INTRODUCTION .............................................................................................................6
GLOSSARY OF COMMONLY USED ABBREVIATIONS ...............................................7

1. PRODUCT DESCRIPTION

1.1 PRODUCTS ...........................................................................................................11
1.2 IDENTIFICATION ...............................................................................................12
1.3 PHYSICAL PROPERTIES ...................................................................................13

2. PACKAGING

2.1 PLASTIC PAILS ....................................................................................................17
2.2 BIG BAGS ...........................................................................................................19
2.3 GENERAL PACKAGING INFORMATION ............................................................20

3. TRANSPORTATION

3.1 PACKAGING AND TRANSPORTATION ............................................................23
3.2 DRIVER'S LOADING CHECKLIST ......................................................................27
3.3 DRIVER'S ROAD REMINDERS .........................................................................29
4. USER GUIDE

4.1 GENERAL SITE RECOMMENDATIONS ...................................................... 33
4.2 PROCESS SAFETY MANAGEMENT REGULATIONS ............................. 39
4.3 HAZARDOUS EXPOSURE LIMITS .......................................................... 40
4.4 DETECTION METHODS ........................................................................ 41
4.5 PROTECTIVE CLOTHING .................................................................... 41
4.6 RESPIRATORY PROTECTION PROGRAM .............................................. 42

5. EMERGENCY RESPONSE

5.1 FACILITY EMERGENCY ACTION PLANNING .................................... 47
5.2 TRANSPORT EMERGENCY RESPONSE ............................................. 49
5.3 HAZARD IDENTIFICATION ................................................................. 50
5.4 RISK AND SAFETY PHRASES ............................................................. 52
5.5 FIRE-FIGHTING ................................................................................ 53
5.6 SPILLS OR LEAKS ............................................................................. 55
5.7 EMERGENCY REPAIRS ...................................................................... 57
5.8 EXPOSURE TO BCDMH ..................................................................... 58
6. OPERATORS GUIDE

6.1 OPERATOR HEALTH MONITORING...............................................61

6.2 OPERATOR/DRIVER SAFETY TRAINING.........................................63

APPENDIX

A. TYPICAL QUALITY SPECIFICATION.............................................67

B. REFERENCES....................................................................................68
This Safety Handbook has been compiled by the Dead Sea Bromine Group (DSBG) as a part of its continuing commitment to the principles of Product Stewardship, and is intended to provide a guide to the safe handling and use of its Halogene products.

Halogene biocides are broad-spectrum halogen releasing products for the control of algae, bacterial and fungal populations in industrial water systems.

Halogene biocides contain bromo, chloro-dimethyl hydantoin (BCDMH) active ingredient which slowly releases bromine and chlorine when placed in water.

Whether you are a manufacturer, transporter, distributor or end user, we hope that the information contained in this Safety Handbook will prove useful in your handling of these products. Information is also provided to assist regulatory and transportation authorities in determining whether BCDMH is being handled or transported properly, and to assist medical personnel in case of accident involving this product.

BCDMH is not a substance to be used casually. It is a hazardous chemical which can be used safely if its properties are understood and the necessary safety precautions are observed. Safety is the personal responsibility of everyone working with BCDMH. Managers and supervisors should be well versed in the safe handling practices required and enforce their implementation. Operators should be well trained in the use of safety equipment and safety procedures.

Note: The relevant Material Safety Data Sheet should be consulted before undertaking any activities involving BCDMH.

The handling of BCDMH is strictly regulated by international agreements and government regulations. As new information is continuously becoming available, anyone handling this substance must keep up-to-date on relevant practices and regulations.

DSBG emphasizes the need for safe handling of BCDMH, the integrity of the containers and the prominent display of instructions and warnings.

For further information on BCDMH, please contact your local DSBG office.

We also welcome your comments and input on the content and presentation of this Safety Handbook.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, DEAD SEA BROMINE GROUP makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the person receiving it will make their own determination as to its safety and suitability for their purposes prior to use. In no event will DEAD SEA BROMINE GROUP be responsible for damages of any nature whatsoever resulting from the use or reliance upon information.

In the event of a discrepancy between the contents of the safety handbook and the updated MSDS then the MSDS will prevail (see DSBG website for latest version www.dsbg.com).

NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE, ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH THE INFORMATION REFERS.
## GLOSSARY OF COMMONLY USED ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAR</td>
<td>American Association of Railroads</td>
</tr>
<tr>
<td>ACC</td>
<td>American Chemistry Council (US), formerly Chemical Manufacturers Assoc.</td>
</tr>
<tr>
<td>ACEP</td>
<td>Approved Continuous Examination Program (CSC)</td>
</tr>
<tr>
<td>ACGIH</td>
<td>American Conference of Governmental Industrial Hygienists</td>
</tr>
<tr>
<td>ACOP</td>
<td>Approved Code of Practice (UK)</td>
</tr>
<tr>
<td>ADR</td>
<td>European Agreement concerning the International Carriage of Dangerous Goods by Road</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>BCDMH</td>
<td>Bromo, Chloro-5,5-dimethyl hydantoin</td>
</tr>
<tr>
<td>C</td>
<td>Ceiling Limit Value (For TLV)</td>
</tr>
<tr>
<td>CAF</td>
<td>Compressed Asbestos Fiber</td>
</tr>
<tr>
<td>CAS</td>
<td>Chemical Abstract Service</td>
</tr>
<tr>
<td>CEFIC</td>
<td>European Chemical Industry Council</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation &amp; Liability Act (US)</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations (US)</td>
</tr>
<tr>
<td>CGA</td>
<td>Compressed Gas Association (US)</td>
</tr>
<tr>
<td>CHEMTREC</td>
<td>Chemical Transportation Emergency Center (US)</td>
</tr>
<tr>
<td>CIMAH</td>
<td>Control of Industrial Major Accident Hazards Regulations (UK)</td>
</tr>
<tr>
<td>COSHH</td>
<td>Control of Substances Hazardous to Health Regulations (UK)</td>
</tr>
<tr>
<td>CPL</td>
<td>Classification, Packaging and Labelling of Dangerous Substances Regulations (UK)</td>
</tr>
<tr>
<td>CSC</td>
<td>International Convention for Safe Containers (IMO)</td>
</tr>
<tr>
<td>CWA</td>
<td>Clean Water Act (US)</td>
</tr>
<tr>
<td>DOT</td>
<td>Dept of Transportation (US)</td>
</tr>
<tr>
<td>DSBG</td>
<td>Dead Sea Bromine Group</td>
</tr>
<tr>
<td>EMSno.</td>
<td>Emergency Schedule Number (IMO)</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency (IMO)</td>
</tr>
<tr>
<td>FM</td>
<td>Factory Mutual System (US)</td>
</tr>
<tr>
<td>HAP</td>
<td>Hazardous Air Pollutant</td>
</tr>
<tr>
<td>HSE</td>
<td>Health and Safety Executive (UK)</td>
</tr>
<tr>
<td>IARC</td>
<td>International Agency for Research on Cancer</td>
</tr>
<tr>
<td>IATA</td>
<td>International Air Transport Association</td>
</tr>
<tr>
<td>IDLH</td>
<td>Immediately Dangerous to Life or Health</td>
</tr>
<tr>
<td>IMDG</td>
<td>International Maritime Dangerous Goods code</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>IPIC</td>
<td>Israel Poisons Information Center</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organization</td>
</tr>
<tr>
<td>MAK</td>
<td>Maximum Concentration at the Workplace (Germany)</td>
</tr>
<tr>
<td>MEL</td>
<td>Maximum Exposure Limit (UK)</td>
</tr>
</tbody>
</table>
MFAG  Medical First Aid Guide (IMO)
MSDS  Material Safety Data Sheet
NA    North America (US)
NATICH National Air Toxics Information Clearing House (US)
NESHAP National Emission Standard For Hazardous Air Pollutants (US)
NFPA   National Fire Protection Association (US)
NIHHS Notification of Installation Handling Hazardous Substances Regulations (UK)
NIOSH National Institute of Occupational Safety & Health (US)
NOS   Not Otherwise Specified
NTP National Toxicology Program (US)
OSHA  Occupational Safety and Health Administration (US)
OES Occupational Exposure Standard (UK)
PEL   Permissible Exposure Limit (US)
PGR   Road Traffic (Carriage of Dangerous Substances in Packages etc.) Regulations (UK)
RCRA Resources Conservation and Recovery Act (US)
REL   Recommended Exposure Limit
RID Regulations concerning the International Carriage of Dangerous Goods by Rail
RQ    Reportable quantity (US)
SARA   Superfund Amendments and Reauthorization Act (US)
SCBA Self-Contained Breathing Apparatus
STEL  Short-term Exposure Limit
TEFC Totally Enclosed Fan Cooled electric motor
TLV Threshold Limit Value (ACGIH) (US)
TREMCARD Transport Emergency Card
TSCA Toxic Substances Control Act (US)
TWA   Time Weighted Average
UIC International Union of Railways (Europe)
UL Underwriters Laboratories (US)
UN United Nations
PRODUCT DESCRIPTION

