



U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

JAN 17 2016

Matt Thompson
Superintendent of Supply Chain
Robinson Nevada Mining Company
P.O. Box 382, 4232 West White Pine County Rd 44
Ruth, NV 89319

Reference No. 16-0177

Dear Mr. Thompson:

This letter is in response to your October 17, 2016, letter requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to shipping a hazardous substance. You provide a scenario in which a hazardous substance (molybdenum concentrate) in a bulk package is offered for transportation by highway.

We have paraphrased and answered your questions as follows:

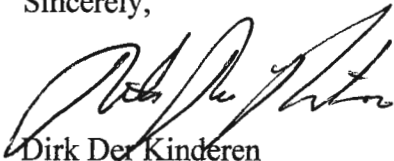
- Q1. Is a hazmat endorsement on a commercial driver's license (CDL) required to transport molybdenum concentrate in a bulk package?
- A1. The answer is no. Section 172.504(f)(9) states that a CLASS 9 placard is not required for domestic transportation. Therefore, the Federal Motor Carrier Safety Regulations (FMCSR) would not require a driver to have a hazmat endorsement on a CDL.
- Q2. Is a driver required to have hazmat training in accordance with Subpart H of Part 172 if the driver has a hazmat endorsement on a CDL?
- A2. In accordance with § 177.800(c), each driver who is a hazmat employee is subject to the training requirements in Subpart H of Part 172) and the driver training requirements in § 177.816, regardless of whether a hazmat endorsement is required. However, the training required to obtain a hazmat endorsement may be used to satisfy the training requirements of the HMR to the extent that such training addresses the training components of § 172.704(a).
- Q3. In the scenario provided, are placards required on each bag of molybdenum concentrate, as well as the outside of the transport vehicle?
- A3. See A1. Placards are not required on each bag or the transport vehicle. However, identification number markings are still required on each bulk package in accordance

with § 172.302. In accordance with § 172.332, a placard, an orange panel, or a white square-on-point are all acceptable methods of displaying the identification number. Furthermore, § 172.331(c) states that if the identification number marking on a bulk package is not visible because it is contained inside a transport vehicle or freight container, the identification number marking must be displayed on each side and each end of the transport vehicle.

- Q4. When is a driver required to meet the training requirements in the HMR?
- A4. Drivers meeting the definition of a “hazmat employee” in accordance with § 171.8 are subject to the training requirements in the HMR.
- Q5. What are the requirements for shipping 16 bags of molybdenum concentrate weighing 3,000 pounds each?
- A5. A material that meets the definition of a hazardous material is subject to all applicable requirements of the HMR unless specifically excepted, including, but not limited to: packaging, hazard communication (e.g., shipping papers), and training requirements.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,



Dirk Der Kinderen
Chief, Standards Development Branch
Standards and Rulemaking Division



Ciccarone
\$172,500
Placarding
16-0177

17 October 2016

U.S. DOT
PHMSA Office of Hazardous Materials Standards
Attn: PHH-10
East Building
1200 New Jersey Avenue, SE.
Washington, DC 20590-0001

Dear Office of Hazardous Materials Standards,

I would like to kindly request an interpretation regarding shipment requirements for molybdenum concentrate. The Robinson Nevada Mining Company produces this product on site in Northern Nevada and ships to end users in different parts of the United States. The molybdenum concentrate is shipped in bags that weigh approximately 3,000 pounds each. A "sales lot" shipment is typically made up of 16 bags that are shipped at once via a flatbed truck.


Robinson's molybdenum concentrate is currently classified as class 9, UN3077, Packing group III, RQ and is flagged as an environmentally hazardous substance since arsenic and phosphorus are contained within.

Based on the above classification, I respectfully request an interpretation on the following:

1. Is a Hazmat endorsement on a CDL license required to transport this material in the quantities stated above?
2. Does a Hazmat endorsement on a CDL override the PHMSA introductory training class?
3. When shipping this product, are placards required on the bags as well as on the transport truck? Would placards only attached to each bag suffice?

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4. When would the introductory PHMSA class be required for the transport trucker? Is this solely based on the class of product being shipped or do quantities of product also come into consideration?
 5. Our MSDS for molybdenum concentrate is included with this letter in the following pages. What requirements for shipping would be needed to move 16 bags of this concentrate, weighing 3,000 pounds each?

