MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name: Worthington Water Soluble Soldering Flux
Version #: 01
Issue date: 25-October-2013
Revision date: -
Supersedes date: -
CAS #: Mixture
MSDS Number: WC015
Product use: Soldering flux.

Manufacturer information
Manufacturer/Supplier: Worthington Cylinder Corporation
Address: 1690 Lowery Street
Winston-Salem, NC 27101
United States
Contact Person: Melissa Grimes
Melissa.Grimes@worthingtonindustries.com
Telephone Number: 336-831-8601
CHEMTREC - 24 HOURS: (800) 424-9300

2. Hazards Identification

Physical state: Solid.
Appearance: White paste.
Emergency overview: CAUTION
Causes skin and eye burns. Harmful if swallowed. Irritating to respiratory system.

OSHA regulatory status: This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

Potential health effects
Routes of exposure: Fume inhalation. Ingestion. Skin contact. Eye contact.
Eyes: Causes eye burns.
Skin: Causes skin burns.
Inhalation: Irritating to respiratory system. Elevated temperatures or mechanical action may form dust and fumes which may be irritating to the respiratory tract.
Ingestion: Harmful if swallowed. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Target organs: Eyes. Skin. Respiratory system.
Signs and symptoms: Symptoms of overexposure include: salivation, coughing, choking, chills, may cause weight loss, brittle bones, anemia and stiff joints.

Potential environmental effects: This material has not been tested for environmental effects.

3. Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS #</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc chloride</td>
<td>7646-85-7</td>
<td>1 - 3</td>
</tr>
</tbody>
</table>

Composition comments: All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Unlisted percentages are non-hazardous stabilizers and water. None of the products in this material are listed in NTP, IARC, or OSHA as carcinogens.

Worthington Water Soluble Soldering Flux
911143 Version #: 01 Revision date: - Issue date: 25-October-2013
4. First Aid Measures

First aid procedures

Eye contact
Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

Skin contact
Remove and isolate contaminated clothing and shoes. Immediately flush with plenty of water for at least 15 minutes. Get medical attention immediately. Wash clothing separately before reuse.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention immediately.

Ingestion
If swallowed, rinse mouth with water (only if the person is conscious). Never give anything by mouth to a victim who is unconscious or is having convulsions. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention immediately.

Notes to physician
Treat symptomatically. Exposure may aggravate pre-existing respiratory, lung or kidney disorders.

General advice
Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties
Will release small amounts of HCL upon decomposition.

Extinguishing media

Suitable extinguishing media
Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media
None.

Protection of firefighters

Specific hazards arising from the chemical
Fire may produce irritating, corrosive and/or toxic gases.

Protective equipment and precautions for firefighters
Firefighters should wear full protective clothing including self contained breathing apparatus.

Fire fighting equipment/instructions
Move containers from fire area if you can do it without risk.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental Release Measures

Personal precautions
Use personal protection as recommended in Section 8 of the MSDS. Avoid inhalation of dust and contact with skin and eyes.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not contaminate water.

Methods for cleaning up
Neutralize with soda ash or sodium bicarbonate. Dilute with plenty of water. Dispose of in accordance with EPA regulations.

7. Handling and Storage

Handling
Wear appropriate personal protective equipment (See Section 8). Use only with adequate ventilation. Do not breathe fumes and dusts. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling.

Storage
Store in plastic containers in cool area away from heat. Store away from incompatible materials.

8. Exposure Controls / Personal Protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc chloride (CAS 7646-85-7)</td>
<td>STEL</td>
<td>2 mg/m3</td>
<td>Fume.</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>1 mg/m3</td>
<td>Fume.</td>
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</table>

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

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<td>Zinc chloride (CAS 7646-85-7)</td>
<td>PEL</td>
<td>1 mg/m3</td>
<td>Fume.</td>
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</table>
Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

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Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

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Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

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Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

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<td>1 mg/m³</td>
<td>Fume.</td>
</tr>
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Mexico. Occupational Exposure Limit Values

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<td>1 mg/m³</td>
<td>Fume.</td>
</tr>
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</table>

Exposure guidelines
Use personal protective equipment as required. Keep working clothes separately.

Engineering controls
Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal protective equipment
- **Eye / face protection**: Wear approved safety glasses or goggles.
- **Skin protection**: Wear protective gloves.
- **Respiratory protection**: Use a respirator when local exhaust or ventilation is not adequate to keep exposures below the OEL. In a confined space a supplied respirator may be required. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134; or in Canada with CSA Standard Z94.4.
- **General hygiene considerations**: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical & Chemical Properties

- **Appearance**: White paste.
- **Physical state**: Solid.
- **Form**: Paste.
- **Color**: White.
- **Odor**: Odorless.
- **Odor threshold**: Not available.
- **pH**: 1
- **Vapor pressure**: Not available.
- **Vapor density**: Not available.
- **Boiling point**: 219.2 °F (104 °C)
Melting point/Freezing point 140 °F (60 °C) / 14 °F (-10 °C)
Solubility (water) Unlimited.
Specific gravity 0.99
Flash point Not Applicable.
Flammability limits in air, upper, % by volume Not available.
Flammability limits in air, lower, % by volume Not available.
Auto-ignition temperature Not applicable.
VOC 0 %
Evaporation rate 0.6 (Butyl acetate = 1)
Percent volatile Not available.
Other data
Explosive limit - lower (%) Not applicable.
Explosive limit - upper (%) Not applicable.

