

**criteria for a recommended standard . . . .**

# **OCCUPATIONAL EXPOSURE TO**

**COKE OVEN EMISSIONS**

**U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
Public Health Service  
Health Services and Mental Health Administration  
National Institute for Occupational Safety and Health**

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## PREFACE

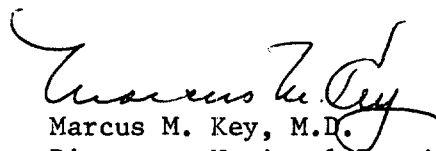
The Occupational Safety and Health Act of 1970 emphasizes the need for standards to protect the health of workers exposed to an ever-increasing number of potential hazards at their workplace. To provide relevant data from which valid criteria and effective standards can be deduced, the National Institute for Occupational Safety and Health has projected a formal system of research, with priorities determined on the basis of specified indices.

It is intended to present successive reports as research and epidemiologic studies are completed and sampling and analytic methods are developed. Criteria and standards will be reviewed periodically to ensure continuing protection of the worker.

This "work practices" document applies to occupational exposure to the emissions produced during the coking of coal. Due to the absence of reliable dose response data, this report does not recommend an environmental air standard as a safe exposure level. Instead, it recommends a combination of respiratory protection and "work practices" or operating procedures. These measures are intended to reduce not only the coke oven emissions, but also workers' exposure to the emissions.

I am pleased to acknowledge the contributions to this report on coke oven emissions by members of my staff, by Robert B. O'Connor, M.D., NIOSH consultant in occupational medicine, and by Edwin J. Kloos and Robert H. Schutz, consultants on respiratory protection. Valuable and constructive comments were presented by the Review Consultants on Coke Oven Emissions and by the ad-hoc committees of the American

Academy of Occupational Medicine and of the American Academy of Industrial Hygiene. The NIOSH recommendations for standards are not necessarily a consensus of all the consultants and professional societies that reviewed this criteria document on coke oven emissions. Lists of the NIOSH Review Committee members and of the Review Consultants appear on pages iv and v.



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The Office of Research and Standards Development, National Institute for Occupational Safety and Health, had primary responsibility for development of the criteria and recommended standard for Coke Oven Emissions. The draft document was developed by Mr. John V. Crable, Dr. Bobby F. Craft, Mr. Alan K. Gudeman, Dr. J. William Lloyd, Dr. Lester D. Scheel, Dr. William D. Parnes, and Dr. Joseph K. Wagoner; and the American Iron and Steel Institute, which developed some of the information under contract HSM-99-72-137. Bryan D. Hardin served as criteria manager and had NIOSH program responsibility.

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CRITERIA DOCUMENT: RECOMMENDATIONS FOR AN  
OCCUPATIONAL EXPOSURE STANDARD FOR COKE OVEN EMISSIONS

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## I. RECOMMENDATIONS FOR COKE OVEN OPERATING PROCEDURES

The National Institute for Occupational Safety and Health recommends that worker exposure to coke oven emissions be controlled by requiring compliance with the following five sections.

Reduction of worker exposure can best be achieved by the elimination of emissions through improved engineering controls and coking methods. Operating procedures and respiratory protective devices are recommended pending development of sufficient data for identification of a safe environmental level of coke oven emissions. Pertinent new information will be reviewed periodically, and these recommendations will be revised where substantial changes in the control of emissions are achieved. These recommendations are not intended to supplant the existing standard for occupational exposure to coal tar pitch volatiles as set forth in part 1910.93 of the Federal Register, Volume 37, dated October 18, 1972, which can serve both as an index of worker exposure to coke oven emissions and as a measure of the effectiveness of engineering controls and operating procedures.

### Section 1 - Operating Procedures

Engineering controls should be used to prevent workers' exposure to coke oven emissions. All new construction shall incorporate the best available engineering controls which will contribute to the elimination of coke oven emissions or which will reduce workers' exposure. The operator of each coke plant shall actively seek, design, and implement engineering controls, and shall maintain all

engineering, ventilation, and physical control systems in efficient working order at all times.

