

ADVANCE TURNING & MFG INC  
2515 PRECISION ST  
JACKSON MI 49202

WHILE THE INFORMATION SET FORTH ON THIS MATERIAL SAFETY DATA SHEET IS BELIEVED TO BE ACCURATE, AS OF THE REVISION DATE, CARPENTER TECHNOLOGY CORPORATION MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON. NO WARRANTY, EITHER EXPRESS OR IMPLIED OF MERCHANTABILITY OR FITNESS OR OF ANY NATURE WITH RESPECT TO THE MATERIAL OR DATA HEREIN IS MADE HEREUNDER.

FOR ADDITIONAL INFORMATION, PLEASE CONTACT THE HEALTH AND SAFETY DEPARTMENT AT: 215-371-2000.

## SECTION I - PRODUCT IDENTIFICATION

PRODUCT DESCRIPTION: TYPE 321

## SECTION II - HAZARDOUS INGREDIENTS

| INGREDIENTS | %     | PEL / TLV<br>8 HOUR TWA UNLESS OTHERWISE NOTED |     |
|-------------|-------|--|-----|
|             |       | PEL  | TLV |
| IRON *      | 69.50 | 10.0 MG/M3                                     |     |
| 1309-37-1   |       | 5.0 MG/M3                                      |     |
| CHROMIUM    | 18.00 | 1.0 MG/M3                                      |     |
| 7440-47-3   |       | 0.5 MG/M3                                      |     |
| NICKEL      | 10.50 | 1.0 MG/M3                                      |     |
| 7440-02-0   |       | 1.0 MG/M3                                      |     |
| MANGANESE   | 2.00  | 5.0 MG/M3                                      |     |
| 7439-96-5   |       | 5.0 MG/M3                                      |     |
| COBALT      | .75   | 0.1 MG/M3                                      |     |
| 7440-48-4   |       | 0.1 MG/M3                                      |     |

\* - THESE SUBSTANCES ARE REGULATED IN THEIR OXIDE FORM

THE ABOVE PERCENT CONCENTRATIONS ARE CONSIDERED NOMINAL AND ARE PROVIDED FOR INDUSTRIAL HYGIENE PURPOSES.  
THEY DO NOT REPRESENT A CERTIFICATION OF CONTENT.

## SECTION III - PHYSICAL DATA

BOILING PT.: HIGH  
MELTING PT.: 2400 to 2800 F  
SPECIFIC GRAVITY: 7.5 to 8.5  
VAPOR PRESSURE: NIL

VAPOR DENSITY: NIL  
SOLUBILITY IN WATER: INSOLUBLE  
APPEARANCE AND ODOR: SOLID,  
ODORLESS METAL

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

UNLESS OTHERWISE NOTED, NONE. PRODUCT IS A SOLID METAL.  
NOTES:

## SECTION V - HEALTH HAZARD DATA

SPECIALTY STEEL ALLOYS ARE GENERALLY NOT CONSIDERED HAZARDOUS IN THE FORM SHIPPED (SOLID BARS, BILLETS, RODS, WIRE, ETC.). HOWEVER, IF YOUR PROCESS INVOLVES GRINDING, MELTING, WELDING, CUTTING, OR ANY OTHER PROCESS THAT CAUSES A RELEASE OF DUST OR FUME, HAZARDOUS LEVELS OF DUST OR FUME OF THE CONSTITUENTS OF THESE ALLOYS COULD BE GENERATED. THE FOLLOWING IS A LIST OF POTENTIAL HEALTH EFFECTS FOR ALL HAZARDOUS ELEMENTS THAT ARE POSSIBLY CONTAINED IN ANY OF OUR ALLOYS. PLEASE REFER TO SECTION II TITLED "HAZARDOUS INGREDIENTS" FOR A LIST OF THOSE SPECIFIC ELEMENTS CONTAINED IN THIS PARTICULAR ALLOY.

## HEALTH EFFECTS:

\*ALUMINUM: METAL DUST AND OXIDE IS GENERALLY CONSIDERED A "NUISANCE" PARTICULATE. MAY CAUSE IRRITATION OF THE EYES, NOSE, AND THROAT IN EXCESSIVE CONCENTRATIONS.

\*BERYLLIUM: CAN CAUSE DERMATITIS, ALSO CAUSES A SEVERE CHRONIC LUNG DISEASE KNOWN AS "CHRONIC BERYLLIUM DISEASE" WHICH IS OFTEN FATAL.

\*IRON OXIDE: HAS CAUSED IRRITATION OF THE EYES, NOSE, AND SKIN OF EXPERIMENTAL ANIMALS. IT MAY HAVE THE SAME EFFECT ON HUMANS.

