SAFETY DATA SHEET

HAYNES International

Structural Wire

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SDS IDENTIFICATION NUMBER	PREVIOUS REVISION	EMERGENCY PHONE NUMBERS
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This Safety Data Sheet (SDS) provides information on a specific group of manufactured metal products. Since these metal products share a common physical nature and constituents, the data presented are applicable to all alloys identified. This document was prepared to meet the requirements of the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals, United States" OSHA's Hazard Communication Standard, 29 CFR 1910.1200, the Canadian Workplace Hazardous Materials Information System (WHMIS), European Economic Community (EEC) Directives, UK COSHH-HSE, and other jurisdictions that have adopted the GHS.

1. PRODUCT IDENTIFICATION

CHEMICAL NAME: See Table 1 for Alloy Designations	CHEMICAL FAMILY: Alloy
TRADE NAME: See Alloys listed in Table 1	FORMULA: Alloy wire composed of varying concentrations of elements listed in Table 1.

2. HAZARDS IDENTIFICATION

The health hazards described in this section do not apply under normal handling and use of these products in solid form. Cutting, grinding, etc., of these products may produce dust, or particulate containing the component elements of these materials with associated health hazards described in this section. If these products are involved in welding or melting, the health hazards described in the Haynes International SDS for Welding Products and Thermal Spray Wire also apply.

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This SDS is available in the English, French, German, Spanish, Italian, Czech, Japanese, Korean, and Chinese languages.

2. HAZARDS IDENTIFICATION (continued)

2.1 GHS Hazard Classification – Signal Word, Classification, and Category (separate classifications are provided for each Haynes product or product groups) | **Hazard Codes and Hazard Statements**

All products in Table 1: **Danger:** Respiratory sensitization (Category 1) | H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.

All products in Table 1: **Warning:** Skin sensitization, (Category 1) | H317 May cause an allergic skin reaction

All products in Table 1: **Warning:** Skin irritation (Category 2) | H315 Causes skin irritation.

All products except those listed below: **Warning:** Acute toxicity, oral (Category 4) | H302 Harmful if swallowed

HASTELLOY® HYBRID BC1®, HASTELLOY® G-35®, HAYNES® 242®, HAYNES® 625, HAYNES® 718, HAYNES® X-750, HAYNES® 601, HAYNES® I-36, HAYNES® M400, HAYNES® M413, HAYNES® N- 61, HAYNES® NFE 258, HAYNES® NIT 32, HAYNES® NIT 50, HAYNES® NIT 60, HAYNES® 17/7 PH, HAYNES® 20CB3, HAYNES® 52, HAYNES® 72, HAYNES® 80/20, HAYNES® 80/20 Cb, HAYNES® 95/5, HAYNES® 200, HAYNES® 202, and HAYNES® 302 alloys.



2.2 Label Elements and Hazards

Precautionary Statements and Symptoms; All products in Table 1:

P261 + P270 Do not eat, drink or smoke when using this product. Avoid breathing dust or fume

P264 Wash hands thoroughly after touching dust created by these products

P272 Contaminated work clothing should not be allowed out of the workplace

P280 Wear protective gloves, clothing, eye and/or face protection

Hazards not otherwise classified or not covered by GHS

INHALATION: Inhalation of metal dust, fume, or powder may result from sawing, grinding, crushing, or similar operations which generate airborne metal particulate during use of these materials. Inhaled particulate may irritate the respiratory tract. Excessive inhalation of aluminum, cobalt, copper, manganese, nickel, and zinc can cause respiratory irritation, cough, bronchitis, chills, “metal fume fever,” and asthma-like symptoms.

INGESTION: Amounts ingested incidental to industrial handling are not likely to cause injury. Avoid hand, clothing, food, and drink contact with metal dust, or fume by washing hands before hand to mouth activities such as drinking, smoking, nail biting, eating, etc. Ingestion of large doses may cause nausea, vomiting, and diarrhea.

SKIN: Skin contact with these materials may cause irritation and in some sensitive individuals an allergic dermatitis, sensitization or hypersensitivity when elements such as chrome, cobalt, copper, and nickel are present.

EYES: Contact with particulate metal (dust, fume, or powder) may inflame the conjunctiva. Airborne particulate (chips, dust, or powder) is always a potential problem as well as inserting fingers into the eye if the hand or clothing is contaminated with metal particulate.

CHRONIC HEALTH EFFECTS OF OVEREXPOSURE SEE ALSO TABLE 4	Respiratory disease with symptoms ranging from shortness of breath and cough to permanent disability due to loss of lung function; and fibrosis or subsequent effects on the heart may be caused by excessive exposure to dust containing cobalt, nickel, titanium, and tungsten. Central nervous system depression has been identified with excessive manganese exposure. Aluminum and iron have been indicated to cause gastro-intestinal disorders and non-significant changes in the lung. Chronic health effects specific to an element(s) may be difficult to detect due to the numerous elemental constituents in these alloys.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE	Individuals who may have had an allergic reaction or sensitivity to metals such as chromium, copper, cobalt, and nickel may encounter skin rash or dermatitis if skin contact with this product occurs. Persons with impaired pulmonary function, airway diseases and conditions such as asthma, emphysema, chronic bronchitis, etc., may incur further disability if excessive concentrations of dust or fume are inhaled. If prior damage or disease to the Neurologic (nervous), Circulatory, Hematologic (blood) or Renal (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk if handling and use of these materials cause excessive exposure.

3. COMPOSITION / INFORMATION ON INGREDIENTS

The chemical ingredients of these SDS products are shown in TABLE 1: Structural Wire Products. Ingredients reportable per United States EPA Section 313 of SARA are marked with an (▲); see Section 15 for an explanation. Standard chemical abbreviations and terminology are used in the tables relating to this section.

HEALTH HAZARD TABLES: TABLE 2 shows the HMIS hazard rating for each product. Complete chemical names, abbreviations, and Chemical Abstracts Service (CAS) numbers and exposure limits are given in TABLE 3. The American Conference of Governmental Industrial Hygienists (ACGIH) cautions "These limits are not fine lines between safe and dangerous concentration and should not be used by anyone untrained in the discipline of industrial hygiene."

4. FIRST AID PROCEDURES

INHALATION	Breathing difficulty caused by inhalation of dust or fume requires removal to fresh air and keep the victim comfortable. If breathing has stopped, perform artificial respiration. Obtain medical assistance if exposed or concerned. If experiencing respiratory symptoms, call a poison center or doctor.
INGESTION	If swallowed, rinse mouth, but never give anything by mouth to an unconscious person. Contact a poison center. Unless the poison center advises otherwise, have that conscious person slowly drink 1 to 2 glasses of water to dilute, inducement of vomiting is not necessary. Obtain medical assistance if you feel unwell.
SKIN	Skin cuts and abrasions can be treated by standard first aid. Quickly remove contaminated clothing but do not shake clothing. Skin contamination with dust or powder can be removed by washing with soap and water. If irritation or reddened, blistered skin occurs, obtain medical assistance.
EYES	Do not allow victims to rub or keep eyes tightly shut. Dust or powder should be flushed from the eyes with copious amounts of clean water. If irritation persists, obtain medical assistance.

5. FIRE FIGHTING MEASURES

As shipped, these products are nonflammable and nonexplosive. However, welding arcs and sparks can ignite combustibles, and can initiate fires and explosions. Be sure you read and understand American National Standard Institute standard ANSI Z49.1 "Safety in Welding and Cutting" and National Fire Protection Association standard 51B for fire prevention in "Cutting and Welding Processes" before using these products.

