



## MSE Series

### Valve-Regulated Lead Acid Batteries

### Installation and Operating Instructions




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**PRELIMINARY**

## SAFETY WARNINGS

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

	<p>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 NEAR THE BATTERIES BUT AWAY FROM THE CELLS AND FLAME ARRESTERS BEFORE TOUCHING THE BATTERY.</p> <p>ALL TOOLS MUST BE ADEQUATELY INSULATED TO AVOID THE POSSIBILITY OF SHORTING. DO NOT LAY TOOLS ON TOP OR NEAR THE BATTERY.</p>
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	<p>ALTHOUGH MSE BATTERIES ARE EQUIPTED WITH PRESSURE RELIEF VENTS AND EMIT VIRTUALLY NO GAS DURING NORMAL OPERATION, THEY CONTAIN POTENTIALLY EXPLOSIVE GASES, WHICH MAY BE RELEASED UNDER ABNORMAL OPERATING CONDITIONS, SUCH AS A 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 TYPICALLY PRECLUDE ANY HYDROGEN BUILD-UP, EVEN DURING EQUALIZE CHARGING. NEVER INSTALL BATTERIES IN A SEALED CABINET OR ENCLOSURE.</p>
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	<p>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.</p>
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For technical assistance contact the Technical Service Department located at:  
C&D Technologies, Inc., Powercom Division  
1400 Union Meeting Road  
P.O. Box 3053  
Blue Bell, PA 19422-0858  
Telephone 800-543-8630 FAX 215-619-7899  
[Powercomfswarranty@cdtechno.com](mailto:Powercomfswarranty@cdtechno.com)

<p style="text-align: center;"><b>WARRANTY NOTICE</b></p> <p>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.</p> <p>Do not remove vent caps. They must remain in place at all times. Removal will void warranty.</p>
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## **IMPORTANT**

Before handling cells or storing cells for future installation, take time to read this manual. It contains information that could avoid injury to personnel, irreparable damage to the battery and/or void product warranty.

## **1. Introduction**

MSE batteries referenced in this document are valve-regulated, non-spillable types constructed with an absorbent glass mat (AGM) with pasted flat lead-calcium alloy plates. They are designed to provide long, reliable service life with minimal maintenance.

MSE 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.

Information and specifications contained in this manual are subject to change without notice. Contact C&D Technologies' Powercom (C&D) Sales, Blue Bell, PA for the latest specifications. All statements, information, and data given herein are believed to be accurate and reliable but are presented without guaranty, warranty, or responsibility of any kind, expressed, or implied. Statements or suggestions concerning possible use of C&D product are made without representation or warranty that any such use is free of patent infringement, and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated, or that other measures may not be required.

## **2. Recommended Practices and Technical References**

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

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

Federal Codes that may directly affect your 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. They should be consulted for safe handling, installation, testing, and maintaining standby batteries. You may also refer to the battery brochure for additional information, specific to the battery.

- ◆ IEEE 1187, "Recommended Practice for Design and Installation of Valve-Regulated Lead-Acid Storage Batteries for Stationary Applications"
- ◆ IEEE 1188, "Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Application"
- ◆ IEEE 1189, "Guide for Selection of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Application"
- ◆ IEEE 1375, "Guide for Protection of Stationary Battery Systems"
- ◆ IEEE 1491, "Guide for Selection and Use of Battery Monitoring Equipment in Stationary Applications"
- ◆ IEEE P1578, "Guide for Battery Spill Containment" (expected publication date – 2004, presently in draft).

Copies may be obtained by contacting:

The Institute of Electrical and Electronic Engineers (IEEE), Inc.

IEEE Customer Service

445 Hoes Lane

PO Box 1331

Piscataway, NJ 08855-1331

[customer.service@ieee.org](mailto:customer.service@ieee.org)

or visit the IEEE web site: [www.standards.ieee.org](http://www.standards.ieee.org)

### 3. Safety Precautions

#### IMPORTANT

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

#### 3.1 Caution

Valve-Regulated Lead Acid (VRLA) batteries are potentially a hazardous material as they contain: explosive gases, sulfuric acid, lead, and large amounts of electrical energy. Care must be taken to provide personal safety in handling, storing, installing, and disposing of Lead Acid Batteries. Only trained personnel should be handling and maintaining batteries.

