



GLOSSARY OF STATIONARY BATTERY TERMINOLOGY

The following glossary is intended to provide definitions for many of the terms one would encounter in the installation and maintenance of stationary batteries. In general, the word cell is used for many definitions in which the words battery or monobloc may be substituted to obtain a similar definition for the term as applied to a battery or monobloc.

Throughout the world, different terms are used in different countries to describe components and procedures associated with stationary batteries. To the extent practical, as many of these terms as possible have been included in the glossary.

A list of common [acronyms](#) and [units](#) follows the definitions.

Note: the letters "K", "X", "Y" and "Z" do not have terms and definitions.

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>
<u>I</u>	<u>J</u>	K	<u>L</u>	<u>M</u>	<u>N</u>	<u>O</u>	<u>P</u>
<u>Q</u>	<u>R</u>	<u>S</u>	<u>T</u>	<u>U</u>	<u>V</u>	<u>W</u>	X
Y	Z						



A

Absorbed electrolyte: Electrolyte that has been immobilized in an absorbent separator. (The separator is usually made of a glass or polymeric fiber.)

Absorbed electrolyte cell: A cell, usually a valve regulated lead-acid type, which utilizes absorbed electrolyte. Also see **valve regulated lead-acid cell**.

Active neutralization: The process of a person(s) adding a base to an acidic solution (i.e., for acid electrolyte) or an acid to a basic solution (i.e., alkaline electrolyte) until the resulting solution is chemically neutral (i.e., pH=7). See **passive neutralization**.

Ac conductance: The real part of internal admittance. Also referred to as **internal conductance**.

Ac conductance (cell): The real part of the internal admittance of a cell. Also referred to as **internal conductance**.

Ac conductance test: The measurement of the internal conductance of a cell. Normally accomplished by applying a voltage of known frequency and amplitude across a cell and measuring the ac component of current that is in phase with the ac voltage. The conductance is then calculated, typically by the measuring instrument. Also referred to as a **conductance test**.

Ac impedance: The resistance of a cell to an alternating current of a specific frequency. Also referred to as **internal impedance**.

Ac impedance (cell): The resistance of a cell to an alternating current of a specific frequency. Also referred to as **internal impedance**.



Ac impedance test: The measurement of the internal impedance of a cell. Normally accomplished by passing a current of known amplitude and frequency through the cell and measuring the resultant ac voltage drop across the cell. The impedance is then calculated, typically by the measuring instrument. Also referred to as an **impedance test**.

Acceptance test: A constant-current (or constant-power) capacity test made on a new battery to determine that it meets the manufacturer's ratings. Outside of North America referred to as **initial performance test**.

Accessories: The components, usually shipped with the battery, required to complete the battery installation. E.g., intercell connectors, flame-arrestor vents, cell numbers, hardware, and so forth.

Accumulator: A term used primarily outside of North America that refers to an electrochemical cell that is capable of being discharged and then recharged. Also referred to as **secondary battery**, **storage cell** or **storage battery**.

Acid lift system: A system that enables electrolyte near the bottom of the cell jar to be transported to the top of the cell (e.g., above the electrolyte high level line) to promote mixing of the electrolyte and prevent or eliminate electrolyte stratification, without causing any negative effects to the cell or its performance. Also referred to as an **electrolyte lift system**. Also see **bubble**, **bubbling**.

Activated stand life (charged and wet cell): The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a freshening charge. Also referred to as **storage time**.

Activation: The changing of a passive surface of a metal to a chemically active state.

Activation charge: The process of making a dry-charged cell functional by introducing electrolyte and charging.

Active material: The material in the electrodes (plates) of the cell which reacts chemically to produce electric energy when the cell discharges and which is restored to its original composition during the charge process. The active material in the positive



and negative plate of the lead-acid cell is lead dioxide, PbO_2 , and sponge lead, Pb , respectively. The active material in the positive and negative plate of the nickel-cadmium cell is nickel-hydrate, $Ni(OH)_3$, and cadmium sponge, Cd , respectively.

Actual capacity: The total number of Ampere-hours (or Watt-hours) that could be withdrawn from a cell based upon specific set of operating conditions (including initial state-of-charge, discharge rate, initial cell temperature, and end voltage) and the age of the cell. Also referred to as **available capacity**.

Ambient temperature: The average temperature of the surrounding air that comes into contact with the battery e.g., the battery room air temperature.

Ampere-hour capacity: The capacity assigned to a cell by its manufacturer, expressed as Ampere-hours for a given discharge time, at a specified electrolyte temperature and specific gravity (lead-acid only) to a given end-of-discharge voltage. Also referred to as **capacity** or **rated capacity**.

Ampere-hour efficiency: The electrochemical efficiency, expressed as a percent, of the ratio of the Ampere-hour output of the battery, to the Ampere-hour input required to restore the initial state of charge. Also referred to as **battery efficiency**.

Anode: The electrode in an electrochemical cell where oxidation takes place. During discharge, the negative electrode of the cell is the anode. During charge, this reverses and the positive electrode of the cell is the anode.

Antimony-free effect: A phenomenon originally attributed to antimony-free alloy lead-acid cells that causes a reduction in the capacity of the positive plate on cycling. The capacity loss can be reversed by proper charging if secondary effects have not damaged the active material. Also referred to as **premature capacity loss**, **reversible capacity decay** or **reversible insufficient mass utilization**.

Antimony transfer: The process in an antimony-alloy lead-acid cell whereby antimony is leached out of the positive grid and is deposited on the negative plate. Also referred to as **antimony poisoning**.



Antimony poisoning: The process in an antimony-alloy lead-acid cell whereby antimony is leached out of the positive grid and is deposited on the negative plate. Also referred to as **antimony transfer**.

Approved water: Water containing less than the maximum amount of impurities specified by the battery manufacturer, making it suitable for use in a vented cell. Distilled, demineralized and deionized water are always preferred for use.

As found: A term used to inform the person performing a test on a battery e.g., a capacity test, that the battery should be tested without performing certain checks, so that the test results will reflect the effect (i.e., good or bad) of the maintenance practices followed for the installation. Also referred to as “**as found**” (**condition**).

As found (condition): A term used to inform the person performing a test on a battery e.g., a capacity test, that the battery should be tested without performing certain checks, so that the test results will reflect the effect (i.e., good or bad) of the maintenance practices followed for the installation. Also referred to as “**as found**”.

Autonomy period: A term used outside of North America to represent the time that the battery is expected to serve its loads when ac power is lost. This may be 15 minutes for a UPS application, while a 3 to 5 hour time is more likely for a telecommunication application and 3 to 8 hours is typical for an electric generating station or substation. Also referred to as **backup time**; **battery duty cycle**.

Available capacity: The total number of Ampere-hours (or Watt-hours) that could be withdrawn from a cell based upon specific set of operating conditions (including initial state-of-charge, discharge rate, initial cell temperature, and end voltage) and the age of the cell. Also referred to as **actual capacity**.

Average density: The average of the individual cell densities of all the cells in a battery. Also see **density**.

Average specific gravity: The average of the individual cell specific gravities of all the cells in a battery. Also see **specific gravity**.



Average temperature: The average of the individual cell temperatures of all the cells in a battery.

Average voltage: The average of the individual cell voltages of all the cells in a battery. This term may be applied to a variety of conditions, e.g., average float voltage, or average discharge voltage and may be expressed as volts per cell (Vpc) or volts per battery (Vpb).

B

Backup time: The time that the battery is expected to serve its loads when ac power is lost. This may be 15 minutes for a UPS application, while a 3 to 5 hour time is more likely for a telecommunication application and 3 to 8 hours is typical for an electric generating station or substation.

Battery: Two or more cells connected together electrically. Cells may be connected in series or parallel, or both, to provide the required operating voltage and current levels. (Note: common usage permits this designation to be applied to a single cell used independently.)

Battery cabinet: A structure used to both support and enclose a group of cells. Also referred to as a **cabinet**.

Battery case: This may refer to either the battery **jar** or **container** or a structure used to both support and enclose a group of cells.

Battery charger: An apparatus which is capable of restoring the charge of a secondary battery. In the telecommunications industry it is referred to as a **rectifier**.

Battery discharge rate classification: See cell discharge rate classification.

Battery duty cycle: The load (in Amperes or Watts) a battery is expected to supply for a specified time period(s). This may be presented in the form of a list or as a graph of



current (or power) vs. time. Also called **duty cycle, profile, battery profile, or load profile**.

Battery efficiency: The electrochemical efficiency, expressed as a percent, of the ratio of the Ampere-hour (or Watt-hour) output of the battery, to the Ampere-hour (or Watt-hour) input required to restore the initial state of charge.

Battery monitor: A piece of equipment used to monitor various parameters of a battery, such as individual cell voltage, battery voltage, temperature, internal resistance, internal impedance, and so forth.

Battery nominal voltage: The nominal voltage of one cell multiplied by the number of cells in the battery. Also referred to as **nominal voltage**.

Battery profile: The load (in Amperes or Watts) a battery is expected to supply for a specified time period(s). This may be presented in the form of a list or as a graph of current (or power) vs. time. Also called **duty cycle, profile, battery duty cycle, or load profile**.

Battery rack: A structure used to support a group of cells. The most common rack material is steel with a coating to resist the corrosive effects of the cell's electrolyte, although racks made of polyester-reinforced fiberglass, wood and concrete are in use. Also see **earthquake rack**. Also called **rack**; however, in the telecommunications industry it is referred to as a **battery stand** or simply **stand**.

Battery stand: This term is used most often in the telecommunications industry to refer to a structure used to support a group of cells. The most common stand material is steel with a coating to resist the corrosive effects of the cell's electrolyte, although stands made of polyester-reinforced fiberglass, wood and concrete are in use. Also see **earthquake stand**. Also referred to as a **battery rack** or simply **rack**.

Boost charge: An overcharge of arbitrary length. Sometimes called a **quick charge**.

Bridge hung: A term used to refer to a positive plate support system used in larger lead-acid cells whereby the positive plates are supported (typically using a hanging lug cast as part of the plate grid) by a non-conductive bridge (and support rod) which rests on top of the top edges of the negative plates, thus allowing room for the positive plates



(which are slightly shorter than the negative plates) to grow as the cell ages. Also referred to as **top hung**, or **top supported**.

Bridging time: A term used outside of North America to represent the time that the battery is expected to serve its loads when ac power is lost. This may be 15 minutes for a UPS application, while a 3 to 5 hour time is more likely for a telecommunication application and 3 to 8 hours is typical for an electric generating station or substation. See **backup time**.

Bubble: The process of introducing air into a vented cell at a controlled rate to promote mixing of the electrolyte to prevent or eliminate stratification of the electrolyte. Also referred to as **bubbling**. Also see **acid lift system**, **electrolyte lift system**.

Bubbler: A device used to introduce air into a vented cell at a controlled rate to promote mixing of the electrolyte to prevent or eliminate stratification of the electrolyte (e.g., an air pump). See **acid lift system**, **bubble**, **bubbling**, **electrolyte lift system**.

Bubbling: The process of introducing air into a vented cell at a controlled rate to promote mixing of the electrolyte to prevent or eliminate stratification of the electrolyte.

Bubbling system: A system used to bubble vented cells on a periodic or continuous basis without causing any negative effects to the cell or its performance. See **acid lift system**, **electrolyte lift system**.

C

C rate: A term used primarily outside North America, to express cell capacity (at specified references), or charge and discharge rates. When used to indicate capacity, the symbol C is followed by a number (normally shown as a subscript) which represents the rate of discharge, in hours. When used to represent charge or discharge current, the current is referenced to a specific cell capacity. It is usually expressed as the symbol C preceded by a number which represents the current as a fraction of the cell capacity and followed by a number (normally shown as a subscript) representing the rate on which the current is based.



Cabinet: A structure used to both support and enclose a group of cells. Also referred to as a **battery cabinet**.

Carbonization: A condition where the electrolyte becomes contaminated with potassium carbonate (K_2CO_3) to a point where it influences cell performance. See **carbonization (pocket-plate nickel-cadmium cells)**.

Carbonization (pocket-plate nickel-cadmium cells): A condition where the electrolyte becomes contaminated with potassium carbonate (K_2CO_3) to a point where it influences cell performance.

Capacity: The Ampere-hour (or Watt-hour) capacity assigned to a cell by its manufacturer for a given discharge time, at a specified electrolyte temperature and specific gravity (lead-acid cells only) to a given end-of-discharge voltage. Also referred to as **rated capacity, ampere-hour capacity, or watt-hour capacity**.

Capacity retention: The ability of a cell to retain some portion of its capacity at specified conditions, after it has been stored for a period of time without being charged (normally expressed as a percentage of rated capacity).

Capacity test: A discharge of a battery at a constant-current (or constant-power) to a designated terminal voltage. See **acceptance test, performance test, and service test**. Also referred to as a **discharge test**.

Capacity test set: A piece of equipment that can be used to perform a capacity test or discharge on a cell or battery. Also referred to as a **capacity tester, discharge tester, or discharge test set**.

