

Proposed New Code for Medical Surveillance for Designated Substances in Ontario Regulation 490/09 under the *Occupational Health and Safety Act*

Overview

The Ministry of Labour's proposed new Code for Medical Surveillance for Designated Substances ("Code") updates and consolidates the Medical Surveillance Program requirements for the following designated substances: asbestos, benzene, isocyanates, lead (inorganic and organic), mercury (alkyl and non-alkyl compounds) and silica.

This Code would, if approved, apply to employers that are required to provide for medical examinations required under subsection 20(4) of O. Reg. 490/09.

Medical surveillance programs established in accordance with this proposed Code would assist in the detection of exposure-related adverse health effects for appropriate medical follow-up, including removal from exposure, and direct the need for immediate evaluation of primary exposure control measures.

They would help protect the health of workers by:

- Providing direction to examining physicians concerning the medical examinations and clinical tests used in the determination of a worker's fitness for working in exposure to the designated substance;
- Identifying workers with conditions which may be aggravated by exposure to the designated substance and establishing a baseline measure for determining changes in health;
- Evaluating the effects of exposure to the designated substance on workers;
- Enabling remedial action to be taken in the workplace when necessary; and
- Providing health education.

In accordance with section 29 of O. Reg. 490/09, physicians conducting medical examinations or supervising clinical tests would be governed by this Code in making a determination of whether a worker is fit, fit with limitations or unfit to continue working in exposure to the designated substance.

Part I: Medical Surveillance Programs – General Requirements

Application

This Code applies:

1. In respect of the provisions for medical examinations, in control programs, required under subsection 20(4) of O. Reg. 490/09, Designated Substances.

Health Education

1. At pre-placement and periodic medical examinations in respect of a designated substance, workers shall be advised of:
 - a) The hazards and adverse health effects and symptoms associated with exposure to the designated substance;
 - b) The importance of notifying their employer if they are experiencing symptoms possibly resulting from exposure to the designated substance so that appropriate follow-up can be arranged (e.g. review of control measures and referral for medical assessment);
 - c) The results of any clinical tests and if not available at the time of the medical examination, the process for ensuring that workers are notified of the results when they become available;
 - d) The importance of good personal hygiene practices;
 - e) The hazards associated with eating or drinking in areas where there is the risk of exposure through ingestion of designated substances such as lead and mercury;
 - f) The reproductive risks associated with exposure to certain designated substances such as lead and mercury; and
 - g) With respect to asbestos and silica, the harmful effects of smoking and exposure to the designated substance.
2. At exit examinations, workers shall be advised:
 - a) Where appropriate, of the possible risks of future health effects associated with past exposures to the designated substance including:
 - For asbestos, the risk of asbestosis, lung cancer and mesothelioma which are greatest following a minimum of 10 years of exposure.
 - For benzene, the risk of leukemia which is greatest in the 10 year period immediately following exposure.

- For silica, the risk of silicosis and lung cancer which are greatest following a minimum of 10 years of exposure.
- b) To inform their personal physician* of previous exposure to a designated substance and provide copies of health records, as may be appropriate, for medical follow-up.

* Note: If different than the physician overseeing the medical surveillance.

Notification of Results of Medical Examinations and Clinical Tests

After advising a worker and the worker's employer that the worker is fit with limitations or unfit to continue working in exposure to a designated substance in accordance with subsections 29 (2) and (3) of O. Reg. 490/09, physicians are reminded of the provisions of subsections 29 (6) and (7) concerning the notification of the workplace joint health and safety committee and the Ministry of Labour's Chief Physician¹ of that advice.

Record Keeping

1. Under section 31 of O. Reg. 490/09 – Designated Substances, a physician who conducts medical examinations or supervises the clinical tests of a worker must keep the records of the examination and clinical tests (health records).

In accordance with section 32, the health records must be kept in a secure place until the later of the following dates;

- a) The 40th anniversary of the date the first record was made;
- b) The 20th anniversary of the date the last record was made.

If the physician is no longer able to keep the health records, he or she shall forward the records to the Chief Physician, Ministry of Labour, or to a physician designated by the Chief Physician, who shall keep them until the later of the dates specified above.

2. The health records required by section 31 should include the following information:
 - a) Worker's Name (in full)
 - a) Date of birth
 - b) Gender
 - c) Occupations or job titles, including start dates and end dates
 - d) The kinds of operations or processes in which the worker was involved
 - e) Concentrations of airborne designated substance(s) to which the worker was exposed

¹ Position title reflects name change to "Chief Physician" from "Provincial Physician". References in O. Reg. 490/09 will be updated accordingly.

- f) Use of personal protective equipment
- g) Medical examination reports
- h) Results of clinical tests (e.g. blood and urine tests, chest radiographs and pulmonary function tests)
- i) Copies of all relevant correspondence concerning health (e.g. referral letters), and any information concerning the actions taken in response to abnormal clinical tests, and
- j) Copies of the Health Professional's Report (Form 8) to the Workplace Safety and Insurance Board, if completed.