Kind Regards,



Mr. Matt Thompson
Superintendent of Supply Chain

MATERIAL SAFETY DATA SHEET

Section I: Product and Company Identification

Product: **Molybdenite (Molybdenum Disulfide) Concentrate**
 Manufacturer or Supplier: Robinson Nevada Mining Company,
 A subsidiary of Quadra Mining LTD
 Address: P.O. Box 382 (4232 West White Pine County Road 44)
 Ruth, Nevada 89319
 Emergency Contact: 775-289-7301

Section II: Composition/Information on Ingredients

<u>Chemical Ingredient</u>	<u>Wt %</u>	<u>CAS Number</u>
Sulfur (S)	22-36	7704-34-9
Molybdenum (Mo)	13-54	7439-98-7
Silica, Crystalline Quartz (SiO ₂)**	4-6	14808-60-7
Iron (Fe)	0.8-6	7439-89-6
Rhenium (Re)**	0.2-0.3	7440-15-5
Copper* (Cu)	0.2-1.0	7440-50-8
Aluminum (Al)*	0.09-0.6	1344-28-1
Fluorine (F)*	0.09-0.4	7782-41-4
Zinc (Zn)*	0.01-0.05	7440-66-6
Calcium (Ca)	<0.01-2	1305-78-8
Phosphorus (P)*	<0.01-0.05	7723-14-0
Chlorine (Cl)*	0.007-0.1	7782-50-5
Arsenic (As)*	0.003-0.05	7440-38-2
Cadmium (Cd)*	<0.001-0.002	7440-43-9
Selenium (Se)*	<0.0005-0.02	7782-49-2
Lead (Pb)*	<0.0002-0.01	7439-92-1
Other Trace Metals	0.09 or less	

Note: *Subject to Sara Title III and other regulatory requirements. See Regulatory Information in Part XV.

** Based on limited testing.

Section III: Hazard Identification

Ingredient	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH IDLH	NFPA Hazard
	TWA	STEL	TWA	STEL	TWA	STEL		
Silica, Crystalline Quartz	10 mg/m ³ +%SiO ₂ (respirable)	None established	0.05 mg/m ³ %SiO ₂ * (respirable)	None established	0.05 mg/m ³	None established	None established	Health 1 Fire 0 Reactivity 0
Molybdenum metal dusts	15 mg/m ³ (Insoluble total dust-respirable)	None established	10 mg/m ³ (inhalable) 3 mg/m ³ (respirable)	None established	-----	None established	5,000 mg/m ³	Health 2 Fire 1 Reactivity 0
Copper metal dusts/ mists	1.0 mg/m ³	None established	1.0 mg/m ³ *	None established	1.0 mg/m ³	None established	100 mg/m ³ (as Cu)	Health 0 Fire 1 Reactivity 0
Copper fume	0.1 mg/m ³	None established	0.2 mg/m ³	None established	0.1 mg/m ³	None established	100 mg/m ³ (as Cu)	Health 2 Fire 0 Reactivity 0

*Proposed for Adoption: Elemental/metal and copper oxides: 0.1 mg/m³ (inhalable fraction); Soluble Cu compounds: 0.05 mg/m³ (respirable) and withdrawing of current values. Silica, Crystalline -Quartz: 0.025 mg/m³ (respirable)

Section IV: First Aid Measures

- Eye Contact: Flush eyes with large amounts of water for at least 15 minutes, periodically lifting the eyelids. If irritation persists, seek medical attention.
- Skin Contact: Wash with plenty of soap and water. Remove contaminated clothing and wash thoroughly before reuse.
- Inhalation: Move from work area to fresh air. Provide supplemental oxygen as required or artificial respiration if unconscious and not breathing. Seek medical attention for respiratory ailments.
- Ingestion: Give large amounts of water and induce vomiting if large quantities have been ingested. Seek medical attention immediately.

Section V: Fire Fighting Measures

- Flammability: None.
- Extinguishing Media: Use dry sand, dry dolomite, or limestone to extinguish fire and minimize dust or extinguishing media appropriate to surrounding fire.
- Special Conditions: Wear full body protection to protect contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) with a full-face piece operated in the pressure demand or positive pressure mode. Keep upwind.
- Hazardous Decomposition: When heated to melting point decomposes to sulfur dioxide, molybdenum oxide fume, and carbon monoxide.
- Explosion Data: No data to establish limit. Fine powder can be explosive under confined or concentrated conditions.

Section VI: Accidental Release Measures

Use appropriate equipment for the size of the spill. Large spills may require the use of loaders and trucks. Smaller spills may be cleaned up with the use of vacuum, broom or shovel. Recover salvageable product in a manner that minimizes dust. Place recovered product into process for recycle. Handle waste generated from cleanup consistent with national, regional, or local regulations.