1.1 PRODUCTS ........................................................................................................11
1.2 IDENTIFICATION ..................................................................................................12
1.3 PHYSICAL PROPERTIES .....................................................................................13
1.1 PRODUCTS

Halogene biocides:

- Are broad-spectrum halogen releasing products for the control of algae, bacterial and fungal populations in industrial water systems
- Are supplied as free-flowing granules (Halogene G) and as tablets (Halogene T, T-30)
- Contain bromo, chloro-dimehtyl hydantoin (BCDMH) active ingredient which slowly releases bromine and chlorine when placed in water

Halogene biocides are recommended for use in the following cooling towers and other related water treatment applications:

- Recirculating cooling towers, flow-through filters and lagoons
- Heat-exchange water systems
- Industrial water-scrubbing systems
- Brewery and canning pasteurizers
- Industrial air-washing systems with efficient mist eliminators
- Once-through cooling towers and closed-cycle fresh and sea water cooling systems, cooling ponds, canals and lagoons
- Ornamental fountains
- Air conditioner condensate

Features and Benefits

- Broad spectrum antimicrobial action
- Excellent source of bromine
- Effective at very low concentrations
- More effective than chlorine in the presence of ammonia contamination
- Safer to handle and store than chlorine gas or liquid
- Easy to use in solid form
- Especially useful for small to medium size cooling water systems, where handling of chemical additives may be difficult
1.2 IDENTIFICATION

**UN number**
Oxidizing solid, N.O.S. 1479
Bromo, Chloro-5,5-Dimethyl Hydantoin

**CAS number**
32718-18-6

**Empirical Formula**
\( \text{C}_5\text{H}_6\text{BrClN}_2\text{O}_2 \)

**Synonyms**
- Bromo, Chloro-5,5-dimethyl hydantoin
- N,N'-Bromo, Chloro-dimethyl hydantoin
- 1,3 - Bromo, Chloro-5,5-dimethyl hydantoin
- 1,3 - Bromo, Chloro-5,5-dimethyl-2,4-imidazolidinedione

**Trade Names**
- Halogene
- Halogene T
- Halogene T-30
- Halogene G (Granular)

**Chemical Family**
Halogenated hydantoin

**Typical Properties**
- Appearance: White/off-white granules or tablets of approx. 30 mm. diameter (1 1/4”) and approx. 20 gr. weight
- Odor: Faint halogenous odor

**RCRA Waste number (U.S.)**
40 CFR 261.23 (a) (4) and 40 CFR 261.23 (b)

BCDMH is classified as a hazardous substance due to its characteristics of reactivity when mixed with water. When heated to decomposition, may release poisonous and corrosive fumes. Its disposal is regulated by the US Federal RCRA regulations as hazardous waste with the characteristic of ignitability number D001.
1.3 PHYSICAL PROPERTIES

CHARACTERISTIC

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Point</td>
<td>N/A (Decomposes)</td>
</tr>
<tr>
<td>Flash Point</td>
<td>None</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>241.5</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.8 - 2</td>
</tr>
<tr>
<td>Vapor pressure (at 25°C)</td>
<td>9.35x10^{-3} Pa</td>
</tr>
<tr>
<td>Flammable Limits</td>
<td>not flammable</td>
</tr>
<tr>
<td>Solubility in Water (at 25°C)</td>
<td>0.2 g/100 ml</td>
</tr>
<tr>
<td>Solubility in organic Solvents</td>
<td></td>
</tr>
<tr>
<td>• Benzene (at 25°C)</td>
<td>2.5 g/100g</td>
</tr>
<tr>
<td>• Carbon Tetrachloride (at 20°C)</td>
<td>0.3 g/100g</td>
</tr>
<tr>
<td>• Chloroform (at 20°C)</td>
<td>3.5 g/100g</td>
</tr>
<tr>
<td>• Glacial Acetic Acid (at 25°C)</td>
<td>1.6 g/100g</td>
</tr>
<tr>
<td>• Heptane (at 25°C)</td>
<td>0.2 g/100g</td>
</tr>
<tr>
<td>• Methylene Dichloride (at 25°C)</td>
<td>11.7 g/100g</td>
</tr>
<tr>
<td>Decomposition Temp.</td>
<td>Above 160°C</td>
</tr>
</tbody>
</table>

Decomposition Products: Forms hydrogen bromide, bromine, hydrogen chloride, nitrogen oxides.
PACKAGING

2.1 PLASTIC PAILS.................................................................................................17
2.2 BIG BAGS..........................................................................................................19
2.3 GENERAL PACKAGING INFORMATION......................................................20
Types of packaging include the following:

- 5 kg (11 lbs) polyethylene pails (granular, tablets)
- 11.3 kg (25 lbs) polyethylene pails (granular, tablets)
- 22.7 kg (50 lbs) polyethylene pails (granular, tablets)
- 227 kg (500 lbs) big bags (granular)
- 500 kg (1100 lbs) big bags (granular)

### 2.1 PLASTIC PAILS

#### 5 KG (11 LBS) PLASTIC PAILS

A plastic pail made of HDPE sealed with a press-in lid, 5 pails in an outer packaging consisting of a double wall corrugated box.

**PACKAGING**

<table>
<thead>
<tr>
<th>Color</th>
<th>INNER PACKAGING</th>
<th>OUTER PACKAGING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (cm)</td>
<td>22 dia. x 23</td>
<td>59 x 50 x 25</td>
</tr>
<tr>
<td>U.N. No. for packaging</td>
<td>-</td>
<td>UN 4G/Y28/S</td>
</tr>
<tr>
<td>Tare weight for 1 unit (kg)</td>
<td>0.25</td>
<td>2.85</td>
</tr>
<tr>
<td>Net weight for 1 unit (kg)</td>
<td>5</td>
<td>25 (5 x 5)</td>
</tr>
</tbody>
</table>

**UNIT LOAD (PALLET)**

<table>
<thead>
<tr>
<th>Dimensions (cm)</th>
<th>W100 x L120 x H105</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of units per pallet</td>
<td>16 (4 x 4)</td>
</tr>
<tr>
<td>Tare weight per pallet (kg)</td>
<td>70</td>
</tr>
<tr>
<td>Net weight per pallet (kg)</td>
<td>400</td>
</tr>
<tr>
<td>No. of pallets per container 20 ft</td>
<td>20</td>
</tr>
<tr>
<td>Net weight per container 20 ft (kg)</td>
<td>8,000</td>
</tr>
</tbody>
</table>
**11.3 KG (25 LBS) PLASTIC PAILS**
A plastic pail made of HDPE with a screwed lid closure.

**PACKAGING**

<table>
<thead>
<tr>
<th>Color</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (cm)</td>
<td>35.5 dia. x 27</td>
</tr>
<tr>
<td>U.N. No. for packaging</td>
<td>UN 1H2/Y 19/S</td>
</tr>
<tr>
<td>Tare weight for 1 unit (kg)</td>
<td>1.3</td>
</tr>
<tr>
<td>Net weight for 1 unit (kg)</td>
<td>11.3</td>
</tr>
</tbody>
</table>

**UNIT LOAD (PALLET)**

<table>
<thead>
<tr>
<th>Dimensions (cm)</th>
<th>W102 x L122 x H84</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of units per pallet</td>
<td>30 (3 x 10)</td>
</tr>
<tr>
<td>Tare weight per pallet (kg)</td>
<td>62</td>
</tr>
<tr>
<td>Net weight per pallet (kg)</td>
<td>340</td>
</tr>
<tr>
<td>No. of pallets per container</td>
<td>20 ft: 20</td>
</tr>
<tr>
<td>Net weight per container (kg)</td>
<td>20 ft: 6,798</td>
</tr>
</tbody>
</table>

**22.7 KG (50 LBS) PLASTIC PAILS**
A plastic pail made of HDPE with a screwed lid closure.

**PACKAGING**

<table>
<thead>
<tr>
<th>Color</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (cm)</td>
<td>35 dia. x 46</td>
</tr>
<tr>
<td>U.N. No. for packaging</td>
<td>UN 1H2/Y 30/S</td>
</tr>
<tr>
<td>Tare weight for 1 unit (kg)</td>
<td>1.8</td>
</tr>
<tr>
<td>Net weight for 1 unit (kg)</td>
<td>22.7</td>
</tr>
</tbody>
</table>

**UNIT LOAD (PALLET)**

<table>
<thead>
<tr>
<th>Dimensions (cm)</th>
<th>W100 x L106 x H105</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of units per pallet</td>
<td>18 (2 x 9)</td>
</tr>
<tr>
<td>Tare weight per pallet (kg)</td>
<td>52</td>
</tr>
<tr>
<td>Net weight per pallet (kg)</td>
<td>408.6</td>
</tr>
<tr>
<td>No. of pallets per container</td>
<td>20 ft: 20</td>
</tr>
<tr>
<td>Net weight per container (kg)</td>
<td>20 ft: 8,172</td>
</tr>
<tr>
<td></td>
<td>40 ft: 40</td>
</tr>
<tr>
<td></td>
<td>40 ft: 16,344</td>
</tr>
</tbody>
</table>
2.2 BIG BAGS

A polypropylene coated outer packaging with a transparent inner EVOH or PE lining. The big bags are stretched and tied together.

