**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (where there is a fault in a system, scheduled services are due, or an upgrade to the system is needed or proposed), you are given an electrical one-line diagram for an electrical distribution system.

**Standards:** Interpret an electrical one-line diagram by identifying electrical flow and electrical symbols and their relationships.

**Performance Steps**

1. Identify the correct electrical one-line diagram for the electrical system.
2. Identify all lines and symbols on the diagram.
3. Determine the function of all symbols on the one-line diagram and the relationships between the electrical devices.
4. Identify all possible electrical paths depending on switchgear positioning.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to interpret an electrical one-line diagram.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Identified the correct electrical one-line diagram for the electrical system.	—	—
2. Identified all lines and symbols on the diagram.	—	—
3. Determined the function of all symbols on the one-line diagram and the relationships between the electrical devices.	—	—
4. Identified all possible electrical paths depending on switchgear positioning.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- EM 385-1-1
- FM 5-412
- FM 5-422
- LCH
- TM 5-684
- TM 5-686
- TM 5-811-1
- TM 5-811-3



## **Splice a Medium-Voltage Power Cable**

**052-204-1129**

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (during an initial installation of cables where the power cables must be joined or a power cable is damaged beyond repair), you are given an applicable splice kit with instructions, applicable tools as specified in the splice kit instructions, an electrician's tool kit, a lockout and tagout kit, grounding equipment, a megohmmeter test set, a voltage detector, the applicable manufacturer's literature, and applicable personal protective equipment (PPE). You are also given applicable climbing and rigging equipment, two conductor grips, universal sticks with attachments, and resistor sticks for overhead splices.

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIALS (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: CLEANLINESS IS VITAL DURING THE CONSTRUCTION OF A SPLICE. THE SPLICER'S TOOLS, HANDS, AND SPLICING MATERIALS MUST BE CLEAN AND KEPT CLEAN DURING THE CONSTRUCTION OF A SPLICE. FAILURE TO KEEP THE SPLICE CLEAN MAY CAUSE THE SPLICE TO FAIL, RESULTING IN FUTURE DAMAGE TO THE CABLE AND IMMEDIATE PERSONAL INJURY.**

**WARNING: EMPLOY EVERY MEANS TO PREVENT MOISTURE (SUCH AS DRIPPINGS, CONDENSATION, AND PERSPIRATION) FROM ENTERING THE JOINT INSULATION. FAILURE TO KEEP THE JOINT INSULATION DRY MAY CAUSE FUTURE DAMAGE TO THE CABLE AND IMMEDIATE PERSONAL INJURY.**

**NOTE: There are several different types of splicing kits available for use with medium-voltage power cables. Each kit contains specific instructions on how to make the splice. Always follow the manufacturer's procedures for the specific kit used.**

**Standards:** Splice a medium-voltage power cable so that the splice meets the rating of the original cable and does not cause an electrical hazard to personnel and equipment. Ensure that the cable is able to transmit the maximum electrical load without undue heating and is at the full mechanical strength of the conductors.

### **Performance Steps**

1. Perform lockout and tagout procedures, if required.

**NOTE: If the two cables do not have enough length to be spliced, an additional length of cable will be needed.**

**NOTE: Some performance steps will have to be omitted when splicing overhead, medium-voltage cable.**

2. Inspect the splice kit.
  - a. Ensure that the correct splice kit for the cable is being used.
  - b. Inventory the kit to ensure that all of the components are present.
3. Prepare the cable, and splice it as specified in the manufacturer's literature.
  - a. Measure and mark the cable.
  - b. Inspect the cable for carbon particles, and remove any that are found.
  - c. Inspect the cable jacket for nicks, and remove any that are found.
4. Align the cables so that the ends of the conductors conjoin squarely.
  - a. Ensure that all cuts are made squarely and leave a smooth edge.
  - b. Perform ring cuts, as needed, without causing damage to the other parts of the cable.

### Performance Steps

5. Remove the jacket, using the distance indicated by the splice kit instructions.

**NOTE: All cuts should be made square to the conductor.**

**NOTE: Steps 6 through 9 are only for the splicing of underground, medium-voltage cable.**

6. Remove the metallic shield of the cable, using the distance indicated by the splice kit instructions.

**NOTE: Do not ring cut into the metallic shielding or the insulation when removing the jacket.**

7. Remove the high-voltage insulation layer, using the distance indicated by the splice kit instructions.

8. Remove the semiconductor from the edge of the metallic shield, using the distance indicated by the splice kit instructions.

9. Apply the connector using the correct compression tool.

- a. Measure back the depth needed for the conductor to penetrate the connector plus the distance indicated by the splice kit.
- b. Clean the entire area of the splice with cable cleaning solvent.
- c. Remove any sharp edges.
- d. Place two crimps on the connector, and ensure an offset between each crimp that is approximately 90°.

**NOTE: Steps 10 through 12 are only for the splicing of overhead, medium-voltage cable.**

10. Ensure that the overhead conductors are resagged.

11. Splice overhead, medium-voltage cables using one of the following splices:

- a. Automatic sleeve splice.
  - (1) Rig as necessary.
  - (2) Trim to the desired length.
  - (3) Clean and insert conductors into the sleeve ends.
- b. Compression sleeve splice.
  - (1) Rig as necessary.
  - (2) Trim to the desired length.
  - (3) Clean and insert conductors into the sleeve ends.
  - (4) Crimp the sleeve using a compression tool.
- c. Western union splice
  - (1) Rig as necessary.
  - (2) Trim to the desired length
  - (3) Clean and wrap the conductors.

12. Clean all of the surfaces with an approved solvent to remove any carbon dust or residue.

**NOTE: Steps 13 through 16 are only for the splicing of underground, medium-voltage cable.**

13. Replace the high-voltage insulation layer as specified in the manufacturer's literature.

14. Apply a semiconductive layer from the edge of the shielding tape to the edge of the opposing shield as specified in the manufacturer's literature.

15. Recreate a shield layer across the splice connector as specified in the manufacturer's literature.

16. Attach a ground to a shield as specified in the manufacturer's literature. Leave the ground long enough to reach the grounding point.

**NOTE: Steps 17 through 19 are for all medium-voltage splices.**

17. Apply an outer jacket as specified in the manufacturer's literature to prevent moisture from entering.

18. Test the splice to ensure that it meets the cable rating.

19. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to splice a medium-voltage power cable.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Performed lockout and tagout procedures, if required.	—	—
2. Inspected the splice kit.	—	—
3. Prepared the cable, and spliced it as specified in the manufacturer's literature.	—	—
4. Aligned the cables so that the ends of the conductors conjoined squarely.	—	—
5. Removed the jacket, using the distance indicated by the splice kit instructions.	—	—
<b>Note: Step 6 through 9 is only for the splicing of underground medium-voltage cable.</b>		
6. Removed the metallic shield of the cable, using the distance indicated by the splice kit instructions.	—	—
7. Removed the high-voltage insulation layer, using the distance indicated by the splice kit instructions.	—	—
8. Removed the semiconductor from the edge of the metallic shield, using the distance indicated by the splice kit instructions.	—	—
9. Applied the connector using the correct compression tool.	—	—
<b>NOTE: Steps 10 through 12 are only for the splicing of overhead, medium-voltage cable.</b>		
10. Ensured that the overhead conductors were resagged.	—	—
11. Spliced overhead, medium-voltage cables using one of the following splices: <ul style="list-style-type: none"> <li>a. Automatic sleeve splice.</li> <li>b. Compression sleeve splice.</li> <li>c. Western union splice.</li> </ul>	—	—
12. Cleaned all of the surfaces with an approved solvent to remove any carbon dust or residue.	—	—
<b>NOTE: Steps 13 through 16 are only for the splicing of underground medium-voltage cable.</b>		
13. Replaced the high-voltage insulation layer as specified in the manufacturer's literature.	—	—
14. Applied a semiconductive layer from the edge of the shielding tape to the edge of the opposing shield as specified in the manufacturer's literature.	—	—
15. Recreated a shield layer across the splice connector as specified in the manufacturer's literature.	—	—
16. Attached a ground to a shield as specified in the manufacturer's literature. Left the ground long enough to reach the grounding point.	—	—
<b>NOTE: Steps 17 through 19 are for all medium-voltage splices.</b>		

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
17. Applied an outer jacket as specified in the manufacturer's literature to prevent moisture from entering.	—	—
18. Tested the splice to ensure that it met the cable rating.	—	—
19. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- EM 385-1-1
- FM 5-412
- FM 5-422
- LCH
- NESC™
- TM 5-682
- TM 5-684
- TM 5-686
- TM 5-811-1
- TM 5-811-3

## Terminate a Medium-Voltage Power Cable

052-204-1130

**Conditions:** As a power line distribution specialist in a tactical or nontactical environment (during an initial installation of cables where the power cables must be terminated or when an existing power cable termination is damaged beyond repair), you are given an electrician's tool kit, a lockout and tagout kit, grounding equipment, a megohmmeter test set, a voltage detector, applicable termination kit with instructions, applicable tools as specified in the termination kit instructions, applicable manufacturer's literature, and applicable personal protective equipment (PPE).

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: EVERY MEANS MUST BE EMPLOYED TO PREVENT MOISTURE (SUCH AS DRIPPINGS, CONDENSATION, AND PERSPIRATION) FROM ENTERING THE JOINT INSULATION. FAILURE TO KEEP THE JOINT INSULATION DRY MAY RESULT IN FUTURE DAMAGE TO THE CABLE AND CAUSE IMMEDIATE PERSONAL INJURY.**

**WARNING: CLEANLINESS IS VITAL DURING THE CONSTRUCTION OF A TERMINATION. THE SPLICER'S TOOLS, HANDS, AND TERMINATION MATERIAL MUST BE CLEAN AND KEPT CLEAN DURING THE CONSTRUCTION OF A TERMINATION. FAILURE TO KEEP THE SPLICE CLEAN MAY CAUSE THE TERMINATION TO FAIL RESULTING IN FUTURE DAMAGE TO THE CABLE AND POSSIBLE PERSONAL INJURY.**

**NOTE: There are several different types of termination kits available for use with a medium-voltage power cable. Each kit contains specific instructions on how to construct the termination. Always follow the manufacturer's instructions for the specific kit used.**

**Standards:** Terminate a medium-voltage power cable so that the termination meets the rating of the original cable and does not cause an electrical hazard to personnel and/or damage to equipment. The cable must be able to transmit the maximum electrical load without undue heating and must be at the full mechanical load strength of the conductors.

### Performance Steps

1. Perform lockout and tagout procedures, if required.

**NOTE: Some performance steps will have to be omitted when terminating an overhead, medium-voltage cable.**

2. Inspect the termination kit.
  - a. Ensure that you use the correct termination kit for each cable.
  - b. Inventory the kit to ensure that all of the components are present.
3. Prepare the cable and termination as specified in the manufacturer's literature.
  - a. Measure and mark the cable.
  - b. Inspect the cable for carbon particles, and remove any that are found.
  - c. Inspect the primary insulation of the cable for nicks, and remove any that are found.
  - d. Cut the cable to the proper length.
4. Remove the jacket using the distance indicated in the manufacturer's literature, and ensure that the length required for the lug is added to the measure-back distance.
5. Remove the shield using the distance indicated in the manufacturer's literature.
6. Remove the semiconductor using the distance indicated in the manufacturer's literature.

