PAPERWORK REDUCTION ACT SUBMISSION

Please read the instructions before completing this form. For additional forms or assistance in completing this form, contact your agency's Paperwork Clearance Officer. Send two copies of this form the collection instrument to be reviewed, the Supporting Statement, and any additional documentation to: Office of Information and Regulatory Affairs, Office of Management and Budget, Docket Library, Room 101022, 725 17th Street, NW, Washington, DC 20503.

1. Agency/Subagency originating request

Department of Labor,
Occupational Safety and Health Administration, OSHA

2. OMB control number

a. **1218–0145** b. ☐ None ____ (new)

3. Type of information collection *(check one)*

a. ☐ New Collection
b. ☐ Revision of a currently approved collection
c. ☒ Extension of a currently approved collection
d. ☐ Reinstatement, without change, of a previously approved collection for which approval has expired
e. ☐ Reinstatement, with change, of a previously approved collection for which approval has expired
f. ☐ Existing collection in use without an OMB control number

For b-f, note item A2 of Supporting Statement instructions

4. Type of review requested (check one)

a. ☒ Regular submission
b. ☐ Emergency - Approval requested by: __/__/__
c. ☐ Delegated

5. Small entities

Will this information collection have a significant economic impact on a substantial number of small entities?

☐ Yes ☒ No

6. Requested expiration date

a. ☒ Three years from approval date?
b. ☐ Other Specify: __ / __ (month/ year)

7. Title: Formaldehyde (29 CFR 1910.1048)

8. Agency form number(s) (if applicable) None

9. Keywords:

10. Abstract

The Formaldehyde Standard and its collections of information are designed to provide protection for employees from the adverse health effects associated with occupational exposure to formaldehyde. The Standard requires employers to monitor employee exposure and provide notification to employees of their exposure. Employers are required to make available medical surveillance to employees.

11. Affected public *(Mark primary with "P" and all others that apply with "X")*

a. __ Individuals or households
b. **P** Business or other for-profit
c. __ Not-for-profit institutions
d. __ Farms
e. __ Federal Government
f. __ State, Local or Tribal Government

12. Obligation to respond (Mark primary with "P" and all others that apply with "X")

a. __ Voluntary
b. __ Required to obtain or retain benefits
c. **P** Mandatory

13. Annual reporting and recordkeeping hour burden

a.	Number of respondents	84,931
b.	Total annual responses	904,202
1.	Percentages of these responses collected electronically	**0%**
c.	Total annual hours requested	237,854
d.	Current OMB inventory	327,533
e.	Difference	-89,679
f.	Explanation of difference	
1.	Program change	
2.	Adjustments	-89,679

14. Annual reporting and recordkeeping cost burden (in of dollars)

a.	Total annualized capital/startup costs	0
b.	Total annual costs (O&M)	41,724,296
c.	Total annualized cost requested	
d.	Current OMB inventory	42,626,346
e.	Difference	-902,050
f.	Explanation of difference	
1.	Program change	
2.	Adjustment	-902,050

15. Purpose of information collection *(Mark primary with "P" and all others that apply with "X")*

a. ___ Application for benefits
b. __ Program evaluation
c. __ General purpose statistics
d. **X** Audit
e. __ Program planning or management
f. **X** Research
g. **P** Regulatory or compliance

16. Frequency of recordkeeping or reporting (check all that apply)

a. ☒ Recordkeeping b. ☒ Third party disclosure
c. ☒ Reporting
1. ☒ On occasion 2. ☐ Weekly 3. ☐ Monthly
4. ☐ Quarterly 5. ☒ Semi-annually 6. ☒ Annually
7. ☐ Biennially 8. ☐ Other (describe) _____

17. Statistical methods

Does this information collection employ statistical methods?

☐ Yes ☒ No

18. Agency contact (person who can best answer questions regarding the content of this submission)

Name: Todd Owen

Phone: (202) 693-2222

19. Certification for Paperwork Reduction Act Submissions

On behalf of this Federal agency, I certify that the collection of information encompassed by this request complies with 5 CFR 1320.9.

NOTE: The text of 5 CFR 1320.9, and the related provisions of 5 CFR 1320.8 (b)(3), appear at the end of the instructions. *The certification is to be made with reference to those regulatory provisions as set forth in the instructions.*

The following is a summary of the topics, regarding the proposed collections of information, that the certification covers:

(a) Is necessary for proper performance of the agency's functions and has practical utility;

(b) It avoids unnecessary duplication;

(c) It reduces burden on small entities;

(d) It uses plain, coherent and unambiguous terminology that is understandable to respondents;

(e) Its implementation will be consistent and compatible with current reporting and recordkeeping practices;

(f) It indicates the retention periods for recordkeeping requirements;

(g) It informs respondents of the information called for under 5 CFR 1320.8 (b)(3)

(h) Why the information is being collected;

(ii) Use of information;

(iii) Burden estimate;

(iv) Nature of response (voluntary, required for a benefit, or mandatory);

(v) Nature and extent of confidentiality; and

(vi) Need to display currently valid OMB control number;

(h) It was developed by an office that has planned and allocated resources for the efficient and effective management and use of the information to be collected (see note in Item 19 of the Instructions);

(i) It uses effective and efficient statistical survey methodology; and,

(j) It makes appropriate use of information technology.

If you are unable to certify compliance with any of these provisions, identify the item below and explain the reason in Item 18 of the Supporting Statement.

Agency Clearance Officer Todd R. Owen, OSHA Clearance Officer	Date
Signature of Senior Departmental Official or Designee Michel Smyth, Departmental Clearance Officer	Date

SUPPORTING STATEMENT FOR THE
INFORMATION COLLECTION REQUIREMENTS CONTAINED
IN THE FORMALDEHYDE STANDARD (29 CFR 1910.1048)
OFFICE OF MANAGEMENT AND BUDGET (OMB)
Control No. 1218-0145 (July 2013)

A. JUSTIFICATION

1. Explain the circumstances that make the collection of information necessary. Identify any legal or administrative requirements that necessitate the collection. Attach a copy of the appropriate section of each statute and regulation mandating or authorizing the collection of information.

The main objective of the Occupational Safety and Health Act (OSH Act) is to "assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources" (29 U.S.C. 651). To achieve this objective, the OSH Act specifically authorizes "the development and promulgation of occupational safety and health standards" (29 U.S.C. 651) to ensure that workers will be furnished "employment and a place of employment . . . free from recognized hazards that are causing or likely to cause death or serious physical harm."

To protect worker health, the OSH Act authorizes the Occupational Safety and Health Administration (OSHA) to develop standards that provide for "monitoring or measuring worker exposure" to occupational hazards and "prescribe the type and frequency of medical examinations and other tests which shall be made available [by the employer] to workers exposed to such hazards . . . to most effectively determine whether the health of such workers is adversely affected by such exposure" (29 U.S.C. 655). In addition, the OSH Act mandates that "[e]ach employer shall make, keep and preserve, and make available to the Secretary [of Labor] . . . such records regarding [his/her] activities relating this Act as the Secretary . . . may prescribe by regulation as necessary or appropriate for the enforcement of this Act or for developing information regarding the causes and prevention of occupational accidents and illnesses" (29 U.S.C. 657). In addition, the OSH Act directs the Agency to "issue regulations requiring employers to maintain accurate records of worker exposures to potentially toxic materials or other harmful physical agents which are required to be monitored and measured," and further specifies that such regulations provide "for each worker or former worker to have access to such records as will indicate [their] own exposure to toxic materials or harmful physical agents" (29 U.S.C. 657). The OSH Act states further that "[t]he Secretary . . . shall prescribe such rules and regulations as [he/she] may deem necessary to carry out [his/her] responsibilities under this Act, including rules and regulations dealing with the inspection of an employer's establishment" (29 U.S.C. 651).

Under the authority granted by the OSH Act, the Agency published a General Industry health standard at 29 CFR 1910.1048 regulating worker exposures to formaldehyde (the Standard). OSHA based the Standard on a determination that occupational exposure to formaldehyde poses a hazard to exposed workers. This determination showed that breathing formaldehyde may cause: an itchy, runny, and stuffy nose; a dry or sore throat; eye irritation; headache; and cancer of the lung, buccal cavity, and pharynx. In addition, the determination indicated that

formaldehyde solutions can damage the skin and burn the eyes. Items 2 and 12 below describe the specific information collection requirements of the Standard.

2. Indicate how, by whom, and for what purpose the information is to be used. Except for a new collection, indicate the actual use the agency has made of the information received from the current collection.

The following are the collection of information requirements as stated in the Standard, followed by discussions indicating how, by whom, and for what purpose the information is used.

A. Exposure monitoring (§1910.1048(d))

General (§1910.1048(d)(1)

§1910.1048(d)(1)(i) - Each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde.

(§1910.1048(d)(1)(ii)) – Exception. Where the employer documents, using objective data, that the presence of formaldehyde or formaldehyde-releasing products in the workplace cannot result in airborne concentrations of formaldehyde that would cause any employee to be exposed at or above the action level or the STEL under foreseeable conditions of use,[1] the employer will not be required to measure employee exposure to formaldehyde.

Purpose: Requiring employers to record this determination permits OSHA to ascertain whether or not an employer is complying with the Standard, thereby ensuring that workers are receiving adequate protection from formaldehyde exposures.

Initial monitoring (§1910.1048(d)(2)) - The employer shall identify all workers who may be exposed at or above the action level or at or above the STEL and accurately determine the exposure of each employee so identified.

§1910.1048(d)(2)(i) - Unless the employer chooses to measure the exposure of each employee potentially exposed to formaldehyde, the employer shall develop a representative sampling strategy and measure sufficient exposures within each job classification for each workshift to correctly characterize and not underestimate the exposure of any employee within each exposure group.

§1910.1048(d)(2)(ii) - The initial monitoring process shall be repeated each time there is a change in production, equipment, process, personnel, or control measures which may result in new or additional exposure to formaldehyde.

[1]Paragraph (b) of the Standard specifies an action level (AL) of 0.50 parts of formaldehyde per million parts of air (0.50 ppm). Paragraph (c) specifies two permissible exposure levels (PELs): An 8-hour, time-weighted average (TWA) of 0.75 parts of formaldehyde per million parts of air (0.75 ppm), and a 15-minute, short-term exposure level (STEL) of two parts of formaldehyde per million parts of air (2.0 ppm).

*§*1910.1048(d)(2)(iii) - If the employer receives reports of signs or symptoms of respiratory or dermal conditions associated with formaldehyde exposure, the employer shall promptly monitor the affected employee's exposure.

Purpose: Employers must perform initial monitoring to determine the extent of formaldehyde exposure in their workplace. Initial monitoring allows employers to identify areas of operation that may require additional reduction in airborne formaldehyde to meet the PELs. Initial monitoring also provides information regarding the effectiveness of engineering and work-practice controls, including the need to implement or revise these controls, and the selection of appropriate respirators to prevent worker overexposure to formaldehyde.

Periodic monitoring (§1910.1048(d)(3))

§1910.1048(d)(3)(ii) - If the last monitoring results reveal employee exposure at or above the action level, the employer shall repeat monitoring of the employees at least every 6 months.

§1910.1048(d)(3)(iii) - If the last monitoring results reveal employee exposure at or above the STEL, the employer shall repeat monitoring of the employees at least once a year under worst conditions.

Termination of monitoring (§1910.1048(d)(4) - The employer may discontinue periodic monitoring for employees if results from two consecutive sampling periods taken at least 7 days apart show that employee exposure is below the action level and the STEL. The results must be statistically representative and consistent with the employer's knowledge of the job and work operation.

Purpose: Periodic exposure monitoring allows employers to determine if changes in processes, materials, or environmental conditions result in increased levels of airborne formaldehyde. Periodic monitoring also enables employers to evaluate the effectiveness of selected control methods.

Employee notification of monitoring results (§1910.1048(d)(6)) - The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees. If employee exposure is above the PEL, affected employees shall be provided with a description of the corrective actions being taken by the employer to decrease exposure.

Purpose: Consistent with section 8(c)(3) of the Act, every worker has the right to know what their exposure level is and whether it is above or below the AL. Moreover, since the PEL is one that also considers feasibility and, therefore, is not necessarily a “safe” level, it is necessary for workers to know the level of formaldehyde to which they were exposed. Additionally, when exposures are above the PEL, the employer must also state in the notification what corrective action the employer is going to take to reduce the exposure level. This requirement is necessary

to assure workers that the employer is making every effort to furnish them with a safe and healthful work environment as required by section 8(c)(3) of the OSH Act.

The Standard requires employers to implement a respiratory-protection program, including fit-testing, as specified by the Agency's Respiratory Protection Standard (29 CFR 1910.134). OSHA accounts for the burden hours and cost of this requirement under the ICR for the Respiratory Protection Standard (OMB Control Number 1218-0099).

B. Regulated areas (§1910.1048(e))

§1910.1048(e)(1) - The employer shall establish regulated areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL and post all entrances and access ways with signs bearing the following information:

DANGER
FORMALDEHYDE
MAY CAUSE CANCER
CAUSES SKIN, EYE and RESPIRATORY IRRITATION
AUTHORIZED PERSONNEL ONLY

1910.1048(e)(1)(ii) - Prior to June 1, 2016, employers may use the following legend in lieu of that specified in paragraph (e)(1)(i) of this section:

DANGER
FORMALDEHYDE
IRRITANT AND POTENTIAL CANCER HAZARD
AUTHORIZED PERSONNEL ONLY

§1910.1048(e)(3) - An employer at a multiemployer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite.

C. Respiratory protection (§1910.1048(g)(1))

General §1910.1048(g)(1) - For employers who use respirators required by this section, the employer must provide each employee an appropriate respirator that complies with the requirements of this paragraph. Respirators must be used during:

§1910.1048(g)(1)(i) - Periods necessary to install or implement feasible engineering and work-practice controls.

§1910.1048(g)(1)(ii) - Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work-practice controls are not feasible.

§1910.1048(g)(1)(iii) - Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the PELs.

§1910.1048(g)(1)(iv) - Emergencies.

Respirator program (§1910.1048(g)(2)(i)) **-** The employer must implement a respiratory protection program in accordance with §1910.134(b) through (d) (except (d)(1)(iii), (d)(3)(iii)(b)(1), and (2)), and (f) through (m), which covers each employee required by this section to use a respirator.

Purpose: The Respiratory Protection Standard assists employers in protecting the health of workers exposed to airborne contaminants and biological agents. The Respiratory Protection Standard collections of information are contained in the Respiratory Protection Standard ICR, OMB Control Number 1218-0099. The Respiratory Protection Standard ICR provides the justification, purpose, and burden hours and cost estimates for these provisions.

D. Protective equipment and clothing (§1910.1048(h)

Maintenance of protective equipment and clothing (§1910.1048(h)(2))

§1910.1048(h)(2)(ii) - The employer shall assure that protective equipment and clothing that has become contaminated with formaldehyde is cleaned or laundered before its reuse.

§1910.1048(h)(2)(ii)(A) - Signs. Storage areas for contaminated clothing and equipment shall have signs bearing the following information:

DANGER
FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT
MAY CAUSE CANCER
CAUSES SKIN, EYE AND RESPIRATORY IRRITATION
DO NOT BREATHE VAPOR
DO NOT GET ON SKIN

§1910.1048(h)(2)(ii)(B) - Labels. The employer shall ensure containers for contaminated clothing and equipment are labeled consistent with the Hazard Communication Standard, §1910.1200, and shall, as a minimum, include the following:

DANGER
FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT
MAY CAUSE CANCER
CAUSES SKIN, EYE, AND RESPIRATORY IRRITATION
DO NOT BREATHE VAPOR
DO NOT GET ON SKIN

§1910.1048(h)(2)(ii)(C) - Prior to June 1, 2016, employers may use the following information in lieu of that specified in paragraph (h)(2)(ii)(A) of this section:

DANGER
FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT
AVOID INHALATION AND SKIN CONTACT

§1910.1048(h)(2)(ii)(D) - Prior to June 1, 2015, employers may include the following information on containers of protective clothing and equipment in lieu of the labeling requirements in paragraphs (h)(2)(ii)(B) of this section:

DANGER
FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT
AVOID INHALATION AND SKIN CONTACT

Purpose: These signs and labels warn workers of the formaldehyde hazard, and how to prevent exposure to the hazard. In addition, warning labels assure that downstream employers and workers are informed of the hazards of formaldehyde, and that these employers may need to implement special practices to prevent exposure. Furthermore, hazard labels alert other employers who, in the absence of such labels, might not know that formaldehyde is present in their workplace and, consequently, that they must comply with the Standard.

§1910.1048(h)(2)(vi) - The employer shall inform any person who launders, cleans, or repairs such clothing or equipment of formaldehyde's potentially harmful effects and of procedures to safely handle the clothing and equipment.

Purpose: This information allows laundry personnel to protect themselves from formaldehyde exposure.

If an employer ventilates formaldehyde-contaminated clothing and equipment, the employer must establish a storage area that minimizes worker exposure. The storage area, as well as any containers used for contaminated clothing and equipment, must have warning labels and signs. This provision also requires employers to notify laundry personnel who clean or repair formaldehyde-contaminated protective clothing or equipment of the potentially harmful effects of formaldehyde, and of procedures for safely handling this clothing and equipment.

The Agency took no burden hours or cost for the requirement to provide warning labels and signs for storage areas and containers used to hold formaldehyde-contaminated clothing and equipment because the Standard provides specific language for the required labels and signs. (See 5 CFR 1320.3(c)(2).) Regarding notification of laundry personnel, OSHA assumes, based on information in the 1987 RIA, that employers provide disposable protective clothing for their workers; therefore, employers incur no burden hours or cost for this requirement.

E. Housekeeping (§1910.1048(j))

§1910.1048(j)(4) - Formaldehyde-contaminated waste and debris resulting from leaks or spills shall be placed for disposal in sealed containers bearing a label warning of formaldehyde's presence and of the hazards associated with formaldehyde.

Purpose: These labels warn workers of the dangers associated with formaldehyde exposure, and allow them to protect themselves from such exposure.

The Standard requires employers to place formaldehyde-contaminated waste and debris resulting from leaks or spills in sealed containers. These containers must have labels that provide the following information: the containers hold formaldehyde-contaminated materials; and the hazards associated with formaldehyde exposure. Therefore, the Agency took no burden hours or cost for this requirement because employers can use the labels specified by paragraph (h)(2)(ii) of the Standard for this purpose. (See 5 CFR 1320.3(c)(2).)

F. Medical surveillance (§1910.1048(l))

Employees covered (§1910.1048(l)(1))

> *§1910.1048(l)(1)(i)* - The employer shall institute medical surveillance programs for all employees exposed to formaldehyde at concentrations at or exceeding the action level or exceeding the STEL.
>
> *§1910.1048(l)(1)(ii)* - The employer shall make medical surveillance available for employees who develop signs and symptoms of overexposure to formaldehyde and for all employees exposed to formaldehyde in emergencies. When determining whether an employee may be experiencing signs and symptoms of possible overexposure to formaldehyde, the employer may rely on the evidence that signs and symptoms associated with formaldehyde exposure will occur only in exceptional circumstances when airborne exposure is less than 0.1 ppm and when formaldehyde is present in material in concentrations less than 0.1 percent.

Examination by a physician (§1910.1048(l)(2)) - All medical procedures, including administration of medical disease questionnaires, shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

Medical disease questionnaire (§1910.1048(l)(3)) - The employer shall make the following medical surveillance available to employees prior to assignment to a job where formaldehyde exposure is at or above the action level or above the STEL and annually thereafter. The employer shall also make the following medical surveillance available promptly upon determining that an employee is experiencing signs and symptoms indicative of possible overexposure to formaldehyde.

§1910.1048(l)(3)(i) - Administration of a medical disease questionnaire, such as in Appendix D, which is designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperreactive airway disease: allergic skin conditions or dermatitis; and upper or lower respiratory problems.

Medical examinations (§1910.1048(l)(4)) - Medical examinations shall be given to any employee who the physician feels, based on information in the medical disease questionnaire, may be at increased risk from exposure to formaldehyde and at the time of initial assignment and at least annually thereafter to all employees required to wear a respirator to reduce exposure to formaldehyde. The medical examination shall include:

§1910.1048(l)(4)(i) - A physical examination with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of the eyes.

§1910.1048(l)(4)(ii) - Laboratory examinations for respirator wearers consisting of baseline and annual pulmonary function tests. As a minimum, these tests shall consist of forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), and forced expiratory flow (FEF).

§1910.1048(l)(4)(iii) - Any other test which the examining physician deems necessary to complete the written opinion.

§1910.1048(l)(4)(iv) - Counseling of employees having medical conditions that would be directly or indirectly aggravated by exposure to formaldehyde on the increased risk of impairment of their health.

