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OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR COTTON DUST

INTRODUCTION

This guideline summarizes pertinent information about cotton dust for workers, employers, and occupational safety and health professionals who may need such information to conduct effective occupational safety and health programs. Recommendations may be superseded by new developments in these fields; therefore, readers are advised to regard these recommendations as general guidelines.

"Cotton dust" is defined as dust generated into the atmosphere as a result of the processing of cotton fibers combined with any naturally occurring materials such as stems, leaves, bracts, and inorganic matter which may have accumulated on the cotton fibers during the growing or harvesting period. Any dust generated from the processing of cotton through the weaving of fabric in textile mills and dust generated in other operations or manufacturing processes using new or waste cotton fibers or cotton fiber by-products from textile mills is also considered cotton dust.

SUBSTANCE IDENTIFICATION

• **Identifiers:** RTECS GN2275000; DOT 1365 (cotton, wet or contaminated), label required: "Spontaneously Combustible"

• **Appearance:** Whitish solid (fibers and/or particulates)

CHEMICAL AND PHYSICAL PROPERTIES

• **Physical data**

1. Specific gravity (water = 1): 1.3 (approximate)
2. Insoluble in water

• **Reactivity**

Incompatibilities: Contact with strong oxidizers may cause fires and explosions.

• **Flammability**

1. Minimum ignition temperature: 470°C (878°F), cotton flock
2. Minimum explosive dust concentration: 0.05 g/L (50 g/m³), cotton flock
3. Extinguishant: Water
4. Combustible solid (NFPA)

• **Warning properties**

Evaluation of warning properties for respirator selection: Based on lack of information on odor threshold and eye irritation levels, cotton dust should be considered to have poor warning properties.

EXPOSURE LIMITS

The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for cotton dust is 200 micrograms of cotton dust per cubic meter of air ($\mu g/m^3$) as a time-weighted average (TWA) concentration over an 8-hour workshift in yarn manufacturing and cotton washing operations; 750 $\mu g/m^3$ as a TWA over an 8-hour workshift in textile slashing and weaving operations; and 500 $\mu g/m^3$ as a TWA over an 8-hour workshift in textile mill waste house operations and dust from lower grade washed cotton in yarn manuacturing; and 1,000 $\mu g/m^3$ as a TWA over an 8-hour workshift in cotton waste processing operations of waste recycling (sorting, blending, cleaning, willowing, and garnetting). The National Institute for Occupational Safety and Health (NIOSH) recommends that exposure to cotton dust be reduced to the lowest feasible limit, which is defined as being a recommended exposure limit (REL) of less than 200 $\mu g/m^3$. The American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV®) for cotton dust (raw) is 200 $\mu g/m^3$ as a TWA for a normal 8-hour workday and a 40-hour workweek (Table 1).

Table 1.—Occupational exposure limits for cotton dust

	Exposure limits $\mu g/m^3$
OSHA PEL TWA	200 (yarn manufacturing and cotton washing)
	750 (slashing and weaving)
	500 (textile mill waste house operations and lower grade washed cotton in yarn manufacturing)
	1,000 (waste recycling and garnetting)
NIOSH REL	<200
ACGIH TLV TWA	200

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health
Division of Standards Development and Technology Transfer

HEALTH HAZARD INFORMATION

• Routes of exposure

Cotton dust may cause adverse health effects following exposure via inhalation.

• Summary of toxicology

1. *Effects on animals:* In rabbits, inhalation of cotton dust combined with bacterial *(Escherichia coli)* endotoxin caused bronchitis.

2. *Effects on humans:* Short-term exposure to cotton dust has caused bronchitis and acute byssinosis (also known as "Brown Lung" or "Monday Morning Fever"), a reversible respiratory disease produced by inhalation of cotton dust. Chronic exposure has caused lung airway obstruction (which reduces ventilatory capacity) and has led to disability and premature death. A direct relationship has been observed between the total concentration of cotton dust exposure and the rate of development of byssinosis. Among workers exposed to cotton dust, cigarette smokers have an increased risk of developing byssinosis. The biologically active material in cotton dust has not been ascertained; however, the risk of developing byssinosis appears to be reduced for workers who are exposed to dust from washed cotton.

• Signs and symptoms of exposure

1. *Short-term (acute):* Exposure to cotton dust can produce a feeling of chest tightness, coughing, wheezing, phlegm, weakness, fever, chills, and breathing difficulty (dyspnea). These symptoms can disappear following removal from exposure (during brief periods away from work) and can reappear following reexposure.