#### 3.2 Protective Equipment

The following protective equipment should always be used when handling batteries:

- ◆ Safety glasses with side shields or face shields
- ◆ Acid-resistant gloves
- ◆ Protective aprons
- ◆ Safety shoes
- ◆ Proper lifting devices
- ◆ Tools with insulated handles
- ◆ Acid neutralizing/clean-up kit

#### 3.3 Personal Safety

Use caution with batteries as they pose a shock hazard.

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

- ◆ Remove all jewelry, rings, watches and any metallic objects
- ◆ Wear eye protection - face shield or safety glasses with side shields
- ◆ Wear acid-resistant gloves, safety shoes, and protective aprons
- ◆ Use insulated tools
- ◆ Use equipment appropriate for the task when lifting or moving batteries

### 3.4 Battery Room Safety

The usage of 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 in case of damage to the batteries
- ◆ Class C fire extinguisher
- ◆ Proper safety tools

## 4. Receiving

### 4.1 Inspection at time of delivery

Every precaution has been taken to pack the battery for shipment to ensure its safe arrival. As soon as you receive the battery, check the packing material for evidence of damage in transit. If the packing material is physically damaged or wet acid stains are present, make a notation on the delivery receipt **before you accept the shipment / delivery**.

#### Note

Freight Carriers generally require that the carriers' representative inspect concealed damage within 15 days from date of delivery to determine responsibility. The resolution of such claims may extend up to 9 months.

Verify the number of cartons and skids against the bill of lading and verify their components against the packing lists. Keep a copy of the verified lists for your installation records. It is important to verify the accessory package is present and the component quantity is correct. If help is required, call C&D Customer Service to report any discrepancies.

### 4.2 Damage and Shortage Situations

C&D ships FOB factory (title/ownership passes to the ship-to/end-user at the factory shipping 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. Pay both the original invoice and the replacement invoice using the replacement cost as the amount of freight damages or shortages involved as part of your claim. If individual component items are missing, a shortage report should be filed immediately with C&D. 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.

### 4.3 Unpacking and Handling

MSE models are shipped from factory filled with electrolyte and fully charged. The batteries are typically factory assembled (but not electrically connected) in modular steel containers (rack modules) and shipped upright.

The assemblies are bolted to the wooden pallet. The bolts must be removed for handling. Fork lifts or hoists used for handling the battery modules must be of adequate capacity. Never lift more than one (1) battery module at a time.

#### Caution

Appropriate safety measures must be taken to prevent conductive materials from contacting live battery terminals.

If there is no hoist or forklift equipment is available, the battery rack modules may be disassembled for individual cell handling.

Accessories are shipped in separate cartons/boxes. They are shipped on same pallets as the batteries or on separate pallets. Do not throw away any boxes without verifying that all components have been received in the shipment.

#### Note

Never lift MSE cells by terminal posts. Handling cells in such manner will cause terminal seal damages and void the warranty.

## 5. Storage

### 5.1 Stored condition

Store batteries indoors in a cool, well ventilated, clean, dry location and place in service as soon as possible after receiving. Do not subject stored batteries to direct sunlight.

### 5.2 Storage temperature and duration

The recommended temperature for storage is 50°F(10°C) to 77°F(25°C). The batteries may be stored at these temperatures for up to six months. The batteries can be permanently damaged and void the warranties if they are not given a freshening charge within the time duration. **Be sure to record dates and conditions for all charges during storage.**

Higher temperature storage will accelerate the rate of self-discharge. The storage time is less than six months in these cases.

Do not allow the electrolyte to freeze, as this will damage the battery and can cause potentially hazardous leakage.

