AIR FORCE

QUALIFICATION TRAINING PACKAGE (AFQTP)

FOR

ELECTRICAL POWER PRODUCTION

(3E0X2)

MODULE 16

GENERATOR SET GROUNDING FUNDAMENTALS

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MODULE 16

GENERATOR SET GROUNDING FUNDAMENTALS

Career Field Education and Training Plan (CFETP) references from 1 Aug 02 version.

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Supersedes AFQTP 3E0X2-26, 15 Aug 00

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Pages: 9/Distribution F

AIR FORCE QUALIFICATION TRAINING PACKAGES
FOR
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INTRODUCTION

Before starting this AFQTP, refer to and read the "AFQTP Trainer/Trainee Guide."

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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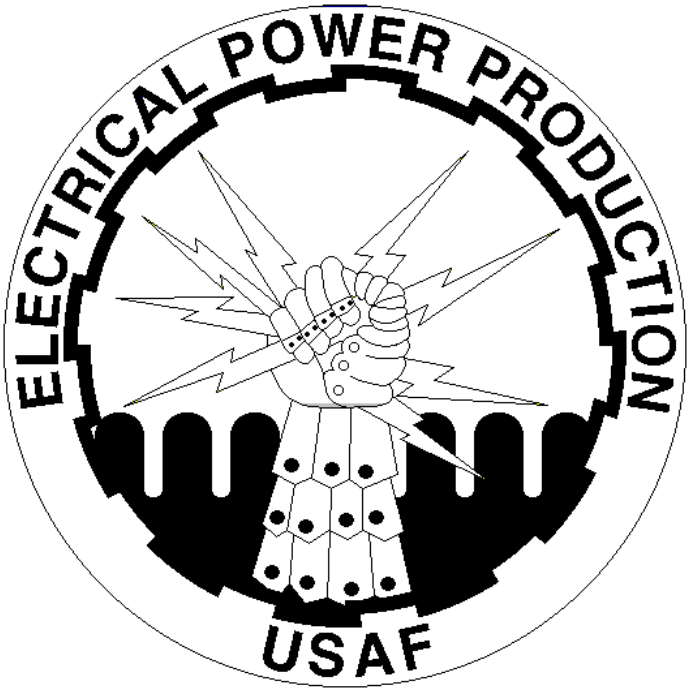
Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



GENERATOR SET GROUNDING FUNDAMENTALS

MODULE 16 **AFQTP UNIT 2**

INSTALL EQUIPMENT GROUNDS (16.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

INSTALL EQUIPMENT GROUNDS

Task Training Guide

STS Reference Number/Title:	16.2., Install equipment grounds.
Training References:	1. CD-ROM Air Force Qualification Training Package (AFQTP) 3E0X2 Electrical Power Production, Version 1.0, Nov 97: *Grounding Fundamentals.* 2. CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Mar 99: *Power Production Test Equipment*. 3. Career Development Course (CDC) 3E052A Vol. 1, Unit 6, Section 065, *Generator Operations* and Vol. 2, Unit 3, *Grounding Fundamentals*. 4. 35C2 series Technical Orders (TOs). 5. Air Force Instruction (AFI) 32-1065, *Grounding Systems.* 6. Local Procedures.
Prerequisites:	1. **Possess, as a minimum 3E032 AFSC.** 2. **Review the following references:** 2.1. CDC 3E052A Vol. 1, Unit 6, Section 065, *Generator Operations* and Vol. 2, Unit 3, *Grounding Fundamentals*. 2.2. AFI 32-1065. 2.3. Applicable TOs. 2.4. CD-ROM 3E0X2 Electrical Power Production, Version 1.0, Mar 99: *Power Production Test Equipment*. 3. **Complete the CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Nov 97: *Grounding Fundamentals*.**
Equipment/Tools Required:	1. Computer to support AFQTP CD-ROMs. 2. Technical and Publications Library. 3. General tool kit. 4. Grounding kit. 5. Generator. 6. Personal safety equipment.
Learning Objective:	Given the proper equipment, properly install a equipment ground to provide a metallic connection with the earth and equipment.
Samples of Behavior:	1. Trainee will be able to identify steps necessary to install ground rods. 2. Trainee will proper install an equipment ground.
Notes:	
1. Trainer must develop an exercise scenario to validate ability of trainee to meet learning objective and samples of behavior. 2. To successfully complete this procedure, follow the steps outlined in the applicable technical manual exactly--no exceptions. 3. Any safety violation is an automatic failure.	

INSTALL EQUIPMENT GROUNDS

1. Background: Distribution system grounds are very important. They allow fuses and other system safety components to operate properly. The most elaborate grounding system you can design may prove ineffective unless the connection of the system to earth is adequate and has a sufficiently low resistance. For safety reasons, electric power systems and equipment are intentionally grounded, so that insulation failure results in operation of protective devices to de-energize circuits, thus reducing risk to personnel. The word grounding is commonly used in electric power system work to cover both system grounding and equipment grounding. However, the distinction between system and equipment grounding should be recognized.

