

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** MAGNESIUM OXIDE FUME ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for MAGNESIUM OXIDE FUME

The basic text of this document contains the draft technical standard approved by the Joint Review Committee of the NIOSH/OSHA Standards Completion Program and the supporting documentation for the substance MAGNESIUM OXIDE FUME.

The SCP draft technical standards are recommendations to the Department of Labor for its consideration in rulemaking and have no legal status until final rules have been promulgated by that agency. This draft standard is provided for your information only.

The References and Sources, Respirator Table Documentation and Use/Exposure and Control Documentation are the working documents used by the various SCP working groups during the development of the draft technical standard and serve as the technical foundation for the standard. The classification for each substance and the regulatory statements were derived following a decision logic established for the various sections of the standard.

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(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of magnesium oxide fume not in excess of 15 milligrams per cubic meter (mg/M3) averaged over an eight-hour work shift (time weighted average), as stated in § 1910.1000, Table Z-1.

(2) "Action level" means one half of the permissible exposure for magnesium oxide fume.

(b) Exposure determination and measurement. (1) Each employer who has a place of employment in which magnesium oxide fume is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of magnesium oxide fume at or above the action level. The determination shall be made each time there is a change in production, process, or control measures which could result in an increase in airborne concentrations of magnesium oxide fume.

(2) A written record of the determination shall be made and shall contain at least the following information:

(i) Any information, observations, or calculations which may indicate employee exposure to magnesium oxide fume;

(ii) Any measurements of magnesium oxide fume taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to magnesium oxide fume; and

(iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.

(3) If the employer determines that any employee may be exposed to magnesium oxide fume at or above the action level, the exposure of the employee in each work operation who is believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum eight-hour time weighted average exposure of the employee.

(4) If the exposure measurement taken pursuant to paragraph (b) (3) of this section reveals employee exposure to magnesium oxide fume at or above the action level, the employer shall:

(i) Identify all employees who may be exposed at or above the action level; and

(ii) Measure the exposure of the employees so identified.

(5) If an employee exposure measurement reveals that an employee is exposed to magnesium oxide fume at or above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every two months.

(6) If an employee exposure measurement reveals that an employee is exposed to magnesium oxide fume above the permissible exposure, the employer shall:

(i) Measure the exposure monthly of the employee so exposed; and

(ii) Institute control measures as required by paragraph (d) of this section; and

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to magnesium oxide fume above the permissible exposure. The employee shall also be notified of the corrective action being taken to reduce the exposure to at or below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to magnesium oxide fume

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below the action level, the employer may terminate measurement for the employee.

(8) For purposes of this paragraph, employee exposure is that which would occur if the employee were not using a respirator.

(c) Methods of measurement. (1) An employee's exposure shall be obtained by any combination of long term or short term samples which represents the employee's actual exposure averaged over an eight-hour work shift (See Appendix B (IV) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95 percent, of not less than that given in Table 1.

Table 1

Concentration	Required Accuracy
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Above permissible exposure	$\pm 25\%$
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At or below permissible exposure	
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and above the action level	$\pm 35\%$
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At or below the action level	$\pm 50\%$
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(d) Compliance. (1) No employee shall be exposed to magnesium oxide fume above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of magnesium oxide fume shall be controlled to at or below the permissible exposure by engineering and work practice controls:

(i) Engineering and work practice controls shall be instituted to reduce exposures to at or below the permissible exposure, except to the extent that such controls are not technically feasible.

(ii) Wherever engineering and work practice controls are not sufficient to reduce exposures to at or below the permissible exposure, they shall nonetheless be used to reduce exposure to the lowest level feasible and shall be supplemented by respirators in accordance with paragraph (d)(4) of this section.

(3) Engineering controls. When mechanical ventilation is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity, static pressure, or air volume, shall be made at least every three months. Measurements of system effectiveness shall also be made within five days of any change in production, process, or control which might result in an increase in airborne concentrations of magnesium oxide fume.

(4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement engineering or work practice controls; or

(ii) In work situations in which engineering and work practice controls are technically not feasible; or

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(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of magnesium oxide fume to at or below the permissible exposure; or

(iv) In emergencies.

(5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR MAGNESIUM OXIDE FUME

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Particulate Concentration	
150 mg/M3 or less	Any fume respirator or high efficiency particulate filter respirator.
	Any supplied-air respirator.
	Any self-contained breathing apparatus.
750 mg/M3 or less	A high efficiency particulate filter respirator with a full facepiece.
	Any supplied-air respirator with a full facepiece, helmet or hood.
	Any self-contained breathing apparatus with a full facepiece.
7,500 mg/M3 or less	A powered air-purifying respirator with a high efficiency particulate filter.
	A Type C supplied-air respirator operated in pressure demand or other positive pressure or continuous-flow mode.
Greater than 7,500 mg/M3 or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
	A combination respirator which includes a Type C supplied air respirator with a full facepiece operated in pressure demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

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(6) Respirators shall be approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(7) The employer shall institute a respiratory protection program in accordance with § 1910.134(b), (d), (e), and (f).

