

**Recommended Medical Screening Protocol For
Workers Exposed to Welding Fumes**

Background

There are no legal requirements to perform medical surveillance on individuals exposed to welding fumes. The Michigan Occupational Safety and Health Administration's (MIOSHA) Respiratory Protection Standard 1910.34 (e) (1) states that the employer shall provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace.

An annual medical examination for individuals who are potentially exposed to welding fumes is good medical practice. Substances identified to be harmful in welding fumes are shown in Table I. It has been well documented that the longer an individual remains exposed to a substance causing respiratory problems the more likely that he/she will have persistent breathing problems even after exposure has ended (Table II). The purpose then of an annual medical screening is to identify symptomatic individuals and those with early chronic obstructive pulmonary disease and remove them from exposure so as to reduce the likelihood of causing a chronic disability.

Excluding individuals with an allergic disposition (family or personal history) or cigarette smokers from working around welding fumes does not reduce future work-related lung disease. The amount of fumes that an individual breathes is the best predictor of who will become symptomatic.



Medical surveillance is not a substitute for good dust, fume and chemical control in the workplace. Medical surveillance is a tool that can be used to check on the adequacy of exposure controls. Controlling exposure is the only effective primary prevention strategy.

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Protocol

The most important part of the medical exam is the questionnaire and review of the responses by medical personnel familiar with the symptoms of work-related lung disease.

1) Questionnaire - A standardized questionnaire should be administered.

A questionnaire should be administered during a pre-placement physical to obtain a baseline and on an annual basis. Since the symptoms from work-related lung disease can be intermittent particularly when they first begin, the person may have a completely normal physical examination and breathing test on an annual exam and still be having breathing problems from work exposures. Key questions that should be included in a pre-placement and annual examination are shown in Tables III and IV, respectively.

Generally a breathing test (spirometry) is recommended on a periodic basis.

2) Spirometry is done as a baseline and annually. All pulmonary function testing should use equipment and follow the protocol of the American Thoracic Society <http://www.thoracic.org/statements/resources/pfet/PFT2.pdf>. The technician administering the test should have completed an accredited training course such as one approved by the National Institute for Occupational Safety and Health.

It is important not only to evaluate the latest spirometry as to whether it is normal or abnormal, but also to observe excessive loss between successive years. On the average people lose up 25-35 ml/year as they grow older. Annual testing and identification of individuals with loss greater than 25-35 ml/year in the FEV₁ allows early intervention to prevent an individual from developing a lung disability, even in the absence of symptoms of asthma. The American College of Occupational and Environmental Medicine has an evidence based statement on evaluating pulmonary function tests over time http://www.acoem.org/uploadedFiles/Public_Affairs/Policies_And_Position_Statements/ACOEM%20Spirometry%20Statement.pdf.

Individuals Identified on the Periodic Questionnaire to be Symptomatic or to Have Excessive Loss on Their Breathing Test Results

Individuals who are suspected to have a work-related lung problem should have the diagnosis confirmed by pre and post shift or mid shift pulmonary function testing (depending on when the individual becomes symptomatic) or measurement of peak flow every two hours over a two-week period with a portable peak flow meter. Sufficient time off work (two weeks or more) may be necessary to allow recovery and documentation by peak flow measurements.

Individuals with confirmed work-related lung disease should, whenever possible, be given the option of transfer to areas of non-exposure. In order for this transfer option to be a realistic alternative, the individual should be able to maintain his/her pay rate at the new job.

All individuals should be strongly advised to stop smoking, and if resources are available, to provide assistance to help employees quit smoking.

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**Table I. Harmful Substances
Identified in Welding Fumes**

Possibly Cause Chronic Obstructive Pulmonary Disease (COPD)

Ozone

Nitrogen Oxide

Particulates

Pulmonary Edema/Bronchiolitis Obliterans

Ozone

Nitrogen Oxide

Phosgene

Metal Fume Fever

Zinc Oxide from Galvanized Metal

Other Metal Oxides

Substances Causing Asthma - Allergens

Amino-Ethyl Ethanolamine –Aluminum Welding

Chromium – Stainless Steel

Cobalt

Nickle

Zinc

Table II.

Studies That Have Found a Worse Prognosis in Work-Related Asthma Patients Who Are Not Removed From Exposure

Marabini A, Dimich-Ward H, Kwan SYL, Kennedy SM, Waxler-Morrison N, and Chan-Yeung M. Clinical and Socioeconomic Features of Subjects With Red Cedar Asthma. *Chest* 1993; 104:821-824.

Pisati G, Baruffini A, and Zedda S. Toluene Diisocyanate Induced Asthma: Outcome According to Persistence or Cessation of Exposure. *British Journal of Industrial Medicine* 1993; 50:60-64.