PACKAGING

<table>
<thead>
<tr>
<th></th>
<th>227 (500)</th>
<th>500 (1100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big bag size, kg (lbs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
<td></td>
</tr>
<tr>
<td>Dimensions (cm)</td>
<td>89 x 89 x 40</td>
<td>89 x 89 x 75</td>
</tr>
<tr>
<td>U.N. No. for packaging</td>
<td>UN 13H4/Y</td>
<td></td>
</tr>
<tr>
<td>Tare weight for 1 unit (kg)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Net weight for 1 unit (kg)</td>
<td>227</td>
<td>500</td>
</tr>
</tbody>
</table>

UNIT LOAD

<table>
<thead>
<tr>
<th></th>
<th>227</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (kg)</td>
<td>227</td>
<td>500</td>
</tr>
<tr>
<td>Dimensions (cm)</td>
<td>W114 x L114 x H110</td>
<td>W100 x L106 x H120</td>
</tr>
<tr>
<td>No. of units per pallet</td>
<td>5 / 6</td>
<td>3</td>
</tr>
<tr>
<td>Tare weight per pallet (kg)</td>
<td>30 / 32</td>
<td>28</td>
</tr>
<tr>
<td>Net weight per pallet (kg)</td>
<td>1135 / 1362</td>
<td>1500</td>
</tr>
<tr>
<td>No. of pallets per container (20 ft)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Net weight per container (kg)</td>
<td>11,350 / 13,620</td>
<td>15,000</td>
</tr>
</tbody>
</table>
2.3 GENERAL PACKAGING INFORMATION

BCDMH is shipped in freight containers. When opening a container at its destination, the doors should be opened wide and the container allowed to be aired for 15 minutes before entering and before any unloading operations are started.

Palletized pails of BCDMH should be stacked no more than two pallets high. Exceeding this limit may lead to damage to the pails. The lowermost pails are the most prone to this type of damage.

Pails should be shipped and stored upright. They should be supported so that there is no danger of them accidentally moving or falling.

BCDMH pails should not be used for any other purpose other than for BCDMH. The receptacles should be kept tightly closed except when in use.

The shelf life of BCDMH products is 12 months for big bags and 36 months for pails.

BCDMH should never be stored in a home or office building. They should only be stored in a well ventilated warehouse, in an area that is adequately marked and locked.

BCDMH is hygroscopic and moisture will be absorbed as the receptacles are not hermetically sealed. This absorbed moisture can cause decomposition of the BCDMH, disintegration of tablets and lumping of the granulated BCDMH.

Pails should be issued "First-in, First-out", and should be inspected for external damage every three months.

After any unusual incident in the warehouse that could be damaging to the pails, they should be inspected.

Receptacles with signs of external damage should never be sent to a customer.

The supplier should be consulted for instructions on disposal of damaged pails.
3.1 PACKAGING AND TRANSPORTATION ..................................................................23
3.2 DRIVER'S LOADING CHECKLIST....................................................................27
3.3 DRIVER'S ROAD REMINDERS.......................................................................29
The following is a summary of the main regulations and requirements regarding the transportation of BCDMH products according to international regulations. The shipper should ensure that the transport of BCDMH conforms to all relevant local regulations as well.

### 3.1 PACKAGING AND TRANSPORTATION

**United Nations (Orange Book)**

There has been considerable harmonization between the Orange Book and the various international regulations. These model regulations have been adopted in the various regulations, agreements and codes specified in this section. Many of the sections are numbered in the same way and much of the text is identical.

UN 1479 and Class 5.1, Packing Group II, are applicable to all of the following regulations, in addition to the details provided in each section.

**US Department of Transportation Regulations (DOT)**

(As reflected by the changes published in the Federal Register, 2001)

Import and Export Shipments — 49 CFR 171.12 Acceptance of Goods

Table of Hazardous Materials: 49 CFR 172.101

Proper Shipping Name: Oxidizing Solid n.o.s.
Contains Bromochloro-5,5-dimethyl hydantoin

Emergency response information 49 CFR 172.600
Emergency Response Guidebook, 2000
Guide number 140

**Packaging**

Non-bulk packaging — 49 CFR 173.212
Exceptions for Division 5.1: 49 CFR 173.152 (G) Limited quantities up to 1.0 Kg.

**Carriage by vessel**

Vessel Stowage category "B" on deck or under deck up to 25 passengers (if this is exceeded it must be stored on deck)

**Carriage by aircraft/ rail**

Cargo aircraft 25 Kg per package
Passenger aircraft/ rail 5 Kg per package
DOT training requirements are specified in 49 CFR 172.704

A label or placard conforming to the UN recommendations may be used. Oxidizer placard:

- For non-bulk shipments, a label conforming to US DOT specifications and/or UN recommendations must be used. Sections 172.400, 172.407 and 172.426.
- For bulk packaging and/or bulk shipments, a placard conforming to US DOT specifications and/or UN recommendations must be used. Sections 172.500, 172.519 and 172.550.
- For marking vehicles.
- Size: 273 mm x 273 mm (10.8" x 10.8").

Details of the placard holder are shown in Appendix C of section 172.

**IMDG Code**

**Packing and Stowage Regulations**

**Stowage, Chapter 7.1**

BCDMH is in stowage category B and is transported on deck or under deck (unless the limiting number of passengers is exceeded).

**Segregation table, chapter 7.2**

"Separated from": Explosives
Flammable gases
Flammable liquids
Infectious substances
Organic peroxides
Corrosive substances

"Away from": Toxic substances
Radioactive materials
Flammable solids

For the purpose of segregation provisions, refer to IMDG code section 7.2.1.17 to determine the provisions for a specific type of vessel.

**Special provisions in the event of an incident and fire precautions involving dangerous goods are included in section 7.3**

The emergency procedures for ships carrying dangerous goods are contained in the supplement. For BCDMH, the emergency schedule is F-A, S-Q.
The Medical First Aid Guide (MFAG) is also contained in the supplement and is for use in accidents involving dangerous goods.

**Special provisions for mixed packing**

BCDMH shall not be packed together with other goods.

**ADR (Europe)**

Regulations concerning the International Carriage of Dangerous Goods by Road.

According to: Table A - Dangerous Goods list BCDMH is classified as:

Oxidising Solid, N.O.S, 5.1, O2, II.

O2 - Oxidizing substance without subsidiary risk - Solid.

Packing group II — Substances presenting medium danger.

Oxidising Solid n.o.s.

Packaging instructions P002 and IBC 08 apply.

IBCs other than metal or rigid plastic IBCs shall be carried in closed vehicles or containers.

Flexible IBCs shall be silt-proof and with water resistant liner.

BCDMH to be transported in "AT" vehicle designed for dangerous goods.

Transport category 2.

**Special provisions for carriage**

Loading, unloading and handling

CV24 Before loading, vehicles and containers shall be thoroughly cleaned and in particular be free of any combustible debris (straw, hay, paper etc.). The use of readily flammable materials for stowing packages is prohibited.

Transport Emergency Card (TREMCARD) requirements

Oxidizing Solid

Transport Emergency Card (Road), TEC (R) - 51 GO2-I+II+III

Hazard identification number for labeling transport units.

Hazard Identification Number, No. 50.

Oxidizing (fire-intensifying) substance.
RID (Europe)
Regulations concerning the International Carriage of Dangerous Goods by Rail

These regulations are similar to the ADR agreement.

IATA
International Air Transport Association Regulations
• Section 4.2, List of Dangerous Goods
  Class 5.1, Oxidizing Substances
  Packing Group II

A. Cargo Aircraft:
  Combination and single packagings are permitted.
  Combination Packaging 25 Kg/ Max Net Qty/ Pkg with inner plastic receptacle: 2.5 Kg

B. Passenger Aircraft:
  Single packagings are not permitted
  • Limited Quantity Packaging: 2.5 Kg max. net quantity per package with 0.5 Kg inner plastic bag receptacles.
  • 5 Kg max. net quantity per package with inner plastic bag receptacles of 1 Kg.