Examinations for employees exposed in an emergency (§1910.1048(l)(5)) - The employer shall make medical examinations available as soon as possible to all employees who have been exposed to formaldehyde in an emergency.

§1910.1048(l)(5)(i) - The examination shall include a medical and work history with emphasis on any evidence of upper or lower respiratory problems, allergic conditions, skin reaction or hypersensitivity, and any evidence of eye, nose, or throat irritation.

§1910.1048(l)(5)(ii) - Other examinations shall consist of those elements considered appropriate by the examining physician.

Purpose: The principal purpose of medical surveillance is the prevention or detection of abnormalities that may occur in some formaldehyde-exposed workers early enough to prevent future or progressive adverse health effects. Documentation and maintenance of the medical-examination results required by the Standard provide a continuous record of worker health. Physicians use these records to determine the extent to which workers, since their last examination, experience health effects related to formaldehyde exposure. Additionally, if signs and symptoms of potential formaldehyde overexposure appear, the physician often needs

information about a worker's previous medical conditions to make an accurate diagnosis of the present condition, ascertain its apparent cause, and identify a course of treatment. Medical records also permit workers to determine whether or not they need treatment, or to evaluate the effectiveness of their employer's exposure-reduction program.

Information provided to the physician (§1910.1048(l)(6)) - The employer shall provide the following information to the examining physician:

§1910.1048(l)(6)(i) - A copy of this standard and Appendix A, C, D, and E;

§1910.1048(l)(6)(ii) - A description of the affected employee's job duties as they relate to the employee's exposure to formaldehyde;

§1910.1048(l)(6)(iii) - The representative exposure level for the employee's job assignment;

§1910.1048(l)(6)(iv) - Information concerning any personal protective equipment and respiratory protection used or to be used by the employee; and

§1910.1048(l)(6)(v) - Information from previous medical examinations of the affected employee within the control of the employer.

§1910.1048(l)(6)(vi) - In the event of a nonroutine examination because of an emergency, the employer shall provide to the physician as soon as possible: A description of how the emergency occurred and the exposure the victim may have received.

Purpose: Making this information available to physicians assists them in evaluating a worker's health and fitness for specific job assignments involving formaldehyde exposure. In the case of medical examinations administered in response to emergency exposures, the physician can use the exposure information to devise an appropriate treatment.

Physician's written opinion (§1910.1048(l)(7))

§1910.1048(l)(7)(i) - For each examination required under this standard, the employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination except that it shall not reveal specific findings or diagnoses unrelated to occupational exposure to formaldehyde. The written opinion shall include:

§1910.1048(l)(7)(i)(A) - The physician's opinion as to whether the worker has any medical condition that would place the worker at an increased risk of material impairment of health from exposure to formaldehyde;

§1910.1048(l)(7)(i)(B) - Any recommended limitations on the worker's exposure or changes in the use of personal protective equipment, including respirators;

§1910.1048(l)(7)(i)(C) - A statement that the worker has been informed by the physician of any medical conditions which would be aggravated by exposure to formaldehyde, whether these conditions may have resulted from past formaldehyde exposure or from exposure in an emergency, and whether there is a need for further examination or treatment.

§1910.1048(l)(7)(ii) - The employer shall provide for retention of the results of the medical examination and tests conducted by the physician.

§1910.1048(l)(7)(iii) - The employer shall provide a copy of the physician's written opinion to the affected employee within 15 days of its receipt.

Purpose: The purpose of requiring the employer to obtain a written opinion from the examining physician is to provide the employer with medical information to aid in determining the initial placement of workers, and to assess the worker's ability to use protective clothing and equipment. The physician's written opinion will also provide information to the employer about whether or not the worker's condition indicates overexposure to formaldehyde. The requirement that the physician's opinion be in writing will ensure that the information is available for future reference. Providing workers with a copy of the physician's written opinion will inform them of the medical-examination results so that they can determine the need for, and evaluate the effectiveness of, treatment or other interventions.

Medical removal (§1910.1048(l)(8))

§1910.1048(l)(8)(ii) - An employee's report of signs or symptoms of possible overexposure to formaldehyde shall be evaluated by a physician selected by the employer pursuant to paragraph (l)(3). If the physician determines that a medical examination is not necessary under paragraph (l)(3)(ii), there shall be a two-week evaluation and remediation period to permit the employer to ascertain whether the signs or symptoms subside untreated or with the use of creams, gloves, first aid treatment or personal protective equipment. Industrial hygiene measures that limit the employee's exposure to formaldehyde may also be implemented during this period. The employee shall be referred immediately to a physician prior to expiration of the two-week period if the signs or symptoms worsen. Earnings, seniority and benefits may not be altered during the two-week period by virtue of the report.

§1910.1048(l)(8)(iii) - If the signs or symptoms have not subsided or been remedied by the end of the two-week period, or earlier if signs or symptoms warrant, the employee shall be examined by a physician selected by the employer. The physician shall presume, absent contrary evidence, that observed dermal irritation or dermal sensitization are not attributable to formaldehyde when products to which the affected employee is exposed contain less than 0.1 percent formaldehyde.

§1910.1048(l)(8)(iv) - Medical examinations shall be conducted in compliance with the requirements of paragraph (l)(5)(i) and (ii). Additional guidelines for conducting medical exams are contained in appendix C.

§1910.1048(l)(8)(v) - If the physician finds that significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization result from workplace formaldehyde exposure and recommends restrictions or removal, the employer shall promptly comply with the restrictions or recommendation of removal. In the event of a recommendation of removal, the employer shall remove the affected employee from the current formaldehyde exposure and if possible, transfer the employee to work having no or significantly less exposure to formaldehyde.

§1910.1048(l)(8)(vii) - The employer shall arrange for a follow-up medical examination to take place within six months after the employee is removed pursuant to this paragraph. This examination shall determine if the employee can return to the original job status, or if the removal is to be permanent. The physician shall make a decision within six months of the date the employee was removed as to whether the employee can be returned to the original job status, or if the removal is to be permanent.

Purpose: Medical removal is an integral and essential part of medical surveillance. Medical removal prevents medical impairments induced or exacerbated by formaldehyde from becoming worse. In addition, medical removal allows workers who have these impairments an opportunity to recuperate and return to their jobs.

Multiple physician review (§1910.1048(l)(9))

§1910.1048(l)(9)(i) - After the employer selects the initial physician who conducts any medical examination or consultation to determine whether medical removal or restriction is appropriate, the employee may designate a second physician to review any findings, determinations or recommendations of the initial physician and to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary and appropriate to evaluate the effects of formaldehyde exposure and to facilitate this review.

§1910.1048(l)(9)(ii) - The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation for the purpose of medical removal or restriction.

§1910.1048(l)(9)(iv) - If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve the disagreement. If the two physicians are unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician who shall be a specialist in the field at issue:

§1910.1048(l)(9)(iv)(A) - To review the findings, determinations or recommendations of the prior physicians; and

§1910.1048(l)(9)(iv)(B) - To conduct such examinations, consultations, laboratory tests and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

§1910.1048(l)(9)(v) - In the alternative, the employer and the employee or authorized employee representative may jointly designate such third physician.

§1910.1048(l)(9)(vi) - The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

Purpose: OSHA believes that multiple-physician review improves worker participation for an employer's medical-surveillance program, thereby increasing early detection and treatment for formaldehyde-related medical conditions. In this regard, participation in the medical-surveillance program is strictly voluntary on the part of workers. If the medical opinion provided by the employer's physician could result in job removal or restriction, and no opportunity existed for workers to obtain a second medical opinion, OSHA believes that many of them would refuse to participate in the medical-surveillance program; such refusal could jeopardize their health and well-being.

G. Hazard communication (§1910.1048(m))

General (*§1910.1048(m)(1)*)

§1910.1048(m)(1)(i) - Chemical manufacturers, importers, distributors and employers shall comply with all requirements of the Hazard Communication Standard (HCS) (§1910.1200) for formaldehyde.

§1910.1048(m)(1)(iii) - Employers shall include formaldehyde in the hazard communication program established to comply with the HCS (§1910.1200). Employers shall ensure that each employee has access to labels on containers of formaldehyde and to safety data sheets, and is trained in accordance with the requirements of HCS and paragraph (n) of this section.

§1910.1048(m)(2)(i) - In addition to the requirements in paragraphs (m)(1) through (m)(1)(iv) of this section, for materials listed in paragraph (m)(1)(iv) capable of releasing formaldehyde at levels above 0.5 ppm, labels shall appropriately address all hazards as defined in paragraph (d) of §1910.1200 and Appendices A and B to §1910.1200, including cancer and respiratory sensitization, and shall contain the hazard statement "May Cause Cancer."

§1910.1048(m)(2)(ii) - As a minimum, for all materials listed in paragraph (m)(1)(i) and (iv) of this section capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, labels shall identify that the product contains formaldehyde; list the name and address of

the responsible party; and state that physical and health hazard information is readily available from the employer and from safety data sheets.

§1910.1048(m)(2)(iii) - Prior to June 1, 2015, employers may include the phrase "Potential Cancer Hazard" in lieu of "May Cause Cancer" as specified in paragraph (m)(2)(i) of this section.

Purpose: Warning labels assure that downstream employers and workers are informed of the hazards of formaldehyde, and that these employers may need to implement special practices to prevent exposure. Furthermore, hazard labels alert other employers, who in the absence of such labels, might not know that formaldehyde is present in their workplace, and, consequently, that they must comply with the Standard.

Safety data sheets (SDSs) serve as the main source of information to workers and downstream employers about the hazards of exposure to formaldehyde. In addition, SDSs provide information about formaldehyde that is essential to the training requirements of the Standard.

A written program provides a structure upon which to evaluate programs. Employers develop criteria they use in developing their programs, as well as the means used to meet those criteria. The written program serves as a useful reference for workers. Having the program in writing makes it easier to determine if the intent of the Standard is being met. Employers need not update their hazard communication programs as long as they meet the criteria established in 29 CFR 1910.1200(e) of the Standard.

Employers and manufacturers, importers or distributers of formaldehyde must comply with the requirements regarding development of SDSs and hazard communication programs as specified in the OSHA Hazard Communication Standard. OSHA accounts for the burden hours and cost of paperwork requirements in paragraph (m) of the Standard under the ICR for its Hazard Communication Standard (29 CFR 1910.1200; OMB Control Number 1218-0072).

H. Employee information and training (§1910.1048(n))

Participation (§1910.1048(n)(1)) - The employer shall assure that all employees who are assigned to workplaces where there is exposure to formaldehyde participate in a training program, except when the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm, the employer is not required to provide training.

Frequency (§1910.1048(n)(2)) - Employers shall provide such information and training to employees at the time of initial assignment, and whenever a new exposure to formaldehyde is introduced into the work area. The training shall be repeated at least annually.

Training program (§1910.1048(n)(3)) - The training program shall be conducted in a manner which the employee is able to understand and shall include:

§1910.1048(n)(3)(i) - A discussion of the contents of this regulation and the contents of the Material Safety Data Sheet.

§1910.1048(n)(3)(ii) - The purpose for and a description of the medical surveillance program required by this standard, including:

§1910.1048(n)(3)(ii)(A) - A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.

§1910.1048(n)(3)(ii)(B) - Instructions to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure.

§1910.1048(n)(3)(iii) - Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde in each job;

§1910.1048(n)(3)(iv) - The purpose for, proper use of, and limitations of personal protective clothing and equipment;

§1910.1048(n)(3)(v) - Instructions for the handling of spills, emergencies, and clean-up procedures;

§1910.1048(n)(3)(vi) - An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls; and

§1910.1048(n)(3)(vii) - A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency.

Access to training materials (§1910.1048(n)(4))

§1910.1048(n)(4)(i) - The employer shall inform all affected employees of the location of written training materials and shall make these materials readily available, without cost, to the affected employees.

§1910.1048(n)(4)(ii) - The employer shall provide, upon request, all training materials relating to the employee training program to the Assistant Secretary and the Director.[2]

Purpose: Training is essential to inform workers of the physical and health hazards of formaldehyde exposure, and to provide them with an understanding of the degree to which they can minimize the health-hazard potential. In addition, training provides information to workers that enable them to recognize how and where formaldehyde exposure occurs, and what steps to take to avoid or limit such exposure. Training serves to explain and reinforce the information presented to workers on warning signs, labels, and MSDs. These written forms of information

[2]"Director" means the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

and warning will be successful and relevant only if workers understand the information, and are aware of the action to be taken to avoid or minimize formaldehyde exposure.

Employers must provide workers with training: prior to assigning them to work areas with airborne formaldehyde concentrations at or above 0.1 ppm, and at least annually thereafter; and if the employer introduces a new exposure to formaldehyde to the work area. In addition, employers must inform the workers of the location of written training materials, and make these materials readily available to the workers, as well as to OSHA compliance officers and NIOSH representatives, on request. In this regard, in previous ICRs, the Agency assumed that employers inform workers of the location and availability of training materials during the training sessions; therefore, OSHA made no burden-hour and cost determinations for this paperwork requirement. In addition, the Agency included the burden hours and cost associated with making these materials available to workers, OSHA compliance officers, and NIOSH representatives in Item 12 of this Supporting Statement, under "Availability of records (including access to training materials) (§1910.1048(o)(6))."

Upon further analysis, the requirement that employers provide training to workers under paragraph (n)(1)-(3) is not considered to be a collection of information. OSHA is not taking burden for this activity under Item 12 of this Supporting Statement.

The requirement to provide the training materials to OSHA compliance officers ensures that the training materials are correct and meet the requirements of the provision. NIOSH may review the training materials for research and evaluation purposes, and to develop additional training materials.

I. Recordkeeping (§1910.1048(o))

Exposure measurements (§1910.1048(o)(1) - The employer shall establish and maintain an accurate record of all measurements taken to monitor worker exposure to formaldehyde. This record shall include:

§1910.1048(o)(1)(i) - The date of measurement;

§1910.1048(o)(1)(ii) - The operation being monitored;

§1910.1048(o)(1)(iii) - The methods of sampling and analysis and evidence of their accuracy and precision;

§1910.1048(o)(1)(iv) - The number, durations, time, and results of samples taken;

§1910.1048(o)(1)(v) - The types of protective devices worn; and

§1910.1048(o)(1)(vi) - The names, job classifications, social security numbers, and exposure estimates of the employees whose exposures are represented by the actual monitoring results.

Exposure determinations (§1910.1048(o)(2)) - Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no worker is exposed to formaldehyde at or above the action level.

Medical surveillance (§1910.1048(o)(3)) - The employer shall establish and maintain an accurate record for each worker subject to medical surveillance under this standard. This record shall include:

§1910.1048(o)(3)(i) - The name and social security number of the employee;

§1910.1048(o)(3)(ii) - The physician's written opinion;

§1910.1048(o)(3)(iii) - A list of any employee health complaints that may be related to exposure to formaldehyde; and

§1910.1048(o)(3)(iv) - A copy of the medical examination results, including medical disease questionnaires and results of any medical tests required by the standard or mandated by the examining physician.

Respirator fit testing (§1910.1048(o)(4))

§1910.1048(o)(4)(i) - The employer shall establish and maintain accurate records for employees subject to negative pressure respirator fit testing required by this standard.

§1910.1048(o)(4)(ii) - This record shall include:

§1910.1048(o)(4)(ii)(A) - A copy of the protocol selected for respirator fit testing.

§1910.1048(o)(4)(ii)(B) - A copy of the results of any fit testing performed.

§1910.1048(o)(4)(ii)(C) - The size and manufacturer of the types of respirators available for selection.

§1910.1048(o)(4)(ii)(D) - The date of the most recent fit testing, the name and social security number of each tested employee, and the respirator type and facepiece selected.

Record retention (§1910.1048(o)(5)) - The employer shall retain records required by this standard for at least the following periods:

§1910.1048(o)(5)(i) - Exposure records and determinations shall be kept for at least 30 years.

§1910.1048(o)(5)(ii) - Medical records shall be kept for the duration of employment plus 30 years.

§1910.1048(o)(5)(iii) - Respirator fit testing records shall be kept until replaced by a more recent record.

Availability of records (§1910.1048(o)(6))

§1910.1048(o)(6)(i) - Upon request, the employer shall make all records maintained as a requirement of this standard available for examination and copying to the Assistant Secretary and the Director.

§1910.1048(o)(6)(ii) - The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination, and copying to the subject employee, or former employee, and employee representatives in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i).

§1910.1048(o)(6)(iii) - Employee medical records required by this standard shall be provided upon request for examination and copying, to the subject employee or former employee or to anyone having the specific written consent of the subject employee or former employee in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i).

Purpose: Exposure-monitoring and medical records are maintained principally to protect worker health, to assist in the prevention or early diagnosis of adverse health affects associated with formaldehyde exposure, and to provide valuable information to both workers and employers about the effectiveness of methods used to control exposure to formaldehyde. The records also assist OSHA in enforcing the Standard. The exposure-monitoring records required by this Standard will aid workers and their physicians in determining whether or not treatment or other interventions are needed for formaldehyde exposure.

Paragraph (h) of §1910.1020 requires employers who cease to do business to transfer medical and exposure-monitoring records to the successor employer, who then must receive and maintain the records. If no successor employer is available, the employer must, at least three months before ceasing business, notify current workers who have records of their right to access these records.[3]

OSHA considers the employer's transfer of records to a successor employer to be usual and customary communications during the transition from one employer to a successor employer. In this regard, the employer would communicate the location of all records, including employee exposure-monitoring and medical records, at the facility to the successor employer during the transfer of business operations, as a matter of usual and customary business practice.

In addition, OSHA accounts for the burden hours and costs resulting from the employee notification requirements under the Information Collection Request (ICR) for its Access to Employee Exposure and Medical Records Standard (§1910.1020), OMB Control No. 1218-0065.

[3]Upon a thorough review of this ICR, the Agency determined that these provisions were not fully addressed in previous ICRs.

3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g., permitting electronic submission of responses, and the basis for the decision for adopting this means of collection. Also describe any consideration of using information technology to reduce burden.

Employers may use improved information technology when establishing and maintaining the required records. The Agency wrote the paperwork requirements of the Standard in performance-oriented language, i.e., in terms of what data to collect, not how to record the data.

4. Describe efforts to identify duplication. Show specifically why any similar information already available cannot be used or modified for use for the purposes described in Item A.2 above.

The information required to be collected and maintained are specific to each employer and worker involved, and is not available from, or duplicated by another source. The information required by the Standard is available only from employers. At this time there is no alternate information source available.

5. If the collection of information impacts small businesses or other small entities, describe any methods used to minimize burden.

The information collection requirements of the Standard do not have a significant impact on a substantial number of small entities.

6. Describe the consequence to Federal program or policy activities if the collection is not conducted or is conducted less frequently, as well as any technical or legal obstacles to reducing burden.

The information collection frequencies specified by this Standard are the minimum frequencies that the Agency believes are necessary to ensure that employers and OSHA can effectively monitor the exposure and health status of workers, and that housekeeping, hazard communication, and training are preventing hazardous worker exposures to formaldehyde.

7. Explain any special circumstances that would cause an information collection to be conducted in a manner:

- **requiring respondents to report information to the agency more often than quarterly;**
- **requiring respondents to prepare a written response to a collection of information in fewer than 30 days after receipt of it;**
- **requiring respondents to submit more than an original and two copies of any document;**
- **requiring respondents to retain records, other than health, medical, government contract, grant-in-aid, or tax records for more than three years;**
- **in connection with a statistical survey, that is not designed to produce valid and reliable results that can be generalized to the universe of study;**
- **requiring the use of a statistical data classification that has not been reviewed and approved by OMB;**

- **that includes a pledge of confidentiality that is not supported by authority established in statute or regulation, that is not supported by disclosure and data security policies that are consistent with the pledge, or which unnecessarily impedes sharing of data with other agencies for compatible confidential use;**

- **requiring respondents to submit proprietary trade secret, or other confidential information unless the agency can demonstrate that it has instituted procedures to protect the information's confidentiality to the extent permitted by law;**

Under paragraph (d)(6) of the Standard, employers must inform workers of their exposure-monitoring results in writing or by posting the results in an appropriate location that is accessible to workers, and do so within 15 working days after obtaining the results. If these results indicate that a worker's exposures are above either of the PELs, the notification must state this fact and describe what corrective actions the employer is taking to reduce the worker's exposure to or below the PEL. Additionally, paragraph (l)(7)(iii) of the Standard requires employers to provide a copy of the physician's written opinion to the worker within 15 working days of receiving the opinion. Also, if the medical examination is in response to an emergency exposure, paragraph (l)(6)(vi) requires that employers provide the physician, as soon as possible, with a description of how the emergency occurred and the worker's likely formaldehyde exposure.

