



MATERIAL SAFETY DATA SHEET

Section 1: Product and Company Identification

Product: Alloy Steel (4XXX, 5XXX, 6XXX, 8XXX, 9XXX series)	Company: The Worthington Steel Company
Description: Alloy Steel Sheet or Strip, Hot or Cold Rolled	Address: 200 Old Wilson Bridge Road Columbus, Ohio 43085
Date Issued: June 13, 2001	Information: 614-438-7960
Last Revised: August 25, 2005	Emergency: 1-877-203-8465 Please give the attendant tracking code: 3448

Section 2: Hazardous Ingredients and Exposure Limits

Ingredient	CAS Number	Weight %	OSHA PEL (mg/m ³)	ACGIH TLV (mg/m ³)
Iron	7439-89-6	96 – 98	See PNOR below	See PNOS below
Chromium	7440-47-3	0 – 4	1	0.5
Nickel	7440-02-0	0 – 3.75	1	1.5
Silicon	7440-21-3	0 – 2.2	5/15 (Respirable/Total dust)	10
Manganese	7439-96-5	0 – 1.9	5 (Ceiling)	0.2
Carbon	7440-44-0	0.1 – 1.1	See PNOR below	See PNOS below
Molybdenum	7439-98-7	0 – 0.4	15 (Total dust)	10
Vanadium	7440-62-2	0 – 0.3	See PNOR below	See PNOS below
Aluminum	7429-90-5	0 – 0.1	5/15 (Respirable/Total dust)	10
Sulfur	7704-34-9	0 – 0.05	See PNOR below	See PNOS below
Phosphorus	7723-14-0	0 – 0.04	0.1	0.1
Lead	7439-92-1	0 – 0.01	0.05	0.05

PNOR: All inert or nuisance dusts not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit of 5 mg/m³ (respirable), and 15 mg/m³ (total dust).

PNOS: Particles Not Otherwise Specified should be kept below 3 mg/m³ (respirable), and 10 mg/m³ (inhalable).

Note: At elevated temperatures oxides or compounds of the above listed ingredients may be formed and released. Metal oxides and compounds may have chemical specific exposure limits lower than the listed values.

Section 3: Physical and Chemical Properties

Boiling Point: Not applicable	Vapor Pressure: Not applicable
Melting Point: 2400 – 2800 °F	Vapor Density: Not applicable
Specific Gravity: 7.5 – 8.5	Solubility in Water: Not soluble
Vapor Pressure: Not applicable	Percent Volatile by Weight: 0.0
Appearance: Metallic gray solid	Odor: None

Section 4: Fire and Explosion Data

Flash Point: Not applicable
Auto Ignition: Not applicable
Upper Explosion Limit: Not applicable



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Lower Explosion Limit: Not applicable

General Fire Hazards: Steel products in the solid state present no fire or explosion hazard and do not contribute to the combustion of other materials.

Hazardous Combustion Products: Irritating and potential toxic fumes will be evolved at extremely high temperatures.

Extinguishing Media: Not applicable. Use methods appropriate for surrounding fires.

Unusual Fire Hazards: Under certain circumstances fine dusts of this material may pose an explosion hazard. Steel reacts with strong acids to form hydrogen.

Section 5: Reactivity Data

Chemical Stability: Considered stable under normal conditions of use.

Hazardous Decomposition Products: Metal oxides of listed ingredients and carbon monoxide from coating oils.

Incompatibility: Not applicable

Hazardous Polymerization: Will not occur

Conditions to Avoid: Corrosive materials

Section 6: Hazards Identification

Overview: This product is a solid alloy of iron and does not present a physical or health hazard. Potentially hazardous airborne particulate and fumes may result from further processing by the material user. Avoid metallic dust and fumes generated during welding, burning, melting, cutting, brazing, grinding, machining, or other similar process. At high temperatures metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Processing operations should be performed in well ventilated areas and, where appropriate, respiratory protection and personal protective equipment should be used.

Primary Entry Routes: Inhalation of metallic dust or fume

Target Organs: Respiratory system

Potential Health Effects:

- **Inhalation:** Exposure to high concentrations of metallic dust and fumes may cause irritation to the nasal passages and mucous membranes of the upper respiratory tract. Excessive exposure may result in metal fume fever, a flu-like illness with symptoms lasting 12 to 48 hours. Long-term excessive exposure to the fume or dust may cause respiratory system effects.
- **Eyes:** Exposure to metallic dust or fumes may cause irritation to the eyes. Particles that become imbedded in the eye may scratch the cornea.
- **Skin:** Prolonged contact with metallic dust and fumes or coating oil may cause skin irritation, dermatitis or allergic reactions in sensitized individuals.
- **Ingestion:** Ingestion of metallic dust may cause nausea or vomiting.

Medical Conditions Aggravated by Exposure: Chronic diseases or disorders of the respiratory system.

Toxicological Information: No toxicity data is available for steel products as a whole. Toxicity data for individual steel ingredients can be found in the Registry of Toxic Effects of Chemical Substances available on-line from the National Institute for Occupational Safety and Health (NIOSH).

Carcinogenic Effects: The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) and OSHA do not list steel products as carcinogens. Steel products contain alloying elements and/or residual elements that are suspected or confirmed human carcinogens (e.g. chromium, nickel).

