



**CD**  
TECHNOLOGIES

**TECHNICAL  
BULLETIN**

# **Operational Qualification and Warranty Registration Checklist**

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# SAFETY PRECAUTIONS

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

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## 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.

ALL TOOLS SHOULD BE ADEQUATELY INSULATED TO AVOID THE POSSIBILITY OF SHORTING CONNECTIONS. DO NOT LAY TOOLS ON THE TOP OF THE BATTERY.

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ALTHOUGH VRLA BATTERIES ARE SEALED AND EMIT NO GAS DURING NORMAL OPERATION. THEY CONTAIN POTENTIALLY EXPLOSIVE GASES, WHICH MAY BE RELEASED UNDER ABNORMAL OPERATING CONDITIONS, SUCH AS CHARGER MALFUNCTION. PROVIDE ADEQUATE VENTILATION SO HYDROGEN GAS ACCUMULATION IN THE BATTERY AREA DOES NOT EXCEED ONE PERCENT BY VOLUME. HOWEVER, NORMAL AIR CIRCULATION IN A VENTILATED FACILITY WILL PRECLUDE ANY HYDROGEN BUILD-UP, EVEN DURING EQUALIZE CHARGING. NEVER INSTALL BATTERIES IN A SEALED CABINET OR ENCLOSURE. IF YOU HAVE ANY QUESTIONS, CONTACT YOUR LOCAL C&D TECHNOLOGIES AGENT.



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.

THIS BATTERY IS DESIGNED FOR **INDUSTRIAL USE ONLY** AND IS NOT INTENDED FOR APPLICATION IN VEHICULAR STARTING, LIGHTING AND IGNITION AND/OR OPERATION OF PORTABLE TOOLS AND APPLIANCES. USE ONLY IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. USE OF THIS PRODUCT OTHER THAN IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS MAY PRODUCE HAZARDOUS AND UNSAFE OPERATING CONDITIONS, LEADING TO DAMAGE OF EQUIPMENT AND/OR PERSONAL INJURY.

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IMPORTANT FOLLOW MANUFACTURER'S PUBLISHED INSTRUCTIONS WHEN INSTALLING, CHARGING AND SERVICING BATTERIES.  
C&D TECHNOLOGIES VALVE-REGULATED LIBERTY SERIES 1000 BATTERIES.

This checklist is intended for use by the responsible facility/systems personnel to document the proper installation of the VRLA battery systems and their proper preparation for service. The operational qualification checklist can be completed in stages during the mechanical installation or immediately following installation. Sections I through IV should be completed prior to application of the battery system charging voltage. Within 10 days of the completion of the system being placed in service, a copy of the completed operational qualification checklist should be sent to C&D Technologies, 1400 Union Meeting Road Blue Bell, PA 19422, Attention - Field Service Manager. This information must be on file to facilitate any warranty claim.

*Note: Refer to RS-990 for equivalent information on Liberty Series 1000 batteries.*

BATTERY SYSTEM LOCATION AND USER \_\_\_\_\_

CONTACT AT USING FACILITY: \_\_\_\_\_ PH # \_\_\_\_\_

BATTERY INSTALLER: \_\_\_\_\_ PH.# \_\_\_\_\_

INSTALLATION COMPLETION DATE: \_\_\_\_\_ BATTERY RECEIPT DATE: \_\_\_\_\_

### BATTERY DESCRIPTION

BATTERY/UNIT PART NO: \_\_\_\_\_ DATE CODE: \_\_\_\_\_ TOTAL QTY. BATTERIES: \_\_\_\_\_

NO. CELLS PER STRING \_\_\_\_\_ NO. UNITS PER STRING: \_\_\_\_\_ NO. PARALLEL STRINGS: \_\_\_\_\_

BATTERY SYSTEM MOUNTING:

RACKS: QTY \_\_\_\_\_ ZONE \_\_\_\_\_ TIERS \_\_\_\_\_ PART NO. \_\_\_\_\_

CABINETS: QTY \_\_\_\_\_ ZONE \_\_\_\_\_ TIERS \_\_\_\_\_ PART NO. \_\_\_\_\_

### APPLICATION DESCRIPTION

USING EQUIPMENT: \_\_\_\_\_ CHARGER RATING: \_\_\_\_\_

BATTERY SYSTEM REQUIRED KILOWATTS: \_\_\_\_\_ KW FOR \_\_\_\_\_ MINUTES/HOURS

BATTERY SYSTEM REQUIRED AMPERES: \_\_\_\_\_ AMPERES FOR \_\_\_\_\_ MINUTES/HOURS

BATTERY MONITORING SYSTEM UTILIZED: \_\_\_\_\_

CHECKLIST COMPLETED BY: \_\_\_\_\_ PH.# \_\_\_\_\_

ADDRESS: \_\_\_\_\_

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## GENERAL INFORMATION

It is important to document proper installation and functional operation of the C&D Technologies VRLA batteries for safety, performance and warranty purposes. Prior to starting this qualification checklist all related personnel and equipment safety information, installation procedures, drawings and maintenance procedures should be reviewed. The manufacturer of the using equipment may have special instructions to be reviewed while applicable C&D instructions may include:

- |    |   |         |
|----|---|---------|
| 1. | Rack Mounted Battery System Installation and Start-up Instruction | 41-7525 |
| 2. | Condensed Installation and Operating Procedures                   | 41-6965 |
| 3. | 48 VDC Battery System Installation, Operation and Maintenance     | 41-6979 |
| 4. | Battery and Rack Assembly Instructions                            | 41-4103 |
| 5. | VRLA Batteries Gassing and Ventilation                            | 41-6739 |
| 6. | Integrity Testing   | 41-7264 |
| 7. | Impedance and Conductance Testing                                 | 41-7271 |
| 8. | Acceptance and Performance Capacity Testing                       | 41-7135 |

Applicable building, fire and electrical codes as well as state and local ordinances should also be reviewed to assure compliance.

### I. BATTERY ROOM AND GENERAL EQUIPMENT CHECKS

	COMMENTS/STATUS
1. Battery room is clean, dry and clear of debris.	_____
2. Battery room/enclosure temperature is 70 to 80 degrees F. Note actual temperature.	_____
3. Battery room/enclosure natural or mechanical ventilation is adequate and operational.	_____
4. Required safety equipment such as fire extinguisher, face and eye protection, insulated gloves,insulating work blanket, etc. are available.	_____
5. Battery maintenance equipment such as insulated tools, digital voltmeter, etc. are available.	_____
6. Battery system installation, operating and maintenance manuals and historical log data sheets are available.	_____

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## II. BATTERY CHARGER/RECTIFIER CHECKS

### COMMENTS/STATUS

1. Charger/rectifier output connected to the battery system/circuit breaker with the correct polarity.
2. Charger/rectifier no load float voltage is properly set to the battery recommended float voltage (number of series connected cells x 2.275 ± .025 volts per cell).
3. Charger/rectifier no load equalization voltage is properly set to the battery recommended equalization voltage (number of series cells x 2.4 volts per cell).
4. Equalize charge timer (if applicable) is properly set.

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## III. BATTERY RACK/ENCLOSURE CHECKS

### COMMENTS/STATUS

1. Rack/enclosures are properly assembled per the applicable drawing.
2. Rack hardware is tightened to specification value.
3. Rack/enclosure is properly secured to floor.
4. Racks/enclosures are properly grounded (if applicable).
5. All metal surfaces are properly protected with paint and/or insulating plastic strips.

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The following checks are to be completed with the battery on open circuit and prior to application of a charging voltage or load. Any required corrective action is usually obvious or detailed in the previously mention publications.

