

UNITED STATES MARINE CORPS
Utilities Instruction Company
Marine Corps Engineer School
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U-20B09
May 00

STUDENT HANDOUT

**PLAN FIELD ELECTRICAL POWER AND
DISTRIBUTION SYSTEM WITH LIGHT SETS**

LEARNING OBJECTIVES:

a. **Terminal Learning Objective:**

Provided a mission, a map, a camp layout, a utility site reconnaissance report, a T/E, a T/O, and references. Plan a field electrical power generation and distribution system such that it will provide electrical power of the voltage, current, and frequency specified for the number and location of tents and facilities per the references. (1141.08.01)

b. **Enabling Learning Objectives:**

(1) Provided an operation order, camp layout, a completed power requirement worksheet, and a completed phase balancing worksheet, with the aid of references, list the minimum size conductors required for a bus bar sufficient to serve as part of an overhead distribution system required to support the operation using the general illumination kits in accordance with the National Electric Code and the SL-3 extracts for the general illumination kits. (1141.08.01f)

(2) Provided an operation order, camp layout, a completed power requirement worksheet, and a completed phase balancing worksheet, using the general illumination kits, with the aid of references, size the different conductors for each circuit that will serve as part of an overhead distribution system required to support the operation in accordance with the National Electric Code and the SL-3 extracts for the general illumination kits. (1141.08.01i)

(3) Provided an operation order, camp layout, a completed power requirement worksheet, and a completed phase balancing worksheet, with the aid of references, size the overcurrent protection devices for each circuit that will serve as part of an overhead distribution system to support the operation in accordance with the National Electric Code and the SL-3 extracts for the general illumination kits. (1141.08.01k)

(4) Provided an operation order, camp layout, a completed power requirement worksheet, and a completed phase balancing worksheet, with

the aid of references, on the camp layout, draw all the overhead distribution system circuits required to support the operation in accordance with the National Electric Code and the SL-3 extracts for the general illumination kits. (1141.08.01n)

BODY

1. The Minimum Size Conductors required For a Bus Bar:

a. The conductors for the bus bar are selected based on the current carrying capacity of the conductors and the maximum current demand for the generator site.

b. The current carrying capacity for the conductors listed in the light sets are as follows:

- (1) 8 AWG is rated at 70 amperes
- (2) 4 AWG is rated at 125 amperes
- (3) 2 AWG is rated at 170 amperes

c. Always ensure that you select a conductor that has a current carrying capacity equal to or greater than the total demand load on the highest phase in amperes.

d. For distribution conductors that may be used that are not part of the light sets, utilize Table 310-17, the 75-degree column of the National Electric Code for sizing.

e. Note that special considerations may have to be considered using Table 310-17 de-rating factors based on the ambient temperatures of the area of operations.

2. Size the Different Conductors for Each Circuit:

a. The conductors for sub feeder circuits are selected based on the current carrying capacity of the conductors and the maximum current demand for the circuit.

b. The conductors within the light sets that can be used as sub feeders are 8 AWG, 4 AWG, and 2 AWG.

c. It is important to remember that a sub feeder conductor can never be larger than the feeder it serves.

d. For sub feeder conductors that may be used that are not part of the light sets, utilize Table 310-17, the 75-degree column of the National Electric Code for sizing.

e. Note that special considerations may have to be considered using Table 310-17 de-rating factors based on the ambient temperatures of the area of operations.

3. Size the Overcurrent Protection Devices for Each Circuit:

a. Overcurrent protection devices should be provided for all ungrounded feeder, sub feeder, and branch circuit conductors.

b. Overcurrent protection devices should be selected based on the ampacity of the ungrounded conductors for each circuit requiring protection.

c. Note that three phase circuits shall have three phase overcurrent protection devices and single-phase circuits shall have single-phase overcurrent protection devices.

d. Except in the case of electric motor circuits, as a general rule the ampacity of the overcurrent protection device should not exceed the ampacity of the ungrounded conductors.

e. Due to the limited availability of overcurrent protection devices within the light sets, in order to safely protect all circuit conductor's overcurrent protection devices may have to be purchased from the civilian market.

4. Draw the Overhead Distribution Circuits:

a. All circuits from the generator to the branch circuits should be neatly drawn on the layout.

b. The number of conductors contained in a circuit will be indicated by 1 slash mark for each conductor drawn on the line that represents the circuit.

c. Equipment Grounding Conductors will be identified for feeder and sub feeder circuits only.

d. All areas requiring clearances should be marked in feet on the layout. Article 225-18 of the NEC covers minimum clearances however, these height requirements may have to be increased to meet a safe height for different situations.

e. Different colors can be used to identify phase conductors or different circuits provided that a legend is illustrated on the layout.

REFERENCES: NATIONAL ELECTRICAL CODE
SL-3 FOR THE GENERAL ILLUMINATION LIGHT SETS