Capacity tester: A piece of equipment used to perform a capacity test on a cell or battery. Also referred to as a **capacity test set, discharge tester, or discharge test set**.

Cathode: The electrode in an electrochemical cell where reduction takes place. During discharge, the positive electrode of the cell is the cathode. During charge, this reverses and the negative electrode of the cell is the cathode.



Cell: The basic electrochemical unit, characterized by an anode and a cathode used to receive, store, and deliver electrical energy. The cell is characterized by a nominal potential which is 2.0 V dc for a lead-acid cell and 1.2 V dc for a nickel-cadmium cell. (Common usage permits the use of the word **battery** when referring to a cell although it is technically incorrect.)

Cell case: The component which holds a cell or a group of cells. Common materials include thermoplastics; however, hard rubber is sometimes used as well and nickel-cadmium cells may be in steel containers. In North America it is normally transparent for vented lead-acid cells to enable plate and sediment inspection. Also referred to as a **battery case, container** or **jar** and when it holds two or more cells as a **multi-cell container, monobloc** or **monoblock**.

Cell connector: An electrical conductor used to connect adjacent cells on the same rack. Most often, the connector is copper bar which is lead- or tin-plated for lead-acid cells; however, for nickel-cadmium cells the connector may be nickel-, cadmium- or tin-plated copper or steel bar. The connector may also be insulated copper wire, or may be lead (with or without a copper insert) for lead-acid cells (where the manufacturer has made the connection between cells in the same multi-cell container). Also referred to as a **bar** or **strap**, although the word strap has another meaning related to an internal component of a cell used to connect all plates of the same polarity together. See **intercell connector, inter-step connector, inter-tier connector, inter-rack connector, terminal connection detail**.

Cell discharge rate classification: A classification which describes the range of discharge rates a cell is designed for use at. The designations are L (low rate) for rates between 20 h and 100 h, M (medium rate) for rates between 3 h and 20 h, and H (high rate) for rates below 3 h. In North America, these classifications are usually associated with nickel-cadmium cells.

Cell partition: The component of the cell container used to separate the individual cells in a monobloc. This is normally an integral part of the monobloc container when it is manufactured. Also referred to a **partition** or **partition wall**.



Cell potential: The algebraic difference between the positive and negative electrode potentials. I.e., $E_{\text{cell}} = E_{\text{positive}} - E_{\text{negative}}$.

Cell reversal: A changing of the normal polarity of a cell. This can be caused by overdischarge or incorrect connection of the charger. Also referred to as **reversal**.

Cell short: A condition in a cell where at least one plate of each polarity (i.e., one positive and one negative) make electrical contact with each other. See **plate short** or **sediment short**.

Cell size: The rated capacity of a cell or the number of plates in the cell.

Cell temperature: The temperature that a cell is operating at. In North America, the reference temperature for a cell is 25 °C (77 °F). Another common reference temperature in other parts of the world is 20°C (68° F). For vented (flooded) cells, cell temperature is also referred to as the **electrolyte temperature**.

Charge: The conversion of electrical energy into chemical energy within a secondary cell.

Charge retention: The ability of a cell to retain some portion of its charge at specified conditions, after it has been stored for a period of time without being charged (normally expressed as a percentage of full charge).

Charged and dry: A term used to refer to a cell which has been assembled with its plates dry, and in a charged state, ready to be activated by the addition of electrolyte. This is normally done for ease in shipping, storage or both. See **dry-charged cell**.

Charged and wet: A cell which is filled with electrolyte and fully charged.

Closed circuit voltage: The voltage of a cell when it is discharging. Also see initial voltage. Also referred to as **working voltage**.

Closed-circuit voltage: The voltage of a cell when it is discharging. Also see initial voltage. Also referred to as **working voltage**.



Cold flow: The tendency of lead to relax when stressed (e.g., when connectors are bolted and torqued at a lead post). In metallurgy, referred to as **creep** or **stress relaxation**.

Cold-flow: The tendency of lead to relax when stressed (e.g., when connectors are bolted and torqued at a lead post). In metallurgy, referred to as **creep** or **stress relaxation**.

Conductance: The real part of internal admittance. Also referred to as **ac conductance**, **internal conductance**.

Conductance meter: An instrument used to measure the internal conductance of a cell.

Conductance test: The measurement of the internal conductance of a cell. Normally accomplished by applying a voltage of known frequency and amplitude across a cell and measuring the ac component of current that is in phase with the ac voltage. The conductance is then calculated, typically by the measuring instrument. Also referred to as an **ac conductance test**.

Connector: 1. An electrical conductor used to connect adjacent cells on the same rack. Most often, the connector is copper bar which is lead- or tin-plated for lead-acid cells; however, for nickel-cadmium cells the connector may be nickel-, cadmium- or tin-plated copper or steel bar. The connector may also be insulated copper wire, or may be lead (with or without a copper insert) for lead-acid cells (where the manufacturer has made the connection between cells in the same multi-cell container). Also referred to as a **bar** or **strap**, although the word strap has another meaning related to an internal component of a cell used to connect all plates of the same polarity together. See **intercell connector**, **inter-step connector**, **inter-tier connector**, **inter-rack connector**, **terminal connection detail**. 2. A plated (normally tin) terminal (normally made of copper or silicon bronze for battery systems) that can be mechanically fastened or using proper tooling compressed, to a wire or cable for the purpose of facilitating the electrical connection of the wire or cable. See **intercell connector**, **inter-step connector**, **inter-tier connector**, **inter-rack connector**, **terminal connection detail**.



Constant current charge: A charge in which the current output of the charger is maintained at a constant value. Sometimes this may be accomplished using two-rate charging (e.g., using a high-rate followed by a finish-rate).

Constant potential charge: A charge in which the potential (or voltage) at the output terminals of the battery charger is maintained at a constant value. Also called **constant voltage charge**.

Contact thermometer: An instrument used to measure temperature by placing a probe in direct contact with the component whose temperature is to be measured. In the case of a cell temperature this component is normally the negative post. Also referred to as a **surface thermometer**.

Container: The component which holds a cell or a group of cells. Common materials include thermoplastics; however, hard rubber is sometimes used as well and nickel-cadmium cells may be in steel containers. In North America containers for flooded lead-acid cells are normally transparent to enable plate and sediment inspection. Also referred to as a **battery case, cell case or jar** and when it holds two or more cells as a **multi-cell container, monobloc or monoblock**.

Contaminant: A compound or element that when introduced into a cell reduces its capacity or otherwise reduces its service life. For vented cells the contaminant is often introduced into the electrolyte (e.g., water used for the cell).

Continuity test: A test used to detect conduction path problems (e.g., loose or high resistance connections). Also referred to as a **integrity test**.

Converter: A device that changes electrical energy from one form to another. E.g., a battery charger or an inverter.

Corrosion: The electrochemical or chemical reactions between a material (usually a metal) and its environment that results in a deterioration of the material and its physical properties.

Corrosion inhibitor: A chemical substance that, when present, prevents or reduces corrosion without significant reaction with the components it is exposed to.



Counter cell: A cell with essentially no capacity, used to oppose the battery voltage. (Note: these cells are rarely used in battery installations today.) Also referred to as **counter electromotive force** or **counter emf cell**.

Counter electromotive force cell: A cell with essentially no capacity, used to oppose the battery voltage. (Note: these cells are rarely used in battery installations today.) Also referred to as **counter emf cell** or **counter cell**.

Counter emf cell: A cell with essentially no capacity, used to oppose the battery voltage. (Note: these cells are rarely used in battery installations today.) Also referred to as **counter electromotive force cell** or **counter cell**.

Coup de Fouet: An initial voltage depression that occurs in lead-acid cells when discharged after the cells have been on float charge for a long period of time. Depending on the length of the discharge, the cell voltage may recover somewhat.

Cover: The lid of a cell jar or of a multi-cell container.

Crazing: The small internal cracking that sometimes occurs in plastics around a point of mechanical stress.

Creep: 1. The tendency of lead to relax when stressed (e.g., when connectors are bolted and torqued at a lead post). In metallurgy, referred to as **stress relaxation**. See **cold flow**. 2. A term used to refer to transport of sulfuric acid on or through a component (e.g., a cell post) in a lead-acid cell due to capillary action. See **creep corrosion**, **wick**.

Creep corrosion: A term used to describe corrosion occurring at the post of a lead-acid cell due to a post seal failure that enables the acid electrolyte to move up the cell post due to capillary action. See **wick**.

Critical period: That portion of the battery duty cycle which is the most severe or the specified time period of the duty cycle.

Cutoff voltage: The cell voltage at which the discharge is terminated. (Note: apart from the user's requirements, the minimum end voltage, as a function of discharge rate, is



normally provided by the cell manufacturer.) Also called **end voltage**, **end-of-discharge voltage**, or **final voltage**.

Current limit: Maintenance of the output current of the battery charger within a prescribed value.

Cycle: A discharge and subsequent charge of a cell. Sometimes additional modifiers are used to describe how much of the cell's capacity was removed during the discharge, e.g., **shallow cycle** or **deep cycle**. Normally, a deep cycle would imply that at least 60 to 80% of the cell's rated capacity was removed during the discharge portion of the cycle.

Cycle counter: A device, that when connected to a battery, is capable of recording the number of cycles that the battery has experienced. These may be categorized by the device based on the duration of the discharge.

Cycle life: The number of cycles, under specified conditions, that a battery can undergo before failing to meet its specified end-of-life capacity.

Cycling: The repeated discharge/charge of a secondary battery.

D

Date code: a combination of numbers and/or letters used to identify the date of manufacturer or warranty date for a cell. This may also include an identifier for the plant the cell was manufactured at.

Dc resistance: The resistance of a cell to a dc electric current within a cell (i.e., the sum of the ionic and electronic resistances of the cell components). Also referred to as **internal resistance**. See **dc resistance (cell)**.

Dc resistance (cell): The resistance of a cell to a dc electric current within a cell (i.e., the sum of the ionic and electronic resistances of the cell components). Also referred to as **internal resistance**. See **dc resistance**.



Dc resistance test: The measurement of the internal resistance of a cell. Normally accomplished by applying a load across a cell, measuring the step change in current and voltage, and computing the resistance using Ohm's Law. Also referred to as an **internal resistance test**.

Deep cycle: A discharge and subsequent charge of a cell where at least 60 to 80% of the cell's rated capacity was removed during the discharge portion of the cycle. Also referred to as a **cycle**.

Deep discharge: The conversion of chemical energy into electrical energy where at least 60 to 80% of a cell's rated capacity was removed during the discharge. Also referred to as a **discharge**.

Dendrite: A crystal that has a treelike branching pattern, being most evident in cast metals slowly cooled through the solidification range.

Dendrites: Crystals that have a treelike branching pattern, being most evident in cast metals slowly cooled through the solidification range.

Density: The weight of a given volume of electrolyte at a specified temperature. This method of measurement is used primarily outside of North America, although its use has become more common in North America. The customary standard international (SI) unit is kg/m^3 ; however, other units such as g/cm^3 are used. (Note: in North America, electrolyte **specific gravity (SG)** is typically measured or referred to rather than density. SG is the ratio of the density of the electrolyte to the density of water at a specified temperature.) Also referred to as **electrolyte density**.

Depolarization: A reduction in the polarization of an electrode.

Depolarizer: A substance or means used to prevent or decrease polarization. For lead-acid cells platinum chloride or chloroplatinic acid $[\text{H}_2\text{PtCl}_6 \cdot (\text{H}_2\text{O})_6]$ are often used as a depolarizer.

Depth of discharge: The Ampere-hours (or Watt-hours) removed from a fully charged battery, expressed as a percentage of its rated capacity at the applicable discharge rate.

Digital density meter: An instrument used to measure specific gravity (SG) or density of a liquid i.e., electrolyte. The SG or density may be read from a digital readout. A



digital density meter will typically correct the measured SG or density to the standard reference temperature. Also referred to as a **digital hydrometer, electronic hydrometer, hydrometer, or electronic density meter.**

Digital hydrometer: An instrument used to measure specific gravity (SG) of a liquid i.e., electrolyte. The SG may be read from a digital readout. An electronic hydrometer will typically correct the measured SG to the standard reference temperature. Also referred to as a **hydrometer, electronic hydrometer, digital density meter, or electronic density meter.**

Discharge: The conversion of chemical energy into electrical energy within a cell. Sometimes additional modifiers are used to describe how much of the cell's capacity was removed during the discharge, e.g., **shallow discharge** or **deep discharge**. Normally, a deep discharge would imply that at least 60 to 80% of the cell's rated capacity was removed during the discharge.

Discharge rate: The rate in Amperes (or Watts), at which current (or power) is delivered by the battery.

Discharge test: A discharge of a battery at a constant-current (or constant-power) which may be to a specific time and terminal voltage if capacity will be measured. See **acceptance test, capacity test, initial performance test, performance test** and **service test.**

Discharge test set: A piece of equipment that can be used to perform a capacity test or discharge on a cell or battery. Also referred to as a **capacity test set, capacity tester, or discharge tester.**

Discharge tester: A piece of equipment that can be used to perform a capacity test or discharge on a cell or battery. Also referred to as a **capacity test set, capacity tester, or discharge test set.**

DLRO[®]: An instrument for measuring extremely low resistance, e.g., intercell connection resistance. Also referred to as a **ductor** or **micro-ohmmeter.** (Note: DRLO[®] and Megger[®] are registered trademarks of Megger Group Limited or its subsidiaries.)



