STP 5-21P34-SM-TG

Soldier's Manual and Trainer's Guide, MOS 21P, Prime Power Production Specialist, Skill Levels 3/4

December 2008

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HEADQUARTERS,
DEPARTMENT OF THE ARMY

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Skill Levels 3 and 4

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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 U.S. 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.

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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. Alternate written tests are provided if equipment is not available for hands-on testing.

1-2. Integration of Individual and Collective Tasks. This manual should be used 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 and title in any correspondence relating to the task.

- **Conditions.** Task conditions identify the equipment, tools, references, job aids, and supporting personnel that the Soldier needs to perform the task in wartime. This section identifies environmental conditions that could alter task performance (visibility, temperature, wind). This section also identifies specific cues or events (chemical attack, identification of a threat vehicle) that trigger task performance.

- **Standards.** 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, evaluation preparation, and/or evaluation guide. The training information outline includes detailed training information. The evaluation preparation subsection indicates the necessary modifications to task performance 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 those given in the task summary description.

1-4. Safety. Some task summaries include safety statements and notes. Safety statements (danger, warning, and caution notices) alert users to the possibility of death, personal injury, or equipment damage. Notes provide an explanation or hint relative to the performance measures.

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 each 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 his 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. 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.

1-8. 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.
- **Appendix B, Wire Gauge Size Conversions.** This appendix provides conversions for wire gauge sizes.
- **Glossary.** The glossary is a comprehensive list of acronyms, abbreviations, terms, definitions, and letter symbols used in this STP.
- **References.** This section contains two lists of references, required and related, that support the training of all tasks in this STP. Required references are listed in the conditions 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 DA Form 5164-R 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 Soldier proficiency at the performance level. This form can be obtained electronically and may be reproduced locally. Follow these instructions when completing DA Form 5164-R:

- Enter the title and number of the task to be evaluated at the top of the form.
- Enter the number of each performance step from the evaluation guide in column A.
- 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, evaluator's name, and 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 (teams, squads, platoons) can be maintained in key critical MOSs at any level by entering the level (1st platoon, 2d platoon, 3d platoon) in column headings. Simply have the trainers report the percentage of their Soldiers who have (GO) and have not (NO-GO) demonstrated proficiency on each task, and record this information for each level.

1-9. Enlisted Personnel Management System. The Enlisted Personnel Management System (EPMS) (Army Regulation [AR] 614-200) is the Army 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 CMF 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 sergeant Senior power plant operator Prime power supervisor CMF 21 staff assignments					
Key leadership assignments	Technician	Team leader	Squad leader/ section leader	Platoon/ section SGT	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

1-10. Skill Progression Chart. Similar or related education, training, and experience are grouped into CMFs. The career progression path for MOS 21P, CMF 21, prime power production specialist is shown in Table 1-1.

Table 1-1. Career Progression Sequence for Prime Power Production Specialist (CMF 21)

E9	21Z50 CSM
SL 5 (E8 and E9)	21X50 Power Station Sergeant
SL 4 (E7)	21P40 Prime Power Supervisor
SL 3 (E6)	21P30 Senior Power Plant Operator
SL 2 (E5)	21P20 Power Plant Operator
SL 1 (E1 through E4)	NA

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 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 21P2 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. Figure 2-1 contains a list of training locations and their corresponding brevity codes.

ASI/SD	Additional skill identifier/special duty
AIT	Advanced individual training
ANCOC	Advanced Noncommissioned Officer Course
BNCOC	Basic Noncommissioned Officer Course
UNIT	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 Soldiers maintain task proficiency. Figure 2-2 identifies the frequency codes used in this column.

BA	Biannually
AN	Annually
SA	Semiannually
QT	Quarterly
MO	Monthly
BW	Biweekly
WK	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 and are broken down by subject area/skill level. (See Figure 2-3.)

1	Overall 21P30 Tasks
2	Additional Skill Identifier Tasks
3	Power Line Distribution Tasks
4	Overall 21P40 Tasks

Figure 2-3. Subject Area Codes

2-3. Critical Tasks List. (See Table 2-1 for critical tasks for this STP.)

Table 2-1. MOS 21P34 Critical Tasks

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
Skill Level 3				
Subject Area 1. Overall 21P30 Tasks				
052-244-3073	Check Power Plant Operational Records	BNCOC	AN	3
052-244-3100	Conduct a Safety Inspection	BNCOC	AN	3
052-244-3101	Check Power Plant to Load Compatibility	BNCOC	AN	3
052-244-3103	Perform a Power Plant Site Reconnaissance	BNCOC	AN	3
052-244-3104	Supervise an Engine Rebuild or Overhaul	BNCOC	AN	3
052-244-3109	Produce an Electrical One-Line Diagram	BNCOC	AN	3
052-244-3111	Supervise the Locating of Faults Using an Infrared (IR) Camera	BNCOC	AN	3
052-244-3113	Supervise the Maintenance of Distribution Equipment	BNCOC	AN	3
052-244-3114	Supervise an Automatic Transfer Switch (ATS) Service	BNCOC	AN	3
052-244-3115	Design an Underground Electrical Distribution System	BNCOC	AN	3
052-244-3116	Design an Overhead Electrical Distribution System	BNCOC	AN	3
Subject Area 2. Additional Skill Identifier Tasks				
052-205-3101	Supervise a Mechanical Annual Service	BNCOC	AN	3
052-206-3100	Supervise an Annual Electrical Service	BNCOC	AN	3
052-206-3101	Produce an Electrical Schematic	BNCOC	AN	3
052-207-3101	Supervise an Instrumentation Annual Service	BNCOC	AN	3
052-264-3100	Perform a Power Quality Analysis	BNCOC	AN	3
Subject Area 3. Power Line Distribution Tasks				
052-204-3014	Supervise the Manual Erection of a Utility Pole	BNCOC	AN	3
052-204-3015	Supervise the Sagging of Overhead Conductors	BNCOC	AN	3
052-204-3016	Supervise the Stringing of Overhead Conductors	BNCOC	AN	3

Table 2-1. MOS 21P34 Critical Tasks

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
Skill Level 4				
Subject Area 4. Overall 21P40 Tasks				
052-244-4200	Inspect a Power Plant Shift Operation	UNIT	AN	4
052-244-4201	Develop a Power Plant Safety Standing Operating Procedure (SOP)	UNIT	AN	4
052-244-4202	Perform a Power Plant After-Installation Inspection	UNIT	AN	4
052-244-4204	Supervise an Annual Service	UNIT	AN	4
052-244-4207	Develop a Power Plant Standing Operating Procedure (SOP)	UNIT	AN	4
052-244-4208	Supervise Power Plant Operations	ANCOC	AN	4
052-244-4209	Perform Quality Assurance (QA) and/or Quality Control (QC) Duties	ANCOC	AN	4
052-244-4210	Supervise a Power Plant Installation	UNIT	AN	4
052-244-4211	Conduct Contract Officer Technical Representative Operations (COTR)	UNIT	AN	4

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CHAPTER 3

MOS/Skill Level Tasks

Skill Level 3

Subject Area 1: Overall 21P30 Tasks

Check Power Plant Operational Records
052-244-3073

Conditions: As a senior power plant operator during power plant operations, you are given an operation logbook, a maintenance logbook, generator hourly check sheets, a safety clearance log, safety and power plant standing operating procedures (SOPs), a pencil, a red pen, and a black pen.

Standards: Check power plant operational records and identify deficiencies.

Performance Steps

1. Inspect the operation logbook.
    a. Check beginning-of-shift entries for—
        (1) Log entry date and time.
        (2) Control room operator's name.
        (3) Equipment operator's name.
        (4) Plant/equipment hours of operation.
        (5) Circuit breaker trips.
        (6) Active cautions and clearances.
        (7) Operational percent and shutdown plant status.
        (8) Completion of before-operation checks.
    b. Check during-shift entries for—
        (1) Circuit breaker opening or closing.
        (2) Large load changes.
        (3) Plant or generator start-up, idle-to-rated, rated-to-idle, and shutdown times.
        (4) Records of changes in control room operator duties.
        (5) Records of new cautions and clearances.
    c. Check end-of-shift entries for—
        (1) After-operation checks and services.
        (2) Engine and kilowatt hours.
        (3) Fluids added (fuel, oil, coolant).
        (4) Control room operators' signatures.

2. Inspect the maintenance logbook.
    a. Ensure that the maintenance logbook contains the nomenclature.
    b. Ensure that the maintenance logbook contains the model number.
    c. Ensure that the maintenance logbook contains the serial number.
    d. Ensure that the maintenance logbook contains the type of maintenance performed.
    e. Ensure that the maintenance logbook contains the corrective action taken.
    f. Ensure that the maintenance logbook contains engine hours.
    g. Ensure that the maintenance logbook contains load-tie breaker trips.
    h. Ensure that the maintenance logbook contains the date maintenance was performed.
    i. Ensure that the maintenance logbook contains the name of the person who performed the maintenance.

3. Inspect the generator hourly check sheets.
    a. Ensure that there is one form filled out for each generator.

Performance Steps

b. Ensure that the forms are complete according to the power plant SOP.

4. Inspect the safety clearance log.
   a. Ensure that the safety clearance log contains all caution and clearance orders.
   b. Ensure that the safety clearance log contains the clearance log.
   c. Ensure that the safety clearance log contains active and inactive clearance files.
   d. Ensure that the safety clearance log contains the caution log.
   e. Ensure that the safety clearance log contains the active and inactive caution files.
   f. Ensure that the safety clearance log contains the safe-clearance SOP.

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 task standards can be met.

Brief Soldier: Direct the Soldier to check power plant operational records.

Performance Measures	**GO**	**NO-GO**
1. Inspected the operation logbook.	____	____
2. Inspected the maintenance logbook.	____	____
3. Inspected the generator hourly check sheets.	____	____
4. Inspected the safety clearance log.	____	____

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
DA PAM 750-8
ER 385-1-31
TM 5-682

Conduct a Safety Inspection

052-244-3100

Conditions: As a senior power plant operator in a nontactical environment, you are given an assigned area, the appropriate Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA) standards and regulations, and AR 385-10.

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

Standards: Conduct a safety inspection of personnel and equipment to verify that the work area is within the safety parameters specified in safety regulations.

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 deficiencies are corrected.

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 task standards can be met.

Brief Soldier: Direct the Soldier to conduct a safety inspection.

Performance Measures	GO	NO-GO
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 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	EM 385-1-1
NFPA STDS AND REGS	ER 385-1-31
OSHA STDS AND REGS	

Check Power Plant to Load Compatibility
052-244-3101

Conditions: As a senior power plant operator in a tactical or nontactical environment, you are tasked to install a power plant. You are given technical data on the specific power plant being installed, a phase sequence indicator, a lockout and tagout kit, and applicable technical references.

DANGER:

1. THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL WHO ARE KNOWLEDGEABLE IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF ELECTRICAL POWER GENERATION EQUIPMENT AND THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT, AS REQUIRED, FOR INSPECTIONS IN HAZARDOUS AREAS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

3. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

Standards: Check power plant to load compatibility by ensuring that the proposed power plant is compatible to the grid with no more than a 10 percent variance between phase balancing.

Performance Steps

1. Identify which type of grid to use in operating the power plant.
    a. Use an infinite grid. An infinite grid is used when the frequency and voltage of the power plant is controlled by the largest power source on the grid. The operator of the power plant controls only the amount of load that the power plant will carry and the power factor at which the power plant will operate. The operator uses the governor controls to set the kilowatt load and the voltage adjust control to set the kilovolt-ampere reactive power or power factor. The power factor should be set at the rated power factor of the generator (0.8 or higher for efficient operation). The adjustment of the load and power factor on a given unit depends on the other units within the plant.
    b. Use an isolated grid. An isolated grid is used when the operator does not control the load amount and the power factor. The load and its power factor are simply whatever the load may be. These parameters vary as the amount of resistive and inductive loads change on the system. The operator controls the operating frequency and voltage with the governor and voltage controls of the power plant. The prescribed values for frequency and voltage are maintained by simultaneously adjusting the governor and voltage controls of each unit. The kilowatt and kilovolt-ampere reactive load should be set on each unit proportional to the amount of load that the unit carries. This results in each unit operating at the same load and power factor.

2. Verify that the phase rotation, frequency, and voltage match between the power plant and the grid.

3. Check the system power factor.

NOTE: The supervisor should consider what effect the power factor has on the plant and the ability of the plant to efficiently supply the required power. The system power factor may decrease the efficiency of the plant in areas such as fuel consumption and increased maintenance needs.

4. Check the system load.
    a. Determine if the plant is capable of supplying the power required by the system load.

Performance Steps

NOTE: In cases where the total connected load is greater than the demand load and the plant is capable of supplying the demand load but not the total connected load, a special operation procedure should be established to prevent overloading the plant. If the system includes an allowance for growth, the plant should be capable of supplying the present total load plus the allowance for growth.

b. Check for equal balancing of the load on each phase.

NOTE: The variance between the phase with the largest load and the phase with the smallest load should not exceed 10 percent.

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 task standards can be met.

Brief Soldier: Direct the Soldier to check power plant to load compatibility.