Engineering controls for several jobs are listed below. If not already in use, these or alternate but at least equally effective engineering controls shall be implemented for the operations listed. Additional engineering controls for the protection of workers in these or other job descriptions shall be implemented as developed.

#### Pusher Operator

- (a) A cab operating under positive air pressure with a filtered air supply.
- (b) A smoke boot or comparable device installed on the leveler bar.

#### Quench Car Operator

A cab operating under positive air pressure with a filtered air supply.

#### Larryman - Lidman

- (a) For lidmen, enclosed and readily accessible standby pulpit(s) under positive air pressure with a filtered air supply.
- (b) A larry car cab operating under positive air pressure with a filtered air supply.
- (c) Mechanical lid lifters.
- (d) Individual drop sleeves, operated either from battery top or operator's cab.
- (e) Mechanized gooseneck cleaners.
- (f) Remote controlled dampering off and charging systems.

### Door Machine Operator

A cab operating under positive air pressure with a filtered air supply.

### Door Cleaners

Automatic door and jamb cleaners on pusher machines and door machines.

Workers' exposure to coke oven emissions can be reduced if certain basic procedures, generally common to the management of coke ovens, are incorporated into the operating procedures which are developed for individual coke batteries. The following basic provisions shall be incorporated into such operating procedures and additional controls developed and implemented as appropriate for each coke plant.

### Prior to charging coal

- (a) Gooseneck and standpipes shall be inspected, and any tar or carbon buildup removed to ensure free flow of gas.
- (b) Liquor sprays on goosenecks shall be cleaned to ensure adequate flushing liquor flow at all times.
- (c) Aspiration systems shall be inspected and any excessive accumulation of tar and carbon removed before any coal is charged into the oven.
- (d) Standpipe caps shall be closed and properly sealed.

- (e) The charging holes shall be inspected, and any carbon buildup which will effectively impede the flow of coal into the oven shall be removed.
- (f) The larry car hoppers shall be filled with coal to a predetermined level as established for each individual hopper so that the oven is properly filled.
- (g) The larry car shall be properly spotted over the oven to be charged to reduce emissions by allowing fast, efficient delivery of coal to the oven, and by preventing spilling.

#### Charging of Coal

- (a) The coal shall be charged into the oven in accordance with specific procedures established to ensure that the charging operation is accomplished with the least evolution of emissions to the atmosphere.
- (b) Procedures shall be established so that the leveling operation is carried out in a manner to minimize the evolution of smoke to the atmosphere.
- (c) Charging hole lids shall be replaced as soon as possible after the coal has emptied from the hoppers. Charging hole lids that do not seat properly shall be sealed or replaced to prevent leakage.
- (d) The aspiration system shall not be turned off until all the charging hole lids have been replaced.
- (e) The top of the battery shall be maintained in a neat, orderly condition, free of coal.

- (f) Procedures shall be established to adjust, repair, or replace self-sealing coke oven doors which fail to seal after the oven is charged. Luted doors which fail to seal after the oven is charged shall be reluted promptly.

#### Coking of the Coal Charge

- (a) The coal charge shall be uniformly heated for a sufficient period to ensure proper coking. For each battery, procedures shall be established for measuring, adjusting, and maintaining of heating flue temperatures to achieve this objective.
- (b) Procedures shall be established for checking the oven back pressure controls to maintain uniform pressure conditions in the collecting main.

#### Pushing of Coke

- (a) For each battery, procedures shall be established for dampering off the ovens at the end of the coking cycle and removal of the charging lids to minimize emissions.
- (b) Procedures shall be established so that doors and jambs are cleaned before the doors are replaced after the coke is pushed.

#### Section 2 - Medical

Medical surveillance shall be made available to all workers regularly assigned to work in any location on a coke oven or on a pusher machine or quench car. All such workers shall be offered a preplacement and annual medical examination which shall include a

complete physical examination. The preplacement examination shall include a comprehensive medical history and occupational exposure history, and the annual medical examinations shall include interval medical and occupational exposure histories.

The following items shall be offered to the worker on all preplacement and annual medical examinations.

