C&D TECHNOLOGIES®

Standby Batteries for Renewable Energy Applications Installation and Operating Instructions

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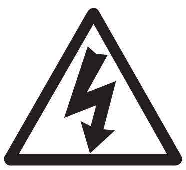
SAFETY PRECAUTIONS

Only authorized and trained personnel familiar with Photovoltaic/Standby battery installation, preparation, charging and maintenance should be permitted access to the battery.



WARNING SHOCK HAZARD - DO NOT TOUCH UN-INSULATED BATTERY, CONNECTORS OR TERMINALS. BE SURE TO DISCHARGE STATIC ELECTRICITY FROM TOOLS AND TECHNICIAN BY TOUCHING A GROUNDED SURFACE IN THE VICINITY OF THE BATTERIES BUT AWAY FROM THE CELLS AND FLAME ARRESTERS.

GAS PRODUCED BY THIS BATTERY CAN BE EXPLOSIVE. PROTECT EYES WHEN AROUND BATTERY. PROVIDE ADEQUATE VENTILATION SO HYDROGEN GAS ACCUMULATION IN THE BATTERY AREA DOES NOT EXCEED TWO PERCENT BY VOLUME. DO NOT SMOKE, USE OPEN FLAME OR CREATE SPARKS NEAR BATTERY.

THIS BATTERY CONTAINS SULFURIC ACID, WHICH CAN CAUSE SEVERE BURNS. IN CASE OF SKIN CONTACT WITH ELECTROLYTE, REMOVE CONTAMINATED CLOTHING AND FLUSH AFFECTED AREAS THOROUGHLY WITH WATER. IF EYE CONTACT HAS OCCURRED, FLUSH FOR A MINIMUM OF 15 MINUTES WITH LARGE AMOUNTS OF RUNNING WATER AND SEEK IMMEDIATE MEDICAL ATTENTION.

For technical assistance contact the Technical Service Department located at:

C&D Technologies, Inc.
1400 Union Meeting Road
P.O. Box 3053
Blue Bell, PA 19422-0858
Telephone 215-619-2700 or 800-543-8630 FAX 215-619-7899

WARRANTY NOTICE

This instruction manual is not a warranty. Each battery is sold subject to a limited warranty, which is in place of all other warranties, express or implied (including the warranties of merchantability or fitness for a particular purpose) and which limits a purchaser's (user's) remedy to the repair or replacement of a defective battery or parts thereof. The terms of the limited warranty are incorporated herein and are available from the corporate website or with the batteries.

Recommended Practices and Technical References

These instructions assume a certain level of competence by the installer/user. Batteries are dangerous. Installers must have the appropriate knowledge and experience to safely install the batteries. The design of the battery room or enclosure, system wiring, wiring protection and safety requirements must comply with any applicable codes, other electrical fire, or environmental codes and required by the applicable enforcement agency.

The following is a partial list of the codes that may have direct impact on the installation. This list is not meant to be comprehensive. Consult with the local building, electrical and fire protection agencies to get proper direction to the local codes that will affect the installation.

- NEC, National Electric Safety Code, ANSI C2-1993 (or latest revision)
- UBC Uniform Building Code or locally applied Building Code
- IBC International Building Code

Copies may be obtained by contacting:

NEC National Electrical Code NFPA (latest version) available from:
National Fire Protection Association
Battery March Park, Quincy, MA 02269
www.nfpa.org/catalog/home/index.asp

Federal Codes that may directly affect the battery room design and battery installation.

- 29CFR1926.441 Safety Requirements for Special Equipment
- 29CFR1910.151(c) Medical Services and First Aid
- 29CFR1910.268(g) Telecommunications
- 29CFR1910.305(j) Wiring Methods, Components and Equipment
- STD 1-8.2(e) OSHA Standing Directive

The following references to IEEE Standards contain relevant information, and should be consulted for safe handling, installation, testing and maintaining standby batteries. Refer to the battery brochure for additional information, specific to the battery.