Dry-charged cell: A cell which has been assembled with its plates dry, and in a charged state, ready to be activated by the addition of electrolyte. This is normally done for ease in shipping, storage or both.

Ductor: An instrument for measuring extremely low resistance, e.g., intercell connection resistance. Also referred to as a **micro-ohmmeter** or **DLRO[®]**. (Note: DRLO[®] and Megger[®] are registered trademarks of Megger Group Limited or its subsidiaries.)

Duty cycle: The load (in Amperes or Watts) a battery is expected to supply for a specified time period(s). This may be presented in the form of a list or as a graph of current (or power) vs. time. Also called **battery duty cycle, profile, battery profile, or load profile**.

E

Earthquake rack: A battery rack which is designed for use in a specific seismic (i.e., earthquake) area. In the US, the seismic design criteria are normally found in the International Building Code (IBC). Previously, seismic zones were used and were designated 0 (no seismic activity) to 4 (high-seismic activity). These racks are provided with extra equipment e.g., side-rails, end-rails, and spacers which restrain the cells during a seismic event. Also referred to as a **seismic rack, earthquake stand, or seismic stand**.

Earthquake stand: A battery stand which is designed for use in a specific seismic (i.e., earthquake) area. In the US, the seismic design criteria are normally found in the International Building Code (IBC). Previously, seismic zones were used and were designated 0 (no seismic activity) to 4 (high-seismic activity). These stands are provided with extra equipment e.g., side-rails, end-rails, and spacers which restrain the cells during a seismic event. Also referred to as a **seismic rack, earthquake rack, or seismic stand**.

Efficiency: 1. When referring to a cell or battery, the electrochemical efficiency, expressed as a percent, of the ratio of the Ampere-hour (or Watt-hour) output of the battery, to the Ampere-hour (or Watt-hour) input required to restore the initial state of charge. 2. When referring to a VRLA cell or battery it may also refer to the ratio of the



quantity of oxygen recombined (at the negative electrode), to the total amount of oxygen generated (at the positive electrode), expressed as a percent. See **battery efficiency**, **oxygen recombination efficiency**.

Electrode: The site, area, or location (e.g., the plate) at which the electrochemical reaction takes place. Also see **plate**, **positive plate**, **negative plate**.

Electrode potential: The voltage developed by a single plate be it positive or negative. Also see **cell potential**.

Electroformation: Electrochemical processing of a cell electrode (or plate) during manufacture which transforms the active material into its usable form. Also referred to as **formation**.

Electrolyte: A medium in which the flow of electric current takes place. The electrolyte in a lead-acid cell is a solution of sulfuric acid (H_2SO_4) in water. The electrolyte in a nickel-cadmium cell is a solution of potassium hydroxide (KOH) in water (small amounts of lithium hydroxide may sometimes be added as well).

Electrolyte density: The weight of a given volume of electrolyte at a specified temperature. This method of measurement is used primarily outside of North America, although its use has become more common in North America. The customary standard international (SI) unit is kg/m^3 ; however, other units such as g/cm^3 are used. (Note: in North America, electrolyte **specific gravity (SG)** is typically measured or referred to rather than density. SG is the ratio of the density of the electrolyte to the density of water at a specified temperature.) Also referred to as **density**.

Electrolyte lift system: A system that enables electrolyte near the bottom of the cell jar to be transported to the top of the cell (e.g., above the electrolyte high level line) to promote mixing of the electrolyte and prevent or eliminate electrolyte stratification, without causing any negative effects to the cell or its performance. Also see **bubble**, **bubbling**.

Electrolyte pumping: Loss of electrolyte from the cell through the electrolyte withdrawal tube due to a pumping action occurring within the cell caused by a capillary action in the withdrawal tube.

Electrolyte specific gravity: The ratio of the weight of a given volume of electrolyte to the weight of an equal volume of water at a specified temperature. In North America, the



reference temperature is 25 °C (77 °F). (Note: outside North America, it is normal practice to measure the electrolyte density, rather than specific gravity in units of kg/m³ with the reference temperature of 20 °C or 68 °F.) Also referred to as **specific gravity** or **gravity**.)

Electrolyte temperature: The temperature of the electrolyte in a vented cell. In North America, the reference temperature for a cell is 25 °C (77 °F). Another common reference temperature in other parts of the world is 20° C (68° F). See **cell temperature**.

Electrolyte-tight pole bushing: A term used outside of North America to refer to the seal between the post and the cover where the post penetrates the cover. Also referred to as a **post-to-cover-seal** or **pole seal**.

Electrolyte withdrawal tube: A tube provided, typically in larger vented lead-acid cells, to allow sampling of electrolyte (i.e., for density or specific gravity) from some depth in the cell, rather than at the top of the plates.

Electronic density meter: An instrument used to measure specific gravity (SG) or density of a liquid i.e., electrolyte. The SG or density may be read from a direct digital readout. An electronic density meter will typically correct the measured SG or density to the standard reference temperature. Also referred to as a **digital hydrometer**, **electronic hydrometer**, **digital density meter**, or **hydrometer**.

Electronic hydrometer: An instrument used to measure specific gravity (SG) or density of a liquid i.e., electrolyte. The SG may be read from a direct digital readout. An electronic hydrometer will typically correct the measured SG to the standard reference temperature. Also referred to as a **digital hydrometer**, **hydrometer**, **digital density meter**, or **electronic density meter**.

Element: The assembly of positive and negative plates, separators, retainers (if used), straps and posts for a single cell.

End cell: A cell which can be added to, or removed from a battery circuit for the purpose of adjusting the battery voltage. (Note: the use of end cells was a practice followed almost exclusively by the telecommunication industry; however, their use is limited in installations in current systems.)



End negative: For cells with an odd number of plates the first and last negative in the plate stack, which are located at each end of the cell. The end negative may be thinner than the negative plates between two positive plates (i.e., since the end negative is the last plate on either side of the element, one side of the plate will not work when the cell is in service). Also referred to as **outside negative** or **outside negative plate**.

End of discharge voltage: The cell voltage at which the discharge is terminated. (Note: apart from the user's requirements, the minimum end voltage, as a function of discharge rate, is normally provided by the cell manufacturer.) Also called **cutoff voltage, end voltage, or final voltage**.

End-of-discharge voltage: The cell voltage at which the discharge is terminated. (Note: apart from the user's requirements, the minimum end voltage, as a function of discharge rate, is normally provided by the cell manufacturer.) Also called **cutoff voltage, end voltage, or final voltage**.

End of life: The point in time where a fully charged battery is no longer capable of delivering a specified percentage of its rated capacity. For most lead-acid battery designs this percentage is 80%. Nickel-cadmium batteries may also use 80%, although that can vary with system design. Also referred to as **service life** or **useful life**.

End-of-life: The point in time where a fully charged battery is no longer capable of delivering a specified percentage of its rated capacity. For most lead-acid battery designs this percentage is 80%. Nickel-cadmium batteries may also use 80%, although that can vary with system design. Also referred to as **service life** or **useful life**.

End voltage: The cell voltage at which the discharge is terminated. (Note: apart from the user's requirements, the minimum end voltage, as a function of discharge rate, is normally provided by the cell manufacturer.) Also called **cutoff voltage, end-of-discharge voltage, or final voltage**.

Energy density: The ratio of the available energy from a cell (in Watt-hours) to its volume or weight. Common units are Wh/l, Wh/lb, and Wh/kg. Also referred to as **watt-hour density**.

Entrainment: The process in a vented cell where gases generated within the cell carry electrolyte out the cell vent.

Equalization: The restoration of all cells in a battery to an equal state-of-charge.



Equalize charge: An extended charge to a measured end point that is given to a storage battery to ensure the complete restoration of the active material in all the plates of the cells.

Equalize voltage: 1. The voltage applied during an equalize charge. This voltage is sufficiently high to ensure the local action of all the cells is overcome. 2. The voltage, higher than float voltage, applied to a battery to correct inequalities among battery cells (i.e., individual cell voltages or specific gravities) that may develop while the battery is in service

Expected service life: The period of time during which a fully charged battery is capable of delivering at least a specified percentage of its rated capacity. For most lead-acid battery designs this percentage is 80%. Nickel-cadmium batteries may also use 80%, although that can vary with system design. Also referred to as **end-of-life, service life, useful life.**

F

Fan curve: A curve used to describe a cell's discharge characteristics in a graphical form.

Fauré plate: A lead-acid plate made from a grid (usually lead-alloy) that is filled with active material applied as a paste. Also referred to a **pasted plate** or **flat plate**.

Fiber plate: A plate made of a porous, conductive, fiber mass, in which the active material is impregnated. Usually used for nickel-cadmium cells. Also referred to as a **fiber-structured plate**.

Fiber-structured plate: A plate made of a porous, conductive, fiber mass, in which the active material is impregnated. Usually used for nickel-cadmium cells. Also referred to as a **fiber plate**.

Filter: A component or group of components designed to reduce ripple, while freely passing direct-current. Also referred to as a **ripple filter**.



Final voltage: The cell voltage at which the discharge is terminated. (Note: apart from the user's requirements, the minimum end voltage, as a function of discharge rate, is normally provided by the cell manufacturer.) Also called **cutoff voltage**, **end-of-discharge voltage**, or **end voltage**.

Finish-rate charge (nickel-cadmium cell): The application of a constant current charge at a low level to a partially recharged battery to complete the recharge. This charge is normally applied to a cell that is being charged at a high-rate of constant current once the cell has begun to gas by reducing the charge current to the lower current value.

Flame-arrested vent plug: This term used outside North America refers to a cell-venting device installed in a vented cell which prevents the propagation of an external flame into the cell. Also referred to as a **flame arrestor** or **flame-arrestor vent**.

Flame arrestor: 1. For a vented cell, a venting device which prevents the propagation of an external flame into the cell. Outside North America it is referred to as a **flame-arrested vent plug**. Also referred to as a **flame-arrestor vent**. 2. For a valve regulated lead-acid cell, a piece of material that is integral with the cell's valve that prevents the propagation of an external flame into the cell.

Flame-arrestor: 1. For a vented cell, a venting device which prevents the propagation of an external flame into the cell. Outside North America it is referred to as a **flame-arrested vent plug**. Also referred to as a **flame-arrestor vent**. 2. For a valve regulated lead-acid cell, a piece of material that is integral with the cell's valve that prevents the propagation of an external flame into the cell.

Flame arrestor vent: 1. For a vented cell, a venting device which prevents the propagation of an external flame into the cell. Outside North America it is referred to as a **flame-arrested vent plug**. Also referred to as a **flame arrestor**. 2. For a valve regulated lead-acid cell, a piece of material that is integral with the cell's valve that prevents the propagation of an external flame into the cell.

Flame-arrestor vent: 1. For a vented cell, a venting device which prevents the propagation of an external flame into the cell. Outside North America it is referred to as a **flame-arrested vent plug**. Also referred to as a **flame arrestor**. 2. For a valve regulated lead-acid cell, a piece of material that is integral with the cell's valve that prevents the propagation of an external flame into the cell.



Flame-retardant: A component capable of limiting the propagation of a fire beyond the area where the fire was initiated.

Flame-retardant material: A material capable of limiting the propagation of a fire beyond the area where the fire was initiated.

Flat plate: A lead-acid plate made from a grid (usually lead-alloy) that is filled with active material applied as a paste. Also referred to a **pasted plate** or **Fauré plate**.

Float: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, floating, float charge, or float charging**.

Float charge: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, floating, or float charging**.

Float charging: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, floating, or float charge**.

Float current: The current drawn by a cell that is being float charged. (Note: assuming the recommended float voltage is used, the cell will draw sufficient current to maintain itself fully charged.)

Float effect; A “voltage depression” that occurs in a nickel-cadmium cell upon discharge for a cell that has been on prolonged float charge, which results in the cell providing less capacity than it would have if the cell had been charged using constant current.



Float effect correction factor: A factor used with nickel-cadmium cells that have been prolonged float charged which is applied to the discharge current of the cell based on constant current charging of the cell to correct the current for float effect. This correction is only used if the battery manufacturer does not have discharge data for the cell based on prolonged float charge.

Float service: A battery installation where the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, floating, float charge, or float charging.**

Float service application: A battery installation where the battery, the battery charger, and the load are all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, floating, float charge, or float charging.**

Float voltage: The voltage applied during full-float operation. This voltage is high enough to overcome local action of the cells and replace discharge losses caused by electrical load peaks, without overcharging the cells. Also referred to as **normal float or normal float voltage.**

Floating: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, float charge, or float charging.**

Flooded cell: A cell design which is characterized by an excess of free electrolyte, and in which the products of electrolysis (i.e., gasses) and evaporation can freely exit the cell through a vent. Also referred to as a **wet cell or vented cell.**

Form: Refers to the electrochemical processing of a cell electrode (or plate) during manufacture which transforms the active material into its usable form.