• Aircraft Emergency Response Guidance, ERG Code 5L

UNITED KINGDOM
The Emergency Action Code (EAC) for BCDMH is:

1Y

1 - Use coarse spray for extinguishing a fire

Y - Wear breathing apparatus
  Avoid spillages from entering drains or water courses
### 3.2 DRIVER'S LOADING CHECKLIST

The following is a **suggested** checklist, based on European Agreement concerning the Carriage of Dangerous Goods by Road (ADR) regulations and good practice. The shipper should also ensure that all local regulations are complied with.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vehicle is marked clearly in front and rear with the UN No. (1479), Hazard Identification Number 50 and Hazard Placard no. 5.1, corrosive substances. Vehicles are marked on the sides and rear, containers on both sides and at each end.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Vehicle is equipped with two portable dry powder fire extinguishers or equivalent, of at least two and six kg capacity, checked within the past year.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Approved portable lamps are available to each member of the crew</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 4. Vehicle has the following emergency equipment:  
  - Emergency tools  
  - Wheel blocks  
  - Two self-standing warning signs  
  - Suitable warning vests or clothing for each member of the crew. |   |    |
| 5. An eye wash bottle is readily available. |   |    |
| 6. Vehicle has a valid license for hazardous materials (Hazmat license). The validity of the license shall expire not later than one year after inspection date. |   |    |
| 7. Driver and assistant driver have valid licenses to operate hazardous material vehicles (Hazmat license), issued or renewed within the past five years. |   |    |
| 8. Oxidising Solids Transport Emergency Card (TREMCARD) is readily accessible. (see sample on page 30). |   |    |
| 9. Hazardous transport unit does not consist of more than one trailer. |   |    |
| 10. The vehicle is not carrying any materials incompatible with BCDMH at the same time (Explosives, flammables, toxic substances, corrosives, radio-active materials, organic peroxides and other oxidizing substances, infectious substances, or strong bases). |   |    |
11. BCDMH will be kept apart from food stuffs and animal feed.

12. Shipping papers include
   - Product name: Oxidising Solid (Bromo, Chloro-5,5-dimethyl hydantoin)
   - UN Identification Number: 1479
   - Permit to transport BCDMH
   - Quantity being shipped.

13. All papers concerning the transport of the hazardous material are kept in a holder on the inside of the door on the driver’s side of the vehicle.

14. Driver has approved route to destination with specified stops. No alternative routes will be used or unauthorized stops made.

15. Vehicle has a full fuel tank before loading the BCDMH.

16. Containers have been fastened with all the twist lock corner fittings.
3.3 DRIVER'S ROAD REMINDERS

The driver and assistant driver of any vehicle transporting BCDMH should comply with the following requirements:

Supervision of vehicles (Section 8.4)

Parking the hazardous goods transport unit should be under one of the following conditions:
- Supervised parking lot, attendant aware of the nature of the load, and how to contact the driver.
- Vehicle parking lot where unit is not likely to suffer damage.
- Open space separated from public highway and public dwellings, where public does not normally pass.

Miscellaneous requirements (Section 8.3)
- No passengers are allowed.
- The crew shall know how to use fire-fighting appliances.
- A driver or driver’s assistant may not open a package containing BCDMH.
- BCDMH receptacles are not to be checked with open flames.
- No smoking is permitted around the transport unit or in the vicinity of the vehicle during handling operations.
- The engine is to be shut-off during all handling operations unless required to drive pumps, hoist, etc.
- Parking brakes are to be applied whenever parked.
- If the vehicle is parked on a road at night or with poor visibility, warning signs are to be placed 10 meters ahead of and behind the vehicle.
SAMPLE TREMCARD

TRANSPORT EMERGENCY CARD (Road)  CEFIC TEC(R) - 51G001-1+2+3

LOAD

Colourless solid

Name of substance(s):
- Colourless solid / Coloured solid.
- Usually with perceptible odour.
- Soluble in water / insoluble in water.

NATURE OF DANGER

- Promotes combustion (oxidising agent)
- Not itself combustible but assists fire in burning materials.
- May react with combustible substances creating fire or explosion hazard and formation of toxic fumes.
- Heating will cause pressure rise with risk of bursting and consequent explosion.
- May have irritant effect on eyes, on skin, on air passages.
- May be harmful by contact, inhalation or ingestion.
- Causes severe damage to eyes.

PERSONAL PROTECTION INTERVENTION EQUIPMENT

- Goggles or face shield.
- Light protective clothing.
- Protective gloves.
- Protective footwear.
- Eyewash bottle with clean water.
- Two self-standing warning signs, hand-lamp, warning vest.

GENERAL ACTIONS BY THE DRIVER

- Stop the engine.
- No naked lights. No smoking.
- Mark roads with self-standing warning signs and warn other road users or passersby.
- Keep public away from danger area. Keep upwind.
- Notify police and fire brigade as soon as possible.

ADDITIONAL AND/OR SPECIAL ACTIONS BY THE DRIVER

- Any action only if without personal risk.
- Stop leaks if without risk.
- Sweep up spilled substance but avoid making dust.
- Do not absorb in sawdust or other combustible materials.
- Avoid direct contact with substance.
- If substance has entered a water course or sewer or been spilled on soil or vegetation, advise police.

FIRST AID

- If substance has got into the eyes, immediately wash out with plenty of water. Continue treatment with medical assistance is provided.
- If clothing is burning extinguish with copious amount of water. Remove loose clothing, but do not attempt removal if adhering to skin. Change affected areas with well wetted clothes. Remove to hospital immediately, changing clothes worked at all times. Even if contaminated clothing is not burning drench with water immediately. Remove clothing and drench affected skin with plenty of water, 8 all traces of substance have been removed.
- Seek medical treatment when anyone has symptoms apparently due to inhalation or contact with skin or eyes.

SUPPLEMENTARY INFORMATION FOR EMERGENCY SERVICES

- Extinguish with water spray, foam or dry chemical.
- Do not use water jet.
- Do not use water jet by spraying with water if exposed to fire.
- When collecting do not use tin containers but use plastic, aluminium or stainless steel containers. Do not seat.

Additional information

EMERGENCY TELEPHONE:............................

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APPLIES ONLY DURING ROAD TRANSPORT ENGLISH
Revision 07/2001  issued: 2001
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 General Site Recommendations</td>
<td>33</td>
</tr>
<tr>
<td>4.2 Process Safety Management Regulations</td>
<td>39</td>
</tr>
<tr>
<td>4.3 Hazardous Exposure Limits</td>
<td>40</td>
</tr>
<tr>
<td>4.4 Detection Methods</td>
<td>41</td>
</tr>
<tr>
<td>4.5 Protective Clothing</td>
<td>41</td>
</tr>
<tr>
<td>4.6 Respiratory Protection Program</td>
<td>42</td>
</tr>
</tbody>
</table>
4.1 GENERAL SITE RECOMMENDATIONS

As BCDMH is a hazardous material, storage areas should be carefully supervised. Local regulations must be complied with.

This guide is to be used for the selection and supervision of a BCDMH storage area. The NFPA code 430 on the storage of solid and liquid oxidizing materials contains recommendations for the storage of quantities of 454 kg or greater of BCDMH.

BCDMH is not specifically listed in the list of typical oxidizers of the NFPA code. However, it does fall under the definition of a class 2 oxidizer, "An oxidizing material that will moderately increase the burning rate or which may cause spontaneous ignition of combustible material with which it comes in contact".

The storage areas can be supplier distribution warehouses, third party distribution warehouses or user storage areas.

The storage area should be located at least 100 meters, (preferably 200 meters), from any school, hospital or concentration of 10 or more private dwellings, and at least 25 meters from the nearest occupied building, or public road.

"Class 2 Oxidizer" hazard signs should be prominently displayed at any facility where BCDMH is stored.
Storage Facilities

The amount of BCDMH stored at the user site should be kept to a minimum. Any local code or regulation should be strictly followed. The following measures should be taken in addition to local regulations, unless in conflict with the local code.

- The work site should be enclosed with a low curb or walls called a dike, to contain any spilled material and prevent the dispersal of fire-fighting water. Within the diked area, there should be no sewer connection. However, a sump should be provided for collecting and pumping away any collected fire-fighting water.

- Arrangement of the storage area should take into consideration the potential for evolution of large quantities of toxic fumes, which would be hazardous to the surrounding areas.

- Provide adequate ventilation to extract fumes from indoor storage areas in case of fire.

- BCDMH should never be stored in a basement.

- BCDMH pails should be stored at least 1.2 meters (4 feet) from a wall or ceiling.

- Buildings should be at least 10 meters apart to allow strengthened approach roads for emergency vehicles on two sides of the installation.

- Building construction should be fire resistant and provisions made for potential fire-fighting activities, according to relevant local and national codes, and in consultation with the local fire-fighting professionals. The fire-fighting installation should include provision for an adequate supply of water. Fire extinguishers and hydrants should be distributed around the area.

- Note that an automatic sprinkler installation may not be effective, since BCDMH is an oxidizer.

- Electrical installation: Junction boxes and light fittings should be dust tight. Cast iron (epoxy-base coated) or a non-metallic material is suitable.
• Use TEFC (Totally Enclosed Fan Cooled) motors of cast iron or steel construction with epoxy-base coating.

• Floors should be of impervious construction, preferably concrete.

**Safety and Security**

• Any area where BCDMH is used or stored should be enclosed so that unauthorized persons and animals are prevented from entering the area. Adequate lighting should be provided to allow sufficient night surveillance. Surveillance should be provided 24 hours a day.

• Provide clearly marked personnel escape routes without obstructions, including adequately sized doors and windows.

• Provide special remote eating and changing areas with adequate supplies of clean water for washing and showers. Provide a smoking area remote from the operating area.