8. If applicable, provide a copy and identify the date and page number of publication in the Federal Register of the agency's notice, required by 5 CFR 1320.8(d), soliciting comments on the information collection prior to submission to OMB. Summarize public comments received in response to that notice and describe actions taken by the agency in response to these comments. Specifically address comments received on cost and hour burden.

Describe efforts to consult with persons outside the agency to obtain their views on the availability of data, frequency of collection, the clarity of instructions and recordkeeping, disclosure, or reporting format (if any), and on the data elements to be recorded, disclosed, or reported.

Consultation with representatives of those from whom information is to be obtained or those who must compile records should occur at least once every 3 years—even if the collection of information activity is the same as in prior periods. There may be circumstances that may preclude consultation in a specific situation. These circumstances should be explained.

As required by the Paperwork Reduction Act of 1995 (U.S.C. 3506(c)(2)(A)), OSHA will publish a Federal Register notice soliciting public comment on its extension of the collection of information requirements contained in the Formaldehyde Standard (29 CFR 1910.1048). The notice is part of a preclearance consultation program that provides interested parties with an opportunity to comment on OSHA's request for an extension by OMB of a previous approval of the information collection requirements found in the Standard. The Agency will respond to comments submitted in response to this notice.

9. Explain any decision to provide any payment or gift to respondents, other than reenumeration of contractors or grantees.

The Agency will <u>not</u> provide payments or gifts to the respondents.

10. Describe any assurance of confidentiality provided to respondents and the basis for the assurance in statute, regulation, or agency policy.

To ensure that the personal information contained in medical records required by the Standard remains confidential, the Agency developed 29 CFR 1913.10 ("Rules of Agency Practice and Procedure Concerning OSHA Access to Worker Medical Records") to regulate access to these records.

11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private. This justification should include the reasons why the agency considers the questions necessary, the specific uses to be made of the information, the explanation to be given to persons from whom the information is requested, and any steps to be taken to obtain their consent.

The paperwork requirements specified by the Standard do not require the collection of sensitive information.

12. Provide estimates of the hour burden of the collection of information. The statement should:

- **Indicate the number of respondents, frequency of response, annual hour burden, and an explanation of how the burden was estimated. Unless directed to do so, agencies should not conduct special surveys to obtain information on which to base hour burden estimates. Consultation with a sample (fewer than 10) of potential respondents is desirable. If the hour burden on respondents is expected to vary widely because of differences in activity, size, or complexity, show the range of estimated hour burden, and explain the reasons for the variance.**

  Generally, estimates should not include burden hours for customary and usual business practices.

- **If this request for approval covers more than one form, provide separate hour burden estimates for each form.**

- **Provide estimates of annualized cost to respondents for the hour burdens for collections of information, identifying and using appropriate wage rate categories. The cost of contracting out or paying outside parties for information collection activities should not be included here. Instead this cost should be included in Item 13.**

Wage Rates

The Agency determined average wage rates using average hourly earnings. For the relevant occupational categories, OSHA adjusted the mean hourly earnings according to the May 2012 Bureau of Labor Statistics (BLS), U.S. Department of Labor, *Occupational Employment Statistics* (www.bls.gov/oes/) to allow for fringe benefits, which comprise about 30.9% of total compensation in the private sector, according to the BLS, *Employer Cost for Employee Compensation*, March 2013 (http://www.bls.gov/news.release/ecec.toc.htm). With wages comprising 69.1% of worker compensation, the Agency multiplied wages by 1.447 (1/0.691) to derive at total hourly worker compensation. Therefore, the costs of labor used in this analysis are estimates of total hourly compensation. These estimates are:

Professional/Manager	$39.95[4]
Clerical/Secretary	$23.34[5]
Chemical technician	$32.09[6]
Worker	$24.01[7]

Annual Burden-Hour and Cost Determinations

The Agency used data from the U.S. Department of Commerce report, 2007 Economic Census, Bureau of Census and 2007 and 2010 County Business Patterns to develop annual burden hours and costs for this ICR. Using the North American Industrial Classification System (NAICS) codes, OSHA identified those sectors likely to be affected by the Standard. Most sectors had a decrease in the number of establishments causing an overall reduction in the number of establishments from 103,511 to 84,931 establishments. Several sectors, however, did have increases in the number of establishments. The Census Bureau's Business Dynamics Statistics Database reports the establishment entry rate for the manufacturing sector at 6.0 new entries per year for every 100 existing establishments. OSHA used this rate to estimate the number of new establishments since 2009, the year the last ICR was completed. Given 84,931 establishments in affected sectors, new establishments can be estimated as 84,931 x .06 x 3 (years) = 15,288 new establishments over the last 3 years.

The Agency reviewed the 1992 amended RIA data to determine the percentage of workers that were exposed above 0.5-0.75 ppm and between 0.75 and 1 ppm. OSHA applied these percentages to the new number of total affected workers to determine the number of workers exposed at these exposure levels. For this ICR, the Agency estimates the total number of production workers is 1,689,326.

The Agency believes the burden hours and costs for this ICR are overestimated as a result of using these percentages since most employers, especially new employers, are likely to have measures in place to keep worker exposures below these exposure levels.

(A) Exposure monitoring (§1910.1048(d))

General (§1910.1048(d)(1))

If employers can document using objective data that worker exposure to formaldehyde or formaldehyde-releasing products are below the AL and STEL under foreseeable conditions of formaldehyde use, they are exempt from the monitoring requirements of the Standard. However, other employers must perform initial monitoring to determine the extent of formaldehyde exposure in their workplace. In estimating the burden hours and costs for this provision, the Agency assumes that establishments will not rely on objective data for determining worker

[4]The mean hourly wage for "First-line supervisors of production and operating workers," (Occupation Code 51-1011), is $27.61.

[5]The mean hourly wage for "Secretaries and Administrative Assistants, Except Legal, Medical and Executive" (Occupation Code 43-6014), is $16.13.

[6]The mean hourly wage for "Chemical Technicians," (Occupation Code 19-4031), is $22.18.

[7]The mean hourly wage for "Production occupations," (Occupation Code 51-0000), is $16.59.

exposures, but instead perform initial monitoring as the most reliable and valid assessment of these exposures. While there was an overall decrease in the total number of establishments, OSHA did identify certain industries that had an increase in the number of establishments.

As noted above, the Agency identified 15,288 new establishments over the last three years, or 5,096 new establishments annually. The Agency assumes, conservatively, that all of these establishments use formaldehyde in production. By dividing the total number of establishments (84,931) into the total number of production workers (1,689,326), the Agency estimates that each of these establishments monitors an average of 20 potentially exposed new workers per plant, for a total of 101,920 new workers potentially exposed annually (i.e., 20 workers x 5,096 establishments). The Agency also assumes from data in the 1987 RIA that these establishments will conduct representative sampling on 20% of these workers for a total of 20,384 exposure monitoring samples (101,920 x 20%). In addition, the Agency believes that these establishments use a collar-badge procedure for sampling, and estimates that a professional will take 10 minutes (.17 hour) to implement the procedure, and then collect and record the necessary information (e.g., worker identification, exposure duration) for each sample.[8]

Burden hours: 20,384 workers x .17 hour = 3,465 hours
Cost: 3,465 hours x $39.95 = $138,427

Periodic monitoring (§1910.1048(d)(3))

If the results of initial monitoring indicate that worker exposure is at or above the action level, employers must perform periodic monitoring at least semi-annually; if the initial results are at or above the STEL, employers must monitor their workers at least annually. In this regard, the Agency assumes that employers conduct representative sampling on 20% of the covered workers twice a year, and no monitoring based on STEL results because semi-annual monitoring would meet the monitoring requirement for the few workers exposed above this limit. Based on data from the previous ICR and the 1992 amended RIA,[9] the Agency estimates that 168,933 workers require periodic monitoring (1% of 1,689,326 production workers); employers would conduct representative sampling on 33,787 of these workers (i.e., 20% of 168,933 workers). Additionally, OSHA assumes that a professional takes 10 minutes (.17 hour) to implement the collar-badge procedure and collect and record the necessary information for each sample.

Burden hours: 33,787 workers x 2 samples/year x .17 hour = 11,488 hours
Cost: 11,488 hours x $39.95 = $458,946

Employee notification of monitoring results (§1910.1048(d)(6))

If employers perform exposure monitoring, they must notify each worker included in the

[8]The badges do not interfere with worker work activities; therefore, the Agency took no burden hours or cost for lost work time.

[9]See Table 1, "Number of Affected Establishments and Workers by Formaldehyde Exposure Level," at 57 FR 22300. Workers exposed between .75 – 1.0 ppm (83,818) and between 0.5 and .75 ppm (122,554) totaled 206,372 workers exposed above the 0.50 AL. The 206,372 exposed workers were divided by the total number of affected workers, 1,472,174, yielding .096; therefore, 370,610 workers are exposed to formaldehyde above the AL (i.e., 10% x 3,706,101 total workers).

monitoring of the results within 15 days after receiving the results. Notification must be in writing, either by distributing copies of the results to individual workers or by posting the results. Further, if the exposure-monitoring results show that a worker's exposure exceeds the PELs,[10] the employer must develop and implement a written plan to reduce the worker's exposure to or below the PELs, and provide written notice to each worker of the corrective action the employer is taking to prevent overexposure to formaldehyde.

Since engineering controls and work practices were to be in place by June 26, 1993, OSHA assumes employers already have developed and implemented the written plan to reduce worker exposure to the lowest possible feasible level; therefore, there are no burden hours for written plans.

Using an updated number of affected establishments (84,931) and applying the percent of establishments that are exposed above the 0.5 ppm action level (15%) from the 1992 RIA,[11] OSHA determined that 12,740 establishments conduct periodic monitoring and post their monitoring results. The Agency assumes that employers notify the required workers by posting their exposure results; accordingly, OSHA estimates that an employer uses about five minutes (.08 hour) of clerical/secretarial time to post the notice in each of these establishments.

Burden hours: 12,740 establishments x 2 samples/year x .08 hour = 2,038 hours
Cost: 2,039 hours x $ 23.34 = $47,567

(B) Regulated areas (§1910.1048(e))

Employers must post signs at the entrances and access ways to regulated areas. If an employer establishes a regulated area at a multi-employer worksite, that employer must communicate the location of, as well as any access restrictions to, the regulated area to the other employers conducting operations at the worksite.

The Agency is unaware of any reliable data to determine the number of multi-employer worksites where the employer must inform other employers about regulated areas. Most likely, such sites would involve the use of particle board, hardwood plywood, or fiberboard where workers may be exposed by off-gasing from formaldehyde in these products. OSHA staff indicated that manufacturers of particle board, hardwood plywood, and fiberboard are modifying the formaldehyde mixture used in these products or are using substitutes; thereby, reducing the number of exposures at such worksites. The Agency assumes that such notification will occur in less than 1% of the affected facilities (i.e., 1% x 84,931 = 849 multi-employer facilities).

[10]PELs are the 8-hour TWA and the 15-minute STEL.

[11]See Table 1, "Number of Affected Establishments and Workers By Formaldehyde Exposure Level," at 57 FR 22300. Establishments having workers exposed between 0.75 – 1.0 ppm (5,453 establishments) and between 0.5 and .75 ppm (11,496 establishments) totaled 16,949 establishments having workers exposed above the 0.50 AL. OSHA divided the 16,949 establishments having workers exposed above the AL by the total affected establishments (112,068), yielding 15% of the total number of establishments having workers exposed above the AL.

For purposes of estimating the burden hours and costs for this provision, the Agency assumes that a manager will take 10 minutes (.17 hour) to inform other employers at the 849 multi-employer facilities of the location and access restriction to the regulated areas.

Burden hours: 849 multi-employer facilities/ worksites x .17 hour = 144 hours
Cost: 144 hours x $39.95 = $5,753

(C) Respirator program (§1910.1048(g)(2)(i))

No burden hours or costs taken. See Item 2 of this Supporting Statement.

(D) Maintenance of protective equipment and clothing (§1910.1048(h)(2))

No burden hours or costs taken. See Item 2 of this Supporting Statement.

(E) Housekeeping (§1910.1048(j))

No burden hours or costs taken. See Item 2 of this Supporting Statement.

(F) Medical surveillance (§1910.1048(l))

Employees covered; *examination by a physician*; *medical disease questionnaire*; *medical examinations*; and *examinations for employees exposed in an emergency (§1910.1048(l)(1)-(l)(5))*

Employers must implement a medical-surveillance program for workers: who are exposed to formaldehyde at concentrations at or above the AL or above the STEL; during emergencies; and who develop signs and symptoms of overexposure to formaldehyde. In addition, a physician must perform or supervise the required medical procedures, including administration of the medical disease questionnaire.

Employers must ensure that workers complete a medical disease questionnaire: prior to assignment to jobs having formaldehyde exposures at or above the AL or above the STEL, and annually thereafter for the duration of such an assignment; and promptly after determining that a worker experiences signs and symptoms of potential formaldehyde overexposure. Employers must also provide medical examinations having a specified content: prior to the initial job assignment and annually thereafter to workers required to wear respirators to reduce formaldehyde exposure; to any worker that the physician determines, based on the worker's responses to the medical disease questionnaire, is at increased risk of health impairment from formaldehyde exposure; to all workers exposed to formaldehyde in emergencies; and when workers develop signs and symptoms of overexposure.

Using the updated total number of workers (1,689,326) and the 1992 percentage of workers exposed above the AL (10%), OSHA estimates 168,933 workers would undergo these procedures each year. The Agency assumes a worker takes one hour to complete the medical disease questionnaire and to undergo a medical examination.

Burden hours: 168,933 workers x 1 hour = 168,933 hours
Cost: 168,933 hours x $24.01= $4,056,081

Information provided to the physician (§1910.1048(l)(6))

Employers must provide the examining physician with specific information on each worker who receives a medical examination. OSHA estimates that physicians administer 171,222 medical examinations each year, including: 168,933 annual medical examinations (discussed above, *§1910.1048(l)(1)-(l)(5));* 600 medical-removal examinations and 1,689 multiple physician examinations (discussed below in the *Medical removal (§1910.1048(l)(8)* and *Multiple physician review (§1910.1048(l)(9))* sections).

The Agency assumes that, for each of these medical examinations, an employer uses about five minutes (.08 hour) of clerical/secretarial time to compile the information for each worker and provide it to the physician.

Burden hours: 171,222 medical examinations x .08 hour = 13,698 hours
Cost: 13,698 hours x $23.34 = $319,711

Physician's written opinion (§1910.1048(l)(7))

Within 15 days of receiving the physician's written opinion, the employer must provide a copy of it to the employee who was the subject of the medical examination. Additionally, the Agency assumes that employers, to reduce the paperwork burden, will include on each copy a written statement that the employee has a right to seek a second opinion if the first physician conducted the medical examination for the purpose of medical removal or restriction; this statement would meet the notification requirement of paragraph (l)(9)(ii) of the Standard. OSHA further assumes that an employer uses about five minutes (.08 hour) of clerical/secretarial time to deliver a copy of the physician's written opinion to each employee who received a medical examination.

Burden hours: 171,222 medical examinations x .08 hour = 13,698 hours
Cost: 13,698 hours x $23.34 = $319,711

Medical removal (§1910.1048(l)(8))

An employer bases the decision to medically remove an employee from a job, or to restrict an employee's exposure to formaldehyde, on a written recommendation provided by the examining physician, which the physician makes following a medical examination. According to the 1992 RIA, OSHA expected the number of employees requiring medical examinations for this purpose to be small (57 FR 22304); as noted above in the determinations made for "Information provided to the physician," the Agency estimates this number to be 600. For the purpose of determining the burden hours and cost of the physician evaluations and medical examinations associated with medical removal, OSHA assumes that each employee takes one hour to complete the required procedures. Therefore, the annual estimated burden hours and cost of this provision are:

Burden hours: 600 employees x 1 hour = 600 hours
Cost: 600 hours x $24.01 = $14,406

Multiple physician review (§1910.1048(l)(9))

The Agency is unaware of any reliable data that would estimate the number of instances when an employee may request a second or third physician to review the findings and determinations made by previous physicians. For purposes of calculating burden hours and costs, the Agency assumes that an additional 1,689 medical examinations will be administered (i.e., approximately 1% of the 168,933 workers) as a result of a worker requesting multiple-physician review, and that the process will involve examinations by a second and third physician. OSHA also estimates that a worker will take one hour to complete the required medical examination. Therefore, the annual estimated burden hours and cost of this provision are:[12]

Burden hours: 1,689 medical examinations x 1 hour = 1,689 hours
Cost: 1,689 hours x $24.01 = $40,553

(G) Hazard communication (§1910.1048(m))

No burden hours or costs taken. See Item 2 of this Supporting Statement.

(H) Employee information and training (§1910.1048(n))

No burden hours or costs taken. See Item 2 of this Supporting Statement.

(I) Recordkeeping (§1910.1048(o))

Employers must establish and maintain worker exposure-monitoring, medical-surveillance, and respirator-fit-testing records, retain these records for specific periods, and make the records available to designated parties. The following paragraphs provide the burden-hour and cost determinations for these paperwork requirements.

Exposure measurements (§1910.1048(o)(1))

Under this provision, employers must establish and maintain an accurate record of the exposure measurements taken under the Standard. Based on data from the burden-hour and cost determinations performed above under "(A) Exposure monitoring," the Agency estimates that these records include 20,384 initial-monitoring records and 67,574 periodic-monitoring records (i.e., 33,787 workers sampled twice a year), for a total of 87,958 records. OSHA further estimates that establishing and maintaining these records requires about five minutes (.08 hour) of clerical/secretarial time. Therefore, the annual estimated burden hours and cost of this provision are:

[12]Note that the Agency accounted for the burden hours and cost of an employer providing workers with notification of their right to multiple-physician review, as specified in paragraph (l)(9)(ii) of the Standard, under the determinations made above for "Physician's written opinion."

Burden hours: 87,958 records x .08 hour = 7,037 hours
Costs: 7,037 hours x $23.34 = $164,244

Exposure determinations (§1910.1048(o)(2))

Employers must establish and maintain a record of the objective data they use to determine that worker exposures to formaldehyde are below the AL and STEL. The Agency assumes that employers made these determinations previously (i.e., employers will not make additional determinations during this ICR period), and that they will not review or update the determinations because the data continue to accurately represent current workplace conditions. Therefore, the only paperwork burden associated with this provision is the requirement to maintain the records, which is negligible. Accordingly, OSHA estimates that this provision results in a total of one burden hour at a cost of $23 (rounded) for clerical/secretarial time for all employers to maintain the required paperwork.

Medical surveillance (§1910.1048(o)(3))

This provision requires employers to establish and maintain an accurate record of the medical-surveillance information obtained under the Standard. Using data from the burden-hour and cost determinations performed above under "(F) Medical surveillance," the Agency estimates that this provision requires employers to establish and update (i.e., maintain) 171,222 medical-surveillance records each year using about five minutes (.08 hour) of clerical/secretarial time for each record. Therefore, the annual estimated burden hours and cost of this provision are:

Burden hours: 171,222 records x .08 hour = 13,698 hours
Cost: 13,698 hours x $23.34 = $319,711

Respirator fit testing (§1910.1048(o)(4))

If an employer conducts fit testing for workers using negative-pressure respirators, the employer must establish and maintain accurate fit-testing records for these workers. The Agency accounts for the burden hours and cost resulting from this requirement under the ICR for its Respiratory Protection Standard (29 CFR 1910.134; OMB Control Number 1218-0099).

Record retention (§1910.1048(o)(5))

Employers must maintain exposure-monitoring records for at least 30 years, medical-surveillance records for the duration of employment plus 30 years, and respirator fit-testing records until replaced by more recent records. OSHA accounts for the paperwork burden of maintaining exposure-monitoring and medical-surveillance records in the burden-hour and cost determinations performed above under "Exposure measurements (§1910.1048(o)(1))(A))," "Exposure determinations (§1910.1048(o)(2))," and "Medical surveillance (§1910.1048(o)(3))."

Availability of records (including access to training materials) (§1910.1048(o)(6))

On request, employers must provide for examination and copying: all records required by the Standard, including training materials specified in paragraph (n)(4), to the Agency's compliance officers and NIOSH representatives; worker exposure-monitoring records to current and former workers covered by the Standard, and to worker representatives; and an worker's medical-surveillance records to that worker (whether currently or formerly employed by the employer), and to anyone having that worker's specific written consent. The requirements of paragraphs (a)-(e) and (g)-(i) of CFR 1910.1020 ("Access to worker exposure and medical records;" referred to as the "Records-Access Standard") regulate the release of exposure-monitoring and medical-surveillance records to workers and other parties.