Part II: Medical Surveillance Program Requirements for Individual Designated Substances

Asbestos

Medical surveillance program requirements

With respect to the medical examinations required under subsection 20(4) of O. Reg. 490/09, the medical examinations for asbestos shall be carried out:

1. Prior to placement.
2. Periodically, as follows, while exposed:
 - At least once every five years, beginning 10 years after first exposure, or
 - More frequently, if required by the examining physician.
3. Upon exiting placement, as follows,
 - Medical examination is required for workers with more than 10 years of exposure, unless the most recent periodic examination was performed within the last 12 months.

Pre-placement Medical Examinations

Pre-placement medical examinations shall include:

- i) Initial medical and occupational history including:
 - Previous exposure (both occupational and non-occupational) to asbestos.
 - History of present or past respiratory disorders, and
 - Personal habits (e.g. smoking and hygiene).
- ii) A physical examination focusing on the respiratory system.
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for asbestos in accordance with this Code.

Periodic Medical Examinations

Periodic medical examinations shall include:

- i) Updating of a worker's medical and occupational history including:

- A history of frequency and duration of exposure to asbestos since previous examination;
- Enquiry for signs and symptoms that may be an early indication of:
 - Asbestosis (e.g. exertional dyspnea, cough), and
 - Malignancy (e.g. hemoptysis, pleuritic pain, loss of weight)
- ii) A physical examination focusing on the respiratory system.
- iii) Provision of health education consistent with Part 1 of this Code.
- iv) Clinical tests for asbestos in accordance with this Code.

Exit Medical Examinations

Exit medical examinations shall include:

- i) Updating of a worker's medical and occupational history including:
 - A history of frequency and duration of exposure to asbestos since previous examination and enquiry for signs and symptoms that may be an early indication of:
 - Asbestosis (e.g. exertional dyspnea, cough), and
 - Malignancy (e.g. hemoptysis, pleuritic pain, loss of weight)
- ii) A physical examination focusing on the respiratory system.
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for asbestos in accordance with this Code.

Note: Monitoring post cessation of exposure to asbestos is not recommended. While routine assessment (e.g. every 5 years for those workers exposed to asbestos for more than 10 years) may assist in early detection of asbestosis or lung cancer, after exposure has ended it is unlikely that this will result in improved health outcomes.

Clinical tests for Asbestos

Types

The following clinical tests are required for pre-placement, periodic and exit medical examinations with respect to exposure to asbestos:

1. Imaging: Chest Radiograph (postero-anterior) (PA)

Note: To avoid unnecessary X-rays, the examining physician shall, where practical, obtain the relevant medical records from another facility if the worker has been previously examined within the past year.

2. Pulmonary Function Tests (PFT)²: (to be taken in conjunction with chest radiograph):

- FEV1, FVC, FEV1/FVC% and a mid-flow rate such as FEF 25-75%

Note: All relevant data shall be corrected to body temperature and pressure (BTPS).

Frequency

Chest radiograph and PFT to be done every 5 years after 10 years of exposure or as required by the examining physician.

Action Levels/Removal Criteria

There are no specific action levels/criteria for removal.

An assessment of a worker's fitness to continue working in exposure to asbestos is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

Where the examining physician determines that the signs of asbestos-induced disease are present, the examining physician should consider whether the worker should be referred for further medical assessment by a respirologist or other knowledgeable/experienced specialist.

Return to Work in Exposure to Asbestos Criteria

To be decided on a case by case basis by the examining physician, in consultation with a respirologist or other knowledgeable/experienced specialist, if any, and after careful review of control measures in the workplace to ensure worker exposure is within acceptable levels.

² All pulmonary function testing must be done according to the latest update of a recognized Standardization of Spirometry (e.g. the American Thoracic Society).

Benzene

Medical surveillance program requirements for designated substances

With respect to the medical examinations required under subsection 20(4) of O. Reg. 490/09, the medical examinations for benzene shall be carried out:

1. Prior to placement.
2. Periodically, as follows:
 - Annually; or
 - More frequently, if required by the examining physician.
3. In the event of an acute exposure requiring immediate medical attention.
4. Upon exiting placement, unless the most recent periodic examination was performed within the last 6 months.

Pre-placement Medical Examinations

Pre-placement medical examinations shall include:

- i) Initial medical and occupational history including:
 - Previous exposure (both occupational and non-occupational) to:
 - Benzene and other hematological toxins
 - Toluene, and
 - Ionizing radiation.
 - Personal history of blood dyscrasias including:
 - Genetic hemoglobin abnormalities
 - Bleeding abnormalities, and
 - Abnormal function of formed blood elements.
 - History of renal and liver dysfunction, neurological or dermal disorders.
 - Medication use, personal habits (e.g. smoking history, alcohol consumption).
 - Family history of blood dyscrasias including hematological neoplasms.
- ii) A physical examination focusing on systems affected by benzene, including the hematological system.
- iii) Provision of health education consistent with Part I of this Code.