Performance Measures	GO	NO-GO
1. Identified which type of grid to use in operating the power plant.	____	____
2. Verified that the phase rotation, frequency, and voltage matched between the power plant and the grid.	____	____
3. Checked the system power factor.	____	____
4. Checked the system load.	____	____

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 5-424
	TM 5-685

Perform a Power Plant Site Reconnaissance

052-244-3103

Conditions: As a senior power plant operator in a tactical or nontactical environment, you are given a requirement to select a site suitable for the permanent or temporary installation of power generation equipment. You are given the corresponding technical manuals for the generator set to be installed.

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

Standards: Perform a power plant site reconnaissance by selecting a site that meets power plant operation and mission requirements.

Performance Steps

1. Determine if the power plant will be temporary, semipermanent, or permanent.
2. Ensure that the plant will be installed near a tie point to a grid; or if powering an isolated load, ensure that the plant will be installed near the load.
3. Check for the availability of shore power that is 120/240 volts, single-phase, 3-wire, and 100 amperes.
4. Check for the flexibility of site possibilities.
5. Ensure that the site will secure the power plant from outsiders or hostilities.
6. Check for the accessibility of the grounds.
7. Determine the availability of transportation by railway, airstrip, highway, or port.
8. Determine the accessibility of plant transportation equipment at the departure point, along the route, or at a setup point.
9. Determine the availability of recommended, alternate, and emergency fuel.
10. Verify that the slope of the terrain is within the acceptable limits for the plant being installed.
11. Ensure that the terrain can be cleared and leveled if necessary.
12. Check prevailing wind requirements and the site compatibility to those requirements.
13. Check generator-spacing requirements and the site compatibility to those requirements.
14. Ensure that the site has good drainage.
15. Verify that the external fuel site is at least 50 feet away from the generators and bunkered to contain fuel spillage.
16. Verify that enough space is available for the movement and operation of support equipment.
17. Ensure that access roads can be upgraded to support the weight of support equipment and generators.
18. Create a site reconnaissance report.

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 task standards can be met.

Brief Soldier: Direct the Soldier to perform a power plant site reconnaissance.

Performance Measures	GO	NO-GO
1. Determined if the power plant would be temporary, semipermanent, or permanent.	____	____
2. Ensured that the plant would be installed near a tie point to a grid; or if powering an isolated load, ensured that the plant would be installed near the load.	____	____
3. Checked for the availability of shore power that was 120/240 volts, single-phase, 3-wire, and 100 amperes.	____	____
4. Checked for the flexibility of site possibilities.	____	____
5. Ensured that the site would secure the power plant from outsiders or hostilities.	____	____
6. Checked for the accessibility of the grounds.	____	____
7. Determined the availability of transportation by railway, airstrip, highway, or port.	____	____
8. Determined the accessibility of plant transportation equipment at the departure point, along the route, or at a setup point.	____	____
9. Determined the availability of recommended, alternate, and emergency fuel.	____	____
10. Verified that the slope of the terrain was within the acceptable limits for the plant being installed.	____	____
11. Ensured that the terrain could be cleared and leveled if necessary.	____	____
12. Checked prevailing wind requirements and the site compatibility to those requirements.	____	____
13. Checked generator-spacing requirements and the site compatibility to those requirements.	____	____
14. Ensured that the site had good drainage.	____	____
15. Verified that the external fuel site was at least 50 feet away from the generators and bunkered to contain fuel spillage.	____	____
16. Verified that enough space was available for the movement and operation of support equipment.	____	____
17. Ensured that the access roads could be upgraded to support the weight of support equipment and generators.	____	____
18. Created a site reconnaissance report.	____	____

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 3-34.480

Supervise an Engine Rebuild or Overhaul

052-244-3104

Conditions: As a senior power plant operator in a nontactical environment, you are given the specific engine manual and applicable literature, a rebuild kit for the engine to be rebuilt or overhauled, the necessary hand tools and special tools, and a lockout and tagout kit.

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

Standards: Supervise an engine rebuild or overhaul, ensuring that all safety and maintenance procedures outlined in the specific engine manual and applicable literature are followed and that the senior Soldier with a mechanical background performs quality assurance checks.

Performance Steps

NOTE: Due to the precision fit of components, all tolerance specifications and torque values must be strictly followed. Long engine life and efficient operation depend on the care and precision with which inspections, repairs, and adjustments are made.

1. Ensure that the required hand tools, manufacturer's special tools, and a rebuild kit are available.
2. Ensure that lockout and tagout procedures are in place.
3. Ensure that work area preparation steps are completed.
   a. Ensure that the work area is thoroughly cleaned and well-lit.
   b. Ensure that inspection tables are covered with clean, dry paper.
   c. Ensure that the special gauges and indicators are secured in cabinets or lockers when not in use.
   d. Ensure that all micrometers, gauges, and indicators are calibrated as specified in applicable literature.
4. Ensure that the engine is removed from the generator set if required.
5. Ensure that critical removal and disassembly steps are completed.
   a. Ensure that all safety policies are followed.
   b. Ensure that all parts and components are checked for wear and damage before cleaning.

NOTE: Fine metallic particles present in a lubricant are evidence of wear.

   c. Inspect all openings that were uncovered during inspection, and repair them to ensure that they are protected.
   d. Ensure that all parts are inspected as specified in the specific engine manual and applicable literature.
   e. Ensure that all common hand tools and special tools are used properly and safely.
6. Ensure that installation and assembly steps are completed.

NOTE: Grease or oil should not be used on rubber seals, gaskets, or O-rings.

   a. Verify that proper torque specifications are followed.
   b. Ensure that the valve adjustment and timing are set as specified in the specific engine manual and applicable literature.
   c. Ensure that clean lubricant is used on bearings.
7. Ensure that the senior Soldier with a mechanical background performs quality assurance checks.
8. Ensure that the engine is reinstalled into the generator set or on a test stand if required.
9. Ensure that lockout and tagout procedures are closed out by removing locking and tagging devices.

Performance Steps

10. Ensure that before-operation tests are conducted.
11. Conduct a load test on the engine.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise an engine rebuild or overhaul.

Performance Measures	GO	NO-GO
1. Ensured that the required hand tools, manufacturer's special tools, and a rebuild kit was available.	____	____
2. Ensured that lockout and tagout procedures were in place.	____	____
3. Ensured that work area preparation steps were completed.	____	____
4. Ensured that the engine was removed from the generator set if required.	____	____
5. Ensured that critical removal and disassembly steps were completed.	____	____
6. Ensured that installation and assembly steps were completed.	____	____
7. Ensured that the senior Soldier with a mechanical background performed quality assurance checks.	____	____
8. Ensured that the engine was reinstalled into the generator set or on a test stand if required.	____	____
9. Ensured that lockout and tagout procedures were closed out by removing locking and tagging devices.	____	____
10. Ensured that before-operation tests were conducted.	____	____
11. Conducted a load test on the engine.	____	____

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 3-34.480

Produce an Electrical One-Line Diagram
052-244-3109

Conditions: As a senior power plant operator in a tactical or nontactical environment tasked to produce an electrical one-line diagram for an electrical system, you are given an electrical system.

Standards: Produce an electrical one-line diagram that accurately depicts an electrical system and is easy to read and understand.

Performance Steps

1. Determine which electrical system needs an electrical one-line diagram.
2. Identify the electrical components and protective devices within the electrical system.
3. Choose the proper starting and ending points for the electrical one-line diagram (power source, substation, loads).
4. Identify the correct electrical symbols for the components and protective devices to put on the electrical one-line diagram.
5. Transcribe information from blueprints, electrical diagrams, and visual inspections.
6. Include key parameters of the electrical system (voltages, protective device set points and amperage ratings, proper electrical flow).
7. Illustrate the electrical one-line diagram.
   a. Organize the correct sequence of electrical- and protective-device symbols.
   b. Ensure that all items are illustrated in the proper order.
   c. Ensure that all notes are properly annotated on the electrical one-line diagram.
8. Perform a complete system trace using the created electrical one-line diagram to check for accuracy.

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 task standards can be met.

Brief Soldier: Direct the Soldier to produce an electrical one-line diagram.

Performance Measures	GO	NO-GO
1. Determined which electrical system needed an electrical one-line diagram.	____	____
2. Identified the electrical components and protective devices within the electrical system.	____	____
3. Chose the proper starting and ending points for the electrical one-line diagram (power source, substation, loads).	____	____
4. Identified the correct electrical symbols for the components and protective devices to put on the electrical one-line diagram.	____	____
5. Transcribed information from blueprints, electrical diagrams, and visual inspections.	____	____
6. Included key parameters of the electrical system (voltages, protective device set points and amperage ratings, proper electrical flow).	____	____
7. Illustrated the electrical one-line diagram.	____	____

Performance Measures	GO	NO-GO
8. Performed a complete system trace using the created electrical one-line diagram to check for accuracy.	____	____

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 55-509-1 UGLYS™

Supervise the Locating of Faults Using an Infrared (IR) Camera
052-244-3111

Conditions: As a senior power plant operator in a tactical or nontactical environment when an IR survey is needed for equipment maintenance, you are given an IR camera, the applicable literature for the camera, and a computer with the required software.

DANGER:

1. IR SURVEYS OF ELECTRICAL SYSTEMS CAN ONLY BE ACCOMPLISHED WHILE THE SYSTEMS ARE ENERGIZED. EXTREME CARE MUST BE EXERCISED WHEN SURVEYING SUCH EQUIPMENT. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. DO NOT TOUCH EXPOSED ELECTRICAL CIRCUITS DURING OPERATIONS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

3. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

WARNING: DO NOT POINT THE IR CAMERA IN THE DIRECTION OF THE SUN. FAILURE TO COMPLY MAY CAUSE EQUIPMENT DAMAGE.

Standards: Supervise the locating of faults using an IR camera by identifying the electrical or mechanical hot spots in the viewer mode and ensuring that images and descriptions are recorded. Review the report of the images taken.

Performance Steps

1. Determine if the faults are electrical or mechanical.
2. Develop an IR survey plan in a logical sequence.
3. Coordinate with the equipment maintenance supervisor.
   a. Determine the type of report requested with specifics.
   b. Find a description of the system.
   c. Find current known faults.
   d. Determine symptoms of possible faults.
   e. Find possible hazards in or around the system.
4. Supervise an IR survey of engine components, turbochargers, radiators, electrical lines, transformers, switchgear, or any other electrical items within the system.
5. Supervise the use of an IR camera for advanced mechanical troubleshooting.
6. Ensure that work is performed using quality assurance and/or quality control measures.
7. Ensure that systems and components are checked.
8. Review the report with the requester or maintenance supervisor and give him a copy of the survey results.

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 task standards can be met.

Brief Soldier: Direct the Soldier supervise the locating of faults using an IR camera.

Performance Measures	GO	NO-GO
1. Determined if the faults were electrical or mechanical.	____	____
2. Developed an IR survey plan in a logical sequence.	____	____
3. Coordinated with the equipment maintenance supervisor.	____	____
4. Supervised an IR survey of engine components, turbochargers, radiators, electrical lines, transformers, switchgear, or any other electrical items within the system.	____	____
5. Supervised the use of an IR camera for advanced mechanical troubleshooting.	____	____
6. Ensured that work was performed using quality assurance and/or quality control measures.	____	____
7. Ensured that systems and components were checked.	____	____
8. Reviewed the report with the requester or maintenance supervisor and gave him a copy of the survey results.	____	____

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 3-34.480

Supervise the Maintenance of Distribution Equipment

052-244-3113

Conditions: As a senior power plant operator 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; a voltage detector; 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); insulating protective equipment; and a lockout and tagout kit.

DANGER:

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

2. A VOLTAGE DETECTOR 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 PERMANENT INJURY OR DEATH.

3. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

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

5. 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, OR OTHER ADVERSE HEALTH CONDITIONS RESULTING IN PERMANENT INJURY OR DEATH.

6. DO NOT EXCEED THE MAXIMUM VOLTAGE STIPULATED FOR SPECIFIC TESTS. FAILURE TO COMPLY WITH RATED VOLTAGES MAY DAMAGE EQUIPMENT OR RESULT IN PERMANENT INJURY OR DEATH.

7. THE INSULATION TESTER PRODUCES A HIGH VOLTAGE. 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 PERMANENT INJURY OR DEATH.

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: Supervise the maintenance of distribution equipment by inspecting and testing as specified in the applicable manufacturer's literature and keeping a record of the results. Reinstall or repair equipment based on test results.

Performance Steps

1. Review danger, warning, and caution notices before proceeding.
2. Review the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that PPE has been correctly tested and is fully mission-capable.
4. Inspect tools and testing equipment for serviceability.
5. Perform lockout and tagout procedures.
6. Supervise pole-climbing procedures if necessary.
7. Supervise the testing of phases to ensure that there is no voltage present.
8. Supervise the installation of personal protective grounds.
9. Supervise the maintenance of distribution equipment by inspecting and testing it as specified in the applicable manufacturer's literature.
10. Record inspection and testing results.
11. Supervise the repair or replacement of equipment based on inspection and test results.
12. Ensure that personal protective grounds are removed.
13. Close out lockout and tagout procedures by removing locking and tagging devices.
14. Ensure that a functions check on the electrical distribution system is completed.
15. Ensure that the items listed in the conditions are properly cleaned and stored.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise the maintenance of distribution equipment.