**Performance Steps**

7. Remove the high-voltage insulation layer using the distance indicated in the manufacturer's literature.
8. Install the termination lug using the correct compression tool.
  - a. Place two crimps on the lug and rotate it approximately 90° between each crimp.
  - b. Remove any sharp edges.
9. Clean all surfaces using an approved solvent to remove any carbon dust or residue.
10. Replace the high-voltage insulation layer as specified in the manufacturer's literature.
11. Apply a semiconductive layer as specified in the manufacturer's literature.
12. Recreate a shield layer as specified in the manufacturer's literature.
13. Attach a ground as specified in the manufacturer's literature, and leave it long enough to reach the grounding point.
14. Apply a high-voltage insulation layer as specified in the manufacturer's literature.
15. Apply an outer jacket to prevent moisture from entering as specified in the manufacturer's literature.
16. Test the splice to ensure that it meets the cable rating.
17. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to terminate a medium-voltage power cable.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Performed lockout and tagout procedures, if required.	_____	_____
<b>NOTE: Some performance steps will have to be omitted when splicing overhead, medium-voltage cable.</b>		
2. Inspected the termination kit.	_____	_____
3. Prepared the cable and termination as specified in the manufacturer's literature.	_____	_____
4. Removed the jacket using the distance indicated in the manufacturer's literature, and ensured that the length required for the lug was added to the measure-back distance.	_____	_____
5. Removed the shield using the distance indicated in the manufacturer's literature.	_____	_____
6. Removed the semiconductor using the distance indicated in the manufacturer's literature.	_____	_____
7. Removed the high-voltage insulation layer using the distance indicated in the manufacturer's literature.	_____	_____
8. Installed the termination lug using the correct compression tool.	_____	_____
9. Cleaned all surfaces using an approved solvent to remove any carbon dust or residue.	_____	_____

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
10. Replaced the high-voltage insulation layer as specified in the manufacturer's literature.	—	—
11. Applied a semiconductive layer as specified in the manufacturer's literature.	—	—
12. Recreated a shield layer as specified in the manufacturer's literature.	—	—
13. Attached a ground as specified in the manufacturer's literature, and left it long enough to reach the grounding point.	—	—
14. Applied a high-voltage insulation layer as specified in the manufacturer's literature.	—	—
15. Applied an outer jacket to prevent moisture from entering as specified in the manufacturer's literature.	—	—
16. Tested the splice to ensure that it met the cable rating.	—	—
17. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

#### **References**

##### **Required**

##### **Related**

EM 385-1-1  
 FM 5-412  
 FM 5-422  
 LCH  
 NESCSM™  
 TM 5-682  
 TM 5-684  
 TM 5-686  
 TM 5-811-1  
 TM 5-811-3

Skill Level 2

Subject Area 1: Safety Operations

**Conduct a Safety Briefing**

**052-204-2207**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment before any work starts on a jobsite, you are given a detailed job description and applicable safety standing operating procedures (SOPs).

**Standards:** Conduct a safety briefing informing all personnel of any dangers, cautions, warnings, or risks related to the jobsite based on the detailed job description and applicable safety SOPs.

**Performance Steps**

1. Perform an initial walk-through of the jobsite.
2. Note any possible hazards or associated risks.
3. Inform personnel (verbally) of possible hazards or associated risks.
4. Remind personnel that everyone at the jobsite is a safety officer with the responsibility of stopping and reporting any future hazards or unsafe actions.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions.

Brief Soldier: Give the Soldier a requirement to conduct a safety briefing.

**Performance Measures**

1. Performed an initial walk-through of the jobsite.
2. Noted any possible hazards or associated risks.
3. Informed personnel (verbally) of possible hazards or associated risks.
4. Reminded personnel that everyone at the jobsite was a safety officer with the responsibility of stopping and reporting any future hazards or unsafe actions.

**GO      NO-GO**

_____	_____
_____	_____
_____	_____
_____	_____

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- AR 385-10
- AR 385-55
- EM 385-1-1
- ER 385-1-31
- FM 3-100.12
- LCH
- TM 5-682
- TM 5-684



**Conduct a Safety Inspection**

**052-204-2208**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment before or during any work performed on a jobsite, you are given a safety checklist, a detailed job description, and applicable safety standing operating procedures (SOPs).

**DANGER: ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT (PPE) AS REQUIRED FOR INSPECTIONS IN HAZARDOUS AREAS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Conduct a safety inspection using the safety checklist, the detailed job description, and applicable safety SOPs. Record all deficiencies found on the safety checklist. Stop all actions that appear to be unsafe.

**Performance Steps**

1. Obtain the standards for the inspection.
2. Inform personnel of the inspection.
3. Conduct the inspection.
4. Note any deficiencies found during the inspection.
5. Inform personnel of the deficiencies found during the inspection.
6. Verify that all the deficiencies are corrected.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions.

Brief Soldier: Give the Soldier a requirement to conduct a safety inspection.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Obtained the standards for the inspection.	—	—
2. Informed personnel of the inspection.	—	—
3. Conducted the inspection.	—	—
4. Noted any deficiencies found during the inspection.	—	—
5. Informed personnel of the deficiencies found during the inspection.	—	—
6. Verified that all the deficiencies were corrected.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- AR 385-10
- AR 385-55
- EM 385-1-1
- ER 385-1-31
- FM 3-100.12

**References  
Required**

**Related**  
LCH  
TM 5-682  
TM 5-684

## **Perform Lockout and Tagout Procedures**

**052-244-2112**

**Conditions:** As a power plant operator in a tactical or nontactical environment (with a system that must be de-energized for troubleshooting or maintenance), you are given Occupational Safety and Health Administration (OSHA) Regulation 1910.147, Technical Manual (TM) 5-682, Engineer Regulation (ER) 385-1-31, Engineer (ENG) Form 1925 (Danger-Main Hold Card), ENG Form 1927-R (Safe Clearance Request), ENG Form 2198 (Operation Log), a lockout and tagout kit, a voltage detector, a two-way radio or telephone communication equipment, other appropriate TMs, and electrical schematics and/or prints (depending on the situation) for the equipment to be locked out or tagged out.

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF MEDIUM-VOLTAGE ELECTRICAL POWER GENERATION EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: ALL SYSTEMS WILL BE CONSIDERED ENERGIZED UNTIL THE SOURCE OF ENERGY IS REMOVED, LOCKED OUT (WHEN POSSIBLE), AND TAGGED OUT. WHEN ENERGY-ISOLATING DEVICES CANNOT BE PHYSICALLY LOCKED OUT, USE TAGOUT PROCEDURES. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Perform lockout and tagout procedures as specified in OSHA regulations to ensure the safe isolation of energized circuits or mechanical hazards.

### **Performance Steps**

#### **NOTES:**

**1. Authorized personnel applying the lockout and tagout devices are also responsible for ensuring the control of residual energy and for the placing, tagging, and removing of protective grounds.**

**2. Safe clearances must be used for all electrical work performed on de-energized lines and equipment operating over 600 volts.**

1. Notify the project supervisor of the work areas requiring lockout and tagout procedures.
2. Initiate a safe clearance request.
  - a. Fill out ENG Form 1927-R.
  - b. Annotate the safe clearance in the power station operation log (ENG Form 2198).
3. Review the schematics and/or prints of the system.
  - a. Identify all energy-isolating devices and disconnecting means.
  - b. Identify where the system can be isolated by—
    - (1) Shutting down the system.
    - (2) Isolating the system.
    - (3) Blocking the system.
    - (4) Securing the system.
4. Isolate all the systems operated by remote controlled power sources.

### Performance Steps

5. Create a list of all the energy-isolating devices and disconnecting equipment to be locked and tagged.
  - a. Identify the primary means of isolation.
  - b. Identify the secondary means of isolation.
6. Review the other work areas to identify possible exposure to other sources of electrical and/or mechanical energy hazards.
7. Identify other energy sources in the immediate area to determine possible exposure to stored or residual energy.
8. Ensure that all potentially hazardous stored or residual energy is relieved, discharged, or otherwise rendered safe.
9. Establish energy control methods to control other hazardous energy sources in the area.
10. Test each phase conductor or circuit part using a voltage detector to verify that it is de-energized.
  - a. Check an energized circuit to ensure that the voltage detector is working.
  - b. Check for the presence of voltage on the de-energized circuit.
  - c. Check the energized circuit again to verify that the voltage detector is working properly.
11. Install lockout devices on each energy-isolating device and disconnecting equipment so they are maintained in the open or de-energized position.

**NOTE: The person who performs the work maintains the keys to the lockout devices while the work is being completed.**

12. Attach ENG Form 1925 as a main hold card for the primary means of energy isolation.
  - a. Ensure that the person installing the lockout device signs the lockout tag with the—
    - (1) Printed name of the installer.
    - (2) Date.
    - (3) Time.
    - (4) Clearance number.
  - b. Ensure that the main hold card lists all the locations of the auxiliary hold cards.
13. Attach ENG Form 1925 as an auxiliary hold card for the secondary means of energy isolation.
  - a. Ensure that the person installing the lockout device signs the lockout tag with the—
    - (1) Printed name of the installer.
    - (2) Date.
    - (3) Time.
    - (4) Clearance number.
  - b. Ensure that the auxiliary hold card number matches the numbered location of the main hold cards.
14. Attach ENG Form 1925 as a tagout device for the energy-isolating device or disconnecting means that cannot be physically locked.
  - a. Ensure that the person installing the lockout device signs the lockout tag with the—
    - (1) Printed name of the installer.
    - (2) Date.
    - (3) Time.
    - (4) Clearance number.
  - b. Ensure that the lockout tag is placed directly over the operating controls of the energy-isolating devices or disconnecting means.

**NOTE: The lockout tag should contain a brief statement prohibiting the unauthorized operation of the energy-isolating device or disconnecting means or the removal of the tag. It should warn against the hazardous condition resulting from the system being energized and include a legend that contains wording (such as do not start, do not energize, do not open, do not close, and/or do not operate).**

**Performance Steps**

15. Perform an inspection with the personnel in the work area and the project supervisor.
  - a. Verify that the system has been isolated and de-energized successfully.
  - b. Accomplish the inspection before starting to work on the systems that have been locked out or tagged out.

**DANGER: VERIFICATION OF ISOLATION AND DE-ENERGIZING OF SYSTEMS MUST BE ACCOMPLISHED BY ATTEMPTING TO OPERATE THE ENERGY-ISOLATING DEVICES AND DISCONNECTING MEANS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

16. Test each phase conductor or circuit part with an adequately rated voltage detector to verify that they are de-energized.
  - a. Check an energized circuit to ensure that the voltage detector is working properly.
  - b. Check for the presence of voltage on the de-energized circuit.
  - c. Check the energized circuit again to verify that the voltage detector is working properly.

17. Perform any required maintenance or service to the phase conductor or circuit part.

18. Request permission from the project supervisor to close out the lockout and tagout procedures.

19. Perform an inspection with the personnel performing the work and the project supervisor to ensure that all affected personnel are notified that the lockout and tagout devices are ready for removal.

**WARNING: BEFORE THE LOCKOUT OR TAGOUT DEVICES ARE REMOVED AND ELECTRIC CIRCUITS OR EQUIPMENT ARE REENERGIZED, APPROPRIATE TESTS AND VISUAL INSPECTIONS WILL BE CONDUCTED BY AUTHORIZED PERSONNEL (THE INSTALLER). THE INSTALLER WILL VERIFY THAT ALL TOOLS; MECHANICAL RESTRAINTS; AND ELECTRICAL JUMPERS, SHORTS, AND GROUNDS HAVE BEEN REMOVED. THE ENTIRE WORK AREA WILL BE INSPECTED AND ALL NONESSENTIAL ITEMS WILL BE REMOVED FROM THE SYSTEM. FAILURE TO COMPLY MAY CAUSE SEVERE DAMAGE TO THE EQUIPMENT AND/OR IMMEDIATE PERSONAL INJURY.**

20. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.

**NOTE: Ensure that each lockout and tagout device is removed by the installer or a designated representative if the installer is not available.**

21. Ensure that all personnel are safely positioned or removed from the area needing to be reenergized.

22. Complete and file all necessary forms.
  - a. Complete ENG Form 1927-R.
  - b. Annotate the completed work on ENG Form 2198.
  - c. File the completed ENG Form 1927-R.

**Evaluation Preparation:**

Setup: Provide the Soldier with a lockout and tagout kit.