(e) Fire and safety. The employer shall familiarize himself with the information contained in the Substance Technical Guidelines (Appendix B of this section) for magnesium oxide fume.

(f) Reserved.

(g) Reserved.

(h) Reserved.

(i) Training and information. (1) Each employer who has a workplace in which magnesium oxide fume is present shall keep a copy of this regulation with Appendixes A, B and C at the workplace. This material shall be made readily available to affected employees.

(2) Each employer who has employees exposed to magnesium oxide fume above the action level or employees who work where a potentially hazardous release of magnesium oxide fume may occur, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for magnesium oxide fume (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to magnesium oxide fume.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to magnesium oxide fume which are listed in Appendix A of the section;

(iv) Instruct affected employees to inform the employer if they develop any of the medical conditions listed in paragraph (j)(2) of this section; and

(v) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to magnesium oxide fume.

(j) Medical surveillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be performed by or under the supervision of a physician at no cost to the employee.

(2) The employer shall obtain from each employee who is exposed, or will be exposed to airborne concentrations of magnesium oxide fume, at or above the action level information as to whether such employee has a history of chronic lung disease.

(3) The employer shall provide a medical examination for the employee if:

(i) The employee provides a history of any of the medical conditions listed in paragraph (j)(2) of this section; or

(ii) The employee informs the employer of the development of any of the medical conditions listed in paragraph (j)(2) of this section or any of the signs or symptoms of exposure to magnesium oxide fume which are listed in Appendix A which the employee suspects are caused by exposure to magnesium oxide fume.

(4) The employer shall provide to the examining physician the following information:

(i) A copy of this regulation with Appendixes A, B and C for magnesium oxide fume;

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(ii) A description of the affected employee's duties as they relate to his exposure to magnesium oxide fume;

(iii) A description of any personal protective equipment and respirators required to be used;

(iv) The results of any measurements which may indicate the affected employee's exposure;

(v) The affected employee's anticipated exposure; and

(vi) Upon request of the physician, any available information from previous medical examinations of the affected employee.

(5) Where a medical examination is required by paragraph (j)(3) of this section, following such examination the employer shall obtain a written opinion from the examining physician which conforms with paragraph (j)(6) of this section.

(6)(i) The physician's written opinion shall be a signed statement by the examining physician specifically stating: (A) Whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to magnesium oxide fume or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to magnesium oxide fume including limitations upon the use of personal protective equipment and respirators;

(C) That the employee has been informed by the physician of any detected medical conditions which require further medical examination or treatment.

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to exposure to magnesium oxide fume.

(iii) The employer shall provide the employee with a copy of the physician's written opinion.

(7) No employee shall be exposed to airborne concentrations of magnesium oxide fume in such a way as would put the employee at increased risk of material impairment of his health from such exposure. This determination may be based on the physician's written opinion.

(8) The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to magnesium oxide fume.

(9) If an employee refuses any required medical examination, the employer shall inform the employee of the possible health consequences of such refusal and obtain a signed statement from the employee indicating that the employee understands the risk involved by refusal to be examined.

(10) No medical procedure which would be performed pursuant to this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(k) Recordkeeping. (1) Exposure determination. (i) The employer shall keep an accurate record of all determinations required to be made pursuant to paragraph (b)(1) of this section.

(ii) This record shall include the written determination required in paragraph (b)(2) of this section.

(iii) This record shall be maintained until replaced by a more recent record.

(2) Exposure measurements. (i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to magnesium oxide fume.

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(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to magnesium oxide fume which are being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy, including the method, results and date of calibration of sampling equipment;

(D) Number, duration, and results of samples taken; and

(E) Name, social security number and exposure of the employee monitored.

(iii) This record shall be maintained until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation. (i) When mechanical ventilation is used as an engineering control, the employer shall maintain an accurate record of the measurements demonstrating the effectiveness of such ventilation required by paragraph (d)(3) of this section.

(ii) This record shall include:

(A) Date of measurement;

(B) Type of measurement taken;

(C) Result of measurement.

(iii) These records shall be maintained for at least one year.

(4) Employee training and information. (i) The employer shall keep an accurate record of all employee training and information required by paragraph (i) of this section.

