

IV. CONTROL GUIDELINES

The National Institute for Occupational Safety and Health recommends that employee exposure to 4,4'-Methylenebis(2-chloroaniline) (MOCA) in the workplace, be controlled so that no worker will be exposed at concentrations in excess of 3 micrograms per cubic meter ($\mu\text{g}/\text{cu m}$) of air determined as a time-weighted average (TWA) concentration for up to a 10-hour workshift, 40 hour workweek, over a working lifetime. The recommended exposure level of 3 $\mu\text{g}/\text{cu m}$ is the lowest level at which 4,4'-Methylenebis(2-chloroaniline) can be reliably measured at this time. The control guidelines contain recommendations for medical surveillance, informing employees of hazards, sanitation, work practices, labeling and posting, personal protective clothing and equipment, monitoring and recordkeeping.

While compliance with these recommendations should materially reduce the risk of developing cancer from 4,4'-Methylenebis(2-chloroaniline), no absolutely safe concentration can be established for a carcinogen at this time. The employer should regard the recommended permissible exposure level as the upper boundary of exposure, and make every effort to keep exposure by all routes as low as possible.

"Occupational exposure to 4,4'-Methylenebis(2-chloroaniline)" refers to any workplace situation in which it is manufactured, processed, used, or stored. Since 4,4'-Methylenebis(2-chloroaniline) is readily absorbed through the skin, all skin contact with it must be prevented.

Section 1 - Permissible Exposure Level

(a) Concentration

4,4'-Methylenebis(2-chloroaniline) shall be controlled in the workplace so that the concentration of airborne 4,4'-Methylenebis(2-chloroaniline), does not exceed 3 $\mu\text{g}/\text{cu m}$ in breathing zone air determined as a time-weighted average (TWA) concentration.

(b) Sampling and Analysis

The recommended environmental level represents the lowest concentration of 4,4'-Methylenebis(2-chloroaniline) reliably measurable by the recommended sampling and analytical methods selected. Procedures for the collection and analysis of air samples shall be as provided in Appendix II, or by any method at least equivalent in accuracy, precision, and sensitivity to the method specified.

Section 2 - Medical

Medical surveillance shall be made available to employees as outlined below:

(a) Preplacement

Preplacement examinations shall be made available to all workers occupationally exposed to 4,4'-Methylenebis(2-chloroaniline).

History and physical testing shall direct emphasis towards, but not be limited to, the pulmonary, renal, and hepatic systems, and shall include the personal and occupational history of the employee and family including genetic and environmental factors. Additionally, such factors as the current systems review, pregnancy, current treatment

with steroids or cytotoxic agents, and smoking habits should be considered.

(b) Laboratory and Other Special Tests

(1) 14" x 17" chest X-Ray

(2) Laboratory examinations to include:

Complete Blood Count;

Blood Chemistry tests to include serum glutamic oxalacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), alkaline phosphatase, total bilirubin, and gamma-glutamyl transpeptidase (GGTP);

Complete urinalysis to include microscopic examination and cytologic examination for neoplastic cells. Monitoring of urinary 4,4'-Methylenebis(2-chloroaniline) content is an important adjunct to the monitoring of airborne 4,4'-Methylenebis(2-chloroaniline) for the detection of worker exposure.

Additional tests such as sputum cytology may be considered by the examining physician.

Referral to appropriate medical specialists shall be considered if abnormalities are demonstrated by the above examinations or tests.

(c) Periodic examinations shall be made available on at least an annual basis and shall consist of those procedures listed in 2 (a) and (b) above.

(d) If the worker being examined has been employed directly in 4,4'-Methylenebis(2-chloroaniline) production or handling for 10 years or longer, the laboratory portions of the above shall be repeated every 6 months. These examinations shall also be provided more frequently

if, in the opinion of the responsible physician, a worker shows abnormalities in the tests that warrant further evaluation.

(e) Pertinent medical records shall be maintained for all employees occupationally exposed to 4,4'-Methylenebis(2-chloroaniline) in the workplace. Such records shall be maintained for at least 30 years after termination of employment. These records shall be made available to the designated medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employer, the employee, or former employee.