Section VII: Handling and Storage

- Storage & Handling Conditions: Keep product dry and covered during transportation, and when practical during storage. When handling material, provide sufficient ventilation to avoid breathing dust. Implement and maintain dust control measures.

Section VIII: Exposure Control and Personal Protection

- Ventilation: Prevent dispersion of dust in the air. Provide sufficient general or local exhaust ventilation to maintain occupational exposure below recommended PELs.
- Respiratory Protection: Use appropriate NIOSH-certified respirator in accordance with U.S. OSHA standards or appropriate national government approved equipment for dusty or particulate borne conditions (29 CFR 1910.134(d)).
A respiratory protection program should be implemented by a suitably trained program administrator for specific worksite conditions and procedures when handling or managing the product in accordance with national or U.S. OSHA standards (29 CFR 1910.134(c)).

Other Protective Equipment:	Wear gloves and eye protection when handling product. Do not wear contact lenses in the work area. Wear personal protective clothing (overalls).
Hygiene Practices:	Wash hands and face thoroughly before eating, drinking, or smoking. Do not smoke, eat, or drink where this product is handled, stored, or processed. Separate contaminated work clothes from street clothes. Launder protective clothing before reuse. Remove material from shoes and clean any personal protection equipment.

Section IX: Physical and Chemical Properties

Appearance:	Gray-black lustrous fine powder.
Mo Boiling point:	4,612° C (8,337° F)
Mo Melting point:	2,617° C (4,743° F)
Mo Specific gravity:	10.22 (at 20° C)
pH:	7.1 to 7.5 s.u. (depending on environment)
Solubility:	Insoluble in water or dilute acid; soluble in strong acid, aqua regia, or hydrogen sulfide
Mo Vapor Pressure:	3.47 Pa @ 2,726.85° C
Evaporation Rate:	NA
Flashpoint:	NA

Section X: Stability and Reactivity

Chemical Stability:	Stable under normal use conditions.
Incompatibility:	Strong oxidizers.
Hazardous	Will not occur.
Polymerization:	
Hazardous Decomposition Products:	Can occur from fire or explosion. Sulfur dioxide gas, carbon monoxide, and molybdenum oxide fume may result.
Corrosive Nature:	Non-corrosive under ambient conditions. Oxidation may occur under high temperature or other specific conditions.

Section XI: Toxicological Information

Acute Toxicity of Respirable Silica (Crystalline Quartz):

<u>Eye contact:</u>	Silica dust can cause eye irritation.
<u>Inhalation:</u>	Acute silicosis can occur from high concentrations of respirable crystalline silica after a few months or as long as two years. Symptoms include severe shortness of breath, weakness, and weight loss and the silicosis can lead to fatal respiratory failure.

Chronic Toxicity of Respirable Silica

<u>Inhalation:</u>	Chronic silicosis can occur after 10 or more years of exposure at relatively low concentrations of respirable crystalline silica. Symptoms may not be obvious but as the disease progresses, shortness of breath during exercise and poor oxygen/carbon dioxide exchange are prevalent, in addition to fatigue and chest pain. Lung damage occurs from inhalation of particles < 10 microns in diameter (micron or micrometer = one one-thousandth of a millimeter). Accelerated silicosis can develop after 5-10 years from first high exposures. Severe
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shortness of breath, weakness, and weight loss occur from silicosis. The fibrosis of the lungs is often diffuse and irregular.

Carcinogenicity:

Respirable crystalline silica has been identified by NIOSH as a potential occupational carcinogen. NIOSH's Hazard Review of the *Health Effects of Occupational Exposure to Respirable Crystalline Silica* states there are studies which support lung cancer is associated with occupational exposures to crystalline silica (2002). ACGIH (2005) lists silica crystalline quartz as a suspected human carcinogen.

Acute Toxicity of Molybdenum:

Potential irritant to the eyes and lungs (Occupational Health Guideline for Molybdenum and Insoluble Molybdenum).

Inhalation:

Limited information. An FDA study indicated there were no observed changes in rats over a 4-week period following inhalation exposures to metallic molybdenum at 25,000 to 30,000 mg/m³ or to molybdenum dioxide at 10,000 to 12,000 mg/m³ for one hour. Workers exposed to 60 to 600 mg/m³ of molybdenum reported increase of non-specific symptoms such as weakness, fatigue, headache, anorexia, and joint and muscle pain (NIOSH-IDLH Documentation).

Oral (ingested):

Limited information. A toxicity study (Fairhall et al., 1945) reported in a Public Health Bulletin that no fatalities in animals occurred from ingestion of large doses of molybdenum disulfide (NIOSH-IDLH Documentation).