- IEEE Std. 450 Flooded Battery Maintenance and testing Standard
- IEEE Std 1188 VRLA Battery Maintenance and testing Standard
- IEEE Std. 1013-2000 Recommended Practice for Sizing Lead-Acid Batteries for Photovoltaic (PV) Systems
- IEEE Std. 937-2000 Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems
- IEEE Std. 1374-1998 Guide for Terrestrial Photovoltaic Power System Safety
- P1361 (D16) Draft Guide for Selection, Charging, Test and Evaluation of Lead-Acid Batteries Used in Stand-Alone Photovoltaics.

Copies may be obtained by contacting:

The Institute of Electrical and Electronic Engineers, Inc.,
345 East 47th Street, New York, NY 10017, USA
www.ieee.org/portal/index.jsp

Cautions and Safety

Batteries can be considered a hazardous material as they contain: explosive gases, sulfuric acid, lead and large amounts of potential electrical energy. Care needs to be taken to provide personal safety in handling, storing, installing and disposing of lead acid batteries. Only trained personnel should be near batteries.

The following personal equipment is recommended for use while installing and conducting maintenance on batteries:

- Eye protection from either a face shield or goggles.
- Acid-resistant gloves, safety shoes and apron or clothing protection.
- Lifting device to locate and place batteries in proper orientation.

Recommended battery room safety equipment is recommended and in many cases may be required by the local fire marshal or building inspectors:

- Eyewash station and shower.
- Electrolyte neutralizing and absorbing agent.
- Insulated tools.

These are available from C&D Technologies Manufacturers' Representatives.
Additionally, the battery room should contain a Class C fire extinguisher.

Battery Room Requirements

When designing a battery system of multiple batteries, the following design considerations must be made to ensure safe operation. Adequate ventilation must be provided to limit the concentration of Hydrogen and thus prevent hydrogen explosions. Safe and well-lit access to the batteries is critical for workers safety while performing the installation and required maintenance.

Ventilation

Lead Acid batteries produce hydrogen gas during normal operation and hydrogen gas is explosive at 2% of room/enclosure volume. Measurements must be taken to ensure that the maximum concentration of hydrogen in the battery room or battery enclosure stays below the explosive concentration. Do not install batteries in unventilated areas or enclosures. Passive measures are not dependent on active measures that depend on components that can fail.

The following is the Hydrogen Evolution Equation used to calculate the maximum rate that the battery under adverse conditions will generate hydrogen gas.

Hydrogen can be evolved at the rate of (0.00269 cubic feet per minute) per charging Ampere per cell a 77°F (25°C).

> An example: a 48 volt system with a maximum charging current of 200 amps may generate up to 1.2912 cubic feet of hydrogen per minute=(24 cells) x (200 amperes) x (0.000269)

Access to the Battery

Critical to safety and proper battery maintenance is the safe and easy access to the batteries for maintenance and battery inspections. Adequate lighting must be provided. A minimum of 36 in (914 mm) should be provided in front of the batteries for aisle access. Failure to provide easy access and a safe workplace will result in inadequate maintenance.

Battery Layout

The layout of the batteries should be determined well before the batteries are installed. If help is needed in determining the layout consult, C & D Technologies Technical Services. When parallel strings are being used, it is important to provide an equal potential to each string. This requires that the cables between the load and the charging sources be of equal resistance.

Location and Temperature

Batteries should be protected from environmental conditions and any other physical interference such as people, animals and other equipment. The optimal location for the battery is a clean, cool dry place where the cells are not affected by sources of radiant heat, such as sunshine, heating units, radiators, steam pipes, and so on. The batteries shall not be placed in an operating environment in which the average annual ambient temperature exceeds 85°F (27°C) or peak temperature exceeds 110°F (43°C) for more than a 24-hour period. Batteries shall not be subjected to freezing conditions or variations of more than 5°F (3°C) between cells in the battery string, as this will cause the battery to develop unbalanced voltages.

Receiving, Initial Inspection and Storage

Receiving

As soon as the batteries are received, check the packing material for evidence of damage in transit. If packing material is physically damaged, wet or stained with acid, make a note on the Bill of Lading before accepting the shipment.