Performance Measures	**GO**	**NO-GO**
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Reviewed the manufacturer's literature, electrical construction prints, and wiring diagrams.	____	____
3. Ensured that PPE was correctly tested and was fully mission-capable.	____	____
4. Inspected tools and testing equipment for serviceability.	____	____
5. Performed lockout and tagout procedures.	____	____
6. Supervised pole-climbing procedures if necessary.	____	____
7. Supervised the testing of phases to ensure that there was no voltage present.	____	____
8. Supervised the installation of personal protective grounds.	____	____
9. Supervised the maintenance of distribution equipment by inspecting and testing it as specified in the applicable manufacturer's literature.	____	____
10. Recorded inspection and testing results.	____	____

Performance Measures	GO	NO-GO
11. Supervised the repair or replacement of equipment based on inspection and test results.	____	____
12. Ensured that personal protective grounds were removed.	____	____
13. Closed out lockout and tagout procedures by removing locking and tagging devices.	____	____
14. Ensured that a functions check on the electrical distribution system was completed.	____	____
15. Ensured that the items listed in the conditions were properly 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
LCH	EM 385-1-1
	ER 385-1-31
	FM 3-34.480
	FM 5-412
	NESC®
	NETA™
	TM 5-682
	TM 5-684
	TM 5-686
	TM 5-811-1
	TM 5-811-3

Supervise an Automatic Transfer Switch (ATS) Service

052-244-3114

Conditions: As a senior power station operator in a tactical or nontactical environment during maintenance or when the ATS is suspected of being defective, you are given the applicable literature with schematics and a lockout and tagout kit.

DANGER:

1. THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL WHO ARE KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF SWITCHGEAR AND POWER EQUIPMENT, ALONG WITH THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. DO NOT TOUCH EXPOSED ELECTRICAL CONNECTIONS WHEN THE POWER SOURCE IS CONNECTED TO THE SWITCH. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

3. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

Standards: Supervise the servicing of an ATS by ensuring that the inspection and testing of the ATS is conducted as specified in the applicable literature and that the repair or replacement of the ATS is based on test results.

Performance Steps

1. Ensure that lockout and tagout procedures are in place.
2. Ensure that visual and manual inspections of the ATS are performed.
3. Validate control functions checking.
4. Ensure that insulation resistance and overpotential tests are performed at the recommended voltages.
5. Ensure that resistance measurements are taken and comply with the manufacturer's specifications.
6. Ensure that corrective action is taken as necessary.
7. Validate the performance of a functions check on the ATS.
8. Ensure that lockout and tagout procedures are closed out by removing locking and 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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise ATS service.

Performance Measures	GO	NO-GO
1. Ensured that lockout and tagout procedures were in place.	____	____
2. Ensured that visual and manual inspections of the ATS were performed.	____	____
3. Validated control functions checking.	____	____

Performance Measures	GO	NO-GO
4. Ensured that insulation resistance and overpotential tests were performed at the recommended voltages.	____	____
5. Ensured that resistance measurements were taken and complied with the manufacturer's specifications.	____	____
6. Ensured that corrective action was taken as necessary.	____	____
7. Validated the performance of a functions check on the ATS.	____	____
8. Ensured that lockout and tagout procedures were closed out by removing locking and 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
NESC®
S AND C HANDBOOK
TM 5-684

Design an Underground Electrical Distribution System

052-244-3115

Conditions: As a senior power plant operator in a tactical or nontactical environment in which an underground electrical distribution system is to be designed, you are given DA Form 2702 (Bill of Materials) and the existing distribution/new distribution system load requirements, one-line diagram.

Standards: Design an underground electrical distribution system. Ensure that the designed system is capable of meeting load parameters without exceeding equipment operating limits.

Performance Steps

1. Determine the maximum load requirement.
2. Identify the origin of the incoming power source as an isolated power plant, overhead distribution from a power grid, or underground distribution from a power grid.
3. Identify the location and size of each load.
4. Determine the size of the transformers based on the load requirement.
   a. Calculate 10 percent above the maximum load if the load will not increase.
   b. Oversize the transformers according to the planned expansion if the load is to increase over time.
5. Determine the proper placement of the transformers.
   a. Base the placement on distances between the transformers.
   b. Base the placement on distances from living and working areas.
   c. Base the placement on voltage drop calculations.
6. Determine the size of the conductors.
   a. Base the size on amperage required for set loads.
   b. Base the size on transformer output if the load is expected to increase.
   c. Base the size on the type of conductor to be used.
   d. Base the size on voltage drop calculations.

NOTE: Always use the lowest values given for that conductor when determining cable sizing if the cable type and manufacturer are unknown.

7. Create a distribution system, one-line or wiring diagram.
8. Prepare a materials takeoff list, taking into account the total quantity of items to be installed.
   a. Include switchgear.
   b. Include protective devices.
   c. Include control wiring, metering, and relays.
   d. Include conduit and cable lengths.
   e. Include concrete pads.
   f. Include insulators.
   g. Include capacitor banks.
   h. Include transformers.
   i. Include mounting hardware.
   j. Include lightning arrestors.
   k. Include grounding materials.
9. Complete DA Form 2702.
   a. Complete the heading with current organization information.
   b. Record the stock or part number.
   c. Record the name/description of the item.
   d. Record the unit of issue.
   e. Record the total quantity of each item.

Performance Steps

f. Submit the completed DA Form 2702 for the items to be ordered.

10. Request a review by the prime power supervisor.
11. Submit the design to the power station sergeant or the customer.

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 task standards can be met.

Brief Soldier: Direct the Soldier to design an underground electrical distribution system.

Performance Measures	GO	NO-GO
1. Determined the maximum load requirement.	____	____
2. Identified the origin of the incoming power source as an isolated power plant, overhead from a power grid, or underground distribution from a power grid.	____	____
3. Identified the location and size of each load.	____	____
4. Determined the size of the transformers based on the load requirement.	____	____
5. Determined the proper placement of the transformers.	____	____
6. Determined the size of the conductors.	____	____
7. Created a distribution system, one-line or wiring diagram.	____	____
8. Prepared a materials takeoff list, taking into account the total quantity of items to be installed.	____	____
9. Completed DA Form 2702.	____	____
10. Requested a review by the prime power supervisor.	____	____
11. Submitted the design to the power station sergeant or the customer.	____	____

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
DA FORM 2702	LCH
	NEC® HANDBOOK
	NESC®
	TM 5-811-1
	TM 5-811-3
	UGLYS™

Design an Overhead Electrical Distribution System

052-244-3116

Conditions: As a senior power plant operator in a tactical or nontactical environment in which an overhead electrical distribution system is to be designed, you are given DA Form 2702 (Bill of Materials) and the existing distribution/new distribution system load requirements one-line diagram.

Standards: Design an overhead electrical distribution system. Ensure that the designed system is capable of meeting the load parameters without exceeding equipment operating limits.

Performance Steps

1. Determine the maximum load requirement.
2. Identify the origin of the incoming power source as an isolated power plant, overhead distribution from a power grid, or underground distribution from a power grid.
3. Identify the location and size of each load.
4. Determine the size of the transformers based on the load requirement.
   a. Calculate 10 percent above the maximum load if the load will not increase.
   b. Oversize the transformers according to the planned expansion if the load is to increase over time.
5. Determine the proper placement of the transformers.
   a. Base the placement on distances between the transformers.
   b. Base the placement on distances from living and working areas.
   c. Base the placement on voltage drop calculations.
6. Determine the size of the conductors.
   a. Base the size on amperage required for set loads.
   b. Base the size on transformer output if the load is expected to increase.
   c. Base the size on the type of conductor to be used.
   d. Base the size on voltage drop calculations.

NOTE: Always use the lowest values given for that conductor when determining cable sizing if the cable type and manufacturer are unknown.

7. Create a distribution system one-line or wiring diagram.
8. Prepare a materials takeoff list, taking into account the total quantity of items to be installed.
   a. Include switchgear.
   b. Include protective devices.
   c. Include cable lengths.
   d. Include utility poles and crossarms.
   e. Include guy wires and anchors.
   f. Include insulators.
   g. Include transformers.
   h. Include mounting hardware.
   i. Include lightning arrestors.
   j. Include grounding materials.
9. Complete DA Form 2702.
   a. Complete the heading with current organization information.
   b. Record the stock or part number.
   c. Record the name/description of the item.
   d. Record the unit of issue.
   e. Record the total quantity of each item.
   f. Submit the completed DA Form 2702 for the items to be ordered.

Performance Steps

10. Request a review by the prime power supervisor.
11. Submit the design to the power station sergeant or the customer.

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 task standards can be met.

Brief Soldier: Direct the Soldier to design an overhead electrical distribution system.

Performance Measures	GO	NO-GO
1. Determined the maximum load requirement.	____	____
2. Identified the origin of the incoming power source as an isolated power plant, overhead distribution from a power grid, or underground distribution from a power grid.	____	____
3. Identified the location and size of each load.	____	____
4. Determined the size of the transformers based on the load requirement.	____	____
5. Determined the proper placement of the transformers.	____	____
6. Determined the size of the conductors.	____	____
7. Created a distribution system one-line or wiring diagram.	____	____
8. Prepared a materials takeoff list, taking into account the total quantitly of items to be installed.	____	____
9. Completed DA Form 2702.	____	____
10. Requested a review by the prime power supervisor.	____	____
11. Submitted the design to the power station sergeant or the customer.	____	____

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
DA FORM 2702	LCH
	NEC® HANDBOOK
	NESC®
	TM 5-704
	TM 5-811-1
	TM 5-811-3
	UGLYS™

Subject Area 2: Additional Skill Identifier Tasks

Supervise a Mechanical Annual Service

052-205-3101

Conditions: As a senior power station mechanic in a tactical or nontactical environment during scheduled maintenance, you are given applicable literature, maintenance logbooks, safety standing operating procedures (SOPs), and a lockout and tagout kit.

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

CAUTION: NOISE LEVELS IN EXCESS OF 85 DECIBELS EXIST WITHIN A 50-FOOT RADIUS OF OPERATING EQUIPMENT. PERSONNEL MUST WEAR SINGLE HEARING PROTECTION WITHIN A 50-FOOT RADIUS. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY.

Standards: Supervise a mechanical annual service by ensuring that the Soldiers test and adjust or replace any components that exceed the tolerances or time limits set in safety SOPs or applicable literature for each specific component in a safe and timely manner.

Performance Steps

1. Ensure that lockout and tagout procedures are in place.
2. Ensure that personnel adhere to danger, warning, and caution notices.
3. Ensure that the engine assembly is inspected.
    a. Ensure that the assembly is inspected for leaks.
    b. Ensure that the assembly is inspected for loose connections.
    c. Ensure that the assembly is inspected for intake and exhaust valve lash serviceability.
    d. Ensure that the assembly is inspected for injector plunger travel serviceability.
4. Supervise air intake system servicing.
    a. Check air restriction indicators for proper readings.
    b. Check primary and safety air filters for cleanliness.
    c. Check manifolds for cracks.
5. Supervise turbocharger inspection.
    a. Ensure that the impeller and turbine blades are inspected.
    b. Ensure that the turbocharger body is inspected for cracks and leaks.
    c. Ensure that the impeller and turbine end clearance and the end play are inspected.
6. Supervise exhaust system inspection by checking the manifolds for cracks and leaks and the mufflers, pipes, and rain caps for serviceability.
7. Supervise cooling system servicing.
    a. Inspect the radiator for leaks.
    b. Inspect radiator fins and tubes for serviceability.
    c. Check coolant, freeze protection, and diesel coolant additive levels.
    d. Check the condition and adjustment of the fan belt.
    e. Inspect the fan shroud and blades for damage.
    f. Check water pump hoses and connections for leaks.
    g. Inspect pulleys for cracks.
8. Supervise lubrication system servicing.
    a. Ensure that the oil level is checked.
    b. Check filter mounts, the oil system, and hoses for leaks.

Performance Steps

c. Ensure that the oil and filters are changed if required.

9. Supervise fuel system servicing.
   a. Ensure that the fuel transfer pump is tested for proper output.
   b. Check fuel mounts, the fuel system, and hoses for leaks.
   c. Ensure that the fuel filters are changed if required.
10. Supervise starting and charging systems servicing.
   a. Inspect the starter gear for wear.
   b. Ensure that the batteries are checked for damage, corrosion, connection tightness, electrolyte level, and specific gravity.
   c. Ensure that the charging system is checked for proper output.
11. Supervise hydraulic system servicing.
   a. Ensure that the fluid level is checked.
   b. Change filters.
   c. Ensure that hoses are checked for leaks.
   d. Ensure that pumps and motors are checked for correct operation and leaks.
12. Supervise the operation and the load test.
   a. Ensure that the test generator is loaded and set at the recommended load.
   b. Ensure that the gauge is checked for malfunctions, unusual noises, leaks, and abnormal vibrations.
   c. Ensure that the emergency shutdown system is tested.
13. Ensure that tests and inspection results are recorded in the maintenance logbook.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise a mechanical annual service.