Chronic Toxicity of Molybdenum:

Inhalation:

ACGIH (American Conference of Governmental Industrial Hygienists) has listed the basis for the Threshold Limit Values (2005) for molybdenum metal and insoluble compounds as critical effects to the lungs and central nervous system. EPA's Integrated Risk Information System database for molybdenum does not have information for inhalation risk. Long term exposure effects are not known, according to the Occupational Health Guide for Molybdenum and Insoluble Molybdenum (U.S. Department of Health and Human Services and U.S. Department of Labor).

Oral (ingested):

Studies of human and animal ingestion suggest that molybdenum has an adverse effect on copper homeostasis that can change the level of serum ceruloplasmin. An increased level of serum ceruloplasmin and urinary excretion of copper observed in some human studies indicates high levels of molybdenum maybe associated with potential mineral imbalance (US EPA Integrated Risk Information System).

Molybdenum intake of 0.14 mg/kg-day may result in serum uric acid levels elevated above the average range of the adult population. This level is designated as the LOAEL (lowest observed adverse effect level) and a reference dose for chronic oral exposure (RfD) of 5E-3 mg/kg-day (US EPA --Integrated Risk Information System (IRIS, revision of August 1, 1993)).

Carcinogenicity:

ACGIH lists soluble molybdenum compounds as confirmed animal carcinogen in high doses with unknown relevance to humans.

Available evidence does not suggest that soluble molybdenum compounds are likely to cause cancer in humans except under uncommon or unlikely routes of exposure. No data available on metal and insoluble compounds (ACGIH, USEPA, ATSDR, NIOSH).

Mutability:

Limited information available; human effects undetermined at this time.

Section XII Ecological Information

Molybdenum is an essential, trace element for animals and plants. Compounds of molybdenum form some of the scarcer constituents of the earth's crust—approximately 3 times more abundant than gold.

The exposure routes of molybdenum to animals are inhalation, ingestion, and physical contact. High intake of molybdenum can produce a condition known as molybdenosis in animals. A study to compare the effects of various molybdenum compounds showed that 500 mg of molybdenite (MoS_2) ingested daily was non-toxic, but animals receiving molybdenum trioxide, calcium molybdate, and ammonia molybdate show anorexia, listlessness, and weight loss (Marston, H.R., Cobalt, Copper, and Molybdenum in the Nutrition of Animals and Plants, *Physiol. Rev.* 32, 66 (1952)).

The element molybdenum is a component of a pterin coenzyme essential for the activity of xanthine dehydrogenase, xanthine oxidase, sulfite oxidase, and aldehyde oxidase—moco dependent human enzymes. Xanthine dehydrogenase catalyzes the conversion of hypoxanthine to xanthine, and xanthine to uric acid. It also catalyzes the reactions of purine end metabolism. Molybdenum is essential in the metabolism of sulfites to sulfates—sulfite being toxic to the nervous system (Information from National Academy of Sciences/National Research Council, PDR Health publication, part of Thomson Healthcare, and Merck Manual—Section 1, Chapter 4, Mineral Deficiency and Toxicity).

A study of Lin Xian, a small region in Honan Province of China, found that the low presence of molybdenum in the soil contributed to the nitrates in the soil being converted to nitroamines instead of amines. Nitroamines are known carcinogenic substances. Nitrates in the soil require a molybdenum—dependent enzyme (nitrate reductase) to reduce the nitrates to nitrogenous substances for plant nutrition. This province area of China had one of the highest incidences of esophageal cancer until the soil was enriched with molybdenum. It is believed that the incidence of cancer is declining with the introduction of the molybdenum enriched soil (PDR Health publication, part of Thomson Healthcare).

It has also been reported that high concentrations of molybdenum can be injurious to plants, depending on the concentration and species. Oats exposed to concentrations of 50 mg/L of molybdenum exhibited a slight effect where as at 200 mg/L of molybdenum the oats exhibited stunted growth. Soybeans and flax exhibited toxic effects at a concentration of 10-20 mg/l molybdenum (Water Quality Criteria, Publication 3-A, reprinted 1973, California Water Resources Control Board).

Studies of fish and other aquatic life also show variability in the deleterious concentration of molybdenum and molybdenum compounds depending on the hardness of the water and the species. Several species of algae concentrate molybdenum from water by a factor of 2 to 15. A species of *Daphnia* tolerate concentrations of 1000 mg/L of molybdenum without perceptible injury (Water Quality Criteria, Publication 3-A, reprinted 1973, California Water Resources Control Board).