Formation: Electrochemical processing of a cell electrode (or plate) during manufacture which transforms the active material into its usable form. Also referred to as **electroformation**.

Formed: A cell that has been manufactured through the process of formation. .

Freshening charge: A charge given to a battery following nonuse or storage. (Note: except for dry-charged cells, lead-acid cells in storage require freshening charges in accordance with the manufacturer's instructions.) Also referred to as **initial charge** or **refresher charge**.

Full float: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, floating, float charge, or float charging**.

Full float operation: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **full-float operation, float, floating, float charge, or float charging**.

Full-float operation: Operation of a dc system with the battery, the battery charger, and the load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the battery charger is unavailable or the load exceeds the charger output.) Also referred to as **float, floating, float charge, or float charging**.

Fully charged (nickel-cadmium cells): The condition that exists following a long term constant current charge. (Note: long term constant potential charging may reduce capacity to some degree due to **float effect**.)



G

Gassing: Evolution of gas by one or more of the plates in a cell. Gassing may result from electrolysis of water into hydrogen and oxygen within a cell during charging (normally near the end of a charge), from overcharging, from corrosion of the positive grid (lead-acid cells) or from local action.

Gel cell: A cell, usually a lead-acid or a valve regulated lead-acid type, which utilizes **gelled electrolyte**. Also referred to as a **gelled electrolyte cell**.

Gelled electrolyte: Electrolyte that has been immobilized by the addition of a gelling agent.

Gelled electrolyte cell: A cell, usually a lead-acid or a valve regulated sealed lead-acid type, which utilizes **gelled electrolyte**. Also referred to as a **gel cell**.

General purpose cell: A lead-acid cell designed to supply a duty cycle requiring both high currents for short periods of time and lower currents for a long periods of time. This term is used in North America for cells designed for switchgear tripping, generating stations and control application. For nickel-cadmium cells this type of cell may be referred to as **medium**.

Grain: An individual crystal in a polycrystalline metal or alloy.

Grain boundary: A narrow zone in a metal corresponding to the transition from one crystallographic orientation. The atoms in each grain are arranged in an orderly pattern.

Grain boundary corrosion: Corrosion that occurs at a grain boundary, typically **intergranular corrosion** in a lead-acid cell. .

Gravity: Used to refer to **electrolyte specific gravity** which is the ratio of the weight of a given volume of electrolyte to the weight of an equal volume of water at a specified temperature. In North America, the reference temperature is 25 °C (77 °F). (Note: outside of North America, it is normal practice to measure the electrolyte density, rather



than specific gravity in units of kg/m^3 with the reference temperature of 20 °C or 68 °F.) Also referred to as **nominal gravity** or **specific gravity**.

Gravity drop: The change in SG of the electrolyte for a lead-acid cell upon discharge of the cell. Often expressed in “points,” where 1 point of SG is equal to a 0.001 change in SG.

Gravity spread: A term used to describe the difference between the highest and lowest individual cell specific gravity (or density) readings in a battery. E.g., if in a 60 cell battery, the lowest cell SG was 1.205 (1205 kg/m^3 density) and the highest cell SG was 1.220 (1220 kg/m^3 density), the gravity (density) spread would be 0.015 or 15 points of gravity (15 kg/m^3 or 15 points of density).

Grid: A framework for a plate in a cell which supports or retains the active material and conducts the electric current.

Group: An assembly of plates of the same polarity connected together (usually in parallel). Also referred to as a **plate group**.

Group bar: A term used outside of North America to refer to the component in a cell where all the plates of like polarity are joined. Also see **strap** which is the term used for this component in North America.

H

Half-cell: An electrode immersed in a suitable electrolyte, usually designed for the measurement of electrode potential.

Half-cell potential: The potential of a cell electrode to a reference electrode which has been introduced into the cell. For a lead-acid cell some common reference electrodes are the standard hydrogen electrode, the cadmium electrode and the mercury/mercurous sulphate electrode.

Hanging lug: A tab at the top of the positive plate which has a hole through it that is used with top hung positive plates to provide support for the plates. A support bridge



(or comb) is put in place and a non-conductive rod is normally driven through the hole of the hanging lugs in the plate group during cell assembly.

Harmonic: A sinusoidal component of a periodic wave having a frequency that is an integral multiple of the fundamental (or base) frequency.

High level line: A line on the side of a jar which represents the maximum level of electrolyte that should be present in a cell. Also see **level line**.

High performance cell: A lead-acid cell designed to supply a duty cycle requiring a high current for a short period of time (generally less than one hour, but typically 10 to 15 minutes). This term is used in North America for cells designed for UPS application. For nickel-cadmium cells this type of cell may be referred to as **high** or **ultra-high**.

High rate cell: A classification which describes the range of discharge rates a cell is designed for use at, which for a high rate cell is for rates below 3 h. In North America, these classifications are usually associated with nickel-cadmium cells. See **cell discharge rate classification**.

High rate charge: The application of a constant potential charge, at a higher level than the float charge, to a partially or fully discharged battery to recharge it. See **high-rate charge (nickel cadmium cells)**.

High-rate charge (nickel-cadmium cells): 1. The application of a constant potential charge, at a higher level than the float charge, to a partially or fully discharged battery to recharge it. 2. The application of a constant current charge at a high level to a partially or fully discharged battery to recharge it. This charge normally continues until the cell begins to gas and is then reduced to a **finish-rate**.

High rate discharge: Removal of a large current (i.e., relative to cell size) over a short period of time (normally less than 1 hour).

High-rate discharge: Removal of a large current (i.e., relative to cell size) over a short period of time (normally less than 1 hour).

Hit: A term used to indicate that a standby battery has been called on to discharge, without specific reference to discharge duration. Commonly used in UPS applications.

Hit counter: A device used to record the number of discharges experienced by a battery.



Hydration: A condition caused by discharging a cell, and failing to recharge it in a timely manner. When this happens, the lead in the cell goes into solution forming lead-hydrate, rendering the cell useless.

Hydration (lead-acid cell): A condition caused by discharging a cell, and failing to recharge it in a timely manner. When this happens, the lead in the cell goes into solution forming lead-hydrate, rendering the cell useless.

Hydrogen embrittlement: A process resulting in a decrease in the toughness or ductility of a material due to the presence of atomic hydrogen.

Hydrometer: An instrument used to measure specific gravity (SG) or density of a liquid i.e., electrolyte. The hydrometer may be electronic or may be a manual bulb type. The SG or density may be read from a calibrated float or from a direct digital readout on an electronic hydrometer. Electronic hydrometers will typically correct the measured SG or density to the standard reference temperature. (Also referred to as a **digital hydrometer, electronic hydrometer, digital density meter, or electronic density meter.**)

I

Immobilized electrolyte: Electrolyte that is retained by a gel or absorbent mat.

Impedance: The apparent opposition of an ac circuit to the flow of current. It consists of two components, namely resistive (i.e., the real part) and reactive (i.e., the imaginary part).

Impedance meter: An instrument used to measure the internal impedance of a cell.

Impedance test: The measurement of the internal impedance of a cell. Normally accomplished by passing a current of known amplitude and frequency through the cell and measuring the resultant ac voltage drop across the cell. The impedance is then calculated, typically by the measuring instrument. Also referred to as an **ac impedance test.**



Industrial battery: A classification of batteries, which includes stationary batteries, designed for motive power (e.g., forklifts), railroad, telecommunications, electric utility, industrial, UPS, etc., applications.

Initial charge: The charge given to a new battery before placing the battery in service. Also see **freshening charge**.

Initial performance test: A constant-current (or constant-power) capacity test made on a new battery to determine that it meets the manufacturer's ratings. In North America this is referred to as an **acceptance test**.

Initial voltage: The closed-circuit voltage at the beginning of a discharge. (Note: the value considered to be the initial voltage is that voltage measured after current has been flowing for a sufficient period of time so that the rate of change of voltage is essentially constant.)

Inside negative plate: A negative plate that has a positive plate on each side of it in the element. The inside negative plates may be thicker than the **outside negative plates** located at each end of the element. See **outside negative plate**.

Insulating pin: A nonconductive spacer, normally made of nylon, used to prevent metallic contact between plates of opposite polarity within a nickel-cadmium pocket plate cell since the pocket plate surfaces do not have active material on the surface of the plates. Also referred to as a **pin insulator**. See **separator**.

Insulating pin (pocket-plate type cells): A nonconductive spacer, normally made of nylon, used to prevent metallic contact between plates of opposite polarity within a nickel-cadmium pocket plate cell since the pocket plate surfaces do not have active material on the surface of the plates. See **separator**. Also referred to as a **pin insulator**.

Integrity test: A test used to detect conduction path problems (e.g., loose or high resistance connections). Also referred to as a **continuity test**.



Intercell connection resistance: The total electrical resistance of the connection made between the terminals of two cells that are electrically connected to each other. It includes the resistance of the connector and the contact-resistance at the point(s) of connection to the cell terminals. (Note: multiple resistance measurements must be made on cells having more than one post per polarity.)

Intercell connector: An electrical conductor used to connect adjacent cells on the same rack. Most often, the connector is copper bar which is lead- or tin-plated for lead-acid cells; however, for nickel-cadmium cells the connector may be nickel-, tin- or cadmium-plated copper or steel bar. The connector may also be insulated copper wire, or may be lead (with or without a copper insert) for lead-acid cells (where the manufacturer has made the connection between cells in the same multi-cell container). Also referred to as a **bar** or **strap**, although the word strap has another meaning related to an internal component of a cell used to connect all plates of the same polarity together.

Intercell connector safety cover: An insulated cover, which may or may not be clear, placed over the intercell connector and post, used to prevent accidental contact by personnel or accidental short circuiting of the cell. Also referred to as **terminal cover**.

Intergranular: Between crystals or grains.

Intergranular corrosion: Corrosion occurring preferentially at grain boundaries, usually with slight or negligible attack on adjacent grains.

Internal admittance: The inverse of internal impedance.

Internal conductance: The real part of internal admittance. Also referred to as **ac conductance**.

Internal drop: The product of the current passing through the cell (in amperes) and the internal resistance (in ohms). Also referred to as **internal voltage drop**, **IR drop**.

Internal impedance: The resistance of a cell to an alternating current of a specific frequency. Also referred to as **ac impedance**.



Internal ohmic measurement (cell): Refers to the measurement of the internal ac impedance, ac conductance or dc resistance of a cell. See **internal conductance, internal impedance, internal resistance**.

Internal resistance: The dc resistance of a cell to an electric current within a cell (i.e., the sum of the ionic and electronic resistances of the cell components).

Internal resistance test: The measurement of the internal resistance of a cell. Normally accomplished by applying a load across a cell, measuring the change in current and voltage, and computing the resistance using Ohm's Law. (Also referred to as a **dc resistance test**.)

Internal voltage drop: The product of the current passing through the cell (in amperes) and the internal resistance (in ohms). Also referred to as **internal drop, IR drop**.

Inter-rack connector: An electrical conductor used to connect cells on two separate rack sections. Most often this connector is insulated copper wire.

Inter-step connector: An electrical conductor used to connect two cells on different steps of the same rack. Most often this connector is insulated copper wire; however, in the past, plated copper bar was also used.

Inter-tier connector: An electrical conductor used to connect two cells on different tiers of the same rack. Most often this connector is insulated copper wire.

IR drop: The product of the current passing through the cell (in amperes) and the internal resistance (in ohms). Also referred to as **internal drop, internal voltage drop**.

J

Jar: The component which holds a cell or a group of cells. Common materials include thermoplastics; however, hard rubber is sometimes used as well and nickel-cadmium cells may be in steel containers. In North America jars for vented lead-acid cells are normally transparent to enable plate and sediment inspection. (Also referred to as a



battery case, cell case or container, particularly when it holds two or more cells in which case it is referred to as a **multi-cell container, monobloc or monoblock.**)

Jar seal: The seal at the interface of the jar and cover.

Jar supported: A term used to refer to a positive plate support system used in larger lead-acid cells whereby the positive plates are supported by a ledge in the cell jar on which protrusions (e.g., “ears”) at the top of the positive plate rest, thus allowing room for the positive plates (which are slightly shorter than the negative plates) to grow as the cell ages. Also referred to as **ledge supported** or **ledge hung**.

Jar to cover seal: The seal at the interface of the jar and cover.

Jar-to-cover seal: The seal at the interface of the jar and cover.

L

Lead-acid cell: A secondary cell in which the electrodes are made of lead and the electrolyte is a solution of sulfuric acid (H_2SO_4) in water. Lead-acid cells include pure lead cells (i.e., those with pure lead plates or grids) and lead-alloy cells (i.e., those with lead-alloy plates or grids) such as lead-antimony, lead-calcium, lead-selenium, etc.

Lead-antimony cell: A lead-acid cell in which the plate grids are made from a lead-antimony alloy. There may be other elements in the alloy such as arsenic, but they are normally not included in the alloy description. Also see **lead-acid cell**.

