ALUMINUM ALLOYS MATERIAL SAFETY DATA SHEET

MATERIAL IDENTIFICATION AND USE

MATERIAL NAME: ALUMINUM ALLOYS
SERIES 1000, 2000, 3000, 5000, 6000 & 7000
SYNONYMS: Includes Sheet, Plate & etc.
WHMIS CLASS: D2A, D2B

SUPPLIER: RUSSEL METALS INC.
ADDRESS: 1900 MINNESOTA COURT, MISSISSAUGA, ONTARIO. CANADA. L5N 3C9.
TEL: 905-819-7295
FAX: 905-819-7262
FORM#: MSDS-02-2011.
DATE: NOVEMBER 2011.

1. PRODUCT INFORMATION

MATERIAL NAME: ALUMINUM ALLOYS
FORM #: MSDS-02-2011
DATE: NOVEMBER 2011
MATERIAL USE: MANUFACTURE OF ARTICLES

2. HAZARDOUS INGREDIENTS

BASE METAL

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS NUMBER</th>
<th>TLV (ACGIH - mg/m³)</th>
<th>LD₅₀</th>
<th>% WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALUMINUM</td>
<td>7429-90-5</td>
<td>1.0 (Metal &amp; Insoluble Compounds - Respirable)</td>
<td>U</td>
<td>90-99.7</td>
</tr>
<tr>
<td>CHROMIUM</td>
<td>7440-47-3</td>
<td>0.5 (Metal &amp; Cr⁺³), 0.05 (Cr⁺6 Soluble), 0.01 (Cr⁺6 Insoluble)</td>
<td>U</td>
<td>&lt;0.01-0.4</td>
</tr>
<tr>
<td>COPPER</td>
<td>7440-50-8</td>
<td>0.1 (Dust), 0.2 (Fume)</td>
<td>350 mg/kg Oral-Mouse</td>
<td>&lt;0.05-6.0</td>
</tr>
<tr>
<td>IRON</td>
<td>7439-89-6</td>
<td>5.0 (as Iron Oxide - Respirable)</td>
<td>30,000 mg/kg Oral-Rat</td>
<td>&lt;0.35-10</td>
</tr>
<tr>
<td>NICKEL</td>
<td>7440-02-0</td>
<td>1.5 (Metal), 0.2 (Insoluble), 0.1 (Soluble - all as Inhalable)</td>
<td>&gt;9,000 mg/kg Oral-Rat</td>
<td>&lt;0.01-2.0</td>
</tr>
<tr>
<td>MAGNESIUM</td>
<td>7439-95-4</td>
<td>Not Established for Metal (10.0 for Magnesium Oxide)</td>
<td>U</td>
<td>&lt;0.02-1.5</td>
</tr>
<tr>
<td>MANGANESE</td>
<td>7439-96-5</td>
<td>0.2 (as inorganic Manganese)</td>
<td>9,000 mg/kg Oral-Rat</td>
<td>&lt;0.12-1.2</td>
</tr>
<tr>
<td>SILICON</td>
<td>7440-21-3</td>
<td>10.0 (Inhalable), 3.0 (Respirable as non fibrous Silic on Carbide)</td>
<td>3,160 mg/kg Oral-Rat</td>
<td>&lt;0.12-1.2</td>
</tr>
<tr>
<td>TITANIUM</td>
<td>7440-32-6</td>
<td>Not established (10.0 for Titanium Dioxide)</td>
<td>U</td>
<td>&lt;0.02-0.2</td>
</tr>
<tr>
<td></td>
<td>7440-48-4</td>
<td>0.02 (Dust &amp; fume)</td>
<td>6,171 mg/kg Oral-Rat</td>
<td>&lt;0.01-0.6</td>
</tr>
<tr>
<td>ZINC</td>
<td>7440-66-6</td>
<td>2.0 (as Zinc Oxide , Respirable)</td>
<td>U</td>
<td>&lt;0.05-8.0</td>
</tr>
<tr>
<td>BISMUTH</td>
<td>7440-69-9</td>
<td>Not Established</td>
<td>10,000 mg/kg Oral-Mouse</td>
<td>&lt;0.40-0.7</td>
</tr>
<tr>
<td>BORON</td>
<td>7440-42-8</td>
<td>10.0 (as Boron Oxide)</td>
<td>2,000 mg/kg Oral-Mouse</td>
<td>&lt;0.06 max</td>
</tr>
<tr>
<td>LEAD</td>
<td>7439-92-1</td>
<td>0.05 (Elemental &amp; inorganic Compounds as Lead)</td>
<td>U</td>
<td>&lt;0.40-0.7</td>
</tr>
<tr>
<td>VANDIUM</td>
<td>7440-62-2</td>
<td>0.05 (Inhalable Dust of Fume as V₂O₅)</td>
<td>130 mg/kg Oral-Rat</td>
<td>&lt;0.01-0.6</td>
</tr>
</tbody>
</table>