The Agency estimates that each year its compliance officers make requests for formaldehyde-related records during inspections conducted at 175 facilities,[13] and that a professional takes about five minutes (.08 hour) during the inspection to inform an OSHA compliance officer of the location of the requested records. In addition, the Agency assumes that each year requests are made for access to exposure-monitoring and medical-surveillance records, as well as training materials (as specified by paragraph (n)(4)(i) of the Standard), by about 10% (16,893) of the 168,933 covered workers (see "Periodic monitoring (§1910.1048(d)(3))" above), which includes their representatives and anyone having their specific written consent (regarding medical-surveillance records). OSHA estimates that an employer uses about five minutes (.08 hour) of clerical/secretarial time to make these records available to the workers and their designated worker representatives. Therefore, the annual estimated burden hours and cost of this provision are:

Burden hours: ((175 inspections x .08 hours) = 14 hours) + ((16,893 worker-related requests x .08) =1,351) = 1,365 hours
Cost: ((14 hours x $39.95 (professional) = $559) + ((1,351 hours x $23.34 (clerical/secretarial) = $31,532) = $32,091

Table 1 - Summary of Annual Burden Hours and Cost Estimates

Information Collection Requirement	Responses	Current Burden Hours	Requested Burden Hours	Change	Estimated Cost
A. Exposure monitoring					
General	20,384	5,420	3,465	-1,955	$138,427
Periodic monitoring	67,574	13,963	11,488	-2,475	$458,946
Worker notification of monitoring results	25,480	2,484	2,038	-446	$47,567
B. Regulated areas	849	176	144	-32	$5,753
C. Respiratory protection (including	0	0	0	0	$0

[13] The Agency estimated the number of inspections by determining the inspection rate (1.4%) for all facilities under the jurisdiction of the OSH Act including both Federal OSHA and approved state plan agencies), and then multiplied the total number of facilities regulated by the Standard (12,740) by the inspection rate.

Information Collection Requirement	Responses	Current Burden Hours	Requested Burden Hours	Change	Estimated Cost
respirator fit testing)					
D. Maintenance of protective equipment and clothing	0	0	0	0	$0
E. Housekeeping	0	0	0	0	$0
F. Medical surveillance					
Workers covered, examination by a physician, Medical disease questionnaire, medical examinations, and examinations for Workers exposed to an emergency	168,933	205,333	168,933	-36,400	$4,056,081
Information provided to the physician	171,222	16,639	13,698	-2,941	$319,711
Physician's written opinion	171,222	16,639	13,698	-2,941	$319,711
Medical removal	600	600	600	0	$14,406
Multiple physician review	1,689	2,053	1,689	-364	$40,553
G. Hazard communication	0	0	0	0	$0
H. Employee information and training	0	36,805	0	-36,805	$0
I. Recordkeeping					
Exposure measurements	87,958	9,121	7,037	-2,084	$164,244
Exposure determinations	1	1	1	0	$23
Medical surveillance	171,222	16,639	13,698	-2,941	$319,711
Respirator fit testing	0	0	0	0	$0
Record retention	0	0	0	0	$0
Availability of records (including access to training materials)	17,068	1,660	1,365	-295	$32,091
TOTALS	**904,202**	**327,533**	**237,854**	**-89,679**	**$5,917,224**

13. Provide an estimate of the total annual cost burden to respondents or recordkeepers resulting from the collection of information. (Do not include the cost of any hour burden shown in Items 12 and 14.)

- **The cost estimate should be split into two components: (a) a total capital and start-up cost component (annualized over its expected useful life); and (b) a total operation and maintenance and purchase of services component. The estimates should take into account costs associated with generating, maintaining, and disclosing or providing the information. Include descriptions of methods used to estimate major cost factors including system and technology acquisition, expected useful life of capital equipment, the discount rate(s), and the time period over which costs will be incurred. Capital and start-up costs include, among other items, preparations for collecting information such as purchasing computers and software; monitoring, sampling, drilling and testing**

equipment; and record storage facilities.

- **If cost estimates are expected to vary widely, agencies should present ranges of cost burdens and explain the reasons for the variance. The cost of purchasing or contracting out information collection services should be a part of this cost burden estimate. In developing cost burden estimates, agencies may consult with a sample of respondents (fewer than 10), utilize the 60-day pre-OMB submission public comment process and use existing economic or regulatory impact analysis associated with the rulemaking containing the information collection, as appropriate.**

- **Generally, estimates should not include purchases of equipment or services, or portions thereof, made: (1) prior to October 1, 1995, (2) to achieve regulatory compliance with requirements not associated with the information collection, (3) for reasons other than to provide information or keep records for the government, or (4) as part of customary and usual business or private practices.**

Exposure monitoring

The Agency estimated a cost of $50 per sample to collect and analyze airborne formaldehyde using collar badges.[14] The determinations made under "(L) Recordkeeping" above indicate a total of 87,958 samples are taken per year. Therefore, the annual estimated cost of this requirement to employers is $4,397,900 ($50 per sample x 87,958 samples).

Medical surveillance

Consistent with recent ICRs and RIAs for other standards, the Agency estimates that each medical examination costs an employer $218.[15] According to the determinations made above, a total of 171,222 medical examinations are administered each year. Therefore, the annual estimated cost of this requirement to employers is $37,326,396 ($218 x 171,222 medical examinations). Therefore, the annual estimated cost of the medical surveillance and exposure monitoring to employers is $41,724,296 ($37,326,396 + $4,397,900).

14. Provide estimates of annualized cost to the Federal government. Also, provide a description of the method used to estimate cost, which should include quantification of hours, operational expenses (such as equipment, overhead, printing, and support staff), and any other expense that would not have been incurred without this collection of information. Agencies also may aggregate cost estimates from Items 12, 13, and 14 in a single table.

The total cost to the Federal government of the Standard's information collection requirements is $523. This cost results from the information collection requirements specified in paragraph (o)(6) ("Availability of records (including access to training materials") of the Standard. Other occupational expenses, such as equipment, overhead, and support-staff expenses, would occur without the collection of information requirements, and the Agency considers these to be normal operating expenses.

[14] Inflated to 2013 prices using CPI inflation rate from 2009 to 2013: 10%.

[15] Average price of an office-based visit with a physician, MEPS 2012.

OSHA Access to Records

Based on the determinations made above under "Availability of records (including access to training materials) (§1910.1048(o)(6))," employers covered by the Standard receive 175 inspections each year. The Agency estimates that a compliance officer (GS-12/5), with an hourly wage rate of $37.37,[16] spends about five minutes (.08 hour) reviewing requested information during an inspection. Therefore, the estimated annual hours and cost of this requirement to the Federal government are:

Burden hours: 175 inspections x .08 hour = 14 hours
Cost: 14 hours x $37.37= $523

15. Explain the reasons for any program changes or adjustments.

OSHA is requesting an adjustment decrease in the burden hours of these paperwork requirements from 327,533 hours to 237,854 hours, for a total decrease of 86,679 hours. The decrease is due to the overall estimated decrease in the number of covered establishments and workers, and due to the removal of burden hours associated with paragraph (n) of the Standard, the requirement that employers provide training to workers. Upon further analysis, this provision is not considered to be a collection of information. Table 1 above provides a summary of the burden hour and costs.

The costs to conduct a medical examination increased (from $180 to $218) and for contract industrial hygiene services to conduct exposure-monitoring sampling increased (from $45 to $50). However, overall capital costs decreased, from $42,626,346 to $41,724,296, a decrease of $902,050. The decrease is due to the estimated decrease in the number of covered workers undergoing exposure monitoring and medical exams.

16. For collections of information whose results will be published, outline plans for tabulation, and publication. Address any complex analytical techniques that will be used. Provide the time schedule for the entire project, including beginning and ending dates of the collection of information, completion of report, publication dates, and other actions.

OSHA will not publish the information collected under this Standard.

17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons that display would be inappropriate.

No forms are available for the Agency to display the expiration date.

18. Explain each exception to the certification statement.

The Agency is not seeking an exception to the certification statement.

[16]Source: U.S. Office of Personnel Management, General Schedule and Locality Tables, Salary Table 2012-RUS, http://archive.opm.gov/oca/12tables/pdf/rus_h.pdf.

B. COLLECTION OF INFORMATION EMPLOYING STATISTICAL METHODS.

This Supporting Statement does not contain any collection of information requirements that employ statistical methods.

SEC. 2. Congressional Findings and Purpose

29 USC 651

(a) The Congress finds that personal injuries and illnesses arising out of work situations impose a substantial burden upon, and are a hindrance to, interstate commerce in terms of lost production, wage loss, medical expenses, and disability compensation payments.

(b) The Congress declares it to be its purpose and policy, through the exercise of its powers to regulate commerce among the several States and with foreign nations and to provide for the general welfare, to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources --

(1) by encouraging employers and employees in their efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthful working conditions; (2) by providing that employers and employees have separate but dependent responsibilities and rights with respect to achieving safe and healthful working conditions;

(3) by authorizing the Secretary of Labor to set mandatory occupational safety and health standards applicable to businesses affecting interstate commerce, and by creating an Occupational Safety and Health Review Commission for carrying out adjudicatory functions under the Act;

(4) by building upon advances already made through employer and employee initiative for providing safe and healthful working conditions;

(5) by providing for research in the field of occupational safety and health, including the psychological factors involved, and by developing innovative methods, techniques, and approaches for dealing with occupational safety and health problems;

(6) by exploring ways to discover latent diseases, establishing causal connections between diseases and work in environmental conditions, and conducting other research relating to health problems, in recognition of the fact that occupational health standards present problems often different from those involved in occupational safety;

(7) by providing medical criteria which will assure insofar as practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work experience;

(8) by providing for training programs to increase the number and competence of personnel engaged in the field of occupational safety and health; affecting the OSH Act since its passage in 1970 through January 1, 2004.

(9) by providing for the development and promulgation of occupational safety and health standards;

(10) by providing an effective enforcement program which shall include a prohibition against giving advance notice of any inspection and sanctions for any individual violating this prohibition;

(11) by encouraging the States to assume the fullest responsibility for the administration and enforcement of their occupational safety and health laws by providing grants to the States to assist in identifying their needs and responsibilities in the area of occupational safety and health, to develop plans in accordance with the provisions of this Act, to improve the administration and enforcement of State occupational safety and health laws, and to conduct experimental and demonstration projects in connection therewith;

(12) by providing for appropriate reporting procedures with respect to occupational safety and health which procedures will help achieve the objectives of this Act and accurately describe the nature of the occupational safety and health problem;

(13) by encouraging joint labor-management efforts to reduce injuries and disease arising out of employment.

SEC. 8. Inspections, Investigations, and Recordkeeping

(a) In order to carry out the purposes of this Act, the Secretary, upon presenting appropriate credentials to the owner, operator, or agent in charge, is authorized -- 29 USC 657

(1) to enter without delay and at reasonable times any factory, plant, establishment, construction site, or other area, workplace or environment where work is performed by an employee of an employer; and

(2) to inspect and investigate during regular working hours and at other reasonable times, and within reasonable limits and in a reasonable manner, any such place of employment and all pertinent conditions, structures, machines, apparatus, devices, equipment, and materials therein, and to question privately any such employer, owner, operator, agent or employee.

(b) In making his inspections and investigations under this Act the Secretary may require the attendance and testimony of witnesses and the production of evidence under oath. Witnesses shall be paid the same fees and mileage that are paid witnesses in the courts of the United States. In case of a contumacy, failure, or refusal of any person to obey such an order, any district court of the United States or the United States courts of any territory or possession, within the jurisdiction of which such person is found, or resides or transacts business, upon the application by the Secretary, shall have jurisdiction to issue to such person an order requiring such person to appear to produce evidence if, as, and when so ordered, and to give testimony relating to the matter under investigation or in question, and any failure to obey such order of the court may be punished by said court as a contempt thereof.

(c) (1) Each employer shall make, keep and preserve, and make available to the Secretary or the Secretary of Health and Human Services, such records regarding his activities relating to this Act as the Secretary, in cooperation with the Secretary of Health and Human Services, may prescribe by regulation as necessary or appropriate for the enforcement of this Act or for developing information regarding the causes and prevention of occupational accidents and illnesses. In order to carry out the provisions of this paragraph such regulations may include provisions requiring employers to conduct periodic inspections. The Secretary shall also issue regulations requiring that employers, through posting of notices or other appropriate means, keep their employees informed of their protections and obligations under this Act, including the provisions of applicable standards.

(2) The Secretary, in cooperation with the Secretary of Health and Human Services, shall prescribe regulations requiring employers to maintain accurate records of, and to make periodic reports on, work-related deaths, injuries and illnesses other than minor injuries requiring only first aid treatment and which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job.

(3) The Secretary, in cooperation with the Secretary of Health and Human Services, shall issue regulations requiring employers to maintain accurate records of employee exposures to potentially toxic materials or harmful physical agents which are required to be monitored or measured under section 6. Such regulations shall provide employees or their representatives with an opportunity to observe such monitoring or measuring, and to have access to the records thereof. Such regulations shall also make appropriate provision for each employee or former employee to have access to such records as will indicate his own exposure to toxic materials or harmful physical agents. Each employer shall promptly notify any employee who has been or is being exposed to toxic materials or harmful physical agents in concentrations or at levels which exceed those prescribed by an applicable occupational safety and health standard promulgated under section 6, and shall inform any employee who is being thus exposed of the corrective action being taken.

(d) Any information obtained by the Secretary, the Secretary of Health and Human Services, or a State agency under this Act shall be obtained with a minimum burden upon employers, especially those operating small businesses. Unnecessary duplication of efforts in obtaining information shall be reduced to the maximum extent feasible.

(e) Subject to regulations issued by the Secretary, a representative of the employer and a representative authorized by his employees shall be given an opportunity to accompany the Secretary or his authorized representative during the physical inspection of any workplace under subsection (a) for the purpose of aiding such inspection. Where there is no authorized employee representative, the Secretary or his authorized representative shall consult with a reasonable number of employees concerning matters of health and safety in the workplace.

(f) (1) Any employees or representative of employees who believe that a violation of a safety or health standard exists that threatens physical harm, or that an imminent danger exists, may request an inspection by giving notice to the Secretary or his authorized representative of such violation or danger. Any such notice shall be reduced to writing, shall set forth with reasonable particularity the grounds for the notice, and shall be signed by the employees or representative of employees, and a copy shall be provided the employer or his agent no later than at the time of inspection, except that, upon the request of the person giving such notice, his name and the names of individual employees referred to therein shall not appear in such copy or on any record published, released, or made available pursuant to subsection (g) of this section. If upon receipt of such notification the Secretary determines there are reasonable grounds to believe that such violation or danger exists, he shall make a special inspection in accordance with the provisions of this section as soon as practicable, to determine if such violation or danger exists. If the Secretary determines there are no reasonable grounds to believe that a violation or danger exists he shall notify the employees or representative of the employees in writing of such determination.

(2) Prior to or during any inspection of a workplace, any employees

or representative of employees employed in such workplace may notify the Secretary or any representative of the Secretary responsible for conducting the inspection, in writing, of any violation of this Act which they have reason to believe exists in such workplace. The Secretary shall, by regulation, establish procedures for informal review of any refusal by a representative of the Secretary to issue a citation with respect to any such alleged violation and shall furnish the employees or representative of employees requesting such review a written statement of the reasons for the Secretary's final disposition of the case.

(g) (1) The Secretary and Secretary of Health and Human Services are authorized to compile, analyze, and publish, either in summary or detailed form, all reports or information obtained under this section.

(2) The Secretary and the Secretary of Health and Human Services shall each prescribe such rules and regulations as he may deem necessary to carry out their responsibilities under this Act, including rules and regulations dealing with the inspection of an employer's establishment.

(h) The Secretary shall not use the results of enforcement activities, such as the number of citations issued or penalties assessed, to evaluate employees directly involved in enforcement activities under this Act or to impose quotas or goals with regard to the results of such activities.

Pub. L. 105-198 added subsection (h).

e-CFR Data is current as of August 22, 2013

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§ 1910.1048 Formaldehyde.

(a) Scope and application. This standard applies to all occupational exposures to formaldehyde, i.e. from formaldehyde gas, its solutions, and materials that release formaldehyde.

(b) Definitions. For purposes of this standard, the following definitions shall apply:

Action level means a concentration of 0.5 part formaldehyde per million parts of air (0.5 ppm) calculated as an eight (8)-hour time-weighted average (TWA) concentration.

Assistant Secretary means the Assistant Secretary of Labor for the Occupational Safety and Health Administration, U.S. Department of Labor, or designee.

Authorized person means any person required by work duties to be present in regulated areas, or authorized to do so by the employer, by this section, or by the OSH Act of 1970.

Director means the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

Emergency is any occurrence, such as but not limited to equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of a significant amount of formaldehyde.

Employee exposure means the exposure to airborne formaldehyde which would occur without corrections for protection provided by any respirator that is in use.

Formaldehyde means the chemical substance, HCHO, Chemical Abstracts Service Registry No. 50-00-0.

(c) Permissible Exposure Limit (PEL) —(1) TWA: The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds 0.75 parts formaldehyde per million parts of air (0.75 ppm) as an 8-hour TWA.

(2) Short Term Exposure Limit (STEL): The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds two parts formaldehyde per million parts of air (2 ppm) as a 15-minute STEL.

(d) Exposure monitoring —(1) General. (i) Each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde.

(ii) Exception. Where the employer documents, using objective data, that the presence of formaldehyde or formaldehyde-releasing products in the workplace cannot result in airborne concentrations of formaldehyde that would cause any employee to be exposed at or above the action level or the STEL under foreseeable conditions of use, the employer will not be required to measure employee exposure to formaldehyde.

(iii) When an employee's exposure is determined from representative sampling, the measurements used shall be representative of the employee's full shift or short-term exposure to formaldehyde, as appropriate.

(iv) Representative samples for each job classification in each work area shall be taken for each shift unless the employer can document with objective data that exposure levels for a given job classification are equivalent for different work shifts.

(2) Initial monitoring. The employer shall identify all employees who may be exposed at or above the action level or at or above the STEL and accurately determine the exposure of each employee so identified.

(i) Unless the employer chooses to measure the exposure of each employee potentially exposed to formaldehyde, the employer shall develop a representative sampling strategy and measure sufficient exposures within each job classification for each workshift to correctly characterize and not underestimate the exposure of any employee within each exposure group.

(ii) The initial monitoring process shall be repeated each time there is a change in production, equipment, process, personnel, or control measures which may result in new or additional exposure to formaldehyde.

(iii) If the employer receives reports of signs or symptoms of respiratory or dermal conditions associated with formaldehyde exposure, the employer shall promptly monitor the affected employee's exposure.

(3) Periodic monitoring. (i) The employer shall periodically measure and accurately determine exposure to formaldehyde for employees shown by the initial monitoring to be exposed at or above the action level or at or above the STEL.

(ii) If the last monitoring results reveal employee exposure at or above the action level, the employer shall repeat monitoring of the employees at least every 6 months.

(iii) If the last monitoring results reveal employee exposure at or above the STEL, the employer shall repeat monitoring of the employees at least once a year under worst conditions.

(4) Termination of monitoring. The employer may discontinue periodic monitoring for employees if results from two consecutive sampling periods taken at least 7 days apart show that employee exposure is below the action level and the STEL. The results must be statistically representative and consistent with the employer's knowledge of the job and work operation.

(5) Accuracy of monitoring. Monitoring shall be accurate, at the 95 percent confidence level, to within plus or minus 25 percent for airborne concentrations of formaldehyde at the TWA and the STEL and to within plus or minus 35 percent for airborne concentrations of formaldehyde at the action level.

(6) Employee notification of monitoring results. The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees. If employee exposure is above the PEL, affected employees shall be provided with a description of the corrective actions being taken by the employer to decrease exposure.

(7) Observation of monitoring. (i) The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to formaldehyde required by this standard.

(ii) When observation of the monitoring of employee exposure to formaldehyde requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the clothing and equipment to the observer, require the observer to use such clothing and equipment, and assure that the observer complies with all other applicable safety and health procedures.

(e) Regulated areas. —(1) Signs. (i) The employer shall establish regulated areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL and post all entrances and access ways with signs bearing the following legend:

DANGER

FORMALDEHYDE

MAY CAUSE CANCER

CAUSES SKIN, EYE, AND RESPIRATORY IRRITATION

AUTHORIZED PERSONNEL ONLY

(ii) Prior to June 1, 2016, employers may use the following legend in lieu of that specified in paragraph (e)(1)(i) of this section:

DANGER

FORMALDEHYDE

IRRITANT AND POTENTIAL CANCER HAZARD

AUTHORIZED PERSONNEL ONLY

(2) The employer shall limit access to regulated areas to authorized persons who have been trained to recognize the hazards of formaldehyde.