Gannon PFG, Weir DC, Robertson AS, and Burge PS. Health, Employment, and Financial Outcomes in Workers With Occupational Asthma. *British Journal of Industrial Medicine* 1993; 50:491-496.

Paggiaro PL, Vagaggini B, Bacci E, Bancalari L, Carrara M, Di Franco A, Giannini D, Dente FL, and Giuntini C. Prognosis of Occupational Asthma. *European Respiratory Journal* 1994; 7:761-767.

Besides the individual references listed above, removal from exposure is recommended in the following consensus statements:

1. Guidelines for the Diagnosis and Management of Asthma. National Heart, Lung and Blood Institute National Asthma Education Program Expert Panel Report. *J. Allergy and Clinical Immunology* 1991; 88:425-534.
2. Workshop on Environmental and Occupational Asthma. *Chest* 1990; 98:145S-252S.
3. AD HOC Committee on Occupational Asthma of the Standards Committee, Canadian Thoracic Society. Occupational Asthma: Recommendations in Diagnosis, Management and Assessment of Impairments. *J. Canadian Medical Association* 1989; 140:1029-1032.
4. Chan-Yeung M. ACCP Consensus Statement Assessment of Asthma in the Workplace. *Chest* 1995; 108:1084-1117.
5. ATS AD HOC Committee on Impairment/Disability Evaluation in Subjects With Asthma. Guidelines for the Evaluation of Impairment/Disability in Patients With Asthma. *Am. Rev. Resp. Dis.* 1993; 147:1056-1061.

All published individual authors and consensus statements recommend removal from exposure where the patient is diagnosed as having become sensitized to a work exposure.

Table III. Questions to be Included in the Initial Preplacement Medical Exam for Workers Exposed to Welding Fumes

1. Have you ever seen a doctor regarding:
 - a. Shortness of breath? 1a. No ___ Yes ___ Unknown ___
 - b. If YES, what year? 1b. ___ ___ ___ year
 - c. Sinus problems? 1c. No ___ Yes ___ Unknown ___
 - d. If YES, what year? 1d. ___ ___ ___ year
 - e. Skin rash? 1e. No ___ Yes ___ Unknown ___
 - f. If YES, what year? 1f. ___ ___ ___ year

2. Have you ever had asthma? 2. No ___ Yes ___ Unknown ___

If YES,

 - a. What year? 2a. ___ ___ ___ year
 - b. Was your asthma confirmed by a doctor? 2b. No ___ Yes ___ Unknown ___
 - c. At what age did your asthma start? 2c. ___ ___ age started
 - d. If you no longer have asthma, at what age did it stop? 2d. ___ ___ age stopped

3. Do you currently require medicine or treatment for asthma? 3. No ___ Yes ___ Unknown ___
 - a. IF YES, what type of medicine? _____

4. Have you ever had:
 - a. Allergies? 4a. No ___ Yes ___ Unknown ___
 - b. If YES, what year? 4b. ___ ___ ___ year
 - c. Hayfever? 4c. No ___ Yes ___ Unknown ___
 - d. If YES, what year? 4d. ___ ___ ___ year
 - e. Eczema (skin rash)? 4e. No ___ Yes ___ Unknown ___
 - f. If YES, what year? 4f. ___ ___ ___ year

5. Do any of your blood relatives (father, mother, brothers, sisters) have allergies, hay fever, asthma or eczema (skin rash)? 5. No ___ Yes ___ Unknown ___

Circle all that apply:

	Father	Mother	Brother(s)	Sister(s)
Allergies	Yes	Yes	Yes	Yes
Hayfever	Yes	Yes	Yes	Yes
Asthma	Yes	Yes	Yes	Yes
Eczema (skin rash)	Yes	Yes	Yes	Yes

6. Do or did you ever smoke cigarettes? 6. No ___ Yes ___ Unknown ___

If YES,

 - a. How many packs per day? 6a. ___ ___ packs per day
 - b. If you quit smoking, how old were you? 6b. ___ ___ age quit smoking cigarettes
 - c. Do you carry cigarettes into the workplace? 6c. No ___ Yes ___ Unknown ___

7. Circle how often any of the following symptoms bother you at work:

Circle the number that corresponds to how often you are bothered by each symptom AT WORK.							
	NEVER	SELDOM	MONTHLY	WEEKLY	DAILY	Month & Year Started	PLANT AREA
NASAL STUFFINESS	1	2	3	4	5		
RUNNY NOSE	1	2	3	4	5		
TEARING, BURNING EYES	1	2	3	4	5		
EYE REDNESS	1	2	3	4	5		
FACE SWELLING	1	2	3	4	5		
HIVES	1	2	3	4	5		
SORE THROAT	1	2	3	4	5		
COUGH	1	2	3	4	5		
WHEEZING	1	2	3	4	5		
CHEST TIGHTNESS	1	2	3	4	5		
SHORTNESS OF BREATH	1	2	3	4	5		
FEVER, SWEATS	1	2	3	4	5		
CHILLS, SHIVERING	1	2	3	4	5		
ACHE ALL OVER	1	2	3	4	5		
UNUSUAL TIREDNESS	1	2	3	4	5		