## 6. Installation and Electrical Connection

### 6.1 Location (Battery Room)

Install the battery in a clean, cool, well ventilated, and dry location. An ideal operating temperature of 68°F to 77°F (20°C to 25°C) provides the best choice for performance and life. Lower temperatures will reduce battery efficiency, while higher temperatures will reduce battery life.

Avoid locations where batteries will be exposed to direct sunlight, or sources of hot or cold air directed on a section of the battery that could cause temperature variations within the battery assembly. Such variations will compromise optimum battery performance such as float voltages of individual cells. Temperature variations should not exceed 5°F(2.8°C) across the battery.

Be sure to display Battery Warning Notices and Safety Precautions near batteries.

### 6.2 Ventilation

Adequate ventilation must be provided to limit the concentration of hydrogen to prevent explosions. **Never install batteries in a non-ventilated room.**

MSE batteries require general room ventilation (recommend two to three room air exchange per hour) during normal operations.

**Note:**

Battery charging must be done in accordance with recommended instructions in this manual.

### 6.3 Floor Loading and Anchoring

Typical MSE batteries consist of floor mounting beams and battery rack modules. Verify that the room floor can support the battery weight before planning the installation.

Make sure that the floor is level and capable of supporting the weight of the battery system.

Determine the floor loading and anchoring requirements for the installation. The battery room floor should allow for proper anchoring. In all cases, floor anchoring is considered mandatory. **Proper floor anchoring is the responsibility of the user and the installing contractor.**

#### **6.4 Spill Containment**

Although most lead-acid battery codes consider VRLA products to be non-spillable by design, please follow all requirements of the fire marshal and building inspectors.

#### **6.5 Parallel Strings**

When installing parallel strings, 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.

#### **6.6 Battery Rack Module Assembly**

The MSE batteries are shipped installed in the modules attached to shipping pallets. These modules should be lifted one at a time with lifting straps (not included) attached diagonally across the module using the holes in the corners of the module. The hooks of the straps should be inserted into the modules' holes, pointing outwards and no more than one module at a time should be lifted.

##### **Note**

Provide at least 4 in (10.2 cm) of clearance around the back, right, and left sides of the rack module.

Lift the module and place onto the already located base beams, and align the holes. Be aware of the polarity orientation as indicated on the provided layout drawing. Prior to installing the hardware, level the base beam and module with shims as necessary. C&D does not supply shims with the MSE batteries. Once proper level is achieved, install hardware between the base channel/modules. Continue to install modules in the same manner while confirming the polarity orientation. Once entire stack of modules is assembled, and level, torque down the hardware to 338 in-lbs (38 N-m)

#### **6.7 Electrical Connection**

Bolting tin-plated copper intercell connectors to the cell posts per system assembly drawing will complete the electrical connection.

MSE 960 through MSE 1440 cells do not require No-Ox-Id grease. All electrical contacting surfaces must have a clean and electrolyte free finish. Any tarnish or discoloration should be carefully removed with the brass wire brush. Do not use steel brushes, steel wool, sandpaper, or emery cloth to clean surfaces, as these will damage the plating.

Do not use cleaning solvents. These can cause crazing or cracking of the plastic cell containers (jars) and covers. The use of any unauthorized cleaning solvents or materials may void the warranty.

### **SAFETY NOTE**

**The use of insulated tools and personal protection specifically eye protection is highly recommended. Only personnel experienced in working with batteries should be used for battery installation and maintenance.**

MSE batteries have color-coded terminals to indicate polarity, RED for the positive (+) polarity and BLACK for the negative (-).

Make inter-cell connections by bolting tin-plated copper connectors (straps) from the POS (+) post of one cell to the adjoining cell's NEG (-) post. Always start with the top row of cells working down to the next row. Install the top bolt of each inter-cell connector first to remove the potential of accidental shorting. Be sure to follow the inter-cell connector assembly drawing. The washers with beveled side should contact the connector. Make all connections finger tight to allow for position adjustment if necessary.