Section 3 - Labeling and Posting

A label shall be placed on each shipping and storage container of 4,4'-Methylenebis(2-chloroaniline), and all areas where there is occupational exposure to 4,4'-Methylenebis(2-chloroaniline) shall be posted.

All warning signs shall be printed both in English and in the predominant language of non-English-reading workers. Workers unable to read the labels and signs provided shall be informed verbally about hazardous areas and the instructions printed on labels and signs.

(a) Labeling

Each container of 4,4'-Methylenebis(2-chloroaniline) shall bear the following label:

4,4'-METHYLENEBIS(2-CHLOROANILINE)

(Trademark, Common Name, or Chemical Name)

WARNING!!

SUSPECT CANCER AGENT

DANGEROUS TO HEALTH IF INHALED OR SWALLOWED

Keep containers closed when not in use.

Wash thoroughly before eating, drinking, smoking, or using toilet.

AVOID SKIN CONTACT

(b) Posting

Entrances to areas where there is occupational exposure to 4,4'-Methylenebis(2-chloroaniline) shall be posted with signs bearing the legend:

CANCER SUSPECT AGENT

AUTHORIZED PERSONNEL ONLY

If respiratory protection is required in accordance with Section 4, the following statement in large letters shall be added to the required sign:

RESPIRATORY PROTECTION REQUIRED IN THIS AREA

Section 4 - Personal Protective Equipment and Clothing

(a) Respiratory Protection

(1) Engineering controls shall be used wherever needed to keep airborne 4,4'-Methylenebis(2-chloroaniline) concentrations below the recommended permissible exposure level. Compliance with this level may be achieved by the use of respirators under the following conditions only:

(A) During the time necessary to develop, install or test the required engineering controls or when such controls fail.

(B) For nonroutine operations, such as emergency maintenance or repair activities.

(C) During emergencies when air concentrations of 4,4'-Methylenebis(2-chloroaniline) may exceed the recommended permissible exposure level.

(2) When a respirator is permitted by paragraph (a)(1) of this section, it shall be selected and used pursuant to the following requirements:

(A) The employer shall ensure that no employee is exposed to 4,4'-Methylenebis(2-chloroaniline) because of improper respirator selection, fit, use, or maintenance.

(B) The employer shall establish and enforce a respirator program meeting the requirements of 29 CFR 1910.134 as amended.

(C) The employer shall provide respirators in accordance with Table I-1, and shall ensure that the employee uses the respirator provided when necessary.

(D) Respiratory protective devices described in Table I-1 shall be those approved under the provisions of 30 CFR 11.

(E) The employer shall ensure that respirators are adequately cleaned and maintained, and that employees are instructed and drilled, at least annually, in the proper use and testing for leakage of respirators assigned to them.

(F) Respirators shall be easily accessible and employees shall be informed of their location.

TABLE I-1

RESPIRATOR SELECTION GUIDE

Concentration of 4,4'-Methylenebis(2-chloroaniline)	Respirator Type Approved under Provisions of 30 CFR 11
Greater than 3 $\mu\text{g}/\text{cu m}$, or <u>Emergency</u> (entry into areas of unknown concentration for emergency purposes)	(1) Self-contained breathing apparatus with full facepiece operated in pressure- demand or other positive pressure mode. (2) Combination Type C supplied-air respirator with full facepiece operated in pressure-demand mode and auxiliary self-contained air supply.

(b) Eye protection

Eye protection shall be provided by the employer and used by the employees where eye contact with 4,4'-Methylenebis(2-chloroaniline) is likely. Selection, use, and maintenance of eye protective equipment shall be in accordance with the provisions of the American National Standard Practice for Occupational and Educational Eye and Face

Protection, ANSI Z87.1-1968. Unless eye protection is afforded by a respirator hood or facepiece, protective goggles (splash-proof safety goggles or cup-cover type dust and splash safety goggles) that comply with 29 CFR 1910.133(a)(2)-(a)(6)), or a face shield (8-inch minimum) shall be worn at operations where there is danger of eye contact with 4,4'-Methylenebis(2-chloroaniline) because of spills or splashes. If there is danger of 4,4'-Methylenebis(2-chloroaniline) striking the eyes from underneath or around the sides of the face shield, safety goggles shall be worn as added protection.