(3) An employer at a multiemployer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite.

(f) Methods of compliance —(1) Engineering controls and work practices. The employer shall

institute engineering and work practice controls to reduce and maintain employee exposures to formaldehyde at or below the TWA and the STEL.

(2) Exception. Whenever the employer has established that feasible engineering and work practice controls cannot reduce employee exposure to or below either of the PELs, the employer shall apply these controls to reduce employee exposures to the extent feasible and shall supplement them with respirators which satisfy this standard.

(g) Respiratory protection —(1) General. For employees who use respirators required by this section, the employer must provide each employee an appropriate respirator that complies with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls.

(ii) Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the PELs.

(iv) Emergencies.

(2) Respirator program. (i) The employer must implement a respiratory protection program in accordance with § 1910.134(b) through (d) (except (d)(1)(iii), (d)(3)(iii)(b)(1), and (2)), and (f) through (m), which covers each employee required by this section to use a respirator.

(ii) When employees use air-purifying respirators with chemical cartridges or canisters that do not contain end-of-service-life indicators approved by the National Institute for Occupational Safety and Health, employers must replace these cartridges or canisters as specified by paragraphs (d)(3)(iii)(B)(1) and (B)(2) of 29 CFR 1910.134, or at the end of the workshift, whichever condition occurs first.

(3) Respirator selection . (i) Employers must:

(A) Select, and provide to employees, the appropriate respirators specified in paragraph (d)(3)(i)(A) of 29 CFR 1910.134.

(B) Equip each air-purifying, full facepiece respirator with a canister or cartridge approved for protection against formaldehyde.

(C) For escape, provide employees with one of the following respirator options: A self-contained breathing apparatus operated in the demand or pressure-demand mode; or a full facepiece respirator having a chin-style, or a front-or back-mounted industrial-size, canister or cartridge approved for protection against formaldehyde.

(ii) Employers may substitute an air-purifying, half mask respirator for an air-purifying, full facepiece respirator when they equip the half mask respirator with a cartridge approved for protection against formaldehyde and provide the affected employee with effective gas-proof goggles.

(iii) Employers must provide employees who have difficulty using negative pressure respirators with powered air-purifying respirators permitted for use under paragraph (g)(3)(i)(A) of this standard and that affords adequate protection against formaldehyde exposures.

(h) Protective equipment and clothing. Employers shall comply with the provisions of 29 CFR 1910.132 and 29 CFR 1910.133. When protective equipment or clothing is provided under these provisions, the employer shall provide these protective devices at no cost to the employee and assure that the employee wears them.

(1) Selection. The employer shall select protective clothing and equipment based upon the form of formaldehyde to be encountered, the conditions of use, and the hazard to be prevented.

(i) All contact of the eyes and skin with liquids containing 1 percent or more formaldehyde shall be prevented by the use of chemical protective clothing made of material impervious to formaldehyde and the use of other personal protective equipment, such as goggles and face shields, as appropriate to the operation.

(ii) Contact with irritating or sensitizing materials shall be prevented to the extent necessary to eliminate the hazard.

(iii) Where a face shield is worn, chemical safety goggles are also required if there is a danger of formaldehyde reaching the area of the eye.

(iv) Full body protection shall be worn for entry into areas where concentrations exceed 100 ppm and for emergency reentry into areas of unknown concentration.

(2) Maintenance of protective equipment and clothing. (i) The employer shall assure that protective equipment and clothing that has become contaminated with formaldehyde is cleaned or laundered before its reuse.

(ii) When formaldehyde-contaminated clothing and equipment is ventilated, the employer shall establish storage areas so that employee exposure is minimized.

(A) Signs. Storage areas for contaminated clothing and equipment shall have signs bearing the following legend:

DANGER

FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT

MAY CAUSE CANCER

CAUSES SKIN, EYE AND RESPIRATORY IRRITATION

DO NOT BREATHE VAPOR

DO NOT GET ON SKIN

(B) Labels. The employer shall ensure containers for contaminated clothing and equipment are labeled consistent with the Hazard Communication Standard, § 1910.1200, and shall, as a minimum, include the following:

DANGER

FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT

MAY CAUSE CANCER

CAUSES SKIN, EYE, AND RESPIRATORY IRRITATION

DO NOT BREATHE VAPOR

DO NOT GET ON SKIN

(C) Prior to June 1, 2016, employers may use the following legend in lieu of that specified in paragraph (h)(2)(ii)(A) of this section:

DANGER

FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT

AVOID INHALATION AND SKIN CONTACT

(D) Prior to June 1, 2015, employers may include the following information on containers of protective clothing and equipment in lieu of the labeling requirements in paragraphs (h)(2)(ii)(B) of this section:

DANGER

FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT

AVOID INHALATION AND SKIN CONTACT

(iii) The employer shall assure that only persons trained to recognize the hazards of formaldehyde remove the contaminated material from the storage area for purposes of cleaning, laundering, or disposal.

(iv) The employer shall assure that no employee takes home equipment or clothing that is contaminated with formaldehyde.

(v) The employer shall repair or replace all required protective clothing and equipment for each affected employee as necessary to assure its effectiveness.

(vi) The employer shall inform any person who launders, cleans, or repairs such clothing or equipment of formaldehyde's potentially harmful effects and of procedures to safely handle the clothing and equipment.

(i) Hygiene protection. (1) The employer shall provide change rooms, as described in 29 CFR 1910.141 for employees who are required to change from work clothing into protective clothing to prevent skin contact with formaldehyde.

(2) If employees' skin may become spashed with solutions containing 1 percent or greater formaldehyde, for example, because of equipment failure or improper work practices, the employer shall provide conveniently located quick drench showers and assure that affected employees use these facilities immediately.

(3) If there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater formaldehyde, the employer shall provide acceptable eyewash facilities within the

immediate work area for emergency use.

(j) Housekeeping. For operations involving formaldehyde liquids or gas, the employer shall conduct a program to detect leaks and spills, including regular visual inspections.

(1) Preventative maintenance of equipment, including surveys for leaks, shall be undertaken at regular intervals.

(2) In work areas where spillage may occur, the employer shall make provisions to contain the spill, to decontaminate the work area, and to dispose of the waste.

(3) The employer shall assure that all leaks are repaired and spills are cleaned promptly by employees wearing suitable protective equipment and trained in proper methods for cleanup and decontamination.

(4) Formaldehyde-contaminated waste and debris resulting from leaks or spills shall be placed for disposal in sealed containers bearing a label warning of formaldehyde's presence and of the hazards associated with formaldehyde. The employer shall ensure that the labels are in accordance with paragraph (m) of this section.

(k) Emergencies. For each workplace where there is the possibility of an emergency involving formaldehyde, the employer shall assure appropriate procedures are adopted to minimize injury and loss of life. Appropriate procedures shall be implemented in the event of an emergency.

(l) Medical surveillance —(1) Employees covered. (i) The employer shall institute medical surveillance programs for all employees exposed to formaldehyde at concentrations at or exceeding the action level or exceeding the STEL.

(ii) The employer shall make medical surveillance available for employees who develop signs and symptoms of overexposure to formaldehyde and for all employees exposed to formaldehyde in emergencies. When determining whether an employee may be experiencing signs and symptoms of possible overexposure to formaldehyde, the employer may rely on the evidence that signs and symptoms associated with formaldehyde exposure will occur only in exceptional circumstances when airborne exposure is less than 0.1 ppm and when formaldehyde is present in material in concentrations less than 0.1 percent.

(2) Examination by a physician. All medical procedures, including administration of medical disease questionnaires, shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(3) Medical disease questionnaire. The employer shall make the following medical surveillance available to employees prior to assignment to a job where formaldehyde exposure is at or above the action level or above the STEL and annually thereafter. The employer shall also make the following medical surveillance available promptly upon determining that an employee is experiencing signs and symptoms indicative of possible overexposure to formaldehyde.

(i) Administration of a medical disease questionnaire, such as in appendix D, which is designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperreactive airway disease: allergic skin conditions or dermatitis; and upper or lower respiratory problems.

(ii) A determination by the physician, based on evaluation of the medical disease questionnaire, of

whether a medical examination is necessary for employees not required to wear respirators to reduce exposure to formaldehyde.

(4) Medical examinations. Medical examinations shall be given to any employee who the physician feels, based on information in the medical disease questionnaire, may be at increased risk from exposure to formaldehyde and at the time of initial assignment and at least annually thereafter to all employees required to wear a respirator to reduce exposure to formaldehyde. The medical examination shall include:

(i) A physical examination with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of the eyes.

(ii) Laboratory examinations for respirator wearers consisting of baseline and annual pulmonary function tests. As a minimum, these tests shall consist of forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), and forced expiratory flow (FEF).

(iii) Any other test which the examining physician deems necessary to complete the written opinion.

(iv) Counseling of employees having medical conditions that would be directly or indirectly aggravated by exposure to formaldehyde on the increased risk of impairment of their health.

(5) Examinations for employees exposed in an emergency. The employer shall make medical examinations available as soon as possible to all employees who have been exposed to formaldehyde in an emergency.

(i) The examination shall include a medical and work history with emphasis on any evidence of upper or lower respiratory problems, allergic conditions, skin reaction or hypersensitivity, and any evidence of eye, nose, or throat irritation.

(ii) Other examinations shall consist of those elements considered appropriate by the examining physician.

(6) Information provided to the physician. The employer shall provide the following information to the examining physician:

(i) A copy of this standard and appendix A, C, D, and E;

(ii) A description of the affected employee's job duties as they relate to the employee's exposure to formaldehyde;

(iii) The representative exposure level for the employee's job assignment;

(iv) Information concerning any personal protective equipment and respiratory protection used or to be used by the employee; and

(v) Information from previous medical examinations of the affected employee within the control of the employer.

(vi) In the event of a nonroutine examination because of an emergency, the employer shall provide to the physician as soon as possible: A description of how the emergency occurred and the exposure the victim may have received.

(7) Physician's written opinion. (i) For each examination required under this standard, the employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination except that it shall not reveal specific findings or diagnoses unrelated to occupational exposure to formaldehyde. The written opinion shall include:

(A) The physician's opinion as to whether the employee has any medical condition that would place the employee at an increased risk of material impairment of health from exposure to formaldehyde;

(B) Any recommended limitations on the employee's exposure or changes in the use of personal protective equipment, including respirators;

(C) A statement that the employee has been informed by the physician of any medical conditions which would be aggravated by exposure to formaldehyde, whether these conditions may have resulted from past formaldehyde exposure or from exposure in an emergency, and whether there is a need for further examination or treatment.

(ii) The employer shall provide for retention of the results of the medical examination and tests conducted by the physician.

(iii) The employer shall provide a copy of the physician's written opinion to the affected employee within 15 days of its receipt.

(8) Medical removal. (i) The provisions of paragraph (l)(8) apply when an employee reports significant irritation of the mucosa of the eyes or the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization attributed to workplace formaldehyde exposure. Medical removal provisions do not apply in the case of dermal irritation or dermal sensitization when the product suspected of causing the dermal condition contains less than 0.05% formaldehyde.

(ii) An employee's report of signs or symptoms of possible overexposure to formaldehyde shall be evaluated by a physician selected by the employer pursuant to paragraph (l)(3). If the physician determines that a medical examination is not necessary under paragraph (l)(3)(ii), there shall be a two-week evaluation and remediation period to permit the employer to ascertain whether the signs or symptoms subside untreated or with the use of creams, gloves, first aid treatment or personal protective equipment. Industrial hygiene measures that limit the employee's exposure to formaldehyde may also be implemented during this period. The employee shall be referred immediately to a physician prior to expiration of the two-week period if the signs or symptoms worsen. Earnings, seniority and benefits may not be altered during the two-week period by virtue of the report.

(iii) If the signs or symptoms have not subsided or been remedied by the end of the two-week period, or earlier if signs or symptoms warrant, the employee shall be examined by a physician selected by the employer. The physician shall presume, absent contrary evidence, that observed dermal irritation or dermal sensitization are not attributable to formaldehyde when products to which the affected employee is exposed contain less than 0.1% formaldehyde.

(iv) Medical examinations shall be conducted in compliance with the requirements of paragraph (l)(5) (i) and (ii). Additional guidelines for conducting medical exams are contained in appendix C.

(v) If the physician finds that significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization result from workplace formaldehyde exposure and recommends restrictions or removal, the employer shall promptly comply with the restrictions or recommendation of removal. In the event of a recommendation of removal, the employer shall remove the effected employee from the current formaldehyde exposure and if possible, transfer the employee to work having no or significantly less exposure to formaldehyde.

(vi) When an employee is removed pursuant to paragraph (l)(8)(v), the employer shall transfer the employee to comparable work for which the employee is qualified or can be trained in a short period (up to 6 months), where the formaldehyde exposures are as low as possible, but not higher than the action level. The employeer shall maintain the employee's current earnings, seniority, and other benefits. If there is no such work available, the employer shall maintain the employee's current earnings, seniority and other benefits until such work becomes available, until the employee is determined to be unable to return to workplace formaldehyde exposure, until the employee is determined to be able to return to the original job status, or for six months, whichever comes first.

(vii) The employer shall arrange for a follow-up medical examination to take place within six months after the employee is removed pursuant to this paragraph. This examination shall determine if the employee can return to the original job status, or if the removal is to be permanent. The physician shall make a decision within six months of the date the employee was removed as to whether the employee can be returned to the original job status, or if the removal is to be permanent.

(viii) An employer's obligation to provide earnings, seniority and other benefits to a removed employee may be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program or from employment with another employer made possible by virtue of the employee's removal.

(ix) In making determinations of the formaldehyde content of materials under this paragraph the employer may rely on objective data.

(9) Multiple physician review. (i) After the employer selects the initial physician who conducts any medical examination or consultation to determine whether medical removal or restriction is appropriate, the employee may designate a second physician to review any findings, determinations or recommendations of the initial physician and to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary and appropriate to evaluate the effects of formaldehyde exposure and to facilitate this review.

(ii) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation for the purpose of medical removal or restriction.

(iii) The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen (15) days after receipt of the notification of the right to seek a second medical opinion, or receipt of the initial physician's written opinion, whichever is later;

(A) The employee informs the employer of the intention to seek a second medical opinion, and

(B) The employee initiates steps to make an appointment with a second physician.

(iv) If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve the disagreement. If the two physicians are unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician who shall be a specialist in the field at issue:

(A) To review the findings, determinations or recommendations of the prior physicians; and

(B) To conduct such examinations, consultations, laboratory tests and discussions with the prior

physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(v) In the alternative, the employer and the employee or authorized employee representative may jointly designate such third physician.

(vi) The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(m) Communication of hazards —(1) Hazard communication—General. (i) Chemical manufacturers, importers, distributors and employers shall comply with all requirements of the Hazard Communication Standard (HCS) (§ 1910.1200) for formaldehyde.

(ii) In classifying the hazards of formaldehyde at least the following hazards are to be addressed: Cancer; skin and respiratory sensitization; eye, skin and respiratory tract irritation; acute toxicity effects; and flammability.

(iii) Employers shall include formaldehyde in the hazard communication program established to comply with the HCS (§ 1910.1200). Employers shall ensure that each employee has access to labels on containers of formaldehyde and to safety data sheets, and is trained in accordance with the requirements of HCS and paragraph (n) of this section.

(iv) Paragraphs (m)(1)(i), (m)(1)(ii), and (m)(1)(iii) of this section apply to chemicals associated with formaldehyde gas, all mixtures or solutions composed of greater than 0.1 percent formaldehyde, and materials capable of releasing formaldehyde into the air at concentrations reaching or exceeding 0.1 ppm.

(v) In making the determinations of anticipated levels of formaldehyde release, the employer may rely on objective data indicating the extent of potential formaldehyde release under reasonably foreseeable conditions of use.

(2)(i) In addition to the requirements in paragraphs (m)(1) through (m)(1)(iv) of this section, for materials listed in paragraph (m)(1)(iv) capable of releasing formaldehyde at levels above 0.5 ppm, labels shall appropriately address all hazards as defined in paragraph (d) of § 1910.1200 and Appendices A and B to § 1910.1200, including cancer and respiratory sensitization, and shall contain the hazard statement "May Cause Cancer."

(ii) As a minimum, for all materials listed in paragraph (m)(1)(i) and (iv) of this section capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, labels shall identify that the product contains formaldehyde; list the name and address of the responsible party; and state that physical and health hazard information is readily available from the employer and from safety data sheets.

(iii) Prior to June 1, 2015, employers may include the phrase "Potential Cancer Hazard" in lieu of "May Cause Cancer" as specified in paragraph (m)(2)(i) of this section.

(n) Employee information and training —(1) Participation. The employer shall assure that all employees who are assigned to workplaces where there is exposure to formaldehyde participate in a training program, except that where the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm, the employer is not required to provide training.

(2) Frequency. Employers shall provide such information and training to employees at the time of initial assignment, and whenever a new exposure to formaldehyde is introduced into the work area. The training shall be repeated at least annually.

(3) Training program. The training program shall be conducted in a manner which the employee is able to understand and shall include:

(i) A discussion of the contents of this regulation and the contents of the Material Safety Data Sheet.

(ii) The purpose for and a description of the medical surveillance program required by this standard, including:

(A) A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.

(B) Instructions to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure.

(iii) Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde in each job;

(iv) The purpose for, proper use of, and limitations of personal protective clothing and equipment;

(v) Instructions for the handling of spills, emergencies, and clean-up procedures;

(vi) An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls; and

(vii) A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency.

(4) Access to training materials. (i) The employer shall inform all affected employees of the location of written training materials and shall make these materials readily available, without cost, to the affected employees.

(ii) The employer shall provide, upon request, all training materials relating to the employee training program to the Assistant Secretary and the Director.

(o) Recordkeeping —(1) Exposure measurements. The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to formaldehyde. This record shall include:

(i) The date of measurement;

(ii) The operation being monitored;

(iii) The methods of sampling and analysis and evidence of their accuracy and precision;

(iv) The number, durations, time, and results of samples taken;

(v) The types of protective devices worn; and

(vi) The names, job classifications, social security numbers, and exposure estimates of the employees whose exposures are represented by the actual monitoring results.

(2) Exposure determinations. Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no employee is exposed to formaldehyde at or above the action level.

(3) Medical surveillance. The employer shall establish and maintain an accurate record for each employee subject to medical surveillance under this standard. This record shall include:

(i) The name and social security number of the employee;

(ii) The physician's written opinion;

(iii) A list of any employee health complaints that may be related to exposure to formaldehyde; and

(iv) A copy of the medical examination results, including medical disease questionnaires and results of any medical tests required by the standard or mandated by the examining physician.

(4) Respirator fit testing. (i) The employer shall establish and maintain accurate records for employees subject to negative pressure respirator fit testing required by this standard.

(ii) This record shall include:

(A) A copy of the protocol selected for respirator fit testing.

(B) A copy of the results of any fit testing performed.

(C) The size and manufacturer of the types of respirators available for selection.

(D) The date of the most recent fit testing, the name and social security number of each tested employee, and the respirator type and facepiece selected.

(5) Record retention. The employer shall retain records required by this standard for at least the following periods:

(i) Exposure records and determinations shall be kept for at least 30 years.

(ii) Medical records shall be kept for the duration of employment plus 30 years.

(iii) Respirator fit testing records shall be kept until replaced by a more recent record.

(6) Availability of records. (i) Upon request, the employer shall make all records maintained as a requirement of this standard available for examination and copying to the Assistant Secretary and the Director.

(ii) The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination, and copying to the subject employee, or former employee, and employee representatives in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i).

(iii) Employee medical records required by this standard shall be provided upon request for examination and coying, to the subject employee or former employee or to anyone having the specific written consent of the subject employee or former employee in accordance with 29 CFR 1910.1020 (a)-

(e) and (g)-(i).

APPENDIX A TO § 1910.1048—SUBSTANCE TECHNICAL GUIDELINES FOR FORMALIN

The following Substance Technical Guideline for Formalin provides information on uninhibited formalin solution (37% formaldehyde, no methanol stabilizer). It is designed to inform employees at the production level of their rights and duties under the formaldehyde standard whether their job title defines them as workers or supervisors. Much of the information provided is general; however, some information is specific for formalin. When employee exposure to formaldehyde is from resins capable of releasing formaldehyde, the resin itself and other impurities or decomposition products may also be toxic, and employers should include this information as well when informing employees of the hazards associated with the materials they handle. The precise hazards associated with exposure to formaldehyde depend both on the form (solid, liquid, or gas) of the material and the concentration of formaldehyde present. For example, 37-50 percent solutions of formaldehyde present a much greater hazard to the skin and eyes from spills or splashes than solutions containing less than 1 percent formaldehyde. Individual Substance Technical Guidelines used by the employer for training employees should be modified to properly give information on the material actually being used.