2. *Long-term (chronic):* Exposure to cotton dust can cause permanent and disabling breathing difficulties that include chronic bronchitis with emphysema.

RECOMMENDED MEDICAL PRACTICES

• Medical surveillance program

Workers with potential exposures to cotton dust should be monitored in a systematic program of medical surveillance intended to prevent or control occupational injury and disease. The program should include education of employers and workers about work-related hazards, placement of workers in jobs that do not jeopardize their safety and health, earliest possible detection of adverse health effects, and referral of workers for diagnostic confirmation and treatment. The occurrence of disease (a "sentinel health event," SHE) or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and personal protective equipment). A medical surveillance program is intended to supplement, not replace, such measures.

A medical surveillance program should include systematic collection and epidemiologic analysis of relevant environmental and biologic monitoring, medical screening, morbidity, and mortality data. This analysis may provide information about the relatedness of adverse health effects and occupational exposure that cannot be discerned from results in individual workers. Sensitivity, specificity, and predictive values of biologic monitoring and medical screening tests should be evaluated on an industry-wide basis prior to application in any given worker group. Intrinsic to a surveillance program is the dissemination of summary data to those who need to know, including employers, occupational health professionals, potentially exposed workers, and regulatory and public health agencies.

• Preplacement medical evaluation

Prior to placing a worker in a job with a potential for exposure to cotton dust, the physician should evaluate and document the worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the respiratory tract. Medical surveillance for respiratory disease should be conducted by using the principles and methods recommended by NIOSH and the American Thoracic Society (ATS).

A preplacement medical evaluation is recommended in order to detect and assess preexisting or concurrent conditions which may be aggravated or result in increased risk when a worker is exposed to cotton dust at or below the NIOSH REL. The examining physician should consider the probable frequency, intensity, and duration of exposure, as well as the nature and degree of the condition, in placing such a worker. Such conditions, which should not be regarded as absolute contraindications to job placement, include a history of asthma or significant breathing impairment due to chronic lung disease. In addition to the medical interview and physical examination, the means to identify respiratory conditions may include the methods recommended by NIOSH and ATS.

• Periodic medical screening and/or biologic monitoring

Occupational health interviews and physical examinations should be performed at regular intervals. Additional examinations may be necessary should a worker develop symptoms that may be attributed to exposure to cotton dust. The interviews, examinations, and appropriate medical screening and/or biologic monitoring tests should be directed at identifying an excessive decrease or adverse trend in the physiologic function of the respiratory tract as compared to the baseline status of the individual worker or to expected values for a suitable reference population. The following tests should be used and interpreted according to standardized procedures and evaluation criteria recommended by NIOSH and ATS: standardized questionnaires, pre- and post-shift tests of lung function, and chest X-rays.

• Medical practices recommended at the time of job transfer or termination

The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic and laboratory tests which were conducted at the time of placement should be repeated at the time of job transfer or termination. Any changes in the worker's health status should be compared to those expected for a suitable reference population. Because occupational exposure to cotton dust may cause

diseases of prolonged induction-latency, the need for medical surveillance may extend well beyond termination of employment.

• **Sentinel health events**

1. Acute SHE's include: Byssinosis (acute form)
2. Delayed-onset SHE's include: Byssinosis (chronic form) and chronic bronchitis with emphysema

MONITORING AND MEASUREMENT PROCEDURES

• **Method**

Sampling and analysis may be performed by collecting cotton dust using a vertical elutriator preselector with a high-efficiency membrane filter and analyzing by gravimetric methods. Detailed sampling and analytical methods for cotton dust may be found in the *Criteria for a Recommended Standard. . . .Occupational Exposure to Cotton Dust.*

SANITATION

Cleaning of equipment by "blowing-down" with compressed air or dry sweeping should be avoided. Vacuum cleaning should be instituted for all processes whenever possible. If "blow-down" is necessary, it should be conducted only in the absence of personnel not directly involved in the "blow-down" operation. Those workers involved in "blow-down" should wear adequate respiratory protection.

Good housekeeping practices designed to prevent the resuspension of settled dust shall be developed and followed at all times.

Change and shower rooms should be provided with separate locker facilities for street and work clothes.

The storage, preparation, dispensing, or consumption of food or beverages, the storage or application of cosmetics, the storage or smoking of tobacco or other smoking materials, and the storage or use of products for chewing should be prohibited in work areas.

Workers who handle cotton dust should wash their faces, hands, and forearms thoroughly with soap and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

Common operations in which exposure to cotton dust may occur and control methods which may be effective in each case are listed in Table 2.