5.1 Extinguishing Media:	5.2 Advice for Fire Fighters:	5.3 Specific Fire and Explosive Hazards:
Not Aplicable	Not Applicable	Not Applicable

6. ACCIDENTAL RELEASE OR SPILL CONTROL MEASURES

In solid form this material poses no special clean-up problems. If this material is in powder or dust form, notify safety personnel, isolate the area and deny entry. Do not sweep. Clean-up should be conducted with a vacuum system utilizing a high efficiency particulate air (HEPA) filtration system. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air and water. Cleanup personnel should protect against exposure. Properly label all materials collected in waste container. Follow applicable emergency response regulations, such as OSHA (29 CFR 1910.120).

7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING	This product must be handled according to the size, shape and quantity of material involved. Dusts and powders should be moved or transported to minimize spill or release potential. Avoid dust inhalation and eye or skin contact. Wear personal protective equipment to prevent contact with skin and eyes (Section 8). Practice good housekeeping techniques that minimize accumulation of dust. Practice good personal hygiene after handling dust or powder forms of this material, especially before eating, drinking, smoking, or applying cosmetics.
7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING INCOMPATIBILITIES	In solid form this material poses no special problems. Store metal powder in a dry area away from heat, ignition sources, and incompatibles (See Sections 10 and 14).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Occupational Exposure Limits - as milligrams per cubic meter of air (mg/m^3). See Table 3.

8.2 Exposure, Engineering Controls, and Personal Protection

ENGINEERING CONTROLS	Local exhaust ventilation should be used to control exposure to airborne dust and fume emissions near the source (during crushing, grinding, welding, etc.) below the exposure limits cited in Table 3.	
RESPIRATORY PROTECTION	Use NIOSH approved respirators as specified by an Industrial Hygienist or qualified Safety Professional. Lung function tests are recommended for users of negative pressure devices. Use a respirator where local exhaust or ventilation does not keep exposure below the exposure limits for air contamination.	
SKIN PROTECTION	Wear gloves to prevent metal cuts and skin abrasions. Protective clothing such as uniforms, disposable coveralls, safety shoes, etc., may be required during metal handling operations as appropriate to the circumstances of exposure.	
EYE PROTECTION	Wear safety glasses when risk of eye injury is present particularly during machining, grinding, welding, powder handling, etc. Contact lenses should not be worn if working with metal dusts and powders.	
RECOMMENDED MONITORING PROCEDURES	ENVIRONMENTAL SURVEILLANCE: Exposure to the elements identified in Section 3 can be best determined by having air samples taken in the employee breathing zone.	MEDICAL SURVEILLANCE: Lung function tests, chest x-rays and routine physical examinations may be useful to determine effects of dust exposure.

9. PHYSICAL PROPERTIES

MELTING POINT: >2100˚F <2600˚F	VAPOR DENSITY (AIR=1): Not Applicable
SUBLIMES @: Not Applicable	SPECIFIC GRAVITY: (H_2O=1) 7-9
BOILING POINT: Not Applicable	pH = Not Applicable
EVAPORATION RATE: Not Applicable	SOLUBILITY IN WATER = None
VAPOR PRESSURE (mmHg): Not Applicable	% VOLATILES BY VOLUME: None
PHYSICAL STATE : Solid - Silver Gray Color or No Color	PARTICLE CHARACTERISTICS: Varies by process.

10. STABILITY AND REACTIVITY

10.1 and 10.2 REACTIVITY AND STABILITY	Stability – These wire alloy products are stable, non-reactive materials. For those processes that create a dust form of these products, Haynes recommends a dust sample be tested to determine if the dust is explosible according to the National Fire Protection Association (NFPA) Standard 654.
10.3, 10.4 AND 10.5 POSSIBILITY OF HAZARDOUS REACTIONS, INCOMPATIBILITY, AND MATERIALS TO AVOID	These structural wire alloys were designed for use in, and possess outstanding resistance to, mineral acids. Be aware, however, that if corrosion does occur, hydrogen might be evolved, causing a potentially explosive environment in confined, closed systems.
10.6 HAZARDOUS DECOMPOSITION PRODUCTS	Various elemental metals and metal oxides may be generated from welding, cutting, grinding, melting, or dross handling operations. Refer to Table 3 for occupational exposure limits.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA	Eye: Rabbit (cobalt) unknown amount produced severe reaction with abscess involving lens, ciliary body, vitreous humor, and retina.
	Skin: No data.
	Ingestion: Guinea Pig (nickel): LD_{Lo}: 5 mg/kg Rat (cobalt): LD_{50}: 6171 mg/kg Rabbit (cobalt)): LD_{50}: 750 mg/kg Human (copper): TD_{Lo}: 120 µg/kg affects the gastrointestinal tract (nausea or vomiting). Human (chromium): LD_{Lo}: 71 mg/kg Rat (Iron): LD_{50}: 30,000 mg/kg Rat (manganese) LD_{50}: 9,000 mg/kg Rat (Titanium): LD_{50}: >5,000 mg/kg
	Inhalation: Rabbit (nickel): TC_{Lo}: 130 µg/m^3 35 weeks (intermittent-6 hours) Pig (cobalt) TC_{LO}: 100 µg/m^3/6 hours for 13 weeks - (intermittent) Human (chromium VI): TC_{Lo}: 110 µg/m^3 3 years (continuous) tumorigenic (carcinogenic per RTECS) Human (manganese): TC_{LO}: 2,300 µg/m^3
	Subchronic: Rat (molybdenum) inhalation: 12-16 g/m^3/1 hour/30 days, resulted in slight growth depression, and thickening of the intraaveolar septa, which contained connective tissue fibers.
	Other: Intravenous; Dog (nickel) LD_{Lo}: 10 mg/kg Implant; Rat (chromium) TD_{Lo}: 1200 µg/kg intermittent over 6 weeks. Rat (cobalt) intramuscular: 126 mg/kg, tumorigenic at site of application.
CHRONIC/ CARCINOGENICITY (See Table 4)	Teratology: Rat (molybdenum) oral: 5800 µg/kg given to female 30 weeks prior to mating and during days 1-20 of pregnancy caused specific musculoskeletal system development abnormalities.
	Reproduction: Rat (cobalt) unspecified exposure route, 0.05 mg/kg continuous, administered throughout gestation to female was embryotoxic.
	Mutagenicity: Hamster (chromium III) lung cell: 34 mg/L caused sister chromatid exchange. Human (cobalt) DNA damage: Human Leukocyte 3 mg/L. Human (Chromium VI) DNA damage: Human Leukocyte 50 µmol/L.

12. ECOLOGICAL INFORMATION

In solid form this material poses no special environmental problems. Metal powders, fumes, or dusts may have significant impact on air and water quality. Airborne emissions, spills, and releases to the environment (discharge to streams, sewer systems, ground water, surface soil, etc.) should be controlled immediately.

Ecotoxicity: Few plants accumulate cobalt at greater than 100 ppm, the level at which severe phytotoxicity would occur. There is little tendency for chromium III bioaccumulation along the food chain.

Molybdenum: (fathead minnow), LC_{50}: 370 mg/L/96 hours. Terrestrial plants can contain enough molybdenum to be toxic to animals but still grow normally.

