



# STATIONARY BATTERY BASICS & MAINTENANCE SEMINAR - VRLA

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# STATIONARY BATTERY BASICS & MAINTENANCE SEMINAR - VRLA



Developed by  
Marco W. Migliaro, PE, Life Fellow IEEE

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# INTRODUCTION & STATIONARY BATTERY BASICS - VRLA

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## TERMINAL OBJECTIVE

**Upon completion of this training, the participant will:**

Understand where VRLA batteries are used in stationary applications; typical applications for VRLA stationary batteries; their chemistry; the recombinant reactions, plate materials; expected life; standard ratings; and the distinction between vented and valve regulated lead-acid (VRLA) cells.

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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:**

- **VI01** Identify the types of stationary batteries, their applications and the types of loads served by stationary batteries.
- **VI02** Describe the differences between vented and VRLA cells and name the two types of VRLA cells.
- **VI03** Recall the standard rating parameters for a stationary battery, including the standard discharge rate, temperature, electrolyte specific gravity and end-of-discharge voltage.



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# STATIONARY BATTERY VISUAL INSPECTIONS - VRLA

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## TERMINAL OBJECTIVE




Upon completion of this training, the participant will be able to perform a detailed visual inspection of a stationary VRLA battery, rack and/or cabinet, and identify potential battery problems

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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:**

- **VV01** Recognize the DATE CODE on a cell and how it factors into an inspection
- **VV02** Identify the types of visual checks that can be made on a valve regulated lead-acid battery
- **VV03** State the visual checks that would be made on the container, cover, post-to-cover and jar-to-cover seals
- **VV04** State the visual checks that would be made on the cell posts and intercell connections
- **VV05** State the checks that would be made on the battery rack or cabinet

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# STATIONARY BATTERY INSPECTION REQUIREMENTS - VRLA

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## TERMINAL OBJECTIVE



**Upon completion of this training, the participant will:**

Understand the industry standards that provide recommendations for maintaining stationary VRLA batteries; the safety equipment required for maintaining stationary batteries; the safety procedures to be followed during maintenance; the requirements for hazard reportability and disposal of spent cells; the requirements for periodic inspections and tests including visual checks, measurement of voltage, cell temperature, charge current, ripple current/voltage, intercell connection resistance and internal resistance; how thermography can be used for maintenance; and the requirements for maintaining records.

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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:**

- **VM01** Recall the industry standards that provide recommendations for stationary VRLA battery maintenance.
- **VM02** State the safety equipment that is required when maintaining stationary batteries.
- **VM03** Recall the safety procedures that are followed during stationary battery maintenance and the requirements for hazard reportability and disposal of spent cells or batteries.
- **VM04** Recall the inspection frequencies for VRLA stationary batteries and the types of inspections performed for each.
- **VM05** Recall the types of capacity tests for VRLA stationary batteries, their frequencies and the signs of degradation that would cause the testing interval to be decreased.
- **VM06** Recall the requirements for maintaining records of battery maintenance inspections.

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## ENABLING OBJECTIVES





- **VM07** Recall how the individual cell/monobloc voltage and temperature are measured on VRLA batteries.
- **VM08** Recall the instrument used to measure intercell connection resistance.
- **VM09** Recall the model of a cell and the three techniques used to measure internal cell resistance.
- **VM10** Recall how the charge current for a battery may be determined and how charge current is used as an indicator of full charge for a cell/battery.
- **VM11** Recall how individual cell voltage is measured during a battery discharge test.
- **VM12** Recall where discharge data on a cell may be found and the types of discharge data made available by the battery manufacturers.
- **VM13** Recall how thermography may be used during battery maintenance and testing.

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# STATIONARY BATTERY CORRECTIVE ACTIONS - VRLA


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## TERMINAL OBJECTIVE




**Upon completion of this training, the participant will:**


Understand the corrective actions to be taken as a result of the problems/issues identified during maintenance inspections and tests; the criteria used to determine the need for an equalize charge to be applied to a battery; and the situations where single cell charging may be used in lieu of equalize charging the entire 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:**

- **VC01** Recall the corrective action that should be taken if internal cell/monobloc resistance is found to be high.
- **VC02** Recall the corrective action to be taken if corrosion is found on cell connections or intercell connection resistance is high.
- **VC03** Recall the corrective action to be taken if the cells/monoblocs are found to have electrolyte or dirt on them.
- **VC04** Recall the corrective action to be taken if the battery float voltage, measured at the battery terminals is outside of the specified limits.
- **VC05** Recall the corrective action to be taken if a cell/monobloc voltage is below the manufacturer's critical voltage.
- **VC06** Recall the corrective action to be taken if the temperature differential between cells is found to be greater than 3 °C (5 °F).

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