- iv) Clinical tests for benzene in accordance with this Code.

Periodic Medical Examinations

Periodic medical examinations shall include:

- i) Updating of a worker's medical and occupational history including:
 - New exposures to potential marrow toxins.
 - Frequency and duration of exposure to benzene since previous examination.
 - Changes in medication.
 - The appearance of signs or symptoms related to blood disorders.
 - Inquiry for signs and symptoms consistent with benzene exposure which may precede or follow clinical signs, including:
 - Headache
 - Dizziness
 - Loss of appetite
 - Subjective complaint of shortness of breath, and
 - Excessive tiredness.
- ii) A physical examination focusing on the following, which may be signs of chronic exposure to benzene:
 - Leucopenia
 - Anemia, and
 - Thrombocytopenia
- iii) Provision of health education consistent with Part I of this Code
- iv) Clinical tests for benzene in accordance with this Code.

Acute exposure medical examinations

Medical examinations carried out in the event of an acute exposure shall include:

- i) Inquiry for signs and symptoms consistent with benzene exposure, including:
 - Dizziness
 - Loss of appetite
 - Subjective complaint of shortness of breath, and
 - Excessive tiredness.

- ii) A physical examination focusing on the following, which may be signs of chronic exposure to benzene:
 - Leucopenia
 - Anemia, and
 - Thrombocytopenia
- iii) Tests for S-Phenylmercapturic acid (S-PMA) in urine collected at end of work shift, as follows;
 - Levels below 25 µg/g creatinine S-PMA in urine require no further testing.
 - Levels at or above 25 µg/g creatinine S-PMA in urine require a complete blood count (CBC) test including: an erythrocyte count, a leukocyte count with differential and thrombocyte count, to be performed monthly for 3 months following the exposure.

Exit Medical Examinations

Exit medical examinations shall include:

- i) Updating a worker's medical and occupational history to include:
 - New exposures to potential marrow toxins.
 - Frequency and duration of exposure to benzene since previous examination.
 - Changes in medication.
 - The appearance of signs or symptoms related to blood disorders.
 - Inquiry for symptoms consistent with benzene exposure which may precede or follow clinical signs including:
 - Headache
 - Dizziness
 - Loss of appetite
 - Subjective complaint of shortness of breath, and
 - Excessive tiredness
- ii) A physical examination focusing on the following, which may be signs of chronic exposure to benzene:
 - Leucopenia
 - Anemia, and
 - Thrombocytopenia

iii) Provision of health education consistent with Part I of this Code.

iv) Clinical tests for benzene in accordance with this Code.

Note: Post cessation monitoring is recommended. The worker and the worker's personal physician* should receive a copy of worker's medical records.

*Note: If different than the physician overseeing the medical surveillance.

Clinical tests for Benzene

Types

The following clinical tests are required for pre-placement, periodic and exit medical examinations with respect to exposure to benzene:

1. A complete blood count (CBC) including: hemoglobin, hematocrit, erythrocyte count and erythrocyte indices [mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC)], leucocyte count with differential, band neutrophils and thrombocyte count.
2. S – Phenylmercapturic acid in urine collected at end of work shift.

Frequency

To be done annually, CBC and S-PMA in urine collected at end of work shift or as required by the examining physician

- Repeat CBC testing within two weeks where biological monitoring reveals abnormalities based on laboratory-specified normal limits or there is a persistent downward trend compared to the individual's baseline pre-exposure CBC.

Action Levels/Removal Criteria

An assessment of a worker's fitness to continue working in exposure to benzene is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

1. Review Level

Levels of S – Phenylmercapturic acid in urine at or above 25 µg/g creatinine trigger the review of engineering controls, work practices, worker health status and personal hygiene practice

2. Removal Criteria

- i) Signs or symptoms consistent with benzene exposure.
- ii) Abnormalities on biological monitoring with persistent abnormalities on repeat testing at two weeks.

Upon removal, the worker should be referred to a hematologist for further medical investigation where there are persistent abnormalities in CBC.

Return to Work in Exposure to Benzene Criteria

To be decided on a case by case basis by the examining physician in consultation with the attending hematologist, or other knowledgeable/experienced specialist, if any, and after careful review and implementation of measures in the workplace to ensure worker exposure is reduced to acceptable levels.

Isocyanates

Medical surveillance program requirements

With respect to the medical examinations required under subsection 20 (4) of O. Reg. 490/09, the medical examinations for isocyanates shall be carried out:

1. Prior to placement.
2. Periodically, as follows:
 - At 6 month intervals for the first two years.
 - Annually after the first two years, or
 - More frequently, if required by the examining physician.
3. In the event of an acute exposure requiring immediate medical attention.
4. Upon exiting placement unless the most recent periodic medical examination was performed within the last 6 months.