• A telephone should be provided which is freely available and readily accessible for the reporting of accidents or emergency situations.

• A windsock should be clearly visible from all points on the site and replaced as required for indicating wind velocity and direction.

• Emergency equipment cabinets should be installed not more than 30 meters or ten seconds walking distance from any location in the storage area.

• Non freeze safety showers and eyewash fountains should be provided, clearly marked, well lighted and with unobstructed access. They should be located close to the BCDMH storage area and not more than 30 meters or 10 seconds walking distance from any location in the storage area. Provide an alternative supply of clean water.
Handling BCDMH

All management and operating personnel involved in the use or handling of BCDMH, should undergo safety training, in addition to the specific task training. Only experienced well-trained operators should be allowed to receive and unload BCDMH receptacles. The management should ensure that emergency response plans have been made and coordinated with the local emergency response authorities.

- Precautions should be taken from the moment the shipment of BCDMH arrives at the site gate.
- Work with BCDMH should be carried out with a high standard of housekeeping and personal hygiene.
- Ensure that road and rail vehicles cannot be moved during a transfer operation.
- BCDMH is shipped in freight containers. When opening a container at its destination, cautiously open the doors completely and allow the container to be aired for 15 minutes before entering and before any of the unloading operations are started.
- The pails should not be handled roughly.
- No open flame heating is allowed; and keep the BCDMH receptacles away from heating coils.
- Operators that could be exposed to BCDMH dust should wear goggles and a dust filter. Otherwise, eyeglasses are sufficient.
- Receptacles should be kept dry and tightly closed. When dry, BCDMH powder is non-corrosive. Protective measures should be taken when there is the possibility of dusting conditions or the decomposition of BCDMH.
- Use only clean and dry utensils for handling BCDMH.
- Make sure that any handling equipment is clean and dry before starting a process involving BCDMH. Clean the equipment of all trace materials after process completion.
• Carefully choose process lubricants or additives that will not cause decomposition of BCDMH. Avoid mixing with other chemicals. Do not start a batch process involving BCDMH unless the process can be completed. Do not interrupt a BCDMH process once it has started.

• Prevent contact of BCDMH with materials such as mineral lubricants, oxidizers, or organic materials which can cause decomposition.

• Filters of dust collecting systems, which are contaminated with BCDMH, have to be disposed of in an approved manner at an approved disposal facility. Consult with the local authorities for information on these regulations and facilities.

• Vents from BCDMH equipment should be collected and dispersed from a stack, which is high enough to prevent air stream inversions during adverse weather conditions. Three meters above adjacent buildings should be sufficient.

• Provide up to one ton of neutralizing materials for dealing with BCDMH spills. This can be Slaked Lime Ca(OH)₂ or Soda Ash Na₂CO₃. These materials should be stored separately from BCDMH.

• Provide clean, dry, empty receptacles or overpacks for dealing with spills or damaged BCDMH drums.
## Sample Checklist for a BCDMH Handling Facility

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidizer hazard signs displayed</td>
<td></td>
</tr>
<tr>
<td>Minimum amount is being stored</td>
<td></td>
</tr>
<tr>
<td>Area surrounded by curb or dike</td>
<td></td>
</tr>
<tr>
<td>No sewer connections</td>
<td></td>
</tr>
<tr>
<td>Sump and pump for fire water</td>
<td></td>
</tr>
<tr>
<td>Minimize pits and confined spaces</td>
<td></td>
</tr>
<tr>
<td>Reinforced road for emergency vehicles</td>
<td></td>
</tr>
<tr>
<td>Adequate ventilation</td>
<td></td>
</tr>
<tr>
<td>Clear space 1.2 m. from walls and ceiling</td>
<td></td>
</tr>
<tr>
<td>Nearest building - 10 meter gap</td>
<td></td>
</tr>
<tr>
<td>Fire resistant building construction</td>
<td></td>
</tr>
<tr>
<td>Fire-fighting hydrants with adequate water supply</td>
<td></td>
</tr>
<tr>
<td>Fire-fighting extinguishers</td>
<td></td>
</tr>
<tr>
<td>Dust and vapor tight electrical fittings</td>
<td></td>
</tr>
<tr>
<td>TEFC electric motors</td>
<td></td>
</tr>
<tr>
<td>Impervious floor</td>
<td></td>
</tr>
<tr>
<td>Vents dispersed via stack</td>
<td></td>
</tr>
<tr>
<td>Area enclosed and secure</td>
<td></td>
</tr>
<tr>
<td>Clearly marked escape routes</td>
<td></td>
</tr>
<tr>
<td>Remote areas for eating, changing and smoking</td>
<td></td>
</tr>
<tr>
<td>Telephone with free access for emergencies</td>
<td></td>
</tr>
<tr>
<td>Wind sock</td>
<td></td>
</tr>
<tr>
<td>Emergency equipment cabinets, showers and eye-wash</td>
<td></td>
</tr>
<tr>
<td>Prevent vehicles from moving during handling operations</td>
<td></td>
</tr>
<tr>
<td>Good housekeeping and personal hygiene</td>
<td></td>
</tr>
<tr>
<td>No open flame heating</td>
<td></td>
</tr>
<tr>
<td>Safety goggles available for workers subject to exposure</td>
<td></td>
</tr>
<tr>
<td>Clean utensils and equipment</td>
<td></td>
</tr>
<tr>
<td>Selection of process lubricants</td>
<td></td>
</tr>
<tr>
<td>Dust collector filter disposal</td>
<td></td>
</tr>
<tr>
<td>Provide neutralizing agents</td>
<td></td>
</tr>
<tr>
<td>Availability of overpacks for spills or damaged drums</td>
<td></td>
</tr>
</tbody>
</table>
4.2 PROCESS SAFETY MANAGEMENT REGULATIONS

USA

- Facilities handling HIGHLY HAZARDOUS CHEMICALS over a threshold quantity (40CFR1910.119):
  For BCDMH there is no threshold quantity.

  The management is required to prepare EMERGENCY ACTION PLANS to minimize the consequences of a hazardous release of this toxic material. This written emergency action plan describes the measures taken to prevent any release and the activities of the workers and community services in the event of a release. Workers, including contractor workers, are to be given adequate training and refresher courses to implement this emergency action plan. Compliance audits are to be made before starting up a facility and after changes have been made in a facility or its operation procedures. Deficiencies and the corrections made are to be documented to assure that the facility can be put into safe operation. Changes may have to be reflected in emergency action plans. A compliance audit is to be repeated every three years.

  All incidents, which result in a release of hazardous materials or could have resulted in the release are to be investigated. The results of the investigation and corrective actions recommended and taken are to be documented.

- Toxic Chemical Release Reporting (40 CFR 372)
  BCDMH is not listed

- CERCLA (40 CFR 302)
  BCDMH is not listed


The purpose of this directive is to prevent and limit the consequences of major accidents involving a dangerous substance. BCDMH is not listed in these regulations, but does fall under the category of oxidizing substances whose inventory is cumulative, with respect to other substances in the same category. Therefore specific safety reports and emergency plans may have to be prepared and accidents involving BCDMH may have to be reported under these regulations.
4.3 HAZARDOUS EXPOSURE LIMITS

Exposure limit values go under different names in the various standards, countries, time periods and populations.

Generally, the exposure limit is specified as TWA, Time Weighted Average, for an eight or a ten hour workday and a STEL, Short Term Exposure Limit for fifteen minute, five minute periods or a ceiling value not to be exceeded.

Some of the limits are called TLV, Threshold Limit Values (ACGIH), REL, Recommended Exposure Limit (NIOSH) or OES, Occupational Exposure Standard (UK - HSE - COSHH).

There is also an ERPG, Emergency Response Planning Guideline value for planning exposure limits for the civilian population that includes children, the elderly and disabled persons.

The following table shows representative values established by US and UK authorities:

<table>
<thead>
<tr>
<th>USA</th>
<th>UNITED KINGDOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH, 2001</td>
<td>Guidance Note EH 40/02,</td>
</tr>
<tr>
<td></td>
<td>Occupational Exposure Limits</td>
</tr>
<tr>
<td>OSHA, 2001, 29 CFR 1910.1000, Table Z-1</td>
<td>Not listed</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4 DETECTION METHODS

There are no specific detectors for BCDMH, but decomposition of the product can be checked with a halogen detector (Bromine, Chlorine). The most common method of checking halogen presence is with a detector tube of which there are several reliable manufacturers. There are also electronic detectors, either portable or fixed which can be used for monitoring the workplace. Exposure to BCDMH dust can be checked with a personal air sampler.

4.5 PROTECTIVE CLOTHING

The protective clothing required for workers, under routine operating conditions, should be sufficient to allow the worker to escape the operating area, if there should be a release of hazardous material. Dust masks, goggles, gloves and full body covering clothing should be worn when handling BCDMH, or when there is a possibility of dusty conditions.