Performance Measures	**GO**	**NO-GO**
1. Ensured that lockout and tagout procedures were in place.	____	____
2. Ensured that personnel adhered to danger, warning, and caution notices.	____	____
3. Ensured that the engine assembly was inspected.	____	____
4. Supervised air intake system servicing.	____	____
5. Supervised turbocharger inspection.	____	____
6. Supervised exhaust system inspection by checking the manifolds for cracks and leaks and the mufflers, pipes, and rain caps for serviceability.	____	____
7. Supervised cooling system servicing.	____	____
8. Supervised lubrication system servicing.	____	____
9. Supervised fuel system servicing.	____	____
10. Supervised starting and charging systems servicing.	____	____
11. Supervised hydraulic system servicing.	____	____
12. Supervised the operation and the load test.	____	____

Performance Measures	GO	NO-GO
13. Ensured that tests and inspection results were recorded in the maintenance logbook.	____	____

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
	TM 9-6115-604-12

Supervise an Annual Electrical Service

052-206-3100

Conditions: As a senior power plant electrician in a tactical or nontactical environment during scheduled maintenance of a power plant, you are given applicable literature, maintenance logbooks, a lockout and tagout kit, safety standing operating procedures (SOPs), and InterNational Electrical Testing Association (NETA) Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems.

DANGER:

1. THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL WHO ARE KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRONICS AND POWER EQUIPMENT AND THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. DO NOT TOUCH EXPOSED ELECTRICAL CONNECTIONS WHEN THE POWER SOURCE IS CONNECTED TO THE CIRCUIT BREAKER. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

3. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

Standards: Supervise an annual electrical service of a power plant by ensuring that Soldiers test and adjust or replace any components that exceed the tolerances or time limits set in safety SOPs or applicable literature for each specific component in a safe and timely manner.

Performance Steps

1. Review danger, warning, and caution notices before proceeding.
2. Review the manufacturer's literature, wiring diagrams, and schematics.
3. Review maintenance logbooks and historical data pertaining to equipment.
4. Ensure that lockout and tagout procedures are in place.
5. Ensure that Soldiers have the appropriate tools and supplies, required test equipment, and time necessary to complete this task.
6. Supervise generator inspection.
    a. Ensure that air intakes and air outlets are checked for obstructions.
    b. Ensure that the generator is inspected for signs of burning or overheating.
    c. Ensure that insulation resistance is checked in the—
        (1) Main stator coil assembly.
        (2) Main rotor assembly.
        (3) Exciter rotor assembly.
        (4) Exciter stator (field).
    d. Ensure that the current boost module is checked.
7. Supervise main contactor/breaker servicing (inspection, servicing, and testing).
8. Supervise secondary electrical component servicing.
    a. Monitor inspection.
    b. Supervise testing of the—
        (1) Voltage regulator.
        (2) Potential transformers.
        (3) Current transformers.

Performance Steps

(4) Load terminals.
(5) Wiring harness.
(6) Screws and nuts on the terminal board.
(7) Electrical components for corrosion.
(8) Direct-current (DC) circuit breaker.
(9) Alternating-current (AC) circuit breakers.
(10) High-voltage output stabs.
(11) High-voltage cables.
(12) Lightning arresters.
(13) Surge capacitor.
(14) Magnetic pickup.
(15) High-voltage cabinet doors.
(16) Generator grounding.
(17) Shore power cable, plug, and receptacle.

9. Ensure that lockout and tagout procedures are closed out by removing locking and tagging devices.
10. Ensure that tests and inspection results are recorded in maintenance logbooks.
11. Ensure that the items listed in the conditions are properly cleaned and stored.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise an annual electrical service.

Performance Measures	**GO**	**NO-GO**
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Reviewed the manufacturer's literature, wiring diagrams, and schematics.	____	____
3. Reviewed maintenance logbooks and historical data pertaining to equipment.	____	____
4. Ensured that lockout and tagout procedures were in place.	____	____
5. Ensured that Soldiers had the appropriate tools and supplies, required test equipment, and time necessary to complete the task.	____	____
6. Supervised generator inspection.	____	____
7. Supervised main contactor/breaker servicing (inspection, servicing, and testing).	____	____
8. Supervised secondary electrical component servicing.	____	____
9. Ensured that lockout and tagout procedures were closed out by removing locking and tagging devices.	____	____
10. Ensured that tests and inspection results were recorded in maintenance logbooks.	____	____
11. Ensured that the items listed in the conditions were properly 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
NETA™	TM 9-6115-604-12

Produce an Electrical Schematic

052-206-3101

Conditions: As a senior power plant electrician in a tactical or nontactical environment, you are tasked to produce an electrical schematic for an electrical system that does not have an electrical schematic. You are given an electrical system.

Standards: Produce an electrical schematic that accurately depicts an electrical system.

Performance Steps

1. Determine which electrical system needs an electrical schematic.
2. Identify the electrical components and protective devices within the electrical system.
3. Identify the correct electrical symbols for the components and protective devices on the electrical schematic.
4. Illustrate the electrical schematic.
   a. Organize the correct sequence of the electrical- and protective-device symbols.
   b. Determine the electrical path of each electrical system.
   c. Label the electrical paths, voltage, wire size, device numbers, wire numbers, components, and special notes on the electrical schematic.
5. Perform a complete system trace using the created electrical schematic to check for accuracy.

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 task standards can be met.

Brief Soldier: Direct the Soldier to produce an electrical schematic.

Performance Measures	GO	NO-GO
1. Determined which electrical system needed an electrical schematic.	____	____
2. Identified the electrical components and protective devices within the electrical system.	____	____
3. Identified the correct electrical symbols for the components and protective devices on the electrical schematic.	____	____
4. Illustrated the electrical schematic.	____	____
5. Performed a complete system trace using the created electrical schematic to check for accuracy.	____	____

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 5-424 FM 55-509-1 LCH S AND C HANDBOOK TM 5-704

References

Required

Related

TM 5-811-1
TM 5-811-3

Supervise an Instrumentation Annual Service

052-207-3101

Conditions: As a senior power station instrument technician in a tactical or nontactical environment during scheduled maintenance of a power plant, you are given safety standing operating procedures (SOPs), a lockout and tagout kit, maintenance logbooks, and applicable literature with schematics.

DANGER:

1. THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL WHO ARE KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRONICS AND CONTROL INSTRUMENTATION, AND THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. ENSURE THAT CURRENT TRANSFORMERS SUPPLYING CURRENT TO THE ELECTRONICS AND CONTROL DEVICES ARE DE-ENERGIZED AND ELECTRICALLY SHORTED BEFORE SERVICING THE METER. IF ENERGIZED, AN OPEN CURRENT TRANSFORMER CIRCUIT WILL PRODUCE VERY HIGH VOLTAGES. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. ENSURE THAT POTENTIAL TRANSFORMERS FEEDING THE ELECTRONICS AND CONTROL DEVICES ARE DE-ENERGIZED BEFORE SERVICING THE METER. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY, DEATH, OR EQUIPMENT DAMAGE.

3. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

NOTES:

1. The low-voltage side of the potential transformer that supplies voltage to the controls may be fuse-protected. To further isolate the circuit electrically and as an additional measure of safety, this fuse may be removed. Check the schematics for verification.

2. All tests should be conducted as specified in applicable literature. When applicable literature is not available, industry standards should be used.

Standards: Supervise an instrumentation annual service of a power plant by ensuring that Soldiers test and adjust or replace any components as specified in safety SOPs and applicable literature for each specific component in a safe and timely manner.

Performance Steps

1. Review danger, warning, and caution notices before proceeding.
2. Ensure that subordinates read and understand safety SOPs.
3. Ensure that lockout and tagout procedures are in place.
4. Ensure that Soldiers have the appropriate tools and supplies, required test equipment, and time required to complete this task.
5. Supervise relay servicing, and ensure that relays are tested and labeled, including any solid-state, induction disk, timing, and auxiliary relays.
6. Supervise meter servicing, and ensure that meters are tested and labeled.
   a. Test and label ammeters.
   b. Test and label voltmeters.

Performance Steps

c. Test and label power meters.
d. Test and label frequency meters.
e. Test and label power factor meters.
f. Test and label volt-ampere reactance meters.

7. Supervise generator control servicing, and ensure that generator controls are tested and labeled.
   a. Test and label the voltage regulator.
   b. Test and label the electronic governor.
   c. Test and label the current boost module.
   d. Test and label speed control panels.
   e. Test and label the digital synchronizer and load controllers.
   f. Test and label programmable logic controllers.
   g. Test and label signal transmission circuits.
8. Supervise instrumentation sensing device servicing, and ensure that instrumentation sensing devices are tested and labeled, including potential and current transformers and magnetic pickups.
9. Supervise auxiliary sensing device servicing, and ensure that auxiliary sensing devices are tested and labeled, including temperature and pressure transducers and speed switches.
10. Ensure that lockout and tagout procedures are closed out by removing locking and tagging devices.
11. Ensure that tests and inspection results are recorded in maintenance logbooks.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise an instrumentation annual service.

Performance Measures	**GO**	**NO-GO**
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Ensured that subordinates read and understood safety SOPs.	____	____
3. Ensured that lockout and tagout procedures were in place.	____	____
4. Ensured that Soldiers had the appropriate tools and supplies, required test equipment, and time required to complete the task.	____	____
5. Supervised relay servicing and ensured that relays were tested and labeled, including any solid-state, induction disk, timing, and auxiliary relays.	____	____
6. Supervised meter servicing, and ensured that meters were tested and labeled.	____	____
7. Supervised generator control servicing, and ensured that generator controls were tested and labeled.	____	____
8. Supervised instrumentation sensing device servicing, and ensured that instrumentation sensing devices were tested and labeled, including potential and current transformers and magnetic pickups.	____	____
9. Supervised auxiliary sensing device servicing, and ensured that auxiliary sensing devices were tested and labeled, including temperature and pressure transducers and speed switches.	____	____

Performance Measures	GO	NO-GO
10. Ensured that lockout and tagout procedures were closed out by removing locking and tagging devices.	____	____
11. Ensured that tests and inspection results were recorded in maintenance logbooks.	____	____

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
TM 5-6115-593-12
TM 5-6115-593-34

Perform a Power Quality Analysis

052-264-3100

Conditions: As a senior power station instrument technician or a senior power station electrician in a tactical or nontactical environment during an installation containing sensitive electronic loads, you are given safety standing operating procedures (SOPs), a lockout and tagout kit, a multimeter, an oscilloscope, a power quality analyzer, the National Electrical Code (NEC) Handbook, maintenance logbooks, and applicable literature with schematics.

DANGER:

1. THIS TASK SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL WHO ARE KNOWLEDGEABLE IN THE INSTALLATION AND MAINTENANCE OF ELECTRONICS AND CONTROL INSTRUMENTATION AND THE ASSOCIATED HAZARDS. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

2. REMOVE RINGS, NECKLACES, OTHER JEWELRY, AND LOOSE CLOTHING. FAILURE TO COMPLY MAY CAUSE PERMANENT INJURY OR DEATH.

Standards: Perform a power quality analysis and provide the facility engineer or installation administrator with your recommendations for resolving any power quality issues.

Performance Steps
NOTE: All tests should be conducted as specified in the manufacturer's literature when available.

1. Review danger, warning, and caution notices before proceeding.
2. Review manufacturer's literature, wiring diagrams, and schematics.
3. Review the maintenance logbooks and historical data pertaining to equipment.
4. Identify the nature of the problem as nuisance trips or component failures.
5. Identify circuits supporting sensitive electronic loads.
6. Visually inspect power panels for signs of overheating.
7. Check the circuit for proper wiring.
   a. Ensure that the conductor is the correct size.
   b. Ensure that the correct number of conductors is used for the conduit size.
   c. Ensure that the proper fault coordination is used.
8. Check the circuit for proper grounding (as specified in the NEC handbook) and adequate signal and high-frequency grounding.
9. Check the circuit for adequate surge protection on lightning arresters at service drops and secondary surge protection on sensitive electronic equipment.
10. Identify possible sources of harmonic disturbance (switching-mode power supplies, fluorescent ballasts, rectifiers, shared neutrals).

NOTE: Some large facilities (such as hospitals) run an increased risk of harmonic disturbance due to the large number of solid-state devices, and switching power supplies and fluorescent lighting. Neutrals and grounds in these facilities should be oversized by 100 to 200 percent.

11. Obtain power data.
    a. Use true root-mean-square (RMS) meters to identify power transients.
    b. Verify the proper alternating-current (AC) waves using an oscilloscope.
    c. Verify that the frequency is close to 50 or 60 hertz.
    d. Measure the current on each phase and neutral.

Performance Steps

12. Analyze test results.
    a. Determine if the results indicate a bad component or a faulty power system.
        (1) Replace any suspected bad components.
        (2) Install a power quality analyzer to obtain more data if a faulty power system is suspected.
    b. Retest the system for quality power output.
13. Determine the appropriate solution for correcting power quality disturbances.
    a. Correct power line conditioners.
    b. Correct line voltage regulators.
    c. Correct uninterruptible power supplies.
    d. Correct shielded isolation transformers.
    e. Correct transformer k-factor ratings for nonlinear loads.
14. Provide the facility engineer or installation administrator with recommendations for resolving power quality issues.
15. Ensure that the items listed in the conditions are properly cleaned and stored.

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 task standards can be met.

Brief Soldier: Direct the Soldier to perform a power quality analysis.