#### IV. BATTERY OPEN CIRCUIT CHECKS

#### COMMENTS/STATUS

1. Individual batteries are installed with a minimum of 0.5" spacing to allow free air circulation. \_\_\_\_\_
2. Visual appearance of batteries is OK and there is no evidence of container or terminal damage. \_\_\_\_\_
3. Individual batteries are clean and clear of debris. \_\_\_\_\_
4. Open circuit voltage of the individual battery strings and individual batteries within the strings is measured and recorded. \_\_\_\_\_
5. The individual string and unit voltages are a minimum of  $2.03 \text{ V/C} \times \text{number of cells}$  connected in series (eg. 6 cells = 12.18 VDC minimum and 180 cells = 365.4 VDC). \_\_\_\_\_
6. Polarity of all the individual batteries in the system is visually verified as correct. \_\_\_\_\_
7. Each individual string of batteries within a system of parallel strings is individually cabled to the load or a common tie point. \_\_\_\_\_
8. Each individual string of batteries within a system of parallel strings has a separate disconnect, circuit breaker or fuse in its output. \_\_\_\_\_
9. Battery system output is connected to the charger/rectifier/load with the correct polarity. \_\_\_\_\_
10. Individual batteries within a string are numbered starting with #1 at positive output through the highest # at the negative output. \_\_\_\_\_
11. The individual strings within a system of parallel strings are properly identified \_\_\_\_\_
12. Pilot units are properly identified as those with the lowest open circuit voltage and which are representative of temperature within the string. \_\_\_\_\_

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#### IV. BATTERY OPEN CIRCUIT CHECKS (continued)

#### COMMENTS/STATUS

- 13. Inter-unit connections have been properly cleaned and coated with protective grease. \_\_\_\_\_
- 14. Connection hardware is torqued to the specification value. \_\_\_\_\_
- 15. Inter-unit connection resistance's are within  $\pm 10\%$  of the average. \_\_\_\_\_
- 16. Any related battery monitoring equipment has been properly installed and connected. \_\_\_\_\_

When the battery system has been in storage or enroute for an extended period or the battery system is intended for use at the minimum float charging voltage or when the number of cells in series is greater than 24, it is recommended the battery system be given a freshening charge at 2.4 volts per cell for 24 hours. This will assure higher initial performance and will reduce the time period required for the cells to achieve proper voltage balance between the individual units.

#### V. INITIAL FRESHENING CHARGE CHECKS

#### COMMENTS/STATUS

- 1. Freshening (equalize) charge voltage to be applied to the battery system is equal to the number of series connected cells x 2.4 V/C. \_\_\_\_\_
- 2. Upon application of the freshening charge voltage, the charger/ rectifier output meter indicates charge current acceptance by the battery. \_\_\_\_\_
- 3. The charging current declines to 0.01C (0.01 amperes per ampere hour capacity of the battery) within 6 hours of initiation of the freshening charge. \_\_\_\_\_
- 4. Individual battery temperatures are normal, within  $\pm 5$  degrees F of each other and within 5 degrees F of the ambient. \_\_\_\_\_
- 5. Individual battery freshening charge voltages are within the range of 7.2 + .25 for 6 volt units and 14.4 + .5 volts for 12 volt units. \_\_\_\_\_
- 6. Freshening charge is terminated within 24 hours. \_\_\_\_\_

Note:  $C/_{20}$  is the 20 hour rated capacity in AH

After the battery system has been on float for at least 24 hours the following checks should be performed and the data recorded in the battery system log using historical records such as 41-6650 and 41-7665 provided by C&D Technologies.

## VI. FLOAT CHARGING CHECKS

### COMMENTS/STATUS

1. Battery system float charging voltage is equal to the number of series connected cells x 2.275 ± .025 volts per cell.
2. Individual battery temperatures are normal, within ±5 degrees F of each other and within 5 degrees F of the ambient.
3. Charger output current is approximately equal to .005 C (.005 amperes per rated AH of capacity) or less but not zero.
4. Individual battery float charge voltages are within the following range:  
12 volt units - 13.3 min. and 14.5 max.  
6 volt units - 6.65 min. and 7.25 max.  
4 volt units - 4.43 min. and 4.85 max.  
2 volt units - 2.22 min. and 2.43 max

The following checks, while not a requirement of the warranty, are strongly recommended so as to assure maximum reliability of the VRLA battery system over time.

## VII. OPTIONAL TESTS AND CHECKS

### COMMENTS/STATUS

1. Individual batteries pass the “high rate momentary load” test as described in pamphlet 41-7264.
2. The individual battery impedance, resistance or conductance base line data has been measured and recorded with no battery being more than 20% below (conductance) or above (impedance and resistance) the average value.
3. Performance capacity test of the battery system is completed in accordance with pamphlet 41-7135 and the system capacity is 95% of the system rating and no individual battery is less than 90% of rating.



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