OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF CONSUMER AND BUSINESS SERVICES

PROGRAM DIRECTIVE

Program Directive A-185
Issued April 1, 1981
Revised September 20, 2018

SUBJECT: Inorganic Arsenic

AFFECTED CODES/ DIRECTIVES: OAR 437-002-1910.1018, Inorganic Arsenic

PURPOSE: The purpose of this directive is to provide guidelines and establish uniform inspection and compliance procedures for the occupational exposure standard for arsenic and arsenic-containing, inorganic compounds published in the Federal Register May 5, 1978, and effective August 1, 1978.

REFERENCES: CPL 02-02-022 and 29 CFR 1910.1018 Inspection and Compliance Procedures for the Permanent Occupation Exposure Standard for Inorganic Arsenic Compounds

BACKGROUND: The standard for occupational exposure to inorganic arsenic has created the need for additional guidance beyond that contained in the Technical Manual. This directive focuses on providing such supplemental guidance.

CLARIFICATION: Based on available scientific evidence, federal OSHA concludes that employees exposed to elemental arsenic and to inorganic compounds containing trivalent and pentavalent arsenic have an increased risk of developing cancer. Therefore, according to OSHA policy of limiting employee exposures to carcinogens to the lowest level generally feasible, a standard for occupational exposure to the aforementioned chemicals has been promulgated.

The standard limits occupational exposure to air contaminated with the chemicals under its scope on the basis of the mass concentration of arsenic that is airborne. The limit is 10 micrograms of arsenic per cubic meter of air, averaged over any 8-hour period.

Other provisions of the standard concern the following: Exposure monitoring.

Regulated areas.
Methods of compliance.
Respiratory protection.
Protective work clothing and equipment.
Housekeeping.
Hygiene facilities and practices.
Medical surveillance.
Employee information and training.
Signs and labels.
Recordkeeping.
Observation of monitoring.

ACTION:

1. Scope and applicability.

    a. Coverage by industry segments.

        1910.1018 applies to "General Industry," "Construction" and Maritime Employment," but does not apply to "agricultural operations."

    b. Occupational exposures within the scope of the standard.

        i. 1910.1018 applies to most occupational exposures to elemental arsenic and arsenic-containing, inorganic compounds. Many of the occupational exposures covered occur at establishments listed in the industry profile, Attachment 2 with this directive.

    c. Occupational exposures outside the scope of the standard.

        i. 1910.1018 does not apply to occupational exposure resulting from cotton ginning, agricultural uses of arsenic or any of its compounds, treatment of wood with any type of arsenic-containing preservatives and application of any type of arsenic-containing pesticides.

        ii. 1910.1018 does not apply to arsenic exposures of farm employees and applicators which occur during mixing of pesticides and cleaning of pesticide containers. These operations are considered to be a part of pesticide application.

        iii. 1910.1018 does not apply to exposures resulting from utilization of arsenically preserved wood.

    d. Portions of the standard which are inapplicable when airborne concentrations are below set limits.

        i. Portions of the standard which are inapplicable when initial monitoring reveals that all employee exposures are at or less than the permissible exposure limit are as follows:

            1. Subparagraph (e)(3)(ii) – Exposure monitoring – Frequency.

2. Subparagraph (e)(5)(ii) – Exposure monitoring – Employee notification.

3. Subparagraph (e)(6)(i) – Exposure monitoring--Accuracy of measurement.

4. Paragraph (f) – Regulated area.

5. Paragraph (g) – Methods of compliance.

6. Paragraph (h) – Respiratory protection.

7. Subparagraph (m)(3)(i) – Hygiene facilities and practices--Lunchrooms.

8. Subparagraph (m)(5) – Hygiene facilities and practices--Vacuuming clothes. (In fact, this subparagraph is inapplicable if 8-hour TWA airborne exposures are at or less than 100 micrograms (as arsenic) per cubic meter.)

   Subparagraph (p)(2) – Signs and labels – Signs.