Environmental Degradation: In water, cobalt is adsorbed greatly to hydrolysate or oxidate sediments. It may be taken into solution in small amounts through bacteriological activity. In water, chromium III oxide is expected to eventually precipitate to sediments. In air, chromium III oxide is primarily removed by fallout and precipitation. Soils with a high chromium content (>0.2%) are expected to be infertile. The half-life of chromium in soils may be several years.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Whenever possible, recover scrap for reuse or recycling. If necessary, dispose of waste material in accordance with local, state, or federal regulations. P501 For specific labeling, packing, storage, transportation, and disposal procedures, contact an Environmental Engineer or consultant familiar with waste disposal regulations.

14. TRANSPORT INFORMATION (Not Meant to be All Inclusive)

As a wrought product, these alloys are not regulated by the U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA). The following information should be used by individuals with "Function-specific Training" required by 49 CFR 172.704, and Dangerous Goods Regulations published by the International Air Transport Association (IATA), and the International Maritime Dangerous Goods (IMDG) Code.

SHIPPING NAME	If alloy dust or powder is created, it may be a flammable solid or spontaneously combustible material (DOT hazard class 4.1 and 4.2, respectively). A sample of metal powder should be tested according to the U.N. manual of tests and criteria. See US Department of Transportation 49 CFR 173.124 (a) and (b).
IDENTIFICATION NUMBER	Not Available (Determine by test results)
HAZARD CLASS	Not Available (Determine by test results)
LABEL(S) REQUIRED	Not Available (Determine by test results)

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS	**OSHA**: Listed as air contaminants (29 CFR 1910.1000). Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
	TSCA (Toxic Substance Control Act): Components of this material are listed on the TSCA inventory.
	CERCLA: Hazardous Substance (40 CFR 302.4): Chromium, Copper, Nickel. Extremely Hazardous Substance (40 CFR 355): Not Listed
	SARA HAZARD CATEGORY: Listed below are the hazard categories for Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III):
	Immediate Hazard: X Delayed Hazard: X Fire Hazard: - Pressure Hazard: - Reactivity Hazard: -
	Chemicals subject to the reporting requirements of Section 313 or Title III of SARA and 40 CFR Part 372: Aluminum (as a fume or dust), cobalt, chromium, copper, manganese, nickel.
U.S. STATE REGULATIONS	**WARNING**: ⚠ This product can expose you to chemicals including chromium, cobalt nickel, and titanium, which are known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov.
	Pennsylvania Worker and Community Right to Know: Aluminum, Cobalt, Copper, Chromium, Manganese, Nickel, and Vanadium (fume or dust) are designated environmental hazards on the Hazardous Substance List. Title 34, Part XIII, Chapter 323.
UNITED KINGDOM, E.U. and Other INTER-NATIONAL REGULATIONS	**Labeling in Accordance with the GHS** The following hazard classification and risk phrases required by the GHS apply to dust and particulate created by fabrication of these products. Danger: May cause allergy or asthma symptoms or breathing difficulties if inhaled, Category 1. Warning: May cause an allergic skin reaction, Category 1. Warning: causes skin irritation, Category 2. All products except: HASTELLOY® HYBRID-BC1®, HASTELLOY® G-35®, HAYNES® 242®, HAYNES® 625, HAYNES® 718, HAYNES® X-750, HAYNES® 625(Low Iron), HAYNES® 601, HAYNES® I-36, HAYNES® M400, HAYNES® M413, HAYNES® N- 61, HAYNES® NFE 258, HAYNES® NIT 32, HAYNES® NIT 50, HAYNES® NIT 60, HAYNES® 17/7 PH, HAYNES® 20CB3, HAYNES® 52, HAYNES® 72, HAYNES® 80/20, HAYNES® 80/20 Cb, HAYNES® 95/5, HAYNES® 200, and alloys listed on page 10: Warning, Harmful if swallowed, acute toxicity Category 4. **Canada WHIMS** These products have been classified in accordance with the hazard criteria of the CPR, and the SDS contains all of the information required by the CPR.

15. REGULATORY INFORMATION (continued)

UNITED KINGDOM, EU, and OTHER INTER-NATIONAL REGULATIONS

International Inventories

Europe (EINECS), China (IECSC), Korea (KECL), Japan (ENCS), Canada (DSL/NDSL), Australia AIIC, US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710).

Component	CAS No	EINECS	TSCA	IECSC	DSL	KECL	ENCS	AIIC
Aluminum (Al)	7429-90-5	231-072-3	Listed	Listed	Listed	Listed	-	Listed
Chromium (Cr)	7440-47-3	231-157-5	Listed	Listed	Listed	Listed	-	Listed
Cobalt (Co)	7440-48-4	231-158-0	Listed	Listed	Listed	Listed	Listed	Listed
Copper (Cu)	7440-50-8	231-159-0	Listed	Listed	Listed	Listed	Listed	Listed
Iron (Fe)	1309-37-1	215-168-2	Listed	Listed	Listed	Listed	-	Listed
Manganese (Mn)	7439-96-5	231-105-1	Listed	Listed	Listed	Listed	-	Listed
Molybdenum (Mo)	7439-98-7	231-107-2	Listed	Listed	Listed	Listed	-	Listed
Nickel (Ni)	7440-02-0	231-111-4	Listed	Listed	Listed	Listed	-	Listed
Palladium	7440-05-3	231-115-6	Listed	Listed	Listed	Listed	-	Listed
Silicon (Si)	7440-21-3	231-130-8	Listed	Listed	Listed	Listed	-	Listed
Tin (Sn)	7440-31-5	231-141-8	Listed	Listed	Listed	Listed	-	Listed
Titanium (Ri)	7440-32-6	241-036-9	Listed	Listed	Listed	Listed	-	Listed
Tungsten (W)	7440-33-7	231-143-9	Listed	Listed	Listed	Listed	-	Listed
Vanadium (V)	7440-62-2	231-171-1	Listed	Listed	Listed	Listed	-	Listed

Authorization/Restrictions according to EU REACH Not applicable

Seveso III Directive (2012/18/EC)

Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals: Not applicable.

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)? Not applicable

The contents and format of this SDS are in accordance with EEC Commission Directive 2008/1272/EC, and EEC Commission Regulation 1907/2006/EC (REACH) Annex II. This product is classified according to Regulation (EC) Number 2020/878.

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.

16. OTHER INFORMATION

SDS STATUS

This SDS replaces the April 7, 2025 revision for wire & rod. Sections 2, 4, 7, 8, 9, 10, and 15, have been changed.

The above information has been prepared by APTIM, LLC, under contract with Haynes International and is a compilation of information from various sources believed to be accurate. As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for any material described herein. Information contained herein is believed to be true and accurate, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Compliance with all applicable Federal, State, Provincial, and local laws and regulations remain the responsibility of the user.