Pre-placement Medical Examinations

Pre-placement medical examinations shall include:

- i) Initial medical and occupational history including:
 - Previous exposure (both occupational and non-occupational) to isocyanates, and
 - History of present or past respiratory or dermatological disorders (e.g. allergies, asthma).
- ii) A physical examination focusing on systems affected by isocyanates, including the respiratory system and exposed skin if indicated by medical and occupational history
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for isocyanates in accordance with this Code.

Periodic Medical Examinations

Periodic medical examinations shall include:

- i) Updating of a worker's medical and occupational history including:
 - A history of frequency and duration of exposure to isocyanates since previous examination, and

- Inquiry for signs and symptoms of respiratory problems and history of skin rashes, particularly on hands and face.
- ii) A physical examination, if required by the examining physician based on the worker's medical and occupational history, symptoms or clinical tests.
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for isocyanates in accordance with this Code.

Acute exposure medical examinations

A medical examination required in the event of an acute exposure to isocyanates shall include:

- i) A physical examination focusing on systems affected by isocyanates, including the respiratory system and exposed skin.
- ii) Clinical tests for isocyanates in accordance with this Code.

If respiratory symptoms persist, the worker should be referred for further medical assessment by a respirologist or other knowledgeable/experience specialist for further medical assessment.

Exit Medical Examinations

Exit medical examinations shall include:

- i) Updating of a worker's medical and occupational history including:
 - A history of frequency and duration of exposure to isocyanates since previous examination
 - Inquiry for signs and symptoms of respiratory problems and history of skin rashes, particularly on hands and face
- ii) A physical examination, if required by the examining physician if indicated by the worker's medical and occupational history, symptoms or clinical tests
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for isocyanates in accordance with this Code.

Note: No monitoring post cessation of exposure is recommended.

Clinical tests for Isocyanates

Types

The following clinical tests are required for pre-placement, periodic, acute exposure and exit medical examinations with respect to exposure to isocyanates:

1. Pulmonary function tests³ aid in the assessment of a worker's exposure to isocyanates. Tests are to include: FEV₁, FVC, FEV₁/FVC% and a mid-flow rate such as FEF 25-75%.

Note: All relevant data shall be corrected to body temperature and pressure (BTPS).

Frequency

Every 6 months for the first two years, and then annually.

Action Levels/Removal Criteria

A worker should not be removed from exposure pending further medical assessment to confirm a medical condition resulting from exposure to isocyanates, as long as their condition is stable. Removal from isocyanates exposure may present a barrier to diagnosis and determination of work restrictions.

An assessment of a worker's fitness to continue working in exposure to isocyanates is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

1. Review Level:

Individuals with respiratory symptoms and/ or changes in pulmonary function testing (15% or greater fall in FEV₁ from baseline) should be referred to a respirologist or other knowledgeable/experienced specialist for further medical assessment.

2. Removal Criteria:

Individuals who are confirmed to have a medical condition resulting from the inhalation of, or skin contact with, isocyanates.

Return to Work in Exposure to Isocyanates

Individuals who are determined to have respiratory or dermatological sensitization to isocyanates should not have any subsequent exposure to isocyanates.

³ All pulmonary function testing must be done according to the latest update of a recognized Standardization of Spirometry (e.g. the American Thoracic Society)

Lead

Medical surveillance program requirements

Inorganic Lead

With respect to the medical examinations required under subsection 20 (4) of O. Reg. 490/09, the medical examinations for inorganic lead shall be carried out:

1. Prior to placement.
2. Periodically, at a frequency dependent on the findings of prior medical examinations and clinical test results.
3. In the event of an acute exposure requiring immediate medical attention.
4. Upon exiting placement unless the most recent periodic medical examination was performed within the last 6 months.

Pre-placement Medical Examinations

Pre-placement medical examinations shall include:

- i) Initial medical and occupational history including:
 - Previous exposure (both occupational and non-occupational) to inorganic lead.

Note: Potential non-occupational sources may include: leaded paint in the home, leaded pipes, handling of munitions and firearm usage and some unlicensed imported medications.

- Symptom history focusing on:
 - Gastrointestinal, neurological (central and peripheral)
 - Musculoskeletal, hematopoietic and renal systems, and
 - Personal habits (e.g. smoking history)
- ii) A physical examination focusing on:
 - Gastrointestinal
 - Neurological (central and peripheral)
 - Musculoskeletal, and
 - Renal systems
 - iii) Provision of health education consistent with Part I of this Code

- iv) Clinical tests for inorganic lead in accordance with this Code.

Periodic Medical Examinations

Periodic medical examinations shall include the following:

- i) An updating of a worker's medical and occupational history only if there are positive findings at prior examination on clinical testing. A physical examination only if there are positive findings at prior examination or clinical testing.
- ii) Provision of health education consistent with Part I of this Code
- iii) Clinical tests for inorganic lead in accordance with this Code.