(ii) This record shall include:

(A) Date of training;

(B) Name and social security number of employee trained;

(C) Content or scope of training provided.

(iii) This record shall be maintained until replaced by a more recent record.

(5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.

(ii) This record shall include:

(A) Information concerning medical conditions obtained from the employee pursuant to paragraph (j)(2) of this section;

(B) Any employee medical complaints relative to exposure to magnesium oxide fume;

(C) A copy of information provided to the physician pursuant to paragraph (j)(4)(ii), (iii), (iv), (v), and (vi) of this section.

(D) Physician's written opinion; and

(E) A signed statement of any refusal to be examined.

(iii) This record shall be maintained for the duration and for one year after termination of the employment of the affected employee.

(6) Access to records. (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.

(ii) Employee exposure determination and exposure measurement records required to be maintained by this section shall be made available to employees and former employees and their designated representatives.

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(iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.

(1) Employee observation of measurement. (1) The employer shall give affected employees or their representatives an opportunity to observe any measurement of employee exposure to magnesium oxide fume which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to magnesium oxide fume requires entry into an area where the use of personal protective devices, including respirators, is required, the observer shall be provided with and required to use such equipment and comply with all other applicable safety procedures.

(3) Without interfering with the measurement, observers shall be entitled to:

- (i) Receive an explanation of the measurement procedure.
- (ii) Visually observe all steps related to the measurement of the airborne concentration of magnesium oxide fume that are being performed at the place of exposure; and
- (iii) Record the results obtained.

NOTE: The information contained in the following appendixes is advisory in nature and is not intended, by itself, to create any additional obligations not otherwise imposed or detract from any existing obligation.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR MAGNESIUM OXIDE FUME

- I. SUBSTANCE IDENTIFICATION
 - A. Substance: Magnesium oxide fume
 - B. Permissible Exposure: 15 milligrams of magnesium oxide fume per cubic meter of air (mg/M3) averaged over an eight-hour work shift.
 - C. Appearance: White fume
- II. HEALTH HAZARD DATA
 - A. Ways in which the chemical affects your body: Magnesium oxide fume can affect your body if you inhale it or if it comes in contact with your eyes.
 - B. Effects of Overexposure:
 - 1. Short-term Exposure: Magnesium oxide fume may cause irritation of the eyes and nose. It may also cause metal fume fever. Symptoms of metal fume fever include chills, fever, headache, tightness of chest, cough,

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weakness, tiredness, dryness of the nose and mouth, muscular pain, nausea and vomiting.

2. Long-term Exposure: None known.
3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to magnesium oxide fume.

III. EMERGENCY FIRST AID PROCEDURES

- A. Breathing: If you or any other person breathes in large amounts of magnesium oxide fume move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.
- B. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

- A. Respirators: Respirators are not the best way to control exposure to magnesium oxide fume. You can only be required to wear them for routine use if your employer is in the process of installing controls or control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where their use is required. If you experience difficulty breathing while wearing a respirator, tell your employer.
- B. Protective Clothing: Not applicable.
- C. Eye Protection: Not applicable.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. Ask your supervisor where magnesium oxide fume may be inadvertently released in your work area and for any additional plant safety and health rules.

VI. ACCESS TO INFORMATION

- A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for magnesium oxide fume. In addition, your employer must instruct you in emergency procedures, and the correct use of protective equipment.
- B. Your employer is required to determine whether you are being exposed to magnesium oxide fume. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you

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of the exposure and of the actions which are being taken to reduce your exposure.

- C. Your employer is required to keep records of exposure determinations, exposure measurements, and medical surveillance. Your employer is required to make records of exposure determinations and your exposure measurements available to you or your representative upon your request. Your employer is required to release your medical records to your physician upon your written request.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR MAGNESIUM OXIDE FUME

- I. PHYSICAL AND CHEMICAL DATA
- A. Substance Identification
1. Synonyms: Magnesia fume
 2. Formula: MgO
 3. Molecular weight: 40.3
- B. Physical Data
1. Boiling point (760 mm Hg): 3580 C (6480 F) (solid)
 2. Specific gravity (water = 1): Solid = 3.58
 3. Vapor density (air = 1 at boiling point of magnesium oxide fume): Not applicable
 4. Melting point: 2800 C (5072 F) (solid)
 5. Vapor pressure at 20 C (68 F): Essentially zero
 6. Solubility in water, % by weight at 20 C (68 F): Insoluble
 7. Evaporation rate (butyl acetate = 1): Not applicable
 8. Appearance: White fume
- II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA
- A. Fire
1. Not combustible
- B. Reactivity
1. Conditions contributing to instability: None
 2. Incompatibilities: Reacts violently with chlorine trifluoride
 3. Hazardous decomposition products: None.
 4. Special precautions: None.
- III. SPILL PROCEDURES
- A. If potentially hazardous amounts of magnesium oxide fume are inadvertently released, ventilate the area of the release to disperse the fume.
- B. Persons not wearing protective equipment should be restricted from areas of releases until cleanup has been completed.
- IV. MONITORING AND MEASUREMENT PROCEDURES