Contaminated work clothes should be placed in closed containers until laundering. The clothes should be laundered under supervision, by the employer and not laundered at home.
4.6 RESPIRATORY PROTECTION PROGRAM

Under routine operating conditions, when working with BCDMH, a gas mask is not necessary, but a dust filter should be used in situations where dust may be generated.

However, should BCDMH begin to decompose, a full face gas mask with a new, unused chlorine/bromine canister should be used to escape the area.

The face piece should be full face made of neoprene or other non-natural or non-butyl rubber elastomer. Eyeglasses cannot be worn with regular face pieces. Special face pieces or face piece adapter kits can be supplied for use with special eyeglass frames.

Color coding of gas mask filters differ under different regulations.

  - Chlorine, Color-coded: White, with a yellow stripe, combined with a particle element, with additional gray stripe near the top of the canister.

- **European Standard, EN 141,**
  - Inorganic gases, Type B, Color-coded: Grey.
    - Combined with a particle element P2.

It should be emphasized that the filter life is limited, even at low vapor concentrations (no more than 20 minutes continuous use). While wearing a gas mask, the operator should immediately leave the area on detecting any smell, taste or irritation of the eyes.

A self contained breathing apparatus should be worn to reenter an area where BCDMH is decomposing and when the oxygen content, is less than 19.5%, the Bromine or Chlorine concentration is more than 5 ppm, or if odor is detected while wearing a gas mask.

The self-contained breathing apparatus should be stored in a clean sanitary cupboard, conveniently located. Whenever possible, respirators should be individually assigned for hygienic purposes and to assure a good fit. After each use, they should be inspected, cleaned and disinfected. A respirator should also be cleaned and disinfected each month, even if the respirator has not been used. A record should be kept of the inspection date, and what was found at the time. The breathing air cylinders of
the self-contained breathing apparatus, should be tested and maintained in accordance with the local pressure vessel regulations.

A new operator should be trained in respirator use, and fitting the face piece before starting his assignment. A record should be kept of the training and fitting dates.

Chlorine/Bromine vapors can seep through punctured ear drums whilst wearing a respirator. Protection is possible with lubricated earplugs, but hearing can be expected to be affected.

Contact lenses must not be worn with a respirator.

Canisters should not be used after expiration date.

**Respirator Regulations**

A respirator protection program is required in the U.S. (29 CFR 1910.134(c)), and is recommended for other locations:

- Written standard procedures governing the selection and use of respirators shall be established.

- Written procedures shall be prepared, covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies.

- Training shall provide an opportunity to handle the respirator, have it fitted properly, test its face-piece-to-face seal, and wear it in normal air and a test atmosphere.

- A record shall be kept of inspection dates and findings, for respirators maintained for emergency use.

- There shall be an annual inspection and evaluation to determine the effectiveness of the respiratory program including respirator condition and correct gas mask face-piece fitting.
5.1 FACILITY EMERGENCY ACTION PLANNING.................................47
5.2 TRANSPORT EMERGENCY RESPONSE...........................................49
5.3 HAZARD IDENTIFICATION..............................................................50
5.4 RISK AND SAFETY PHRASES........................................................52
5.5 FIRE-FIGHTING .............................................................................53
5.6 SPILLS OR LEAKS.........................................................................55
5.7 EMERGENCY REPAIRS.................................................................57
5.8 EXPOSURE TO BCDMH.................................................................58
5.1 FACILITY EMERGENCY ACTION PLANNING

• USA - OSHA (29 CFR 1910.119n and 29 CFR 1910.120q)
  Emergency Action plans must be established and submitted to state and local authorities for any facility where Threshold Quantities (TQ) of hazardous substances are handled.

Reportable Quantities (RQ) - U.S.A.

BCDMH is classified as a hazardous substance due to its characteristic of reactivity with water. It generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or to the environment 40 CFR 261.23 (a) (4).

The disposal of BCDMH is regulated by the US federal RCRA regulations as a hazardous waste, number D003. 40 CFR 261.23 (b).

Any release, leak or spill of 100 pounds (45.4 Kg) or more of bromo, chloro dimethyl hydantoin must be immediately reported to the:

National Response Center, phone: 800-424-8802.

New Jersey Toxic Catastrophic Prevention Act, Not Listed.

A Facility Emergency Coordinator is to be appointed to the local Emergency Planning Committee. The plan has to be reviewed and audited every three years.

When there is a release of a hazardous material, the Emergency Planning Committee is to be advised of the following information (a transportation related release may be notified to the 911 emergency operator):
• That the released material, BCDMH, is an oxidizer.
• The quantity released, the time of the release and its duration.
• The media into which the release occurred.
• An indication of the health risks and sources for medical advice.
• Precautions to be taken by the local community, preferably as established in a previously prepared emergency plan.
• Names and phone numbers for receiving further information on the material.
The Emergency Planning Committee is to be given the following follow-up information:

- Actions that were taken to contain the release.
- Any acute or chronic health problems that were the result of the release.
- Medical advice that was given to the exposed individuals.

**EUROPE & UK:** (EC Directive 82/501 with the latest amendments)

The European Economic Community has issued regulations on Major Accident Hazards, Directive 82/501/EEC.

**Storage sites** for 50 tons or more of BCDMH must prepare a written policy for identifying the major accident hazards at their sites and what steps have been taken to prevent and limit the consequences of major accidents. In addition, a safety management system, a training program, planning for emergencies and reporting of major accidents or near misses are to be implemented at these sites.

**Process sites** for 200 tons or more of BCDMH must prepare a safety report, emergency plans, and provide information to the public, in accordance with the schedules contained in the directive.
5.2 TRANSPORT EMERGENCY RESPONSE

The driver of a vehicle involved in an accident while transporting a hazardous material should immediately leave the vehicle, taking with him the shipping papers, and take reasonable measures to extinguish any small fires.

The driver should call for help, and furnish the following information about the hazardous material involved:
- UN number: 1479 (Oxidizing Solid n.o.s.).
- Hazard Class Placard.
- Hazardous response markings (e.g. EAC Code, NFPA diamond numbers).
- Quantity of hazardous material involved.
- Emergency contact phone number.

The first responder is generally the local fire department, which should act to:
- Protect persons, property and environment.
- Contain the release from a safe distance.
- Do not get involved in stopping the release.
- Ensure that a qualified responder has been called.

Qualified responder, Hazardous Waste Operations & Emergency Response (HAZWOPER), is called by the shipper of the hazardous material or by the first responder if the shipper has not acted.
The Hazardous Materials Technician is qualified to stop the release.

Hazardous Materials Specialist provides support to responders with information on the hazardous materials, but he is not authorized to become actively involved in response action.
The shipper, the first responder or the qualified responder calls the hazardous material specialist when additional information or procedures are required.

Emergency Response Telephone Number should be clearly identified as "EMERGENCY CONTACT" on labels and shipping papers.
- USA: CHEMTREC 1-800-424-9300
- National Response Center 1-800-424-8802
- UK: National Chemical Emergency Center "CARECHEM 24" 44-1865-407 333
- DSBG, Israel 972-7-623 0393
- Clearon, USA 1-304-746-3000

BCDMH EMERGENCY RESPONSE 49
5.3 HAZARD IDENTIFICATION

ADR  Hazard Identification Number
Oxidizing Solid n.o.s.  UN1479
Hazard identification number  No. 50
Oxidizing (fire intensifying) substance

EAC  Emergency Action Code (EAC)
The UK CDG Road - Carriage of Dangerous Goods Regulations require the
display of this code number in the UK.
The EAC - Emergency Action Code for BCDMH is:

1Y

1  Use full water jet for extinguishing a fire.
Y  Danger of violent reaction or explosion.
   Wear chemical protective clothing including gloves and breathing apparatus.
   Contain and gather spilled material.
   Prevent material from entering drains and watercourses.

NFPA Hazard Identification: BCDMH

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazard:</td>
<td>3</td>
<td>Serious. Materials that under emergency conditions can cause serious or permanent injury. Areas should be entered only when wearing self-contained breathing apparatus and special protective clothing.</td>
</tr>
<tr>
<td>Flammability hazard</td>
<td>0</td>
<td>BCDMH does not burn. However, when BCDMH reacts with metals, hydrogen (a flammable gas) is produced.</td>
</tr>
<tr>
<td>Reactivity Hazard</td>
<td>1</td>
<td>Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures.</td>
</tr>
<tr>
<td>Special hazard</td>
<td>OX</td>
<td>Possesses oxidizing properties.</td>
</tr>
</tbody>
</table>
Decomposition of BCDMH

If exposed to a temperature of 160°C or more, decomposition will take place with the generation of heat and toxic gases such as bromine, hydrogen bromide, hydrogen chloride, carbon monoxide, carbon dioxide and nitrogen oxides. The intensity of the heat is sufficient to continue the decomposition activity, ignite paper which may be laying around or wood with which it is in contact.

Even if the heat is removed, the decomposition will continue. The product of decomposition is a yellow or brown residue. A dense black smoke accompanies the decomposition, which is difficult to see through.

The decomposition of BCDMH gives the appearance of combustion, but since it does not combine with the oxygen in the air, BCDMH is not combustible.