Initial Inspection

Each C&D Technologies battery (cell) has an identifying label that lists the battery type and Ah rating. At the first opportunity, for flooded batteries, check the electrolyte level in each cell. **It should be below the bottom of the vent well and above the moss shield. Note that even if this level is below the moss shield do not add water until after the battery has been fully charged.**

> IF THE LEVEL IS BELOW THE TOP OF THE PLATES, IMMEDIATELY REPORT THE CONDITION TO C&D TECHNOLOGIES AT THE ADDRESS AT THE BEGINNING OF THIS MANUAL.

Do not add water before putting cells on charge as the start of gassing could cause high levels and possible leakage through the vent or sampling tube. If electrolyte is found on the top of the cell or terminal posts, clean immediately with proper battery neutralizing materials or a solution of one-pound baking soda to one gallon of water, followed by a water rinse. **Do not introduce the cleaning solution into the cell.**

Damage and Shortage Situations

C&D Technologies ships FOB plant (ownership passes at our dock). If shipments are damaged or if cartons or skids are damaged or missing, a claim must be filed with the carrier. Place an immediate order for replacement with C&D Technologies and use the replacement cost as the amount of freight damages or shortages involved. If individual component items are missing, a shortage report should be filed immediately with C&D Technologies. Mail (express mail recommended) or fax a copy of the VERIFIED component packing list. This verified list should show both the name of the packer, as well as the quantities of items checked off by the receiver.

Storage of Charged and Wet Batteries

Store batteries in a cool, dry location and place in service as soon as possible after receiving.
The recommended temperature for storage is 77°F (25°C), but a range of 60°F(16°C) to 80°F (27°C) is acceptable. Do not allow the electrolyte to freeze, as this will damage the battery and can cause potentially hazardous leakage. Batteries must be given a freshening charge to all cells every six months when stored at 77°F (25°C) or every three months if stored at temperatures of 92°F (33°C) after ship date from C&D Technologies factory until final installation. Specifically, the CPV batteries must be given a freshening charge every three months at 77°F(25°C). See the Initial/Freshening charge parameters as discussed in the Battery Installation Section.

Battery Installation

After battery has been unpacked and placed in its final location with the proper orientation for polarity, all electrical contacting surfaces should be prepared for making inter-cell connections. Use industry standard practices for this procedure in addition to the following steps.

1. Assemble and mount any racks according to the "Rack Assembly Instructions" and mount according to the site's requirements.
2. Remove any factory-applied grease coating from the terminals with a dry cloth.
3. With a neutralizing solution consisting of one-pound baking soda mixed with one gallon of water, wipe the cover and terminal seal area with a cloth or brass bristle brush moistened with the neutralizing solution. Do not allow the neutralizing solution from entering the cell. Rinse with clear water and dry thoroughly.
4. Brush the terminal with the fiber bristle brush to a bright, shiny finish.
5. Remove the oxidation film from the connectors with the fiber bristle brush, resulting in a bright, shiny finish.
6. Coat all electrical surfaces with pre-heated NO-OX-ID. (Use heat gun)
7. Re-flow excess NO-OX-ID with heat gun and wipe excess.

CAUTION
Be sure flame-arresting vent assemblies are installed on flooded cells before making battery connections.

8. Place cell identification numbers in sequence in an appropriate position on the battery.
9. Measure battery/cell voltage readings and record for future reference.

Electrical Connections

1. Install inter-cell connections and hardware as supplied with each battery as previously specified to make parallel or series connections.
2. Confirm that no cells are installed in reverse polarity.
3. Once hardware is installed and batteries are properly aligned, torque as indicated.

Torque Value Chart

Model	Torque Value	
CPV 360, 430, 550, 660, 780, 890, 1000, 1220, 1330, 1440, 1880 & 2030	160 in-lbs	18 N-m
CPV 1550, 1660, 1770, 2190, 2340, 2500	110 in-lbs	12.4 N-m
VRS12-75, 88, 100, 155F, 175F, 215F	110 in-lbs	12.4 N-m
VRS12-33 & VRS12-50	30 in-lbs	3.4 N-m
D, K, L-CPS	110 in-lbs	12.4 N-m

4. With batteries installed and torqued. Measure inter-cell resistance with a calibrated device and record. If any inter-cell resistant values exceed the average, re-inspect as needed.
5. Use plated lugs on cable terminations.
6. When multiple cables are being terminated, use plated terminal plates.
7. Make sure that all cables are adequately supported to eliminate any stress on the battery posts.
8. Confirm the overall battery polarity before making any battery terminations.
9. After making the first battery connection measure the voltage potential between the remaining battery termination and the cable to be connected. **Do Not Make the Connection if the Voltage is over 0.5 Volts**.
10. Correct the voltage potential before making the connection.

