STATIONARY BATTERY SIZING SHORTCOURSE

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ESA℠

TERMINAL OBJECTIVE

Upon completion of this training, the participant will be able to identify the factors to consider when sizing a new or replacement stationary battery, understand the use of "C rates" to describe battery capacity and discharge and charge rates, determine the number of cells to be used in a battery based upon the system minimum and maximum voltages and the battery float and equalize voltage, develop a load list and associated battery duty cycle diagram, perform a discrete analysis of momentary loads to determine the maximum momentary load to be used when sizing the battery, evaluate and select factors for temperature correction, design margin and aging, determine if a float correction factor is necessary for a nickel-cadmium battery, determine a float correction for a nickel cadmium battery, recall the alloys used for lead-acid cells, recognize the various type of positive plate designs available for lead-acid batteries and describe the advantages and/or disadvantages of each, recognize the plate designs available for nickel-cadmium batteries, determine the R_T and/or K_T factors for cells using the battery manufacturers' curves and data sheets, size a stationary battery using either the constant current (using positive plates or Ampere-hours) or constant power method and size a battery charger for a dc system that utilizes a stationary battery.

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ENABLING OBJECTIVES

The standard for each of the following objectives is the material contained in the course materials provided to the participant.

Given the course materials the participant shall be able to:

- **S01** Recall the definition of stationary battery, float charge, vented cell, and valve regulated cell and describe the differences between the vented and valve regulated cell types.
- **S02** Recall the characteristics and common applications for long duration, general purpose and high performance vented batteries.
- **S03** Recall the basis for the rating of a stationary battery and the standard references (i.e., discharge rate, end-of-discharge voltage, temperature and electrolyte specific gravity for lead-acid cells) used in North America.
- **S04** Recall the factors that may need to be considered when sizing a stationary battery.

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ENABLING OBJECTIVES
(continued)

- **S05** Discuss the temperature correction factor, design margin factor, aging factor and float correction factor (nickel-cadmium) and how each is applied when sizing a stationary battery.
- **S06** Discuss the importance of knowing the system minimum and maximum voltages and how that factors into the selection of number of cells and selection of end-of-discharge voltage.
- **S07** Discuss how to ensure that the float voltage, equalize voltage and end-of-discharge voltage meet the system design requirements once the number of cells are selected.
- **S08** Explain how a load list is developed and used to create a duty cycle diagram that can be used for battery sizing.
- **S09** Explain the two methodologies used to size a stationary battery, the capacity rating factors R_T and K_T, the factors for temperature correction, design margin, aging and float correction (NiCd).

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ENABLING OBJECTIVES
(continued)

- **S10** Discuss the float correction (sometimes referred to as a voltage depression) factor related to nickel-cadmium batteries that will be constant potential charged and how it is used in battery sizing, if it has not been accounted for in the manufacturer's data.
- **S11** Discuss the discharge characteristics for a cell and the format in which they are available.
- **S12** Describe "S" curves and "Fan" curves and how they may be used in battery sizing.
- **S13** Discuss how discrete modeling of momentary loads may be used to optimize the battery sizing.
- **S14** Explain how a stationary battery is sized using the manufacturer's data and battery duty cycle.
- **S15** Discuss the importance of developing a duty cycle for each scenario that requires the battery to support the load and why it is necessary to analyze each section of a battery duty cycle when performing the sizing calculation.

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ENABLING OBJECTIVES
(continued)

- **S16** Discuss the short circuit current available from a battery and how it may be calculated. Recall the rule-of-thumb for determining the available short circuit current from a battery.
- **S17** Recall the method for sizing a battery charger for a stationary battery system including the de-rating required for altitude and temperature.

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