8. Have you ever had emphysema/Chronic Obstructive Pulmonary Disease (COPD)? 8. No ___ Yes ___ Unknown ___

If YES,

a. Was your emphysema/COPD confirmed by a breathing test that your doctor gave you? 8a. No ___ Yes ___ Unknown ___

b. At what age did your emphysema/COPD start? 8b. ___ age started

9. Does your chest ever sound wheezy or whistling? 9a. No ___ Yes ___ Unknown ___

a. When you have a cold? 9a. No ___ Yes ___ Unknown ___

b. Occasionally apart from colds? 9b. No ___ Yes ___ Unknown ___

c. Most days or nights? 9c. No ___ Yes ___ Unknown ___

d. IF YES to a, b or c for how many years has this been present? 9d. ___ # of years

10. Have you ever had an attack of wheezing that has made you feel short of breath? 10. No ___ Yes ___ Unknown ___

If YES,

a. How old were you when you had your first such attack? 10a. ___ age

b. Have you had 2 or more such episodes? 10b. No ___ Yes ___ Unknown ___

c. Have you required medicine or treatment for these attacks? 10c. No ___ Yes ___ Unknown ___

d. Is there a chemical, substance or job at work which you think causes these attacks? 10d. No ___ Yes ___ Unknown ___

IF YES, please describe: _____

11. Do you bring up phlegm or mucus most days of the week (4 out of 7 days) for a period of 3 months straight? Count phlegm or mucus with first smoke or on first going out-of-doors. Do not count phlegm or mucus from your nose. 11. No ___ Yes ___ Unknown ___

If YES,

a. How many years have you brought up phlegm or mucus? 11a. ___ # of years

**Table IV. Questions to be Included in Periodic Medical Exam for
Workers Exposed to Welding Fumes**

1. In the past year, have you seen a doctor regarding:
 - a. Shortness of breath? 1a. No ___ Yes ___ Unknown ___
 - b. Sinus problems? 1b. No ___ Yes ___ Unknown ___
 - c. Skin rash? 1c. No ___ Yes ___ Unknown ___

2. In the past year, have you had asthma? 2. No ___ Yes ___ Unknown ___

If YES,

 - a. Was your asthma confirmed by a doctor? 2a. No ___ Yes ___ Unknown ___

3. Do you currently require medicine or treatment for asthma? 3. No ___ Yes ___ Unknown ___
 - a. IF YES, what type of medicine? _____

4. Circle how often any of the following symptoms have bothered you at your current job. Note area of the plant which you suspect may cause or make symptoms worse.

	NEVER	SELDOM	MONTHLY	WEEKLY	DAILY	Month & Year Started	PLANT AREA
NASAL STUFFINESS	1	2	3	4	5		
RUNNY NOSE	1	2	3	4	5		
TEARING, BURNING EYES	1	2	3	4	5		
EYE REDNESS	1	2	3	4	5		
FACE SWELLING	1	2	3	4	5		
HIVES	1	2	3	4	5		
SORE THROAT	1	2	3	4	5		
COUGH	1	2	3	4	5		
WHEEZING	1	2	3	4	5		
CHEST TIGHTNESS	1	2	3	4	5		
SHORTNESS OF BREATH	1	2	3	4	5		
FEVER, SWEATS	1	2	3	4	5		
CHILLS, SHIVERING	1	2	3	4	5		
ACHE ALL OVER	1	2	3	4	5		
UNUSUAL TIREDNESS	1	2	3	4	5		

5. In the past year, have you had an attack of wheezing that has made you feel short of breath? 5. No ___ Yes ___ Unknown ___

If YES,

 - a. Have you had 2 or more such episodes? 5a. No ___ Yes ___ Unknown ___
 - b. Have you required medicine or treatment for these attacks? 5b. No ___ Yes ___ Unknown ___
 - c. Is there a chemical, substance or job at work which you think causes these attacks? 5c. No ___ Yes ___ Unknown ___

IF YES, please describe: _____

6. During the past year, did you bring up phlegm or mucus most days of the week (4 out of 7 days) for a period of 3 months straight? Count phlegm or mucus with first smoke or on first going out-of-doors. Do not count phlegm or mucus from your nose. 6. No ___ Yes ___ Unknown ___

7. Do you smoke cigarettes? 7. No ___ Yes ___ Unknown ___

If YES,

 - How many packs of cigarettes do you smoke each day? 7a. ___ # packs per day