Lead-calcium cell: A lead-acid cell in which the plate grids are made from a lead-calcium alloy. There may be other elements in the alloy such as tin, but they are normally not included in the alloy description. Also see **lead-acid cell**.

Lead-hybrid cell: A lead-acid cell in which the plate grids of one polarity (usually the positive) are made from a lead-antimony alloy and the plate grids of the other polarity are made from a lead-calcium alloy. Also see **lead-acid cell**.



Lead-selenium cell: A lead-acid cell in which the plate grids made from a lead-antimony alloy (with low antimony content) to which selenium has been added. Also see **lead-acid cell**.

Lead-tin cell: A lead-acid cell in which the plate grids made from a lead-tin alloy. Also see **lead-acid cell**.

Ledge hung: A term used to refer to a positive plate support system used in larger lead-acid cells whereby the positive plates are supported by a ledge in the cell jar on which protrusions (e.g., “ears”) at the top of the positive plate rest, thus allowing room for the positive plates (which a slightly shorter than the negative plates) to grow as the cell ages. Also referred to as **jar supported** or **ledge supported**.

Ledge supported: A term used to refer to a positive plate support system used in larger lead-acid cells whereby the positive plates are supported by a ledge in the cell jar on which protrusions (e.g., “ears”) at the top of the positive plate rest, thus allowing room for the positive plates (which a slightly shorter than the negative plates) to grow as the cell ages. Also referred to as **jar supported** or **ledge hung**.

Level line: A line (or set of lines) on the sides of the jar used to indicate the minimum and/or maximum (or range) electrolyte level for the cell. Also see **high level line**, **low level line**.

Lid: The cover of a cell jar or of a multi-cell container

Limiting oxygen index: The minimum concentration of oxygen, expressed as percent volume, in a mixture of oxygen and nitrogen that will just support flaming combustion of a material initially at room temperature. Also referred to as **oxygen index**.

Load profile: The load (in Amperes or Watts) a battery is expected to supply for a specified time period(s). This may be presented in the form of a list or as a graph of current (or power) vs. time. Also called **duty cycle**, **profile**, **battery profile**, or **battery duty cycle**.

Local action: The internal losses of a battery standing on open-circuit or on float charge, without considering any losses incidental to any discharge. Also referred to as



self-discharge or **standing losses**.

Long duration cell: A lead-acid cell designed to supply a duty cycle requiring a constant current for a long period of time (typically greater than one hour). This term is used in North America for cells designed for telecommunications application. For nickel-cadmium cells this type of cell may be referred to as **long**.

Long duration discharge: Removal of a small to moderate current (i.e., relative to cell size) over a long period of time (normally 1 hour or longer).

Low level line: A line on the side of a jar which represents the minimum level of electrolyte that should be present in a cell. Also see **level line**.

Low rate cell: A classification which describes the range of discharge rates a cell is designed for use at, which for a low rate cell is between 20 h and 100 h. In North America, these classifications are usually associated with nickel-cadmium cells.

Low rate discharge: Removal of a small to moderate current (i.e., relative to cell size) typically for a long period of time (normally 1 hour or longer).

Low-rate discharge: Removal of a small to moderate current (i.e., relative to cell size) typically for a long period of time (normally 1 hour or longer).

Low voltage cutout: A device that is used to disconnect a lead-acid battery from either a piece of equipment or the dc system to prevent overdischarge of the battery. Also referred to as a **low voltage disconnect**.

Low voltage disconnect: A device that is used to disconnect a lead-acid battery from either a piece of equipment or the dc system to prevent overdischarge of the battery. Also referred to as a **low voltage cutout**.



M

Maintenance free cell: A term incorrectly used to describe a valve regulated lead-acid cell.

Maintenance-free cell: A term incorrectly used to describe a valve regulated lead-acid cell.

Medium rate cell: A classification which describes the range of discharge rates a cell is designed for use at, which for a medium rate cell is between 3 h and 20 h. In North America, these classifications are usually associated with nickel-cadmium cells.

Micro-ohmmeter: An instrument for measuring extremely low resistance, e.g., intercell connection resistance. Also referred to as a **ductor** or **DLRO**[®]. (Note: DRLO[®] and Megger[®] are registered trademarks of Megger Group Limited or its subsidiaries.)

Mixing charge: A charge given after adding an appreciable amount of water, if reasonable mixing/diffusion is not expected under normal operation.

Modified performance test: A constant-current (or constant-power) capacity test made on a battery sometimes in the **as-found condition**, that combines a performance test and service test to demonstrate the capacity of the battery, as well as, the ability of the battery to perform its design function. See **performance test**, **service test**.

Modified-Planté plate: A lead-alloy grid containing holes into which pure lead corrugated strip, which has been rolled into buttons (or rosettes), are placed.

Module: Multiple cells/multi-cell units in a single assembly.

Monobloc: A multi-cell container in which cells are installed. (Note: some multi-cell units may already have the intercell connectors installed on the cells within the unit.) Also referred to as a **multi-cell unit** or **monoblock**.



Moss: A deposition of a sponge-like layer of lead on the negative plates or negative strap.

Mossing: The deposition of a sponge-like layer of lead on the negative plates or negative strap.

Mossing (lead-acid cell): The deposition of a sponge-like layer of lead on the negative plates or negative strap.

Mud: A term used to refer to the **sediment** in a cell, which is the active material or grid metal that separates from the battery plates and falls to the bottom of the jar.

Mud short: A cell short caused by the accumulation of sediment in a cell to a point where the sediment provides a conduction path between at least one plate of each polarity (i.e., one positive and one negative). Also referred to as a **sediment short**.

Mud space: The area beneath the plates in a vented cell that is provided to accommodate the active material or grid metal that may shed from the plates over the service life of the cell. More often referred to as **sediment space**

Multi-cell unit: A multi-cell container in which cells are installed. (Note: some multi-cell units may already have the intercell connectors installed on the cells within the unit.) Also referred to as a **monobloc** or **monoblock**.

Multi-cell container: A multi-compartment container in which each compartment may contain an individual cell, with the component separating the individual cells within the container referred to as a **partition**. Also referred to as a **jar**.

N

Nameplate capacity: The Ampere-hour (or Watt-hour) capacity assigned to a cell by its manufacturer for a given discharge time, at a specified electrolyte temperature and



specific gravity (lead-acid cells only) to a given end-of-discharge voltage. Also referred to as **capacity**, **ampere-hour capacity**, **rated capacity** or **watt-hour capacity**.

Negative electrode: The electrode to which current flows from the external circuit when the cell is discharging. Also referred to as a **negative plate**.

Negative group bar: A term commonly used outside of North America to refer to the component in a cell where all the negative plates are joined. Outside of North America this is also referred to as the **negative pole bridge**. Also see **negative strap** which is the term used for this component in North America.

Negative pillar: The terminal toward which positive electric charge flows in the external circuit i.e., from the positive terminal, when the cell discharges. Also referred to as the **negative post**, **negative terminal**, **negative pole**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Negative plate: The electrode to which current flows from the external circuit when the cell is discharging. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.) Also referred to as a **negative electrode**.

Negative plate group bar: A term commonly used outside of North America to refer to the component in a cell where all the negative plates are joined. Outside of North America this is also referred to as the **negative pole bridge**. Also see **negative strap** which is the term used for this component in North America.

Negative pole: The terminal toward which positive electric charge flows in the external circuit i.e., from the positive terminal, when the cell discharges. Also referred to as the **negative post**, **negative pillar**, **negative terminal**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Negative pole bridge: A term commonly used outside of North America to refer to the component in a cell where all the negative plates are joined. Outside of North America this is also referred to as the **negative pole bridge**. Also see **negative strap** which is the term used for this component in North America.



Negative post: The terminal toward which positive electric charge flows in the external circuit i.e., from the positive terminal, when the cell discharges. Also referred to as the **negative terminal, negative pillar, negative pole**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Negative strap: The component in a cell where all the plates of like polarity are joined. Outside of North America this is often referred to as the **negative group bar** or **negative pole bridge**.

Negative terminal: The terminal toward which positive electric charge flows in the external circuit i.e., from the positive terminal, when the cell discharges. Also referred to as the **negative post, negative pillar, negative pole**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Neutralize: The process of adding a base to an acidic solution (i.e., for acid electrolyte) or an acid to a basic solution (i.e., alkaline electrolyte) until the resulting solution is chemically neutral (i.e., pH=7).

Nominal density: The density, typically in kg/m³ of the electrolyte selected for the determination of the rated capacity of the cell when it is fully charged. (Note: this also implies that the cell temperature and the electrolyte level are at their respective reference points.)

Nominal gravity: The specific gravity of the electrolyte selected for the determination of the rated capacity of the cell when it is fully charged. (Note: this also implies that the cell temperature and the electrolyte level are at their respective reference points.)

Nominal voltage: The nominal voltage of one cell multiplied by the number of cells in the battery. Also referred to as **battery nominal voltage**.

Normal float: The voltage applied during full-float operation. This voltage is high enough to overcome local action of the cells and replace discharge losses caused by electrical load peaks, without overcharging the cells. Also referred to as **float voltage**.

Normal float voltage: The voltage applied during full-float operation. This voltage is high enough to overcome local action of the cells and replace discharge losses caused



by electrical load peaks, without overcharging the cells. Also referred to as **float voltage**.

O

Open circuit voltage: The voltage of a cell with no current flow in either direction after the cell has had time to stabilize. [Note: for a lead-acid cell this can be closely approximated by adding 0.84 to the nominal SG of the electrolyte of the cell, i.e., $E_{OC} = 0.84 + SG$.]

Open-circuit voltage: The voltage of a cell with no current flow in either direction after the cell has had time to stabilize. [Note: for a lead-acid cell this can be closely approximated by adding 0.84 to the nominal SG of the electrolyte of the cell, i.e., $E_{OC} = 0.84 + SG$.]

Outside negative: For cells with an odd number of plates the first and last negative in the plate stack, which are located at each end of the cell. The outside negative may be thinner than the negative plates between two positive plates (i.e., since the outside negative is the last plate on either side of the element, one side of the plate will not work when the cell is in service). Also referred to as **end negative, outside negative plate, outside negative plate (lead-acid cell)**.

Outside negative plate: For cells with an odd number of plates the first and last negative in the plate stack, which are located at each end of the cell. The outside negative may be thinner than the negative plates between two positive plates (i.e., since the outside negative is the last plate on either side of the element, one side of the plate will not work when the cell is in service). Also referred to as **end negative, outside negative, outside negative plate (lead-acid cell)**.

Outside negative plate (lead-acid cell): For cells with an odd number of plates the first and last negative in the plate stack, which are located at each end of the cell. The outside negative may be thinner than the negative plates between two positive plates (i.e., since the outside negative is the last plate on either side of the element, one side



of the plate will not work when the cell is in service). Also referred to as **end negative, outside negative, outside negative plate**.

Over-the-partition-weld (or connection): The connection of two adjacent cells in a monobloc made up-and-over the partition that separates the two cells.

Overcharge: The forcing of excess current through a battery after it has been fully recharged.

Overcharging: The process of forcing excess current through a battery after it has been fully recharged.

Oxidation: 1. A reaction in which there is an increase in valence resulting from a loss of electrons, e.g., the release of electrons by the cell's active material to the external circuit. 2. A corrosion reaction in which the corroded metal forms an oxide.

Oxygen cycle: A process whereby oxygen generated at the positive electrode recombines with hydrogen at the negative electrode to convert to water. See **oxygen recombination**.

Oxygen index: The minimum concentration of oxygen, expressed as percent volume, in a mixture of oxygen and nitrogen that will just support flaming combustion of a material initially at room temperature. Also referred to as **limiting oxygen index, LOI**.

Oxygen recombinant cell: A cell in which oxygen recombination takes place with the cell in operation. See **valve regulated lead-acid cell**.

Oxygen recombination: A process whereby oxygen generated at the positive electrode recombines with hydrogen at the negative electrode to convert to water.

Oxygen recombination cell: A cell in which oxygen recombination takes place with the cell in operation. See **valve regulated lead-acid cell**.

Oxygen recombination efficiency: A ratio of the quantity of oxygen recombined (at the negative electrode), to the total amount of oxygen generated (at the positive electrode), expressed as a percent.



P

Parallel: The term used to describe the interconnection of cells in which all the like terminals are connected together.

Parallel strings: The term used to describe the interconnection of two or more battery strings in which the like terminals of each string are connected together.

Partition: The material used to separate individual cells in a monobloc. This is normally an integral part of the monobloc container when it is manufactured.

Partition connection: The connection of two adjacent cells in a monobloc made through, or up-and-over the partition.

Partition wall: The component used to separate individual cells in a monobloc. This is normally an integral part of the monobloc container when it is manufactured. See **partition**.

Partition weld: The connection of two adjacent cells in a monobloc made through, or up-and-over the partition. Also referred to as a **partition connection, over the partition weld (or connection), through the partition weld (or connection)**.

Passivation: 1. The process in metal corrosion by which metals become passive. 2. The changing of a chemically active surface of a metal to a much less reactive state.