EMERGENCY FIRST AID PROCEDURES

• **Eye exposure**

Where there is any possibility of a worker's eyes being exposed to cotton dust, an eye-wash fountain should be provided within the immediate work area for emergency use. Contact lenses should not be worn when working with this substance.

Table 2.—Operations and methods of control for cotton dust

Operations	Controls
During carding operations, mixing and blowing opertions, bale breaking, manufacturing of cotton yarn, and handling of cottonseed in the extraction of cottonseed oil	Process enclosure, local exhaust ventilation, personal protective equipment
During cotton batting operations and weaving of textiles containing cotton yarn	General dilution ventilation
During raw cotton ginning, bale pressing, and harvesting	Local exhaust ventilation, personal protective equipment

SPILLS AND LEAKS

In cases in which environmental levels exceed the NIOSH REL, workers not wearing respiratory protection should be restricted from areas of cotton dust contamination until cleanup has been completed.

If cotton dust contamination occurs, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of contamination.
3. Cotton dust may be collected by vacuuming with an appropriate high-efficiency filtration system or by using wet methods and placed in an appropriate container. If a vacuum system is used, there should be no sources of ignition in the vicinity of the contamination, and sufficient flashback prevention devices should be provided.

WASTE REMOVAL AND DISPOSAL

U.S. Environmental Protection Agency, Department of Transportation, and/or state and local regulations shall be followed to assure that removal, transport, and disposal are in accordance with existing regulations.

RESPIRATORY PROTECTION

It must be stressed that the use of respirators is the least preferred method of controlling worker exposure and should not normally be used as the only means of preventing or minimizing exposure during routine operations. However, there are some exceptions for which respirators may be used to control exposure: when engineering and work practice controls are not technically feasible, when engineering controls are in the process of being installed, or during emergencies and certain maintenance operations including those requiring confined-space entry (Table 3).

In addition to respirator selection, a complete respiratory protection program should be instituted which as a minimum complies with the requirements found in the OSHA Safety and Health Standards 29 CFR 1910.134. A respiratory protection program should include as a minimum an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, fit testing, periodic environmental monitoring, maintenance, inspection, and cleaning. The implementation of an adequate respiratory protection program, including selection of the correct respirators, requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly.

Only respirators that have been approved by the Mine Safety and Health Administration (MSHA, formerly Mining Enforcement and Safety Administration) and by NIOSH should be used. **Remember! Air-purifying respirators will not protect from oxygen-deficient atmospheres.**

For each level of respiratory protection, only those respirators that have the minimum required protection factor and meet other use restrictions are listed. All respirators that have higher protection factors may also be used.

BIBLIOGRAPHY

• American Conference of Governmental Industrial Hygienists: "Cotton Dust," *Documentation of the Threshold Limit Values and Biological Exposure Indices* (5th ed.), Cincinnati, 1986.

• American Conference of Governmental Industrial Hygienists: *TLVs® Threshold Limit Values and Biological Exposure Indices for 1987-88*, Cincinnati, 1987.

• American Lung Association of San Diego and Imperial Counties: "Taking the Occupational History," *Annals of Internal Medicine* 99:641-651, November 1983.

• Clayton, G.D., and Clayton, F.E. (eds.): *Toxicology*, Vol. IIC of *Patty's Industrial Hygiene and Toxicology* (3rd rev. ed.), John Wiley & Sons, Inc., New York, 1982.

• *Code of Federal Regulations*, U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.134, 1910.1043, OSHA 2206, revised July 1, 1986.

• *Code of Federal Regulations*, U.S. Department of Transportation, 49 CFR 172.101, Transportation 49, revised October 1, 1982.

• Goldman, R.H., and Peters, J.M.: "The Occupational and Environmental Health History," *Journal of the American Medical Association*, 246:2831-2836, 1981.

• Halperin, W.E., Ratcliffe, J., Frazier, T.M., Wilson, L., Becker, S.P., and Shulte, P.A.: "Medical Screening in the Workplace: Proposed Principles," *Journal of Occupational Medicine*, 28(8):547-552, 1986.

• Hankinson, J.L.: "Pulmonary Function Testing in the Screening of Workers: Guidelines for Instrumentation, Performance, and Interpretation," *Journal of Occupational Medicine*, 28(10):1081-1092, 1986.

• Harrison, T.R., et al.: "Byssinosis and Respiratory Diseases of Cotton Mill Workers," *Journal of Occupational Medicine*, 14:199-206, 1972.