NOTES:
- Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH - 2011) are 8-hour Time Weighted Average concentrations unless otherwise noted.
- Ingredients listed as required by the WHMIS Ingredient Disclosure List of the Hazardous Products Act (Canada).
- For exact composition, refer to analysis or specifications.

3. HAZARDS IDENTIFICATION

ROUTES OF ENTRY:
None in its natural solid form. Prolonged skin contact with coated aluminum may cause skin irritation in sensitive individuals. Inhalation of metal particulate or elemental oxide fumes generated during welding, burning, grinding or machining may pose acute or chronic health effects.

EYES:
Fumes can cause eye irritations. Ultra-violet radiation from welding can cause flash burns (welder's flash or pink eye).

SKIN:
May cause skin irritations. Ultra-violet radiation from welding can cause flash burns or skin burns.

TARGET ORGANS:
Respiratory system.

ACUTE EFFECTS:
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANGANESE, COPPER &amp; ZINC</td>
<td>Inhilation overexposure to manganese, copper or zinc (coated products) may cause metal fume fever characterized by fever and chills (i.e. flu-like symptoms) which appear 4-6 hours after exposure with no long-term effects.</td>
</tr>
<tr>
<td>IRON</td>
<td>May cause a benign pneumoconiosis (siderosis).</td>
</tr>
<tr>
<td>LEAD</td>
<td>May cause chronic exposure may cause lead poisoning that can affect the digestive system, nervous system, reproductive systems, muscles and joints. IARC lists lead and its inorganic compounds under its Group 2B category - &quot;possibly carcinogenic to humans&quot;.</td>
</tr>
<tr>
<td>CHROMIUM</td>
<td>May cause a benign pneumoconiosis (silicosis).</td>
</tr>
<tr>
<td>COBALT</td>
<td>May result in an asthma-like condition (cough, shortness of breath). IARC lists metallic cobalt under its Group 2B category - &quot;possibly carcinogenic to humans&quot;.</td>
</tr>
<tr>
<td>NICKEL</td>
<td>May cause skin sensitivity.</td>
</tr>
</tbody>
</table>

CHRONIC EFFECTS:
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHROMIUM</td>
<td>May cause chronic effects (i.e. &quot;confirmed human carcinogens&quot; and metallic chromium under its Group 3 category - &quot;not classifiable as to their carcinogenicity to humans&quot;). Chromium metal is classified as carcinogenic by NTP.</td>
</tr>
<tr>
<td>COBALT</td>
<td>May result in an asthma-like condition (cough, shortness of breath). Cobalt dust may result in an asthma-like condition (cough, shortness of breath). IARC lists metallic cobalt under its Group 2B category - &quot;possibly carcinogenic to humans&quot;.</td>
</tr>
<tr>
<td>NICKEL</td>
<td>Nickel may cause skin sensitivity.</td>
</tr>
</tbody>
</table>

NOTES:
## 4. First Aid Measures

**Eyes:** Dust acts as a foreign body. Flush eyes with plenty of water for at least 15 minutes. Seek medical attention if eye irritation persists.

**Skin:** Maintain good personal hygiene. Wash affected area with mild soap and water. Seek medical attention if skin irritation persists.

**Inhalation:** Remove to fresh air. Check for clear airway, breathing and presence of pulse. If necessary administer CPR. Consult a physician immediately.

**Ingestion:** Rare in industry. Dust may irritate mouth and gastrointestinal tract. If ingested, seek medical attention promptly.

## 5. Fire Fighting Measures

**Flammability Classification:** No, not flammable.

**Means of Extinction:** Use extinguishers appropriate for surrounding materials. Use dry powder for aluminum metal fires.

**Flash Point (°C):** N/A

**Auto-Ignition Temp (°C):** N/A

**Upper Flammable Limit % by Vol.:** N/A

**Lower Flammable Limit % by Vol.:** N/A

**Sensitivity to Static Discharge:** N/A

**Explosion Data (Sensitivity to Impact):** No

**Hazardous Combustion Products:** Aluminum oxide and smaller amounts of other metallic oxides. If heated to very high temperatures, copper and zinc fumes may evolve.