Brief Soldier: Give the Soldier a scenario and tell him to perform lockout and tagout procedures.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Notified the project supervisor of the work areas requiring lockout and tagout procedures.	—	—
2. Initiated a safe clearance request.	—	—
3. Reviewed the schematics and/or prints of the system.	—	—
4. Isolated all the systems operated by remote controlled power sources.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
5. Created a list of all the energy-isolating devices and disconnecting equipment to be locked and tagged.	—	—
6. Reviewed the other work areas to identify possible exposure to other sources of electrical and/or mechanical energy hazards.	—	—
7. Identified other energy sources in the immediate area to determine possible exposure to stored or residual energy.	—	—
8. Ensured that all potentially hazardous stored or residual energy was relieved, discharged, or otherwise rendered safe.	—	—
9. Established energy control methods to control other hazardous energy sources in the area.	—	—
10. Tested each phase conductor or circuit part using a voltage detector to verify that it was de-energized.	—	—
11. Installed lockout devices on each energy-isolating device and disconnecting equipment so they were maintained in the open or de-energized position.	—	—
12. Attached ENG Form 1925 as a main hold card for the primary means of energy isolation.	—	—
13. Attached ENG Form 1925 as an auxiliary hold card for the secondary means of energy isolation.	—	—
14. Attached ENG Form 1925 as a tagout device for the energy-isolating device or disconnecting means that could not be physically locked.	—	—
15. Performed an inspection with the personnel in the work area and the project supervisor.	—	—
16. Tested each phase conductor or circuit part with an adequately rated voltage detector to verify that they were de-energized.	—	—
17. Performed any required maintenance or service to the phase conductor or circuit part.	—	—
18. Requested permission from the project supervisor to close out the lockout and tagout procedures.	—	—
19. Performed an inspection with the personnel performing the work and the project supervisor to ensure that all affected personnel were notified that the lockout and tagout devices were ready for removal.	—	—
20. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—
21. Ensured that all personnel were safely positioned or removed from the area needing to be reenergized.	—	—
22. Completed and filed all necessary forms	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
ENG FORM 1925

**Related**  
EM 385-1-1

**References**

**Required**

ENG FORM 1927-R  
ENG FORM 2198  
ER 385-1-31  
OSHA REG 1910.147  
TM 5-682

**Related**

Subject Area 3: Installation of Electrical Equipment

**Install Distribution Equipment (Energized)**

**052-204-2209**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when distribution equipment needs to be installed or replaced [energized]), you are given electrical construction prints, applicable distribution equipment as specified in the electrical construction prints, applicable climbing and rigging equipment, hot-line tools, an electrician's tool kit, a voltage detector, a lockout and tagout kit, grounding equipment, safety standing operating procedures (SOPs), applicable manufacturer's literature, the Lineman's and Cableman's Handbook (LCH), applicable personal protective equipment (PPE), and insulating protective equipment.

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT TOUCH EXPOSED ELECTRICAL CONNECTIONS WITHOUT THE PROPER PROTECTIVE GEAR WHEN THE POWER SOURCE IS CONNECTED TO THE FUSE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER POSITION YOURSELF UNDER A SUSPENDED LOAD. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**NOTE: All distribution equipment is not the same and may function differently depending on make, model, or manufacturer. The application of the installation steps are similar but may vary. Always consult the manufacturer's literature for each piece of equipment.**

**Standards:** Install distribution equipment (energized) as specified in the manufacturer's literature. Ensure that all hardware is mechanically tight and electrically connected.

**Performance Steps**

1. Review all of the manufacturer's literature, the electrical construction prints, and the wiring diagrams.
2. Ensure that all PPE and hot-line equipment has been correctly tested and is fully mission capable.
3. Inspect all tools and rigging equipment for serviceability.
4. Install all rigging equipment, as necessary.
5. Raise and position the distribution equipment (safely) to prepare it for installation.
6. Install all mounting hardware as stated in the applicable manufacturer's literature.
7. Remove all rigging equipment.
8. Connect the distribution equipment (electrically) as stated in the applicable manufacturer's literature.



**Performance Steps**

9. Verify the correct phase sequence.
10. Position or sag the conductors to the appropriate clearance as stated in the applicable manufacturer's literature.
11. Perform a functions check on the electrical distribution system.
12. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to install distribution equipment (energized).

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Reviewed all of the manufacturer's literature, the electrical construction prints, and the wiring diagrams.	—	—
2. Ensured that all PPE and hot-line equipment had been correctly tested and was fully mission capable.	—	—
3. Inspected all tools and rigging equipment for serviceability.	—	—
4. Installed all rigging equipment, as necessary.	—	—
5. Raised and positioned the distribution equipment (safely) to prepare it for installation.	—	—
6. Installed all mounting hardware as stated in the applicable manufacturer's literature.	—	—
7. Removed all rigging equipment.	—	—
8. Connected the distribution equipment (electrically) as stated in the applicable manufacturer's literature.	—	—
9. Verified the correct phase sequence.	—	—
10. Positioned or sagged the conductors to the appropriate clearance as stated in the applicable manufacturer's literature.	—	—
11. Performed a functions check on the electrical distribution system.	—	—
12. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
ER 385-1-31  
FM 5-125

**References  
Required**

**Related**  
FM 5-412  
FM 5-422  
FM 5-424  
NESC™  
NETA™  
TM 5-682  
TM 5-684  
TM 5-686  
TM 5-811-1  
TM 5-811-3

## Secure Conductor to Insulator (Energized)

052-204-2210

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when conductors need to be secured to insulators and after lines have been properly sagged [energized]), you are given appropriately sized clips and/or ties for the conductors, applicable climbing and rigging equipment, safety standing operating procedures (SOPs), the Lineman's and Cableman's Handbook (LCH), hot-line tools, a voltage detector, grounding equipment, applicable personal protective equipment (PPE), and insulating protective equipment.

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT TOUCH EXPOSED ELECTRICAL CONNECTIONS WITHOUT THE PROPER PROTECTIVE GEAR WHEN THE POWER SOURCE IS CONNECTED TO THE FUSE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Secure a conductor to an insulator (energized) ensuring that all phases are level and the conductors are not stressed.

### Performance Steps

1. Ensure that all PPE and hot-line equipment has been correctly tested and is fully mission capable.
2. Determine the best tie method for each location.
  - a. Use preformed tie wires, if available.

**NOTE: Preformed tie wires are not one size fits all. They must match the application and conductor size.**

- b. Use armor rod ties, when applicable

**NOTE: An armor rod tie is used to protect the conductors from damage due to vibration and is placed on the conductors the same way as preformed tie wires.**

**NOTE: Never cross tie wires.**

- c. Use a top tie wire when the conductor is in the top groove of the insulator.
  - (1) Center the tie wire on the top of the insulator, pulling one end toward and one end away from you. Both sides of the tie wire should be of equal length and positioned under the conductor. Wrap both ends halfway around the insulator.
  - (2) Tighten both tie wires against the insulator and wrap 2 close wraps, 3 spaced wraps, and 2 more close wraps around the conductor.
  - (3) Bend the ends back, and cut off the excess tie wire.
- d. Use a side tie wire when the conductor pulls against the side of the insulator.
  - (1) Center the tie wire on the back side of the insulator, pulling the ends toward you and forming a U. Both sides of the tie wire should be of equal length and positioned under the conductor.
  - (2) Tighten the tie wires against the insulator, and wrap 2 close wraps, 3 spaced wraps, and 2 more close wraps around the conductor.

**Performance Steps**

- (3) Bend the ends back, and cut off the excess tie wire.
- 3. Inspect the ties to ensure that the conductors remain secure.
- 4. Ensure that all PPE, hot-line equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to secure a conductor to an insulator (energized).

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO-GO</b></u>
1. Ensured that all PPE and hot-line equipment had been correctly tested and was fully mission capable.	——	——
2. Determined the best tie method for each location. <ul style="list-style-type: none"> <li>a. Used preformed tie wires, if available.</li> <li>b. Used armor rod ties, when applicable.</li> <li>c. Used a top tie wire when the conductor was in the top groove of the insulator.</li> <li>d. Used a side tie wire when the conductor pulled against the side of the insulator.</li> </ul>	——	——
3. Inspected the ties to ensure that the conductors remained secure.	——	——
4. Ensured that all PPE, hot-line equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	——	——

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
FM 5-422  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

Subject Area 4: Electrical Service Calls

**Develop a Bill of Materials (BOM) List  
052-204-2211**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when materials are needed for an electrical construction project), you are given electrical construction prints, Technical Manual (TM) 5-811-1, the Lineman's and Cableman's Handbook (LCH), paper, pencils, a calculator, and Department of the Army (DA) Form 2702 (Bill of Materials).

**Standards:** Develop a BOM list that reflects the total materials required to complete an electrical construction project. All materials must be of the size and type required according to the electrical construction prints, TM 5-811-1, and the LCH. Record all materials on DA Form 2702.

**Performance Steps**

1. Review all electrical construction prints.
2. Complete a BOM list.
  - a. Record the stock or part number as indicated on the electrical construction prints, if applicable.
  - b. Record the item name or item description as indicated on the electrical construction prints.
  - c. Record the number of pieces required as indicated on the electrical construction prints, if applicable.
  - d. Record the size and the length of an item as indicated on the electrical construction prints, if applicable.
  - e. Record the unit of issue and indicate whether the item is a spool or a length or if the item is issued as "each".
  - f. Record the estimated waste of each item.
  - g. Total up the quantities needed based on the number of pieces, units of issue, required lengths, and estimated waste for each item.
  - h. Record the total quantity of each item.
3. Complete DA Form 2702.
  - a. Complete the heading with the current information of the unit.
  - b. Record the stock or part number.
  - c. Record the name and/or description of the item.
  - d. Record the unit of issue.
  - e. Record the total quantity of each item.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to develop a BOM list.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Reviewed all electrical construction prints.	_____	_____
2. Completed a BOM list.	_____	_____
3. Completed DA Form 2702.	_____	_____

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
DA FORM 2702  
LCH  
TM 5-811-1

**Related**  
FM 5-412  
FM 5-422  
TM 5-684

## **Energize an Electrical Distribution System**

**052-204-2212**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when an electrical distribution system must be energized or reenergized), you are given the applicable, electrical one-line diagrams; the electrical construction prints; the manufacturer's literature; a two-way radio or telephone communication equipment; safety standing operating procedures (SOPs); the Lineman's and Cableman's Handbook (LCH); and applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF MEDIUM-VOLTAGE, ELECTRICAL POWER GENERATION EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: ALL SYSTEMS WILL BE CONSIDERED ENERGIZED UNTIL THE SOURCE OF ENERGY IS REMOVED, LOCKED OUT (WHEN POSSIBLE), TAGGED OUT AND GROUNDED. WHEN ENERGY-ISOLATING DEVICES CANNOT BE PHYSICALLY LOCKED OUT, USE TAGOUT PROCEDURES. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Energize an electrical distribution system following the one-line diagram, safety SOPs, the LCH, and the applicable manufacturer's literature.

### **Performance Steps**

1. Review all applicable, electrical one-line diagrams; electrical construction prints; and the manufacturer's literature.
2. Request permission from the project supervisor to energize the electrical distribution system.
3. Perform an inspection with the personnel who performed work on the distribution system and the project supervisor to ensure that all personnel are notified that the distribution system will soon be reenergized.
4. Ensure that each lockout and tagout device is removed by the installer or designated representative if the installer is not available.