Passive neutralization: The process of automatically neutralizing an acidic solution (i.e., for acid electrolyte) or a basic solution (i.e., alkaline electrolyte) until the resulting solution is chemically neutral (i.e., pH=7). This is normally done by components (e.g., spill containment pillows) that have been installed around and/or under the battery. See **passive neutralization**.

Paste: The active material within a lead-acid cell utilizing pasted plates, normally manufactured by mixing water, sulfuric acid and lead oxide.



Pasted plate: A lead-acid plate made from a grid (usually lead-alloy) that is filled with active material applied as a paste. Also referred to a **flat plate** or **Fauré plate**. See **paste**.

Percent ripple: The ratio of the rms value of the ripple voltage (or current) to the average value of the total (i.e., direct-current) voltage (or current).

Performance test: A constant-current (or constant-power) capacity test made on a battery sometimes in the **as-found condition**, after being placed in service, to detect any change in the capacity determined by the acceptance test.

Period: An interval of time in the battery duty cycle during which the current (or power) is assumed to be constant for purposes of cell sizing calculations.

Pillar: The part of a cell to which the external circuit is connected. Also referred to as a **post, pole, terminal**, or **terminal post**. See **positive terminal, negative terminal**.

Pilot cell: A selected cell (or cells) in a battery whose condition is assumed to indicate the condition of the entire battery.

Pin insulator (pocket-plate type cells): A nonconductive spacer, normally made of nylon, used to prevent metallic contact between plates of opposite polarity within a nickel-cadmium pocket plate cell since the pocket plate surfaces do not have active material on the surface of the plates. Also referred to as a **insulating pin**. See **separator**.

Planté plate: A pure lead plate for a lead-acid cell in which the active material is formed directly from a lead substrate.

Plaque (pocket-plate type cells): Individual pocket strips attached to one another and cut to the required plate height and width. See **plate**.

Plate: An assembly of active materials on a supporting framework grid, frame, or support strip. Also referred to as an **electrode**.



Plate group: An assembly of plates of the same polarity connected together (usually in parallel). Also referred to as a **group**.

Plate group bar: A term used outside of North America to refer to the component in a cell where all the plates of like polarity are joined. Also see **strap** which is the term used for this component in North America.

Plate growth: Physical growth of the positive plates of a lead-acid cell as the cell ages, primarily due to intergranular corrosion of the grid.

Plate lug: The tab at the top of the plate that is later joined to the strap, forming the plate group.

Plate polarization: The change in voltage at the plate (or electrode) of a cell when a specified current is flowing into the cell; it is equal to the difference between the actual plate voltage and the plate open circuit voltage, exclusive of the internal voltage drop.

Plate short: A condition in a cell where at least one plate of each polarity (i.e., one positive and one negative) make electrical contact with each other. Also referred to as a **cell short** or **sediment short**.

Pocket plate: A plate in which the active material is held in perforated metal pockets on a support strip. Usually used for nickel-cadmium cells.

Point: Used in conjunction with electrolyte specific gravity (SG) or density to refer to a change or a spread (e.g., minimum to maximum) in SG or density.

Point (of specific gravity): One-thousandth (0.001) of specific gravity (SG). E.g., a 0.010 change in SG would be a 10 point change.

Point (of density): One unit of density. E.g., a change in density of $\pm 10 \text{ kg/m}^3$ would be a ± 10 point change.

Polarization: The change in voltage at the terminals of a cell when a specified current is flowing into the cell; it is equal to the difference between the actual cell voltage and the open circuit voltage, exclusive of the internal voltage drop.



Pole: The part of a cell to which the external circuit is connected. Also referred to as a **post, pillar, terminal, terminal post**. See **positive terminal, negative terminal**.

Pole bridge: A term used outside of North America to refer to the component in a cell where all the plates of like polarity are joined. Also see **strap** which is the term used for this component in North America.

Pole seal: A term used outside of North America to refer to the seal between the post and the cover where the post penetrates the cover. Also referred to as a **post-to-cover-seal** or **electrolyte-tight pole bushing**.

Positive electrode: The electrode from which current flows to the external circuit when the battery is discharging. Also referred to as a **positive plate**.

Positive group bar: A term commonly used outside of North America to refer to the component in a cell where all the positive plates are joined. Outside of North America this is also referred to as the **positive pole bridge**. Also see **positive strap** which is the term used for this component in North America.

Positive pillar: The terminal from which the positive electric charge flows through the external circuit to the negative terminal when the cell discharges. Also called **positive post, positive terminal, positive pole**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Positive plate: The electrode from which current flows to the external circuit when the battery is discharging. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.) Also referred to as a **positive electrode**.

Positive plate group bar: A term commonly used outside of North America to refer to the component in a cell where all the positive plates are joined. Outside of North America this is also referred to as the **positive pole bridge**. Also see **positive strap** which is the term used for this component in North America.

Positive pole: The terminal from which the positive electric charge flows through the external circuit to the negative terminal when the cell discharges. Also called **positive**



post, positive pillar, positive terminal. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Positive pole bridge: A term commonly used outside of North America to refer to the component in a cell where all the positive plates are joined. Outside of North America this is also referred to as the **positive plate group bar**. Also see **positive strap** which is the term used for this component in North America.

Positive post: The terminal from which the positive electric charge flows through the external circuit to the negative terminal when the cell discharges. Also called **positive terminal, positive pillar, positive pole**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Positive strap: The component in a cell where all the positive plates are joined. Outside of North America this is often referred to as the **positive group bar** or **positive pole bridge**.

Positive terminal: The terminal from which the positive electric charge flows through the external circuit to the negative terminal when the cell discharges. Also called **positive post, positive pillar, positive pole**. (Note: the flow of electrons in the external circuit is from the negative terminal to the positive terminal.)

Post: The part of a cell to which the external circuit is connected. Also referred to as a **pillar, pole, terminal, or terminal post**. See **terminal, positive terminal, negative terminal**.

Post seal: The seal between the post and the cover where the post penetrates the cover. Outside of North America, also referred to as a **pole seal** or **electrolyte-tight pole bushing**.

Post to cover seal: The seal between the post and the cover where the post penetrates the cover. Outside of North America, also referred to as a **pole seal** or **electrolyte-tight pole bushing**.

Post-to-cover seal: The seal between the post and the cover where the post penetrates the cover. Outside of North America, also referred to as a **pole seal** or



electrolyte-tight pole bushing.

Power density: The ratio of the available power from a cell (in Watts) to its volume or weight. Common units are W/l, W/lb, and W/kg. Also referred to as **Watt density**.

Premature capacity loss: A phenomenon originally attributed to antimony-free alloy lead-acid cells that causes a reduction in the capacity of the positive plate on cycling. The capacity loss can be reversed by proper charging if secondary effects have not damaged the active material. Also referred to as **antimony-free effect**, **reversible capacity decay** or **reversible insufficient mass utilization**.

Profile: The load (in Amperes or Watts) a battery is expected to supply for a specified time period(s). This may be presented in the form of a list or as a graph of current (or power) vs. time. Also referred to as a **duty cycle**, **battery duty cycle**, **battery profile**, or **load profile**.

Q

Quick charge: An overcharge of arbitrary length. Also referred to as a **boost charge**.

R

Rack: A structure used to support a group of cells. The most common rack material is steel with a coating to resist the corrosive effects of the cell's electrolyte, although racks made of polyester-reinforced fiberglass, wood and concrete are in use. A rack may also be designed for use in a specific seismic (i.e., earthquake) area, which will require additional components including cell (or monobloc) restraints. See **earthquake rack**. Also called **battery rack**; however, in the telecommunications industry it is referred to as a **battery stand** or simply **stand**. See battery rack, earthquake rack.

Rack section: A freestanding portion of the battery rack. (I.e., a battery rack may be comprised of multiple rack sections which are installed to form the battery rack. For



example two, 30 cell rack sections may be provided to make up a rack for a 60 cell battery.)

Rated capacity: The Ampere-hour (or Watt-hour) capacity assigned to a cell by its manufacturer for a given discharge time, at a specified electrolyte temperature and specific gravity (lead-acid cells only) to a given end-of-discharge voltage. Also referred to as **capacity**, **ampere-hour capacity**, or **watt-hour capacity**. See **rated capacity (lead-acid cell)**; **rated capacity (nickel-cadmium cell)**.

Rated capacity (lead-acid cell): The Ampere-hour (or Watt-hour) capacity assigned to a cell by its manufacturer for a given discharge time, at a specified cell temperature and specific gravity to a given end-of-discharge voltage. Also referred to as **capacity**, **ampere-hour capacity**, or **watt-hour capacity**.

Rated capacity (nickel-cadmium cell): The Ampere-hour (or Watt-hour) capacity assigned to a cell by its manufacturer for a given discharge time, at a specified cell temperature to a given end-of-discharge voltage. This rating is normally based on the cell being constant current charged. If the cell has been prolong float charged (i.e., constant potential) it will have a lesser capacity due to float effect. Also referred to as **capacity**, **ampere-hour capacity**, or **watt-hour capacity**. See **float effect**, **voltage depression (nickel-cadmium cell)**, **float effect correction factor**.

Recombinant cell: A cell in which oxygen recombination takes place with the cell in operation. Also referred to as an **oxygen recombinant cell**. See **valve regulated lead-acid cell**.

Recombination vent: A vent in which most of the gasses escaping from the cell are catalytically recombined and returned to the cell as water.

Rectifier: An apparatus which is capable of restoring the charge of a secondary battery. Also referred to as a **battery charger**.

Reduction: A reaction in which there is a decrease in valence resulting from a gain in electrons.

Reference electrode: A special (i.e., nonpolarizable) electrode which has a reproducible potential against which other electrode potentials can be referred. For a lead-acid cell some common reference electrodes are the standard hydrogen electrode, the cadmium electrode and the mercury/mercurous sulphate electrode. For nickel-



cadmium cells some common reference electrodes are cadmium/cadmium hydroxide and mercury/mercuric oxide.

Refresher charge: A charge given to a battery following nonuse or storage. (Note: except for dry-charged cells, lead-acid cells in storage require freshening charges in accordance with the manufacturer's instructions.) Also referred to as **initial charge** or **freshening charge**.

Reserve cell: A cell which has been assembled with its plates dry, and in a charged state, ready to be activated by the addition of electrolyte. This is normally done for ease in shipping, storage or both. Also referred to as a **dry-charged cell**.

Rest potential: The potential of an electrode in an electrolyte, relative to a reference electrode when there is no current flow. See **open circuit voltage**.

Retainer: Any material which is used to prevent the loss of active material from the positive plate.

Retainer mat: Glass fiber manufactured as a mat used as a retainer.

Reversal: A changing of the normal polarity of a cell. This can be caused by overdischarge or incorrect connection of the charger. Also referred to as **cell reversal**.

Reversible capacity decay: A phenomenon originally attributed to antimony-free alloy lead-acid cells that causes a reduction in the capacity of the positive plate on cycling. The capacity loss can be reversed by proper charging if secondary effects have not damaged the active material. Also referred to as **antimony-free effect**, **premature capacity loss** or **reversible insufficient mass utilization**.

Reversible insufficient mass utilization: A phenomenon originally attributed to antimony-free alloy lead-acid cells that causes a reduction in the capacity of the positive plate on cycling. The capacity loss can be reversed by proper charging if secondary effects have not damaged the active material. Also referred to as **antimony-free effect**, **premature capacity loss** or **reversible capacity decay**.

Ripple: The alternating-current (ac) component from a direct-current (dc) power supply arising from sources within the power supply. The ripple includes unclassified noise, unless specified otherwise. Ripple is normally expressed in peak, peak-to-peak, root-



mean-square (rms) or percent of rms. Also referred to as **ripple current; ripple voltage; percent ripple.**)

Ripple current: The alternating component whose instantaneous values are the difference between the average and instantaneous values of a pulsating unidirectional current.

Ripple filter: A component or group of components designed to reduce ripple, while freely passing direct-current.

Ripple voltage: The alternating component whose instantaneous values are the difference between the average and instantaneous values of a pulsating unidirectional voltage.

Round plate: A pure lead grid for a lead-acid cell which is filled with active material applied as a paste.

Rundown test: A partial discharge test to a voltage other than the system designed end voltage. [Note: this type of test is frequently performed on UPS systems; however, it does not verify manufacturer's rated capacity nor does it guarantee the battery would be able to serve its load for the design duty cycle.]

S

S Curve: A curve used to describe a cell's discharge characteristics in a graphical form.

Safety vent: For a vented cell, a venting device which prevents the propagation of an external flame into the cell. Outside North America it is referred to as a **flame-arrested vent plug**. See **flame-arrestor vent**.

Sealed cell: A cell which is sealed; however, this term is often used to refer to valve regulated lead-acid cells, which cannot be sealed and must have a vent, although it may be a valve that is normally closed, but opens when the internal cell pressure exceeds a certain value.



Secondary battery: Two or more secondary cells connected together electrically. Cells may be connected in series or parallel, or both, to provide the required operating voltage and current levels. [Note: common usage permits this designation to be applied to a single secondary cell used independently.]