Acute exposure medical examinations

A medical examination required in the event of an acute exposure to inorganic lead shall include.

- i) Inquiry for signs and symptoms consistent with exposure to inorganic lead focussing on:
 - Gastrointestinal, neurological (central and peripheral)
 - Musculoskeletal, hematopoietic and renal systems,
- ii) A physical examination focusing on:
 - Gastrointestinal
 - Neurological (central and peripheral)
 - Musculoskeletal, and
 - Renal systems
- iii) Clinical tests for inorganic lead in accordance with this Code.

Exit Medical Examinations

Exit examinations shall include:

- i) An updating of a worker's medical and occupational history if there are positive findings at prior examination or clinical testing (blood lead levels > 0.5 µmol/L).
- ii) A physical examination if there are positive findings at prior examination or clinical testing (blood lead levels > 0.5 µmol/L).
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for inorganic lead in accordance with this Code.

Note: No monitoring post cessation of exposure is recommended.

Clinical tests for Inorganic Lead

Types

The following clinical tests are required for pre-placement, periodic, acute exposure and exit medical examinations with respect to exposure to inorganic lead:

1. Blood lead level

Frequency

- i) At a minimum, every 4 months for the first 12 months following testing in relation to pre-placement medical examinations to address potential exposures through hygiene and work practices.
- ii) Monthly for blood lead level $> 1 \mu\text{mol/L}$.
- iii) Every 3 months for blood lead level $0.5 \mu\text{mol/L} - 1 \mu\text{mol/L}$.
- iv) Every 6 months or if change in work practices for blood lead level $< 0.5 \mu\text{mol/L}$.

The above schedule for blood lead level testing may be inadequate for certain situations where the exposures are very high and/or highly variable. In these situations the examining physician should tailor the blood lead level testing schedule to address the special risks of different types of work and exposures.

Action Levels/Removal Criteria

An assessment of a worker's fitness to continue working in exposure to inorganic lead is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

1. Review Levels: The blood lead action levels for initiating a review of engineering controls, work practices, health status and personal hygiene practices are:
 - For general population of workers:
 - Blood lead level $> 0.25 \mu\text{mol/L}$ increase from baseline, or
 - Blood lead level $> 0.5 \mu\text{mol/L}$ (single measure - confirmed by immediate repeat testing)

- For vulnerable worker subpopulations (including women who are pregnant or of childbearing potential, individuals with chronic renal dysfunction, hypertension or neurologic disorders):
 - Blood lead level > 0.25 µmol/L (single measure – confirmed by immediate repeat testing)

2. Removal Criteria:

The levels for removal of the worker from exposure to inorganic lead are as follows:

- For general population of workers:
 - Blood lead level > 1.0 µmol/L (two repeat measures, one month apart), or
 - Blood lead level > 1.4 µmol/L (single measure – confirmed by immediate repeat testing)
- For vulnerable worker subpopulations:
 - Blood lead level > 0.5 µmol/L

Return to Work in Exposure to Inorganic Lead Criteria

- For general population of workers:
 - Blood lead level < 0.7 µmol/L
- For vulnerable worker subpopulations
 - Blood lead level < 0.25 µmol/L

and after careful review and implementation of measures in the workplace to ensure worker exposure is reduced to acceptable levels.

Organic Lead

With respect to the medical examinations required under subsection 20 (4) of O. Reg. 490/09, the medical examinations for organic lead shall be carried out:

1. Prior to placement.
2. Periodically, at a frequency dependent on the findings at prior medical examinations and clinical test results.
3. In the event of an acute exposure requiring immediate medical attention.
4. Upon exiting placement unless the most recent periodic medical examination was performed within the last 6 months.

Pre-placement Medical Examinations

Pre-placement medical examinations shall include:

- i) Initial medical and occupational history including:
 - Inquiry for potential mild manifestations of organic lead toxicity including:
 - Insomnia and nervous excitation
 - Nausea
 - Vomiting, and
 - Tremor
- ii) A physical examination focusing on the central nervous system looking for:
 - Mild symptoms including:
 - Tremor
 - Hyperreflexia
 - Muscular contractions
 - Bradycardia
 - Arterial hypertension, and
 - Hypothermia.
 - More severe symptoms including:
 - Disorientation
 - Mania
 - Ataxia
 - Hallucinations
 - Exaggerated muscular activity; and
 - Seizures
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests in accordance with this Code.

Periodic Medical Examinations

Periodic medical examinations shall include the following:

- i) Updating of a worker's medical and occupational history if there are positive findings at prior examination or clinical testing. (i.e. any detectable urinary diethyl lead)

- ii) A physical examination if there are positive findings at prior examination or clinical testing.
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests in accordance with this Code.