LABEL INFORMATION

Structrual Wire

HASTELLOY® HYBRID-BC1®、HASTELLOY® B-3®、HASTELLOY® C-4、HASTELLOY® C-22®、HASTELLOY® C-22®HS、HASTELLOY® C-276、HASTELLOY® C-2000®、HASTELLOY® G-30®、HASTELLOY® G-35®、HASTELLOY® N、HASTELLOY® S、HASTELLOY® W、HASTELLOY® WR-66®, and HASTELLOY® X alloys。

ELGILOY®, HAYNES® 17/7 PH、HAYNES® 20、HAYNES® 20CB3、HAYNES® 25, HAYNES® 52、HAYNES® 72、HAYNES® 80/20、HAYNES® 80/20 CB、HAYNES® 92, HAYNES® 95/5, HAYNES® 188、HAYNES® 200、HAYNES® 202, HAYNES® , HAYNES® 214®、HAYNES® 214-W®、HAYNES® 230®-W、HAYNES® 233®, HAYNES® 242®、HAYNES® 244®, HAYNES® 282®、HAYNES® 292®, 、HAYNES® 302、HAYNES® 302 HQ、HAYNES® 302 MO、HAYNES® 302 N、HAYNES® 302 NC、HAYNES® 302 V、HAYNES® 304、HAYNES® 304 L、HAYNES® 304 V、HAYNES® 305、HAYNES® 308 L、HAYNES® 316、HAYNES® 316 LVM、HAYNES® 316 L、HAYNES® 320、HAYNES® 347、HAYNES® 416、HAYNES® 420、HAYNES® 420 VMH、HAYNES® 420 VML、HAYNES® 420 DVM、HAYNES® 420 NWH、HAYNES® 430、HAYNES® 455、HAYNES® 556®, HAYNES® 600、HAYNES® 601、HAYNES® 622、HAYNES® 625、HAYNES® 625（low iron）、HAYNES® 718, HAYNES® 718 (Low Cobalt), HAYNES® 800、HAYNES® 825,and HAYNES® 875 alloys。

HAYNES® C-263、HAYNES® HMA879®、HAYNES® HR-120®、HAYNES® HR-160®、HAYNES® HR-224®、HAYNES® HR-235®, HAYNES® I-36、HAYNES® L605、HAYNES® M-400、HAYNES® M-413, HAYNES® M418、HAYNES® MP35N, HAYNES® N 61, HAYNES® N 86, HAYNES® NFE 258, HAYNES® NIT 32、HAYNES® NIT 50、HAYNES® NIT 60, HAYNES® X-750, MULTIMET®, ULTIMET®, and HAYNES® Waspaloy alloys。.

The following hazard classification and risk phrases required by the Globally Harmonized System (GHS) apply **only** when these products create dust and particulate when subjected to cutting, grinding, machining, crushing, or similar operations.

Danger: May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Warning: May cause an allergic skin reaction.

Warning: Causes skin irritation.

Warning: Harmful if swallowed, acute toxicity. All products except: HASTELLOY® HYBRID®-BC1, HASTELLOY®G-35®, HAYNES® 92, HAYNES® 182, HAYNES® 242, HAYNES® 625, HAYNES® 718, HAYNES® X-750, HAYNES® 625(Low Iron)-alloy, HAYNES® 601, HAYNES® I-36, HAYNES® M400, HAYNES® M413, HAYNES® N- 61, HAYNES® NFE 258, HAYNES® NIT 32, HAYNES® NIT 50, HAYNES® NIT 60, HAYNES® 17/7 PH, HAYNES® 20CB3, HAYNES® 52, HAYNES® 72, HAYNES® 80/20, HAYNES® 80/20 CB, HAYNES® 95/5, HAYNES® 200 alloy, and all alloys listed on page 9 of the Safety Data Sheet (SDS):



DANGER WARNING

Do not eat, drink, or smoke when using this product. Avoid breathing dust or fume.

Wear safety glasses. Cut-resistant gloves and respiratory protection may be required for specific jobs. Wash hands thoroughly after touching dust created by these products.

If exposed or concerned, get medical advice. Whenever possible recover alloys for reuse of recycling. If necessary, dispose of waste material in accordance with local, state or federal regulations.

First Aid: (The following instructions apply only to dust and welding fume forms of the product)

Inhalation: Breathing difficulty caused by inhalation of dust or fume requires removal to fresh air. If breathing has stopped, perform artificial respiration and obtain medical assistance at once.

Ingestion: Never give anything by mouth to an unconscious person. Contact a poison control center. Unless the poison control center advises otherwise, have that conscious person slowly drink 1 to 2 glasses of water to dilute, inducement of vomiting is not necessary. Obtain medical assistance at once.

Skin: Skin cuts and abrasions can be treated by standard first aid. Quickly remove contaminated clothing but do not shake clothing. Skin contamination with dust or powder can be removed by washing with soap and water. If irritation or reddened, blistered skin occurs, obtain medical assistance.

Eyes: Do not allow victims to rub or keep eyes tightly shut. Dust or powder should be flushed from the eyes with copious amounts of clean water. If irritation persists, obtain medical assistance.

WARNING: This product can expose you to chemicals including chromium, cobalt nickel, and titanium, which are known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov.

- The products identified on the Haynes® International SDS HW-7032 may contain, in varying concentrations, the following elemental constituents: aluminum, cobalt, chromium, copper, iron, manganese, molybdenum, nickel, titanium, and tungsten. For specific concentrations of these and other elements present, refer to the Safety Data Sheet (SDS) for this product.
- Inhalation of metal dust or fume generated from cutting, grinding, melting, or machining these alloys may cause adverse health effects such as reduced lung function, nasal, and mucous membrane irritation. Exposure to dust generated by the use of these alloys may also cause eye irritation, skin rash, and effects on other organ systems.
- Avoid breathing dust of fume. If the use of this material produces dust or fume, use appropriate ventilation controls, personal protective equipment, or both. For additional information refer to the Safety Data Sheets (SDS H2071 and H1072) for these products.

HAYNES International

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Table 1 Structural Wire Products

ALLOY	AWS/UNS Alloy No.	Normal Composition, Weight Percent												
		Ni▲	Co▲	Cr▲	Mo	W	Fe	Si	Mn▲	Al▲	Ti	Cu▲	B	Others (V▲)
ELGILOY® alloy	(1299)	15	40	20	6.4	0.1 Max	15	1 Max	2	0.1 Max	0.1 Max	-	0.001 Max	Cb 0.1 Max; V 0.1 Max
HASTELLOY® HYBRID-BC1® alloy	2362**	62	--	15	22	--	2*	0.08*	0.25	0.5*	--	--	--	
HASTELLOY® B-3® alloy	N10675	65	3	<3	30	3	<3	0.1	<3	<1	<1	<1	--	
HASTELLOY® C-4 alloy	N06455	65	2*	16	16	0.5*	3*	0.08*	<1	--	0.7*	0.5*	--	--
HASTELLOY® C-22® alloy	N06022	56	2.5*	22	12	13	3	0.02	0.5*	--	--	0.5*	--	V-0.35*
HASTELLOY® C-22HS® alloy	2321**	61	1*	21	17	1*	2*	0.08*	0.8*	0.5*	--	0.5*	0.006*	--
HASTELLOY® C-86 alloy	N06686	55	--	21	16	3.7	2*	0.08*	0.75*	0.5*	0.14	--	--	--
HASTELLOY® C-276 alloy	N10276	57	2.5*	16	16	3	5	0.08*	<1	--	--	0.5*	--	V-0.35*
HASTELLOY® C-2000® alloy	N06200	59	2*	23	16	--	3*	0.08*	0.5*	0.5*	--	1.6	--	--
HASTELLOY® G-30® alloy	N06030	43	5*	30	5.5	2.5	15	0.8*	1.5*	--	--	2	--	Cb-0.8
HASTELLOY® N alloy	N10003	71	<1	7	17	<1	<5	<1	<1	--	--	<1	--	V-<1
HASTELLOY® G-35® alloy	N06035	58	<1	33.2	8.1	0.6*	2*	0.6*	0.5*	0.4*	--	0.3*	--	--
HASTELLOY® S alloy	N06635	67	2*	16	15	<1	3*	0.4	0.5	0.25	0.35*	--	0.015*	La-0.02
HASTELLOY® W alloy	N10004	63	2.5*	5	24	<1	6	<1	<1	--	--	0.5*	--	V- <0.6*
HASTELLOY® WR-66®	-	-	62	27	3	2	3	0.5	1	-	-	-	-	N-0.18, C-0.1
HASTELLOY® X alloy	N06002	47	1.5	22	9	0.6	18	<1	<1	<0.5	0.15*	0.5	0.008*	Cb-0.5*
HAYNES® 17/7 PH alloy	S17700	8*	0.1*	16	0.5*	--	73	0.5*	1*	1*	<0.1	0.4*	--	
HAYNES® 20 alloy	N08904	25	0.1	21	4.5	--	46	0.4*	2*	0.1	--	1.9	--	
HAYNES® 20CB3 alloy	N08020	33	<0.1	20	3*	--	71	0.4*	2*	<0.1	<0.1	3.4	<0.1	Cb-.06*, V-<0.1, Ta-<0.1
HAYNES® 25 alloy	R30605	10	51	20	<1	15	3*	0.4*	1.5	--	--	--	--	--
HAYNES® 52 alloy	N14052	50	<0.1	<0.1	--	--	49	0.1	0.5*	<0.1	<0.1	<0.1	--	
HAYNES® 72 alloy	N06072	55	<0.1	44	<0.1	--	0.3	<0.1	<0.1	0.2*	0.5	<0.1	<0.1	
HAYNES® 80/20 alloy	N06003	78	<0.1	20	--	--	0.7	1.3	<0.1	0.2	--	<0.1	--	
HAYNES® 80/20 CB alloy	N06003	77	--	19	--	--	0.7	1.3	0.3	--	--	--	--	Cb-0.8
HAYNES® 92 alloy	N0709	>67	--	16	--	--	<8	<1	2	--	3	<1	--	
HAYNES® 95/5 alloy	N03301	94	<0.1	--	--	--	<0.1	0.5*	0.3	5	0.7*	0.1*	--	Cb-<0.1, Ta-<0.1