**DANGER: BEFORE THE LOCKOUT OR TAGOUT DEVICES ARE REMOVED AND ELECTRICAL CIRCUITS OR EQUIPMENT ARE REENERGIZED, APPROPRIATE TESTS AND VISUAL INSPECTIONS WILL BE CONDUCTED BY AUTHORIZED PERSONNEL (THE INSTALLER). THE INSTALLER WILL VERIFY THAT ALL PERSONNEL, TOOLS, MECHANICAL RESTRAINTS, AND ELECTRICAL JUMPERS, SHORTS, AND GROUNDS HAVE BEEN REMOVED. THE ENTIRE WORK AREA WILL BE INSPECTED AND ALL NONESSENTIAL ITEMS WILL BE REMOVED FROM THE SYSTEM. FAILURE TO COMPLY MAY CAUSE SEVERE DAMAGE TO EQUIPMENT AND RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

5. Ensure that all personnel, PPE, hot-line equipment, climbing and rigging equipment, and tools are safely positioned or removed from the area needing to be reenergized.
6. Reenergize the distribution system.
7. Perform a functions check on the electrical distribution system.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to energize an electrical distribution system.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all applicable, electrical one-line diagrams; electrical construction prints; and the manufacturer's literature.	—	—
2. Requested permission from the project supervisor to energize the electrical distribution system.	—	—
3. Performed an inspection with the personnel who performed work on the distribution system and the project supervisor to ensure that all personnel were notified that the distribution system would soon be reenergized.	—	—
4. Ensured that each lockout and tagout device was removed by the installer or designated representative if the installer was not available.	—	—
5. Ensured that all personnel, PPE, hot-line equipment, climbing and rigging equipment, and tools were safely positioned or removed from the area needing to be reenergized.	—	—
6. Reenergized the distribution system.	—	—
7. Performed a functions check on the electrical distribution system.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
ER 385-1-31  
FM 5-412  
FM 5-422  
NESC™  
TM 5-682  
TM 5-684  
TM 5-686  
TM 5-811-1  
TM 5-811-3



## Locate an Underground Cable and/or a Fault

052-204-2213

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when an underground cable and/or fault needs to be located), you are given a cable fault locator with the manufacturer's literature, an electrician's tool kit, and applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT TOUCH EXPOSED ELECTRICAL CONNECTIONS WHEN A POWER SOURCE IS CONNECTED TO THE CABLES. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT USE CLAMP-ON OR DIRECT-CONNECT METHODS OF FAULT FINDING UNTIL YOU HAVE VERIFIED THAT THE CABLES ARE DE-ENERGIZED. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Locate an underground cable and/or fault safely and accurately as specified in the manufacturer's literature on the test equipment.

### Performance Steps

1. Review all DANGERS, WARNINGS, and CAUTIONS in the work area and for the test equipment.
2. Perform lockout and tagout procedures.
3. Determine the best test method for locating the cable or fault (such as inductive, flexible coupler, and direct-connect).
4. Perform all preoperational checks for the test equipment as specified in the manufacturer's literature.
5. Connect the test set to the cable.
6. Locate the buried cable by tracing it from the source to the load.
7. Mark the path of the cable with flags.
8. Perform a preoperational check on the test equipment as specified in the manufacturer's literature.
9. Connect the fault locator to the cable being tested.
10. Set up the fault locator for surge tracing.
11. Operate the surge detector, and follow the marked cable path until a thump indicates the location of the fault.
12. Locate the fault by tracing it from the source to the fault location.
13. Repair the fault in the cable.
14. Test the repairs.
15. Mark the cable location from the source to the load.

**Performance Steps**

16. Remove the test equipment from the circuit being tested.
17. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to locate an underground cable and/or fault.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all DANGERS, WARNINGS, and CAUTIONS in the work area and for the test equipment.	—	—
2. Performed lockout and tagout procedures.	—	—
3. Determined the best test method for locating the cable or fault (such as inductive, flexible coupler, and direct-connect).	—	—
4. Performed all preoperational checks for the test equipment as specified in the manufacturer's literature.	—	—
5. Connected the test set to the cable.	—	—
6. Located the buried cable by tracing it from the source to the load.	—	—
7. Marked the path of the cable with flags.	—	—
8. Performed a preoperational check on the test equipment as specified in the manufacturer's literature.	—	—
9. Connected the fault locator to the cable being tested.	—	—
10. Set up the fault locator for surge tracing.	—	—
11. Operated the surge detector, and followed the marked cable path until a thump indicated the location of the fault.	—	—
12. Located the fault by tracing it from the source to the fault location.	—	—
13. Repaired the fault in the cable.	—	—
14. Tested the repairs.	—	—
15. Marked the cable location from the source to the load.	—	—
16. Removed the test equipment from the circuit being tested.	—	—
17. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References  
Required**

**Related**  
EM 385-1-1

**References  
Required**

**Related**  
ER 385-1-31  
FM 5-412  
FM 5-422  
LCH  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

## Perform Live-Line Testing

052-204-2214

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when live-line distribution equipment needs to be tested), you are given a one-line diagram, applicable climbing and rigging equipment, hot-line tools, a voltage detector, a clamp-on amp meter, safety standing operating procedures (SOPs), applicable manufacturer's literature, the Lineman's and Cableman's Handbook (LCH), applicable personal protective equipment (PPE), and insulating protective equipment.

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF MEDIUM-VOLTAGE, ELECTRICAL POWER GENERATION EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Perform live-line testing to determine whether the line is or is not energized based on the test results.

### Performance Steps

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE, hot-line equipment, and test equipment has been correctly tested and is fully mission capable.
4. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
5. Ensure that all personnel are safely positioned or removed from the area that needs testing.
6. Perform an initial equipment self test.
7. Test each phase conductor or circuit part with adequately rated test equipment.
  - a. Check a known energized circuit to ensure that the test equipment is working correctly.
  - b. Check a known de-energized circuit to ensure that the test equipment is working correctly.
  - c. Test the identified energized circuit, and verify the test results.
8. Ensure that all PPE, hot-line equipment, and test equipment are correctly cleaned and stored.

### Evaluation Preparation:

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to perform live-line testing.

### Performance Measures

1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.

**GO**    **NO-GO**

—        —

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE, hot-line equipment, and test equipment had been correctly tested and was fully mission capable.	—	—
4. Determined the BOM for the tools and equipment necessary to perform the task.	—	—
5. Ensured that all personnel were safely positioned or removed from the area that needed testing.	—	—
6. Performed an initial equipment self test.	—	—
7. Tested each phase conductor or circuit part with adequately rated test equipment.	—	—
8. Ensured that all PPE, hot-line equipment, and test equipment were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
ER 385-1-31  
FM 5-412  
FM 5-422  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

**Perform an Insulation-Resistance Test**  
**052-204-2215**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (during maintenance or whenever electrical equipment is initially installed), you are given a megohmmeter or a direct current (DC), high-potential test set; an electrician's tool kit; a voltage detector; wire markers; a hot stick; grounding equipment; applicable manufacturer's literature or industry standards; a lockout and tagout kit; and applicable personal protective equipment (PPE).

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: USE THE CORRECT TEST EQUIPMENT TO TEST FOR VOLTAGE BEFORE CONTACTING THE COMPONENTS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: THE INSULATION TESTER PRODUCES A HIGH VOLTAGE. TO AVOID PERSONAL INJURY DURING THE TEST, DO NOT TOUCH THE CABLE BEING TESTED OR THE TEST LEADS. ALWAYS REMOVE THE POWER AND DISCHARGE THE CIRCUIT. GROUND THE CIRCUIT FOR TWICE THE AMOUNT OF THE TIME THAT IT WAS TESTED BEFORE HANDLING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: THIS TASK SHOULD NOT BE PERFORMED ON EQUIPMENT THAT CONTAINS POLYCHLORINATED BIPHENYL (PCB). FAILURE TO COMPLY MAY CAUSE SKIN AILMENTS, REPRODUCTIVE DISORDERS, LIVER DISEASE, AND OTHER ADVERSE HEALTH CONDITIONS RESULTING IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Perform an insulation-resistance test by determining the condition of the insulation based on the test results and as specified in the applicable manufacturer's literature or industry standards. Repair or replace the equipment, if necessary. Retest any repaired or replaced equipment.

**Performance Steps**

1. Perform lockout and tagout procedures on the system where the equipment is installed.
2. Use a voltage detector to verify that there is no voltage at the connection points.
3. Install safety grounds.
4. Prepare an as-found wiring diagram that shows the connection configuration used to connect the equipment to the system.
5. Disconnect the cables from the equipment terminals, as necessary, to perform the test.
6. Mark the cable ends to identify their connection points and designated phases.

**NOTE: If as-found results are needed, the equipment should be cleaned after the test.**

7. Clean the equipment to be tested.

**NOTE: Always complete a megohmmeter test before performing a high-potential test. The megohmmeter test is less destructive and can find faults before the high-potential test.**

8. Determine which type of insulation test to use, such as the megohmmeter test or the high-potential test.

**Performance Steps**

**DANGER: THE INSULATION TESTER PRODUCES A HIGH VOLTAGE. TO AVOID PERSONAL INJURY DURING THE TEST, DO NOT TOUCH THE EQUIPMENT BEING TESTED OR THE TEST LEADS. ALWAYS REMOVE THE POWER AND DISCHARGE THE CIRCUIT. GROUND THE CIRCUIT FOR TWICE THE AMOUNT OF TIME THAT IT WAS TESTED BEFORE HANDLING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

9. Employ the test equipment, and perform the insulation-resistance test as specified in the operation instructions provided with the test set.

**NOTE: When electrical equipment has multiple primary and secondary windings, all primary and secondary windings that are not being tested must be shorted together and shorted to the ground.**

**NOTE: If no standards or test records for the equipment can be found, the minimum accepted standard for the megohmmeter test is 1 megohm per kilovolt of rated voltage, plus 1 megohm.**

- 10. Keep a record of the test results.
- 11. Determine the status of the insulation by interpreting the test.
  - a. Proceed to step 12 if the results are acceptable.
  - b. Clean, repair, or replace the equipment if the results are unacceptable.
  - c. Retest the equipment.
- 12. Reconnect and torque the cables, as necessary.
- 13. Remove the safety grounds.
- 14. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.
- 15. Reenergize the equipment.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to perform an insulation-resistance test.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Performed lockout and tagout procedures on the system where the equipment was installed.	—	—
2. Used a voltage detector to verify that there was no voltage at the connection points.	—	—
3. Installed safety grounds.	—	—
4. Prepared an as-found wiring diagram that showed the connection configuration used to connect the equipment to the system.	—	—
5. Disconnected the cables from the equipment terminals, as necessary, to perform the test.	—	—
6. Marked the cable ends to identify their connection points and designated phases.	—	—
7. Cleaned the equipment to be tested.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
8. Determined which type of insulation test to use, such as the megohmmeter test or the high-potential test.	—	—
9. Employed the test equipment, and performed the insulation-resistance test as specified in the operation instructions provided with the test set.	—	—
10. Kept a record of the test results.	—	—
11. Determined the status of the insulation by interpreting the test.	—	—
12. Reconnected and torqued the cables, as necessary.	—	—
13. Removed the safety grounds.	—	—
14. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—
15. Reenergized the equipment.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- EM 385-1-1
- ER 385-1-31
- FM 5-412
- FM 5-422
- LCH
- TM 5-682
- TM 5-684
- TM 5-811-1
- TM 5-811-3



**Perform Maintenance on Electrical Distribution Equipment****052-204-2216**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when maintenance must be performed on electrical distribution equipment), you are given electrical, one-line diagrams for distribution equipment; applicable climbing and rigging equipment; hot-line tools; an electrician's tool kit; a voltage detector; a lockout and tagout kit; grounding equipment; safety standing operating procedures (SOPs); applicable manufacturer's literature or industry standards; the Lineman's and Cableman's Handbook (LCH), applicable personal protective equipment (PPE), and insulating protective equipment.

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT TOUCH EXPOSED ELECTRICAL CONNECTIONS WHEN A SOURCE OF POWER IS CONNECTED TO THE DISTRIBUTION SYSTEM. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED ON EQUIPMENT THAT DOES NOT CONTAIN POLYCHLORINATED BIPHENYL (PCB). FAILURE TO COMPLY MAY CAUSE SKIN AILMENTS, REPRODUCTIVE DISORDERS, LIVER DISEASE, AND OTHER ADVERSE HEALTH CONDITIONS RESULTING IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: DO NOT EXCEED THE MAXIMUM VOLTAGE STIPULATED FOR SPECIFIC TESTS. FAILURE TO COMPLY WITH RATED VOLTAGES MAY CAUSE DAMAGE TO EQUIPMENT AND RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: THE INSULATION TESTER PRODUCES A HIGH VOLTAGE. TO AVOID PERSONAL INJURY DURING THE TEST, DO NOT TOUCH THE CABLE BEING TESTED OR THE TEST LEADS. ALWAYS REMOVE THE POWER, AND DISCHARGE AND GROUND THE CIRCUIT FOR TWICE THE AMOUNT OF TIME THAT IT WAS TESTED BEFORE HANDLING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: HEATERS IN THE ENCLOSURE MAY CAUSE SERIOUS BURNS EVEN AFTER THE POWER HAS BEEN REMOVED. CONTACT WITH HEATERS MAY CAUSE IMMEDIATE PERSONAL INJURY.**

**NOTE: All tests should be conducted as specified in the manufacturer's literature, when available. Use industry standards when the manufacturer's literature cannot be obtained.**

**Standards:** Perform maintenance on electrical distribution equipment by inspecting and testing as specified in the applicable manufacturer's literature, and keep a record of the results. Reinstall or repair equipment based on the test results.

**Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been correctly tested and is fully mission capable.
4. Inspect all of the tools and testing equipment for serviceability.
5. Perform lockout and tagout procedures.
6. Ascend the pole to the desired height, if necessary.
7. Test all of the phases to ensure that there is no voltage present.
8. Install personal protective grounds.
9. Perform maintenance on electrical distribution equipment by inspecting and testing it as specified in the applicable manufacturer's literature.
10. Record the inspection and testing results.
11. Repair or replace equipment based on the inspection and test results.
12. Remove the personal protective grounds.
13. Close out the lockout and tagout procedures by removing all locking and/or tagging devices.
14. Perform a functions check on the electrical distribution system.
15. Ensure that all PPE, hot-line equipment, testing equipment, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to perform maintenance on electrical distribution equipment.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE had been correctly tested and was fully mission capable.	—	—
4. Inspected all of the tools and testing equipment for serviceability.	—	—
5. Performed lockout and tagout procedures.	—	—
6. Ascended the pole to the desired height, if necessary.	—	—
7. Tested all of the phases to ensure that there was no voltage present.	—	—
8. Installed personal protective grounds.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
9. Performed maintenance on electrical distribution equipment by inspecting and testing it as specified in the applicable manufacturer's literature.	—	—
10. Recorded the inspection and testing results.	—	—
11. Repaired or replaced equipment based on the inspection and test results.	—	—
12. Removed the personal protective grounds.	—	—
13. Closed out the lockout and tagout procedures by removing all locking and/or tagging devices.	—	—
14. Performed a functions check on the electrical distribution system.	—	—
15. Ensured that all PPE, hot-line equipment, testing equipment, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
ER 385-1-31  
FM 5-412  
FM 5-422  
NESC™  
NETA™  
TM 5-682  
TM 5-684  
TM 5-686  
TM 5-811-1  
TM 5-811-3

Subject Area 5: Supervision and Management of Electrical Projects

**Manage a Power Line Crew**

**052-204-2217**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when work must be performed on electrical distribution equipment), you are given a power line distribution crew, a line truck with a cable trailer, safety standing operating procedures (SOPs), applicable manufacturer's literature, the Lineman's and Cableman's Handbook (LCH), and personal protective equipment (PPE).

**DANGER: ALWAYS WEAR PPE AS REQUIRED FOR INSPECTIONS IN HAZARDOUS AREAS. FAILURE TO COMPLY MAY RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRONICS AND CONTROL INSTRUMENTATION, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: IT IS VITAL THAT EACH INDIVIDUAL UNDERSTANDS HIS ASSIGNMENT AND THAT HE CARRIES IT OUT WITHOUT HESITATION WHEN THE SUPERVISOR GIVES A COMMAND. FAILURE TO COMPLY MAY RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER LIFT ANY OBJECTS WITHOUT A GROUND GUIDE TO ASSIST IN FINDING THE LOCATION OF THE ITEMS BEING LIFTED AND ANOTHER INDIVIDUAL TO HELP ENSURE THAT THE OBJECT DOES NOT BEGIN TO SWAY OUT OF CONTROL. FAILURE TO COMPLY MAY CAUSE DAMAGE TO EQUIPMENT RESULTING IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**WARNING: BEFORE MOVING ANY LINE TRUCK, THE OPERATOR MUST PERFORM ALL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) AND BE LICENSED ON THE EQUIPMENT OR HAVE A LICENSED DRIVER IN THE VEHICLE CAB TO ENSURE THAT PROPER OPERATING PROCEDURES ARE FOLLOWED. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY AND/OR SEVERE DAMAGE TO EQUIPMENT.**

**WARNING: WHEN EXTENDING THE SECOND STAGE OF THE BOOM OR WHEN WINCHING UP, ENSURE THAT THE WINCH HOOK DOES NOT GET PULLED INTO THE WINCH LINE GUIDE. FAILURE TO COMPLY MAY CAUSE IMMEDIATE PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT.**

**Standards:** Manage a power line crew by ensuring that the power line crew adheres to all work and safety requirements as stated in the safety SOPs, applicable manufacturer's literature, and the Lineman's and Cableman's Handbook (LCH).

**Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before any task is performed.
2. Ensure that all PPE has been correctly tested and is fully mission capable.
3. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
4. Inspect all tools and climbing and rigging equipment for serviceability.

**Performance Steps**

5. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform any mission.
6. Issue a safety briefing that highlights all safety precautions and the concept of any operation.
7. Assign personnel positions, and ensure that they understand their role in the accomplishment of any task.
8. Supervise the operation of a line truck with auxiliary equipment.
9. Ensure that the tasks are performed to standard and that all safety procedures are followed.
10. Ensure that all PPE, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to manage a power line crew.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before any task was performed.	—	—
2. Ensured that all PPE had been correctly tested and was fully mission capable.	—	—
3. Determined the BOM for the tools and equipment necessary to perform the task.	—	—
4. Inspected all tools and climbing and rigging equipment for serviceability.	—	—
5. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform any mission.	—	—
6. Issued a safety briefing that highlighted all safety precautions and the concept of any operation.	—	—
7. Assigned personnel positions, and ensured that they understood their role in the accomplishment of any task.	—	—
8. Supervised the operation of a line truck with auxiliary equipment.	—	—
9. Ensured that the tasks were performed to standard and that all safety procedures were followed.	—	—
10. Ensured that all PPE, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
EM 385-1-1  
ER 385-1-31  
FM 5-412  
FM 5-422  
NESC™

**References  
Required**

**Related**  
NETA™  
TM 5-682  
TM 5-684  
TM 5-686  
TM 5-811-1  
TM 5-811-3

## **Supervise the Installation of Underground Cable**

**052-204-2218**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when an underground cable needs to be installed), you are given electrical construction prints, applicable electrical distribution equipment as specified in the electrical construction prints, a line truck with a cable trailer, applicable digging or trenching equipment, a voltage detector, a lockout and tagout kit, grounding equipment, safety standing operating procedures (SOPs), applicable manufacturer's literature, the Lineman's and Cableman's Handbook (LCH), and applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: A VOLTAGE DETECTION TESTER SHOULD BE USED TO ENSURE THAT THE CABLE IS NOT ENERGIZED. MATERIAL (SUCH AS A LEAD SHEATH THAT ACTS AS A SHIELD) MUST NOT BE BETWEEN THE TESTER AND THE CONDUCTORS OF THE CIRCUIT BEING TESTED. FAILURE TO TEST THE CABLES MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER POSITION YOURSELF UNDER A SUSPENDED LOAD. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: REMOVE ALL RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Supervise the installation of underground cable by ensuring that the cable is safely installed at the appropriate depth and according to the cable ratings in the safety standing operating procedures (SOPs), applicable manufacturer's literature, and the LCH.

### **Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been correctly tested and is fully mission capable.
4. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
5. Inspect all of the tools and rigging equipment for serviceability.
6. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights all of the safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in the accomplishment of the task.

**NOTE: Conductors should never be removed from a nonrotating reel or coil. Failure to rotate the reel or coil will cause the conductors to twist and kink, resulting in their damage.**

9. Determine whether the mobile- or stationary-reel method of reeling out the conductors will be used.
10. Inspect the conductors to ensure that they were not damaged during the reeling out process.
11. Ensure that the conductors are placed on the conductor support devices in the proper sequence.
12. Ensure that the underground cable is installed according to the electrical construction prints.

**Performance Steps**

13. Ensure that all PPE, rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise the installation of underground cable.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE had been correctly tested and was fully mission capable.	—	—
4. Determined the BOM for the tools and equipment necessary to perform the task.	—	—
5. Inspected all of the tools and rigging equipment for serviceability.	—	—
6. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.	—	—
7. Issued a safety briefing that highlighted all of the safety precautions and the concept of the operation.	—	—
8. Assigned personnel positions, and ensured that they understood their role in the accomplishment of the task.	—	—
9. Determined whether the mobile- or stationary-reel method of reeling out the conductors would be used.	—	—
10. Inspected the conductors to ensure that they were not damaged during the reeling out process.	—	—
11. Ensured that the conductors were placed on the conductor support devices in the proper sequence.	—	—
12. Ensured that the underground cable was installed according to the electrical construction prints.	—	—
13. Ensured that all PPE, rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
AR 385-10  
EM 385-1-1  
ER 385-1-31  
FM 3-100.12  
FM 5-422



**References  
Required**

**Related**  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

**Supervise the Loading and Unloading of Utility Poles**

**052-204-2219**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when utility poles need to be loaded and/or unloaded), you are given a line truck with auxiliary equipment, a pole trailer, a cant hook, lifting tongs, chains, hoists, cable slings, wheel chocks, ground guides, safety standing operating procedures (SOPs), and applicable personal protective equipment (PPE).

**DANGER: NEVER LIFT ANY OBJECTS WITHOUT A GROUND GUIDE TO ASSIST IN FINDING THE LOCATION OF THE ITEMS BEING LIFTED AND ANOTHER INDIVIDUAL TO HELP ENSURE THAT THE OBJECT DOES NOT BEGIN TO SWAY OUT OF CONTROL. FAILURE TO COMPLY MAY CAUSE DAMAGE TO EQUIPMENT RESULTING IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER POSITION YOURSELF UNDER A SUSPENDED LOAD. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Supervise the loading and unloading of utility poles by ensuring that the poles are loaded and/or unloaded safely.

**Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Ensure that all PPE has been correctly tested and is fully mission capable.
3. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
4. Inspect all tools and rigging equipment for serviceability.
5. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.
6. Issue a safety briefing that highlights all of the safety precautions and the concept of the operation.
7. Assign personnel positions, and ensure that they understand their role in the accomplishment of the task.
8. Ensure that the equipment brakes are set and that the wheels are chocked.
9. Ensure that the utility poles are loaded and/or unloaded safely.
10. Ensure that all PPE, rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise the loading and unloading of utility poles.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Ensured that all PPE had been correctly tested and was fully mission capable.	—	—
3. Determined the BOM for the tools and equipment necessary to perform the task.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
4. Inspected all tools and rigging equipment for serviceability.	—	—
5. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.	—	—
6. Issued a safety briefing that highlighted all of the safety precautions and the concept of the operation.	—	—
7. Assigned personnel positions, and ensured that they understood their role in the accomplishment of the task.	—	—
8. Ensured that the equipment brakes were set and that the wheels were chocked.	—	—
9. Ensured that the utility poles were loaded and/or unloaded safely.	—	—
10. Ensured that all PPE, rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

**Related**

- AR 385-10
- EM 385-1-1
- ER 385-1-31
- FM 3-100.12
- FM 5-422
- LCH
- TM 5-682
- TM 5-684
- TM 5-811-1

## **Supervise the Mechanical Erection of a Utility Pole**

**052-204-2220**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when a utility pole needs to be mechanically erected), you are given a line truck, tampers, a shovel, applicable guying equipment, applicable pole-grounding equipment, a buttman, a truck operator, ground guides, the Lineman's and Cableman's Handbook (LCH), safety standing operating procedures (SOPs), and applicable personal protective equipment (PPE).

**DANGER: THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRICAL DISTRIBUTION SYSTEMS AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**DANGER: NEVER POSITION YOURSELF UNDER A SUSPENDED LOAD. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Supervise the mechanical erection of a utility pole by ensuring that the utility pole is facing the proper direction, firmly imbedded into the ground at the proper depth, and rigged and raised in a safe manner.