Acute exposure medical examinations

A medical examination required in the event of an acute exposure to organic lead shall include:

- i) Inquiry for potential mild manifestations of organic lead toxicity including:
 - Insomnia and nervous excitation
 - Nausea
 - Vomiting, and
 - Tremor
- ii) A physical examination focusing on the central nervous system looking for:
 - Mild symptoms including:
 - Tremor
 - Hyperreflexia
 - Muscular contractions
 - Bradycardia
 - Arterial hypertension, and
 - Hypothermia.
 - More severe symptoms including:
 - Disorientation
 - Mania
 - Ataxia
 - Hallucinations
 - Exaggerated muscular activity; and
 - Seizures
- iii) Clinical tests in accordance with this Code

Exit Medical Examinations

Exit examinations shall include:

- i) Updating of a worker's medical and occupational history where there are positive findings at prior examination or clinical testing. (i.e. any detectable urinary diethyl lead)
- ii) A physical examination where there are positive findings at prior examination or clinical testing. (i.e. any detectable urinary diethyl lead)
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests as required by this Code.

Note: No monitoring post cessation of exposure is recommended.

Clinical tests for Organic Lead

Types

The following clinical tests are required for pre-placement, periodic, acute exposure and exit medical examinations with respect to exposure to organic lead:

1. Diethyl lead in urine sample taken at the end of the work shift at the end of the work week.

Frequency

Diethyl lead in urine:

- Following testing in relation to pre-placement medical examinations, at a minimum, every 4 months during the first 12 months to address potential exposures through hygiene and work practices.
- Or otherwise required by the examining physician based on previous results or if a change in work practices.

Action Levels/Removal Criteria

An assessment of a worker's fitness to continue working in exposure to organic lead is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

1. Review Level

The detection of diethyl lead in urine triggers the review of engineering controls, work practices, worker health status and personal hygiene practices.

2. Removal Criteria

The criteria for removal of the worker from exposure to organic lead are as follows:

- For general population of workers (urine):
 - Diethyl lead in urine > 0.075 $\mu\text{mol/L}$ (20 $\mu\text{g/L}$)

Return to Work in Exposure to Organic Lead Criteria

Return to work in exposure to organic lead is at the discretion of the examining physician.

Mercury

Medical surveillance program requirements

Mercury and non-alkyl mercury compounds

With respect to the medical examinations required under subsection 20 (4) of O. Reg. 490/09, the medical examinations for mercury and non-alkyl mercury compounds shall be carried out:

1. Prior to placement.
2. Periodically, at a frequency dependent on the findings at prior examinations and results of testing. (Note: Medical examinations should be monthly or sooner if there are positive findings at prior examination or clinical testing and clinically indicated).
3. In the event of an acute exposure requiring immediate medical attention
4. Upon exiting placement unless the periodic medical examination was performed within the last 6 months.

Pre-placement Examinations

Pre-placement examinations shall include:

- i) Initial medical and occupational history including:
 - Previous exposure (both occupational and non-occupational) to mercury and non-alkyl mercury compounds.

Note: Potential non-occupational sources include recent dental amalgam procedures that may transiently elevate urinary mercury levels for 3 or more days.

- ii) Symptom history focusing on:
 - Neurological (central and peripheral)
 - Renal
 - Respiratory, and
 - Dermal systems.
- iii) A physical examination focusing on:
 - Neurological (central and peripheral)
 - Renal
 - Respiratory, and

- Dermal systems.
- iv) Provision of health education consistent with Part I of this Code.
- v) Clinical tests in accordance with this Code.

Periodic Medical Examinations

Periodic medical examinations shall include the following:

- i) Updating of a worker's medical and occupational history if there are positive findings at prior examination or clinical testing. (i.e. spot urinary mercury > 0.15 µmol/L)
- ii) A physical examination where there are positive findings at prior examination or clinical testing. (i.e. spot urinary mercury > 0.15 µmol/L)
- iii) Provision of health education consistent with Part I of this Code
- iv) Clinical tests in accordance with this Code.

Acute exposure medical examinations

A medical examination required in the event of an acute exposure to mercury or non-alkyl mercury compounds shall include:

- i) A physical examination focusing on:
 - Neurological (central and peripheral)
 - Renal
 - Respiratory, and
 - Dermal systems.
- ii) Clinical tests in accordance with this Code.

Exit Medical Examinations

Exit examinations shall include:

- i) Updating of a worker's medical and occupational history if there are positive findings at prior examination or clinical testing. (i.e. spot urinary mercury > 0.15 µmol/L)
- ii) A physical examination where there are positive findings at prior examination or clinical testing. (i.e. spot urinary mercury > 0.15 µmol/L)
- iii) Provision of health education consistent with Part I of this Code.

- iv) Clinical tests in accordance with this Code.

Note: No monitoring post cessation of exposure is recommended.