Secondary cell: An electrochemical cell that is capable of being discharged and then recharged. Also referred to as a **secondary battery, storage cell, storage battery, or accumulator.**

Sediment: The active material or grid metal that separates from the battery plates and falls to the bottom of the jar. Sometimes referred to as **mud.**

Sediment short: A cell short caused by the accumulation of sediment in a cell to a point where the sediment provides a conduction path between at least one plate of each polarity (i.e., one positive and one negative). Also referred to as a **cell short, plate short or mud short.**

Sediment space: The area beneath the plates in a vented cell that is provided to accommodate the active material or grid metal that may shed from the plates over the service life of the cell.

Seismic stand: A battery stand which is designed for use in a specific seismic (i.e., earthquake) area. In the US, the seismic design criteria are normally found in the International Building Code (IBC). Previously, seismic zones were used and were designated 0 (no seismic activity) to 4 (high-seismic activity). These stands are provided with extra equipment e.g., side-rails, end-rails, and spacers which restrain the cells during a seismic event. (Also referred to as a **seismic rack, earthquake stand, or earthquake rack.**)

Seismic rack: A battery rack which is designed for use in a specific seismic (i.e., earthquake) area. In the US, the seismic design criteria are normally found in the International Building Code (IBC). Previously, seismic zones were used and were designated 0 (no seismic activity) to 4 (high-seismic activity). These racks are provided with extra equipment e.g., side-rails, end-rails, and spacers which restrain the cells during a seismic event. (Also referred to as a **earthquake rack, earthquake stand, or seismic stand.**)

Self discharge: The internal losses of a battery standing on open-circuit or on float



charge, without considering any losses incidental to any discharge. Also referred to as **local action** or **standing losses**.

Self-discharge: The internal losses of a battery standing on open-circuit or on float charge, without considering any losses incidental to any discharge. Also referred to as **local action** or **standing losses**.

Self-discharge rate: The amount of capacity reduction occurring per unit of time in a battery as a result of self-discharge while off charge and/or in storage. Typically, expressed as percent capacity loss per month and it is dependent on cell temperature.

Separator: An ionic permeable, nonconductive spacer used to prevent metallic contact between plates of opposite polarity within a cell. [Note: rather than a full separator, cells with pocket plates may use nonconductive insulating pins since the pocket plate surfaces do not have active material on them.]

Separator mat: Glass or polymeric fiber manufactured as a mat used as a separator in VRLA cells.

Series: The interconnection of cells in such a manner that the positive terminal of the first is connected to the negative of the second, and so on.

Series string: A common way to refer to a number of cells connected together in series, to form a battery; when used, it is normally preceded by a number which represents either, the number of cells connected together or the nominal battery voltage. E.g., a 60 cell string, a 48-V string, a 188 cell string. Also referred to as **string**.

Service life: The period of time during which a fully charged battery is capable of delivering at least a specified percentage of its rated capacity. For most lead-acid battery designs this percentage is 80%. Nickel-cadmium cells may also use 80%, although that can vary with system design. Also referred to as **end-of-life** or **useful life**.

Service test: A special test of the battery's capability, as found, to satisfy the design requirements (battery duty cycle) of the dc system. Also referred to as a **duty cycle test** or **profile test**.



Shallow cycle: A discharge (normally less than 1 hour) and subsequent charge of a cell, where a small portion of the cell's capacity has been removed on discharge. See **cycle**.

Shallow discharge: The conversion of chemical energy into electrical energy within a cell of a small portion of the rated capacity of the cell. See **discharge**.

Shed: Active material that has been lost from the plate. See **shedding**.

Shedding: The loss of active material from a plate. Also see **sediment**.

Shelf life: 1. The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a freshening charge. 2. The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. Also referred to as **storage time**.

Shipping vent: The vent placed in the cell for the purpose of shipping the cell. Outside of North America it may be referred to as a **transit plug**.

Short life: A term referring to a battery that fails before the end of its expected service life. See **short life battery**.

Short life battery: A battery that fails before the end of its expected service life.

Short circuit current: The value of current obtained from a cell when connected to an external circuit with negligible resistance.

Short duration discharge: Removal of a current which may be a large current (i.e., relative to cell size) over a short period of time (normally less than 1 hour).

Single cell capacity tester: A piece of equipment that can be used to perform a capacity test or discharge on a single cell. Some single cell capacity testers can perform a capacity test on two individual cells, but at one-half of the test set's maximum discharge current (or power) for a single cell. Also referred to as a **single cell capacity test set**, **single cell discharge test set**, or **single cell discharge tester**.

Single cell capacity test set: A piece of equipment that can be used to perform a capacity test or discharge on a single cell. Some single cell capacity test sets can perform a capacity test on two individual cells, but at one-half of the test set's maximum



discharge current (or power) for a single cell. Also referred to as a **single cell capacity test set, single cell capacity tester, or single cell discharge tester.**

Single cell discharge tester: A piece of equipment that can be used to perform a capacity test or discharge on a single cell. Some single cell discharge testers can perform a capacity test on two individual cells, but at one-half of the test set's maximum discharge current (or power) for a single cell. Also referred to as a **single cell capacity tester, single cell capacity test set, or single cell discharge test set.**

Single cell discharge test set: A piece of equipment that can be used to perform a capacity test or discharge on a single cell. Some single cell discharge test sets can perform a capacity test on two individual cells, but at one-half of the test set's maximum discharge current (or power) for a single cell. Also referred to as a **single cell capacity tester or single cell discharge tester.**

SLI battery: A battery designed to start internal combustion engines or provide emergency lighting. **SLI** is an acronym for **starting, lighting and ignition**. Examples are batteries for automobiles, trucks, boats, snow mobiles, jet skis, motorcycles, lawn tractors, emergency lights, emergency generators and so forth.

Spall: The spontaneous chipping, fragmentation or separation of a surface or surface coating. Also referred to as **spalling**.

Spalling: The spontaneous chipping, fragmentation or separation of a surface or surface coating.

Specific gravity: The ratio of the weight of a given volume of electrolyte to the weight of an equal volume of water at a reference temperature. In North America, the reference temperature is 25 °C (77 °F). (Note: outside North America, it is normal practice to measure the electrolyte density at a reference temperature of 20 °C (68 °F), rather than specific gravity in units of kg/m³, although measurement of density is becoming more prevalent in North America.) Also referred to as **electrolyte specific gravity or gravity.**)

Spill containment: A system that will contain an electrolyte spill from a cell or battery that will prevent it from posing a hazard. This system may be permanently installed or may be temporary.



Split rate charge: A charge in which two different charge rates are used, the first being higher than the second. The rate is usually changed from high to low when the battery starts gassing. Also referred to as a **two-rate charge**.

Sponge lead: Metallic lead in a highly reactive, porous structure, used as the active material in the negative plate of a lead-acid cell. When the active material is squeezed it feels sponge-like.

Stand: A term commonly used in the telecommunications industry to refer to a structure used to support a group of cells. The most common material for a stand is steel with a coating to resist the corrosive effects of the cell's electrolyte, although stands made of polyester-reinforced fiberglass, wood and concrete are in use. A stand may also be designed for use in a specific seismic (i.e., earthquake) area, which will require additional components including cell (or monobloc) restraints. .See **earthquake stand**. More commonly referred to as a rack. See **battery rack, earthquake rack**.

Stand life: 1. The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a freshening charge. 2. The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. See **storage time**.

Stand loss: The internal losses of a battery standing on open-circuit or on float charge, without considering any losses incidental to any discharge. Also referred to as **local action** or **standing losses**.

Standby battery: A battery designed for applications where the battery is required to function only when the normal source of power fails or in some applications, when the load on the dc system exceeds the battery charger output rating for short (generally less than one minute) periods of time. See **full-float operation**.

Standby charge: A charge given to a battery with no external load connected to it, to maintain it in a fully charged condition. Also referred to as a **trickle charge**.

Standing losses: The internal losses of a battery standing on open-circuit or on float charge, without considering any losses incidental to any discharge. Also referred to as **local action** or **self discharge**.

Starved cell: A cell, usually a valve regulated lead-acid type, which utilizes absorbed electrolyte. Also referred to as a **valve regulated lead-acid cell**.



Starved electrolyte cell: A cell, usually a valve regulated lead-acid type, which utilizes absorbed electrolyte. Also referred to as a **valve regulated lead-acid cell**.

State of charge: The actual capacity of a cell, expressed as a percent of its rated capacity that would be available if a discharge were to occur.

State-of-charge: The actual capacity of a cell, expressed as a percent of its rated capacity that would be available if a discharge were to occur.

Stationary battery: A secondary battery designed for service in a permanent location.

Step rack: A rack in which cells are placed at different levels in a stepped arrangement. When this term is used, it is normally preceded by a number which represents the number of steps the rack has. E.g., a two step rack. In the telecommunications industry also referred to as a **stepped stand**.

Stepped stand: A term used in the telecommunications industry to refer to stand in which cells are placed at different levels in a stepped arrangement. When this term is used, it is normally preceded by a number which represents the number of steps the stand has. E.g., a two step stand. Also referred to as a **step rack**.

Storage battery: Two or more secondary cells connected together electrically. Cells may be connected in series or parallel, or both, to provide the required operating voltage and current levels. [Note: common usage permits this designation to be applied to a single secondary cell used independently.] Also referred to as a **secondary battery**.

Storage cell: An electrochemical cell that is capable of being discharged and then recharged. Also referred to as a **secondary battery, secondary cell, storage battery, or accumulator**.

Storage life: 1. The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a **freshening charge**. 2. The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. See **storage time**.

Storage time: 1. The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a



freshening charge. 2. The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell.

Storage period: 1. The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a **freshening charge.** 2. The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. See **storage time.**

Strap: 1. The component in a cell where all the plates of like polarity are joined. Outside of North America this is often referred to as the **group bar** or **pole bridge.** 2. An electrical conductor used to connect adjacent cells on the same rack. Most often, the connector is copper bar which is lead- or tin-plated for lead-acid cells; however, for nickel-cadmium cells the connector may be nickel-, cadmium- or tin-plated copper or a steel bar. The connector may also be insulated copper wire, or may be lead (with or without a copper insert) for lead-acid cells (where the manufacturer has made the connection between cells in the same multi-cell container). Also referred to as an **intercell connector.**

Stratification: A condition that occurs in vented lead-acid cells when recharged after a discharge, whereby the heavier acid is initially at, or near, the bottom of the cell. Stratification can also occur after an appreciable amount of water is added to a vented cell.

Stratified: A condition that occurs in vented lead-acid cells where the heavier acid is located at or near the bottom of the cell. Stratification can occur on recharge following a discharge or after an appreciable amount of water is added to a vented cell. See **stratification.**

Stress relaxation: The tendency of lead to relax when stressed (e.g., when connectors are bolted and torqued at a lead post). In metallurgy, also referred to as **creep.** See **cold flow.**

String: A common way to refer to a number of cells connected together in series, to form a battery; when used, it is normally preceded by a number which represents either, the number of cells connected together or the nominal battery voltage. E.g., a 60 cell string, a 48-V string, a 188 cell string.



Sulfation: A state where the cell has developed an abnormal amount of lead sulfate and its capacity is impaired. This is different from normal sulfate which occurs during discharge.

Sulphation: A variation in the spelling of sulfation, referring to an abnormal amount of lead sulfate on the plates of the cell.

Sulfation (lead-acid cell): A state where the cell has developed an abnormal amount of sulfate and its capacity is impaired. This is different from normal sulfate which occurs during discharge.

Surface thermometer: An instrument used to measure temperature by placing a probe in direct contact with the component whose temperature is to be measured. In the case of a cell temperature this component is normally the negative post. Also referred to as a **contact thermometer**.

T

Tafel: See **Tafel line**; **Tafel diagram**.

Tafel line: A plot, on semi-logarithmic coordinates, of the relationship between current and potential of a polarized electrode.

Tafel diagram: A diagram containing the positive and negative electrode Tafel lines for a cell.

Tafel plot: A graph, typically with a logarithmic x-axis and linear y-axis that describes the relationship between cell float current, cell voltage, plate potentials and plate polarization. See **Tafel line**; **Tafel diagram**.

Taper charge: A charge where both current and voltage decrease over the recharge period.

Temperature coefficient of capacity: The change in capacity of a cell per degree, relative to its reference temperature.



Temperature coefficient of voltage: The change in open circuit voltage of a cell per degree, relative to its open circuit voltage at the reference temperature.

Temperature compensation: A term used to refer to the correction of float voltage or other battery parameter for the fact that the cell is not operating at its reference temperature.

Temperature compensated battery charger: A battery charger that senses battery temperature using a temperature sensing device and automatically adjusts its output voltage to the correct voltage for the battery operating at that temperature, based upon the **temperature coefficient of voltage** for the battery.

Temperature compensated rectifier: A rectifier that senses battery temperature using a temperature sensing device and automatically adjusts its output voltage to the correct voltage for the battery operating at that temperature, based upon the **temperature coefficient of voltage** for the battery.