Once all connectors are installed, torque M6 terminal hardware with an insulated torque wrench to 75 in-lbs (8.5 N-m). Exceeding the specified torque value may damage the terminal post seals.

Clear plastic shields are provided to prevent accidental contact with battery terminal posts. After completing the connections to the proper torque value, install the protective shields. The shields have holes to allow for individual cell voltage measurements.

## **6.8 Final Check**

MSE batteries are shipped with battery terminations in various orientations, which are determined at the time of order placement.

With the battery on open circuit (not connected to the charging source), check individual cell voltage and total battery voltage after torquing all connections. The total voltage should be the sum of each individual cell voltages. Record the data for future reference. This will become part of the battery's permanent maintenance records.

### **Caution**

It is the sole responsibility of the user to check connections. All bolted connections should be checked at regular intervals to ensure that they are clean and tight. Never operate a battery with loose or corroded connections.

## 7. Battery Operation

### 7.1 Float Charging

Standby batteries are continuously connected to control circuits, which must be energized at all times. Connected to a load in parallel with a continuously operating power supply, these batteries assure instantaneous support of the load in the event of a power failure or brownout. In addition to operating the connected load, the power supply keeps the standby battery fully charged. This parallel interconnection and operation is called float service. Maximum battery life can be expected in full float service, in which the frequency and depth of discharges are kept at a minimum.

MSE batteries should be connected to a temperature-compensating rectifier and adjusted to **2.23-2.25 Vpc** at 77°F(25°C) as normal float condition. Improper set points and temperatures greater than 77°F(25°C) can reduce the battery life.

If the operating temperature is other than 77°F(25°C), it is recommended that the float voltage be changed as follows:

For temperatures other than 77°F(25°C), correct the float voltage by 2 mV (0.002) per degree F (3.6 mV per degree C):

- ◆ Add 2 mV (0.002 volts) per degree F (3.6 mV per degree C) below 77°F(25°C).
- ◆ Subtract 2 mV (0.002 volts) per degree F (3.6 mV per degree C) above 77°F(25°C).

Note: Temperature compensation can materially improve battery service life when provided.

### 7.2 Equalizing/Boost Charging

Under normal float operation, the MSE batteries do need an equalization charge. An equalizing charge delivered at a voltage higher than the nominal float voltage is used to restore uniform cell voltage to a battery.

Also, upon installation of the battery, an optional boost charge can be applied per below table.

Voltage	Time of equalizing / boost charge*	Max Charge Current
2.23 Vpc	>24 hours	0.1C to 0.4C
2.25 Vpc	>24 hours	
2.28 Vpc	15 to 20 hours	
2.33 Vpc	3 to 4 hours	
2.40 Vpc	2 to 3 hours	

\* Time of boost charge may vary depending on the length of storage.

**Note**

Do not charge over 2.40 volts-per-cell. It may cause over heating due to over charge condition.

## 8. Record Keeping

Records of cell/battery operation and maintenance should be recorded, dated, and kept in a permanent file. Accurate, consistent records of battery maintenance and operation are essential. They can help to determine causes for associated equipment failures, monitor maintenance procedures, and indicate remedial action. Complete battery operation and maintenance records must be maintained in accordance with the battery warranty requirements.

A suggested record data sheet is contained within this manual.

## 9. Maintenance Schedule

### 9.1 Monthly Inspection

- ◆ Total battery string voltage under float charge
- ◆ Visual inspection of the battery system

### 9.2 Semi-Annual Inspection

- ◆ Total battery voltage (cells and string) under charge
- ◆ Visual inspection of the battery system

### 9.3 Annual Inspection

- ◆ Total battery voltage (cells and string) under charge
- ◆ Visual inspection of the battery system
- ◆ Connection integrity – retorque value is 75 in-lbs (8.5 N-m).

**Caution**

When doing the battery inspection, the same safety procedures listed in Section 3 must be followed.