### **Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been correctly tested and is fully mission capable.
4. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
5. Inspect all tools and rigging equipment for serviceability.
6. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights all of the safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in the accomplishment of the task.
9. Inspect the hole to ensure that it is placed at the appropriate depth.
10. Ensure that all rigging is done so that the pole does not slip.
11. Ensure that the pole is lowered into the center of the hole.
12. Inspect the pole while it is in the hole to ensure that it is the proper depth and that it is centered in the hole (facing the correct direction) and aligned correctly.
13. Ensure that the pole is tamped.
14. Ensure that a watershed was created at the base of the pole.
15. Recheck the depth, centering, facing, and alignment of the pole before mounting the hardware.
16. Ensure that the guys and the anchors are installed as stated in the electrical construction prints.
17. Ensure that all PPE, rigging equipment, and tools are correctly cleaned and stored.

### **Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise the mechanical erection of a utility pole.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE has been correctly tested and is fully mission capable.	—	—
4. Determined the BOM for the tools and equipment necessary to perform the task.	—	—
5. Inspected all tools and rigging equipment for serviceability.	—	—
6. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.	—	—
7. Issued a safety briefing that highlighted all of the safety precautions and the concept of the operation.	—	—
8. Assigned personnel positions, and ensured that they understood their role in the accomplishment of the task.	—	—
9. Inspected the hole to ensure that it was placed at the appropriate depth.	—	—
10. Ensured that all rigging was done so that the pole did not slip.	—	—
11. Ensured that the pole was lowered into the center of the hole.	—	—
12. Inspected the pole while it was in the hole to ensure that it was the proper depth and that it was centered in the hole (facing the correct direction) and aligned correctly.	—	—
13. Ensured that the pole was tamped.	—	—
14. Ensured that a watershed was created at the base of the pole.	—	—
15. Rechecked the depth, centering, facing, and alignment of the pole before mounting the hardware.	—	—
16. Ensured that the guys and the anchors were installed as stated in the electrical construction prints.	—	—
17. Ensured that all PPE, rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**  
LCH

**Related**  
AR 385-10  
EM 385-1-1  
ER 385-1-31

**References  
Required**

**Related**  
FM 3-100.12  
FM 5-422  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

## Skill Level 3

## Subject Area 5: Supervision and Management of Electrical Projects

**Supervise the Manual Erection of a Utility Pole****052-204-3014**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when a utility pole needs to be manually erected), you are given a jenny; a cant hook; a bump board; digging tools; tampers; the proper number of pike poles for the size pole being erected; applicable guying equipment; applicable pole-grounding equipment; a team to operate the jenny, the cant hook, and each pike pole; the Lineman's and Cableman's Handbook (LCH); safety standing operating procedures (SOPs); and applicable personal protective equipment (PPE).

**DANGER: IT IS VITAL THAT EACH INDIVIDUAL UNDERSTANDS HIS ASSIGNMENT AND THAT HE CARRIES IT OUT WITHOUT HESITATION WHEN THE SUPERVISOR GIVES A COMMAND. FAILURE TO COMPLY MAY CAUSE THE POLE TO FALL TO THE GROUND AND MAY RESULT IN IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Supervise the manual erection of a utility pole by ensuring that the utility pole is facing the proper direction, firmly embedded into the ground at the proper depth, and rigged and raised in a safe manner.

**Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been correctly tested and is fully mission capable.
4. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
5. Inspect all of the tools and rigging equipment for serviceability.
6. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights all of the safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in the accomplishment of the task.
9. Inspect the hole to ensure that it is placed at the appropriate depth.
10. Ensure that the bump board is placed in the hole.
11. Assign personnel to positions around the pole.
12. Supervise personnel as the pole is lifted up and placed in the jenny.
13. Inspect the pole while it is in the hole to ensure that it is the proper depth and that it is centered in the hole (facing the correct direction) and aligned correctly.
14. Ensure that the pole is tamped.
15. Ensure that a watershed is created at the base of the pole.
16. Recheck the depth, centering, facing, and alignment of the pole before mounting the hardware.
17. Ensure that the guys and the anchors are installed as stated in the electrical construction prints.

**Performance Steps**

18. Ensure that all PPE, rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise the manual erection of a utility pole.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO-GO</b></u>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE had been correctly tested and was fully mission capable.	—	—
4. Determined the BOM for the tools and equipment necessary to perform the task.	—	—
5. Inspected all of the tools and rigging equipment for serviceability.	—	—
6. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.	—	—
7. Issued a safety briefing that highlighted all of the safety precautions and the concept of the operation.	—	—
8. Assigned personnel positions, and ensured that they understood their role in the accomplishment of the task.	—	—
9. Inspected the hole to ensure that it was placed at the appropriate depth.	—	—
10. Ensured that the bump board was placed in the hole.	—	—
11. Assigned personnel to positions around the pole.	—	—
12. Supervised personnel as the pole was lifted up and placed in the jenny.	—	—
13. Inspected the pole while it was in the hole to ensure that it was the proper depth and that it was centered in the hole (facing the correct direction) and aligned properly.	—	—
14. Ensured that the pole was tamped.	—	—
15. Ensured that a watershed was created at the base of the pole.	—	—
16. Rechecked the depth, centering, facing, and alignment of the pole before mounting the hardware.	—	—
17. Ensured that the guys and the anchors were installed as stated in the electrical construction prints.	—	—
18. Ensured that all PPE, rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.



**References**  
**Required**  
LCH

**Related**  
AR 385-10  
EM 385-1-1  
ER 385-1-31  
FM 3-100.12  
FM 5-422  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

**Supervise the Sagging of Overhead Conductors**  
**052-204-3015**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when overhead conductors need to be sagged), you are given two line crews with applicable climbing and rigging equipment, a sagging chart, a dynamometer and conductor tie material, the Lineman's and Cableman's Handbook (LCH), safety standing operating procedures (SOPs), and applicable personal protective equipment (PPE).

**Standards:** Supervise the sagging of overhead conductors by ensuring that the conductors are sagged according to the sagging chart and based on the surrounding factors. Once the conductors are sagged, ensure that they are secured to the support devices.

**Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been correctly tested and is fully mission capable.
4. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
5. Inspect all of the tools and climbing and rigging equipment for serviceability.
6. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights all of the safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in the accomplishment of the task.
9. Inspect the conductors to ensure that they are sagged according to the sagging chart and based on surrounding factors, such as the—
  - a. Span length.
  - b. Conductor material.
  - c. Conductor size.
  - d. Geographical location.
  - e. Climate.
10. Ensure that the conductors are sagged (either visually or by using a dynamometer).
11. Ensure that the conductors are secured in place after being sagged.
12. Ensure that all PPE, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise the sagging of overhead conductors.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE had been correctly tested and was fully mission capable.	—	—
4. Determined the BOM for the tools and equipment necessary to perform the task.	—	—
5. Inspected all of the tools and climbing and rigging equipment for serviceability.	—	—
6. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.	—	—
7. Issued a safety briefing that highlighted all of the safety precautions and the concept of the operation.	—	—
8. Assigned personnel positions, and ensured that they understand their role in the accomplishment of the task.	—	—
9. Inspected the conductors to ensure that they were sagged according to the sagging chart and based on surrounding factors.	—	—
10. Ensured that the conductors were sagged (either visually or by using a dynamometer).	—	—
11. Ensured that the conductors were secured in place after being sagged.	—	—
12. Ensured that all PPE, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

#### **References**

**Required**  
LCH

**Related**  
AR 385-10  
EM 385-1-1  
ER 385-1-31  
FM 3-100.12  
FM 5-422  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

**Supervise the Stringing of Overhead Conductors  
052-204-3016**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment (when overhead conductors need to be strung), you are given a line crew with applicable climbing and rigging equipment, reels of conductors, a reel trailer or stand, the Lineman's and Cableman's Handbook (LCH), safety standing operating procedures (SOPs), and applicable personal protective equipment (PPE).

**Standards:** Supervise the stringing of overhead conductors by ensuring that the conductors are not damaged while they are being reeled out and placed in the correct sequence on the support devices.

**Performance Steps**

1. Review all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.
2. Review all of the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that all PPE has been correctly tested and is fully mission capable.
4. Determine the bill of materials (BOM) for the tools and equipment necessary to perform the task.
5. Inspect all of the tools and climbing and rigging equipment for serviceability.
6. Develop a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights all of the safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in the accomplishment of the task.

**NOTE: Conductors should never be removed from a nonrotating reel or coil. Failure to rotate the reel or coil will cause the conductors to twist and kink, resulting in their damage.**

9. Determine whether the mobile- or stationary-reel method of reeling out the conductors will be used.
10. Inspect the conductors to ensure that they were not damaged during the reeling-out process.
11. Ensure that the conductors are placed on the conductor support devices in the proper sequence.
12. Ensure that all PPE, climbing and rigging equipment, and tools are correctly cleaned and stored.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise the stringing of overhead conductors.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Reviewed all of the safety SOPs, DANGERS, WARNINGS, and CAUTIONS before proceeding.	—	—
2. Reviewed all of the manufacturer's literature, electrical construction prints, and wiring diagrams.	—	—
3. Ensured that all PPE has been correctly tested and is fully mission capable.	—	—
4. Determined the BOM for the tools and equipment necessary to perform the task.	—	—

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
5. Inspected all of the tools and climbing and rigging equipment for serviceability.	—	—
6. Developed a plan for obtaining any nonorganic tools and equipment necessary to perform the mission.	—	—
7. Issued a safety briefing that highlighted all of the safety precautions and the concept of the operation.	—	—
8. Assigned personnel positions, and ensured that they understood their role in the accomplishment of the task.	—	—
9. Determined whether the mobile- or stationary-reel method of reeling out the conductors will be used.	—	—
10. Inspected the conductors to ensure that they were not damaged during the reeling-out process.	—	—
11. Ensured that the conductors were placed on the conductor support devices in the proper sequence	—	—
12. Ensured that all PPE, climbing and rigging equipment, and tools were correctly cleaned and stored.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

#### **References**

##### **Required**

LCH

##### **Related**

AR 385-10  
 EM 385-1-1  
 ER 385-1-31  
 FM 3-100.12  
 FM 5-422  
 TM 5-682  
 TM 5-684  
 TM 5-811-1  
 TM 5-811-3

Skill Level 4

Subject Area 5: Supervision and Management of Electrical Projects

**Supervise Risk-Management Procedures**

**052-204-4003**

**Conditions:** As a power line distribution supervisor in a tactical or nontactical environment supervising risk-management procedures for a job site, you are given Field Manual (FM) 3-0 and FM 3-100.12.

**DANGER: ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT AS REQUIRED FOR INSPECTIONS IN HAZARDOUS AREAS. FAILURE TO COMPLY MAY CAUSE IMMEDIATE DEATH OR PERMANENT INJURY.**

**Standards:** Supervise risk management procedures by verifying that a risk assessment has been conducted and that controls have been developed and properly implemented. Ensure that the overall risk level for this task is acceptable.

**Performance Steps**

1. Verify that a risk assessment has been conducted as specified in FM 3-100.12 by ensuring that—
  - a. All hazards associated with the mission or task are identified.
  - b. The level of risk for each hazard is estimated correctly.
2. Ensure that the appropriate controls are developed and correctly implemented and that the residual risk for each hazard and the overall residual risk for the mission or task is acceptable.
3. Verify how the controls are monitored by observing the technique used and how well the controls and the risk management process works.
4. Ensure that the hazards and associated risks are identified during all phases (planning, preparation, and execution) of the operation and controlled during the preparation and execution phases.

**Evaluation Preparation:**

Setup: Provide the Soldier with all the items listed in the conditions. Give the Soldier a safety briefing before starting the test, and ensure that all safety precautions are followed. Prepare the testing area and equipment in advance to ensure that the task standards can be met.

Brief Soldier: Give the Soldier a requirement to supervise risk management procedures.

**Performance Measures**

	<u>GO</u>	<u>NO-GO</u>
1. Verified that a risk assessment had been conducted as specified in FM 3-100.12.	—	—
2. Ensured that the appropriate controls were developed and correctly implemented and that the residual risk for each hazard and the overall residual risk for the mission or task was acceptable.	—	—
3. Verified how the controls were monitored by observing the technique used and how well the controls and the risk management process worked.	—	—
4. Ensured that the hazards and associated risks were identified during all phases (planning, preparation, and execution) of the operation and controlled during the preparation and execution phases.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**

**Required**

FM 3-0  
FM 3-100.12

**Related**

AR 385-10  
AR 385-55  
EM 385-1-1  
ER 385-1-31  
FM 5-422  
LCH  
TM 5-682  
TM 5-684  
TM 5-811-1  
TM 5-811-3

## Perform Electrical Project Management

052-244-4205

**Conditions:** As a prime power supervisor assigned a project, you are given a project directive, the unit standing operating procedure (SOP), Field Manual (FM) 5-412, paper, a pen, a pencil, and a calculator.