Substance Identification

Chemical Name: Formaldehyde

Chemical Family: Aldehyde

Chemical Formula: HCHO

Molecular Weight: 30.03

Chemical Abstracts Service Number (CAS Number): 50-00-0

Synonyms: Formalin; Formic Aldehyde; Paraform; Formol; Formalin (Methanol-free); Fyde; Formalith; Methanal; Methyl Aldehyde; Methylene Glycol; Methylene Oxide; Tetraoxymethalene; Oxomethane; Oxymethylene

Components and Contaminants

Percent: 37.0 Formaldehyde

Percent: 63.0 Water

(Note—Inhibited solutions contain methanol.)

Other Contaminants: Formic acid (alcohol free)

Exposure Limits:

OSHA TWA—0.75 ppm

OSHA STEL—2 ppm

Physical Data

Description: Colorless liquid, pungent odor

Boiling point: 214 °F (101 °C)

Specific Gravity: 1.08 (H_2 O=1 @ 20 °C)

pH: 2.8-4.0

Solubility in Water: Miscible

Solvent Solubility: Soluble in alcohol and acetone

Vapor Density: 1.04 (Air=1 @ 20 °C)

Odor Threshold: 0.8-1 ppm

Fire and Explosion Hazard

Moderate fire and explosion hazard when exposed to heat or flame.

The flash point of 37% formaldehyde solutions is above normal room temperature, but the explosion range is very wide, from 7 to 73% by volume in air.

Reaction of formaldehyde with nitrogen dioxide, nitromethane, perchloric acid and aniline, or peroxyformic acid yields explosive compounds.

Flash Point: 185 °F (85 °C) closed cup

Lower Explosion Limit: 7%

Upper Explosion Limit: 73%

Autoignition Temperature: 806 °F (430 °C)

Flammability (OSHA): Category 4 flammable liquid

Extinguishing Media: Use dry chemical, "alcohol foam", carbon dioxide, or water in flooding amounts as fog. Solid streams may not be effective. Cool fire-exposed containers with water from side until well after fire is out.

Use of water spray to flush spills can also dilute the spill to produce nonflammable mixtures. Water runoff, however, should be contained for treatment.

National Fire Protection Association Section 325M Designation:

Health: 2—Materials hazardous to health, but areas may be entered with full-faced mask self-contained breathing apparatus which provides eye protection.

Flammability: 2—Materials which must be moderately heated before ignition will occur. Water spray may be used to extinguish the fire because the material can be cooled below its flash point.

Reactivity: D—Materials which (in themselves) are normally stable even under fire exposure conditions and which are not reactive with water. Normal fire fighting procedures may be used.

Reactivity

Stability: Formaldehyde solutions may self-polymerize to form paraformaldehyde which precipitates.

Incompatibility (Materials to Avoid): Strong oxidizing agents, caustics, strong alkalies, isocyanates, anhydrides, oxides, and inorganic acids. Formaldehyde reacts with hydrochloric acid to form the potent carcinogen, bis-chloromethyl ether. Formaldehyde reacts with nitrogen dioxide, nitromethane, perchloric acid and aniline, or peroxyformic acid to yield explosive compounds. A violent reaction occurs when formaldehyde is mixed with strong oxidizers.

Hazardous Combustion or Decomposition Products: Oxygen from the air can oxidize formaldehyde to formic acid, especially when heated. Formic acid is corrosive.

Health Hazard Data

Acute Effects of Exposure

Ingestion (Swallowing): Liquids containing 10 to 40% formaldehyde cause severe irritation and inflammation of the mouth, throat, and stomach. Severe stomach pains will follow ingestion with possible loss of consciousness and death. Ingestion of dilute formaldehyde solutions (0.03-0.04%) may cause discomfort in the stomach and pharynx.

Inhalation (Breathing): Formaldehyde is highly irritating to the upper respiratory tract and eyes. Concentrations of 0.5 to 2.0 ppm may irritate the eyes, nose, and throat of some individuals. Concentrations of 3 to 5 ppm also cause tearing of the eyes and are intolerable to some persons. Concentrations of 10 to 20 ppm cause difficulty in breathing, burning of the nose and throat, cough, and heavy tearing of the eyes, and 25 to 30 ppm causes severe respiratory tract injury leading to pulmonary edema and pneumonitis. A concentration of 100 ppm is immediately dangerous to life and health. Deaths from accidental exposure to high concentrations of formaldehyde have been reported.

Skin (Dermal): Formalin is a severe skin irritant and a sensitizer. Contact with formalin causes white discoloration, smarting, drying, cracking, and scaling. Prolonged and repeated contact can cause numbness and a hardening or tanning of the skin. Previously exposed persons may react to future exposure with an allergic eczematous dermatitis or hives.

Eye Contact: Formaldehyde solutions splashed in the eye can cause injuries ranging from transient discomfort to severe, permanent corneal clouding and loss of vision. The severity of the effect depends on the concentration of formaldehyde in the solution and whether or not the eyes are flushed with water immediately after the accident.

NOTE. The perception of formaldehyde by odor and eye irritation becomes less sensitive with time as one adapts to formaldehyde. This can lead to overexposure if a worker is relying on formaldehyde's warning properties to alert him or her to the potential for exposure.

Acute Animal Toxicity:

Oral, rats: LD50=800 mg/kg

Oral, mouse: LD50=42 mg/kg

Inhalation, rats: LCLo=250 mg/kg

Inhalation, mouse: LCLo=900 mg/kg

Inhalation, rats: LC50=590 mg/kg

Chronic Effects of Exposure

Carcinogenicity: Formaldehyde has the potential to cause cancer in humans. Repeated and prolonged exposure increases the risk. Various animal experiments have conclusively shown formaldehyde to be a carcinogen in rats. In humans, formaldehyde exposure has been associated with cancers of the lung, nasopharynx and oropharynx, and nasal passages.

Mutagenicity: Formaldehyde is genotoxic in several in vitro test systems showing properties of both an initiator and a promoter.

Toxicity: Prolonged or repeated exposure to formaldehyde may result in respiratory impairment. Rats exposed to formaldehyde at 2 ppm developed benign nasal tumors and changes of the cell structure in the nose as well as inflamed mucous membranes of the nose. Structural changes in the epithelial cells in the human nose have also been observed. Some persons have developed asthma or bronchitis following exposure to formaldehyde, most often as the result of an accidental spill involving a single exposure to a high concentration of formaldehyde.

Emergency and First Aid Procedures

Ingestion (Swallowing): If the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving milk, activated charcoal, or water. Any organic material will inactivate formaldehyde. Keep affected person warm and at rest. Get medical attention immediately. If vomiting occurs, keep head lower than hips.

Inhalation (Breathing): Remove the victim from the exposure area to fresh air immediately. Where the formaldehyde concentration may be very high, each rescuer must put on a self-contained breathing apparatus before attempting to remove the victim, and medical personnel should be informed of the formaldehyde exposure immediately. If breathing has stopped, give artificial respiration. Keep the affected person warm and at rest. Qualified first-aid or medical personnel should administer oxygen, if available, and maintain the patient's airways and blood pressure until the victim can be transported to a medical facility. If exposure results in a highly irritated upper respiratory tract and coughing continues for more than 10 minutes, the worker should be hospitalized for observation and treatment.

Skin Contact: Remove contaminated clothing (including shoes) immediately. Wash the affected area of your body with soap or mild detergent and large amounts of water until no evidence of the chemical remains (at least 15 to 20 minutes). If there are chemical burns, get first aid to cover the area with sterile, dry dressing, and bandages. Get medical attention if you experience appreciable eye or respiratory irritation.

Eye Contact: Wash the eyes immediately with large amounts of water occasionally lifting lower and upper lids, until no evidence of chemical remains (at least 15 to 20 minutes). In case of burns, apply sterile bandages loosely without medication. Get medical attention immediately. If you have experienced appreciable eye irritation from a splash or excessive exposure, you should be referred promptly to an opthamologist for evaluation.

Emergency Procedures

Emergencies: If you work in an area where a large amount of formaldehyde could be released in an accident or from equipment failure, your employer must develop procedures to be followed in event of an emergency. You should be trained in your specific duties in the event of an emergency, and it is important that you clearly understand these duties. Emergency equipment must be accessible and you should be trained to use any equipment that you might need. Formaldehyde contaminated equipment must be cleaned before reuse.

If a spill of appreciable quantity occurs, leave the area quickly unless you have specific emergency duties. Do not touch spilled material. Designated persons may stop the leak and shut off ignition sources if these procedures can be done without risk. Designated persons should isolate the hazard area and deny entry except for necessary people protected by suitable protective clothing and respirators adequate for the exposure. Use water spray to reduce vapors. Do not smoke, and prohibit all flames or flares in the hazard area.

Special Firefighting Procedures: Learn procedures and responsibilities in the event of a fire in your workplace. Become familiar with the appropriate equipment and supplies and their location. In firefighting, withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.

Spill, Leak, and Disposal Procedures

Occupational Spill: For small containers, place the leaking container in a well ventilated area. Take up small spills with absorbent material and place the waste into properly labeled containers for later disposal. For larger spills, dike the spill to minimize contamination and facilitate salvage or disposal. You may be able to neutralize the spill with sodium hydroxide or sodium sulfite. Your employer must comply with EPA rules regarding the clean-up of toxic waste and notify state and local authorities, if required. If the spill is greater than 1,000 lb/day, it is reportable under EPA's Superfund legislation.

Waste Disposal: Your employer must dispose of waste containing formaldehyde in accordance with applicable local, state, and Federal law and in a manner that minimizes exposure of employees at the site and of the clean-up crew.

Monitoring and Measurement Procedures

Monitoring Requirements: If your exposure to formaldehyde exceeds the 0.5 ppm action level or the 2 ppm STEL, your employer must monitor your exposure. Your employer need not measure every exposure if a "high exposure" employee can be identified. This person usually spends the greatest amount of time nearest the process equipment. If you are a "representative employee", you will be asked to wear a sampling device to collect formaldehyde. This device may be a passive badge, a sorbent tube attached to a pump, or an impinger containing liquid. You should perform your work as usual, but inform the person who is conducting the monitoring of any difficulties you are having wearing the device.

Evaluation of 8-hour Exposure: Measurements taken for the purpose of determining time-weighted average (TWA) exposures are best taken with samples covering the full shift. Samples collected must be taken from the employee's breathing zone air.

Short-term Exposure Evaluation: If there are tasks that involve brief but intense exposure to formaldehyde, employee exposure must be measured to assure compliance with the STEL. Sample collections are for brief periods, only 15 minutes, but several samples may be needed to identify the peak exposure.

Monitoring Techniques: OSHA's only requirement for selecting a method for sampling and analysis is that the methods used accurately evaluate the concentration of formaldehyde in employees' breathing zones. Sampling and analysis may be performed by collection of formaldehyde on liquid or solid sorbents with subsequent chemical analysis. Sampling and analysis may also be performed by passive diffusion monitors and short-term exposure may be measured by instruments such as real-time continuous monitoring systems and portable direct reading instruments.

Notification of Results: Your employer must inform you of the results of exposure monitoring representative of your job. You may be informed in writing, but posting the results where you have ready access to them constitutes compliance with the standard.

Protective Equipment and Clothing

[Material impervious to formaldehyde is needed if the employee handles formaldehyde solutions of 1% or more. Other employees may also require protective clothing or equipment to prevent dermatitis.]

Respiratory Protection: Use NIOSH-approved full facepiece negative pressure respirators equipped with approved cartridges or canisters within the use limitations of these devices. (Present restrictions on cartridges and canisters do not permit them to be used for a full workshift.) In all other situations, use positive pressure respirators such as the positive-pressure air purifying respirator or the self-contained breathing apparatus (SCBA). If you use a negative pressure respirator, your employer must provide you with fit testing of the respirator at least once a year.

Protective Gloves: Wear protective (impervious) gloves provided by your employer, at no cost, to prevent contact with formalin. Your employer should select these gloves based on the results of permeation testing and in accordance with the ACGIH Guidelines for Selection of Chemical Protective Clothing.

Eye Protection: If you might be splashed in the eyes with formalin, it is essential that you wear goggles or some other type of complete protection for the eye. You may also need a face shield if your face is likely to be splashed with formalin, but you must not substitute face shields for eye protection. (This section pertains to formaldehyde solutions of 1% or more.)

Other Protective Equipment: You must wear protective (impervious) clothing and equipment provided by your employer at no cost to prevent repeated or prolonged contact with formaldehyde liquids. If you are required to change into whole-body chemical protective clothing, your employer must provide a change room for your privacy and for storage of your normal clothing.

If you are splashed with formaldehyde, use the emergency showers and eyewash fountains provided by your employer immediately to prevent serious injury. Report the incident to your supervisor and obtain necessary medical support.

ENTRY INTO AN IDLH ATMOSPHERE

Enter areas where the formaldehyde concentration might be 100 ppm or more only with complete body protection including a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied air respirator with full facepiece and operated in a positive pressure mode. This equipment is essential to protect your life and health under such extreme conditions.

Engineering Controls

Ventilation is the most widely applied engineering control method for reducing the concentration of airborne substances in the breathing zones of workers. There are two distinct types of ventilation.

Local Exhaust: Local exhaust ventilation is designed to capture airborne contaminants as near to the point of generation as possible. To protect you, the direction of contaminant flow must always be toward the local exhaust system inlet and away from you.

General (Mechanical): General dilution ventilation involves continuous introduction of fresh air into the workroom to mix with the contaminated air and lower your breathing zone concentration of formaldehyde. Effectiveness depends on the number of air changes per hour. Where devices emitting formaldehyde are spread out over a large area, general dilution ventilation may be the only practical method of control.

Work Practices: Work practices and administrative procedures are an important part of a control system. If you are asked to perform a task in a certain manner to limit your exposure to formaldehyde, it is extremely important that you follow these procedures.

Medical Surveillance

Medical surveillance helps to protect employees' health. You are encouraged strongly to participate in the medical surveillance program.

Your employer must make a medical surveillance program available at no expense to you and at a reasonable time and place if you are exposed to formaldehyde at concentrations above 0.5 ppm as an 8-hour average or 2 ppm over any 15-minute period. You will be offered medical surveillance at the time of your initial assignment and once a year afterward as long as your exposure is at least 0.5 ppm (TWA) or 2 ppm (STEL). Even if your exposure is below these levels, you should inform your employer if you have signs and symptoms that you suspect, through your training, are related to your formaldehyde exposure because you may need medical surveillance to determine if your health is being impaired by your exposure.

The surveillance plan includes:

(a) A medical disease questionnaire.

(b) A physical examination if the physician determines this is necessary.

If you are required to wear a respirator, your employer must offer you a physical examination and a pulmonary function test every year.

The physician must collect all information needed to determine if you are at increased risk from your exposure to formaldehyde. At the physician's discretion, the medical examination may include other tests, such as a chest x-ray, to make this determination.

After a medical examination the physician will provide your employer with a written opinion which includes any special protective measures recommended and any restrictions on your exposure. The physician must inform you of any medical conditions you have which would be aggravated by exposure to formaldehyde.

All records from your medical examinations, including disease surveys, must be retained at your employer's expense.

EMERGENCIES

If you are exposed to formaldehyde in an emergency and develop signs or symptoms associated with acute toxicity from formaldehyde exposure, your employer must provide you with a medical examination as soon as possible. This medical examination will include all steps necessary to stabilize your health. You may be kept in the hospital for observation if your symptoms are severe to ensure that any delayed effects are recognized and treated.

APPENDIX B TO § 1910.1048—SAMPLING STRATEGY AND ANALYTICAL METHODS FOR FORMALDEHYDE

To protect the health of employees, exposure measurements must be unbiased and representative of employee exposure. The proper measurement of employee exposure requires more than a token commitment on the part of the employer. OSHA's mandatory requirements establish a baseline; under the best of circumstances all questions regarding employee exposure will be answered. Many employers, however, will wish to conduct more extensive monitoring before undertaking expensive commitments, such as engineering controls, to assure that the modifications are truly necessary. The following sampling strategy, which was developed at NIOSH by Nelson A. Leidel, Kenneth A. Busch, and Jeremiah R. Lynch and described in NIOSH publication No. 77-173 (Occupational Exposure Sampling Strategy Manual) will assist the employer in developing a strategy for determining the exposure of his or her employees.

There is no one correct way to determine employee exposure. Obviously, measuring the exposure of every employee exposed to formaldehyde will provide the most information on any given day. Where few employees are exposed, this may be a practical solution. For most employers, however, use of the following strategy will give just as much information at less cost.

Exposure data collected on a single day will not automatically guarantee the employer that his or her workplace is always in compliance with the formaldehyde standard. This does not imply, however, that it is impossible for an employer to be sure that his or her worksite is in compliance with the standard. Indeed, a properly designed sampling strategy showing that all employees are exposed below the PELs, at least with a 95 percent certainty, is compelling evidence that the exposure limits are being achieved provided that measurements are conducted using valid sampling strategy and approved analytical methods.

There are two PELs, the TWA concentration and the STEL. Most employers will find that one of these two limits is more critical in the control of their operations, and OSHA expects that the employer will concentrate monitoring efforts on the critical component. If the more difficult exposure is controlled, this information, along with calculations to support the assumptions, should be adequate to show that the other exposure limit is also being achieved.

Sampling Strategy

Determination of the Need for Exposure Measurements

The employer must determine whether employees may be exposed to concentrations in excess of the action level. This determination becomes the first step in an employee exposure monitoring program that minimizes employer sampling burdens while providing adequate employee protection. If employees may be exposed above the action level, the employer must measure exposure. Otherwise, an objective determination that employee exposure is low provides adequate evidence that exposure potential has been examined.

The employer should examine all available relevant information, eg. insurance company and trade association data and information from suppliers or exposure data collected from similar operations. The employer may also use previously-conducted sampling including area monitoring. The employer must make a determination relevant to each operation although this need not be on a separate piece of paper. If the employer can demonstrate conclusively that no employee is exposed above the action level or the STEL through the use of objective data, the employer need proceed no further on employee exposure monitoring until such time that conditions have changed and the determination is no longer valid.

If the employer cannot determine that employee exposure is less than the action level and the STEL, employee exposure monitoring will have to be conducted.

Workplace Material Survey

The primary purpose of a survey of raw material is to determine if formaldehyde is being used in the work environment and if so, the conditions under which formaldehyde is being used.

The first step is to tabulate all situations where formaldehyde is used in a manner such that it may be released into the workplace atmosphere or contaminate the skin. This information should be available through analysis of company records and information on the MSDSs available through provisions of this standard and the Hazard Communication standard.

If there is an indication from materials handling records and accompanying MSDSs that formaldehyde is being used in the following types of processes or work operations, there may be a potential for releasing formaldehyde into the workplace atmosphere:

(1) Any operation that involves grinding, sanding, sawing, cutting, crushing, screening, sieving, or any other manipulation of material that generates formaldehyde-bearing dust

(2) Any processes where there have been employee complaints or symptoms indicative of exposure to formaldehyde

(3) Any liquid or spray process involving formaldehyde

(4) Any process that uses formaldehyde in preserved tissue

(5) Any process that involves the heating of a formaldehyde-bearing resin.

Processes and work operations that use formaldehyde in these manners will probably require further investigation at the worksite to determine the extent of employee monitoring that should be conducted.

Workplace Observations

To this point, the only intention has been to provide an indication as to the existence of potentially exposed employees. With this information, a visit to the workplace is needed to observe work operations, to identify potential health hazards, and to determine whether any employees may be exposed to hazardous concentrations of formaldehyde.

In many circumstances, sources of formaldehyde can be identified through the sense of smell. However, this method of detection should be used with caution because of olfactory fatigue.

Employee location in relation to source of formaldehyde is important in determining if an employee may be significantly exposed to formaldehyde. In most instances, the closer a worker is to the source, the higher the probability that a significant exposure will occur.

Other characteristics should be considered. Certain high temperature operations give rise to higher evaporation rates. Locations of open doors and windows provide natural ventilation that tend to dilute formaldehyde emissions. General room ventilation also provides a measure of control.

Calculation of Potential Exposure Concentrations

By knowing the ventilation rate in a workplace and the quantity of formaldehyde generated, the employer may be able to determine by calculation if the PELs might be exceeded. To account for poor mixing of formaldehyde into the entire room, locations of fans and proximity of employees to the work operation, the employer must include a

safety factor. If an employee is relatively close to a source, particularly if he or she is located downwind, a safety factor of 100 may be necessary. For other situations, a factor of 10 may be acceptable. If the employer can demonstrate through such calculations that employee exposure does not exceed the action level or the STEL, the employer may use this information as objective data to demonstrate compliance with the standard.