Table 1 Structural Wire Products (continued)

ALLOY	AWS/UNS Alloy No.	Normal Composition, Weight Percent												
		Ni▲	Co▲	Cr▲	Mo	W	Fe	Si	Mn▲	Al▲	Ti	Cu▲	B	Others (V▲)
HAYNES® 188 alloy	R30188	22	39	22	--	14	3*	0.35	1.25*	--	--	--	0.015*	La-0.03
HAYNES® 200 alloy	N02200	99.4	--	<0.1	<0.1	--	0.2	<0.1	<0.1	--	<0.1	<0.1	--	
HAYNES® 202 alloy	S20200	5*	--	18*	--	--	69*	0.6*	8	--	--	--	--	
HAYNES® 214 alloy	N07214	70[b]	2*	<17	0.5*	0.5*	<4	0.2*	0.5*	<5	0.5*	-	0.004*	Cb 0.15*; Y<0.04; Zir 0.02*
HAYNES® 214-W® alloy	N07214	75	2*	16	0.5*	0.5*	3	0.2*	0.5*	4.5	0.5*	--	0.01*	Y-0.01, Zr-0.1*, Cb-0.15*
HAYNES® 230-W® alloy	N06231	57	5*	22	2	14	3*	0.4	0.5	0.3	0.1*	0.5*	0.003*	La-0.02
HAYNES® 233® alloy	8400	48	19	19	7.5	0.3*	1.5*	0.2*	0.4*	3.3	0.5	-	0.004	Ta-0.5, Y-0.025*, Zr-0.03
HAYNES® 242® alloy	N10242	65	<1	8	25	--	2*	0.8*	0.8*	0.5*	--	0.5*	0.006*	--
HAYNES® 244® alloy	2444	60	1*	8	22.5	6	2*	0.1*	0.8*	0.5*	-	0.5*	0.006*	--
HAYNES® 282® alloy	2082**	57	10	20	8.5	--	1.5*	0.15*	0.3*	1.5	2.1	--	0.005	--
HAYNES® 292® alloy	--	--	--	--	--	--	0.25	--	--	3	94	--	--	V-2.5, C-0.05, N-0.02
HAYNES® 302 alloy	S30200	8	--	18	0.3*	--	72	0.6*	1.8*	--	--	0.4*	--	
HAYNES® 302 HQ alloy	S30430	9	--	17	--	--	70	0.5	0.7	--	--	3	--	
HAYNES® 302 MO alloy	S30200	9	0.1	17	1.3	--	71	0.5	1.2	<0.1	--	0.1	--	
HAYNES® 302 N alloy	S30200	9	--	18	--	--	70	0.6*	1.9	--	--	0.4	--	
HAYNES® 302 NC alloy	S30200	8	--	17	<0.1	<0.1	74	0.4	0.3	<0.1	<0.1	<0.1	<0.1	V-0.1, Ta-<0.1
HAYNES® 302 V alloy	S30200	8	<0.1	18	0.4	--	72	0.4	1	<0.1	--	0.2	--	
HAYNES® 304 alloy	S30400	9	--	18	0.3*	--	71	0.5*	1.8*	--	--	0.3*	--	
HAYNES® 304 L alloy	S30403	9	0.2*	18	0.4*	--	70	0.7*	1.8*	<0.1	--	0.5*	--	Y-<0.1
HAYNES® 304 V alloy	S30400	8	0.15	18	0.2*	--	72	0.6*	0.7*	--	--	0.3*	--	
HAYNES® 305 alloy	S30500	12*	--	18	0.3*	--	68	0.5*	1.4*	--	--	0.4*	--	
HAYNES® 308 L alloy	S30800	10	--	21	--	--	66	0.8	1.9	--	--	--	--	
HAYNES® 316 alloy	S31600	10	--	17*	2	--	69	0.5*	1.5*	--	--	0.5*	--	
HAYNES® 316 LVM alloy	S31603	15*	<0.1	18*	3*	<0.1	62	0.5*	1.7	<0.1	<0.1	0.3*	<0.1	Cb-<0.1; V-0.3*;
HAYNES® 316 L alloy	S31603	10	--	16	2	--	70	0.5*	1.5*	--	--	<0.1	--	
HAYNES® 320 alloy	N08020	33	<0.1	20	3*	--	71	0.4*	2*	<0.1	<0.1	3.4	<0.1	

Table 1 Structural Wire Products (continued)