### MATERIAL SAFETY DATA SHEET

SECTION I: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION	
<b>PRODUCT IDENTITY:</b> Sealed, Lead-Acid Battery  <b>CDID:</b> MSE Valve Regulated Lead Acid Battery Series	<b>MANUFACTURER NAME:</b> C & D Technologies, Inc  <b>ADDRESS:</b> 1400 Union Meeting Road P. O. Box 3053 Blue Bell, PA 19422-0858 <b>TELEPHONE:</b> (215) 619-2700 <b>EMERGENCY:</b> (610) 828-9309
<b>24 HOUR EMERGENCY TELEPHONE: (CHEM TEL) 1-800-255-3924</b>	

SECTION II: COMPOSITION / INFORMATION ON INGREDIENTS				
<b>NOTE:</b> The C&D MSE Lead Acid batteries are a sealed non-spillable design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances.				
HAZARDOUS COMPONENT	CAS#	OSHA PEL	ACGIH TLV	% BY WEIGHT
*Lead & Lead Components	7439-92-1	0.05mg/m3	0.15mg/m3	72-73%
*Sulfuric Acid	7664-93-9	1.0mg/m3	1.0mg/ m3	7-8%
Tin	7440-31-5	2.0mg/m3	2.0mg/m3	< .01%
Non-Hazardous Contents				18-21%
Percentages of compounds are dependent upon the model of the battery and the state of charge/discharge.				
SECTION 311, 312 and 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) (40 CFR 372) LISTED TOXIC CHEMICALS ARE PRECEDED BY AN *.				

SECTION III: HAZARDS IDENTIFICATION				
<b>RATING CODES:</b> 0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme				
<b>NFPA RATING:</b>	Health: <b>3</b>	Flammability: <b>0</b>	Reactivity: <b>2</b>	Other: <b>CORR</b>
<b>TARGET ORGANS:</b> Skin, Eyes, Upper Respiratory Tract		<b>ROUTES OF ENTRY:</b> Inhalation <b>X</b> Skin <b>X</b> Ingestion <b>X</b>		
<b>HEALTH HAZARDS (ACUTE AND CHRONIC):</b>				
<b>ACUTE: ACID /Battery Electrolyte:</b> Tissue destruction on contact with acid. May cause 2nd and 3rd degree burns or blindness with prolonged contact. Ingestion will cause corrosive burns on contact. May be fatal if swallowed.				
<b>CHRONIC:</b> Inhalation of acid mists may cause upper respiratory irritation.				
<b>SIGNS AND SYMPTOMS:</b> Irritation and burning of exposed tissues.				
<b>MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:</b> Respiratory disorders may be aggravated by prolonged inhalation of acid mists.				
<b>California Proposition 65 Warning</b> – Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. The only possible exposure would be the terminal posts on MSE models 150, 200 and 300. MSE models 500 through 1440 do not have lead terminal posts, but are a tin-plated brass terminal. Wash hands thoroughly after handling batteries and before eating, drinking or smoking.				

## SECTION IV: FIRST AID MEASURES

### EMERGENCY AND FIRST AID PROCEDURES:

SKIN / EYES	INGESTION	INHALATION
<ul style="list-style-type: none"> <li>• Flush with water for 15 minutes</li> <li>• Remove contaminated clothing</li> <li>• If irritation continues, seek medical attention</li> </ul>	<ul style="list-style-type: none"> <li>• If conscious, drink large quantities of milk or water</li> <li>• Do not induce vomiting</li> <li>• Give CPR if breathing has stopped</li> <li>• Seek medical attention immediately</li> </ul>	<ul style="list-style-type: none"> <li>• Remove to fresh air</li> <li>• Give oxygen or artificial respiration if needed</li> <li>• Get immediate medical attention</li> </ul>

## SECTION V: FIREFIGHTING MEASURES

### FIRE AND EXPLOSIVE PROPERTIES:

Flash Point: N/A	Flammable Limits:	LEL: 4.10%	UEL: 74.20%
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**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Hydrogen and oxygen gases are generated in cells during normal battery operation or when on charge. (Hydrogen is flammable and oxygen supports combustion). These gases enter the air through the vent caps. To avoid risk of fire or explosion, keep sparks and other sources of ignition away from the battery. Do not allow metal objects to simultaneously contact both the positive and negative terminals of batteries. Ventilate area well.