Performance Measures	**GO**	**NO-GO**
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Reviewed the manufacturer's literature, wiring diagrams, and schematics.	____	____
3. Reviewed maintenance logbooks and historical data pertaining to equipment.	____	____
4. Identified the nature of the problem as nuisance trips or component failures.	____	____
5. Identified circuits supporting sensitive electronic loads.	____	____
6. Visually inspected power panels for signs of overheating.	____	____
7. Checked the circuit for proper wiring.	____	____
8. Checked the circuit for proper grounding (as specified in the NEC handbook) and adequate signal and high-frequency grounding.	____	____
9. Checked the circuit for adequate surge protection on lightning arresters at service drops and secondary surge protection on sensitive electronic equipment.	____	____
10. Identified possible sources of harmonic disturbance (switching-mode power supplies, fluorescent ballasts, rectifiers, shared neutrals).	____	____
11. Obtained power data.	____	____
12. Analyzed test results.	____	____
13. Determined the appropriate solution for correcting power quality disturbances.	____	____
14. Provided the facility engineer or installation administrator with recommendations for resolving power quality issues.	____	____
15. Ensured that the items listed in the conditions were properly 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
NEC® HANDBOOK	FM 3-34.480
	NESC®

Subject Area 3: Power Line Distribution Tasks

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); applicable personal protective equipment (PPE), and DA Form 2702 (Bill of Materials).

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

Standards: Supervise the manual erection of a utility pole by ensuring that it 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 danger, warning, and caution notices before proceeding.
2. Review the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that PPE is correctly tested and fully mission-capable.
4. Complete DA Form 2702 for the tools and equipment necessary to perform this task.
5. Inspect tools and rigging equipment for serviceability.
6. Develop a plan for obtaining nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in accomplishing the task.
9. Inspect the hole to ensure that it is the proper 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 and placed in the jenny.
13. Inspect the pole while it is in the hole to ensure that it is at the proper depth, 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 hardware.
17. Ensure that guys and anchors are installed as stated in electrical construction prints.
18. Ensure that PPE, rigging equipment, and tools are correctly cleaned and stored.

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 task standards can be met.

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

Performance Measures	GO	NO-GO
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Reviewed the manufacturer's literature, electrical construction prints, and wiring diagrams.	____	____
3. Ensured that PPE was correctly tested and fully mission-capable.	____	____
4. Completed DA Form 2702 for the tools and equipment necessary to perform the task.	____	____
5. Inspected tools and rigging equipment for serviceability.	____	____
6. Developed a plan for obtaining nonorganic tools and equipment necessary to perform the mission.	____	____
7. Issued a safety briefing that highlighted safety precautions and the concept of the operation.	____	____
8. Assigned personnel positions and ensured that they understood their role in accomplishing the task.	____	____
9. Inspected the hole to ensure that it was the proper 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 and placed in the jenny.	____	____
13. Inspected the pole while it was in the hole to ensure that it was at the proper depth, centered in the hole, facing the correct direction, and aligned correctly.	____	____
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 hardware.	____	____
17. Ensured that guys and anchors were installed as stated in electrical construction prints.	____	____
18. Ensured that 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
DA FORM 2702	AR 385-10
LCH	EM 385-1-1

References

Required	Related
	ER 385-1-31
	FM 3-34.480
	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), applicable personal protective equipment (PPE), and DA Form 2702 (Bill of Materials).

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

Performance Steps

1. Review danger, warning, and caution notices before proceeding.
2. Review the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that PPE is correctly tested and fully mission-capable.
4. Complete DA Form 2702 for the tools and equipment necessary to perform this task.
5. Inspect tools and climbing and rigging equipment for serviceability.
6. Develop a plan for obtaining nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in accomplishing this task.
9. Inspect conductors to ensure that they are sagged according to the sagging chart and based on surrounding factors.
    a. Ensure that conductors are sagged according to span length.
    b. Ensure that conductors are sagged according to material.
    c. Ensure that conductors are sagged according to size.
    d. Ensure that conductors are sagged according to geographical location.
    e. Ensure that conductors are sagged according to climate.
10. Ensure that conductors are sagged visually or with a dynamometer.
11. Ensure that conductors are secured in place after being sagged.
12. Ensure that PPE, climbing and rigging equipment, and tools are correctly cleaned and stored.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise the sagging of overhead conductors.

Performance Measures	GO	NO-GO
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Reviewed the manufacturer's literature, electrical construction prints, and wiring diagrams.	____	____
3. Ensured that PPE was correctly tested and fully mission-capable.	____	____

Performance Measures	GO	NO-GO
4. Completed DA Form 2702 for the tools and equipment necessary to perform the task.	____	____
5. Inspected tools and climbing and rigging equipment for serviceability.	____	____
6. Developed a plan for obtaining nonorganic tools and equipment necessary to perform the mission.	____	____
7. Issued a safety briefing that highlighted safety precautions and the concept of the operation.	____	____
8. Assigned personnel positions and ensured that they understood their role in accomplishing the task.	____	____
9. Inspected conductors to ensure that they were sagged according to the sagging chart and based on surrounding factors.	____	____
10. Ensured that conductors were sagged visually or with a dynamometer.	____	____
11. Ensured that conductors were secured in place after being sagged.	____	____
12. Ensured that 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	Related
DA FORM 2702	AR 385-10
LCH	EM 385-1-1
	ER 385-1-31
	FM 3-34.480
	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), applicable personal protective equipment (PPE), and DA Form 2702 (Bill of Materials).

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

Performance Steps

1. Review danger, warning, and caution notices before proceeding.
2. Review the manufacturer's literature, electrical construction prints, and wiring diagrams.
3. Ensure that PPE is correctly tested and fully mission-capable.
4. Complete DA Form 2702 for the tools and equipment necessary to perform this task.
5. Inspect tools and climbing and rigging equipment for serviceability.
6. Develop a plan for obtaining nonorganic tools and equipment necessary to perform the mission.
7. Issue a safety briefing that highlights safety precautions and the concept of the operation.
8. Assign personnel positions, and ensure that they understand their role in accomplishing this task.

WARNING: Conductors should never be removed from a nonrotating reel or coil. Failure to rotate the reel or coil will damage conductors by twisting and kinking them.

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

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise the stringing of overhead conductors.

Performance Measures	GO	NO-GO
1. Reviewed danger, warning, and caution notices before proceeding.	____	____
2. Reviewed the manufacturer's literature, electrical construction prints, and wiring diagrams.	____	____
3. Ensured that PPE was correctly tested and fully mission-capable.	____	____
4. Completed DA Form 2702 for the tools and equipment necessary to perform the task.	____	____
5. Inspected tools and climbing and rigging equipment for serviceability.	____	____

Performance Measures	GO	NO-GO
6. Developed a plan for obtaining nonorganic tools and equipment necessary to perform the mission.	____	____
7. Issued a safety briefing that highlighted safety precautions and the concept of the operation.	____	____
8. Assigned personnel positions and ensured that they understood their role in accomplishing the task.	____	____
9. Determined whether the mobile- or stationary-reel method would be used.	____	____
10. Inspected conductors to ensure that they were not damaged during reeling out.	____	____
11. Ensured that conductors were placed on conductor support devices in the proper sequence.	____	____
12. Ensured that 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	Related
DA FORM 2702	AR 385-10
LCH	EM 385-1-1
	ER 385-1-31
	FM 3-34.480
	TM 5-682
	TM 5-684
	TM 5-811-1
	TM 5-811-3

Skill Level 4

Subject Area 4: Overall 21P40 Tasks

Inspect a Power Plant Shift Operation

052-244-4200

Conditions: As a prime power supervisor in a tactical or nontactical environment when your section is operating a multiunit power plant, you are given power plant and safety standing operating procedures (SOPs), applicable literature for each piece of equipment, operation and maintenance logbooks, and a lockout and tagout kit.

Standards: Inspect a power plant shift operation to ensure that preventive-maintenance checks and services (PMCS), hourly checks, and lockout and tagout procedures are performed as required. Ensure that operational and maintenance data is recorded in appropriate logbooks while power output parameters are maintained.

Performance Steps

NOTE: These performance steps are only a general guide for this task. They are not intended to replace the knowledge and experience needed to perform this task. The inspector should be an experienced prime power production specialist.

1. Observe personnel for alertness and accountability.
2. Inspect uniforms and equipment for serviceability and the appropriate safety level.
3. Inspect power plant output parameters to ensure that they are within design specifications.
4. Inspect the area of operations (AO) to ensure that it is a safe, secure, and clean work environment.
5. Inspect PMCS records.
6. Inspect hourly log sheets to ensure that they are filled out properly and to note any possible problems with the power plant.
7. Test the knowledge of personnel on lockout and tagout procedures.
8. Inspect operation logbooks for proper operation records.
9. Inspect maintenance logbooks for proper maintenance records.
10. Inspect the manual and publication library to ensure that proper publications and forms are available.
    a. Ensure that applicable technical manuals for the generators are available.
    b. Ensure that applicable equipment inspection and maintenance forms are available.
    c. Ensure that hourly log sheets are available.
    d. Ensure that the safety SOP is available.
    e. Ensure that operation and maintenance logbooks for each piece of equipment are available.
    f. Ensure that the current power plant SOP is available.
11. Inspect the power plant perimeter and spaces between each generator to ensure that areas are clear of debris and hazards that may affect the safe operating environment.
12. Inspect the fuel supply to ensure that there is enough fuel to operate the plant until the next resupply.
13. Inspect petroleum, oils, and lubricants and parts storage areas for cleanliness, neatness, and general accessibility.

Performance Steps

14. Conduct on-the-spot corrections as needed.

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 task standards can be met.

Brief Soldier: Direct the Soldier inspect power a plant shift operation.

Performance Measures	GO	NO-GO
1. Observed personnel for alertness and accountability.	____	____
2. Inspected uniforms and equipment for serviceability and the appropriate safety level.	____	____
3. Inspected power plant output parameters to ensure that they were within design specifications.	____	____
4. Inspected the AO to ensure that it was a safe, secure, and clean work environment.	____	____
5. Inspected PMCS records.	____	____
6. Inspected hourly log sheets to ensure that they were filled out properly and to note any possible problems with the power plant.	____	____
7. Tested the knowledge of personnel on lockout and tagout procedures.	____	____
8. Inspected operation logbooks for proper operation records.	____	____
9. Inspected the maintenance logbooks for the proper maintenance records.	____	____
10. Inspected the manual and publication library to ensure that proper publications and forms were available.	____	____
11. Inspected the power plant perimeter and spaces between each generator to ensure that areas were clear of debris and hazards that may affect a safe operating environment.	____	____
12. Inspected the fuel supply to ensure that there was enough fuel to operate the plant until the next resupply.	____	____
13. Inspected petroleum, oils, and lubricants and parts storage areas for cleanliness, neatness, and general accessibility.	____	____
14. Conducted on-the-spot corrections as needed.	____	____

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 3-34.480
	FM 5-412
	FM 5-424

Develop a Power Plant Safety Standing Operating Procedure (SOP)
052-244-4201

Conditions: As a prime power supervisor in a tactical or nontactical environment when a new power plant has been installed, you are given applicable literature for power plant equipment and operation and maintenance logbooks.

Standards: Develop a power plant safety SOP that provides information designed for safe and efficient power plant operation.

Performance Steps
NOTE: The following performance steps are intended to standardize guidance for power plant safety SOPs. Safety SOPs should be detailed and developed specifically for each particular mission.

1. Create a safety SOP references index.
    a. Include all applicable references that pertain specifically to power plant operation.
    b. Include—
        (1) Directives from higher headquarters (battalion or company SOP).
        (2) Safety guidance from technical manuals applicable to the equipment being operated in the power plant.
        (3) Environmental protection references.
2. Develop the contents of the safety SOP.
    a. Include a requirement for at least two individuals to be on duty for each shift at all times.
    b. Include information on developing shifts of sufficient duration and scheduled time off so that personnel do not become a safety hazard to themselves or others.
    c. Include a requirement for emergency phone numbers to be posted by the telephone and for assigned personnel to become familiar with the numbers.
    d. Include a requirement for high-voltage switches, transformers, and circuit breaker cabinets to be secure and accessible only to prime power personnel.
    e. Include instructions on performing lockout and tagout procedures.
    f. Include the location of power plant safety equipment, such as—
        (1) Fire extinguishers.
        (2) Hot sticks.
        (3) First aid kits.
        (4) Hearing protection.
        (5) Safety goggles.
        (6) Rescue hooks.
        (7) Automatic external defibrillator.
3. Post the safety SOP in an accessible location.
4. Conduct spot-checks to ensure that personnel are adhering to the safety SOP.

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 task standards can be met.

Brief Soldier: Direct the Soldier to develop a power plant safety SOP.

Performance Measures	GO	NO-GO
1. Created a safety SOP references index.	____	____
2. Developed the contents of the safety SOP.	____	____

Performance Measures	GO	NO-GO
3. Posted the safety SOP in an accessible location.	____	____
4. Conducted spot-checks to ensure that personnel were adhering to the safety SOP.	____	____

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 3-34.480
FM 5-412
FM 5-424
NEC® HANDBOOK
NESC®

Perform a Power Plant After-Installation Inspection

052-244-4202

Conditions: As a prime power supervisor in a tactical or nontactical environment after a power plant is connected to an isolated load or an infinite grid, you are given power plant and safety standing operating procedures (SOPs); applicable manufacturer's literature; equipment operation and maintenance logbooks; a distribution system, one-line diagram; and a lockout and tagout kit.