- (a) A 14" x 17" posterior-anterior chest X-ray.
- (b) A sputum cytology examination.
- (c) A skin examination for premalignant and malignant lesions and evidence of hyperpigmentation or photosensitivity.
- (d) A routine urinalysis to include tests for red blood cells.
- (e) A medical questionnaire that includes the presence and degree of respiratory symptoms (breathlessness, cough, sputum production, and wheezing).

Respiratory function evaluation is also recommended as a guide to respirator usage and to determine whether the individual can wear a respirator.

Based on the judgment of the responsible physician, the frequency of the sputum cytology examinations may be increased or decreased depending upon the individual circumstances such as age, length of employment, smoking status, etc. Any worker with Papanicolaou grade 3, 4, or 5 should be referred immediately to an appropriate specialist for thorough medical evaluation. The return of such a worker to his former work will be based on the judgment of the responsible physician.

Dermatological examinations are primarily concerned with the prevention of skin cancer, and suspicious lesions should be treated expeditiously. The return of the employee to his former work will be based on the judgment of the responsible physician. Such workers should receive detailed instruction on the signs and symptoms of skin cancer, the necessity for good personal hygiene, and the possible risks associated with further exposure.

Workers should have an evaluation of pulmonary function before assignment to jobs requiring regular or periodic respirator usage, and annually thereafter, with spirometry including determination of FEV<sub>1.0</sub> and FVC performed initially and annually thereafter for all personnel permanently assigned to such jobs. An evaluation of workers temporarily assigned to such jobs is not needed if a respiratory evaluation made within the preceding 12 months indicated adequate pulmonary function. When there is evidence of impaired pulmonary function (or of cardiovascular disease) the employee's ability to wear a respirator and the advisability of permitting him to do so should be evaluated in view of the individual circumstances. A worker who shows pulmonary impairment, but is allowed to perform work requiring respirator usage, should be followed carefully and re-evaluated as medically indicated. Such a worker should be counseled on his increased risk and advised to report promptly any difficulties experienced.

The medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, and of the employer



shall have access to all medical records. Physicians designated and authorized by any employee or former employee shall have access to his medical records.

Medical records shall be maintained for persons employed one or more years on the coke ovens. X-rays for the five years preceding termination of employment and all medical records with pertinent supporting documents shall be maintained at least 20 years after the individual's employment is terminated.

### Section 3 - Labeling (Posting)

In order to warn employees of the health risks associated with exposure to coke oven emissions, the following warning signs/placards shall be affixed and maintained in readily visible locations at or near entrances or accessways to coke ovens and coke oven work stations.

WARNING

COKE OVEN EMISSIONS

HEALTH HAZARD

Prolonged exposure to coke oven emissions

may cause cancer

The following warning signs/placards shall be affixed and maintained in readily visible locations to identify the boundaries of those areas in which respiratory protection is required.

RESPIRATORY PROTECTION  
REQUIRED BEYOND THIS POINT

These warning signs /placards shall be printed both in English, and in the predominant primary language of non-English-speaking workers, if any.

Section 4 - Respiratory Protection

Respirators as described herein shall be provided, used, and maintained as a means of respiratory protection for everyone in the locations specified. Respirators are not required for those persons in operating cabs equipped with air filtration systems which are at least as effective against particulate coke oven emissions as are the respirators specified for workers in that location on the oven. Personnel topside on the coke ovens shall wear a supplied air respirator or a powered air-purifying positive-pressure respirator with a half mask, full facepiece, hood, or helmet. Personnel on the side between the pinion walls, in or on door machines and pusher machines when between the pinion walls, and in or on quench cars shall wear any respirator approved for use topside on the coke oven or a nonpowered air-purifying respirator with a half mask or full facepiece. Other respirator types may be used if shown to be at least as effective as the respirator for which substituted. All air-purifying respirators shall use a replaceable dust filter or other particulate removing filter which has been tested and found effective against particulate coke oven emissions.

