

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** CARBON BLACK ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for CARBON BLACK

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 CARBON BLACK.

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 carbon black not in excess of 3.5 milligrams per cubic meter (mg/M3) (as total dust) 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 carbon black averaged over an eight-hour work shift.

(b) Initial determination and exposure measurement. (1) Each employer who has a place of employment in which carbon black is released into the workplace air shall determine if there is any possibility that any employee may be exposed to airborne concentrations of carbon black above the permissible level. The initial determination shall be made each time there is a change in production, process, or control measures which may result in an increase in airborne concentrations of carbon black.

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

(i) Any information, observations, or calculations which may indicate employee exposure to carbon black;

(ii) Any measurements of carbon black taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to carbon black; and

(iv) Date of initial determination, work being performed at the time, location within work site, and employees considered.

(3) If the employer determines that any employee may be exposed to carbon black above the permissible exposure, 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 carbon black above the action level, the employer shall:

(i) Identify all employees who may be exposed above the permissible level; and

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

(5) If an employee exposure measurement reveals that an employee is exposed to carbon black above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every three months.

(6) If an employee exposure measurement reveals that an employee is exposed to carbon black 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 carbon black above the permissible exposure. The employee shall also be notified of the results of the exposure measurements and of the corrective action being taken to reduce the exposure to below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to carbon black 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.

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(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	.
and above the action level	$\pm 35\%$

At or below the action level	$\pm 50\%$
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(d) Compliance. (1) No employee shall be exposed to carbon black above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of carbon black 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 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 local exhaust is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity or static pressure, 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 carbon black.

(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 not feasible; or

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

(iv) For operations which require entry into tanks or closed vessels; or

(v) In emergencies.

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(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 CARBON BLACK

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Particulate Concentration	
17.5 mg/M3 or less	Any dust and mist respirator.
35 mg/M3 or less	Any dust and mist respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
175 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.
2000 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. A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet or hood operated in continuous-flow mode.
Greater than 2000 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

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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.

(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 carbon black.

(2) For the purpose of compliance with § 1910.309, locations classified as hazardous locations due to the presence of carbon black shall be Class II, Group F.

(3) For the purpose of compliance with § 1910.157, carbon black is classified as a Class A fire hazard.

(4) For the purpose of compliance with § 1910.178, locations classified as hazardous locations due to the presence of carbon black shall be Class II, Group F.

(5) Carbon black shall be stored so as not to come in contact with strong oxidizing agents.

(6) Sources of ignition such as smoking or open flames are prohibited where carbon black presents a fire or explosion hazard.

(f) Personal protective equipment. Employers shall provide and ensure that employees use dust-resistant safety goggles which comply with § 1910.133(a)(2)-(a)(6) necessary to prevent repeated eye contact with carbon black.

(g) Spills and disposal. In the event that carbon black is spilled the employer shall immediately provide available ventilation and then clean up the spill.

(h) Sanitation. Employers shall ensure that employees who have contacted carbon black wash with soap or mild detergent and water any areas of the body which have contacted carbon black at the end of the work day.

(i) Training and information. (1) Each employer who has a workplace in which carbon black 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 carbon black above the action level without regard to the use of respirators, or employees who may have repeated eye contact with carbon black, or employees who work where carbon black presents a fire or explosion hazard, shall annually:

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

(ii) Advise affected employees as to the signs and symptoms of exposure to carbon black.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of overexposure to carbon black which are listed in Appendix A of the section;

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(iv) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to carbon black.

(j) Medical surveillance. (Reserved)

(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 carbon black.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to carbon black 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)(i) 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) 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 carbon black which is conducted pursuant to this section.

(2) When observation of monitoring of employee exposure to carbon black 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 carbon black that are being performed at the place of exposure; and

(iii) Record the results obtained.

NOTE: The information contained in the following appendix for carbon black is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligation. To the extent that the information supplements this regulation for carbon black, it is advisory in nature.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR CARBON BLACK

I. SUBSTANCE IDENTIFICATION

A. Substance: Carbon black

B. Permissible Exposure: 3.5 milligrams of carbon black per cubic meter of air (mg/M3) averaged over an eight-hour work shift.