This thermal decomposition can be initiated by:
- Exposure to the sun
- Welding operations
- Hot spots on equipment such as bearings
- Lighted cigarettes or matches

Decomposition can be initiated at a temperature as low as 35°C if the BCDMH is contaminated by organic materials such as greases and sawdust. Similarly, strong bases, oxidizers and moisture can initiate decomposition. This contamination can sometimes cause spontaneous decomposition at ambient temperatures.

If water is added to BCDMH or BCDMH is in a humid atmosphere, decomposition will take place with the generation of heat, toxic gases and black smoke as previously described.

To avoid decomposition, only add BCDMH to water, and in the recommended dose of about 1 to 3 kilogram of BCDMH to 35,000 liters of water. When BCDMH is added to water in the recommended dosage, bromine and chlorine are released for disinfecting. Check that the free chlorine/ bromine level does not increase over 3 ppm.
5.4 RISK AND SAFETY PHRASES

BCDMH is not listed in Annex I of European Council Directive 67/548/EEC, relating to the classification, packaging and labeling of dangerous substances but is classified according to Annex 6 of this directive.

Following is the classification for Bromo, Chloro-5,5-dimethyl hydantoin, EINECS no.2511715 under the Directive:

- Oxidizer, symbol required (O)
- Corrosive, symbol required (C)

The following Risk and Safety Phases are assigned for BCDMH:

**Risk Phrases:**

R 8  Contact with combustible material may cause fire.
R 22  Harmful if swallowed.
R 31  Contact with acids liberates toxic gas.
R 34  Causes burns.
R 43  May cause sensitization by skin contact.

**Safety Phrases:**

S 26  In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28  After contact with skin, wash immediately with plenty of water and soap.
S 45  In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S 36/37/39  Wear suitable protective clothing, gloves and eye/face protection.
5.5 FIRE-FIGHTING

It is very important that BCDMH receptacles should not remain in a fire zone, as the heat will lead to decomposition and to production of toxic vapors.

If possible, the BCDMH receptacles should be physically removed from the fire zone. Sometimes, it is possible to move the fire source away from the BCDMH receptacles.

The closed BCDMH receptacles, involved in the fire should be cooled by the most practical means. Direct contact with water should be avoided unless copious amounts of water can be used.

A fire in an area containing BCDMH should be extinguished with the most appropriate means available. Do not use an ammonium phosphate powder extinguisher. If the BCDMH is itself involved in the fire, use copious amounts of water to extinguish the fire and cool the BCDMH to prevent and arrest its decomposition due to heat.

If there is a BCDMH spill at the same time that there is a fire, the safety Procedure for spills has to be immediately implemented:

1. Evacuation of a zone, 50 m around the spill zone.
2. Self-contained breathing apparatus for the fire-fighters.
3. Wearing of impervious and chemical resistant, clothing. This clothing may not be suitable for fire-fighting.
4. Protect water sources from being contaminated by spilled BCDMH.
5. Have all non-essential personnel leave the area immediately.

After the fire, all BCDMH containers should be carefully inspected for leaks or any physical damage. The BCDMH supplier should be immediately informed of any unusual conditions, which have been noticed.
On the road

If a vehicle carrying BCDMH catches fire and no BCDMH leak is detectable, the driver should move the vehicle to an open area, remove shipping and other emergency response documents (MSDS) from the vehicle and make reasonable efforts to extinguish any small fires. He should then:

- Notify the local police and the fire department.
- Warn other drivers and pedestrians of the danger.
- Notify the nearest BCDMH handling facility.
- Stay at a safe distance until the incident has been declared resolved by the responder in charge on the scene.

If the driver cannot reasonably extinguish the fire and/or a BCDMH leak is evident, ”Spills or Leaks” procedure (Section 5.6) should be followed immediately.

DOT EMERGENCY RESPONSE GUIDEBOOK 2000
Guide number: 140
Fire - Consider evacuation of 800 meters in all directions
5.6 **SPILLS OR LEAKS**

BCDMH has been shipped for many years with very few accidents. This is due to the care taken in packaging and handling this material.

Only trained, suitably protected personnel should respond to a BCDMH emergency. See section 4.5 of this handbook for the personnel protective equipment recommended for emergency response personnel.

If there should be an uncontrolled BCDMH spill or leak, immediately call the fire department, giving them the maximum information. The competent authorities should be informed of the spill in accordance with local regulations.

Twenty-four hour telephone advice is available in most countries for BCDMH road transport emergencies, as noted in section 5.2 above.

If there is a BCDMH spill, it should be immediately contained and gathered into covered, clean, dry containers.

Prevent the spilled BCDMH from penetrating a water source or sewer system.

Dust masks, goggles, gloves and full body covering clothing should be worn if there is no decomposing of the BCDMH.

The area of decomposing BCDMH should only be entered with self-contained breathing apparatus with a full-face mask, impervious fully-encapsulated and chemically inert clothing, should be worn.

After collecting as much as possible into containers, the remaining traces of BCDMH should be flushed to drain with copious amounts of water.

A safer practice would be to spread dry slaked lime (Ca(OH)$_2$) or dry soda ash Na$_2$CO$_3$ over the traces of BCDMH and then flush to drain with copious amounts of water.

Protect the BCDMH from contamination by materials which can cause decomposition. Floor sweeping compounds should not be used for the removal of BCDMH.

Keep the spilled material dry. Decomposition can start if the BCDMH is allowed to stand in wet or damp areas.
Do not discard BCDMH spill material in the conventional manners. Consult with the local authorities for disposal of BCDMH spill material in an authorized-disposal facility.

If a small amount of BCDMH begins to decompose for any reason, the immediate area of 20 meters (50 feet) should be isolated.

If a large amount of BCDMH begins to decompose, a distance of 50 meters (150 feet) around the area, should be immediately evacuated. Further evacuation decisions should be based on the size of the spill, wind intensity, height of the release above the ground, and the relative health level of the people in the area.

All non-essential personnel should be kept out of the area.

Used, empty receptacles can be rinsed with copious amounts of water and disposed of in the conventional manners.

**On The Road**
The driver of a vehicle leaking BCDMH should try to get the vehicle to an unpopulated area, put on his escape gas mask, take with him all the shipping documents, and get to a safe spot upwind and higher than the vehicle. From this safe spot, he should warn oncoming traffic and pedestrians and call for help. People not properly equipped should be kept out of the area.

In any BCDMH road transport emergency, call the EMERGENCY CONTACT that should be clearly marked on the shipping papers and labels.

**DOT EMERGENCY RESPONSE GUIDE BOOK 2000**
Guide number: 140
Large spill - Consider downwind evacuation of at least 100 meters
5.7 EMERGENCY REPAIRS

Empty, clean, dry, covered receptacles (overpacks) should be available for leaking BCDMH drums and for collecting spilled BCDMH or contaminated absorbent materials.

It is difficult to define the protective clothing required for the protection of rescue, fire and emergency repair teams, who have to enter a BCDMH spill area, because of the variety of conditions which can be encountered.

The following points are indicative of the precautions to be taken under various levels of exposure.

Dust masks, goggles, gloves and full body covering clothing should be worn when handling a BCDMH spill which is not decomposing.

If the BCDMH Spill material is decomposing, enter the spill area, only with a self-contained breathing apparatus. This equipment is for limited time depending on the cylinder size and pressure. One apparatus should be provided for each emergency worker who will be expected to enter the danger zone. Two spare cylinders should be provided for each apparatus. This should be sufficient equipment for the initial response.
Encapsulated, chemically inert and impervious clothing will prevent BCDMH from causing chemical burns.

Not all protective clothing is suitable for fire-fighting.
5.8 EXPOSURE TO BCDMH

When a person who has been exposed to BCDMH is sent to a hospital, information should be pinned to the person’s clothing stating that he was exposed to BCDMH. If possible, the MSDS should be sent with the patient.

**Acute exposure:**
- **Eye contact:** Corrosive. May cause temporary or even permanent eye damage.
- **Skin contact:** Corrosive.
- **Inhalation:** Shortness of breath, headache and nausea. Irritant to upper respiratory tract.
- **Ingestion:** Irritant to the digestive tract. Symptoms include nausea, abdominal pain, vomiting and diarrhea.

**First Aid**
- **Eye contact:** Holding the eyelids apart, flush eyes at once with copious flowing water for at least 20 minutes. Get medical attention immediately.
- **Skin contact:** Remove contaminated clothing. Wash skin thoroughly with mild soap and plenty of water for at least 15 minutes. Get medical attention immediately. Wash clothing before re-use.
- **Inhalation:** In case of dust inhalation or breathing fumes released from heated material, remove person to fresh air. Keep him quiet and warm. Apply artificial respiration if necessary, and get medical attention immediately.
- **Ingestion:** If swallowed, wash mouth thoroughly with plenty of water. Get medical attention immediately. Note: Never give an unconscious person anything to drink.