Terminal: The part of a cell to which the external circuit is connected. Also referred to as a **post, pillar, pole, terminal post**.

Terminal connection: A term used to refer to any connection at the terminal of a cell including intercell connections, terminal details or cable terminal (i.e., compression or mechanical terminals) connections,

Terminal connection detail: A plated copper plate that is used to adapt field cables inter-tier, inter-step or inter-rack cables to the cell post(s). See **terminal connection detail (lead-acid cell); terminal connection detail (nickel-cadmium cell)**.

Terminal connection detail (lead-acid cell): Connections made between rows of cells or at the positive and negative terminals of the battery, which may include lead-plated terminal plates, cables with lead- or tin-plated lugs, and lead- or tin-plated rigid copper connectors.

Terminal connection detail (nickel-cadmium cell): Connections made between rows of cells or at the positive and negative terminals of the battery, which may include nickel-, tin- or cadmium-plated terminal plates, cables with nickel- or tin-plated lugs, and nickel- or tin-plated rigid copper or steel connectors.



Terminal cover: An insulated cover, which may or may not be clear, placed over the intercell connector and post, used to prevent accidental contact by personnel or accidental short circuiting of the cell. Also referred to as **intercell connector safety cover**.

Terminal detail: A plated copper plate that is used to adapt field cables inter-tier, inter-step or inter-rack cables to the cell post(s). See **terminal connection detail (lead-acid cell)**; **terminal connection detail (nickel-cadmium cell)**.

Terminal post: The part of a cell to which the external circuit is connected. Also referred to as a **post, pillar, pole, terminal**.

Thermal runaway: 1. A condition whereby a cell on charge or discharge will destroy itself through internal heat generation caused by high overcharge or overdischarge current or other abusive condition. 2. A condition that is caused by a battery charging current which produces more internal heat than the battery can dissipate. This condition ultimately causes cell venting in a valve regulated cell and premature failure.

Through-the-partition weld (or connection); The connection of two adjacent cells in a monobloc made through a hole in the partition separating the cells.

Tier rack: A rack in which cells are placed directly above each other at different levels. When this term is used, it is normally preceded by a number which represents the number of tiers the rack has. E.g., a two tier rack. In the telecommunications industry also referred to as a **tier stand, tiered stand**.

Tier stand: A term used in the telecommunications industry that refers to a stand in which cells are placed directly above each other at different levels. When this term is used, it is normally preceded by a number which represents the number of tiers the stand has. E.g., a two tier stand. Also referred to as a **tier rack**.

Tiered stand: A term used in the telecommunications industry that refers to a stand in which cells are placed directly above each other at different levels. When this term is used, it is normally preceded by a number which represents the number of tiers the stand has. E.g., a two tier stand. Also referred to as a **tier rack**.

Top bar: The component in a lead-acid cell where all the plates of like polarity are joined. Outside of North America this is often referred to as the **group bar** or **pole bridge**. Also referred to as a **strap**.



Top hung: A term used to refer to a positive plate support system used in larger lead-acid cells whereby the positive plates are supported (typically using a hanging lug cast as part of the plate grid) by a non-conductive bridge (and support rod) which rests on top of the top edges of the negative plates, thus allowing room for the positive plates (which are slightly shorter than the negative plates) to grow as the cell ages. Also referred to as **bridge hung**, or **top supported**.

Top lead: The strap and post assembly for both the positive and negative plates in a lead-acid cell. See **strap, post**.

Top lead (lead-acid cells): The strap and post assembly for both the positive and negative plates in a lead-acid cell. See **strap, post**.

Top off: A term used to refer to the addition of approved water to a cell to bring the electrolyte level to the cell manufacturer's reference point (i.e., the high level line or the mid-point between the high and low level lines). Also referred to as **watering**.

Topping up: A term used to refer to the addition of approved water to a cell to bring the electrolyte level to the cell manufacturer's reference point (i.e., the high level line or the mid-point between the high and low level lines). Also referred to as **watering**.

Top supported: A term used to refer to a positive plate support system used in larger lead-acid cells whereby the positive plates are supported (typically using a hanging lug cast as part of the plate grid) by a non-conductive bridge (and support rod) which rests on top of the top edges of the negative plates, thus allowing room for the positive plates (which are slightly shorter than the negative plates) to grow as the cell ages. Also referred to as **bridge hung**, or **top hung**.

Top up: A term used to refer to the addition of approved water to a cell to bring the electrolyte level to the cell manufacturer's reference point (i.e., the high level line or the mid-point between the high and low level lines). Also referred to as **watering**.

Transit plug: A term used outside of North America to refer to the vent placed in the cell for the purpose of shipping the cell. Also referred to as a **shipping vent**.

Tree: A growth in lead-calcium cells, that is normally not detrimental to the cell, where material (that looks like a fuzz ball or iron filings) hangs from the bottom of the negative plate in a cell. See **treeing**.



Trees: Growths in lead-calcium cells, that are normally not detrimental to the cell, where material (that looks like a fuzz balls or iron filings) hangs from the bottom of the negative plates in a cell. See **treeing**.

Treeing: A condition common in lead-calcium cells, that is normally not detrimental to the cell, where material (that looks like fuzz balls or iron filings) hangs from the bottom of the negative plates in a cell.

Trickle charge: A charge given to a battery with no external load connected to it, to maintain it in a fully charged condition.

Tubular plate: A lead-alloy plate consisting of a top bar to which a set of spines (or core rods) are attached; a porous tube, which holds the active material is fitted over each spine.

Two-rate charge: A charge in which two different charge rates are used, the first being higher than the second. The rate is usually changed from high to low when the battery starts gassing.

U

Unactivated shelf life (dry-charged cell): The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. See **storage time**.

Unactivated stand life (dry-charged cell): The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. See **storage time**.

Unactivated storage life (dry-charged cell): The period of time that a dry-charged secondary cell can be stored, at specified conditions, without having to activate the cell. See **storage time**.

Undercharge: Applying less voltage or current than is necessary to recharge a cell or to maintain a cell fully charged.



Undercharging: Applying less voltage or current than is necessary to recharge a cell or to maintain a cell fully charged.

Useful life: The period of time during which a fully charged battery is capable of delivering at least a specified percentage of its rated capacity. For most lead-acid battery designs this percentage is 80%. Nickel-cadmium cells may also use 80%, although that can vary with system design. Also referred to as **end-of-life or service life**.

V

Valve: A normally sealed mechanism which allows for the controlled escape of gasses from within a cell.

Valve regulated lead-acid cell: A cell that is sealed with the exception of a valve which opens to vent the cell to atmosphere whenever the internal pressure of the cell exceeds the atmospheric pressure to the cell by a pre-selected amount. (Also referred to as a **sealed cell, valve regulated sealed lead-acid cell, recombinant cell, oxygen recombinant cell, oxygen recombination cell, and maintenance-free cell** although this is a misnomer.)

Valve regulated sealed lead-acid cell: A cell that is sealed with the exception of a valve which opens to vent the cell to atmosphere whenever the internal pressure of the cell exceeds the atmospheric pressure to the cell by a pre-selected amount. (Also referred to as a **sealed cell, valve regulated lead-acid cell, recombinant cell, oxygen recombinant cell, oxygen recombination cell, and maintenance-free cell** although this is a misnomer.)

Vent: A device which allows the escape of gasses from within a cell. This device, when used with vented (flooded) cells, is so designed that it minimizes the carryover of electrolyte droplets out of the cell, usually by a baffle arrangement. Also see **flame-arrestor vent, valve**. Also referred to as a **vent plug** or **vent cap**.

Vent cap: A device which allows the escape of gasses from within a cell. This device, when used with vented (flooded) cells, is so designed that it minimizes the carryover of electrolyte droplets out of the cell, usually by a baffle arrangement. Also see **flame-arrestor vent, valve**. Also referred to as a **vent, vent plug** or **vent cap**.



Vent plug: A device which allows the escape of gasses from within a cell. This device, when used with vented (flooded) cells, is so designed that it minimizes the carryover of electrolyte droplets out of the cell, usually by a baffle arrangement. Also see **flame-arrestor vent, valve**. Also referred to as a **vent, vent plug** or **vent cap**.

Vented cell: A cell design which is characterized by an excess of free electrolyte, and in which the products of electrolysis (i.e., gasses) and evaporation can freely exit the cell through a vent. Also referred to as a **wet cell** or **flooded cell**.

Voltage depression (nickel-cadmium cell): A phenomenon that occurs when a nickel-cadmium cell is charged at constant voltage for a prolonged period of time, e.g., when it is on float charge, which results in the cell having less capacity than it would have had it been on a constant current charge. Also referred to as **float effect**.

Voltage efficiency: A ratio of the average voltage during discharge to the average voltage during recharge, under specified conditions.

Voltage spread: A term used to describe the difference between the highest and lowest individual cell voltage readings in a battery. E.g., if in a 60 cell battery, the lowest cell read 2.20 V dc and the highest cell read 2.30 V dc, the voltage spread would be 0.10 V.

W

Walk in: A controlled increase in output power by the battery charger from the ac input into the battery charger.

Walk-in: A controlled increase in output power by the battery charger from the ac input into the battery charger.

Water: The process of adding approved water to a vented cell to replace water lost from the electrolyte due to overcharging (e.g., gases generated due to the electrolysis of water in the electrolyte) or evaporation. See **watering; approved water**.



Watering: The process of adding approved water to a vented cell to replace water lost from the electrolyte due to overcharging (e.g., gases generated due to the electrolysis of water in the electrolyte) or evaporation.

Watt density: The ratio of the available power from a cell (in Watts) to its volume or weight. Common units are W/l, W/lb, and W/kg. Also referred to as **Watt density**.

Watt-hour density: The ratio of the available energy from a cell (in Watt-hours) to its volume or weight. Common units are Wh/l, Wh/lb, and Wh/kg. (Also referred to as **energy density**.)

Watt-hour capacity: The Watt-hour capacity assigned to a cell by its manufacturer for a given discharge time, at a specified electrolyte temperature and specific gravity (lead-acid cells only) to a given end-of-discharge voltage. Also referred to as **capacity**, **ampere-hour capacity**, or **rated capacity**. See **rated capacity (lead-acid cell)**; **rated capacity (nickel-cadmium cell)**.

Watt-hour efficiency: The electrochemical efficiency, expressed as a percent, of the ratio of the Watt-hour output of the battery, to the Watt-hour input required to restore the initial state of charge. See **battery efficiency**.

Wet: A term that refers to a cell containing liquid electrolyte. See **vented cell**.

Wet cell: A cell design which is characterized by an excess of free electrolyte, and in which the products of electrolysis (i.e., gases) and evaporation can freely exit the cell through a vent. (Also called **vented cell** or **vented cell**.)

Wet-charged: A cell which is filled with electrolyte and fully charged. See **charged and wet**.

Wet-charged shelf life: The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a freshening charge. See **storage time**.

Wet-charged stand: The period of time that a fully charged secondary cell can be stored, at specified conditions (e.g., temperature), without the need for the application of a freshening charge. See **storage time**.

Wet and charged: A cell which is filled with electrolyte and fully charged. See **charged and wet**.



Wick: 1. A term used to refer to a process where a liquid (typically electrolyte) is transported on or through a component (e.g., a cell post) by capillary action. 2. The term used to describe the process where the electrolyte in an **absorbed electrolyte cell** is drawn through the separator mat by capillary action.

Wicking height: The maximum height that electrolyte will **wick** up the separator mat in an **absorbed electrolyte cell**.

Withdrawal tube: A tube provided, typically in larger vented lead-acid cells, to allow sampling of electrolyte (i.e., for density or specific gravity) from some depth in the cell, rather than at the top of the plates. Also referred to as an **electrolyte withdrawal tube**.

Working voltage: The voltage of a cell when it is discharging. Also referred to as **closed-circuit voltage**.



Commonly used acronyms

- ABS acrylonitrile butadiene styrene
- ac alternating-current
- AGM absorbed glass mat
- CCV closed-circuit voltage
- COS cast on strap
- dc direct-current
- DoD depth of discharge
- emf electromotive force
- FNC fiber nickel-cadmium
- ICV initial cell voltage, or individual cell voltage
- LOI limiting oxygen index
- NAM negative active material
- OCV open circuit voltage
- OI oxygen index
- PAM positive active material
- PCL premature capacity loss
- PVC polyvinyl chloride
- p-p peak-to-peak
- rms root-mean-square
- SAN styrene acrylonitrile copolymer
- SG specific gravity

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SLI starting, lighting and ignition

SoC state of charge

UPS uninterruptible power supply

VRLA valve regulated lead-acid

VR valve regulated



Commonly used units

A	Ampere
Ah	Ampere-hour
G	giga (i.e., 10^9)
g	gram
h	hour
l	liter
lb	pound
k	kilo (i.e., 10^3)
M	mega (i.e., 10^6)
m	milli (i.e., 10^{-3}), minute, meter
s	second
S	siemen
V	Volt
Vpb	volts per battery
Vpc	volts per cell
μ	micro (i.e., 10^{-6})
W	Watt
Wh	Watt-hour