Initial Charge/Freshening Charge

All batteries shipped wet and fully charged lose some charge in transit or while standing idle before installation. At the first opportunity, they should be given an initial charge. This compensates for the open circuit standard loss due to self-discharge. **To keep the warranty in effect**, the battery must be given a boost charge every three months while in storage and place it in service within six months of shipment from a C&D Technologies factory. The charger must have the ability to adjust for temperature compensation.

Initial Charge Requirements

Battery Series	Initial/Equalize Charging at 77°F (25°C)	Time
CPV Models	2.55 Vpc	12-16 Hrs
VR Solar®	14.4 to 14.8 VDC/Unit Average	16-24 Hrs
D, K, L - CPS-A	2.50 to 2.55 Vpc	40 Hrs
D, K, L - CPS-D	2.43 to 2.47 Vpc	40 Hrs

Initial Charge Records

At the completion of the initial charge, record and retain a record of all cell voltages and specific gravities if applicable.

Important: Initial charge records are essential for review by C&D Technologies Sales/Service personnel in the event of problems. Since these records can materially affect the warranty, be sure to maintain these records.

Battery Operation and Charging

General Principles of Operation

Shallow and Deep Cycling Applications

Although there are many different types of battery applications in photovoltaic and other renewable energy systems there are two main types of battery applications. The most common application is in cycling applications where the battery carries the load when the solar resource or other renewable energy source is not available. This can be during the night or during cloudy days. Depending on how the system is designed the batteries are regularly discharged and regularly re-charged. In these applications, the charging system should be sized so that, on the average, the battery is returned to between 85 to 90% state of charge daily. On a weekly basis the battery should be charged to 100% or fully charged state.

Float Charging Applications

The second main type of battery application is for backup power on grid-tied systems. These systems charge he backup batteries by putting them on Float Charge. Under normal operation of the backup battery system, the batteries are maintained a full state of chare by a continuous constant voltage charging. When the grid connection fails then the batteries carry the load and when the grid is reconnected, the battery is recharged using the float voltage setting.

Battery Charging in Cycling Applications

Cycling applications in photovoltaic applications are the most demanding applications that lead acid batteries are subjected. In many cases the batteries are in a constant state of either being charges or discharged. Knowing how the system is operates is critical to understanding how the batteries should be charged.
In optimal conditions the battery is fully charged after every discharge cycle. Under these circumstances, the battery will be brought back to full charge using a charging rate designed to bring the batteries back to full charge before the next discharge.

If the system cannot achieve a full charge between discharging cycles then additional charging needs to be employed to bring it back to full charge at least once a week. The charging system should be capable of automatically adjusting the charging voltage based on the temperature of the battery. The measurement of the battery temperature must be taken at the battery not ambient temperature. (Please see the Charging Voltage Temperature Compensation Chart).

If the system is a solar-only system then the charging strategy is solely based on the photovoltaic panels returning all of the energy to the battery every day. The ratio to the photovoltaic array to the load during the worst conditions should be able to bring the batteries to full charge at least once a week.

If the system is a hybrid system where there is dispatch able battery charging capability, the batteries should be charged to between 85 and 90% of full charge on a daily basis (daily charge). Weekly they should be given a weekly charge to insure that they were fully charged.

The following Cycling Battery Charging Chart provides the voltage for daily charging, and weekly charging for different types of C&D Technologies solar batteries.

Cycling Battery Charging Chart

Battery Series	Daily Charge at 77°F (25°C)	Weekly Charge at 77°F (25°C)
CPV Models	2.55 Vpc	2.50 to 2.55 Vpc
VR Solar®	13.62 to 13.80 VDC/Unit Average	14.4 to 14.8 VDC/Unit Average
D, K, L - CPS-A	2.50 Vpc	2.50 to 2.55 Vpc
D, K, L - CPS-D	2.43 Vpc	2.43 to 2.47 Vpc

Float Applications

Batteries in back-up power applications are constantly charged. In most cases, a constant voltage charger maintains the float voltage. Under these circumstances, the battery is fully charged when the cell voltage has reached its upper limit and the charge current has dropped a float current. These systems are rarely discharged, but should they, it is critical that they are immediately recharged to a full state of charge. Utilizing the constant voltage charging algorithm will result in a full charge battery after the charging current has dropped to a float current as described in the following chart.