**Unusual Fire Hazards:** Small aluminum chips, fine turnings and dust from processing or grinding may ignite readily. Aluminum dust or fines combined with air can form explosive mixtures. Aluminum chips, dust and fines in contact with water can generate flammable hydrogen gas.

**Special Fire Fighting:** None for this product. Dry powder for aluminum metal fires. Do not use water on dust, powder, fume or molten metal fires.

## 6. Accidental Release Measures

**Leak and Spill Procedures:** Solid metal does not pose any problems. Dust or chip spills should be cleaned up avoiding dust generation. Collect and recycle to process. Wash down with water if in contact with acids. Avoid inhalation of dusts.

## 7. Handling and Storage

**Handling:** Operations with the potential for generating high concentrations of airborne particulates should be evaluated and controlled as necessary. Practice good housekeeping. Avoid breathing metal fumes and/or dust. Avoid generating dusts. Avoid contact with sharp edges or with heated metal. Hot and cold aluminum are not visually different.

**Storage:** Store away from corrosive chemicals, such as acids. Product should be kept dry to prevent corrosion.

## 8. Exposure Controls

**Engineering Controls:** General or local exhaust during welding or grinding operations. Where local ventilation and vacuum systems are used to collect aluminum dusts and fines, use explosion-proof systems. Do not allow dusts to accumulate - good housekeeping practices must be maintained. Avoid all ignition sources.

**Personal Protective Equipment:** Dependent upon process being performed on material each operation must be addressed for suitable equipment.

**Gloves (Specify):** Wear gloves as required

**Eyes (Specify):** Safety glasses or goggles as required

**Clothing (Specify):** N/A

**Footwear (Specify):** N/A

**Respirator (Specify):** If concentrations exceed established limits use NIOSH/MSHA approved particulate respirators (dust & fume or high efficiency dust fume) when grinding or welding.

**Other (Specify):** With molten metal, use full body cover clothing suitably treated to prevent burns.

## 9. Chemical and Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical State:</strong></td>
<td>Solid</td>
</tr>
<tr>
<td><strong>Appearance:</strong></td>
<td>Silver gray solid</td>
</tr>
<tr>
<td><strong>Odour:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Boiling Point:</strong></td>
<td>2494°C (4521°F) (approx.)</td>
</tr>
<tr>
<td><strong>Vapour Pressure:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Vapour Density:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Melting Point:</strong></td>
<td>521-650°C (970-1200°F)</td>
</tr>
<tr>
<td><strong>Density:</strong></td>
<td>2.7 (approx.)</td>
</tr>
<tr>
<td><strong>pH:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Evaporation Rate:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Solubility:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Coefficient Water Oil Distribution:</strong></td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

## 10. Stability and Reactivity

**Chemical Stability:** Yes. Aluminum and its alloys are stable under normal storage and handling conditions.
ALUMINUM ALLOYS MATERIAL SAFETY DATA SHEET

HAZARDOUS POLYMERIZATION: Hazardous polymerization cannot occur.

INCOMPATIBILITY TO OTHER SUBSTANCES: Yes, incompatible with strong acids, alkalis and oxidizers. Acetylene.

CONDITIONS OF REACTIVITY: Chips, fines, dust and molten aluminum is considerably more reactive than the metal itself.

CONDITIONS TO AVOID: Water: slowly generates flammable hydrogen gas.
Acids & alkalis: reacts to generate flammable hydrogen gas and heat.
Oxidizers: violent reaction with considerable heat generation.
Note: generation rate is greatly increased with smaller particles (i.e. fines and dust).

HAZARDOUS DECOMPOSITION PRODUCTS: None. Products other than fire or explosion - does not decompose.

11. TOXICOLOGICAL INFORMATION

IRRITANCY OF MATERIAL: See Section 3.

SENSITIZATION OF MATERIAL: Workes with skin sensitivity warrant particular attention.


LC50 (of Material): Not established

MUTAGENICITY OF MATERIAL: N/A

REPRODUCTIVE EFFECTS: LEAD: Clinical studies on test animals exposed to lead indicate adverse reproductive effects.