ALLOY	AWS/UNS Alloy No.	Normal Composition, Weight Percent												
		Ni▲	Co▲	Cr▲	Mo	W	Fe	Si	Mn▲	Al▲	Ti	Cu▲	B	Others (V▲)
HAYNES® 347 alloy	S34700	9	<0.1	17	0.3	--	70	0.6	1.5	<0.1	<0.1	0.2	<0.1	Cb-0.6, V-<0.1, Ta-<0.1
HAYNES® 416 alloy	S41600	0.3*	--	13	<0.1	--	85	0.5*	0.9*	<0.1	--	0.1	--	
HAYNES® 420H	S4208	0.5*	--	<14	0.75*	--	82	0.5*	<0.6	--	--	0.75*	--	
HAYNES® 420 alloy	S42000	0.1	--	13	--	--	86	0.2	0.5*	<0.1	--	0.1	--	
HAYNES® 420 VMH alloy	S42000	0.3*	--	14*	<0.1	--	85	0.5*	0.4*	<0.1	--	<0.1	--	
HAYNES® 420 VML alloy	S42000	0.2*	--	14*	<0.1	--	85	0.5	0.4	<0.1	--	<0.1	--	
HAYNES® 420 DVM alloy	S42000	0.3*	--	14*	<0.1	--	85	0.5*	0.4*	<0.1	--	<0.1	--	
HAYNES® 420 NWH alloy	S42000	0.3*	--	14*	<0.1	--	85	0.5*	0.4*	<0.1	--	<0.1	--	
HAYNES® 430 alloy	S43000	0.2*	--	17	<0.1	--	82	0.5*	0.5*	<0.1	--	0.1	--	
HAYNES® 455 alloy	S45500	8	--	11	<0.1	--	77	<0.1	<0.1	--	1.2	2.2	--	Cb-0.2
HAYNES® 556® alloy	R30556	20	18	22	3	2.5	31	0.4	1	0.2	--	--	0.02*	Zr-0.02, La-0.02, Ta-0.6, Cb-0.3*
HAYNES® 600 alloy	N06600	74	0.05*	16	0.3	<0.1	9	0.4*	0.8	0.2	0.3*	0.02*	--	
HAYNES® 601 alloy	N06601	60	--	23	--	--	16	0.3*	0.6	1.5	0.3	<0.1	0.003	
HAYNES® 617 alloy	N06617	54	12,5	22	9	-	2*	0,2*	0,2*	1,2	0,4	0,5*	0,006*	Cb-0,08
HAYNES® 622 alloy	N06022	52	2.5	<2	14	<3.5	<3	0.08*	0.05*	--	--	--	--	V 0.35*;
HAYNES® 625 alloy	N06625	62	1*	22	9	--	5*	0.5*	0.5*	0.4*	0.4*	0.5*	--	Cb & Ta-3.7
HAYNES® 625 (low iron)	2653**	62	<1	21	9	--	0.75*	0.5*	0.5*	0.4*	0.4*	0.5*	--	Cb+Ta-3.7
HAYNES® 718 alloy	N07718	52	<1	18	3	--	19	0.35*	0.35*	0.5	0.9	0.1*	0.0004	Cb+Ta-5
HAYNES® 718 alloy (Low Cobalt)	N07718	52	<0.1	18	3	--	19	0.35*	0.35*	1.4	0.3	0.1*	0.0004	Cb+Ta-5
HAYNES® 800 alloy	N08800	32	0.2*	19.5	0.2*	--	46*	0.8*	1.0	0.6*	0.5	0.2*	--	
HAYNES® 825 alloy	N08825	41*	0.06*	23*	3*	--	31*	0.3*	0.6*	0.1	1*	2.5*	--	
HAYNES® 875 alloy	--	--	--	--	22*	--	--	71	0.3*	0.2*	6*	--	<0.1	--
HAYNES® C-263 alloy	N07263	52	20	20	6	--	0.7*	0.2	0.4	0.6*	2.4*	0.2*	0.005*	Zr-0.04*, (Al+Ti)-2.6
HAYNES® I-36 alloy	K93601	36	<0.1	<0.1	--	--	63	0.14	0.3	0	--	<0.1	--	
HAYNES® HMA-879® alloy	(8790)	54	7.5	22	9	3	3 Max	0.3 Max	1 Max	1.1	0.3	-	0.006 Max	Al + Ti 1.4

Table 1 Structural Wire Products (continued)

ALLOY	AWS/UNS Alloy No.	Normal Composition, Weight Percent												
		Ni▲	Co▲	Cr▲	Mo	W	Fe	Si	Mn▲	Al▲	Ti	Cu▲	B	Others (V▲)
HAYNES® HR-120® alloy	N08120	37	3.0	25	<1	<0.5	33	0.6	0.7	0.1	0.2*	<0.5	<0.1	Cb-0.7
HAYNES® HR-160® alloy	N12160	37	29	28	<1	<1	3.5*	2.75	1*	0.4	0.5	0.5*	-	Cb+Ta-0.3*
HAYNES® HR-224® alloy	2224**	47	2*	20	0.5*	0.5*	27.5	0.3	0.5*	3.8	0.3	--	0.004*	Cb-0.15*, La-0.01*, Zr-0.025*
HAYNES® HR-235® alloy	2431	57	1.1*	31	5.6	-	1.5*	0.4	0.5	0.3	-	3.8	-	--
HAYNES® L605 alloy	R30605	10	51	20	<1	15	3*	0.4*	1.5	--	--	--	--	--
HAYNES® M400 alloy	N04400	67*	0.2*	--	--	--	1.4*	0.2*	1*	<0.1	--	33*	--	
HAYNES® M413 alloy	C71581	31	<0.1	-	-	-	0.6	<0.1	0.7	<0.1	0.3	68	-	
HAYNES® M418 alloy	N04060	69*	--	--	--	--	2.5*	1.3*	4*	1.3*	<3	<19	--	
HAYNES® MP35N alloy	R30035	37*	34*	20*	10*	<0.1	0.3*	0.1*	0.1*	<0.1	0.7*	<0.1	<0.1	
HAYNES® N 61 alloy	N02061	96	<0.1	<0.1	<0.1	--	<0.1	0.4*	0.4	0.4*	3	<0.1	--	Cb-<0.1, Ta-<0.1
HAYNES® N-86 alloy	N07086	60	2 Max	2.5	10	-	5 Max	1 Max	1 Max	-	-	0.2 Max		Zr 0.1 Max
HAYNES® NFE 258 alloy	W82002	56*	<0.1	<0.1	<0.1	--	43	0.1*	0.7	<0.1	<0.1	<0.1	--	
HAYNES® NIT 32 alloy	S20000	1.5	<0.1	18	0.2	<0.1	69	0.4	12	--	<0.1	0.2	--	Cb-<0.1, V-<0.1
HAYNES® NIT 50 alloy	S20000	12	0.3*	21	2	--	59	0.5*	5	--	--	0.4	--	Cb-.016, V-0.15
HAYNES® NIT 60 alloy	S21800	8	<0.1	16	0.2	<0.1	63	4	8	<0.1	<0.1	0.2	--	V-<0.1
HAYNES® X-750 alloy	N07750	70[b]	1*	16	--	--	8*	0.35*	0.35*	0.8	2.5*	0.5*	--	Cb+Ta-1
MULTIMET® alloy	R30155	20	20	21	3	2.5	30	<1	1.5	--	--	0.5*	--	Cb-1, N 0.15, Ta-0.05*
ULTIMET® alloy	R31233	9	54	26	5	2	3	0.3	0.8	--	--	--	--	N-0.08
HAYNES® Waspaloy alloy	N07001	58	13.5	19	4.3	--	2*	0.1*	0.1*	1.5	3	0.1*	0.006	Zr-0.04*

(▲) Reportable ingredients per Section 313 of SARA - See Section 15 for additional information. XX* - indicates maximum value. XX[b] - indicates minimum value. XX** - Haynes metal No.