Float Battery Charging Chart

Battery Series	Float Charging at 77°F (25°C)
CPV Models	2.28 to 2.33 Vpc
VR Solar®	13.62 to 13.80 VDC/Unit
D, K, L - CPS-A	2.33 to 2.34 Vpc
D, K, L - CPS-D	2.20 to 2.27 Vpc

Equalization Charge

Proper charging in the mode described above will generally maintain the battery and equalization charge will not be required. The latter is required only if the cell voltage spread, measured at the tail-end of the refreshing charge, is such that the tolerable low limits (+/-50 mV of string avg.) are not attained. Typically, equalization charge requires holding at the nominal string voltage in the refreshing charge mode for an additional 8 to 12 hours. The total overcharge during this procedure must not exceed about 10% (i.e. extend **refreshing charge** an additional overcharge of 10%). As before, the overcharge is based on the nominal AH capacity utilized for computing the SOC. Use the Weekly charge Voltages the Cycling Battery Charge Table.

At the tail end of the equalization charge, and while still on charge, the cell voltage spread should be checked. All the individual cell voltages should now conform to within +/-50 mill volts of the string average. If the individual cell voltages exceed +/-50 millivolts of the system average, verify cell gravities where applicable and contact a C&D Technologies Manufacturers' Representative.

Charging Voltage Temperature Compensation Chart

Battery Series	Temperature Compensation
CPV Models	+ 2.8 mV/F per cell below 77°F (25°C) - 2.8 mV/F per cell above 77°F (25°C)
VR Solar®	+ 3.0 mV/F per cell below 77°F (25°C) - 3.0 mV/F per cell above 77°F (25°C)
D, K, L - CPS	+ 2.8 mV/F per cell below 77°F (25°C) - 2.8 mV/F per cell above 77°F (25°C)

Electrolyte Freezing

To prevent freezing make be sure maintain a high state of charge and thus a high specific gravity in the battery. The following graph gives the freezing point of the electrolyte at different specific gravities.

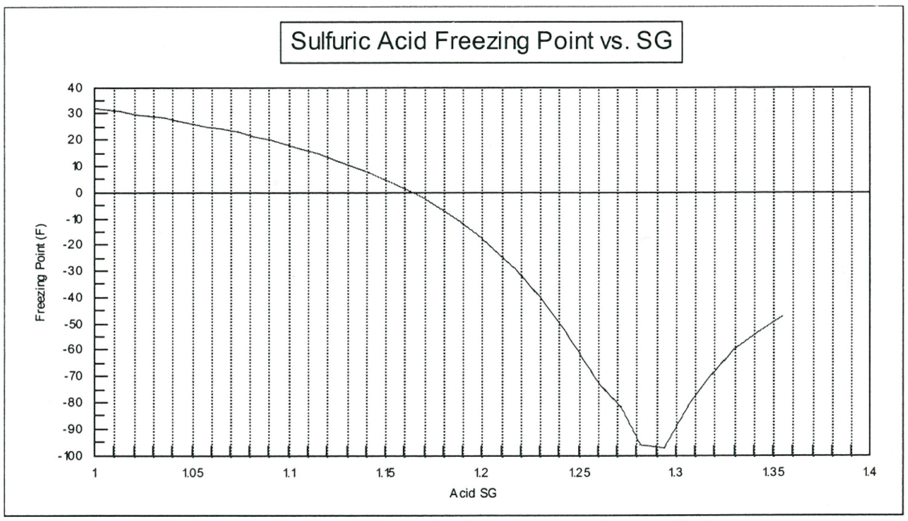


Figure 1 – Electrolyte Specific Gravity and Freeze Point

Testing

Batteries are rated on an ampere-hour basis or on their ability to deliver a certain number of amperes to the load for a specified amount of time before cell voltages drop to a given potential. It is important to realize that the ampere-hour capacity of a cell or battery depends on the rate at which it is discharged.