(c) Protective Clothing

Protective clothing shall be resistant to the penetration and to the chemical action of 4,4'-Methylenebis(2-chloroaniline). Clothing made of butyl rubber, neoprene, spunbonded olefin, or an equally effective material are suggested at this time. Protective clothing including gloves, bib-type aprons, boots, and overshoes, shall be provided for, and worn by, each employee during any operation that may cause direct contact with 4,4'-Methylenebis(2-chloroaniline). Supplied-air hoods or suits resistant to penetration by 4,4'-Methylenebis(2-chloroaniline) shall be worn when entering confined spaces, such as pits or storage tanks. In situations where heat stress is likely to occur, supplied-air suits, preferably cooled, are recommended. The employer shall ensure that all personal protective clothing is inspected regularly for defects, and is maintained in a clean and satisfactory condition.

Section 5 - Informing Employees of Hazards from

4,4'-Methylenebis(2-chloroaniline)

(a) All new and present employees working where occupational exposure to 4,4'-Methylenebis(2-chloroaniline) may occur shall be informed orally and in writing of the hazards, appropriate emergency procedures, and proper conditions and precautions concerning its safe use and handling.

(b) Employers shall institute a continuing education program to ensure that all employees have current knowledge of job hazards, cleanup methods, maintenance, emergency and evacuation procedures. This program shall be held for all employees with occupational exposure to 4,4'-Methylenebis(2-chloroaniline) at intervals not greater than quarterly, or whenever there is a process change.

Section 6 - Work Practices

(a) Emergency Procedures

For all work areas where emergencies may occur, the employer shall ensure that employees are instructed in and follow the procedures specified below and any others appropriate to the specific operation or process.

(1) Procedures shall include at least prearranged plans for reentry into areas where 4,4'-Methylenebis(2-chloroaniline) leaks or spills have occurred for cleanup, decontamination, or maintenance purposes.

(2) Evacuation alarm systems shall be provided by the employer.

(3) Nonessential employees shall be evacuated from hazardous areas during emergencies. Perimeters of these areas shall be delineated, posted, and secured. Employees in adjacent areas shall be trained in evacuation procedures should these work areas become involved.

(4) Only personnel trained in the emergency procedures and protected against the attendant hazards (by personal protective equipment and clothing as specified in Section 4) shall shut off sources of 4,4'-Methylenebis(2-chloroaniline), clean up spills, control and repair leaks, and fight fires in 4,4'-Methylenebis(2-chloroaniline) work areas. Proper protective respirators and clothing shall be worn by all personnel in the hazard area until concentrations of airborne 4,4'-Methylenebis(2-chloroaniline) have been demonstrated by monitoring to be below the recommended permissible exposure level.

(5) Firefighting procedures shall be established for areas where flammable materials are used with 4,4'-Methylenebis(2-chloroaniline). Chemical foam, carbon dioxide, or dry chemicals shall be used for firefighting in areas where 4,4'-Methylenebis(2-chloroaniline) is present.

(6) Showers, eyewash fountains, and washroom facilities shall be provided and so located as to be readily accessible to workers in all areas where skin or eye contact with 4,4'-Methylenebis(2-chloroaniline) is likely. If 4,4'-Methylenebis(2-chloroaniline) comes into contact with clothing or skin, contaminated clothing shall be

promptly removed and the skin washed thoroughly with soap and water. If 4,4'-Methylenebis(2-chloroaniline) gets into the eyes, the eyes shall be flushed immediately with copious quantities of water.

(7) Medical attention shall be provided for any workers involved in an emergency situation. Such exposures shall be reported to the immediate supervisor by the affected worker or a fellow employee.

(b) Control of Airborne 4,4'-Methylenebis(2-chloroaniline).

(1) Suitable engineering controls designed to limit exposure to 4,4'-Methylenebis(2-chloroaniline) to that prescribed in Section 1(a) shall be used.