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- A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the average 8-hour exposure may be determined from a single eight-hour sample or two 4-hour samples. Several short time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). Sampling and analyses may be performed by instruments such as detector tubes certified by NIOSH under 42 CFR part 84, portable direct-reading instruments, dosimeters, or by collection of the particulates using a high efficiency membrane filter with subsequent chemical analyses. The method of measurement must determine the concentration of magnesium oxide fume to plus or minus 35%.
- B. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring and measurements under this section should be essentially the same as described under paragraph IV. A. Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of magnesium oxide fume to plus or minus 25%.
- C. METHODS: Methods meeting these accuracy requirements are available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 under the title "NIOSH Analytical Methods for Set O" (Order number XXXXXXXXXX).
- D. QUALIFIED PERSONS: Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

V. MISCELLANEOUS PRECAUTIONS

- A. Employers should advise employees of all areas and operations where exposure to magnesium oxide fume could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to magnesium oxide fume is likely to occur are: When magnesium compounds are decomposed by heat as in the calcining of magnesium carbonate or magnesium hydroxide; when magnesium metal burns in air; when magnesium oxide refractories are overheated as in crucibles; during fabrication of magnesium alloys; and during casting of magnesium metal and alloys.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

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II. TOXICOLOGY

Magnesium oxide fume is a mild irritant of the eyes and nose. Examination of 95 workers exposed to an unspecified concentration of magnesium oxide dust revealed slight irritation of the eyes and nose; the magnesium level in the serum of 60 percent of those examined was above the normal upper limit of 3.5 mg percent. Experimental subjects exposed to fresh magnesium oxide fume developed metal fume fever, an illness similar to influenza; there was fever, cough, oppression in the chest, and a leucocytosis; there are no reports of metal fume fever resulting from industrial exposure. Metal magnesium slivers produce a gaseous reaction and cause a slow-healing burn with ulceration, but this has not been reported for magnesium oxide.

III. SIGNS AND SYMPTOMS

Irritation of eyes and nose; an influenza-like syndrome with fever, cough, chest pain (metal fume fever) may occur several hours after a heavy exposure.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Flush eyes with water and wash skin with soap or mild detergent and water. Give artificial resuscitation and administer oxygen if indicated. Recovery is usually complete.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Magnesium oxide fume causes irritation of the eyes and nose. A massive exposure to freshly formed fume may cause metal fume fever, an influenza-like illness which lasts no more than 24 hours. It is important that the physician become familiar with plant operating conditions in which exposure to magnesium oxide fume occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. PREPLACEMENT

Routine medical histories and physical examinations are not required. However, the employer must screen employees for history of certain medical conditions (listed below) which might place the employee at increased risk from magnesium oxide fume exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

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1. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of magnesium oxide fume might cause exacerbation of symptoms due to its irritant properties.

C. PERIODIC EXAMINATIONS

Routine periodic examinations are not required. However, if the employer becomes aware of an employee with the above listed conditions, he must refer such employee for further medical examination.

VII. REFERENCES

1. American Conference of Governmental Industrial Hygienists: "Magnesium Oxide Fume," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 147.
2. Hygienic Guide Series: "Magnesium," American Industrial Hygiene Association Journal, 21:97-98, 1960.
3. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 1073-1079.
4. Browning, Ethel: Toxicity of Industrial Metals (2d ed.), Butterworths, London, 1969, pp. 206-212.

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REFERENCES AND SOURCES
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1910.93

- (f) Personal Protective Equipment, and, (h) Sanitation
References: None

COMMENTS

General: There is no indication in the literature that eye or skin contact with or ingestion of this substance is harmful. Because of this, and because of the physical nature of the substance, it is concluded that none of the statements normally specified in this section are appropriate.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

Kirk - Othmer, "Encyclopedia of Chemical Technology," 2nd edition, Vol. 12, p. 724 (K-O)

"Lange's Handbook of Chemistry," 11th edition (Lange)

Sources of data items used:

- I. A. 1. Synonyms: K-O
2. Formula: K-O
3. Molecular weight: Lange
- B. 1. Boiling point: Lange
2. Specific gravity: Lange
3. Vapor density: Not applicable
4. Melting point: Lange
5. Vapor pressure: ADL
6. Solubility in water: Lange
7. Evaporation rate: Not applicable
8. Appearance and odor: Lange
- II. A. 1. Flash point: Not applicable
2. Autoignition temperature: Not applicable
3. Flammable limits: Not applicable
4. Extinguishing media: ADL
5. Special fire fighting procedures: ADL
6. Unusual fire and explosion hazards: None
- B. 1. Conditions contributing to instability: ADL
2. Incompatibilities: NFPA 491 M
3. Hazardous decomposition products: None
4. Special precautions: None
- III. A. Steps if released or spilled: ADL
C. Waste disposal method: Not applicable
- V. Miscellaneous precautions: ADL

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

International Labour Office, "Encyclopedia of Occupational Health and Safety," 1972 (ILO)

Patty, F. A., "Industrial Hygiene and Toxicology," Vol. II, Interscience Publishers, 1962 (Patty)

Steel, J., "Health Hazards in the Welding and Cutting of Paint Primed Steel," Annals of Occupational Hygiene, 7, p. 247 - 252, 1964, NIOSH 16742 (Steel)

Williams, C. R., "Atmospheric Contamination from the Casting of Magnesium," Journal of Industrial Hygiene and Toxicology, 24 - 9,

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p. 277 - 80, 1942, NIOSH 24745 (Williams)

References for Specific Use/Exposure

1. ILO, Patty, Steel
2. Patty, Williams
3. ILO

References for Specific Control Methods

1. ILO
2. Patty
3. ILO

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Magnesium oxide fume

D. O. L. STANDARD: 15 mg/M3

Eye Irritation Level: Magnesium oxide fume is not known to be an eye irritant.

IDLH: There is no evidence in the available toxicological information of an IDLH concentration for magnesium oxide fume, since the symptoms of metal fume fever would not impede escape or cause any irreversible health effects within 1/2 hour. For the purposes of this standard, therefore, allowable respiratory protection has been determined on the basis of the protection factor afforded by each device. It is recognized, however, that for some substances for which there does not appear to exist a concentration immediately dangerous to life and health, the determination of allowable respiratory protection based on protection factors may result in the selection of a concentration which is not likely to be encountered in the occupational environment. Therefore, for all such particulate substances it has been arbitrarily determined that only those respirators allowed for use above IDLH concentrations are permitted for use in concentrations exceeding 500 times the permissible exposure.

Other Toxicological Information: According to the Documentation of TLV's, "Drinker and associates reported results of experiments in 1927 in which four human subjects were exposed at measured concentrations of freshly generated magnesium oxide fume. Although slight reactions were observed after less than 10 minutes of exposure at concentrations of approximately 400 - 600 mg/M3, it was believed that more severe exposure would lead to more severe reactions. Later, Drinker showed, by animal experiments and further experiments on man, that magnesium causes less marked results than does zinc, but that the inhalation of magnesium oxide produced in man a febrile reaction and a leukocytosis analogous to that caused by zinc oxide." The TLV committee recommended a limit of 10 mg/M3 "on the basis that this value represents a maximal desirable limit for dusts of relatively minor hazard."

Browning also states that in animal experiments magnesium oxide fume "produced a reaction similar to that of human metal fume fever, but the characteristic temperature reaction was that of a fall rather than a rise. It was analogous to that caused by zinc but milder in degree."

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MAGNESIUM OXIDE FUME

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of fume during the fabrication of magnesium alloys. Because of its lightness and strength, magnesium is a component of structural materials used for aircraft, ships, automobiles, boats, portable tools, machinery, military equipment, etc. During many operations (welding, cutting, grinding) there is oxidation of the magnesium producing magnesium oxide fume.	A	Local exhaust ventilation; general dilution ventilation; personal protective equipment (respiratory protective devices)
2.	Inhalation of fume during the casting (melting, pouring, mold curing) of magnesium metal and alloys. Magnesium oxide fume has been detected in the working atmosphere but below the suggested maximum allowable concentration.	A	Local exhaust ventilation; general dilution ventilation
3.	Inhalation of fume during fabrication of magnesium metal (grinding, polishing, machining). Small fragments resulting from these operations can be readily ignited by a chance spark or flame to produce magnesium oxide fume. The fire presents a greater hazard to the worker than the fume.	A	Local exhaust ventilation; general dilution ventilation; personal protective equipment (respiratory protective devices)

A -- Inhalation

B -- Skin and eye contact resulting in localized irritation

C -- Ingestion

D -- Skin contact resulting in absorption and subsequent systemic poisoning