Clinical tests for Mercury and Non- Alkyl Mercury Compounds

Types

The following clinical tests are required for pre-placement, periodic and exit medical examinations with respect to exposure to mercury and non-alkyl compounds:

1. Spot urinary mercury test.

Frequency

- i) At a minimum, every 4 months for the first 12 months following testing in relation to pre-placement medical examinations to address potential exposures through hygiene and work practices.
- ii) Annually or sooner if change in work practices or primary prevention measures.
- iii) Monthly or sooner if clinically indicated, for spot urinary tests $> 0.15 \mu\text{mol/L}$ or 0.03 mg/L . A positive test that is $> 0.15 \mu\text{mol/L}$ should be validated with a 24-hour urine mercury test.

Action Levels/Removal Criteria

An assessment of a worker's fitness to continue working in exposure to mercury and non-alkyl mercury compounds is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

1. Review levels

A spot urinary mercury test $> 0.15 \mu\text{mol/L}$ or 0.03 mg/L , confirmed with a 24 hour urinary mercury test, triggers the review of engineering controls, work practices, worker health status and personal hygiene practices.

2. Removal Criteria:

The level for removal of the worker from exposure to mercury and non-alkyl compounds is as follows: Spot urinary mercury test results are $> 0.30 \mu\text{mol/L}$ or 0.06 mg/L , confirmed with 24 hour urinary mercury.

Return to Work in Exposure to Mercury and Non-Alkyl Mercury Compounds Criteria

- Spot urinary mercury test results $\leq 0.15 \mu\text{mol/L}$ or 0.03 mg/L
and after careful review and implementation of measures in the workplace to ensure worker exposure is reduced to acceptable levels.

Mercury (alkyl compounds)

With respect to the medical examinations required under subsection 20(4) of O. Reg. 490/09, the medical examinations for alkyl mercury compounds shall be carried out:

1. Prior to placement.
2. Periodically, at a frequency dependent on the findings at prior examinations and results of clinical testing. (Note: Medical examinations should be monthly or sooner if there are positive findings at prior examination or on testing and clinically indicated).
3. In the event of an acute exposure requiring immediate medical attention.
4. Upon exiting placement unless the most recent periodic medical examination was performed within the last 6 months.

Pre-placement Medical Examinations

Pre-placement medical examinations shall include:

- i) Initial medical and occupational history including:
 - Inquiry for dietary sources of alkyl mercury with particular emphasis on the frequency, amount and types of seafood consumed. Studies have shown that background exposure and variability in blood mercury result primarily from methyl mercury in seafood.
For example a person who eats seafood:
 - infrequently to occasionally would be expected to have a blood mercury level of $<0.025 \mu\text{mol/L}$;
 - regularly up to 3 times per week would be expected to result in blood mercury level in the range of $0.075 \mu\text{mol/L}$;
 - with high mercury levels (e.g. certain fish species) greater than 3 times per week would give blood mercury levels of $0.15 - 0.25 \mu\text{mol/L}$.)
 - Symptom history focusing on:
 - Neurological (central and peripheral)
 - Renal, and

- Dermal systems.
- ii) Initial physical examination focusing on:
 - Neurological (central and peripheral)
 - Renal, and
 - Dermal systems.
- iii) Provision of health education consistent with Part 1 of this Code.
- iv) Clinical tests in accordance with this Code.

Periodic Medical Examinations

The periodic medical examination shall include the following:

- i) Updating of a worker's medical and occupational history if there are positive findings at prior examination or clinical testing.
- ii) A physical examination where there are positive findings at prior examination or clinical testing.
- iii) Provision of health education consistent with Part 1 of this Code.
- iv) Clinical tests in accordance with this Code.

Acute exposure medical examinations

A medical examination required in the event of an acute exposure to alkyl mercury compounds shall include:

- i) Physical examination focusing on:
 - Neurological (central and peripheral)
 - Renal, and
 - Dermal systems.
- ii) Clinical tests in accordance with this Code.

Exit Medical Examinations

Exit examinations shall include:

- i) Updating of a worker's medical and occupational history if there are positive findings at prior examination or clinical testing.

- ii) A physical examination if there are positive findings at prior examination or clinical testing.
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests for alkyl mercury compounds in accordance with this Code.

Note: No monitoring post cessation of exposure is recommended.

Clinical tests for Mercury (alkyl compounds)

Types

The following clinical tests are required for pre-placement, periodic, acute exposure and exit medical examinations with respect to exposure to alkyl mercury compounds:

1. Blood mercury

Frequency

- i) At a minimum, every 4 months for the first 12 months following testing in relation to pre-placement medical examinations to address potential exposures through hygiene and work practices.
- ii) Annually thereafter, or sooner if change in work practices or primary prevention measures.
- iii) Monthly for mercury blood test results $> 0.25 \mu\text{mol/L}$.

Action Levels/Removal Criteria

An assessment of a worker's fitness to continue working in exposure to alkyl mercury compounds is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

1. Review Levels

Mercury blood test results $> 0.25 \mu\text{mol/L}$ triggers the review of engineering controls, work practices, worker health status and personal hygiene practices. Note: Base mercury blood levels for individual may vary according to diet.

