Section 1: Product and Company information

Product Identification: Nickel Based Alloys
REACH Registration Reference #: 01-2119438727-29-0102 (Nickel)
01-2119517392-44-0035 (Cobalt)

Current/Past Alloy in this Category:

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Alloy Code</th>
<th>Spec.</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>116</td>
<td>CW2M</td>
<td>IN 738LC</td>
<td>PWA 1440</td>
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<tr>
<td>117</td>
<td>GMR 235</td>
<td>IN 792</td>
<td>PWA 1480</td>
</tr>
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<td>2316</td>
<td>GTD 111</td>
<td>IN 939</td>
<td>PWA 1483</td>
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<td>Airensist 319</td>
<td>GTD 111M</td>
<td>Lewmet 25</td>
<td>PWA 1484</td>
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<td>Alloy 80</td>
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<td>HAST C</td>
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<td>HAST C22</td>
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<td>HAST D</td>
<td>MAR M 200+Hf</td>
<td>Rene 220</td>
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<td>HAST G</td>
<td>MAR M 246</td>
<td>Rene 220 CH22</td>
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<td>C 1023</td>
<td>HAST S</td>
<td>MAR M 247</td>
<td>Rene 41</td>
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<td>C 263</td>
<td>HAST X</td>
<td>MAR M 421</td>
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<td>CM 186 LC®</td>
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<td>Ni 230</td>
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<td>CM 247 LC®</td>
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<td>CM 681®</td>
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<td>Ni C</td>
<td>Rene 88 DT</td>
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<td>CM 939 Weldable®</td>
<td>IN 610</td>
<td>Ni CU (Monel)</td>
<td>Rene 95</td>
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<td>CM186LC®</td>
<td>IN 611</td>
<td>Ni X</td>
<td>Rene N4</td>
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<td>IN 625</td>
<td>PE 10</td>
<td>Rene N6</td>
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<td>CMSX-4®</td>
<td>IN 690</td>
<td>PWA 1400</td>
<td>Rene 142</td>
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<td>CMSX-6®</td>
<td>IN 713</td>
<td>PWA 1422</td>
<td>RR 2000</td>
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<td>CMSX-10®</td>
<td>IN 713C</td>
<td>PWA 1426</td>
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<td>PWA 1430</td>
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<td>CMSX-485®</td>
<td>IN 718</td>
<td>PWA 1431</td>
<td>TMS 82</td>
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<td>CNK7P®</td>
<td>IN 738</td>
<td>PWA 1432</td>
<td>U 500</td>
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<tr>
<td>CW 12MW®</td>
<td>IN 738C</td>
<td>PWA 1436</td>
<td>Udiment 500</td>
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<td></td>
<td></td>
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<td>PWA 1437</td>
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</tbody>
</table>

Hazard Rating:

1: Xn Harmful

Company Identification:
Cannon-Muskegon Corp.
2875 Lincoln
Muskegon, MI 49441, USA.
Tel: (+1) 231 759 2820
Fax: (+1) 231 759 4975

SDS Prepared By:
Wayne Brege, Technical Lead

Intended Use:
Investment casting

Section 2: Hazards Identification

Risk Phrases:
R40: Possible risk of irreversible effects
R42/43: May cause sensitization by inhalation and skin contact.
R53: May cause long-term adverse effects in the aquatic environment
**Safety Phrases:**

S2 : Keep out of the reach of children.  
S22 : Do not breathe dust.  
S24 : Avoid contact with skin.  
S36 : Wear suitable protective clothing.  
S37 : Wear suitable gloves.  
S61 : Avoid release to the environment. Refer to special instructions/Safety data sheets.

**Solid Form**

As supplied in the solid form, the material presents a minimal hazard. Take care when handling as bars/ingots can be quite heavy.

Nickel base alloyed ingots are not ignitable, corrosive, or reactive. Dust and powders are a moderate fire and explosive hazard when exposed to heat, flame, electric current, or static electricity.

For purposes of the SDS, occupational exposure to alloys is taken to mean dusts, fumes, or solutions containing metals that can become airborne or can spill on the skin or in the eye. Occupational exposure to alloys does not include solid products (i.e., ingots or castings) provided no particle generating operations such as grinding or cutting occur. In most industrial situations, the significant routes of exposure would include inhalation, skin and eye contact.

Dusts and fumes containing nickel, chromium, cobalt, and other metals can be toxic if the PEL or TLV safety guidelines are exceeded. Sensitive individuals may develop allergic asthma. Use local ventilation and/or respiratory equipment to limit exposure to airborne dusts.

**Molten Form**

The product is intended to be melted and cast into finished products. Care should be taken to avoid exposure to product fumes from melting and casting. The molten material can cause severe thermal burns if it contacts the eyes and skin. Exposure to moisture while metal is in its molten state can cause a violent reaction.