Further Medical Treatment
**NOTE TO THE PHYSICIAN!**
- Treat symptomatically and supportively
- In case of ingestion do not induce vomiting

**Recommended Antidote**
There is no specific antidote for BCDMH. Treat symptomatically and supportively.
OPERATORS GUIDE

6.1 OPERATOR HEALTH MONITORING......................................................61
6.2 OPERATOR/DRIVER SAFETY TRAINING...............................................63
6.1 OPERATOR HEALTH MONITORING

Workers regularly exposed to BCDMH should be given routine medical check-ups. This applies to personnel of operations where BCDMH is used, stored, filled, or unloaded. (US Code of Federal Regulations, 29 CFR 1910.120 (f))

There are no regulations or standards indicating a medical test, which would show an overexposure to BCDMH.

It is recommended that complete medical records be kept for each person working in a facility where there is potential exposure to BCDMH vapors. A sample medical record is provided on the following page.
MEDICAL RECORD FOR EMPLOYEE EXPOSED

Name: __________________________ Date of birth: __________________________
Address: _________________________
Occupation: _______________________ Date start employment: ____________

Previous history of following disorders  Yes / No
(Provide details if necessary)

Skin diseases __________________________
Lung diseases __________________________
Liver diseases __________________________
Kidney diseases _________________________
Psychiatric ____________________________
Neurologic _____________________________

MEDICAL EXAMINATIONS

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SICK LEAVE

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</table>
6.2 OPERATOR/DRIVER SAFETY TRAINING

The installation management should be aware of the potential dangers of BCDMH. Management personnel should undergo training in BCDMH specific safety inspections and safety auditing.

Workers involved with BCDMH must have special safety training regarding the precautions to observe in accordance with local regulations. This applies to personnel of operations where BCDMH is used, stored, filled or unloaded.

The safety training for handling BCDMH has to include both theoretical classroom courses and practical hands-on and observation exercises, appropriate to the level of likely exposure of the individual worker to BCDMH.

Records should be kept of each person’s participation in initial training and refresher courses.

The theoretical classroom training should be at least three days. Some of the subjects to be covered should be:

- The main types of hazards
- Packaging details
- Labelling and marking to indicate hazards
- Precautions during loading and unloading
- Environmental protection
- First-aid
- Fire-fighting
- Selection and use of personal protection equipment
- Respiratory protection
- Emergency procedures

Refresher training courses should be taken regularly, at least every two or three years, and should include new technical and substance-related developments. The refresher course should be for at least one full day.
EMPLOYEE SAFETY TRAINING RECORD

Name: ___________________________ Date of birth: ___________________________
Address: ___________________________ Date start employment: ___________________________

Occupation: ___________________________ Date start employment: ___________________________

Education:

<table>
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<tr>
<th>Period</th>
<th>Institute name</th>
<th>Place</th>
<th>Certificate</th>
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<tr>
<td>High School</td>
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<tr>
<td>Technical School</td>
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<tr>
<td>University</td>
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<tr>
<td>Post Graduate</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

"Company organized" courses:

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Institute name</th>
<th>Period</th>
<th>Certificate</th>
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</table>
APPENDIX

A. TYPICAL QUALITY SPECIFICATION ...............................................67
B. REFERENCES..............................................................................68
## APPENDIX A:

**Typical Quality Specification**

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Off-white granules/tablets</td>
</tr>
<tr>
<td>Assay %</td>
<td>98 min</td>
</tr>
<tr>
<td>Total Halogen</td>
<td>64.9 min (calculated as bromine)</td>
</tr>
</tbody>
</table>
APPENDIX B:

REFERENCES

1. Dead Sea Bromine Group
   BCDMH PRODUCT DATA SHEET
   (www.dsbg.com)

2. Dead Sea Bromine Group
   MATERIAL SAFETY DATA SHEET for BCDMH
   (www.dsbg.com)

3. UNITED NATIONS TRANSPORT OF DANGEROUS GOODS (ORANGE BOOK)

4. INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG) CODE, 2000
   (www.imo.org)

5. EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE
   OF DANGEROUS GOODS BY ROAD (ADR), 1 July 2001 (Restructured)
   (www.unece.org/trans/danger/danger.htm)
   (Also, corresponding document for carriage of dangerous goods by rail - RID)

6. US CODE OF FEDERAL REGULATIONS (Issued annually)
   TITLE 29 - Occupational Safety and Health Administration (OSHA), 2001
   TITLE 40 - Environmental Protection Agency (EPA), 2001
   TITLE 49 - Department of Transportation (DOT), 2001
   (www.access.gpo.gov/nara/cfr/index.html)

7. International Air Transportation Association
   (www.iata.org)

8. AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL
   HYGIENISTS (ACGIH)
   THRESHOLD LIMIT VALUES, 2001
   (www.acgih.org)
9. Health and Safety Executive, Merseyside, England
   OCCUPATIONAL EXPOSURE LIMITS, 1999
   Guidance Note EH 40/99

10. US CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS)
    HAZARDOUS CHEMICAL DATA, U.S. COAST GUARD,
    DEPARTMENT OF TRANSPORTATION (DOT), November 1992

11. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
    Hazardous Chemical Data, NFPA 49
    (www.nfpa.org)

12. US DEPARTMENT OF TRANSPORTATION
    EMERGENCY RESPONSE GUIDE BOOK, 2000 Edition
    (hazmat.dot.gov/gydebook.htm)

13. National Institute for Occupational Safety and Health (NIOSH)
    POCKET GUIDE TO CHEMICAL HAZARDS, Publication 97 - 140, June 1997
    (www.cdc.gov)

14. Z. E. Jolles, 1966
    BROMINE AND ITS COMPOUNDS

Note: The internet websites are given for reference only, as their contents are continually changing.
**NORTH AMERICA**

**Ameribrom INC., MARKETING & SALES**
2115 Linwood Avenue, Fort Lee,
New Jersey 07024-5004, USA
Tel: (1) 201 242 6560, Fax: (1) 201 242 6561
E-mail: info1@ameribrom.dsbg.com

**Clearon Corp., PRODUCTION, MARKETING & SALES**
2115 Linwood Avenue, Fort Lee,
New Jersey 07024-5004, USA
Tel: (1) 201 242 6590, Fax: (1) 201 242 5724
E-mail: handa@clearon.com

**Hy Yield Bromine, SERVICE**
3500 N.C MWY, 133 West Rocky Point,
N.C 28457, USA
Tel: (1) 910 675 9409, Fax: (1) 910 602 3106

**Synergy Fluids, SERVICE**
16800 Imperial Valley Drive,
Houston, Texas 77060, USA
Tel: (1) 281 445 0676, Fax: (1) 281 445 2284
E-mail: dhunter@synergyfluids.com

**EUROPE**

**Broomchemie B.V., PRODUCTION**
Frankrijkweg, Zevenaarhaven, P.O.B. 318,
4530 AH Terneuzen, The Netherlands
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E-mail: info@broomchemie.dsbg.com

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E-mail: info1@eurobrom.dsbg.com

**Eurobrom B.V. España, MARKETING & SALES**
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E-mail: corre@eurobrom.dsbg.com

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E-mail: trimbosd@eurobrom.dsbg.com

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Tel: (86) 21 636 20018, Fax: (86) 21 636 20899,
E-mail: info@dsbchina.com

**Bromokem (Far East) Ltd., MARKETING & SALES**
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Tokyo 104-0033, Japan
Tel: (81) 3 3552-1611, Fax: (81) 3 3552-1616
E-mail: info@bromokem.dsbg.com

**Asiabrom Ltd., MARKETING & SALES**
15th Floor, Shun Ho Tower,
No. 24-30 Ice House Street, Central
Hong Kong
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E-mail: info@asiabrom.dsbg.com

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**Isbrom, MARKETING & SALES**
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P.O. Box 180, Beer Sheva 84101, Israel
Tel: (972) 8 629 7633, Fax: (972) 8 629 7878
E-mail: info@isbrom.dsbg.com

**HEAD OFFICE**

**DSBG - Dead Sea Bromine Company Ltd.**
MARKETING & SALES, PRODUCTION, SERVICE
Makleff House 12 Kroitzer St.,
P.O. Box 180, Beer Sheva 84101, Israel
Tel: (972) 8 629 7645, Fax: (972) 8 629 7875
E-mail: info@dsbg.com

**Bromine Compounds Ltd.**
MARKETING & SALES, PRODUCTION, SERVICE
Makleff House, 12 Kroitzer St.,
P.O. Box 180, Beer Sheva 84101, Israel
Tel: (972) 8 629 7645, Fax: (972) 8 629 7875
E-mail: info@dsbg.com
The Dead Sea Bromine Group (DSBG) draws on the vast resources of the Dead Sea (Israel) to promote quality of life on five continents. Supplying over 33% of global demand for bromine and bromine compounds, DSBG works together with 5,000 customers, striving for continuing excellence. Over 95% of DSBG’s sales are to the international market.

DSBG increases food yields through a broad range of agricultural products, enhances healthcare with pharmaceutical intermediates, enforces safety standards in the home and workplace with state-of-the-art flame retardants and improves the quality of water via leading water treatment products.