• Imbus, H.R., and Shu, M.W.: "Byssinosis—A Study of 10,133 Textile Workers," *Archives of Environmental Health*, 26:183-191, 1973.

• Leidel, N.A., Busch, K.A., and Lynch, J.R.: *Occupational Exposure Sampling Strategy Manual*, U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 77-173, Cincinnati, 1977.

• Levy, B.S., and Wegman, D.H. (eds.): *Occupational Health: Recognizing and Preventing Work-Related Disease*, Little, Brown and Company, Boston, 1983.

• Merchant, J.A., Halprin, G.M., Hudson, A.R., Kilburn, K.H., McKenzie, W.N., Hurst, D.J., and Bermazohn, P.: "Responses to Cotton Dust," *Archives of Environmental Health*, 30:222-229, 1975.

• Millar, J.D., Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control: *Congressional Testimony Before Subcommittee on Investigations and Oversight, Committee on Science and Technology*, Washington, DC, September 22, 1982.

• Morgan, W.K.C., and Seaton, A.: *Occupational Lung Diseases*, Saunders, Philadelphia, 1975.

• National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control: *Comments to OSHA Docket H-052E: Cotton Dust, Proposed Occupational Health Standard*, August 1983.

• National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control: *Registry of Toxic Effects of Chemical Substances* (Microfiche Edition), Sweet, D.V., and Lewis, R.J. (eds.), Cincinnati, April 1985.

• National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control: *Criteria for a Recommended Standard. . . .Occupational Exposure to Cotton Dust*, HEW Publication No. 75-118, 1974.

• National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control: *Occupational Diseases—A Guide to Their Recognition* (rev. ed., 2nd printing), DHEW (NIOSH) Publication No. 77-181, 1978.

• Palmer, K.N.: *Dust Explosions and Fires*, Chapman and Hall, London, 1973.

• Parmeggiani, L. (ed.): *Encyclopedia of Occupational Health and Safety* (3rd ed.), International Labour Office, Geneva, Switzerland, 1983.

• Proctor, N.H., and Hughes, J.P.: *Chemical Hazards of the Workplace*, J.B. Lippincott Company, Philadelphia, 1978.

• Rom, W.N. (ed.): *Environmental and Occupational Medicine*, Little, Brown and Company, Boston, 1983.

• Rothstein, M.A.: *Medical Screening of Workers*, Bureau of National Affairs, Washington, DC, 1984.

• Rutstein, D.D., Mullan, R.J., Frazier, T.M., Halperin, W.E., Melius, J.M., and Sestito, J.P.: "Sentinel Health Events (Occupational): A Basis for Physician Recognition and Public

Health Surveillance," *American Journal of Public Health*, 73:1054-1062, 1983.
• Scientific Assembly on Environmental and Occupational Health: "Evaluation of Impairment/Disability Secondary to Respiratory Diseases," *American Review of Respiratory Diseases*, 126:945-951, 1982.
• Scientific Assembly on Environmental and Occupational Health: "Surveillance for Respiratory Hazards in the Occupational Setting," *American Review of Respiratory Diseases*, 126:952-956, 1982.

Table 3.—Respiratory protection for cotton dust

Condition	Minimum respiratory protection*†
Concentration:	
Less than or equal to 1,000 $\mu g/m^3$	Any dust respirator
Less than or equal to 2,000 $\mu g/m^3$	Any dust respirator except single-use and quarter-mask respirators
	Any supplied-air respirator
	Any air-purifying respirator with a high-efficiency particulate filter
	Any self-contained breathing apparatus
Less than or equal to 5,000 $\mu g/m^3$	Any powered air-purifying respirator with a dust filter
	Any supplied-air respirator operated in a continuous flow mode
Less than or equal to 10,000 $\mu g/m^3$	Any air-purifying full facepiece respirator with a high-efficiency particulate filter
	Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
	Any self-contained breathing apparatus with a full facepiece
	Any supplied-air respirator with a full facepiece
	Any supplied-air respirator with a tight-fitting facepiece and operated in a continuous flow mode
Planned or emergency entry into environments containing unknown concentrations or levels above 10,000 $\mu g/m^3$	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive pressure mode
Firefighting	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
Escape only	Any air-purifying full facepiece respirator with a high-efficiency particulate filter
	Any appropriate escape-type self-contained breathing apparatus

*Only NIOSH/MSHA-approved equipment should be used.
†The respiratory protection listed for any given condition is the minimum required to meet the NIOSH REL of <200 $\mu g/m^3$.