**Potential Health Effects**

**Inhalation:** Inhalation of solid product dust may lead to respiratory irritation. Inhalation of fumes from molten product can cause respiratory tract irritation, sore throats, dizziness, headache and nausea.

**Skin Contact:** May cause irritation in sensitized individuals. Molten product can burn the skin.

**Ingestion:** Not believed to be toxic.

**Eyes:** In a finely divided form, i.e. dust or fragments, the product will act as a physical irritant to the eye. Molten product will cause burns to the eye. Fumes from the molten product may irritate the eye.

**Chronic / Other Effects**

Nickel, chromium and cobalt are listed by the National Toxicology Program, International Agency for Research on Cancer, the Occupational Safety and Health Administration, the National Institute for Occupational Safety and Health; or the California Safety and Health Administration as potential cancer hazards in certain chemical forms. Hexavalent chrome (CrVI) is expected to evolve only when a significant energy source, such as a welding arc, is applied. Melting, grinding, or other surface processing is not expected to result in CrVI.

**Component** | **OSHA** | **NTP** | **IARC** | **Target Organ**  
--- | --- | --- | --- | ---  
Chromium Metal | No | Yes | 3 | Lung  
Hexavalent Chromium (Cr VI) | No | Yes | 1 | Lung  
Iron Oxide | No | No | 3 | Lung  
Nickel | No | Yes | 1 | Lung, Nasal
### Section 3: Typical Composition Information

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>FINICS #</th>
<th>Wt. %</th>
<th>Symbols</th>
<th>Risk &amp; Safety Phrases</th>
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</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>7429-90-5</td>
<td>231-072-3</td>
<td>&lt;0.10</td>
<td>---</td>
<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
</tr>
<tr>
<td>Boron</td>
<td>7440-42-8</td>
<td>231-151-2</td>
<td>&lt;0.10</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Carbon</td>
<td>7440-44-0</td>
<td>231-153-3</td>
<td>&lt;0.01</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Chromium</td>
<td>7440-47-3</td>
<td>231-157-5</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Cobalt</td>
<td>7440-48-4</td>
<td>231-158-0</td>
<td>0.10</td>
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<tr>
<td>Columbium</td>
<td>7440-03-1</td>
<td>231-113-5</td>
<td>&lt;0.10</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>(Niobium)</td>
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<td></td>
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</tr>
<tr>
<td>Copper</td>
<td>7440-50-8</td>
<td>231-159-6</td>
<td>&lt;0.10</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Hafnium</td>
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<td>231-166-4</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Iron</td>
<td>7439-89-6</td>
<td>231-096-4</td>
<td>&lt;0.10</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Magnesium</td>
<td>7439-95-4</td>
<td>231-104-6</td>
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<td>Manganese</td>
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<td>Molybdenum</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Nickel</td>
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<td>Rhenium</td>
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<td>231-124-5</td>
<td>&lt;0.10</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<tr>
<td>Silicon</td>
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<td>231-130-8</td>
<td>&lt;0.10</td>
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<tr>
<td>Tantalum</td>
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<td>231-135-5</td>
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<td>Titanium</td>
<td>7440-32-6</td>
<td>231-142-3</td>
<td>&lt;0.10</td>
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<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
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<td>Tungsten</td>
<td>7440-33-7</td>
<td>231-143-9</td>
<td>&lt;0.10</td>
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<td>Vanadium</td>
<td>7440-62-2</td>
<td>231-171-1</td>
<td>&lt;0.10</td>
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<td>Zirconium</td>
<td>7440-67-7</td>
<td>231-176-9</td>
<td>&lt;0.10</td>
<td>---</td>
<td>This substance is not classified in the Annex I of Directive 67/548/EEC.</td>
</tr>
</tbody>
</table>

### Section 4: First Aid Measures

**Inhalation**
Use local ventilation and/or respiratory protective equipment to limit exposure to airborne particulate. If sudden exposure does occur, remove victim to fresh air and begin artificial respiration if victim is not breathing.

Prolonged exposure or repeated contact may irritate the skin of sensitized individuals. Avoid prolonged and repeated contact. Wear suitable protective clothing and gloves. In case of contact, brush off skin and clothing, wash with soap and water. Remove metallic particles and cleanse wounds as necessary.

**Skin Contact**
Seek medical attention immediately.

**Ingestion**
Flush eyes with copious amounts of water.
Section 5: Fire Fighting Measures

Combustion
Solid metal is not ignitable. Dust and powder pose a moderate fire and explosive hazard when exposed to high heat, flames, electric current, or static electricity. If the fire is small and it is safe to do so, fight the fire from a safe distance, using the correct extinguisher and taking extreme care to avoid exposure to combustion products. Do not fight a large fire – obtain immediate professional assistance. Do not enter an enclosed area containing a product fire without proper protective equipment and training in its use, i.e. self-contained breathing apparatus.