Welding Fumes: IARC identifies welding fumes as a group 2B carcinogen, a mixture that is possibly carcinogenic



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to humans. Welding fumes are difficult to classify because the composition and quantity are dependent upon the alloy being welded, electrodes used, and process.

Non-Metallic Coatings: Steel products may be coated with oil based products to prevent rust. Rust preventative oils are generally applied at customer request and usually contain severely hydrotreated light and heavy naphthenic oils. Prolonged contact with rust preventative oil may cause dermatitis.

Section 7: First Aid Measures

Eye Contact: Flush eyes with plenty of water for at least 15 minutes while occasionally lifting the eye lids.

Skin Contact: Wash with soap and water. Get medical attention if irritation develops or persists. For thermal burns flush the area with water and get immediate medical attention. Get medical attention for mechanical abrasions or lacerations.

Inhalation: Remove to fresh air. Administer oxygen or artificial respiration if necessary. Get medical attention.

Ingestion: Get medical attention.

Section 8: Personal Protective Equipment

Engineering Controls: Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace concentrations of hazardous materials to the prescribed exposure limit.

Ventilation: Provide general or local exhaust ventilation systems to minimize airborne concentrations. Local exhaust ventilation controls air contaminants at the source and is the preferred option.

Respiratory Protection: Respirators must be worn if ambient concentrations of contaminants exceed prescribed exposure limits. Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134). Select respirator based on its suitability to provide adequate worker protection for given work conditions, level of airborne contamination, and presence of sufficient oxygen. When required, only NIOSH approved respirators should be used.

Protective Clothing: Protective clothing should be worn to prevent skin contact. Protective gloves should be worn as required for welding, burning, or handling operations.

Eye Protection: Use safety glasses or goggles as required for welding, burning, sawing, brazing, grinding, or machining operations. Contact lenses should not be worn where exposure to metallic fumes or dust is likely.

Section 9: Handling and Storage

Handling Precautions: Avoid generating and breathing metallic fumes or dust. Avoid contact with steel edges that may be sharp. Steel products are massive and care must be given to prevent them from tipping, rolling or falling onto objects in their path.

Storage Requirements: Store in a dry area away from acids or other incompatible materials.

Spill Response Procedures: Not applicable to steel products in the solid state. Metal turnings/shavings can be cleaned up with a broom or shovel. Metallic dust and particles may be collected with a vacuum. Do not use compressed air to clean-up spills. Place collected material into a closed container.

Disposal: Scrap steel is recyclable. When sent for disposal follow applicable federal, state and local regulations.

DOT Requirements: Not classified as a Hazardous Substance under 49 CFR 172.101.

Section 10: Regulatory Information

OSHA Regulations: Steel products as a whole are not listed as Air Contaminants in 29 CFR 1910.1000. Individual ingredients in steel products are listed. Refer to Section 2 for permissible exposure limits. When applicable, the



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product described in this MSDS is considered to be an "article" as defined in 29 CFR 1910.1200.

EPA Regulations:

- RCRA: Steel scrap is not regulated as a solid waste or hazardous waste under 40 CFR 261. Metallic fumes or dust collected during the processing of steel products may contain a constituent identified as hazardous under 40 CFR 261.24.
- CERCLA: Steel products as a whole are not listed as Hazardous Substances under 40 CFR 302.4. Individual ingredients in steel products are listed. Release reporting is not required if the mean diameter of the pieces of the solid metal released is greater than 100 micrometers.
- SARA 311/312 Hazard Class (40 CFR 370): Acute and chronic health hazard.
- SARA 313 (40 CFR 372): The following elements may be present in this product above their de minimus concentration and subject to SARA 313 reporting requirements: chromium (1%), lead, manganese (1%), nickel (0.1%).

State Regulations:

- California Proposition 65: This product contains chemicals known to the State of California to cause cancer (chromium, nickel) and to cause birth defects or other reproductive harm (cadmium, lead).
- New Jersey Right-to-Know: Contains regulated material in the following categories.
 - Hazardous Substance: copper, manganese, molybdenum, sulfur, titanium
 - Special Health Hazard Substances: chromium, nickel
- Pennsylvania Right-to-Know: Contains regulated material in the following categories.
 - Hazardous Substance: molybdenum, silicon, sulfur
 - Environmental Hazards: chromium, copper, manganese, nickel
 - Special Hazard Substances: chromium, nickel

Section 11: Other Information

Steel products may contain residual elements added intentionally or originating in raw materials. These elements are in quantities less than 0.1% and may include: antimony, arsenic, boron, cadmium, calcium, cobalt, copper, niobium, tin, titanium, zinc and zirconium.

Hazard Ratings:

NFPA: F-0, H-0, R-0

HMIS®: H-*1, F-0, PH-0 (* Denotes possible chronic hazard if airborne dusts/fumes are generated)

WHIMS: D-2

The HMIS ratings displayed on this MSDS are from the HMIS Third Edition. There have been significant changes made to the system. "PH" stands for "Physical Hazard" as defined in the OSHA Hazardous Communication Standard and replaces the former code "R" for "Reactivity."

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.