C. Appearance and odor: Black odorless solid

II. HEALTH HAZARD DATA

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- A. Ways in which the chemical affects your body: Carbon black might affect your body if you inhale it or if it comes in contact with your eyes.
- B. Effects of Overexposure:
 - 1. Exposure to carbon black has not been reported to cause illness in man. Animal experiments have shown X-ray and electrocardiographic changes without significant illness following prolonged overexposure.
 - 2. 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 carbon black.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If carbon black gets into your eyes, wash your eyes promptly with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

- A. Respirators: Respirators are not the best way to control exposure to carbon black. 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 there use is required. If you experience difficulty breathing while wearing a respirator, tell your employer.
- B. Protective Clothing: None required.
- C. Eye Protection: You must wear dust-resistant safety goggles to prevent repeated eye contact with carbon black.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. Carbon black is a combustible solid and its dust can form explosive mixtures in air.
- B. Carbon black must be stored in tightly closed containers in a cool, well ventilated area away from strong oxidizers.
- C. Sources of ignition such as smoking and open flames are prohibited wherever carbon black is handled, used or stored in a manner that could create a potential fire or explosion hazard.
- D. If you have contacted carbon black at the end of each work day you must wash with soap or mild detergent and water any areas of your body that may have contacted carbon black.
- E. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them.
- F. Ask your supervisor where carbon black is used or released in your work area and for any additional safety and health rules.

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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 carbon black. In addition, your employer must instruct you in the safe use of carbon black, emergency procedures, and the correct use of protective equipment.
- B. Your employer is required to determine whether you are being exposed to carbon black. 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 of the exposure and the actions which are being taken to reduce your exposure.
- C. Your employer is required to keep records of your exposure for at least one year. Your employer is required to make the exposure data available to you upon your request.

NOTE: The information contained in the following appendix for carbon black is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligation. To the extent that the information supplements this regulation for carbon black, it is advisory in nature.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR CARBON BLACK

I. PHYSICAL AND CHEMICAL DATA

- A. Substance Identification
 - 1. Synonyms: Channel black; lamp black; furnace black; thermal black; acetylene black
 - 2. Formula: C
 - 3. Molecular weight: 12
- B. Physical Data
 - 1. Boiling point (760 mm Hg): Not applicable
 - 2. Specific gravity (water = 1): 1.8 - 2.18
 - 3. Vapor density (air = 1 at boiling point of carbon black): Not applicable
 - 4. Melting point: Not applicable
 - 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 and odor: Odorless, black solid

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

- A. Fire

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1. Flash point: Not applicable
2. Minimum dust ignition temperature: 510 C (950 F) (cloud)
3. Minimum explosive concentration: Data not available
4. Extinguishing media: Water. For fires in containers, inert with carbon dioxide.
5. Special fire-fighting procedures: None
6. Unusual fire and explosion hazards: Carbon black is a combustible solid and its dust can form explosive mixtures in air. All ignition sources must be controlled where carbon black is used, handled or stored in a manner that could create a potential fire or explosion hazard.
7. For purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electrical Code for carbon black shall be Class II, Group F.

B. Reactivity

1. Conditions contributing to instability: None.
2. Incompatibilities: Contact with strong oxidizers (such as chlorates, bromates, and nitrates) may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving carbon black.
4. Special precautions: None.

III. SPILL AND DISPOSAL PROCEDURES

- A. If carbon black is spilled, the following steps should be taken:
 1. Ventilate area of spill.
 2. Collect spilled material in the most convenient and safe manner for reclamation, or for disposal in a sanitary landfill.
- B. Persons not wearing protective equipment should be restricted from areas of spills until cleanup has been completed.
- C. Waste disposal methods: Carbon black may be disposed of in a sanitary landfill.

IV. MONITORING AND MEASUREMENT PROCEDURES

- A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the eight-hour exposure may be determined from a single eight-hour sample or two four-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 portable direct-reading instruments, dosimeters, or by collection of particulates using a high efficiency membrane filter with subsequent gravimetric analysis. The method of measurement must determine the concentration of carbon black to plus or minus 35%.