1.1. System Grounds: A system ground is a connection to one ground from one conductor of an electric circuit, normally the neutral. The purpose of a system ground is to stabilize voltage to ground and give a low impedance path for fault current.

1.2. Equipment Grounds: Equipment ground is a connection to ground from non-current carrying metallic parts of the installation such as conduit and equipment cases of equipment connected to an electric circuit. The equipment ground is connected to an electrical system ground (neutral) only at the service entrance of a building and should not exceed 25 ohms to ground. The purpose of grounding equipment is to ensure personnel safety, by reducing any charge in an equipment item to near zero volts with respect to ground. Thus, reducing potential for a fire or explosive hazard until the circuit protective devices clears the fault.

1.3. Static Grounds: A static ground is a connection made between a piece of equipment and the earth for the purpose of draining off static electricity charges before a sparking potential is reached. Static grounds are typically used on large metal objects, such as fuel tanks and aircraft, to earth through a ground rod. It is also necessary to use static when working on electronic printed circuit cards, since components are subject to voltage spikes that may be caused by static electricity.

2. ***Complete the CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Nov 97, Grounding Fundamentals. Upon completion of the above-mentioned CD-ROM properly install an equipment ground using the step-by-step procedures listed below.***

NOTE:
The review questions for this material are contained in the above–mentioned CD-ROM.

3. ***To perform this task, follow these steps:***

Step 1: Locate the appropriate reference (TO or applicable manufacture's manual) for the equipment to be grounded.

SAFETY:
DO NOT OPERATE EQUIPMENT UNLESS CONNECTED TO A SUITABLE GROUND SYSTEM. ELECTRICAL FAULTS IN EQUIPMENT, LOAD LINES, OR LOAD EQUIPMENT CAN CAUSE INJURY OR ELECTROCUTION FROM CONTACT WITH AN UNGROUNDED SYSTEM.

Step 2: Obtain the appropriate safety clothing and equipment required.

Step 3: Obtain digging permit for the area where the ground will be install, if required.

Step 4: Connect coupling to the ground rod and install driving stud in coupling. Make sure driving stud is bottomed on the ground rod.

SAFETY:
BEFORE DRIVING GROUND RODS INTO THE GROUND, ENSURE THE AREA IS CLEAR OF ANY UNDERGROUND UTILITIES.

Step 5: Drive rod into ground to correct depth; a ground rod must have a minimum diameter of 5/8 inch if solid or ¾ inch if pipe, and must be driven to minimum depth of 8 feet.

Step 6: Connect additional ground rod extensions by removing the driving stud in coupling and installing another ground rod in coupling. Make sure ground rod is bottomed on ground rod previously installed. Connect another coupling on the new ground rod and install driving stud.

Step 7: After ground rods have been driven into the ground, remove the driving stud and top coupling.

Step 8: Connect clamp to the top ground rod.

Step 9: Attach grounding conductor to ground rod clamp and secure by tightening screw.

Step 10: Attach conductor to generator by tightening.

NOTE TO TRAINER:
In order for the trainee to accomplish this task, you must give the trainee the all the necessary supplies and equipment that you want her/him to perform.

HINT TO TRAINER:
The ground system must be tested before the ground system is to be used.

INSTALL EQUIPMENT GROUNDS

PERFORMANCE CHECKLIST

INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE….?	YES	NO
1. Locate the appropriate reference for the grounding procedures for the equipment to be grounded		
2. Obtain the appropriate safety clothing and equipment required		
3. Connect coupling to the ground rod and install driving stud in coupling correctly		
4. Connect additional ground rod extensions correctly		
5. Drive rod into ground to correct depth		
6. Remove the driving stud and top coupling, after ground rods have been driven into the ground		
7. Connect clamp to the top ground rod		
8. Attach grounding conductor to ground rod clamp and secure by tightening screw		
9. Attach conductor to generator by tightening		
10. Comply with all safety requirements		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

MEMORANDUM FOR HQ AFCESA/CEOF
139 Barnes Drive Suite 1
Tyndall AFB, FL 32403-5319

FROM:

SUBJECT: Qualification Training Package Improvement

1. Identify module.

   Module # and title_____

2. Identify improvement/correction section(s):

   _____ STS Task Reference
   _____ Training Reference
   _____ Evaluation Instructions
   _____ Performance Resources
   _____ Steps in Task Performance
   _____ Performance Checklist
   _____ Feedback
   _____ Format
   _____ Other

3. Recommended changes--use a continuation sheet if necessary.

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

4. You may choose to call in your recommendations to DSN 523-6392 or FAX DSN/Commercial 523-6488 or (850) 283-6488 or email ceof.helpdesk@tyndall.af.mil.

5. Thank you for your time and interest.

YOUR NAME, RANK, USAF
Title/Position