\*CHROMIUM: FERROCHROME ALLOYS HAVE BEEN ASSOCIATED WITH LUNG CHANGES IN WORKERS EXPOSED TO THESE ALLOYS.

\*COBALT: FUME OR DUST CAUSES IRRITATION OF THE NOSE AND THROAT AND MAY CAUSE AN ALLERGIC SKIN RASH. ALSO HAS BEEN REPORTED TO CAUSE RESPIRATORY DISEASE WITH SYMPTOMS RANGING FROM COUGH AND SHORTNESS OF BREATH TO PERMANENT DISABILITY AND DEATH. THE SYMPTOMS FREQUENTLY GO AWAY WHEN EXPOSURE HAS STOPPED, BUT SOMETIMES THE SYMPTOMS PROGRESS AFTER EXPOSURE HAS CEASED.

\*COPPER: FUME OR DUST CAUSES IRRITATION OF THE EYES, NOSE, AND THROAT AND A FLU-LIKE ILLNESS CALLED METAL FUME FEVER. SYMPTOMS INCLUDE FEVER, MUSCLE ACHES, NAUSEA, CHILLS, DRY THROAT, COUGH, WEAKNESS, AND SWEET OR METALLIC TASTE IN THE MOUTH.



## SECTION V - HEALTH HAZARD DATA (CONTINUED)

**HAFNIUM:** HAFNIUM SALTS HAVE CAUSED IRRITATION OF THE EYES AND SKIN IN EXPERIMENTAL ANIMALS. OTHER HAFNIUM COMPOUNDS HAVE CAUSED LIVER DAMAGE IN ANIMALS ON PROLONGED FEEDING.

**IRON OXIDE:** REPEATED EXPOSURE TO IRON OXIDE FUME OVER A PERIOD OF YEARS MAY CAUSE X-RAY CHANGES OF THE LUNGS, BUT DOES NOT CAUSE THE EXPOSED PERSON TO BECOME ILL.

**MANGANESE:** INHALATION OF MANGANESE FUME MAY CAUSE "METAL FUME FEVER" WITH SYMPTOMS OF CHILLS, FEVER, NAUSEA, COUGH, DRY THROAT, WEAKNESS, MUSCLE ACHES, AND A SWEET OR METALLIC TASTE IN THE MOUTH. PROLONGED OR REPEATED EXPOSURE MAY AFFECT THE NERVOUS SYSTEM, WITH DIFFICULTY IN WALKING AND BALANCING, WEAKNESS OR CRAMPS IN THE LEGS, HOARSENESS OF THE VOICE, TROUBLE WITH MEMORY OR JUDGEMENT, UNSTABLE EMOTIONS OR UNUSUAL IRRITABILITY. THE RESPIRATORY SYSTEM MAY ALSO BE AFFECTED BY A PNEUMONIA LIKE ILLNESS WITH SYMPTOMS OF COUGHING, FEVER, CHILLS, BODY ACHE, CHEST PAIN AND OTHER COMMON SIGNS OF PNEUMONIA.

**MOLYBDENUM:** OXIDES OF MOLYBDENUM HAVE CAUSED IRRITATION OF THE EYES, NOSE, AND THROAT, WEIGHT LOSS, AND DIGESTIVE DISTURBANCES IN EXPERIMENTAL ANIMALS.

**NICKEL:** FUMES ARE RESPIRATORY IRRITANTS AND MAY CAUSE RESPIRATORY DISEASE. SKIN CONTACT CAN ALSO CAUSE AN ALLERGIC SKIN RASH. NICKEL AND ITS COMPOUNDS HAVE BEEN REPORTED TO CAUSE CANCER OF THE LUNGS AND SINUSES.

**TANTALUM:** GENERALLY CONSIDERED TO HAVE A LOW ORDER OF TOXICITY BUT HAS PRODUCED TRANSIENT LESIONS OF THE LUNGS IN EXPERIMENTAL ANIMALS.

**TIN:** GENERALLY CONSIDERED TO EXHIBIT A LOW ORDER OF TOXICITY. MAY CAUSE IRRITATION OF THE EYES, NOSE, THROAT AND SKIN.

**TITANIUM DIOXIDE:** CONSIDERED TO BE A "NUISANCE" PARTICULATE. CAN CAUSE IRRITATION OF THE EYES, NOSE, AND THROAT IN HIGH CONCENTRATIONS. SLIGHT LUNG CHANGES MAY OCCUR.

**TUNGSTEN:** METAL AND INSOLUBLE COMPOUNDS ARE GENERALLY CONSIDERED TO HAVE A LOW ORDER OF TOXICITY, BUT HAVE PRODUCED LUNG CHANGES IN EXPERIMENTAL ANIMALS.