Fire Fighting

Extinguishing Media
Class D extinguisher or sand, dolomite, graphite powder, or sodium chloride.

Combustion Products
Intense heat, smoke, carbon dioxide, carbon monoxide, and metal/metal oxide fumes.

Other Hazards
A high dust concentration of this product may form an explosive atmosphere, subject to ignition by heat and static discharge.

Section 6: Accidental Release Measures

Solid Product
Return to the original container and recycle. Clean-up personnel should wear protective clothing and equipment: gloves, goggles, aprons, respirators, etc. Keep airborne dust to a minimum. Sweep or vacuum up spilled materials. Wet down area if necessary, but do not flush into drains or waterways. Place in suitable container, seal, and save for reclamation.

Dust

Section 7: Handling and Storage

Storage
Store in sealed metal or plastic containers. Use good housekeeping practices to prevent accumulation of dust and follow cleaning techniques (vacuuming and wet sweeping) that will keep dust to a minimum. Do not eat, drink, or smoke in areas where metal dusts or fumes are generated.

Handling

Section 8: Exposure Controls & Personal Protection

Composition:

<table>
<thead>
<tr>
<th>Component</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
<th>Notes</th>
</tr>
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<tbody>
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<td>Aluminum</td>
<td>15 mg/m³</td>
<td>10 mg/m³</td>
<td>Dust</td>
</tr>
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<td>5 mg/m³</td>
<td>5 mg/m³</td>
<td>Fume</td>
</tr>
<tr>
<td>Boron</td>
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<td>10 mg/m³</td>
<td>Respirable fraction of total dust</td>
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<tr>
<td>Carbon</td>
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<td>3.5 mg/m³</td>
<td>Carbon black</td>
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<tr>
<td></td>
<td>1 mg/m³</td>
<td>0.5 mg/m³</td>
<td>Metal</td>
</tr>
<tr>
<td>Chromium</td>
<td></td>
<td>0.5 mg/m³</td>
<td>Cr II &amp; Cr III</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.05 mg/m³</td>
<td>Cr VI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 mg/m³</td>
<td>Cr VI acid &amp; chromates</td>
</tr>
<tr>
<td>Cobalt</td>
<td>0.05 mg/m³</td>
<td>0.05 mg/m³</td>
<td>Dust &amp; mist</td>
</tr>
<tr>
<td>Columbium (Niobium)</td>
<td>N/E</td>
<td>N/E</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>1 mg/m³</td>
<td>1 mg/m³</td>
<td>Dust &amp; mist</td>
</tr>
<tr>
<td>Hafnium</td>
<td>0.5 mg/m³</td>
<td>0.5 mg/m³</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>10 mg/m³</td>
<td></td>
<td>Metal or insoluble oxide of metal</td>
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<td>15 mg/m³</td>
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<td>Respirable fraction of total dust</td>
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<td>Manganese</td>
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<td>5 mg/m³</td>
<td>Dust &amp; compounds</td>
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<td>Molybdenum</td>
<td>5 mg/m³</td>
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<td>Respirable fraction of total dust</td>
</tr>
</tbody>
</table>
Nickel 1 mg/m³
Fumes & Dust minimize exposure to fume & vapor from the molten product, is strongly recommended. Mechanical methods to controlled.
concentrations of nickel are controlled to levels below the TLV, these minor constituents will also be adequately controlled.

Solid Form Approved safety glasses, steel toe safety shoes, and abrasion resistant gloves recommended as a minimum.
Fumes & Dust Provide local exhaust ventilation in areas where metal fumes or dusts are produced. Use NIOSH approved respirators as necessary. Protective clothing and equipment should be worn to prevent repeated skin contact. Eyes should be protected (approved safety glasses at a minimum) during processing.
Molten Form Wear heat reflective, thermally insulated clothing and face shield/hood to protect against radiant heat and molten metal splash.

Engineering Control Measures:
The product should only be melted or processed in well ventilated areas. Efficient local exhaust ventilation, to minimize exposure to fume & vapor from the molten product, is strongly recommended. Mechanical methods to minimize exposure must take precedence over personal protective measures.

Personal Protective Equipment:
Solid Form Approved safety glasses, steel toe safety shoes, and abrasion resistant gloves recommended as a minimum.
Fumes & Dust Provide local exhaust ventilation in areas where metal fumes or dusts are produced. Use NIOSH approved respirators as necessary. Protective clothing and equipment should be worn to prevent repeated skin contact. Eyes should be protected (approved safety glasses at a minimum) during processing.
Molten Form Wear heat reflective, thermally insulated clothing and face shield/hood to protect against radiant heat and molten metal splash.
General A good standard of industrial hygiene should be practiced when using this product. Wash hands before eating, drinking or smoking. Contaminated clothing should be laundered before reuse.