CAUTION: NOISE LEVELS IN EXCESS OF 85 DECIBELS EXIST WITHIN A 50-FOOT RADIUS OF OPERATING EQUIPMENT. PERSONNEL MUST WEAR SINGLE HEARING PROTECTION WITHIN A 50-FOOT RADIUS. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY.

Standards: Perform a power plant after-installation inspection to ensure that personnel injury or equipment or environmental damage does not occur as a result of the operation.

Performance Steps

1. Perform an initial walk-through inspection of the installation, noticing key areas.
   a. Notice entrance points.
   b. Notice exit points.
   c. Notice overhead obstacles.
   d. Notice the piping location.
   e. Notice cables.
   f. Notice the hazardous materials storage area.
   g. Notice the fuel supply location.
2. Ensure that vehicles have easy access through entrance and exit points and that the fuel supply tanker can easily deliver fuel without compromising safe power plant operation.
3. Ensure that the road surface has sufficient load-bearing capabilities and that entrance and exit points can be accessed during extreme weather conditions (mud, snow, ice).
4. Ensure that appropriate warning signs are in place and that the secure area around the power plant is maintained by controlled access.
5. Ensure that the fuel storage/supply point has a berm/spill containment system in place to avoid environmental damage.
6. Ensure that the hazardous materials storage area has a berm/spill containment system in place to avoid environmental damage.
7. Check the ground system to ensure that connections are secure and that the ground system location does not present a tripping hazard and is sized to load cables.
8. Check the location of repair parts and supply storage areas to ensure that they are protected from the elements.
9. Inspect the area surrounding the power plant to verify that it has been cleared of vegetation that may catch fire.
10. Ensure that generators are placed level, front to back and side to side.

NOTE:

1. Some generators require that the front-to-back slope not exceed 2 inches and the side-to-side slope not exceed 1 inch to maintain proper alignment.

2. If the generator is ungrounded or only grounded through a high-impedance for relay and alarm, the generator neutral will not be grounded.

Performance Steps

11. Check test sheets to ensure that ground resistance is 25 ohms or less.
12. Ensure that a generator alignment inspection is conducted according to the manufacturer's literature.
13. Ensure that shipping protective devices, systems, blocks, and braces are removed.
14. Ensure that there is proper phase sequence and rotation between the power plant and the load.
15. Ensure that lockout and tagout procedures are closed out by removing locking and tagging devices.
16. Supervise power plant start-up.

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 task standards can be met.

Brief Soldier: Direct the Soldier to perform a power plant after-installation inspection.

Performance Measures	**GO**	**NO-GO**
1. Performed an initial walk-through inspection of the installation, noticing key areas.	____	____
2. Ensured that vehicles had easy access through entrance and exit points and that the fuel supply tanker could easily deliver fuel without compromising safe power plant operation.	____	____
3. Ensured that the road surface had sufficient load-bearing capabilities and that entrance and exit points could be accessed during extreme weather conditions (mud, snow, ice).	____	____
4. Ensured that appropriate warning signs were in place and that the secure area around the power plant was maintained by controlled access.	____	____
5. Ensured that the fuel storage/supply point had a berm/spill containment system in place to avoid environmental damage.	____	____
6. Ensured that the hazardous materials storage area had a berm/spill containment system in place to avoid environmental damage.	____	____
7. Checked the ground system to ensure that connections were secure and that the ground system location did not present a tripping hazard and was sized to load cables.	____	____
8. Checked the location of repair parts and supply storage areas to ensure that they were protected from the elements.	____	____
9. Inspected the area surrounding the power plant to verify that it had been cleared of vegetation that could catch fire.	____	____
10. Ensured that generators were placed level, front to back and side to side.	____	____
11. Checked test sheets to ensure that ground resistance was 25 ohms or less.	____	____
12. Ensured that a generator alignment inspection was conducted according to the manufacturer's literature.	____	____
13. Ensured that shipping protective devices, systems, blocks, and braces were removed.	____	____

Performance Measures	GO	NO-GO
14. Ensured that there was proper phase sequence and rotation between the power plant and the load.	____	____
15. Ensured that lockout and tagout procedures were closed out by removing locking and tagging devices.	____	____
16. Supervised power plant start-up.	____	____

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 3-34.480 FM 5-412 FM 5-424 TM 43-0156

Supervise an Annual Service

052-244-4204

Conditions: As a prime power supervisor in a tactical or nontactical environment during an annual service, you are given a power plant standing operating procedure (SOP), applicable literature for each specific component being serviced, applicable operation and maintenance logbooks, and a lockout and tagout kit.

CAUTION: NOISE LEVELS IN EXCESS OF 85 DECIBELS EXIST WITHIN A 50-FOOT RADIUS OF OPERATING EQUIPMENT. PERSONNEL MUST WEAR SINGLE HEARING PROTECTION WITHIN A 50-FOOT RADIUS. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY.

Standards: Supervise an annual service by ensuring that preventive-maintenance checks and services (PMCS) are complete, lockout and tagout procedures are in place, and tests and services are performed on each component.

Performance Steps

1. Inspect the area of operations (AO) to ensure that it is a safe and clean work environment.
2. Inspect equipment historical data to ensure that PMCS was completed.
3. Inspect lockout and tagout procedures.
4. Inspect maintenance logbooks for deficiencies that require special attention.
5. Inspect the manual and publication library to ensure that the proper publications are available for the maintenance team.
6. Review the inventory of basic issue items and additional authorized items.
7. Perform quality assurance (QA) and quality control (QC) spot checks during tests.
8. Review service packets and test sheets for deficiencies.
9. Ensure that lockout and tagout procedures are closed out by removing locking and tagging devices.
10. Ensure that subordinates properly clean and store tools and equipment.
11. Supervise start-up procedures to ensure that equipment is operational upon completion of the annual service.
12. Ensure that the annual service is recorded in maintenance logbooks.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise an annual service.

Performance Measures	GO	NO-GO
1. Inspected the AO to ensure that it was a safe and clean work environment.	____	____
2. Inspected equipment historical data to ensure that PMCS was completed.	____	____
3. Inspected lockout and tagout procedures.	____	____
4. Inspected maintenance logbooks for deficiencies that required special attention.	____	____

Performance Measures	GO	NO-GO
5. Inspected the manual and publication library to ensure that the proper publications were available for the maintenance team.	____	____
6. Reviewed the inventory of basic issue items and additional authorized items.	____	____
7. Performed QA and QC spot checks during tests.	____	____
8. Reviewed service packets and test sheets for deficiencies.	____	____
9. Ensured that lockout and tagout procedures were closed out by removing locking and tagging devices.	____	____
10. Ensured that subordinates properly cleaned and stored tools and equipment.	____	____
11. Supervised start-up procedures to ensure that equipment was operational upon completion of the annual service.	____	____
12. Ensured that the annual service was recorded in maintenance logbooks.	____	____

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 3-34.480

Develop a Power Plant Standing Operating Procedure (SOP)

052-244-4207

Conditions: As a prime power supervisor in a tactical or nontactical environment tasked to operate a power plant, you are given an operation order (OPORD)/mission tasking and the applicable literature for the power plant.

Standards: Develop a power plant SOP that provides instructions for a safe and efficient power plant operation.

Performance Steps

1. Define the mission, ensuring that it addresses the assigned mission of the unit operating the power plant.

NOTE: Details should include, but are not limited to, the installation start date, power plant operation start date, and mission ending date if known.

2. Create an SOP references index.
   a. Ensure that the index lists all applicable references that pertain specifically to power plant operation.
   b. Include the following:
      (1) Directives from higher headquarters (battalion SOP).
      (2) Applicable literature for the equipment being used.
      (3) Power plant operation OPORD.
      (4) Safety SOP.
      (5) SOP for lockout and tagout procedures.
      (6) Environmental protection references.

3. Define the positions and duties of power plant personnel required to complete the mission.

NOTE: The following are examples of positions and duties to include in the SOP.

   a. Include the power system technician, who is responsible for the detachment of personnel and equipment and the implementation of this SOP.
   b. Include the power station sergeant, who is responsible for the administrative needs of detachment personnel and the enforcement of safety and environmental requirements and this SOP.
   c. Include the power plant noncommissioned officer in charge, who is responsible for—
      (1) Managing the power plant by planning, coordinating, and directing power plant operations.
      (2) Inspecting the power plant site selection and preparation if required.
      (3) Planning and coordinating power plant equipment shipment if required.
      (4) Supervising power plant installation if required.
      (5) Planning and coordinating power plant logistics (petroleum, oils, and lubricants; the prescribed load list).
      (6) Assigning personnel to perform power plant duties (control room operator or equipment operator).
      (7) Planning power plant operation shifts.
      (8) Ensuring that personnel are qualified on power plant equipment.
      (9) Ensuring that the power plant is operated safely and efficiently to meet mission requirements.
      (10) Ensuring that power plant operational and maintenance records are maintained.
   d. Include the power plant safety noncommissioned officer, who is responsible for—
      (1) Ensuring that the power plant is operated in a safe manner.
      (2) Ensuring that power plant safety equipment (fire extinguishers, hot sticks, gloves) is maintained and stored according to the safety SOP.
      (3) Ensuring that first aid kits are readily available and serviceable.
      (4) Conducting periodic safety inspections.

Performance Steps

e. Include the control room operator, who is responsible for—
   (1) Operating the power plant safely and according to applicable equipment technical manuals.
   (2) Maintaining power plant operation logbooks.
   (3) Continuously monitoring power plant system parameters and making adjustments as required.
   (4) Ensuring that all clearances and cautions are posted and followed.

f. Include the equipment operator, who is responsible for—
   (1) Performing daily, weekly, and monthly preventive-maintenance checks and services (PMCS).
   (2) Performing and recording unit hourly checks.
   (3) Monitoring power plant equipment for unusual conditions.
   (4) Maintaining and updating unit maintenance logbooks.

g. Include the maintenance crew, who is responsible for—
   (1) Performing scheduled services on power plant equipment.
   (2) Performing unscheduled maintenance on power plant equipment and related distribution equipment as required.
   (3) Recording all maintenance in the maintenance logbook.

4. Establish operation procedures that include the total operation of the power plant.

NOTE: The operation procedures should include, but are not limited to, the following.

a. Include the following general information:
   (1) Directives for maintenance procedures.
   (2) Guidance on shift scheduling and time-off policies.
   (3) Procedures for regular or emergency leave.
   (4) Schedules for unit meetings or briefings.

b. Include the following power plant operating procedures:
   (1) Procedures for establishing operating crews and shifts.
      (a) Ensure that each shift consists of at least one control room operator and one equipment operator.
      (b) Ensure that there are three 2-person, 8-hour shifts for each 24-hour period, depending on personnel availability.
      (c) Ensure that personnel on duty remain in the power plant area.
   (2) Maintenance guidelines for power plant equipment PMCS.
      (a) Perform hourly equipment checks.
      (b) Conduct equipment checks.
   (3) Guidance for generator preparedness.
      (a) Perform before-operation checks before starting a generator.
      (b) Maintain at least one standby generator in a ready state with before-operation checks performed.
   (4) Guidelines for bringing the power plant online to an isolated grid.
   (5) Guidelines for bringing the power plant online to an infinite grid.
      (a) Guidance for adding and removing generators to the buss.
      (b) Detailed instructions on what steps to take if a generator fails.
      (c) Detailed instructions on what steps to take if a fault occurs outside the power plant.
   (6) Instructions for taking the plant off-line.
      (a) Detailed instructions for taking the power plant off an isolated grid.
      (b) Detailed instructions for taking the power plant off an infinite grid.
   (7) Instructions for load management.
      (a) Guidance on when to bring additional generators online, such as operating generators at 60 percent of the rated capability to prevent power plant loss in the event of generator failure.
      (b) Guidance on when to take generators off-line, such as removing excess generators as the load falls below 50 percent of the rated capability online.

Performance Steps

(c) Guidance on running only one generator at a time, such as ensuring a continuity of power to the isolated grid in the event of generator failure by never decreasing the number of generators online below two.

5. Develop a plan for constructing and maintaining a related distribution system that addresses issues related to installing, maintaining, and repairing distribution system equipment that is the responsibility of prime power personnel.
   a. Ensure that prime power personnel secure and maintain control of electrical equipment (high-voltage switches, transformers, circuit breakers).
   b. Post a sign that states "prime power personnel only" for secondary distribution panels installed by prime power personnel.
   c. Notify all customers before de-energizing electrical circuits for routine maintenance or system upgrades.
   d. De-energize high-voltage equipment before prime power personnel perform maintenance.
6. Develop a plan for power plant maintenance, ensuring that it addresses issues that concern scheduled or unscheduled maintenance.
   a. Designate maintenance personnel, ensuring that they are not part of the equipment operator crew, and distinguish which responsibilities are different from equipment operator responsibilities.
   b. Construct an equipment maintenance schedule and records board.
   c. Annotate safe-clearance procedures and reference the safe-clearance SOP.
   d. Implement maintenance logbook procedures.
   e. Construct an electrical, one-line diagram according to Task 052-244-3109.
   f. Create a customer notification chart or table, identify the customers being supplied power by the equipment, and record contact personnel information.
   g. Develop notification procedures for reporting significant events, such as accidents and equipment failure or damage.