**EXTINGUISHING MEDIA:** Dry Chemical, foam, Halon, or Carbon Dioxide

**SPECIAL FIREFIGHTING PROCEDURES:** If batteries are on charge, turn off power. Use positive pressure, self-contained breathing apparatus (SCBA) in fighting fire. Water applied to electrolyte generates heat and causes it to splatter. Ventilate the area well. Acid protective clothing is recommended.

## SECTION VI: ACCIDENTAL RELEASE MEASURES

**STEPS TO BE TAKEN IF BATTERY IS BROKEN:** Neutralize exposed battery parts with soda ash (sodium bicarbonate) until fizzing stops. The pH should be neutral at 6-8. Collect residue in a suitable container. Residue may be hazardous waste. Place the broken battery in a heavy gauge plastic bag or other non-metallic container. Provide adequate ventilation, hydrogen gas may be given off during neutralization.

## SECTION VII: HANDLING AND STORAGE

Store in a cool, dry area away from combustibles. DO NOT store or charge in sealed, unventilated areas. Avoid over-heating and overcharging. Do not use organic solvents or other than recommended chemical cleaners on the batteries.

## SECTION VIII: EXPOSURE CONTROLS / PERSONAL PROTECTION

**ENGINEERING CONTROLS:** General room ventilation is sufficient during normal use and handling. DO NOT install these batteries in a sealed, unventilated area. Recommend 2-3 room air changes per hour to prevent hydrogen gas buildup.

### PERSONAL PROTECTIVE EQUIPMENT (IN THE EVENT OF BATTERY BREAKAGE):

**Eye Protection** = chemical goggles or safety glasses with sideshields and a full-face shield.

**Protective Gloves** = rubber or neoprene

**Respiratory Protection** = NIOSH approved acid mist respirator, if OSHA PEL is exceeded or respiratory irritation occurs.

**Other Protective Equipment** = acid resistant boots, apron or clothes.

**WORK PRACTICES:** DO NOT wear metallic jewelry when working with batteries. Use non-conductive tools only. Discharge static electricity prior to working on a battery by touching a grounded surface in the vicinity of the batteries, but away from cells. Batteries are heavy. Serious injury can result from improper lifting or installation. DO NOT lift, carry, install or remove cells by lifting or pulling the terminal posts for safety reasons and because terminal posts and post seals may be damaged. DO NOT use nylon cloths or wear nylon overalls when working with batteries as these can create static electricity. Maintain an eyewash, fire extinguisher and emergency communication device in the work area. Wash hands thoroughly after handling.

### SECTION IX: PHYSICAL AND CHEMICAL PROPERTIES

<b>ACID:</b> Appearance / Odor: At normal temperatures: colorless, oily fluid / acrid odor when hot.	
Boiling Point: Electrolyte 110° C – 112° C	Vapor Pressure: Electrolyte 11.7 mm Hg. At 20° C
Vapor Density (air = 1): Electrolyte 3.4	Melting Point: N/A
Evaporation Rate (water = 1): N/A	Solubility in water: Lead, Lead Oxide and Lead Sulfate Acid insoluble in water, Sulfuric Acid is 100% soluble in water.
Specific Gravity (contained in battery): Electrolyte 1.300+/- .010	

### SECTION X: STABILITY AND REACTIVITY

<b>STABILITY:</b> This battery and contents are stable under normal conditions.
<b>CONDITIONS TO AVOID:</b> Overheating or overcharging may result in acid mist / Hydrogen generation.
<b>INCOMPATIBILITY (MATERIALS TO AVOID):</b> Strong alkaline materials, conductive metals, organic solvents, sparks or open flame.
<b>HAZARDOUS DECOMPOSITION OR BYPRODUCTS:</b> Hydrogen gas may be generated in an overcharged condition, in fire or at very high temperatures. In fire may emit CO, CO <sub>2</sub> and Sulfur Oxides.
<b>HAZARDOUS POLYMERIZATION WILL NOT OCCUR.</b>