Respirators as described above shall be used pursuant to the following requirements:

- (a) A medical evaluation of employees shall be performed to ensure that they have adequate ventilatory capacity to wear the prescribed respirators. (see Section 2)
- (b) A respiratory protective program meeting the general requirements outlined in section 3.5 of American National Standard for Respiratory Protection Z88.2-1969 shall be established and enforced by the employer.
- (c) The employer shall provide respirators in accordance with this section.

Respiratory protective devices shall be those approved either under the following regulations, or under 30 CFR 11 published March 25, 1972. The termination date of currently approved respirators described in 30 CFR 11 shall apply.

- (a) Replaceable filter-type air-purifying respirator  
30 CFR 14 (Bureau of Mines Schedule 21 B)
- (b) Powered air-purifying positive-pressure respirator  
30 CFR 14 (Bureau of Mines Schedule 21 B)
- (c) Type C positive-pressure supplied air respirator  
30 CFR 12 (Bureau of Mines Schedule 19 B)

#### Section 5 - Informing Employees of Hazard

When the control or elimination of potential safety and health problems is approached through the application of "operating

procedures," much of the responsibility for the effectiveness of the program rests with the worker. The success of such an approach is highly dependent upon the worker's understanding of the work, its attendant hazards, and his motivation to follow procedures designed to minimize the risk of accident or illness. It is the responsibility of the employer to ensure the worker's understanding and motivation through effective training and education programs and other means at the employer's disposal. To help meet these needs, the following programs shall be initiated.

- (a) Each individual working at the coke ovens shall be informed of the health hazards for coke oven workers and given the training necessary to ensure their understanding of the importance of operating procedures designed to reduce or eliminate exposure to coke oven emissions. At those times the carcinogenic hazards of coke oven emissions shall be presented to the worker, and the early symptoms and signs of cancer shall be explained, emphasizing lung, skin, and kidney cancer. Health professionals shall participate in the preparation and/or presentation of such training, which shall be coordinated with and may be presented in conjunction with other health and safety programs. Sessions shall be initiated for present employees within six months of the promulgation of a standard incorporating these recommendations. Thereafter, sessions shall be attended at

least annually. New employees shall attend the first session offered after their employment.

- (b) Within 30 days of the promulgation of a standard incorporating these recommendations, all present employees shall be given specific instruction by the supervisor for that job regarding the operating procedures for each job task. Thereafter, all new employees and employees new to a job shall receive this instruction before assuming their new duties. All workers who must wear respirators shall receive instruction on the proper use of the respirator and how to fit the respirator to the face.

## II. INTRODUCTION

This report presents operating procedures prepared to meet the need for preventing occupational diseases arising from exposure to coke oven emissions. The document fulfills the responsibility of the Secretary of Health, Education, and Welfare, under the Occupational Safety and Health Act of 1970, to develop and establish recommended "occupational safety and health standards" which are described in Section 3(8) of that Act as standards which require "...the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment."

The National Institute for Occupational Safety and Health, after a review of data and consultation with others, formalized a system for the development of criteria upon which standards can be established to protect the health of workers from exposure to hazardous chemical and physical agents. It should be pointed out that these recommended operating procedures should result in the development of better engineering controls, and should not be used as a final goal, but are procedures to be followed until the necessary data are available to define the causative agent(s) and a safe exposure level.

These recommendations are designed as an aid to reducing workers' exposure to coke oven emissions through the application of operating procedures and engineering controls that are both feasible and attainable with existing technology. Until adequate dose response and environmental data are developed, the workers should be protected to

the maximum extent practicable against exposure to these emissions through the use of respiratory protective devices and operating procedures. While it is recognized that the mandatory use of respirators is not the most desirable solution to the health hazards faced by coke oven workers, respiratory protection is recommended as a measure pending the development and implementation of new or improved coking methods and/or emission controls. These recommendations are not intended to supplant the existing standard for occupational exposure to coal tar pitch volatiles as set forth in part 1910.93 of the Federal Register, Volume 37, dated October 18, 1972, which can serve both as an index of worker exposure to coke oven emissions and as a measure of the effectiveness of engineering controls and operating procedures.