10. Chemical Stability & Reactivity Information
Chemical stability Material is stable under normal conditions.
Conditions to avoid Contact with metals. Excessive heat or cold.
Possibility of hazardous reactions Hazardous polymerization does not occur.

11. Toxicological Information
Toxicological data

<table>
<thead>
<tr>
<th>Components</th>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc chloride (CAS 7646-85-7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhalation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC50</td>
<td>Rat</td>
<td>&lt;= 1.975 mg/l, 10 Minutes</td>
</tr>
<tr>
<td>Oral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD50</td>
<td>Rat</td>
<td>350 mg/kg</td>
</tr>
<tr>
<td>Sensitization</td>
<td></td>
<td>Not available.</td>
</tr>
<tr>
<td>Acute effects</td>
<td></td>
<td>Causes burns. Be aware that symptoms of chemical pneumonia (shortness of breath) may occur several hours after exposure. Harmful if swallowed.</td>
</tr>
<tr>
<td>Local effects</td>
<td></td>
<td>Causes burns. Irritating to respiratory system.</td>
</tr>
<tr>
<td>Chronic effects</td>
<td></td>
<td>Can cause delayed lung injury.</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td></td>
<td>This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.</td>
</tr>
<tr>
<td>Symptoms and target organs</td>
<td></td>
<td>Corrosive effects. Causes skin and eye burns.</td>
</tr>
</tbody>
</table>

12. Ecological Information
Ecotoxicological data

<table>
<thead>
<tr>
<th>Components</th>
<th>Species</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc chloride (CAS 7646-85-7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crustacea</td>
<td>EC50</td>
<td>American or virginia oyster (Crassostrea virginica) 0.1511 - 0.2782 mg/l, 48 hours</td>
</tr>
<tr>
<td>Fish</td>
<td>LC50</td>
<td>Rainbow trout, donaldson trout (Oncorhynchus mykiss) 0.101 - 0.197 mg/l, 96 hours</td>
</tr>
<tr>
<td>Ecotoxicity</td>
<td></td>
<td>This material has not been tested for environmental effects.</td>
</tr>
</tbody>
</table>
Persistence and degradability
No data is available on the degradability of this product.

Bioaccumulation / Accumulation
Not available.

13. Disposal Considerations
Waste codes
D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]

Disposal instructions
Dispose waste and residues in accordance with applicable federal, state, and local regulations.

Waste from residues / unused products
Dispose in accordance with all applicable regulations.

Contaminated packaging
Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information
DOT
Not regulated as a hazardous material by DOT.

IATA
Not regulated as dangerous goods.

IMDG
Not regulated as dangerous goods.

TDG
Not regulated as dangerous goods.

15. Regulatory Information
US federal regulations
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
Not regulated.

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List
Not regulated.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration
Zinc chloride (CAS 7646-85-7) 1.0 % N982

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance
Zinc chloride (CAS 7646-85-7) N982 Listed.

CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)
Zinc chloride: 1000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance (40 CFR 355, Appendix A)
No

SARA 311/312 Hazardous chemical
No

Drug Enforcement Administration (DEA) (21 CFR 1308.11-15)
Not controlled

Canadian regulations
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS status
Controlled

WHMIS classification
E - Corrosive
WHMIS labeling

Inventory status

<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>No</td>
</tr>
<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>Yes</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>Yes</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

State regulations

This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance
Zinc chloride (CAS 7646-85-7) Listed.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance
Not listed.

US - New Jersey RTK - Substances: Listed substance
Zinc chloride (CAS 7646-85-7) Listed.

US. Massachusetts RTK - Substance List
Zinc chloride (CAS 7646-85-7) Listed.

US. New Jersey Worker and Community Right-to-Know Act
Zinc chloride (CAS 7646-85-7) 500 lbs

US. Pennsylvania RTK - Hazardous Substances
Zinc chloride (CAS 7646-85-7) Listed.

Mexico regulations

This safety data sheet was prepared in accordance with the Official Mexican Standard (NOM-018-STPS-2000).

16. Other Information

Further information
HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings
Health: 2
Flammability: 0
Physical hazard: 0

NFPA Ratings

Worthington Water Soluble Soldering Flux

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CPH MSDS NA

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Disclaimer

All information in this Material Safety Data Sheet is believed to be accurate and reliable. However, no guarantee or warranty of any kind is made with regard to the accuracy of information or the suitability of the recommendations contained herein. It is the user's responsibility to assess the safety and toxicity of this product under their own conditions of use and to comply with all applicable laws and regulations.