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Table 2 Product Hazard Rating
Hazardous Materials Identification System (HMIS)
H = Health Rating F = Flammability Rating R = Reactivity Rating

Alloy	Solid Article				Metal Dust				Metal Oxide Fume		
	H	F	R		H	F	R		H	F	R
ELGILOY® alloy	0	0	0		2*	2	0		3*	2	0
HASTELLOY® HYBRID-BC1® alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® B-3 alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® C-4 alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® C-22® alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® C-22HS® alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® C-86 alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® C-276 alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® C-2000® alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® G-30® alloy	0	0	0		2*	2	0		3*	2	0
HASTELLOY® G-35® alloy	0	0	0		2*	2	0		3*	0	0
HASTELLOY® N alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® S alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® W alloy	0	0	0		2*	1	0		3*	0	0
HASTELLOY® WR-66® alloy	0	0	0		2	2	0		3*	2	0
HASTELLOY® X alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 17/7 PH alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 20 alloy	0	0	0		2*	2	0		3*	0	0
HAYNES® 20 CB3 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 23® alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® 25 alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® 52 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® 72 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 80/20 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 80/20 CB alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 92 alloy	0	0	0		2*	2	0		3*	0	0
HAYNES® 95/5 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® 188 alloy	0	0	0		2*	2	0		3*	0	0

Table 2 Product Hazard Rating (continued)
Hazardous Materials Identification System (HMIS)
H = Health Rating F = Flammability Rating R = Reactivity Rating

Alloy	Solid Article				Metal Dust				Metal Oxide Fume		
	H	F	R		H	F	R		H	F	R
HAYNES® 200 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® 202 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 214® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 214-W® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 230-W® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 242® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 244® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 282® alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® 292® alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® 302 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 302 HQ alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 302 MO alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 302 N alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 302 NC alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 302 V alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 304 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 304 L alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 304 V alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 305 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 308 L alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 316 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 316 LVM alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 316 L alloy	0	0	0		2*	0	01		3*	0	0
HAYNES® 320 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 347 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 416 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 420 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 420H alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 420 VMH alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 420 VML alloy	0	0	0		2	0	0		3*	0	0

Table 2 Product Hazard Rating (continued)
Hazardous Materials Identification System (HMIS)
H = Health Rating F = Flammability Rating R = Reactivity Rating

Alloy	Solid Article				Metal Dust				Metal Oxide Fume		
	H	F	R		H	F	R		H	F	R
HAYNES® 420 DVM alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 420 NWH alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 430 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 455 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® 556® alloy	0	0	0		2*	1	0		3*	1	0
HAYNES® 600 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 601 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 617 alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® 622 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 625 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 625 (Low Iron) alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® 718 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 718 alloy (Low Cobalt)	0	0	0		2*	0	0		3*	0	0
HAYNES® 800 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 825 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® 875 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® C-263 alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® HMA-879® alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® HR-120® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® HR-160® alloy	0	0	0		2*	2	0		3*	2	0
HAYNES® HR-224® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® HR-235® alloy	0	0	0		2*	1	0		3*	0	0
HAYNES® I-36 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® L605 alloy	0	0	0		2	2	0		2*	0	0
HAYNES® M400 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® M413 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® M418 alloy	0	0	0		2*	0	0		3*	0	0
HAYNES® MP35N alloy	0	0	0		2*	2	0		3*	0	0
HAYNES® N 61 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® N 86 alloy	0	0	0		2*	1	0		3*	0	0

Table 2 Product Hazard Rating (continued)
Hazardous Materials Identification System (HMIS)
H = Health Rating F = Flammability Rating R = Reactivity Rating

Alloy	Solid Article				Metal Dust				Metal Oxide Fume		
	H	F	R		H	F	R		H	F	R
HAYNES® NFE 258 alloy	0	0	0		2*	0	0		2*	0	0
HAYNES® NIT 32 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® NIT 50 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® NIT 60 alloy	0	0	0		2	0	0		3*	0	0
HAYNES® X-750 alloy	0	0	0		2*	1	0		3*	0	0
MULTIMET® alloy	0	0	0		2*	1	0		3*	0	0
ULTIMET® alloy	0	0	0		2*	2	0		2*	1	0
HAYNES® Waspaloy alloy	0	0	0		2*	2	0		3*	2	0

As a solid article, all Haynes alloys are rated 0 for health, flammability, and reactivity. Metal dust may be created by grinding operations. Metal oxide fume may be created during welding, thermal cutting, or melting operations.
Note: Ratings applicable for the metal oxide components of each product. Metal oxides are typically found in welding fume.
* = Chronic health effects, see Table 4. HAYNES® and HASTELLOY® are trademarks of Haynes International, Inc.
Summary of Hazardous Material Information System (HMIS) rating numbers:
H = Health Hazard rating; 0 = minimal hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard; 4 = severe hazard
F = Flammability hazard rating: 0 = minimal hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard; 4 = severe hazard
R = Reactivity hazard rating: 0 = minimal hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard; 4 = severe hazard

Table 3 Exposure Limits for Potentially Hazardous Constituents in Structural Wire

Metal or Chemical, Symbol	CAS Number	Exposure Limits as 8-hour TWA (as mg/m^3)			
		U.S. OSHA - Permissible Exposure Limit (PEL)(1)	ACGIH - Threshold Limit Value (TLV®) (1)	United Kingdom HSE Workplace Exposure Limit (WEL) (1)(11)	German DFG-MAK (1)(12)
Aluminum (Al/Al2O3)	7429-90-5/ 1344-28-1	Aluminum Oxide as Al: 15, total Aluminum Oxide as Al: 5, Respirable	Welding Fume as Al: 1[6]	4 Resp (5), 10 Inh (7)	1.5 Resp (5), 4 Inh (7)
Barium compounds (Ba X)	7440-39-3	Soluble compounds as Ba: 0.5	Soluble compounds as Ba: 0.5	0.5	0.51
Boron Oxide (B_2O_3)	1303-86-2	Oxide Dust Total: 15	Oxide Dust Total: 10	None	None
Calcium (Ca)	7440-70-2	None	None	None	None
Calcium Oxide (CaO)	1305-78-8	5	2	2, 1 Resp (5)	1 Inh (7)
Carbon Monoxide (2) (CO)	630-08-0	55 (50 ppm)	29 (25 ppm)	29, (20 ppm)	35 (30 ppm)
Chromium VI	(3)	0.005	0.0002(as Cr) (7)	0.025	Sensitizer
Chromium oxide Cr III (Cr_2O_3)	1308-38-9	0.5 (as Cr)	0.5 (as Cr)(7)	0.5	Sensitizer
Chromium oxide Cr II (CrO)	12018-00-7	0.5 (as Cr)	-	0.5	None
Chromium metal (Cr)	7440-47-3	1 (as Cr)	0.5 (as Cr)(7)	0.5	None
Cobalt (Co) and inorganic compounds	7440-48-4	0.1 metal dust and fume (as Co)	0.02 (as Co)(7)	0.1 (as Co)	Sensitizer
Columbium (Niobium) (Cb/Cb_2O_8, Nb/Nb_2O_8)	7440-03-1/ 1313-96-8	None	None	None	None
Copper oxide fume (CuO)	1317-38-0	0.1 (as Cu)	0.2 (as Cu)	0.2 (as Cu)	None
Copper (Cu)	7440-50-8	1 (as Cu)	1 (as Cu)	1 (as Cu)	None
Iron oxide (dust and fume) (Fe_2O_3)	1309-37-1	10 (as Fe)	5 (5) (as Fe)	5 (as Fe)	None
Lanthanum (La)	7439-91-0	None	None	None	None
Lithium (Li/Li_2O)	7439-92-2/ 12057-24-8	None	1 (as Li_2O) (ceiling) (4), (6)	None	0.21
Magnesium (Mg)	7439-95-4	None	None	None	None
Magnesium Oxide (MgO)	1309-48-4	Fume as MgO: 15	Fume as MgO: 10 (7)	Fume 4 Resp (5), 10(7)	4, 0.3 Resp (5)
Manganese (Mn, MnO)	7439-96-5	5 (ceiling)(4) (as Mn)	0.02 (5) (as Mn)	0.05 Resp (5), 0.2 Inh (7) (as Mn)	0.2, 0.02 Resp (5)
Molybdenum compounds (Mo X)	7439-98-7	Soluble Compounds as Mo: 5	Soluble Compounds as Mo: 0.5(5) Insoluble Compounds as Mo: 3(5); 10 (7)	Soluble Compounds as Mo 5 Insoluble Compounds as Mo: 10	None
Nickel (Ni, NiX)	7440-02-0	1 (elemental, soluble and insoluble compounds) (as Ni)	1.5(7) elemental, 0.1(7) soluble, 0.2(7) insoluble compounds as Ni	0.5 insoluble compounds as Ni	Skin and Resp Sensitizer
Nitric Oxide (2) (NO)	10102-43-2	30	31	None	0.63 (0.5 ppm)