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 task standards can be met.

Brief Soldier: Direct the Soldier to develop a power plant SOP.

Performance Measures	**GO**	**NO-GO**
1. Defined the mission, ensuring that it addressed the assigned mission of the unit operating the power plant.	____	____
2. Created an SOP references index.	____	____
3. Defined the positions and duties of power plant personnel required to complete the mission.	____	____
4. Established operation procedures that included the total operation of the power plant.	____	____
5. Developed a plan for constructing and maintaining a related distribution system that addressed issues related to installing, maintaining, and repairing distribution system equipment that was the responsibility of prime power personnel.	____	____
6. Developed a plan for power plant maintenance, ensuring that it addressed issues that concerned scheduled or unscheduled maintenance.	____	____

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

DA PAM 750-8
FM 3-34.480
FM 5-412
FM 5-424
NEC® HANDBOOK
STP 21-24-SMCT
UGLYS™

Supervise Power Plant Operations

052-244-4208

Conditions: As a prime power supervisor in a tactical or nontactical environment tasked to provide power to an operational, multiunit power plant (isolated load or infinite grid), you are given the power plant and safety standing operating procedures (SOPs), a power plant operator crew, the applicable literature for power plant equipment, and operation and maintenance logbooks.

CAUTION: NOISE LEVELS IN EXCESS OF 85 DECIBELS EXIST WITHIN A 50-FOOT RADIUS OF OPERATING EQUIPMENT. PERSONNEL MUST WEAR SINGLE HEARING PROTECTION WITHIN A 50-FOOT RADIUS. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY.

Standards: Supervise a multiunit power plant (isolated load or infinite grid) safely, efficiently, and according to applicable literature for power plant equipment and SOPs. Supervise the production of electrical power within established voltage and frequency parameters.

Performance Steps

NOTE: These performance steps are only a general guide for this task. They are not intended to replace the knowledge and experience needed to supervise this task. The supervisor should be an experienced prime power production specialist.

1. Assign and define the duties of the operating crew according to the established power plant SOP.

NOTE: The following positions are intended to establish a minimum standard. More details may be needed depending on the situation. Personnel may perform more than one duty, but at least two individuals are required per shift.

   a. Designate a shift supervisor. Duties should include, but are not limited to—
      (1) Ensuring that personnel adhere to safety procedures.
      (2) Ensuring that maintenance and operation logbooks are maintained.
      (3) Ensuring that at least two individuals are present at the power plant at all times.
      (4) Ensuring that hourly equipment checks are performed and recorded.
   b. Designate a control room operator. Duties should include, but are not limited to—
      (1) Operating the power plant in a safe and efficient manner.
      (2) Maintaining the operation logbook accurately and in a timely manner.
      (3) Maintaining a record of hourly checks.
   c. Designate an equipment operator. Duties should include, but are not limited to—
      (1) Performing daily, weekly, and monthly preventive-maintenance checks and services (PMCS).
      (2) Performing and recording hourly checks.
      (3) Recording entries in the maintenance logbook as maintenance occurs.

2. Define operational requirements.

NOTE: The following operational requirements are intended to set only a minimum standard.

   a. Determine the details necessary to bring the power plant online through customer coordination/load basis.
      (1) Determine how much load to assume and the power factors to maintain when paralleling to an infinite grid.
      (2) Perform a load assessment to determine how many generators will be needed when picking up an isolated load.
   b. Establish a date and time for power plant operation to begin.

NOTE: This step must be coordinated with the power plant officer in charge or noncommissioned officer in charge.

   c. Establish after-operation shift schedules, such as—
      (1) Three 8-hour shifts (recommended for normal operations).
      (2) Two 12-hour shifts (may be used depending on the availability of personnel and during emergency situations).

Performance Steps

d. Conduct a power plant safety briefing, stressing that—
   (1) Safety is important.
   (2) Personnel must maintain mental awareness at all times.
   (3) The use of personal protective equipment is mandatory.
   (4) All personnel will acknowledge and adhere to cautions and clearances.

3. Supervise power plant operations.
   a. Ensure that the operating crew performs duties in a safe and timely manner.
   b. Ensure that the control room operator brings the units online correctly.
      (1) Bring one unit online at a time if parallel to an infinite grid.
      (2) Parallel several units online before picking an isolated load.
   c. Ensure that the operating crew makes necessary adjustments to changing loads.
   d. Ensure that the operating crew has standby units ready to bring online if necessary.
   e. Ensure that the equipment operator performs the required PMCS.

4. Supervise power plant shutdown procedures.
   a. Ensure that the control room operator sheds the load and opens unit circuit breakers according to the established power plant SOP.
   b. Ensure that the equipment operator performs after-operation PMCS.
   c. Ensure that maintenance and operation logbooks are annotated with performed maintenance.

5. Report operation completion to higher headquarters.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise power plant operations.

Performance Measures	**GO**	**NO-GO**
1. Assigned and defined the duties of the operating crew according to the established power plant SOP.	____	____
2. Defined operational requirements.	____	____
3. Supervised power plant operations.	____	____
4. Supervised power plant shutdown procedures.	____	____
5. Reported operation completion to higher headquarters.	____	____

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 3-34.480
	FM 5-412
	FM 5-424

Perform Quality Assurance (QA) and/or Quality Control (QC) Duties
052-244-4209

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 work is completed according to the original agreement.
3. Perform field representative duties and responsibilities.

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

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

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 task standards can be met.

Brief Soldier: Direct the Soldier to perform QA and/or QC duties.

Performance Measures	**GO**	**NO-GO**
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 work 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.

References

Required	**Related**
	DA PAM 750-8 FM 3-34.480

References

Required

Related

FM 5-412
FM 5-424
LCH
NEC® HANDBOOK
NESC®
NETA™
S AND C HANDBOOK
TM 5-684
TM 5-811-1
TM 5-811-3
UGLYS™

Supervise a Power Plant Installation

052-244-4210

Conditions: As a prime power supervisor in a tactical or nontactical environment tasked to supervise the installation of permanent or temporary power plant to an isolated load or an infinite grid, you are given a power plant; a power plant site reconnaissance report; the applicable Theater Construction Management System (TCMS) prints; safety standing operating procedures (SOPs); the applicable manufacturer's literature; the equipment operation and maintenance logbooks; and a distribution system, one-line diagram.

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

CAUTION: NOISE LEVELS IN EXCESS OF 85 DECIBELS EXIST WITHIN A 50-FOOT RADIUS OF OPERATING EQUIPMENT. PERSONNEL MUST WEAR SINGLE HEARING PROTECTION WITHIN A 50-FOOT RADIUS. FAILURE TO COMPLY MAY CAUSE PERSONAL INJURY.

Standards: Supervise a power plant installation, ensuring that electrical requirements are met without injuring personnel or damaging equipment or the environment.

Performance Steps
NOTES:

1. These performance steps are only a general guide for this task. They are not intended to replace the knowledge and experience needed to perform this task. The inspector should be an experienced prime power production specialist.

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

1. Ensure that a good power plant site reconnaissance was performed by reviewing the site reconnaissance report.
2. Review current TCMS prints; SOPs; applicable manufacturer's literature; and the distribution system, one-line diagram.
3. Determine the method for moving and positioning power plant equipment.
4. Make arrangements for using nonorganic equipment support.
5. Determine the activities that must be accomplished, and place them in sequence from start to finish.
6. Assemble work crews and assign responsibilities to individuals to perform critical activities.
    a. Install power plant equipment pads (testing and installing the ground grid system).
    b. Install conduit between units and the centralized control van if required.
    c. Apply safe clearance tags to equipment and the system where required.
    d. Apply occupational health and safety procedures and practices.
    e. Unpack and inventory shipped equipment, materials, and tools.
    f. Move and position power plant equipment.
    g. Install fuel supply systems.
    h. Apply terminations to power and control cables as needed.
    i. Test power and control cables for serviceability.
    j. Connect power and control cables.

Performance Steps

k. Remove blocking from relays, contactors, and switches.
l. Service and install the electrical components of the power plant and distribution system.
m. Install mufflers.
n. Prepare engine components and mechanical systems for operation.
o. Align the engine to the generator.
p. Test the power plant/generator set alternating-current (AC) power system phase rotation.
q. Calibrate protective relays for the power plant/generator set and distribution equipment.
r. Prepare the power plant/generator set monitoring, alarm, and control systems for operation.
s. Perform preventative maintenance checks and services on the power plant.
t. Check system phase rotation.

7. Conduct a work site safety briefing.
8. Supervise work crew leaders during power plant installation.
9. Perform a power plant after-installation inspection and acceptance test.
10. Prepare an after-action report, and conduct an after-action briefing.

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 task standards can be met.

Brief Soldier: Direct the Soldier to supervise a power plant installation.

Performance Measures	**GO**	**NO-GO**
1. Ensured that a good power plant site reconnaissance was performed by reviewing the site reconnaissance report.	____	____
2. Reviewed current TMCS prints; SOPs; applicable manufacturer's literature; and the distribution system, one-line diagram.	____	____
3. Determined the method for moving and positioning power plant equipment.	____	____
4. Made arrangements for using nonorganic equipment support.	____	____
5. Determined the activities that had to be accomplished and placed them in sequence from start to finish.	____	____
6. Assembled work crews and assigned responsibilities to individuals to perform critical activities.	____	____
7. Conducted a work site safety briefing.	____	____
8. Supervised work crew leaders during power plant installation.	____	____
9. Performed a power plant after-installation inspection and acceptance test.	____	____
10. Prepared an after-action report, and conducted an after-action briefing.	____	____

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

References

Required

Related

FM 3-34.471
FM 3-34.480
FM 5-19
FM 5-412
FM 5-424
NEC® HANDBOOK
NESC®
TM 43-0156
TM 5-682
TM 5-684
TM 5-685
TM 5-686
TM 5-704

Conduct Contract Officer's Technical Representative (COTR) Operations

052-244-4211

Conditions: As a prime power supervisor in a tactical or nontactical environment, you are required to conduct COTR operations. You are given contract documentation and written standards and DA Form 3953 (Purchase Request and Commitment) and DFARS 201.602-2.

NOTES:

1. This task should only be performed by qualified personnel who have been trained and certified in basic contract officer representative (COR) operations.

2. COTRs who have direct or indirect financial interests that would place them in a position where there is a conflict of interest between themselves and the government will advise their supervisor and contract officer so that appropriate action may be taken. COTRs must avoid such conflict to maintain public confidence in the conduct of Army business with the private sector.

3. Accurate written records must be kept on all correspondence between you, the contracting officer, and contractors.

4. You are not authorized to provide any government-owned or -leased equipment, supplies, or space to a contractor.

Standards: Conduct COTR operations by serving as a technical subject matter expert, ensuring that government and contractor business relationships are mutually beneficial, keeping an arms-length relationship with the contractor while protecting government interests, treating the contractor with respect and impartiality, and ensuring that the contractor complies with the terms and conditions of the contract.

Performance Steps

1. Prepare to act as an official government representative for technical and administrative matters for a new contract.
   a. Read and ensure that you understand the terms of the contract and discuss unclear areas with the contracting officer.
   b. Ensure that you understand the administrative procedures required for initiating actions under the contract, such as issuing delivery orders or exercising contract options (including responsibilities for initiating additional requisitions).
   c. Create and maintain a file to document your actions as COTR under this contract.
      (1) Include a copy of the contract, memorandum of appointment, and instructions.
      (2) Include copies of relevant correspondence.
      (3) Include records of telephone conversations or other communications with the contractor.
      (4) Include other records of contractor performance (reports of in-process inspections, visits to the contractor's facility, and service reports).

NOTE: These items will vary depending on the nature of the contract.

   d. Review the contract schedule for deliveries, completion dates, option/renewal dates, and other report or data submission dates; and establish a log or tracking system to ensure that you are prepared and available for upcoming actions.

2. Conduct general and administrative duties.
   a. Know the scope and limitations of your authority, and use reasonable care in exercising authority.
   b. Safeguard contractor confidential and technical information.

Performance Steps

NOTE: Confidential information may include proposal pricing, technical documentation and personnel data. Do not release any information without first consulting the contracting officer to determine the release of information is permissible.

c. Notify the contracting officer immediately of any matter related to this contract that may require his action.
d. Provide the contracting officer with copies of all pertinent trip reports, conference reports, and correspondence.
e. Certify that the contractor has satisfactorily completed the contract and that the government has received and accepted all deliverable items.
f. Write an evaluation of the contractor's technical performance after the contract is completed.
g. Notify the contracting officer when you become aware of events or changes, permanent or temporary, that will impair your ability to perform COTR duties.
h. Designate others to perform inspections or monitor stated aspects of performance, when necessary due to distance or geographic dispersion sites.

NOTE: These individuals may act as your eyes and ears at the worksite, but may not be delegated authority to make decisions or represent the government in communications with the contractor. You should instruct them to immediately refer any potentially controversial matters to you.

i. Coordinate and validate that the contractor's staff is compliant with applicable security requirements.