**Standards:** Perform electrical project management according to FM 5-412. Include an activities list with a preceded immediately by (PIB) column and a logic diagram. Calculate the activity durations and resources and the activity start and finish times to ensure that the mission is performed safely and effectively from start to finish.

### Performance Steps

1. Prepare an activities list according to FM 5-412.

**NOTE: Do not consider the time, labor, equipment, order of operations, or materials required.**

- a. Check the list for completeness and accuracy.
- b. Include a PIB column and a logic diagram.
- c. Calculate the activity durations and the early and late start and finish times.
- d. Determine the number of activities by breaking the job into separate activities with enough detail to complete the job.

**NOTE: The number and detail of the activities will vary from job to job.**

- e. Include a brief description of the work to be performed in each activity.
- f. Calculate the total float (TF), the free float (FF), and the interfering float (IF) time for each activity.

2. Complete the PIB column of the activities list according to FM 5-412.

- a. Determine activity relationships by deciding which activity depends on the completion of another activity before it can begin. Consider the following:
  - (1) Whether the activity can start at the beginning of the project.
  - (2) Which activities must be completed before another one can start?
  - (3) Which activities can start or finish at the same time?
  - (4) Which activities cannot begin until another activity is completed?
- b. Record in the PIB column (to the right of each activity) the number of any other activities that depend upon its completion. Write "none" in the PIB column if an activity does not depend on any other activity.

3. Calculate activity durations and required resources on an activity estimate sheet according to FM 5-412.

- a. Determine the quantity of work (the total amount of material to be installed or produced). For example, if installing three runs of cable at 1,000 feet per run, 3,000 feet would be the quantity of work.
- b. Determine the work rate according to FM 5-412, which lists the work rates for most activities performed by an engineer squad. Record each type of work in units. For example, if installing a direct burial cable, 1,000 linear feet would be the unit. If digging trenches by hand, cubic yards would be the unit.
- c. Calculate the standard effort by dividing the quantity of work by the unit for that type of work. Do not round out the total. Record the total two places past the decimal, and drop the remainder. Multiply the total quantity by the man-hours required per unit. This total represents the standard effort. Do not round out the answer. Record the answer to two decimal places.
- d. Determine the efficiency factor. This is the efficiency of your Soldiers to perform a task. The charts in FM 5-412 are calculated at 100 percent efficiency. If you believe that your Soldiers are not 100 percent efficient, record what you believe is their efficiency factor.



**Performance Steps**

- e. Calculate troop effort. Divide the standard effort by the efficiency factor. This total is the troop effort. Do not round out the answer. Record the answer to two decimal places.
- f. Record the crew size. Do not consider the supervisor as part of the work crew.
- g. Calculate the activity duration by dividing the troop effort by the crew size and then rounding the answer to the next highest number if there is a decimal. This is the duration for the activity.

4. Develop a logic diagram with the correct activity node numbering according to FM 5-412.
  - a. Prepare a logic diagram that consists of the start and finish nodes, the activity nodes, and the precedence arrows.
  - b. Place the start and finish nodes, represented by either a circle or an oval, at the beginning and the end of the logic diagram because they do not have duration times.
  - c. Annotate each activity on the activities list in the logic diagram as an activity node. The activity nodes contain the early start and finish times, the late start and finish times, and the activity number and duration and are represented by a parallelogram.
  - d. Complete the activity at the tail of the precedence arrow before completing the activity at the head. Precedence arrows show the order and relationship between activities and represent zero time.
  - e. Use increments of 5 or 10 when numbering activity nodes.
  - f. Number the activity nodes according to FM 5-412. For example, every activity node must be different and the activity node at the head of the precedence arrow must be greater than the one at the tail of the arrow.

5. Calculate the correct early start and early finish and late start and late finish times according to FM 5-412.

- a. Locate the early start time in the upper left portion of the activity node.

**NOTE: All activity nodes that come off the start node will have an early start time of zero.**

- b. Locate the early finish time in the upper-right portion of the activity node and calculate by adding the early start time to the activity duration.

**NOTE: The early finish time of the activity at the tail of the precedence arrow becomes the early start time of the activity at the head of the arrow. If there is more than one activity leading into a single activity, the highest early finish times of all incoming activities become the early start time of the new activity. Continue to calculate the early start and finish times throughout the logic diagram following this process.**

- c. Record the highest early finish time in the finish node of the logic diagram.
- d. Locate the late finish time in the lower-left portion of the activity node.

**NOTE: All activity nodes that come directly out of the finish node will have the highest early finish time that was recorded in the finish node as the late finish time.**

- e. Calculate the late start time for the activity by working backwards through the logic diagram and subtracting the duration of the activity from the late finish time.

**NOTE: The late start time of the activity at the head of the arrow becomes the late finish time for the activity at the tail of the arrow.**

- f. Use the lowest late start time as the late finish of the incoming node when two or more activity nodes lead into one.
- g. Continue the process of working backward through the logic diagram.

6. Identify critical paths on a logic diagram according to FM 5-412.

- a. Identify the critical activities by using the following three rules:
  - (1) The early start time for a particular activity is the same as the late start time.
  - (2) The early finish time for a particular activity is the same as the late finish time.
  - (3) The early start time or late start time added to the duration of the activity results in the early finish time or the late finish time.

**NOTE: None of the activities on the critical path will have a float time.**

**Performance Steps**

- b. Mark the critical path beginning at the start node and working through the logic diagram by following each precedence arrow line. If all of the activity nodes on the line are critical, then it is the critical path. Mark the critical path by either highlighting the precedence arrow lines or drawing a double precedence arrow line from the start node to the finish node. It is possible to have two or more critical paths through the same logic diagram.
7. Calculate the TF time according to FM 5-412 by subtracting the early start time from the late start time or subtracting the early finish time from the late finish time. Either method will equal the TF time for that activity.
  8. Record the TF at the top-outside edge of the activity.
  9. Calculate the IF time according to FM 5-412 by subtracting the early start time of the activity at the head of the precedence arrow from the late finish time of the activity at the tail of the arrow.
  10. Record the IF at the top-outside edge of the activity node.
  11. Calculate the FF time according to FM 5-412 by subtracting the IF time from the TF time for each activity.
  12. Record the FF time at the top-outside edge of the activity node.
  13. Complete an early start schedule according to FM 5-412.
    - a. Record the activity node numbers in numerical order in the column marked "network number."
    - b. Record the PIB activities in parentheses to the right of the activity numbers.
    - c. Place an activity start bracket for each activity by taking the early start time from the activity and adding the number one to it. For example, if an activity node has an early start time of 5, then  $5 + 1 = 6$ . Locate the box for day six on the early start schedule, and place a bracket against the left edge of the day six box for that activity.
    - d. Place an activity end bracket by taking the late finish time from the activity node in the logic diagram and adding the TF time for that activity. For example, if an activity has a late finish time of 14 and a TF time of 3, then  $14 + 3 = 17$ . Locate the box for day 17 on the early start schedule, and place the end bracket against the right edge of the box for that activity.
  14. Record the required resources on an early start schedule according to FM 5-412.
    - a. Find the required resources for each activity in the bottom-center portion of the activity node.
    - b. Record the required resources by beginning at the start bracket and placing the number of resources inside each box along the activities line. Do not exceed the activities duration. Stop at the early finish time. The remaining boxes between the start and end brackets will become either FF time or IF time later.
  15. Record the IF time on an early start schedule according to FM 5-412.
    - a. Calculate the IF time. Refer to step 9.
    - b. Record the IF time. Refer to the activity numbers listed in the network number column of the early start schedule. If an activity has other activities that depend on it being completed before they can begin, that activity may have IF time. Find the start bracket of the dependant follow-on activity. If it begins within the start and end brackets of the previous activity, IF time is present. Place an "X" in each remaining box until you reach the end bracket of that activity. This represents the IF time within that activity. Once IF time has started in an activity, all remaining time periods along the activity lined up to the end bracket become IF time.

**NOTE: Any blank box along an activity line within the start and end brackets represent FF time.**

16. Record the total resources on an early start schedule according to FM 5-412.
  - a. Record the total resources required for each time period or day at the bottom of the early start schedule.
  - b. Add all the resources annotated for that time period from top to bottom.
  - c. Record that total at the bottom of the early start schedule. This represents the total resources required for that day of the project.

**Evaluation Preparation:**

Setup: Provide the Soldier with the items listed in the conditions.

Brief Soldier: Give the Soldier a requirement to perform electrical project management.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Prepared an activities list according to FM 5-412.	—	—
2. Completed the PIB column of the activities list according to FM 5-412.	—	—
3. Calculated activity durations and required resources on an activity estimate sheet according to FM 5-412.	—	—
4. Developed a logic diagram with the correct activity node numbering according to FM 5-412.	—	—
5. Calculated the correct early start and early finish and late start and late finish times according to FM 5-412.	—	—
6. Identified critical paths on a logic diagram according to FM 5-412.	—	—
7. Calculated the TF time according to FM 5-412 by subtracting the early start time from the late start time or subtracting the early finish time from the late finish time.	—	—
8. Recorded the TF at the top-outside edge of the activity.	—	—
9. Calculated the IF time according to FM 5-412 by subtracting the early start time of the activity at the head of the precedence arrow from the late finish time of the activity at the tail of the arrow.	—	—
10. Recorded the IF at the top-outside edge of the activity node.	—	—
11. Calculated the FF time according to FM 5-412 by subtracting the IF time from the TF time for each activity.	—	—
12. Recorded the FF time at the top-outside edge of the activity node.	—	—
13. Completed an early start schedule according to FM 5-412.	—	—
14. Recorded the required resources on an early start schedule according to FM 5-412.	—	—
15. Recorded the IF time on an early start schedule according to FM 5-412.	—	—
16. Recorded the total resources on an early start schedule according to FM 5-412.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**References**  
**Required**  
FM 5-412

**Related**

**Perform Quality Assurance (QA) and/or Quality Control (QC) Responsibilities**

**052-244-4206**

**Conditions:** As a prime power supervisor in a tactical or nontactical environment required to perform QA and/or QC duties, you are given specific written standards.

**Standards:** Perform QA and/or QC duties to ensure that the mission requirements meet the standard of the original agreement.

**Performance Steps**

1. Obtain written standards for the task being performed.
2. Perform project manager duties and responsibilities.
  - a. Perform QA audits throughout the project to ensure that QC functions are strictly enforced.
  - b. Prepare QC procedures and detailed QC inspection plans to ensure that the work is completed according to the original agreement.
3. Perform field representative duties and responsibilities.

**NOTE: The selection of a field representative should be based on experience. The field representative's specialty should also be considered and matched to the specific type of QA and/or QC mission.**

- a. Carry out on-site inspections.
    - (1) Monitor the inspected construction, equipment, or materials day-to-day.
    - (2) Document the inspections in comprehensive reports.
  - b. Perform and document materials and equipment testing as required on-site or off-site to ensure that all construction equipment and materials being inspected meet the established standards.
  - c. Take corrective and preventive action, as allowed by the contract, to eliminate nonconformities and minimize the impact to the schedule and the cost.
  - d. Alert the project manager of any situations not covered in the field representative's instructions.
4. Perform a final inspection to ensure that all the work performed meets the standards set in the original agreement.

**Evaluation Preparation:**

Setup: Provide the Soldier with the items listed in the conditions.

Brief Soldier: Give the Soldier a requirement to perform QA and/or QC duties.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO-GO</u></b>
1. Obtained written standards for the task being performed.	—	—
2. Performed project manager duties and responsibilities.	—	—
3. Performed field representative duties and responsibilities.	—	—
4. Performed a final inspection to ensure that all the work performed met the standards set in the original agreement.	—	—

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**This page intentionally left blank.**

**APPENDIX A - METRIC CONVERSION CHART**

This appendix complies with current Army directives, which state that the metric system will be incorporated into all new publications. Table A-1 is a metric conversion chart.