Sampling Strategy

Once the employer determines that there is a possibility of substantial employee exposure to formaldehyde, the employer is obligated to measure employee exposure.

The next step is selection of a maximum risk employee. When there are different processes where employees may be exposed to formaldehyde, a maximum risk employee should be selected for each work operation.

Selection of the maximum risk employee requires professional judgment. The best procedure for selecting the maximum risk employee is to observe employees and select the person closest to the source of formaldehyde. Employee mobility may affect this selection; eg. if the closest employee is mobile in his tasks, he may not be the maximum risk employee. Air movement patterns and differences in work habits will also affect selection of the maximum risk employee.

When many employees perform essentially the same task, a maximum risk employee cannot be selected. In this circumstance, it is necessary to resort to random sampling of the group of workers. The objective is to select a subgroup of adequate size so that there is a high probability that the random sample will contain at least one worker with high exposure if one exists. The number of persons in the group influences the number that need to be sampled to ensure that at least one individual from the highest 10 percent exposure group is contained in the sample. For example, to have 90 percent confidence in the results, if the group size is 10, nine should be sampled; for 50, only 18 need to be sampled.

If measurement shows exposure to formaldehyde at or above the action level or the STEL, the employer needs to identify all other employees who may be exposed at or above the action level or STEL and measure or otherwise accurately characterize the exposure of these employees.

Whether representative monitoring or random sampling are conducted, the purpose remains the same—to determine if the exposure of any employee is above the action level. If the exposure of the most exposed employee is less than the action level and the STEL, regardless of how the employee is identified, then it is reasonable to assume that measurements of exposure of the other employees in that operation would be below the action level and the STEL.

Exposure Measurements

There is no "best" measurement strategy for all situations. Some elements to consider in developing a strategy are:

(1) Availability and cost of sampling equipment

(2) Availability and cost of analytic facilities

(3) Availability and cost of personnel to take samples

(4) Location of employees and work operations

(5) Intraday and interday variations in the process

(6) Precision and accuracy of sampling and analytic methods, and

(7) Number of samples needed.

Samples taken for determining compliance with the STEL differ from those that measure the TWA concentration in important ways. STEL samples are best taken in a nonrandom fashion using all available knowledge relating to the area, the individual, and the process to obtain samples during periods of maximum expected concentrations. At least three measurements on a shift are generally needed to spot gross errors or mistakes; however, only the highest value represents the STEL.

If an operation remains constant throughout the workshift, a much greater number of samples would need to be taken over the 32 discrete nonoverlapping periods in an 8-hour workshift to verify compliance with a STEL. If employee exposure is truly uniform throughout the workshift, however, an employer in compliance with the l ppm TWA would be in compliance with the 2 ppm STEL, and this determination can probably be made using objective data.

Need To Repeat the Monitoring Strategy

Interday and intraday fluctuations in employee exposure are mostly influenced by the physical processes that generate formaldehyde and the work habits of the employee. Hence, in-plant process variations influence the employer's determination of whether or not additional controls need to be imposed. Measurements that employee exposure is low on a day that is not representative of worst conditions may not provide sufficient information to determine whether or not additional engineering controls should be installed to achieve the PELs.

The person responsible for conducting sampling must be aware of systematic changes which will negate the validity of the sampling results. Systematic changes in formaldehyde exposure concentration for an employee can occur due to:

(1) The employee changing patterns of movement in the workplace

(2) Closing of plant doors and windows

(3) Changes in ventilation from season to season

(4) Decreases in ventilation efficiency or abrupt failure of engineering control equipment

(5) Changes in the production process or work habits of the employee.

Any of these changes, if they may result in additional exposure that reaches the next level of action (i.e. 0.5 or 1.0 ppm as an 8-hr average or 2 ppm over 15 minutes) require the employer to perform additional monitoring to reassess employee exposure.

A number of methods are suitable for measuring employee exposure to formaldehyde or for characterizing emissions within the worksite. The preamble to this standard describes some methods that have been widely used or subjected to validation testing. A detailed analytical procedure derived from the OSHA Method 52 for acrolein and formaldehyde is presented below for informational purposes.

Inclusion of OSHA's method in this appendix in no way implies that it is the only acceptable way to measure employee exposure to formaldehyde. Other methods that are free from significant interferences and that can determine formaldehyde at the permissible exposure limits within ±25 percent of the "true" value at the 95 percent confidence level are also acceptable. Where applicable, the method shou1d a1so be capab1e of measuring formaldehyde at the action level to ±35 percent of the "true" value with a 95 percent confidence level. OSHA encourages emp1oyers to choose methods that will be best for their individual needs. The employer must exercise caution, however, in choosing an appropriate method since some techniques suffer from interferences that are likely to be present in workplaces of certain industry sectors where formaldehyde is used.

OSHA's Analytical Laboratory Method

Method No: 52

Matrix: Air

Target Concentration: 1 ppm (1.2 mg/m^3)

Procedures: Air samples are collected by drawing known volumes of air through sampling tubes containing XAD-2 adsorbent which have been coated with 2-(hydroxymethyl) piperidine. The samples are desorbed with toluene and then analyzed by gas chromatography using a nitrogen selective detector.

Recommended Sampling Rate and Air Volumes: 0.1 L/min and 24 L

Reliable Quantitation Limit: 16 ppb (20 µg/m^3)

Standard Error of Estimate at the Target Concentration: 7.3%

Status of the Method: A sampling and analytical method that has been subjected to the established evaluation procedures of the Organic Methods Evaluation Branch.

Date: March 1985

1. General Discussion

1.1 Background: The current OSHA method for collecting acrolein vapor recommends the use of activated 13X molecular sieves. The samples must be stored in an ice bath during and after sampling and also they must be analyzed within 48 hours of collection. The current OSHA method for collecting formaldehyde vapor recommends the use of bubblers containing 10% methanol in water as the trapping solution.

This work was undertaken to resolve the sample stability problems associated with acrolein and also to eliminate the need to use bubb1ers to sample formaldehyde. A goal of this work was to develop and/or to evaluate a common sampling and analytical procedure for acrolein and formaldehyde.

NIOSH has developed independent methodologies for acrolein and formaldehyde which recommend the use of reagent-coated adsorbent tubes to collect the aldehydes as stable derivatives. The formaldehyde sampling tubes contain Chromosorb 102 adsorbent coated with N-benzylethanolamine (BEA) which reacts with formaldehyde vapor to form a stable oxazolidine compound. The acrolein sampling tubes contain XAD-2 adsorbent coated with 2-(hydroxymethyl)piperidine (2-HMP) which reacts with acrolein vapor to form a different, stable oxazolidine derivative. Acrolein does not appear to react with BEA to give a suitable reaction product. Therefore, the formaldehyde procedure cannot provide a common method for both aldehydes. However, formaldehyde does react with 2-HMP to form a very suitable reaction product. It is the quantitative reaction of acrolein and formaldehyde with 2-HMP that provides the basis for this evaluation.

This sampling and analytical procedure is very similar to the method recommended by NIOSH for acrolein. Some changes in the NIOSH methodology were necessary to permit the simultaneous determination of both aldehydes and also to accommodate OSHA laboratory equipment and analytical techniques.

1.2 Limit-defining parameters: The analyte air concentrations reported in this method are based on the recommended air volume for each analyte collected separately and a desorption volume of 1 mL. The amounts are presented as acrolein and/or formaldehyde, even though the derivatives are the actual species analyzed.

1.2.1 Detection limits of the analytical procedure: The detection limit of the analytical procedure was 386 pg per injection for formaldehyde. This was the amount of analyte which gave a peak whose height was about five times the height of the peak given by the residual formaldehyde derivative in a typical blank front section of the recommended sampling tube.

1.2.2 Detection limits of the overall procedure: The detection limits of the overall procedure were 482 ng per sample (16 ppb or 20 µg/m^3 for formaldehyde). This was the amount of analyte spiked on the sampling device which allowed recoveries approximately equal to the detection limit of the analytical procedure.

1.2.3 Reliable quantitation limits: The reliable quantitation limit was 482 ng per sample (16 ppb or 20 µg/m^3)

for formaldehyde. These were the smallest amounts of analyte which could be quantitated within the limits of a recovery of at least 75% and a precision (±1.96 SD) of ±25% or better.

The reliable quantitation limit and detection limits reported in the method are based upon optimization of the instrument for the smallest possible amount of analyte. When the target concentration of an analyte is exceptionally higher than these limits, they may not be attainable at the routine operating parameters.

1.2.4 Sensitivity: The sensitivity of the analytical procedure over concentration ranges representing 0.4 to 2 times the target concentration, based on the recommended air volumes, was 7,589 area units per µg/mL for formaldehyde. This value was determined from the slope of the calibration curve. The sensitivity may vary with the particular instrument used in the analysis.

1.2.5 Recovery: The recovery of formaldehyde from samples used in an 18-day storage test remained above 92% when the samples were stored at ambient temperature. These values were determined from regression lines which were calculated from the storage data. The recovery of the analyte from the collection device must be at least 75% following storage.

1.2.6 Precision (analytical method only): The pooled coefficient of variation obtained from replicate determinations of analytical standards over the range of 0.4 to 2 times the target concentration was 0.0052 for formaldehyde (Section 4.3).

1.2.7 Precision (overall procedure): The precision at the 95% confidence level for the ambient temperature storage tests was ±14.3% for formaldehyde. These values each include an additional ±5% for sampling error. The overall procedure must provide results at the target concentrations that are ±25% at the 95% confidence level.

1.2.8 Reproducibility: Samples collected from controlled test atmospheres and a draft copy of this procedure were given to a chemist unassociated with this evaluation. The formaldehyde samples were analyzed following 15 days storage. The average recovery was 96.3% and the standard deviation was 1.7%.

1.3 Advantages:

1.3.1 The sampling and analytical procedures permit the simultaneous determination of acrolein and formaldehyde.

1.3.2 Samples are stable following storage at ambient temperature for at least 18 days.

1.4 Disadvantages: None.

2. Sampling Procedure

2.1 Apparatus:

2.1.1 Samples are collected by use of a personal sampling pump that can be calibrated to within ±5% of the recommended 0.1 L/min sampling rate with the sampling tube in line.

2.1.2 Samples are collected with laboratory prepared sampling tubes. The sampling tube is constructed of silane treated glass and is about 8-cm long. The ID is 4 mm and the OD is 6 mm. One end of the tube is tapered so that a glass wool end plug will hold the contents of the tube in place during sampling. The other end of the sampling tube is open to its full 4-mm ID to facilitate packing of the tube. Both ends of the tube are fire-polished for safety. The tube is packed with a 75-mg backup section, located nearest the tapered end and a 150-mg sampling section of pretreated XAD-2 adsorbent which has been coated with 2-HMP. The two sections of coated adsorbent are

separated and retained with small plugs of silanized glass wool. Following packing, the sampling tubes are sealed with two 7/32 inch OD plastic end caps. Instructions for the pretreatment and the coating of XAD-2 adsorbent are presented in Section 4 of this method.

2.1.3 Sampling tubes, similar to those recommended in this method, are marketed by Supelco, Inc. These tubes were not available when this work was initiated; therefore, they were not evaluated.

2.2 Reagents: None required.

2.3 Technique:

2.3.1 Properly label the sampling tube before sampling and then remove the plastic end caps.

2.3.2 Attach the sampling tube to the pump using a section of flexible plastic tubing such that the large, front section of the sampling tube is exposed directly to the atmosphere. Do not place any tubing ahead of the sampling tube. The sampling tube should be attached in the worker's breathing zone in a vertical manner such that it does not impede work performance.

2.3.3 After sampling for the appropriate time, remove the sampling tube from the pump and then seal the tube with plastic end caps.

2.3.4 Include at least one blank for each sampling set. The blank should be handled in the same manner as the samples with the exception that air is not drawn through it.

2.3.5 List any potential interferences on the sample data sheet.

2.4 Breakthrough:

2.4.1 Breakthrough was defined as the relative amount of analyte found on a backup sample in relation to the total amount of analyte collected on the sampling train.

2.4.2 For formaldehyde collected from test atmospheres containing 6 times the PEL, the average 5% breakthrough air volume was 41 L. The sampling rate was 0.1 L/min and the average mass of formaldehyde collected was 250 µg.

2.5 Desorption Efficiency: No desorption efficiency corrections are necessary to compute air sample results because analytical standards are prepared using coated adsorbent. Desorption efficiencies were determined, however, to investigate the recoveries of the analytes from the sampling device. The average recovery over the range of 0.4 to 2 times the target concentration, based on the recommended air volumes, was 96.2% for formaldehyde. Desorption efficiencies were essentially constant over the ranges studied.

2.6 Recommended Air Volume and Sampling Rate:

2.6.1 The recommended air volume for formaldehyde is 24 L.

2.6.2 The recommended sampling rate is 0.1 L/min.

2.7 Interferences:

2.7.1 Any collected substance that is capable of reacting 2-HMP and thereby depleting the derivatizing agent is a potential interference. Chemicals which contain a carbonyl group, such as acetone, may be capable or reacting with 2-HMP.

2.7.2 There are no other known interferences to the sampling method.

2.8 Safety Precautions:

2.8.1 Attach the sampling equipment to the worker in such a manner that it well not interfere with work performance or safety.

2.8.2 Follow all safety practices that apply to the work area being sampled.

3. Analytical Procedure

3.1 Apparatus:

3.1.1 A gas chromatograph (GC), equipped with a nitrogen selective detector. A Hewlett-Packard Model 5840A GC fitted with a nitrogen-phosphorus flame ionization detector (NPD) was used for this evaluation. Injections were performed using a Hewlett-Packard Model 7671A automatic sampler.

3.1.2 A GC column capable of resolving the analytes from any interference. A 6 ft × ¼ in OD (2mm ID) glass GC column containing 10% UCON 50-HB-5100 + 2% KOH on 80/100 mesh Chromosorb W-AW was used for the evaluation. Injections were performed on-column.

3.1.3 Vials, glass 2-mL with Teflon-lined caps.

3.1.4 Volumetric flasks, pipets, and syringes for preparing standards, making dilutions, and performing injections.

3.2 Reagents:

3.2.1 Toluene and dimethylformamide. Burdick and Jackson solvents were used in this evaluation.

3.2.2 Helium, hydrogen, and air, GC grade.

3.2.3 Formaldehyde, 37%, by weight, in water. Aldrich Chemical, ACS Reagent Grade formaldehyde was used in this evaluation.

3.2.4 Amberlite XAD-2 adsorbent coated with 2-(hydroxymethyl—piperidine (2-HMP), 10% by weight (Section 4).

3.2.5 Desorbing solution with internal standard. This solution was prepared by adding 20 µL of dimethylformamide to 100 mL of toluene.

3.3 Standard preparation:

3.3.1 Formaldehyde: Prepare stock standards by diluting known volumes of 37% formaldehyde solution with methanol. A procedure to determine the formaldehyde content of these standards is presented in Section 4. A standard containing 7.7 mg/mL formaldehyde was prepared by diluting 1 mL of the 37% reagent to 50 mL with methanol.

3.3.2 It is recommended that analytical standards be prepared about 16 hours before the air samples are to be analyzed in order to ensure the complete reaction of the analytes with 2-HMP. However, rate studies have shown the reaction to be greater than 95% complete after 4 hours. Therefore, one or two standards can be analyzed after this reduced time if sample results are outside the concentration range of the prepared standards.

3.3.3 Place 150-mg portions of coated XAD-2 adsorbent, from the same lot number as used to collect the air samples, into each of several glass 2-mL vials. Seal each vial with a Teflon-lined cap.

3.3.4 Prepare fresh analytical standards each day by injecting appropriate amounts of the diluted analyte directly onto 150-mg portions of coated adsorbent. It is permissible to inject both acrolein and formaldehyde on the same adsorbent portion. Allow the standards to stand at room temperature. A standard, approximately the target levels, was prepared by injecting 11 µL of the acrolein and 12 µL of the formaldehyde stock standards onto a single coated XAD-2 adsorbent portion.

3.3.5 Prepare a sufficient number of standards to generate the calibration curves. Analytical standard concentrations should bracket sample concentrations. Thus, if samples are not in the concentration range of the prepared standards, additional standards must be prepared to determine detector response.

3.3.7 Desorb the standards in the same manner as the samples following the 16-hour reaction time.

3.4 Sample preparation:

3.4.1 Transfer the 150-mg section of the sampling tube to a 2-mL vial. Place the 75-mg section in a separate vial. If the glass wool plugs contain a significant number of adsorbent beads, place them with the appropriate sampling tube section. Discard the glass wool plugs if they do not contain a significant number of adsorbent beads.

3.4.2 Add 1 mL of desorbing solution to each vial.

3.4.3 Seal the vials with Teflon-lined caps and then allow them to desorb for one hour. Shake the vials by hand with vigorous force several times during the desorption time.

3.4.4 Save the used sampling tubes to be cleaned and recycled.

3.5 Analysis:

3.5.1 GC Conditions

Column Temperature:

Bi-level temperature program—First level: 100 to 140 °C at 4 °C/min following completion of the first level.

Second level: 140 to 180 °C at 20 °C/min following completion of the first level.

Isothermal period: Hold column at 180 °C until the recorder pen returns to baseline (usually about 25 min after injection).

Injector temperature: 180 °C

Helium flow rate: 30 mL/min (detector response will be reduced if nitrogen is substituted for helium carrier gas).

Injection volume: 0.8 µL

GC column: Six-ft × ¼ -in OD (2 mm ID) glass GC column containing 10% UCON 50-HB-5100+2% KOH on 80/100 Chromosorb W-AW.

NPD conditions:

Hydrogen flow rate: 3 mL/min

Air flow rate: 50 mL/min

Detector temperature: 275 °C

3.5.2 Chromatogram: For an example of a typical chromatogram, see Figure 4.11 in OSHA Method 52.

3.5.3 Use a suitable method, such as electronic integration, to measure detector response.

3.5.4 Use an internal standard method to prepare the calibration curve with several standard solutions of different concentrations. Prepare the calibration curve daily. Program the integrator to report results in µg/mL.

3.5.5 Bracket sample concentrations with standards.

3.6 Interferences (Analytical)

3.6.1 Any compound with the same general retention time as the analytes and which also gives a detector response is a potential interference. Possible interferences should be reported to the laboratory with submitted samples by the industrial hygienist.

3.6.2 GC parameters (temperature, column, etc.) may be changed to circumvent interferences.

3.6.3 A useful means of structure designation is GC/MS. It is recommended this procedure be used to confirm samples whenever possible.

3.6.4 The coated adsorbent usually contains a very small amount of residual formaldehyde derivative (Section 4.8).

3.7 Calculations:

3.7.1 Results are obtained by use of calibration curves. Calibration curves are prepared by plotting detector response against concentration for each standard. The best line through the data points is determined by curve fitting.

3.7.2 The concentration, in µg/mL, for a particular sample is determined by comparing its detector response to the calibration curve. If either of the analytes is found on the backup section, it is added to the amount found on the front section. Blank corrections should be performed before adding the results together.

3.7.3 The acrolein and/or formaldehyde air concentration can be expressed using the following equation:

$mg/m^3 = (A)(B)/C$

where A=µg/mL from 3.7.2, B=desorption volume, and C=L of air sampled.

No desorption efficiency corrections are required.

3.7.4 The following equation can be used to convert results in mg/m^3 to ppm.

$ppm = (mg/m^3)(24.45)/MW$

where mg/m^3 =result from 3.7.3, 24.45=molar volume of an ideal gas at 760 mm Hg and 25 °C, MW=molecular weight (30.0).

4. Backup Data

4.1 Backup data on detection limits, reliable quantitation limits, sensitivity and precision of the analytical method, breakthrough, desorption efficiency, storage, reproducibility, and generation of test atmospheres are available in OSHA Method 52, developed by the Organics Methods Evaluation Branch, OSHA Analytical Laboratory, Salt Lake City, Utah.

4.2 Procedure to Coat XAD-2 Adsorbent with 2-HMP:

4.2.1 Apparatus: Soxhlet extraction apparatus, rotary evaporation apparatus, vacuum dessicator, 1-L vacuum flask, 1-L round-bottomed evaporative flask, 1-L Erlenmeyer flask, 250-mL Buchner funnel with a coarse fritted disc, etc.

4.2.2 Reagents:

4.2.2.1 Methanol, isooctane, and toluene.

4.2.2.2 2-(Hydroxymethyl)piperidine.

4.2.2.3 Amberlite XAD-2 non-ionic polymeric adsorbent, 20 to 60 mesh, Aldrich Chemical XAD-2 was used in this evaluation.