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- 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 carbon black 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 R" (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. Store carbon black in tightly closed containers in a cool, well ventilated area.
- B. Employers should advise employees of all areas and operations where their exposure to carbon black could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to carbon black is likely to occur are: During its production and during its use as a reinforcing agent for rubber and some plastics; as a pigment in printing inks and paints; as a toner for electrostatic copy machines; in the manufacture of dry cell batteries; as an insulator; in match formulations; in filters for liquids and gases; and in the manufacture of gunpowder and other propellants.

NOTE: The information contained in the following appendix is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligation. To the extent that the information supplements this regulation for carbon black, it is advisory in nature.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

Even though studies have indicated that there are no well-demonstrated health hazards to humans from exposure to carbon black, repeated inhalation by monkeys caused deposition of the dust in the lungs with

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minimal or no fibrous tissue proliferation. Repeated exposure of the monkeys to 1.6 mg/M3 for a total of 10,000 hours produced electrocardiographic changes interpreted as right atrial and right ventricular strain, probably a result of massive deposition of the dust in the lungs. Although the repeated administration of the benzene-extractable fraction of carbon black caused tumors in several species of animals by ingestion, skin contact, or subcutaneous or intraperitoneal injection in oil, similar exposures to carbon black were not carcinogenic; moreover, carbon black was demonstrated to adsorb known carcinogens and prevent their tumorigenic action. The morbidity and mortality of workers in a plant engaged in the manufacture of carbon black over a 17-1/2 year period (1939 to 1956) were not significantly different from those of the general population. A research chemist who was exposed to many types of carbon black over a period of 11 years developed an epidermoid carcinoma of the right cheek of the face; later involvement and excision of the left parotid gland revealed the presence of a black material and squamous cell metaplasia.

III. SIGNS AND SYMPTOMS

None expected.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

None specific. Prolonged skin contact should be avoided.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Benzene extracts of carbon black are carcinogenic in animals. However, human studies have not shown a significant increase in cancer. Carcinogenic agents are absorbed and not easily released and this may account for the low incidence of cancer.

B. PREPLACEMENT

None required.

C. PERIODIC EXAMINATIONS

None Required.

VII. REFERENCES

1. American Conference of Governmental Industrial Hygienists: "Carbon Black," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, pp. 38-39.

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2. Nau, C.A., et al: "A Study of the Physiological Effects of Carbon Black. I. Ingestion," A.M.A. Archives of Industrial Health, 17:21-28, 1958.
3. Nau, C.A., et al: "A Study of the Physiological Effects of Carbon Black. II. Skin Contact," A.M.A. Archives of Industrial Health, 18:511-520, 1958.
4. Nau, C.A., et al: "A Study of the Physiological Effects of Carbon Black. III. Absorption and Elution Potentials; Subcutaneous Injections," Archives of Environmental Health, 1:512-533, 1960.
5. Nau, C.A., et al: "Physiological Effects of Carbon Black. IV. Inhalation," Archives of Environmental Health, 4:45-61, 1962.
6. von Haam, E. and F.S. Mallette: "Studies on the Toxicity and Skin Effects of Compounds Used in the Rubber and Plastics Industries," A.M.A. Archives of Industrial Hygiene and Occupational Medicine, 6:237-242, 1952.
7. Ingalls, T.H. and R. Risquez-Iribarren: "Periodic Search for Cancer in the Carbon Black Industry," 2:429-433, 1961.
8. Maisel, B., et al: "Carbon-Black Carcinoma of Stensen's Duct," Archives of Surgery, 78:331-339, 1959.
9. International Labour Office: Encyclopaedia of Occupational Health and Safety, Vol. I, A-K, McGraw Hill Book Company, New York, 1974, pp. 249-251.
10. Qazi, A.H. and C.A. Nau: "Identification of Polycyclic Aromatic Hydrocarbons in Semi-Reinforcing Furnace Carbon Black," American Industrial Hygiene Association Journal, 36:187-192, 1975.