3. Conduct technical liaison, monitoring, and inspection duties.
   a. Interpret government drawings and specifications for the contracting officer, and provide that information to the contractor (upon specific written authorization from the contracting officer).
   b. Coordinate site entry for contractor personnel, and ensure that government-furnished property is available when required.
   c. Review contractor requests for travel, overtime, equipment, or subcontracting not approved by the contracting officer before contract award.
   d. Analyze the contractor's technical and management reports.
   e. Provide the contracting officer with technical recommendations on government or contractor-proposed changes, including assessments of their specific impact on the contract and its cost.
   f. Assist in negotiating postcontract claims and termination adjustments upon request from the contracting officer.
   g. Observe the contractor to determine if performance complies with the contract.

NOTE: This includes observation of the work system, methods, and execution.

   h. Immediately notify the contractor and contracting officer of any potentially hazardous working conditions.

NOTE: The contractor is always required to comply with federal Occupational Safety and Health Administration (OSHA) guidelines and state or local requirements for workplace safety.

   i. Record and report nonconforming work incidents, delays, or problems (including inadequacies, discrepancies, or questionable practices for corrective action) to the contracting officer and advise the contracting officer in the following situations:

NOTE: You are required to submit a monthly report concerning performance of services rendered under this contract.

      (1) Possible changes in contractor management or key personnel, including clauses, if it affects security access to systems/government facilities.
      (2) Potential labor disputes or workforce problems.
      (3) Disagreements.

4. Conduct inspection and acceptance duties.
   a. Inspect all deliverable items, services, or materials to determine satisfactory compliance with the contract.
   b. Accept or recommend the rejection of contract deliverables to the contracting officer.
   c. Inspect off-the-shelf commercial items.
      (1) Verify the type and kind (correct size, color, model, or part number).
      (2) Check the quantity delivered.

Performance Steps

(3) Check for visible damage (including damage to packing materials for items subject to internal damage from rough handling).
(4) Operability.

d. Monitor and accept services not involving deliverable end items upon work completion or at the end of the month.
e. Promptly perform inspections or acceptance testing within the allotted time.

NOTE: If there are any doubts about item compliance with the specifications in the contract, do not accept it. Do not accept the item just because the acceptance period is running out. Delays in inspection may result in the payment of interest penalties to the contractor once items are finally accepted.

f. Ensure that procedures found in the current contract award document are followed, not those in a previous or subsequently revised version.

NOTE: If acceptance test procedures require revision, ask the contracting officer to modify the contract.

g. Observe performance tests. Highly complex items are typically required to perform successfully in the government's working environment for a specified period (usually 30 days) before the government accepts the item. Contract language should include acceptable downtime percentages, mean time between failure standards, or other factors to be used to determine when the equipment or software has satisfied the performance test period requirements.
h. Inform the contracting officer immediately if the delivered items (equipment, photography, report) do not meet the contract's inspection or acceptance requirements.

5. Conduct invoice and payment duties.

NOTE: Contract payment procedures are not the same. Carefully follow the instructions given by your contracting officer regarding the handling of invoices and payment.

a. Review contractor invoices for payment and recommend approval or disapproval as directed by the contracting officer.

NOTE: If this contract is subject to 5 CFR 1315 (Prompt Payment Act), the government must pay interest penalties if invoices are not paid on time. Interest penalties will be paid out of unit program funds.

b. Certify the invoice immediately upon acceptance of items/services by recording the date and time that items were received/services completed on the invoice.
c. Review vouchers to ensure that charges are commensurate with observed performance.

NOTE: It is your responsibility to question or accept direct charges (labor, materials, travel). Alert the contracting officer if the billing includes material or equipment charges of undelivered items due at the work site. The contracting officer is responsible for verifying correctness of indirect rates, fringe benefits, and fees. After you approve the voucher, return it to the contracting officer who will also approve and forward the voucher to the appropriate finance office.

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 task standards can be met.

Brief Soldier: Direct the Soldier to conduct COTR operations.

Performance Measures	**GO**	**NO-GO**
1. Prepared to act as an official government representative for technical and administrative matters for a new contract.	____	____
2. Conducted general and administrative duties.	____	____
3. Conducted technical liaison, monitoring, and inspection duties.	____	____
4. Conducted inspection and acceptance duties.	____	____

Performance Measures	GO	NO-GO
5. Conducted invoice and payment duties.	____	____

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 3953
DFARS 201.602-2

Related
DOD 5500.7-R
EM 385-1-1
ER 385-1-31
FM 3-34.480
FM 5-412
FM 5-424
LCH
NESC®
NETA™
NFPA 70E
OSHA STDS AND REGS
TM 5-682
TM 5-684
TM 5-686
TM 5-704
TM 5-811-1
TM 5-811-3
UGLYS™

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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

U.S. Units	Multiplied By	Equals Metric Units
Length		
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
Area		
Square inches	6.45160	Square centimeters
Square feet	0.09290	Square meters
Square yards	0.83610	Square meters
Volume		
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
Weight		
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
Pressure		
Pounds per square inch	6.90000	Kilopascals

Table A-1. Metric Conversion Chart (continued)

Metric Units	Multiplied By	Equals U.S. Units
Length		
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
Area		
Square centimeters	0.15500	Square inches
Square meters	10.76400	Square feet
Square meters	1.19600	Square yards
Volume		
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
Weight		
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
Pressure		
Kilopascals	0.14493	pounds per square inch

APPENDIX B

Wire Gauge Size Conversion Chart

This appendix contains wire gauge size conversions. Table B-1 is a wire gauge size conversion chart.

Table B-1. Wire Gauge Size Conversion Chart

AWG	Diameter		Cross Section Area			
	Inches	Millimeters	Square Inches	Square Millimeters	Circular Mils	Resistance Ohms/Meters
0000	0.460000	11.6800	0.16620000	107.20000	211600.000	0.000161
000	0.409600	10.4000	0.13180000	85.03000	167800.000	0.000203
00	0.364800	9.2660	0.10450000	67.43000	133100.000	0.000256
0	0.324900	8.2520	0.08289000	53.48000	105500.000	0.000323
1	0.289300	7.3480	0.06573000	42.41000	83690.000	0.000407
2	0.257600	6.5430	0.05123000	33.63000	66370.000	0.000513
3	0.229400	5.8270	0.04134000	26.27000	52630.000	0.000647
4	0.204300	5.1890	0.03278000	21.15000	41740.000	0.000815
5	0.187900	4.6200	0.02600000	16.77000	33100.000	0.001030
6	0.162000	4.1150	0.02062000	13.30000	26250.000	0.001300
7	0.144300	3.6650	0.01635000	10.55000	20820.000	0.001630
8	0.128500	3.2640	0.01297000	8.36600	16510.000	0.002060
9	0.114400	2.9060	0.01028000	6.63400	13090.000	0.002600
10	0.101900	2.5880	0.00815600	5.26100	10380.000	0.003280
11	0.090740	2.3050	0.00646700	4.17200	8234.000	0.004130
12	0.080810	2.0530	0.00512900	3.30900	6530.000	0.005210
13	0.071960	1.8280	0.00406700	2.62400	5178.000	0.006570
14	0.064080	1.6280	0.00322500	2.08100	4107.000	0.008290
15	0.057070	1.4500	0.00255800	1.65000	3257.000	0.010400
16	0.050820	1.2910	0.00202800	1.30900	2583.000	0.013200
17	0.045260	1.1500	0.00160900	1.03800	2048.000	0.016600

Table B-1. Wire Gauge Size Conversion Chart (continued)

AWG	Diameter		Cross Section Area			
	Inches	Millimeters	Square Inches	Square Millimeters	Circular Mills	Resistance Ohm/Meters
19	0.035890	0.9116	0.00101200	0.65270	1288.000	0.026400
20	0.031960	0.8118	0.00080230	0.51760	1022.000	0.033300
21	0.028460	0.7229	0.00063630	0.41050	810.100	0.042000
22	0.025350	0.6439	0.00050460	0.32560	642.400	0.053000
23	0.022570	0.5733	0.00040010	0.25820	509.500	0.066800
24	0.020100	0.5105	0.00031730	0.20470	404.000	0.084200
25	0.017900	0.4547	0.00025170	0.16240	320.400	0.106000
26	0.015840	0.4049	0.00019960	0.12880	254.100	0.134000
27	0.014200	0.3607	0.00015830	0.10210	201.500	0.169000
28	0.012640	0.3211	0.00012550	0.08098	159.800	0.213000
29	0.011260	0.2860	0.00009954	0.06422	126.700	0.268000
30	0.010030	0.2548	0.00007894	0.05093	100.500	0.339000
31	0.008928	0.2268	0.00006260	0.04039	79.700	0.427000
32	0.007950	0.2019	0.00004964	0.03023	63.210	0.538000
33	0.007080	0.1796	0.00003944	0.02545	50.220	0.679000
34	0.006305	0.1601	0.00003122	0.02014	39.750	0.856000
35	0.005615	0.1426	0.00002476	0.01597	31.520	1.080000
36	0.005000	0.1270	0.00001963	0.01267	25.000	1.360000
37	0.004453	0.1131	0.00001557	0.01005	19.830	1.720000
38	0.003965	0.1007	0.00001235	0.00797	15.720	2.160000
39	0.003531	0.0897	0.00000979	0.00632	12.470	2.730000
40	0.003145	0.0799	0.00000777	0.00501	9.888	3.440000
41	0.002800	0.0711	0.00000616	0.00397	7.842	
42	0.002494	0.0633	0.00000488	0.00315	6.219	
43	0.002221	0.0564	0.00000387	0.00250	4.932	

Table B-1. Wire Gauge Size Conversion Chart (continued)

AWG	Diameter		Cross Section Area			
	Inches	Millimeters	Square Inches	Square Millimeters	Circular Mils	Resistance Ohm/Meters
44	0.001978	0.0502	0.00000307	0.00198	3.911	
45	0.001761	0.0447	0.00000244	0.00157	3.102	
46	0.001568	0.0398	0.00000193	0.00125	2.460	
47	0.001397	0.0355	0.00000153	0.00099	1.951	
47	0.001397	0.0355	0.00000153	0.00099	1.951	
48	0.001244	0.0316	0.00000122	0.00078	1.547	
49	0.001107	0.0281	0.00000096	0.00062	1.227	
50	0.000986	0.0251	0.00000076	0.00049	0.973	

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GLOSSARY

Section I
Acronyms & Abbreviations

1SG	first sergeant
AC	alternating current
ACCP	Army Correspondence Course Program
AIT	advanced individual training
AN	annually; Army Navy
ANCOC	Advanced Noncommissioned Officer Course
AO	area of operations
AR	angle of repose; armor; Army regulation
ARNG	Army National Guard
ARNGUS	Army National Guard of the United States
ASI	additional skill identifier
ATS	automatic transfer switch
attn	attention
AWG	American wire gauge
BA	biannually
BNCOC	Basic Noncommissioned Officer Course
BOM	bill of materials
BW	biweekly; biological warfare
CATS	combined arms training strategies
CMF	career management field
COTR	contract officer's technical representative
CPL	corporal
CSM	command sergeant major
CTT	common task test; common task training
DA	Department of the Army

DC	District of Columbia; direct current
DFARS	defense federal acquisition regulation supplement
DOD	Department of Defense
EM	engineer manual;
EPMS	Enlisted Personnel Management System
ER	evaluation report; engineer regulation
F	failed
FM	field manual
freq	frequency
GED	General Education Development
IR	infrared
LCH	Lineman's and Cableman's Handbook
METL	mission-essential task list
MO	Missouri; monthly; month; medical officer; maintenance and operations
MOS	military occupational specialty
MSG	master sergeant
NA	not applicable
NCO	noncommissioned officer
NCOES	Noncommissioned Officer Education System
NEC	National Electrical Code
NESC	National Electrical Safety Code
NETA	InterNational Electrical Testing Association
NFPA	National Fire Protection Association
OPORD	operation order
OSHA	Occupational Safety and Health Administration
P	passed
pam	pamphlet
PFC	private first class

PLDC	Primary Leadership Development Course
PMCS	preventive-maintenance checks and services
PPE	protective posture equipment; personal protective equipment
PVT	private
QA	quality assurance
QC	quality control
QT	quarterly
RMS	root-mean-square
S AND C	switchgear and control
SA	semiannually
SD	special duty
SFC	sergeant first class
SGM	sergeant major
SGT	sergeant
SL	skill level
SM	Soldier's manual
SMCT	Soldier's manual of common tasks
SOP	standing operating procedure
SPC	specialist; standard printing color
SSG	staff sergeant
STD	standard
STP	Soldier training publication
TCMS	Theater Construction Management System
TG	trainer's guide
tm; TM	team; technical manual; theater missile; trademark
tng	training
TRADOC	United States Army Training and Doctrine Command
USAR	United States Army Reserve

USASMA	United States Army Sergeants Major Academy
WK	weekly

Section II
Terms

bus
A fixed assembly of conductors or bars for connecting power generating equipment and associated electrical equipment to a grid or cubicles.

REFERENCES

Required Publications

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

Army Regulations

AR 385-10	The Army Safety Program. 23 August 2007
AR 614-200	Enlisted Assignments and Utilization Management. 27 June 2007

Department of Army Forms

DA forms are available on the APD website (www.apd.army.mil).

DA FORM 2028	Recommended Changes to Publications and Blank Forms
DA FORM 2702	Bill of Materials.
DA FORM 3953	Purchase Request and Commitment.
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