4.2.3 Procedure: Weigh 125 g of crude XAD-2 adsorbent into a 1-L Erlenmeyer flask. Add about 200 mL of water to the flask and then swirl the mixture to wash the adsorbent. Discard any adsorbent that floats to the top of the water and then filter the mixture using a fritted Buchner funnel. Air dry the adsorbent for 2 minutes. Transfer the adsorbent back to the Erlenmeyer flask and then add about 200 mL of methanol to the flask. Swirl and then filter the mixture as before. Transfer the washed adsorbent back to the Erlenmeyer flask and then add about 200 mL of methanol to the flask. Swirl and then filter the mixture as before. Transfer the washed adsorbent to a 1-L round-bottomed evaporative flask, add 13 g of 2-HMP and then 200 mL of methanol, swirl the mixture and then allow it to stand for one hour. Remove the methanol at about 40 °C and reduced pressure using a rotary evaporation apparatus. Transfer the coated adsorbent to a suitable container and store it in a vacuum desiccator at room temperature overnight. Transfer the coated adsorbent to a Soxhlet extractor and then extract the material with toluene for about 24 hours. Discard the contaminated toluene, add methanol in its place and then continue the Soxhlet extraction for an additional 4 hours. Transfer the adsorbent to a weighted 1-L round-bottom evaporative flask and remove the methanol using the rotary evaporation apparatus. Determine the weight of the adsorbent and then add an amount of 2-HMP, which is 10% by weight of the adsorbent. Add 200 mL of methanol and then swirl the mixture. Allow the mixture to stand for one hour. Remove the methanol by rotary evaporation. Transfer the coated adsorbent to a suitable container and store it in a vacuum desiccator until all traces of solvents are gone. Typically, this will take 2-3 days. The coated adsorbent should be protected from contamination. XAD-2 adsorbent treated in this manner will probably not contain residual acrolein derivative. However, this adsorbent will often contain residual formaldehyde derivative levels of about 0.1 µg per 150 mg of adsorbent. If the blank values for a batch of coated adsorbent are too high, then the batch should be returned to the Soxhlet extractor, extracted with toluene again and then recoated. This process can be repeated until the desired blank levels are attained.

The coated adsorbent is now ready to be packed into sampling tubes. The sampling tubes should be stored in a sealed container to prevent contamination. Sampling tubes should be stored in the dark at room temperature. The sampling tubes should be segregated by coated adsorbent lot number. A sufficient amount of each lot number of coated adsorbent should be retained to prepare analytical standards for use with air samples from that lot number.

4.3 A Procedure to Determine Formaldehyde by Acid Titration: Standardize the 0.1 N HCl solution using sodium carbonate and methyl orange indicator.

Place 50 mL of 0.1 M sodium sulfite and three drops of thymophthalein indicator into a 250-mL Erlenmeyer flask. Titrate the contents of the flask to a colorless endpoint with 0.1 N HCl (usually one or two drops is sufficient). Transfer 10 mL of the formaldehyde/methanol solution (prepared in 3.3.1) into the same flask and titrate the mixture with 0.1 N HCl, again, to a colorless endpoint. The formaldehyde concentration of the standard may be calculated by the following equation:

$$\text{Formaldehyde, mg/mL} = \frac{\text{acid titer} \times \text{acid normality} \times 30.0}{\text{mL of sample}}$$

This method is based on the quantitative liberation of sodium hydroxide when formaldehyde reacts with sodium sulfite to form the formaldehyde-bisulfite addition product. The volume of sample may be varied depending on the

formaldehyde content but the solution to be titrated must contain excess sodium sulfite. Formaldehyde solutions containing substantial amounts of acid or base must be neutralized before analysis.

APPENDIX C TO § 1910.1048—MEDICAL SURVEILLANCE—FORMALDEHYDE

I. Health Hazards

The occupational health hazards of formaldehyde are primarily due to its toxic effects after inhalation, after direct contact with the skin or eyes by formaldehyde in liquid or vapor form, and after ingestion.

II. Toxicology

A. Acute Effects of Exposure

1. Inhalation (breathing): Formaldehyde is highly irritating to the upper airways. The concentration of formaldehyde that is immediately dangerous to life and health is 100 ppm. Concentrations above 50 ppm can cause severe pulmonary reactions within minutes. These include pulmonary edema, pneumonia, and bronchial irritation which can result in death. Concentrations above 5 ppm readily cause lower airway irritation characterized by cough, chest tightness and wheezing. There is some controversy regarding whether formaldehyde gas is a pulmonary sensitizer which can cause occupational asthma in a previously normal individual. Formaldehyde can produce symptoms of bronchial asthma in humans. The mechanism may be either sensitization of the individual by exposure to formaldehyde or direct irritation by formaldehyde in persons with pre-existing asthma. Upper airway irritation is the most common respiratory effect reported by workers and can occur over a wide range of concentrations, most frequently above 1 ppm. However, airway irritation has occurred in some workers with exposures to formaldehyde as low as 0.1 ppm. Symptoms of upper airway irritation include dry or sore throat, itching and burning sensations of the nose, and nasal congestion. Tolerance to this level of exposure may develop within 1-2 hours. This tolerance can permit workers remaining in an environment of gradually increasing formaldehyde concentrations to be unaware of their increasingly hazardous exposure.

2. Eye contact: Concentrations of formaldehyde between 0.05 ppm and 0.5 ppm produce a sensation of irritation in the eyes with burning, itching, redness, and tearing. Increased rate of blinking and eye closure generally protects the eye from damage at these low levels, but these protective mechanisms may interfere with some workers' work abilities. Tolerance can occur in workers continuously exposed to concentrations of formaldehyde in this range. Accidental splash injuries of human eyes to aqueous solutions of formaldehyde (formalin) have resulted in a wide range of ocular injuries including corneal opacities and blindness. The severity of the reactions have been directly dependent on the concentration of formaldehyde in solution and the amount of time lapsed before emergency and medical intervention.

3. Skin contact: Exposure to formaldehyde solutions can cause irritation of the skin and allergic contact dermatitis. These skin diseases and disorders can occur at levels well below those encountered by many formaldehyde workers. Symptoms include erythema, edema, and vesiculation or hives. Exposure to liquid formalin or formaldehyde vapor can provoke skin reactions in sensitized individuals even when airborne concentrations of formaldehyde are well below 1 ppm.

4. Ingestion: Ingestion of as little as 30 ml of a 37 percent solution of formaldehyde (formalin) can result in death. Gastrointestinal toxicity after ingestion is most severe in the stomach and results in symptoms which can include nausea, vomiting, and severe abdominal pain. Diverse damage to other organ systems including the liver, kidney, spleen, pancreas, brain, and central nervous systems can occur from the acute response to ingestion of formaldehyde.

B. Chronic Effects of Exposure

Long term exposure to formaldehyde has been shown to be associated with an increased risk of cancer of the nose and accessory sinuses, nasopharyngeal and oropharyngeal cancer, and lung cancer in humans. Animal experiments provide conclusive evidence of a causal relationship between nasal cancer in rats and formaldehyde exposure. Concordant evidence of carcinogenicity includes DNA binding, genotoxicity in short-term tests, and cytotoxic changes in the cells of the target organ suggesting both preneoplastic changes and a dose-rate effect.

Formaldehyde is a complete carcinogen and appears to exert an effect on at least two stages of the carcinogenic process.

III. Surveillance considerations

A. History

1. Medical and occupational history: Along with its acute irritative effects, formaldehyde can cause allergic sensitization and cancer. One of the goals of the work history should be to elicit information on any prior or additional exposure to formaldehyde in either the occupational or the non-occupational setting.

2. Respiratory history: As noted above, formaldehyde has recognized properties as an airway irritant and has been reported by some authors as a cause of occupational asthma. In addition, formaldehyde has been associated with cancer of the entire respiratory system of humans. For these reasons, it is appropriate to include a comprehensive review of the respiratory system in the medical history. Components of this history might include questions regarding dyspnea on exertion, shortness of breath, chronic airway complaints, hyperreactive airway disease, rhinitis, bronchitis, bronchiolitis, asthma, emphysema, respiratory allergic reaction, or other preexisting pulmonary disease.

In addition, generalized airway hypersensitivity can result from exposures to a single sensitizing agent. The examiner should, therefore, elicit any prior history of exposure to pulmonary irritants, and any short- or long-term effects of that exposure.

Smoking is known to decrease mucociliary clearance of materials deposited during respiration in the nose and upper airways. This may increase a worker's exposure to inhaled materials such as formaldehyde vapor. In addition, smoking is a potential confounding factor in the investigation of any chronic respiratory disease, including cancer. For these reasons, a complete smoking history should be obtained.

3. Skin Disorders: Because of the dermal irritant and sensitizing effects of formaldehyde, a history of skin disorders should be obtained. Such a history might include the existence of skin irritation, previously documented skin sensitivity, and other dermatologic disorders. Previous exposure to formaldehyde and other dermal sensitizers should be recorded.

4. History of atopic or allergic diseases: Since formaldehyde can cause allergic sensitization of the skin and airways, it might be useful to identify individuals with prior allergen sensitization. A history of atopic disease and allergies to formaldehyde or any other substances should also be obtained. It is not definitely known at this time whether atopic diseases and allergies to formaldehyde or any other substances should also be obtained. Also it is not definitely known at this time whether atopic individuals have a greater propensity to develop formaldehyde sensitivity than the general population, but identification of these individuals may be useful for ongoing surveillance.

5. Use of disease questionnaires: Comparison of the results from previous years with present results provides the best method for detecting a general deterioration in health when toxic signs and symptoms are measured subjectively. In this way recall bias does not affect the results of the analysis. Consequently, OSHA has determined that the findings of the medical and work histories should be kept in a standardized form for comparison of the year-to-year results.

B. Physical Examination

1. Mucosa of eyes and airways: Because of the irritant effects of formaldehyde, the examining physician should be alert to evidence of this irritation. A speculum examination of the nasal mucosa may be helpful in assessing possible irritation and cytotoxic changes, as may be indirect inspection of the posterior pharynx by mirror.

2. Pulmonary system: A conventional respiratory examination, including inspection of the thorax and auscultation and percussion of the lung fields should be performed as part of the periodic medical examination. Although routine pulmonary function testing is only required by the standard once every year for persons who are exposed over the TWA concentration limit, these tests have an obvious value in investigating possible respiratory dysfunction and should be used wherever deemed appropriate by the physician. In cases of alleged formaldehyde-

induced airway disease, other possible causes of pulmonary dysfunction (including exposures to other substances) should be ruled out. A chest radiograph may be useful in these circumstances. In cases of suspected airway hypersensitivity or allergy, it may be appropriate to use bronchial challenge testing with formaldehyde or methacholine to determine the nature of the disorder. Such testing should be performed by or under the supervision of a physician experienced in the procedures involved.

3. Skin: The physician should be alert to evidence of dermal irritation of sensitization, including reddening and inflammation, urticaria, blistering, scaling, formation of skin fissures, or other symptoms. Since the integrity of the skin barrier is compromised by other dermal diseases, the presence of such disease should be noted. Skin sensitivity testing carries with it some risk of inducing sensitivity, and therefore, skin testing for formaldehyde sensitivity should not be used as a routine screening test. Sensitivity testing may be indicated in the investigation of a suspected existing sensitivity. Guidelines for such testing have been prepared by the North American Contact Dermatitis Group.

C. Additional Examinations or Tests

The physician may deem it necessary to perform other medical examinations or tests as indicated. The standard provides a mechanism whereby these additional investigations are covered under the standard for occupational exposure to formaldehyde.

D. Emergencies

The examination of workers exposed in an emergency should be directed at the organ systems most likely to be affected. Much of the content of the examination will be similar to the periodic examination unless the patient has received a severe acute exposure requiring immediate attention to prevent serious consequences. If a severe overexposure requiring medical intervention or hospitalization has occurred, the physician must be alert to the possibility of delayed symptoms. Followup nonroutine examinations may be necessary to assure the patient's well-being.

E. Employer Obligations

The employer is required to provide the physician with the following information: A copy of this standard and appendices A, C, D, and E; a description of the affected employee's duties as they relate to his or her exposure concentration; an estimate of the employee's exposure including duration (e.g. 15 hr/wk, three 8-hour shifts, full-time); a description of any personal protective equipment, including respirators, used by the employee; and the results of any previous medical determinations for the affected employee related to formaldehyde exposure to the extent that this information is within the employer's control.

F. Physician's Obligations

The standard requires the employer to obtain a written statement from the physician. This statement must contain the physician's opinion as to whether the employee has any medical condition which would place him or her at increased risk of impaired health from exposure to formaldehyde or use of respirators, as appropriate. The physician must also state his opinion regarding any restrictions that should be placed on the employee's exposure to formaldehyde or upon the use of protective clothing or equipment such as respirators. If the employee wears a respirator as a result of his or her exposure to formaldehyde, the physician's opinion must also contain a statement regarding the suitability of the employee to wear the type of respirator assigned. Finally, the physician must inform the employer that the employee has been told the results of the medical examination and of any medical conditions which require further explanation or treatment. This written opinion is not to contain any information on specific findings or diagnoses unrelated to occupational exposure to formaldehyde.

The purpose in requiring the examining physician to supply the employer with a written opinion is to provide the employer with a medical basis to assist the employer in placing employees initially, in assuring that their health is not being impaired by formaldehyde, and to assess the employee's ability to use any required protective equipment.

APPENDIX D TO § 1910.1048—NONMANDATORY MEDICAL DISEASE QUESTIONNAIRE

A. Identification

Plant Name
Date
Employee Name
S.S. #
Job Title
Birthdate:
Age:
Sex:
Height:
Weight:

B. Medical History

1. Have you ever been in the hospital as a patient?

Yes □ No □

If yes, what kind of problem were you having?

2. Have you ever had any kind of operation?

Yes □ No □

If yes, what kind?

3. Do you take any kind of medicine regularly?

Yes □ No □

If yes, what kind?

4. Are you allergic to any drugs, foods, or chemicals?

Yes □ No □

If yes, what kind of allergy is it?

What causes the allergy?

5. Have you ever been told that you have asthma, hayfever, or sinusitis?

Yes □ No □

6. Have you ever been told that you have emphysema, bronchitis, or any other respiratory problems?

Yes □ No □

7. Have you ever been told you had hepatitis?

Yes □ No □

8. Have you ever been told that you had cirrhosis?

Yes □ No □

9. Have you ever been told that you had cancer?

Yes □ No □

10. Have you ever had arthritis or joint pain?

Yes □ No □

11. Have you ever been told that you had high blood pressure?

Yes □ No □

12. Have you ever had a heart attack or heart trouble?

Yes □ No □

B-1. Medical History Update

1. Have you been in the hospital as a patient any time within the past year?

Yes □ No □

If so, for what condition?

2. Have you been under the care of a physician during the past year?

Yes □ No □

If so, for what condition?

3. Is there any change in your breathing since last year?

Yes □ No □

Better?
Worse?
No change?
If change, do you know why?

4. Is your general health different this year from last year?

Yes □ No □

If different, in what way?

5. Have you in the past year or are you now taking any medication on a regular basis?

Yes □ No □

Name Rx
Condition being treated

C. Occupational History

1. How long have you worked for your present employer?

2. What jobs have you held with this employer? Include job title and length of time in each job.

3. In each of these jobs, how many hours a day were you exposed to chemicals?

4. What chemicals have you worked with most of the time?

5. Have you ever noticed any type of skin rash you feel was related to your work?

Yes □ No □

6. Have you ever noticed that any kind of chemical makes you cough?

Yes □ No □

Wheeze?

Yes □ No □

Become short of breath or cause your chest to become tight?

Yes □ No □

7. Are you exposed to any dust or chemicals at home?

Yes □ No □

If yes, explain:

8. In other jobs, have you ever had exposure to:

Wood dust?

Yes □ No □

Nickel or chromium?

Yes □ No □

Silica (foundry, sand blasting)?

Yes □ No □

Arsenic or asbestos?

Yes □ No □

Organic solvents?

Yes □ No □

Urethane foams?

Yes □ No □

C-1. Occupational History Update

1. Are you working on the same job this year as you were last year?

Yes □ No □

If not, how has your job changed?

2. What chemicals are you exposed to on your job?

3. How many hours a day are you exposed to chemicals?

4. Have you noticed any skin rash within the past year you feel was related to your work?

Yes □ No □

If so, explain circumstances:

5. Have you noticed that any chemical makes you cough, be short of breath, or wheeze?

Yes □ No □

If so, can you identify it?

D. Miscellaneous

1. Do you smoke?

Yes □ No □

If so, how much and for how long?

Pipe
Cigars
Cigarettes

2. Do you drink alcohol in any form?

Yes □ No □

If so, how much, how long, and how often?

3. Do you wear glasses or contact lenses?

Yes □ No □

4. Do you get any physical exercise other than that required to do your job?

Yes □ No □

If so, explain:

5. Do you have any hobbies or "side jobs" that require you to use chemicals, such as furniture stripping, sand blasting, insulation or manufacture of urethane foam, furniture, etc?

Yes □ No □

If so, please describe, giving type of business or hobby, chemicals used and length of exposures.

E. Symptoms Questionnaire

1. Do you ever have any shortness of breath?

Yes □ No □

If yes, do you have to rest after climbing several flights of stairs?

Yes □ No □

If yes, if you walk on the level with people your own age, do you walk slower than they do?

Yes □ No □

If yes, if you walk slower than a normal pace, do you have to limit the distance that you walk?

Yes □ No □

If yes, do you have to stop and rest while bathing or dressing?

Yes □ No □

2. Do you cough as much as three months out of the year?

Yes □ No □

If yes, have you had this cough for more than two years?

Yes □ No □

If yes, do you ever cough anything up from chest?

Yes □ No □

3. Do you ever have a feeling of smothering, unable to take a deep breath, or tightness in your chest?

Yes □ No □

If yes, do you notice that this on any particular day of the week?

Yes □ No □

If yes, what day or the week?

Yes □ No □

If yes, do you notice that this occurs at any particular place?

Yes □ No □

If yes, do you notice that this is worse after you have returned to work after being off for several days?

Yes □ No □

4. Have you ever noticed any wheezing in your chest?

Yes □ No □

If yes, is this only with colds or other infections?

Yes □ No □

Is this caused by exposure to any kind of dust or other material?

Yes □ No □

If yes, what kind?

5. Have you noticed any burning, tearing, or redness of your eyes when you are at work?

Yes □ No □

If so, explain circumstances:

6. Have you noticed any sore or burning throat or itchy or burning nose when you are at work?

Yes □ No □

If so, explain circumstances:

7. Have you noticed any stuffiness or dryness of your nose?

Yes □ No □

8. Do you ever have swelling of the eyelids or face?

Yes □ No □

9. Have you ever been jaundiced?

Yes □ No □

If yes, was this accompanied by any pain?

Yes □ No □

10. Have you ever had a tendency to bruise easily or bleed excessively?

Yes □ No □

11. Do you have frequent headaches that are not relieved by aspirin or tylenol?

Yes □ No □

If yes, do they occur at any particular time of the day or week?

Yes □ No □

If yes, when do they occur?

12. Do you have frequent episodes of nervousness or irritability?

Yes □ No □

13. Do you tend to have trouble concentrating or remembering?

Yes □ No □

14. Do you ever feel dizzy, light-headed, excessively drowsy or like you have been drugged?

Yes □ No □

15. Does your vision ever become blurred?

Yes □ No □

16. Do you have numbness or tingling of the hands or feet or other parts of your body?

Yes □ No □

17. Have you ever had chronic weakness or fatigue?

Yes □ No □

18. Have you ever had any swelling of your feet or ankles to the point where you could not wear your shoes?

Yes □ No □

19. Are you bothered by heartburn or indigestion?

Yes □ No □

20. Do you ever have itching, dryness, or peeling and scaling of the hands?

Yes □ No □

21. Do you ever have a burning sensation in the hands, or reddening of the skin?

Yes □ No □

22. Do you ever have cracking or bleeding of the skin on your hands?

Yes □ No □

23. Are you under a physician's care?

Yes □ No □

If yes, for what are you being treated?

24. Do you have any physical complaints today?

Yes □ No □

If yes, explain?

25. Do you have other health conditions not covered by these questions?

Yes □ No □

If yes, explain:

[57 FR 22310, May 27, 1992; 57 FR 27161, June 18, 1992; 61 FR 5508, Feb. 13, 1996; 63 FR 1292, Jan. 8, 1998; 63 FR 20099, Apr. 23, 1998; 70 FR 1143, Jan. 5, 2005; 71 FR 16672, 16673, Apr. 3, 2006; 71 FR 50190, Aug. 24, 2006; 73 FR 75586, Dec. 12, 2008; 77 FR 17784, Mar. 26, 2012]

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