Section XIII: Disposal Considerations

If spilled material cannot be reused in the process, it is recommended to sample and analyze for metals, prior to disposal. Follow national, regional or local regulations governing the disposal of waste materials.

Section XIV: Transportation Information

Ship as: Environmentally hazardous substance, solid, n.o.s., (arsenic, phosphorus), Marine Pollutant (copper), 9, UN 3077, III RQ.

Reportable Quantity for Arsenic and Phosphorus is 1 pound in 49 CFR 172.101-Hazardous Materials Table, Appendix A and in 40 CFR 302, Table 302.4. The product shipped is a mixture containing hazardous substances that by weight in the shipment exceed the reportable quantity and are in a concentration by weight which exceed the level for the hazardous substance in the Table in 49 CFR 171.8.

Note: Copper maybe present in a quantity that exceeds 1% by weight of the mixture and as such, the mixture qualifies as a severe marine pollutant listed in 49 CFR 172.101-Hazardous Materials Table, Appendix B.

Section XV: Regulatory Information*United States of America*

<u>TSCA:</u>	Molybdenum and Molybdenite are listed on the EPA TSCA Chemical Substance Inventory or TSCA Inventory.
<u>CERCLA:</u>	Molybdenum is not a hazardous substance under Section 102(a) of CERCLA.
<u>SARA:</u>	Molybdenum is not on the list of extremely hazardous substances in 40 CFR 355. Molybdenum is not on the list of specific toxic chemicals (40 CFR 355.65) subject to applicable reporting and notification under the toxic chemical release reporting (Form R) section of the EPA regulations (40 CFR 372.85).
<u>Clean Water Act:</u>	Conventional/Non-Conventional Pollutant under Section 307(a) of CWA; 40 CFR Part 122, Appendix D, Table IV.
<u>Safe Drinking Water Act:</u>	Molybdenum is not a substance regulated under 40 CFR 141.86 and 141.88.
<u>RCRA/Solid Waste:</u>	Molybdenum is not on the list for toxicity characteristics under the RCRA regulations (40 CFR 261.24). Other metals associated with molybdenum are on the list for toxicity characteristics, such as but not limited to arsenic, cadmium, and lead. If any molybdenum cannot be recycled or reused in the process, it is recommended to sample and analyze for metals, prior to disposal. In addition, a check of the state and or local regulations should be performed as some state and/or local disposal requirements are more stringent than Federal requirements.
<u>Clean Air Act Amendments:</u>	Molybdenum is not listed as a hazardous air pollutant under Section 112 (b) of the CAAA. Fine mineral fibers are listed under this section and are described as including manufacturing or processing rock of average diameter 1 micrometer or less. Other metal compounds are included on the hazardous air pollutant list and any unique chemical substance containing the other metal compounds on the list are to be considered in the metal's infrastructure.

Section XVI: Other Information:

MSDS =	Material Safety Data Sheet
NA =	Not available
TLVs® =	Threshold limit values for airborne chemicals

BEIs® =	Biological exposure indices
TWA =	8 hour, time weighted average for a 40 hour workweek over a lifetime.
STEL=	Short-term exposure limit
PEL=	Permissible exposure limit
CAS =	Chemical Abstracts Service
CFR =	Code of Federal Regulations
IDLH =	Immediately Dangerous to Life or Health Concentration Value
NFPA =	National Fire Protection Association
ACGIH® =	American Conference of Governmental Industrial Hygienists
NIOSH =	National Institute for Occupational Safety and Health
SARA =	Superfund Amendments and Reauthorization Act
OSHA =	Occupational Safety and Health Administration
CERCLA =	Comprehensive Environmental Response, Compensation, and Liability Act
RCRA =	Resource Conservation and Recovery Act
TSCA =	Toxic Substances Control Act
EPA =	U.S. Environmental Protection Agency
IRIS =	Integrated Risk Information System
ACGIH =	American Conference of Governmental Industrial Hygienists
RfD =	Reference Dose
ATSDR =	Agency for Toxic Substances and Disease Registry
N.O.S. =	Not Otherwise Specified (means a shipping description from 49 CFR § 172.101 table)

The information contained herein is based on the data available at the time this MSDS was prepared and is believed to be correct. However, Robinson Nevada Mining Company and Quadra Mining LTD. make no warranty, expressed or implied, regarding the accuracy of these data or the results to be obtained from the use thereof. Robinson Nevada Mining Company and Quadra Mining LTD assume no responsibility for injury or illness from the use of the product described herein.