2. Removal Criteria (confirmed occupational exposure)

The level for removal of the worker from exposure to alkyl mercury compounds is as follows: Mercury blood test results $> 0.25 \mu\text{mol/L}$.

Return to Work in Exposure to Alkyl Mercury Compounds Criteria

- Mercury blood test results $\leq 0.25 \mu\text{mol/L}$ or at the discretion of physician and after careful review and implementation of measures in the workplace to ensure worker exposure is reduced to acceptable levels.

Silica

Medical surveillance program requirements

With respect to the medical examinations required under subsection 20 (4) of O. Reg. 490/09, the medical examinations for silica shall be carried out:

1. Prior to placement.
2. Periodically, as follows, while exposed:
 - At least once every five years, beginning 10 years after first exposure, or
 - More frequently, as required by the examining physician.

Note:

- i) Greater frequency of medical examinations may be recommended for heavier exposures or where there are changes in job tasks that may require additional medical surveillance.
 - ii) The frequency of examinations may be reduced for worker exposures < 0.025 mg/m³ exposure history and documented exposure data.
3. Upon exiting placement, as follows:
 - Exit medical examination required for workers with more than 10 years of exposure, unless the most recent periodic examination was performed within the last 12 months.

Pre-placement Medical Examinations

Pre-placement examinations shall include:

- i) Initial medical and occupational history including:
 - Previous exposure (occupational and non-occupational) to silica
 - History of present or past respiratory disorders, including
 - Silicosis
 - Chronic obstructive pulmonary disease
 - Tuberculosis and other mycobacterial diseases
 - Connective tissue disease, and
 - Lung cancer.
 - Personal habits (e.g. smoking and hygiene)
- ii) The initial physical examination shall focus on:

- General condition and respiratory status of the worker
 - Depending on the medical and occupational history additional systems, such as musculoskeletal, can be added.
- iii) Provision of health education consistent with Part 1 of this Code
- iv) Clinical tests in accordance with this Code.

Periodic Medical Examinations

Periodic medical examination shall include the following:

- i) Updating of a worker's medical and occupational history to include:
- Estimates of worker's actual exposure and assess need for intervention
 - Reinforcement with worker the importance of preventative measures.
- ii) A physical examination focusing on the general condition and respiratory status of the worker.
- iii) Provision of health education consistent with Part 1 of this Code.
- iv) Clinical tests in accordance with this Code.

Exit Medical Examinations

At the exit examination:

- i) A worker's medical and occupational history shall be updated to include:
- Estimates of worker's actual exposure and assess need for intervention and reinforce with worker the importance of preventative measures.
- ii) A physical examination focusing on the general condition and respiratory status of the worker.
- iii) Provision of health education consistent with Part I of this Code.
- iv) Clinical tests in accordance with this Code.

Note: Monitoring post cessation of exposure is not recommended. Silicosis or lung cancer may develop after exposure has ended, routine assessment (e.g. every 5 years for those workers exposed to silica for more than 10 years) may assist in early detection of the disease but it is unlikely that this will result in improved health outcomes).

Clinical tests for Silica

Types

The following clinical tests are required for pre-placement, periodic and exit medical examinations with respect to exposure to silica:

1. Imaging: Chest Radiograph (postero-anterior) (PA)

Note: To avoid unnecessary X-rays, the examining physician shall where practical obtain the relevant medical records from another facility if the worker has been previously examined within the past year.

2. Pulmonary Function Tests (PFT)⁴: (to be taken in conjunction with chest radiograph):

- FEV1, FVC, FEV1/FVC% and a mid-flow rate such as FEF 25-75%.

Note: All relevant data shall be corrected to body temperature and pressure (BTPS).

Frequency

Chest radiograph and PFT to be done every 5 years after 10 years of exposure or as required by examining physician.

Action Levels/Removal Criteria:

There are no specific action levels/removal criteria.

An assessment of a worker's fitness to continue working in exposure to silica is based on the results of the medical examination in conjunction with the results of the clinical tests. Further medical assessment may be required by the WSIB to qualify for benefits. If the examining physician determines that the worker is fit with limitations or unfit, the physician shall take action in accordance with section 29 of O. Reg. 490/09.

Where the examining physician determines that the signs of silica-induced disease are present, the examining physician should consider whether the worker should be referred for further medical assessment by a respirologist or other knowledgeable/experienced specialist.

Return to Work in Exposure to Silica Criteria

To be decided on a case by case basis by the examining physician, in consultation with a respirologist or other knowledgeable/experienced specialist, if any, and after careful

⁴ All pulmonary function testing must be done according to the latest update of a recognized Standardization of Spirometry (e.g. the American Thoracic Society).

review of control measures in the workplace to ensure worker exposure is within acceptable levels.

Abbreviations:

BTPS Body temperature, standard pressure, saturated with water vapour

FVC Forced vital capacity

FEV₁ Forced expiratory volume in one second

FEF Forced expiratory flow