### SECTION XI: TOXICOLOGICAL INFORMATION - SULFURIC ACID

The "MSE Series" batteries are a sealed, recombinant design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances.		
<b>LD 50:</b> Administration Route: Oral	Dose: <b>2140mg/kg</b>	Test Animal: <b>Rat</b>
<b>LDLo:</b> Administration Route: <b>Unreported</b>	Dose: <b>135mg/kg</b>	Test Animal: <b>Man</b>
<b>LC50:</b> Administration Route: <b>Inhalation</b>	Dose: <b>510mg/m<sup>3</sup></b>	Test Animal: <b>Rat</b>
<b>CARCINOGENICITY:</b> The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a category 1 carcinogen (inhalation), a substance that is carcinogenic to humans. The National Toxicology Program (NTP) has designated strong inorganic sulfuric mists as a "Known Human Carcinogen." This classification does not apply to the liquid forms of sulfuric acid contained within the battery. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist at high levels.		

### SECTION XII: ECOLOGICAL INFORMATION

Lead and its compounds can pose a threat if released to the environment. See waste disposal method in Section XIII.
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### SECTION XIII: DISPOSAL CONSIDERATIONS

<b>WASTE DISPOSAL METHOD:</b> This battery is recyclable. It is illegal to dispose of lead-acid batteries by any means other than recycling. C&D provides an environmentally responsible lead acid battery collection and recycling program. Contact your local C&D sales representative for more information.
<b>HAZARDOUS WASTE CODES:</b> <b>D002, D008</b>

<b>SECTION XIV: TRANSPORTATION INFORMATION</b>
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<b>All DOMESTIC SHIPMENTS:</b>
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BATTERIES – WET, NON-SPILLABLE, ELECTRIC STORAGE, UN 2800
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<b>FOR WATER EXPORT AND CANADIAN SHIPMENTS:</b>
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FOR AIR: NON-SPILLABLE, NOT REGULATED. UNITS MEET A67 SPECIAL PROVISION OF IATA
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IMO = UNREGULATED
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UN OR NA IDENTIFICATION: <u>UN-2800</u>
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PROPER DOT SHIPPING NAME: Batteries, Wet, Non-spillable, Electric Storage
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HAZARD CLASS: 8
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PACKING GROUP: III
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LABEL: Corrosive (NOT REQUIRED FOR CANADA)
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NO PLACARDS OR LABELS REQUIRED.
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<b>SECTION XV: OTHER INFORMATION</b>
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This information has been compiled from sources considered to be dependable and is, to the best of our knowledge, accurate and reliable as of the date compiled. No representation, warranty (expressed or implied) or guarantee is made to the accuracy, completeness or reliability of the information contained herein.
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MSDS Preparation / Review Date: 11/18/03

Revision Number: 1

Prepared by: P. Reich



**Battery Maintenance Record Data Sheet**

Date \_\_\_\_\_

Company \_\_\_\_\_

Name \_\_\_\_\_ Title \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip/Postal Code \_\_\_\_\_

Battery Location and/or Number \_\_\_\_\_

No. of Cells \_\_\_\_\_ Type \_\_\_\_\_ Date New \_\_\_\_\_ Date Installed \_\_\_\_\_

Charger Output \_\_\_\_\_ Ambient Temperature \_\_\_\_\_ °F

Total Battery Voltage \_\_\_\_\_ Power Panel Meter Volts \_\_\_\_\_

**INDIVIDUAL CELL READINGS**

Cell No.	Serial No.	Volts
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Cell No.	Serial No.	Volts
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		

Cell No.	Serial No.	Volts
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		

Remarks and Recommendations \_\_\_\_\_

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**PRELIMINARY**