The C&D Technologies lead acid battery and cells are designed for optimum discharge characteristics of long rate discharge. This permits batteries to discharge to lower end-potentials of 1.90 volts per cell. It is also important to consider low ambient operating temperatures when calculating required battery size. Low operating temperatures will reduce available battery capacity significantly.

To be valid, a capacity test must assume the following:

- A fully charged battery and balanced cell potentials. In some cases, this may require an equalize charge or, in cases of sulfation, other action. Consult the C&D Technologies Technical Services Department.
- All cells equalized to their nominal specific gravity. This may require addition or withdrawal of acid and should only be done following a complete recharge and equalizing charge.
- At least 72 hours on nominal system voltage. This is especially important following an equalize charge, to clear excessive gasses developed at the surface of the plates by letting the battery rest off charge or on float charge.
- Temperature correction for cells tested at any temperature other than 77°F (25°C).
- Batteries are fully charged and all connections are correct.

A complete description of capacity tests on lead acid batteries is beyond the scope of this manual but is discussed in detail in current releases of IEEE STD 450 and IEEE 1188.

A full-load service test to be performed not more than once every twelve (12) months to verify battery capacity at users originally specified discharge rate.

Battery Degradation

Properly maintained and charged lead-acid storage batteries should provide many years of trouble-free service. However, despite their inherent dependability, failure to operate or maintain batteries correctly may lead to damage, shortened life, possible loss of service and voiding the warranty. The following paragraphs address some of the most frequently encountered problems.

Low Cell Voltages

With proper operation, at recommended voltages and individual cell temperatures varying not more than 5°F (2.8°C), individual cell voltages of a battery at 100% state of charge should be within plus or minus 50mV of the average cell voltage.

When the voltages of individual cells are lower than normal, it is logical to conclude that insufficient charging has occurred. The following are possible causes:

- Panel voltmeter reading high. This results in a low system voltage. Recalibrate panel meter.
- Poor terminal connections. Remove connections, clean contact surfaces, neutralize with baking soda solution, dry, coat with NO-OX-ID grease and reassemble.
- Impurities, such as metallic objects, inadvertently introduced into cell electrolyte. Such contaminants dissolve in the electrolyte, increasing the rate of self-discharge. Unless the amount of contaminant is very small, the affected cell or cells will require replacement.

Voltage Drop

IEEE 450 discusses the significance of connection integrity. Typically, a voltage drop between cells should be 30mV or less, at rated current. Voltage drop between rows (inter-tray) is typically less than 100mV, at rated current.

Electrolyte Stratification

A condition when the specific gravity of the electrolyte decreases from the bottom to the top of the container. Stratification does not materially inhibit the ability of a lead-acid battery to deliver power. However, its capacity will naturally be reduced from optimum value. Conducting an equalization charge can eliminate electrolyte stratification.

Low System Voltage and Sulfation

If a battery is left in a partial state of discharge for extended periods, cell voltages may vary erratically. Recharging the battery fully and maintaining it on charge until the specific gravities of all cells stabilize over three successive hourly measurements can reverse this. Conducting an equalize charge. Another method is to repeat battery cycling several times until all cells are within ±0.005 of the recommended specific gravity.

In advanced cases, sulfate may be extremely difficult to reduce. C&D Technologies recommends that, in cases of advanced sulfation, contact the C&D Technologies Technical Service Department for assistance.

Hydration

A battery, which has been over-discharged and left in a discharged condition without immediate recharge, is subject to terminal damage known as "hydration." This is a phenomenon in which the specific gravity of the electrolyte has been reduced to a level so low that it permits the lead components to dissolve into the electrolyte, totally destroying the cells. As a result, short circuits become so extensive that is almost impossible to keep the cells charged. Finally, the cells experience total short circuit failure.

Hydration can be avoided by the use of low-voltage cut-out devices which disconnect battery from load after the battery, discharged at its specified load current, reaches its designed cut-off voltage.