**VANADIUM PENTOXIDE:** DUST AND FUME MAY CAUSE IRRITATION OF THE EYES, NOSE, THROAT, AND RESPIRATORY TRACT. IT MAY ALSO CAUSE BRONCHITIS WITH WHEEZING AND CHEST PAIN. A GREENISH DISCOLORATION OF THE TONGUE MAY OCCUR. AFTER SYMPTOMS HAVE OCCURRED FOLLOWING INITIAL EXPOSURE, REPEATED EXPOSURE MAY CAUSE MORE SEVERE SYMPTOMS OF THE SAME NATURE. REPEATED EXPOSURES MAY CAUSE CHRONIC BRONCHITIS, OR ALLERGIC SKIN RASH.

**ZIRCONIUM:** GENERALLY CONSIDERED TO HAVE A LOW ORDER OF TOXICITY. SKIN RASH HAS BEEN REPORTED FROM EXPOSURE TO ZIRCONIUM CONTAINING DEODORANTS.

**REFERENCES:** HEALTH HAZARD DATA FOR THE ELEMENTS MARKED WITH AN (\*) WAS TAKEN FROM ACGIH'S DOCUMENTATION OF TLV'S. HEALTH HAZARD DATA FOR THE REMAINING ELEMENTS WAS TAKEN FROM THE NIOSH / OSHA OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS. FOR ADDITIONAL SOURCES OF INFORMATION ON POTENTIAL HEALTH EFFECTS OF THESE SUBSTANCES, PLEASE REFER TO OSHA'S HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) APPENDIX C.

**CARCINOGENIC REFERENCES:** CHROMIUM, COBALT-CHROMIUM ALLOYS, AND NICKEL HAVE BEEN IDENTIFIED BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) AND / OR THE NATIONAL TOXICOLOGY PROGRAM (NTP) AS POTENTIAL CANCER CAUSING AGENTS.

### EXPOSURE ROUTES:

EXPOSURE TO SPECIALTY STEEL ALLOYS OCCURS PRIMARILY FROM INHALATION OF DUST OR FUMES. HOWEVER, CONSTITUENTS OF THESE ALLOYS MAY CAUSE EFFECTS DIRECTLY UPON THE SKIN OR EYES. CERTAIN CONSTITUENTS MAY ALSO BE HARMFUL IF SWALLOWED.

### FIRST AID:

INHALATION - MOVE PERSON TO FRESH AIR UNTIL RECOVERED, CONSULT A PHYSICIAN.

SKIN - WASH WITH WATER AND MILD DETERGENT, CONSULT A PHYSICIAN.

EYE - FLUSH THOROUGHLY WITH WATER, CONSULT A PHYSICIAN.

INGESTION - WHILE INGESTION OF LARGE ENOUGH QUANTITIES TO CAUSE HEALTH EFFECTS IS UNLIKELY, CONSULT A PHYSICIAN IF IT OCCURS.

## SECTION VI - REACTIVITY

STABILITY: STABLE

INCOMPATIBLE MATERIALS: NONE

HAZARDOUS DECOMPOSITION: NONE

POLYMERIZATION: WILL NOT OCCUR

## SECTION VII - SPILL OR LEAK PROCEDURES

PRODUCT IS A SOLID METAL AS SHIPPED. NO POTENTIAL FOR SPILL OR LEAK.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

### VENTILATION:

IF YOUR PROCESS CAUSES A RELEASE OF DUST OR FUME, USE LOCAL AND GENERAL EXHAUST VENTILATION TO KEEP AIRBORN CONCENTRATIONS OF DUST OR FUMES BELOW THE TLV.

### RESPIRATORY PROTECTION:

IF YOUR PROCESS CAUSES A RELEASE OF DUST OR FUME IN EXCESS OF THE PERMISSIBLE EXPOSURE LIMIT, NIOSH APPROVED RESPIRATORS FOR PROTECTION AGAINST AIRBORN DUST OR FUMES SHOULD BE WORN. RESPIRATORS SHOULD BE USED IN ACCORDANCE WITH 29CFR 1910.134.

### PROTECTIVE EQUIPMENT:

GLOVES AND BARRIER CREAMS MAY BE NECESSARY TO PREVENT SKIN SENSITIZATION AND DERMATITIS. IF YOUR PROCESS INVOLVES GRINDING OR ANY OTHER ACTION THAT CAUSES THE RELEASE OF DUST OR FUMES, APPROVED SAFETY GLASSES OR GOGGLES SHOULD BE WORN.

## SECTION IX - SPECIAL PRECAUTIONS

NONE