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ONE-DAY* DC SYSTEM DESIGN SEMINAR (ESA-0305)
0.7 CEUs Awarded

OUTLINE

TIME**	SUBJECT
8:00 AM - 8:15 AM	Introduction
8:45 AM - 11:30 AM	Discussion of standards applicable to dc system design, the types of calculations that can be performed, equipment selection, parallel vs. redundant batteries and chargers, equipment location and use of monitoring systems
11:30 AM – 12:30 PM	**** LUNCH ****
12:30 PM – 4:00 PM	Discussion of short circuit currents, main disconnect vs. main protective device, system cross-ties, electrolyte containment systems, hazard reportability, recommended instrumentation and alarms, provision for battery testing, and provision for spare equipment
4:00 PM – 4:30 PM	Summary and review

* A two-day extended version of this seminar is also available
** Seminar start and end times can be modified to suit a client's schedule

OBJECTIVE, SKILLS & TARGET POPULATION

OBJECTIVE

The objective of the DC System Design Seminar is to provide the participants with a basic knowledge of the design bases typically used for dc system design. The participant will also become familiar with the industry standards applicable to dc system design and in the case of nuclear power generation, some of the documents issued by the US Nuclear Regulatory Commission that address system design. The participant will be provided with information that will enable her/him to understand the typical calculations which may be required for dc system design. The types of dc systems addressed by this seminar are

those used in: electric substations and generating systems; telecommunications systems; industrial facilities; data centers; or any other facility that includes a stationary battery installation.

SKILLS

After completing the seminar, the participant will understand dc system design including the requirements for personnel safety. The participant will gain knowledge of the industry standards and government codes or regulations applicable to dc system, as well as, the types of calculations that may be required to be performed for a design. He/she will become familiar with the typical design bases such as maximum and minimum voltage limits, selection of dc protective devices such as fuses and circuit breakers. The participant will understand the criteria used to select equipment locations, considerations for providing cross-ties between systems and criteria used to determine the need for spare parts.

TARGET POPULATION

Design, system or maintenance engineers or others, wishing to understand dc system design. The seminar provides information for both the novice and experienced person alike.

SEMINAR DESCRIPTION

This seminar was originally developed as an enhancement to the stationary battery sizing seminar and is typically presented together with that seminar. The seminar is based on the information and methodologies contained in some **IEEE**® Standards, for example, IEEE Std. 946™ and IEEE Std. 1375™, and the developer's knowledge. It is reviewed on a regular basis and updated as necessary to reflect the latest industry standards. Additionally, the seminar has been recognized as providing ***Continuing Education*** which has become important as more states require evidence of such seminars before renewal of an individual's electrician, professional engineer or other license or certification is granted. Depending upon the state, participants that successfully complete the Seminar may be able to satisfy all, or a portion, of those requirements.

INTRODUCTION

This portion of the seminar introduces the participants to dc system design. It discusses industry and government standards, codes and regulations that may apply to an application. Safety considerations are discussed.

SYSTEM DESIGN

This portion of the seminar discusses the many calculations that can be performed as part of a dc system design. It describes the options the design engineer has for selection of a main disconnect or protective device for the stationary battery and the requirements for ratings of protective devices applied on dc systems. Calculation of dc system short circuit current will be discussed and a rule-of-thumb for determining a conservative estimate of stationary battery short circuit current for lead-acid batteries will be presented. The

participant will understand the criteria for determining equipment location and selection. For example, will a single battery suffice or are multiple batteries a more prudent option and if so, should the multiple batteries be connected on parallel or should they be independent, redundant batteries? Similarly, is one battery charger per battery sufficient, should there be two in parallel or should a spare charger be provided? The criteria used to determine whether or not a dc system is intentionally grounded are discussed. In the case of ungrounded dc systems, the specification and selection of a system ground detector is address with the participants. Options for permanently installed battery monitoring systems are discussed. The pros and cons for provisions for cross-ties between multiple dc systems at a site will be addressed. The participant will understand system design considerations for installation, maintenance and testing (e.g., provision for battery load testing). Spill containment and requirements for hazard reportability will be discussed with the participant and the participant will learn how to determine the quantity of sulfuric acid in a lead-acid battery if it is not available from the manufacturer. The participant will understand the typical instrumentation applied on a dc system, when these instruments may initiate automatic actions and the types of alarms used on dc systems.

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