Table 3 Exposure Limits for Potentially Hazardous Constituents in Structural Wire (continued)

Metal or Chemical, Symbol	CAS Number	Exposure Limits as 8-hour TWA (as mg/m^3)			
		U.S. OSHA - Permissible Exposure Limit (PEL)[1]	ACGIH - Threshold Limit Value (TLV®) [1]	United Kingdom HSE Workplace Exposure Limit (WEL) [1][11]	German DFG-MAK [1][12]
Nitrogen Dioxide [2] (NO_2)	10102-44-2	9 (ceiling)	5.6; 9.4 (STEL) [8]	0.96	0.95 (0.5 ppm)
Ozone [2] (O_3)	10028-15-6	0.2 (0.1 ppm)	0.1 (0.05 ppm), Heavy workload [9]	0.4[8]	None
Silicon (Si)	7440-21-3	Total Dust: 15, Respirable Dust: 5	None	4[5], 10 Inh [7]	None
Strontium (Sr/SrO)	7440-24-6/ 1314-11-0	None	None	None	None
Tantalum (Ta)	7440-25-7	Metal and Oxide Dust: 5	None	5, 10[8]	4
Titanium Dioxide (TiO_2)	13463-67-7	15	10	4 resp [5], 10 Inh [7]	None
Titanium (Ti)	7440-32-6	None	None	None	None
Tungsten (W) compounds	7440-33-7	None	3[5] respirable	Insoluble compounds as W: 5; 10 (STEL) [8] Soluble compounds as W: 1; 3 (STEL) [8]	None
Vanadium Pentoxide (V_2O_5)	1314-62-1	0.5 ceiling - respirable dust 0.1 ceiling - fume	0.05 Inhalable Dust or Fume [7]	0.05	2, 0.005[7] (as Vanadium)
Yttrium (Y)	7440-65-5	1	Metal and Compounds as Y: 1	1, 3 (STEL) [8]	None
Zirconium compounds (Zr X)	7440-67-7	Compounds as Zr: 5	Zr Metal and Compounds as Zr: 5; 10 (STEL) [8]	5, 10 (STEL) [8]	None

(1) All limits are Total Dust unless indicated otherwise.
(2) Gases generated by arc welding processes.
(3) Varies with compound.
(4) Ceiling limit - shall not be exceeded instantaneously.
(5) Respirable fraction of particulate - refer to the ACGIH-TLV® booklet for a definition.
(6) Workplace Environmental Exposure Levels (WEEL), published by the American Industrial Hygiene Association.
(7) Inhalable fraction of particulate - refer to the ACGIH-TLV® booklet for a definition.
(8) STEL = Short-term exposure limit - A 15-minute TWA exposure limit.
(9) See additional TLV® listings for moderate or light workloads.
(10) National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL).
(11) United Kingdom Health and Safety Executive (HSE), EH40/2005 (Fourth Edition 2020) Workplace Exposure Limits (WEL)
(12) German Committee for the determination of occupational exposure limits

Table 4 Health Hazards

The following table shows the compounds and gases which have been discussed previously, and which may be encountered, their names and formulas, their CAS number, and briefly describes possible known short term and long-term health effects which may result from excessive exposure.

Name of Compound, Formula and CAS Number	On Any Carcinogens List? If So, Which Ones?	Health Effects Resulting from Excessive Exposure	
		Acute (Short Term)	Chronic (Long Term)
Metal Dust and Welding Fumes			
Welding Fumes (not otherwise classified) CAS No. - none	Yes IARC	May include metallic taste, nausea, tightness of chest, fever, dizziness, dryness or irritation of eyes, nose or throat	Excessive levels may cause bronchial asthma, lung fibrosis, pneumoconiosis or siderosis.
Hexavalent Chromium (Cr VI)	Yes IARC NTP OSHA	Inhalation and Skin Contact: Irritation of mucous membranes	Inhalation: Perforation of the nasal septum. Increased incidence of lung cancer. Skin Contact: Skin ulceration, dermatitis.
Chromium Metal-Cr CAS No. 7740-47-3 Chromium oxide (Cr II) CrO CAS No. 12018-00-7 Chromium oxide (Cr III) Cr_2O_3	Yes IARC	Skin Contact: Allergic reactions (dermatitis) in some people.	None known.
Nickel-Ni CAS No. 7440-02-0 Nickel oxide-NiO CAS No. 1313-99-1	Yes IARC NTP	Inhalation: Respiratory irritation. Allergic reactions in some people. Metallic taste, nausea, tightness in chest, metal fume fever. Skin Contact: Contact dermatitis with permanent sensitization.	Inhalation: Chronic pulmonary irritation. Perforation of nasal septum. Increased incidence of lung and larynx cancer.
Cobalt-Co CAS No. 7440-48-4 Cobalt Oxide - CoO CAS no. 1307-96-6	No	Inhalation: Pulmonary irritant, cough. Eye Contact: Irritation, conjunctivitis Skin: Mild irritation sensitization, allergic dermatitis. Ingestion: Pain, nausea, vomiting, hypotension (low blood pressure).	Chronic exposure to cobalt is more dangerous than isolated exposures. Possible lung fibrosis and respiratory hypersensitivity. Heart disease, elevated red blood cell counts, chest pain and edema.
Copper-Cu CAS No. 7440-50-8 Copper oxide-CuO CAS No. 1317-38-0	No	Inhalation: Metal fume fever, muscle ache, respiratory irritant. Skin: Irritation, Ingestion: Nausea, vomiting, abdominal pain; large doses may cause stomach and intestine ulceration, and kidney and liver damage.	Mild dermatitis and degeneration of mucous membranes. Repeated inhalation can cause chrome respiratory disease.
Manganese-Mn CAS No. 7439-96-5 Manganese dioxide-as Mn for fume MnO_2 CAS No. 1313-13-9	No	Can include metal fume fever, dry throat, coughing, tight chest, low back pain, vomiting, fatigue, headache	Manganism. SENSITIVITY VARIES. Affects central nervous system. Muscular weakness, tremors, symptoms similar to Parkinson's disease. Exposed employees should get quarterly medical examinations for manganism.
Vanadium Pentoxide (V_20_5)	No	Irritant to mucous membranes. Metallic taste, cough, throat and eye irritation, eczema.	Nasal catarrh, nose bleeds, chronic respiratory problems.
Iron-Fe CAS No. 7439-89-6 Iron Oxide-Fe0 CAS No. 1345-25-1 Iron Oxide-Fe_20_3 CAS No. 1309-37-1 Iron Oxide-Fe_30_4 CAS No. 1309-38-2	No	Probably none, except as nuisance dust.	Possible siderosis if exposures are excessive and long term. Regarded as benign. Lungs clear gradually after exposure is ended.