Section 9: Physical & Chemical Properties (as supplied)

Appearance Solid
Form Bars or ingots
Color Silver / metallic
Odor None
Solubility Not soluble in water
Flash Point N/A
Auto Ignition N/A
Boiling Point Variable depending on chemical composition
Melting Point: Variable depending on chemical composition
Density: Approximately 550 lbs/ft³

Section 10: Stability & Reactivity

**Stability**
This product is stable as supplied. However it is subject to oxidation, which may render it inappropriate for use without further modification, if exposed to moisture or corrosive atmospheres.

**Polymerization**
Will not occur.

**Reactivity**
Will not occur under normal circumstances. The solid product is not reactive, but in powder form metals are incompatible with strong oxidizing agents such as concentrated nitric acid.

**Conditions to Avoid**
Wet or corrosive atmospheres. Excessive generation of powders or dusts. Exposure of powdered metals to ignition sources such as electrical currents or static electricity. Exposure to strong oxidizing agents.

Section 11: Toxicological Information

As supplied, the product is not considered to be toxic. In the molten state, the product will release potentially harmful fumes – care must be taken to observe applicable exposure limits. If the precautions advised elsewhere in the document are observed, the product presents little toxicological hazard.

Section 12: Ecological Information

No specific ecological information has been determined for this product.

Section 13: Disposal Information

Because of their inherent value, nickel based alloy materials are normally reclaimed. Wherever possible, spent material should be returned to the manufacturer, or other qualified reprocessor, for reclamation.

If disposal is to take place, chromium is considered hazardous if it is in the hexavalent form, or if the waste exhibits other hazardous characteristics. Dispose of used product, unwanted product and related packaging in strict accordance with Federal, State, Local or Provincial regulations.

Nickel, cobalt, and most of the other metals contained in these alloys are not RCRA hazardous wastes.

If metals are in a waste water or acid, the metals should be removed before the waste water is discharged to a sanitary sewer (for example through chemical precipitation and neutralization). If the collected solids are hazardous (fail the RCRA toxicity characteristic leaching procedure or are generated from a chemical etching or milling process) they should be disposed of in a hazardous waste landfill.

If the waste stream is wet, the waste should be stabilized before being land filled.

Because alloyed ingots are not ignitable, incineration is not normally a viable disposal technique.

Section 14: Transportation Information

This product is non-hazardous for transportation and is not regulated.

Section 15: Regulatory Information

This product requires the following labeling in Europe:
Section 16: Other Information

To the facility safety/environmental officer,

In accordance with 40 CFR 372.45 Supplier Notification, PCC Airfoils, LLC is providing the attached SDS for parts or metal alloy you receive from us that contain toxic chemicals subject to the reporting of SARA 313.

Although reasonable care has been taken to provide current and accurate information in each SDS, PCC Airfoils, LLC extends no warranties, expressed or implied, makes no representations regarding the accuracy or completeness of the information and assumes no liability for any loss, damage or injury of any kind which may result from or arise out of the use of or reliance on the information by any person. Responsibility for the compliance with federal, state and local law regulations concerning the use of this product rests solely upon the purchaser.

Copies of this Safety Data Sheet may be obtained from Cannon-Muskegon Corp.

Footnotes:

1 Based on components
2 IARC Classification
   1 - Positive
   2 - Probable
   3 - Not Classified
   4 - Probably negative

Abbreviations:

N/E Not Established
N/A Not Applicable
mg/m³ Milligrams per cubic meter
ppm Parts per million
OSHA Occupational Safety and Health Administration
NTP National Toxicology Program
ACGIH American Conference of Industrial Hygienists
PEL Permissible exposure limit
TLV Threshold Limit Value
IARC International Agency for Research on Cancer
ft³ Cubic foot
RCRA Resource Conservation and Recovery Act
History

Original MSDS issued - 29JUN93
Original MSDS Superseded - 17FEB00
CM-MSDS-1940 Rev. 0 issued - 17FEB00
CM-MSDS-1940 Rev 1 issued - 08OCT02
CM-MSDS-1940 Rev 2 issued - 18MAY05
CM-MSDS-1940 Rev 3 issued - 02DEC07
CM-MSDS-1940 Rev 4 issued - 22DEC08
CM-MSDS-1940 Rev 5 issued - 04JUN09
CM-MSDS-1940 Rev 6 issued - 27OCT10
CM-MSDS-1940 Rev 7 issued - 24AUG12
CM-MSDS-1940 Rev 8 issued - 27NOV12
CM-MSDS-1940 Rev 9 issued - 1FEB13
CM-SDS-1940 Rev 10 issued – 17JULY14
CM-SDS-1940 Rev 11 issued – 12NOVEMBER14