**Table A-1. Metric Conversion Chart**

<b>U.S. Units</b>	<b>Multiplied By</b>	<b>Equals Metric Units</b>
<b>Length</b>		
Feet	0.30480	Meters
Inches	2.54000	Centimeters
Inches	0.02540	Meters
Inches	25.40010	Millimeters
Miles (statute)	1.60930	Kilometers
Miles (nautical)	1.85320	Kilometers
Yards	0.91400	Meters
<b>Area</b>		
Square inches	6.45160	Square centimeters
Square feet	0.09290	Square meters
Square yards	0.83610	Square meters
<b>Volume</b>		
Cubic inches	16.38720	Cubic centimeters
Cubic feet	0.02830	Cubic meters
Cubic yards	0.76460	Cubic meters
Gallons	3.78540	Liters
Fluid ounces	29.57300	Milliliters
Quarts	0.94600	Liters
<b>Weight</b>		
Ounces	28.34900	Grams
Pounds	453.59000	Grams
Pounds	0.45359	Kilograms
Short tons	0.90700	Metric tons
Long tons	1.01600	Metric tons
Foot-pounds	1.38300	Newton-meters
<b>Pressure</b>		
Pounds per square inch	6.90000	Kilopascals

**Table A-1. Metric Conversion Chart continued**

<b>Metric Units</b>	<b>Multiplied By</b>	<b>Equals U.S. Units</b>
<b>Length</b>		
Centimeters	0.39370	Inches
Meters per second	2.23700	Miles per hour
Millimeters	0.03937	Inches
Kilometers	0.62137	Miles (statute)
Kilometers	0.53960	Miles (nautical)
Meters	3.28080	Feet
Meters	39.37000	Inches
Meters	1.09360	Yards
<b>Area</b>		
Square centimeters	0.15500	Square inches
Square meters	10.76400	Square feet
Square meters	1.19600	Square yards
<b>Volume</b>		
Cubic centimeters	0.06100	Cubic inches
Cubic meters	35.31440	Cubic feet
Cubic meters	1.30790	Cubic yards
Milliliters	0.03380	Fluid ounces
Liters	1.05700	Quarts
Liters	0.26420	Gallons
<b>Weight</b>		
Grams	0.03527	Ounces
Kilograms	2.20460	Pounds
Metric tons	1.10200	Short tons
Metric tons	0.98400	Long tons
Newton-meters	0.73800	Foot-pounds
<b>Pressure</b>		
Kilopascals	0.14493	Pounds per square inch



## GLOSSARY

### Section I

#### Acronyms & Abbreviations

<b>1SG</b>	first sergeant
<b>ACCP</b>	Army Correspondence Course Program
<b>AEH</b>	American Electricians' Handbook
<b>AFJMAN</b>	Air Force joint manual
<b>AFM</b>	Air Force manual
<b>AFMAN</b>	Air Force manual
<b>AFTTP</b>	Air Force technical training publication
<b>AIT</b>	advanced individual training
<b>AN</b>	annually; Army Navy
<b>ANCOC</b>	Advanced Noncommissioned Officer Course
<b>AR</b>	angle of repose; armor; Army regulation
<b>ARNG</b>	Army National Guard
<b>ARNGUS</b>	Army National Guard of the United States
<b>ASI</b>	additional skill identifier
<b>attn</b>	attention
<b>BA</b>	biannually
<b>BNCOC</b>	Basic Noncommissioned Officer Course
<b>BOM</b>	bill of materials
<b>BW</b>	biweekly; biological warfare
<b>CATS</b>	combined arms training strategy; combined arms training strategies
<b>chap</b>	chapter
<b>CMF</b>	career management field
<b>CPL</b>	corporal
<b>CSM</b>	command sergeant major
<b>CTT</b>	common task test; common task training

<b>DA</b>	Department of the Army; data adapter; data administrator; direct action; directorate for administration; double agent; aerospace drift
<b>DC</b>	Dental Corps; direct current; dislocated civilian; District of Columbia
<b>E1</b>	private 1
<b>E2</b>	private 2
<b>E3</b>	private first class
<b>E4</b>	specialist
<b>E5</b>	sergeant; table value E5
<b>E6</b>	staff sergeant
<b>E7</b>	sergeant first class
<b>E8</b>	master sergeant; first sergeant
<b>E9</b>	sergeant major; command sergeant major
<b>EM</b>	earthmoving; electromagnetic; electronic media; engineer manual; enlisted member
<b>eng</b>	engineer
<b>EPMS</b>	Enlisted Personnel Management System
<b>ER</b>	evaluation report; engineer regulation
<b>F</b>	Fahrenheit; fail; failed; frequency; full
<b>FF; Ff</b>	free float; Navy fast frigate; fatigue correction factor
<b>FM</b>	field manual; flare multiunit; force module; frequency-modulated; frequency modulation
<b>freq</b>	frequency
<b>GED</b>	general education development; gasoline engine driven
<b>IF</b>	interfering float; intermediate frequency
<b>LCH</b>	Lineman's and Cableman's Handbook; light combat helicopter
<b>MANSCEN</b>	Maneuver Support Center
<b>MCRP</b>	Marine Corps reference publication
<b>METL</b>	mission-essential task list
<b>MO</b>	Missouri; monthly; month; medical officer; maintenance and operations

<b>MOS</b>	military occupational specialty; minimum operating strip; minimal operational strip
<b>MSG</b>	message; master sergeant
<b>NCO</b>	noncommissioned officer
<b>NCOES</b>	Noncommissioned Officer Education System
<b>NEC</b>	National Electrical Code
<b>NESC</b>	National Electrical Safety Code
<b>NETA</b>	InterNational Electrical Testing Association
<b>No.; no; NO</b>	number; normally open
<b>NTRP</b>	Navy tactical reference publication
<b>NTTP</b>	Navy tactics, techniques, and procedures
<b>OSHA</b>	Operational Safety and Health Act; Occupational Safety and Health Administration
<b>P</b>	needs practice; pass; passed; barometric pressure; mean radius of curvature
<b>PCB</b>	polychlorinated biphenyl
<b>PFC</b>	private first class
<b>PIB</b>	proceeded immediately by
<b>PLDC</b>	Primary Leadership Development Course
<b>PMCS</b>	preventive-maintenance checks and services
<b>PPE</b>	protective posture equipment; personal protective equipment
<b>PTO</b>	power take-off
<b>PVT</b>	private; point of vertical tangency; positioning, velocity, timing; pressure, volume, temperature
<b>QA</b>	quality assurance
<b>QC</b>	quality control
<b>QT</b>	quart; quarterly; qualification test
<b>RC</b>	rapid cure; Reserve Component; regional command
<b>reg</b>	regiment; regulation; register
<b>SA</b>	Secretary of the Army; semiannually; situational awareness; security assistance; staging area

<b>SD</b>	solvent, dry cleaning; self-destruct; special duty; slope distance
<b>SFC</b>	special forces command; sergeant first class
<b>SGM</b>	sergeant major
<b>SGT</b>	sergeant
<b>SL</b>	skill level; side lap; switch locator; slow curing (asphalt)
<b>SM</b>	Soldier's manual; service member
<b>SMCT</b>	Soldier's manual of common tasks
<b>SOP</b>	standing operating procedure
<b>SPC</b>	specialist; standard printing color
<b>SSG</b>	staff sergeant
<b>STP</b>	Soldier training publication
<b>sust</b>	sustainment
<b>TF</b>	task force; total float
<b>TG</b>	trainer's guide
<b>tm; TM</b>	team; technical manual; theater missile; trademark
<b>tng</b>	training
<b>TRADOC</b>	United States Army Training and Doctrine Command
<b>U.S.</b>	United States
<b>USAR</b>	United States Army Reserve
<b>USASMA</b>	United States Army Sergeants Major Academy
<b>VA</b>	vertical angle; Virginia; volt-ampere; vulnerability assessment
<b>WK</b>	week; weekly

## REFERENCES

### Required Publications

Required publications are sources that users must read in order to understand or to comply with this publication.

#### Army Regulations

AR 614-200                      Enlisted Assignments and Utilization Management. 14 February 2007

#### Department of Army Forms

DA FORM 2028	Recommended Changes to Publications and Blank Forms
DA FORM 2404	Equipment Inspection and Maintenance Worksheet
DA FORM 2702	Bill of Materials
DA FORM 5164-R	Hands-On Evaluation
DA FORM 5988-E	Equipment Inspection Maintenance Worksheet

#### Department of Army Pamphlets

DA PAM 350-59                      Army Correspondence Course Program Catalog. 1 October 2002

#### Field Manuals

FM 25-4	How to Conduct Training Exercises. 10 September 1984
FM 25-5	Training for Mobilization and War. 25 January 1985
FM 3-0	Operations. 14 June 2001
FM 3-100.12	Risk Management for Multiservices Tactics, Techniques, and Procedures. MCRP 5-12.1C/NTTP 5-03.5/AFTTP(I) 3-2.34. 15 February 2001
FM 5-412	Project Management. 13 June 1994
FM 7-0	Training the Force. 22 October 2002
FM 7-1	Battle Focused Training. 15 September 2003

#### Other Product Types

ENG FORM 1925	Danger-Main Hold Card
ENG FORM 1927-R	Safe Clearance Request
ENG FORM 2198	Operation Log
ER 385-1-31	Safety & Occupational Health. The Control of Hazardous Energy (Safe Clearance). 1 August 1994
LCH	The Lineman's and Cableman's Handbook, 10th Edition, McGraw-Hill. 2002
OSHA REG 1910.147	The Control of Hazardous Energy (Lockout/Tagout). 1 September 1989

#### Soldier Training Publications

STP 21-1-SMCT	Soldier's Manual of Common Tasks Skill Level 1. 2 October 2006
STP 21-24-SMCT	Soldier's Manual of Common Tasks (SMCT) Skill Levels 2-4. 2 October 2006

#### Technical Manuals

TM 5-682	Facilities Engineering: Electrical Facilities Safety. 8 November 1999
TM 5-811-1	Electric Power Supply and Distribution. AFJMAN 32-1080. 28 February 1995

### Related Publications

Related publications are sources of additional information. They are not required in order to understand this publication.

#### Army Regulations

AR 385-10 The Army Safety Program. 29 February 2000  
AR 385-55 Prevention of Motor Vehicle Accidents. 12 March 1987

#### Field Manuals

FM 4-25.11 First Aid. NTRP 4-02.1.1/AFMAN 44-163(I)/MCRP 3-02G.  
23 December 2002  
FM 5-125 Rigging Techniques, Procedures, and Applications. 3 October 1995  
FM 5-422 Engineer Prime Power Operations. 7 May 1993  
FM 5-424 Theater of Operations Electrical Systems. 25 June 1997

#### Other Product Types

AEH American Electricians' Handbook, 14th Edition, McGraw Hill. 2002  
EM 385-1-1 Safety and Health Requirements. 3 November 2003  
NEC™ HANDBOOK National Electrical Code Handbook. 2005  
NESC™ National Electrical Safety Code. 2002  
NETA™ Maintenance Testing Specifications for Electrical Power Distribution  
Equipment & Systems. 2005

#### Technical Manuals

TM 5-684 Facilities Engineering - Electrical Exterior Facilities. NAVFAC MO-  
200/AFJMAN 32-1082. 29 November 1996  
TM 5-686 Power Transformer Maintenance and Acceptance Testing.  
16 November 1998  
TM 5-811-3 Electrical Design: Lightning and Static Electricity Protection. AFM 88-9,  
Chap 3. 29 March 1985

By Order of the Secretary of the Army:

**GEORGE W. CASEY, JR.**  
*General, United States Army*  
*Chief of Staff*

Official:



**JOYCE E. MORROW**  
*Administrative Assistant to the*  
*Secretary of the Army*  
0712402

**DISTRIBUTION:**

*Active Army, Army National Guard, and United States Army Reserve:* Not to be distributed. Electronic media only.