The use of completely enclosed processes is the recommended method of control for 4,4'-Methylenebis(2-chloroaniline). Local exhaust ventilation may also be effective when used alone or in combination with process enclosure. When a local exhaust ventilation system is used, it shall be designed to prevent the accumulation or recirculation of ventilation control or process air in the workroom, to maintain 4,4'-Methylenebis(2-chloroaniline) concentrations below the permissible exposure level and to remove it from the breathing zone of employees. Exhaust systems discharging into outside air must conform with applicable local, state, and Federal air pollution regulations. Ventilation systems shall be subjected to regular preventive maintenance and cleaning to ensure effectiveness, which shall be verified by periodic airflow measurements at least quarterly. Measurements of system efficiency shall also be made immediately by personnel properly attired in specified protective equipment when any

change in production, process, or control might result in increased concentrations of airborne 4,4'-Methylenebis(2-chloroaniline).

Tempered makeup air shall be provided to work areas in which exhaust ventilation is operating.

(2) In operations where premixed forms of 4,4'-Methylenebis(2-chloroaniline) can be substituted for other forms of this chemical or where these premixed forms would reduce the degree of worker exposure, such substitution should be made.

(c) Handling of 4,4'-Methylenebis(2-chloroaniline), and Related Work Practices.

(1) Written operating procedures shall be developed and posted wherever 4,4'-Methylenebis(2-chloroaniline) is processed, handled, used, or stored.

(2) The employer shall ensure that safety showers, eyewash fountains, and other emergency equipment are in proper working order through regularly scheduled inspections performed by qualified maintenance personnel.

(3) Operating systems shall be inspected daily for signs of leaks by personnel attired in protective equipment (as specified in Section 4). All equipment, including valves, fittings, and connections, shall be checked for tightness and good working order. All newly made connections shall be checked for leaks by trained personnel attired in the prescribed personal protective equipment immediately after the system is placed in operation.

(4) If a leak occurs, it shall be corrected immediately. Work shall resume normally only after necessary repair or replacement has

been completed, the area has been ventilated, and the concentration of 4,4'-Methylenebis(2-chloroaniline) has been determined by monitoring to be below the permissible exposure level.

(5) Transportation and use of 4,4'-Methylenebis(2-chloroaniline) shall comply with all applicable local, state, and Federal regulations.

(6) When 4,4'-Methylenebis(2-chloroaniline) containers are being moved, or when they are not in use, appropriate covers shall be in place. Such containers shall be moved only with the proper equipment, and secured to prevent dropping or loss of control while moving.

(7) Process valves and fittings shall be readily accessible, and should not be located in pits and congested areas.

(8) Containers and systems shall be handled and opened with care. Approved protective equipment (as specified in Section 4) shall be worn while opening, connecting, and disconnecting 4,4'-Methylenebis(2-chloroaniline) containers and systems. Adequate ventilation shall be made available to prevent exposure of workers to 4,4'-Methylenebis(2-chloroaniline) when opening containers and systems.

(9) Personnel shall work in teams when 4,4'-Methylenebis(2-chloroaniline) in a quantity sufficient enough to create a hazard is first admitted to a system, while repairing leaks, or when entering a confined or enclosed space.

(d) Work Areas

(1) Regulated areas shall be established and access limited to authorized personnel where there is occupational exposure to 4,4'-Methylenebis(2-chloroaniline).

(e) Storage

(1) Storage facilities shall be designed to contain spills completely, and to prevent contamination of the workroom environment.

(2) Storage of 4,4'-Methylenebis(2-chloroaniline) in the same area with reactive metals, such as aluminum or magnesium, or other reactive chemicals, such as liquid ammonia, shall be prohibited.

(3) Storage containers shall be periodically inspected for leakage.

(4) Ventilation switches and emergency respiratory equipment shall be located outside storage areas in readily accessible locations that will be free of 4,4'-Methylenebis(2-chloroaniline) should an emergency occur.

(f) Spills, Leaks, and Waste Disposal

(1) If a leak or spill occurs, the following steps shall be taken:

(A) Evacuate all nonessential personnel from the area.

(B) Adequately ventilate the area where the spill or leak occurs.

(C) If in molten form, allow to crystallize; break up crystallized material and mechanically sweep up for disposal.

(D) If in solid form, collect spilled material (as above) for reclamation or disposal.