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REFERENCES AND SOURCES
CARBON BLACK
1910.1000

- (±) Personal Protective Equipment, and, (h) Sanitation
Eye: Grant, "Toxicology of the Eye;" Sax, "Dangerous Properties of Industrial Materials"
Skin: International Labour Office, "Encyclopedia of Occupational Health and Safety;" Sax, "Dangerous Properties of Industrial Materials"
Ingestion: International Labour Office, "Encyclopedia of Occupational Health and Safety"

COMMENTS

Eye - Classification: 6

Output statement numbers: 12

Exceptions: Statement 12 modified

According to Grant, carbon black has caused "black pigmentation of the palpebral conjunctiva at the upper tarsal border after regular application to the lid margins for at least two years. The conjunctiva of the lower lid is less involved. Although there is lymphocytic infiltration and the pigment is taken up by macrophages, the deposits cause essentially no symptoms."

Sax notes that "carbon in the form of soot can cause conjunctivitis. It can also cause epithelial hyperplasia of the cornea, as well as eczematous inflammation of the eyelids. Some forms of carbon dust can cause irritation of the eyes . . ."

Occasional eye contact with carbon black would not be expected to produce significant adverse effects on the eye. Repeated eye contact, however, can result in eye irritation. Therefore, carbon black is assigned a classification of 6 with statement 12 modified such that eye protection is required only in cases where repeated eye contact occurs.

Skin - Classifications: 6

Output statement numbers: 15

Exceptions: See below

According to the ILO, "in the case of (animal) skin contact, harmful effects were observed and effective absorption of known carcinogens occurred. However, investigations on the peritoneal reactions of carbon black in rats showed that apart from types composed of large spherical particles, carbon black is not completely inert." The ILO further adds, however, that "there are no well demonstrated health hazards in the carbon black industry at present. In some factories in Texas the workers cover their faces with talcum powder in order to prevent the penetration of carbon black into the skin."

Sax considers carbon to be a chronic local irritant of slight toxic hazard.

Carbon black has an essentially zero vapor pressure at 20 degrees C and is insoluble in water.

There is no indication in the literature that skin contact with carbon black can result in harmful effects to

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humans. To prevent the possibility that prolonged contact may lead to adverse chronic effects the substance is, therefore, assigned a classification of 6. However, only statement 15 is specified. This statement is written to apply only at the end of the work shift and only if contamination has occurred.

Ingestion - Classification: 0

Output statement number: 0

Exceptions: None

There are no indications in literature sources leading to the conclusion that the substance has any toxic effects by this route. The ILO says, "animal experiments for the determination of carcinogenicity of carbon black showed that the feeding of this substance to mice leads to no definite changes and that it can absorb a carcinogen and make it ineffective."

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

National Fire Protection Association, "Fire Protection Guide on Hazardous Materials," 5th edition, 1975 (NFPA)

Kirk-Othmer, "Encyclopedia of Chemical Technology," 2nd edition, Supplementary Volume, p. 91; Vol. 9, p. 291; Vol. 4, p. 243 (K-O)

Palmer, K. M., "Dust Explosions and Fires," Chapman and Hall, London (Palmer)

Sources of data items used:

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

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

Beritic, D., Paukovic, R. and Valic, F., "Respiratory Symptoms and Ventilatory Capacities in Workers Exposed to Carbon Black Dust," Presented

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at the 15th International Congress of Occupational Health, Vienna, 1966 (Beretic)

Capusan, I. and Mauksch, J., "Cutaneous Affections Associated with the Manufacture of Carbon Black," *Berufsdermatosen*, 17(1), p. 28 - 37, 1969 (NIOSH Technical Information Service NIOSH 8996)

"Carbon Black," Degussa, Inc., Technical Bulletin Pigments No. 40,

"Carbon Black as Pigment for Plastics," January 31, 1974 (Degussa)

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References for Specific Control Methods

ILO and NIOSH 10756 were the references used in all the Specific Control Methods.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Carbon black

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D. O. L. STANDARD: 3.5 mg/M3

Eye Irritation Level: Carbon black is not known to be an eye irritant.

IDLH: There is no evidence in the available toxicological information that an acute exposure to a high concentration of carbon black would impede escape or cause any irreversible health effects within one-half hour. For the purposes of this standard, therefore, respirators have been selected 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 approximately 500 times the perm exposure.