TERTILOGICITY OF MATERIAL: N/A

CARCINOGENICITY OF MATERIAL: CHROMIUM: IARC lists certain hexavalent chromium compounds under its Group 1 category - "confirmed human carcinogens" and metallic chromium under its Group 3 category - "not classifiable as to their carcinogenicity to humans".
NICKEL: IARC lists metallic nickel under its Group 2B category - "possibly carcinogenic to humans".
COBALT: IARC lists metallic cobalt under its Group 2B category - "possibly carcinogenic to humans".
LEAD: IARC lists lead and its inorganic compounds under its Group 2B category - "possibly carcinogenic to humans".
MANGANESE: Existing studies are inadequate to assess its carcinogenicity.

SYNERGISTIC MATERIALS: N/A

12. ECOLOGICAL INFORMATION

ECOTOXICITY: No data available for the material as a whole. However, individual components of the material have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife.

ENVIRONMENTAL FATE: No data available.

ENVIRONMENTAL DEGRADATION: No data available.

13. DISPOSAL INFORMATION

WASTE DISPOSAL: Aluminum scrap should be recycled whenever possible.

GENERAL INFORMATION: Dispose of in accordance with applicable federal, provincial/state or local regulations.

14. TRANSPORTATION INFORMATION

GENERAL SHIPPING INFORMATION: Material not regulated for shipping.

SHIPPING NAME AND DESCRIPTION: N/A

UN NUMBER: N/A

CLASS: N/A

PACKING GROUP/RISK GROUP: N/A

TRANSPORT REGULATIONS:

15. REGULATORY INFORMATION

REGULATORY INFORMATION: The following listing of regulations relating to a Russell Metals Inc. product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.

ADDITIONAL CANADIAN REGULATIONS:

WHMIS CLASSIFICATION:
Class D2A/D2B: Materials Causing Other Toxic Effects.

DOMESTIC SUBSTANCES LIST: The components of this material are on the federal DSL Inventory.

OTHER CANADIAN REGULATIONS: N/A

ADDITIONAL U.S. REGULATIONS:

SARA:
The components of this material are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA – Oct. 2006), as follows:

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>SARA 302 (40 CFR 355, Appendix A)</th>
<th>SARA 304 (40 CFR Table 302-4)</th>
<th>SARA 313 (40 CFR 372.65)</th>
<th>CERCLA Reportable Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>None listed</td>
</tr>
<tr>
<td>Chromium</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>None listed</td>
</tr>
<tr>
<td>Cobalt</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>None listed</td>
</tr>
<tr>
<td>Copper</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>5,000 lbs</td>
</tr>
<tr>
<td></td>
<td>Lead</td>
<td>Manganese</td>
<td>Nickel</td>
<td>Vanadium</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>-----------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>10 lbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>100 lbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>None</td>
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<tr>
<td>None listed</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>1,000 lbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SARA Threshold Planning Quantity:** There are no specific Threshold Planning Quantities for the components of this material. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb. (4,540 kg) therefore applies, per 40 CFR 370.20.

**TSCA Inventory Status:** The components of this material are listed on the Toxic Substances Control Act Inventory.

**CERCLA Reportable Quantity (RQ):**
- RQ’s for Hazardous Substances in the Comprehensive Environmental Response, Compensation, and Liability Act are: Chromium = 5000 lb. (2270 kg); Copper = 5000 lb. (2270 kg); Nickel = 100 lbs (45 kg); Zinc = 1000 lb. (454 kg).

**California (Proposition 65):**
- Chromium (VI) component of this material is known in the State of California to cause cancer.
- The Cobalt component of this material is known in the State of California to cause cancer.
- The Nickel component of this material is known in the State of California to cause cancer.
- The Lead component of this material is known in the State of California to cause cancer, and/or birth defects (or other reproductive harm).

**Other U.S. Federal Regulations:**

**Additional European Union Regulations:**
- RoHS & WEEE:
  - Lead (Pb):
    - Lead is present in this aluminum alloy at levels above the EU Directive limit of 0.1%.
    - Note, the EU Directive has a lead exemption limit of up to 0.4% as an alloying element in aluminum.
  - Chromium VI (Cr+6):
    - The hexavalent oxidation state of chromium does not normally exist as a part of a metal or alloy.

**16. Other Information**

**Hazard Label Rating Systems:**
- NFPA Code: H=0 F=0 R=0
- HMIS Code: H=1 F=0 R=0 PPE: See Section 8

* Denotes possible chronic hazard if airborne dusts or fumes are generated.

**Prepared By:** Russell Metals Inc. and Envirotech Inc.
**Date:** November 2011
**Telephone:** 905-819-7295
**Note:** Contact supplier for additional product information

**Disclaimer:** The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results obtained from the use thereof.