(2) Personnel entering the spill or leak area shall be furnished with appropriate personal protective equipment. All other personnel shall be excluded from the area.

(3) All wastes and residues containing 4,4'-Methylenebis(2-chloroaniline) shall be collected in 4,4'-Methylenebis(2-chloroaniline) resistant containers, and incinerated or buried in such a manner that no 4,4'-Methylenebis(2-chloroaniline) or toxic decomposition products are released into the environment.

(4) All workplace surfaces including process equipment shall be washed down with soap and water or an effective solvent on a periodic basis, the frequency of this periodic washdown shall be increased as indicated by the results of urinary monitoring and spot tests for work surface contamination. At no time shall the visible accumulation of 4,4'-Methylenebis(2-chloroaniline) be allowed.

Section 7 - Sanitation Practices

(a) Plant sanitation shall meet the requirements of 20 CFR 1910.141.

(b) Workers shall change into work clothing at the start of work and remove it at the end of each day. Appropriate locker rooms that provide separate storage facilities for street, work and protective clothing shall be provided.

(c) Clothing contaminated with 4,4'-Methylenebis(2-chloroaniline) shall be removed and placed in a closed container in a well-ventilated area for later disposal or decontamination. Employers shall require personnel who work with 4,4'-Methylenebis(2-chloroaniline) to shower before leaving the workplace at the end of each workday.

(d) Employers shall ensure that employees who handle 4,4'-Methylenebis(2-chloroaniline) wash their hands thoroughly with soap and water before eating, smoking, or using toilet facilities.

(e) The storage, dispensing, preparation, and consumption of food and beverages shall be prohibited in 4,4'-Methylenebis(2-chloroaniline) work areas. Also, smoking shall be prohibited in 4,4'-Methylenebis(2-chloroaniline) work areas, and smoking or related materials, i.e., snuff or chewing tobacco, shall not be carried into such areas.

(f) The employer shall ensure that personnel who launder and clean clothing or equipment contaminated with 4,4'-Methylenebis(2-chloroaniline) are aware of the potential hazards of exposure.

Section 8 - Monitoring and Recordkeeping Requirements

(a) Requirements set forth below apply to work areas where there is occupational exposure to 4,4'-Methylenebis(2-chloroaniline).

(1) An adequate number of personal air samples shall be collected monthly for the evaluation of the work environment with respect to the occupational exposure of employees.

(2) Environmental samples shall be taken when a new process is installed or changes made that may cause an increase in environmental concentrations. Significant increases in production, relocation of existing operations, interruption of normal maintenance schedules, or other functions that may increase airborne 4,4'-Methylenebis(2-chloroaniline) concentrations shall require resampling and analysis until two consecutive samples collected at least 1 week apart

demonstrate that the concentration is below the permissible exposure level.

(3) The minimum number of representative exposure determinations for an operation or process shall be based on variations in exposures and production schedules, and in accordance with the provisions prescribed in Section 1(b).

(4) If initial, periodic, or special evaluations indicate that the recommended permissible exposure level is exceeded, corrective engineering or other control measures shall be immediately instituted to ensure the safety of employees until a concentration below the recommended permissible exposure level is achieved. In such cases, sampling of each operation and work location shall be conducted until two consecutive employee exposure measurements, taken at least 1 week apart, reveal that the employee is not exposed to 4,4'-Methylenebis(2-chloroaniline) above the recommended permissible exposure level. Routine monitoring may then be resumed. Employers shall notify in writing, within 5 days, every employee who is found to be exposed to 4,4'-Methylenebis(2-chloroaniline) above the recommended permissible exposure level.

(b) Employers or their successors shall maintain records which shall include the sampling and analytical methods, and types of respiratory protection used, airborne concentrations found, and any additional information concerning exposure of employees to 4,4'-Methylenebis(2-chloroaniline). Each employee shall have access to data on his or her own environmental exposures. Pertinent records of occupational accidents and environmental exposures within the workplace

shall be kept for at least 30 years after termination of employment. Records of occupational exposures applicable to an employee should be included in the employee's medical records. These records shall be made available to the designated representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employee or former employee, and of the employer.

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