Other Toxicological Information: According to the ILO, "the epidemiological investigations of the hazards of carbon black were initiated in 1950, when the incidence of cancer in this industry was studied. It was demonstrated that the death rate for cancer and the morbidity of workers in the carbon black industry were similar to those of the general population.

"Animal experiments for the determination of carcinogenicity of carbon black showed that the feeding of this substance to mice leads to no definite changes and that it can adsorb a carcinogen and make it ineffective. The inhalation of high concentrations of channel and furnace carbon black for prolonged periods of time was without significant effects in laboratory animals."

The Documentation of TLV's state that "Nau and co-workers conducted extensive carbon black inhalation studies with animals. A channel black and furnace carbon black, the most widely used types of carbon blacks, were used in the study . . . Hamsters, mice, guinea pigs, rabbits, and monkeys were exposed for prolonged periods of time, seven hours per day, five days a week, to dust concentrations of either 2.4 mg of channel black per cubic meter of air or 1.6 mg of furnace black per cubic meter. These concentrations were considered to be consistent with the average dustiness in carbon black plants on an average day. No malignancies were observed in any of the exposed animals. . . The authors concluded that other than the accumulation of dust in the pulmonary system, the prolonged exposure to carbon black produced no significant effects."

"On the basis of air tests made in rubber plants in Uruguay and in the United States, Sands and Benitez suggested a tentative standard of 3.5 mg of carbon black per cubic meter of air as a safe and practical goal from the standpoint of rubber mill room dust exposures."

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USE/EXPOSURE AND CONTROL DOCUMENT
CARBON BLACK

Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1. Inhalation of dust and skin contact with solid during use in the manufacture of natural and synthetic rubbers (used as a reinforcing agent - tires, automotive and appliance parts, wire and cable covering, belts, hose, shoe heels and soles, etc).	A,B	General dilution ventilation
2. Inhalation of dust and skin contact with solid during manufacture and distribution and during maintenance of equipment and storage containers. All carbon blacks are manufactured by partial combustion or thermal decomposition of liquid or gaseous hydrocarbons and are classified as lamp-, channel-, furnace-, thermal-, or acetylene black.	A,B	General dilution ventilation
3. Inhalation of dust and skin contact with solid during the manufacture and use of printing inks (pigment in newsprint inks, electrostatic copy machines, offset or lithographic inks, book printing, illustrations, typewriter ribbon, carbon paper)	A,B	General dilution ventilation
4. Inhalation of dust and skin contact with solid during use in manufacture of coatings (pigment in paints, lacquers, enamels, automotive finishes, antistatic spray paints. Beaded or pelleted blacks	A,B	General dilution ventilation

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are generally ground
during manufacture of
coating compound)

- | | | | |
|----|--|-----|------------------------------|
| 5. | Inhalation of dust and skin contact with solid during manufacture of plastics (used as pigment, protectant against photo- and thermal oxidation, and as anti-static agent - in cable jackets, polyethylene pipes, phonograph records, flooring, tile, many elastomers, synthetic fibers - nylon) | A,B | General dilution ventilation |
| 6. | Inhalation of dust and skin contact with solid during use in manufacture of paper (used to produce black paper - album paper, leatherboard, wrapping and bag paper, opaque paper for photographic film, high conducting and electrosensitive paper, black electrical tape) | A,B | General dilution ventilation |
| 7. | Inhalation of dust and skin contact with solid during use as a coloring pigment (in linoleum, leather coatings, polishes, plastic tile, concrete, eye cosmetics, confections and other foods, food packaging materials) | A,B | General dilution ventilation |
| 8. | Inhalation of dust and skin contact with solid during use in the manufacture of dry cells (an important filler material for cells with lower resistance, higher capacity, and longer shelf life) | A,B | General dilution ventilation |
| 9. | Inhalation of dust and skin contact with solid | A,B | General dilution ventilation |

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during use in manufacture
of explosives (used as
absorbent and fuel in
liquid oxygen explosives)

11. Inhalation of dust and skin contact with solid during use as a source of carbon (manufacture of carbon brushes and electrodes, ore reduction, carburizing) A,B General dilution ventilation

- A -- Inhalation
- B -- Skin and eye contact resulting in localized irritation
- C -- Ingestion
- D -- Skin contact resulting in absorption and subsequent systemic poisoning