Battery Maintenance

Monthly battery inspection

Should include the following:

- End of charge voltage measured at battery terminal
- End of discharge voltage measured at the battery
- General appearance and cleanliness of battery, battery rack and battery area
- Charging current and voltage
- Electrolyte levels (flooded only)
- Cracks in cell containers or leakage of electrolyte
- Any evidence of corrosion at cell terminals, connectors or racks
- Ambient temperature and condition of ventilation equipment
- Pilot-cell voltage, electrolyte temperature (flooded only)
- Record findings clearly and date entries

Quarterly battery inspection

Should include the monthly observations, plus:

- End of charge voltage of every cell and battery terminal voltage measured at battery
- End of discharge voltage of every cell and battery terminal voltage measured at battery
- Temperature of electrolyte in representative cell(s), typically one cell/tier distributed throughout battery

Annual battery inspection

Should include the following the quarterly observations, plus:

- Inter-cell / inter-unit connection integrity, measured with DLRO
- Record findings clearly and date original and copies
- Retorque to specified value:

Model	Re-Torque Value	
CPV 360, 430, 550, 660, 780, 890, 1000, 1100, 1220, 1330, 1440, 1880 & 2030	150 in-lbs	17 N-m
CPV 1550, 1660, 1770, 2190, 2340, 2500	100 in-lbs	11 N-m
VRS12-33 & 50	30 in-lbs	3.5 N-m
VRS12-75, 88, 100	110 in-lbs	12.4 N-m
D, K, L-CPS	100 in-lbs	11 N-m
VRS12-155F, 175F, 215F	110 in-lbs	12.4 N-m

Watering cells and adjusting electrolyte levels in vented cells

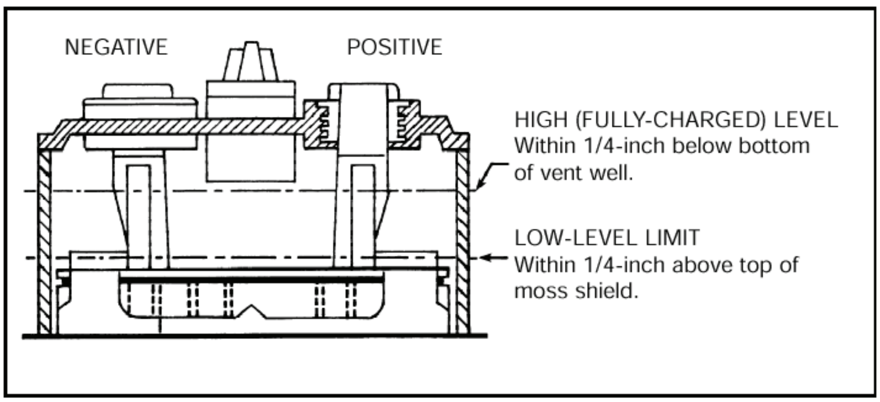
CAUTION: Do not add water or electrolyte to VRLA cells. Removal of vents from VRLA type cells voids the warranty.

Adjust electrolyte levels only when cells are fully charged and stabilized at float voltage. Distilled or de-ionized water is preferred for adjusting electrolyte levels. Before adding water or acid to a battery, consider its condition and state of charge. For example, a new battery, which has recently experienced vibration during shipment,

If the plates are covered by electrolyte, the battery should be placed on charge. The gases produced by charging will displace the electrolyte and will raise it to an acceptable level between the high and low level marks on the container. Had the level been adjusted to the “High” mark before charging, charging could have caused the electrolyte to rise to a point where it could overflow through the vent or be forced up into the flame arrester, requiring needless maintenance.

NOTE: Adding water to a battery to bring the initial electrolyte levels up will reduce the specific gravity.

If, after charging, the electrolyte levels have not risen to between the high and low level lines, add distilled or de-ionized water. **Do Not Add Acid**. Adding acid is a procedure that should be done only after consultation with C&D Technologies or performed by a C&D Technologies Manufacturers’ Representative.



Recycling

Lead-acid batteries are recyclable and C&D Technologies currently has a low cost, convenient and environmentally safe collection and recycling program. Visit the C&D website at www.cdtechno.com for further information.

MSDS

MSDS sheets are available on C&D Technologies website at: www.cdtechno.com

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