   NOTE: Additional portions of the standard, designed to control eye and skin contact and ingestion hazards, may also be inapplicable, but this cannot be established merely on the basis of intensity of exposure to contaminated air.

ii. Portions of the standard, in addition to those listed above, which are inapplicable when initial monitoring reveals that all employee exposures are at or less than the action level are as follows:

1. Subparagraph (e)(3)(iii) – Exposure monitoring – Frequency.

2. Subparagraph (e)(3)(iv) – Exposure monitoring – Frequency.

3. Subparagraph (e)(6)(ii) – Exposure monitoring – Accuracy of measurement.

4. Paragraph (n) – Medical surveillance.

5. Subparagraph (q)(2) – Recordkeeping– Medical surveillance.

   NOTE: 1. Paragraph (n) and subparagraph (q)(2) are applicable if the employer has employees whose past exposures meet the criteria presented in 1910.1018 (n)(1)(i)(B).

   NOTE 2. Additional portions of the standard, designed to control eye and skin contact and ingestion hazards, may also be inapplicable, but this cannot be established merely on the basis of intensity of exposure to contaminated air.

e. Independent contractors and their employees.

i. In accordance with established policy contained in Program Directive A-257, Multi-Employer Workplace Citation Guidelines, independent contractors such as construction contractors are responsible for protecting their employees from health and safety hazards even if they are not the creators of the hazards. However, independent contractors would not normally be required to achieve this protection for their employees by instituting permanent engineering controls at their client's establishment. Worker protection needs to be coordinated with the host employer consistent with their established policies and procedures for engineering controls and supplemented as needed to assure workers are properly protected. For example, contractors can provide portable local exhaust hoods and require their employees to vacate specified areas during cycles or periods of peak air contamination.

ii. The foregoing discussion relates to the methods of compliance provisions under 1910.1018(g). All other provisions under 1910.1018 are accorded the same applicability to independent contractors as to general industry employers.

2. Interpretations and discussions. The reader is encouraged to first read the pertinent portion of 1910.1018 and then read the following interpretation and/or discussion:

a. 1910.1018(e)(1)(i), Exposure monitoring – General.

i. A given employee's exposure will not have to be directly measured by placing a personal sampling system on him or her if another employee's exposure that is known to be virtually identical will be measured and represented as the given employee's exposure.

ii. A measurement is not representative of an employee's exposure if it is not at least as accurate as 1910.1018(e)(6) requires it to be.

iii. 1910.1018(e)(1)(iii), Exposure monitoring – General.

At least 7 continuous hours of sampling is required if the employee's exposure occurs continuously or intermittently over a 7- to 8-hour period. If all the exposure occurs in less than a 7-hour span, it is necessary to sample only during this lesser period.

iv. 1910.1018(e)(3), Exposure monitoring – Frequency.

1. Table I of this directive depicts the minimum frequency with which employers must measure each employee's exposure while working at a routine job.

2. Employees such as maintenance employees who are continuously performing different jobs must have their exposures measured each time they perform a job resulting in a potentially different exposure. Table II of this directive depicts the minimum frequency of measurement of exposure required if the employee occasionally repeats the same job.

Table I – Minimum Required Frequency for Measuring Each Employee's Exposure While Working at a Routine Job

Present exposure result	Last exposure result	Longest time that may elapse between measurement provided an (e)(4) event does not occur first
At or below the AL	None. Present measurement is an initial measurement	No further measurement required until an (e)(4) event occurs
At or below the AL	Above the AL but at or below the PEL	6 months
At or below the AL	Above the PEL	6 months
At or below the AL	At or below the AL	No further measurement required until an (e)(4) event occurs provided 7 days or more elapsed between the last 2 measurements
Above the AL but at or below the PEL	Not relevant for determining the next time exposure must be measured	3 months
Above the PEL	Not relevant for determining the next time exposure must be measured	3 months

Abbreviations: AL = action level
PEL = permissible exposure limit
(e)(4) = 1910.1018(e)(4)

Table II – Minimum Required Frequency for Measuring Sporadically Occurring Employee Exposure

Present exposure result	Last exposure result for the same job	Longest time that may elapse before exposure must be re-measured
At or below the AL	None. Present measurement is an initial measurement	No further measurement required until an (e)(4) event occurs
At or below the AL	Above the AL but at or below the PEL	6 months plus the time that elapses before the job is performed again
At or below the AL	Above the PEL	6 months plus the time that elapses before the job is performed again
At or below the AL	At or below the PEL	No further measurement required until an (e)(4) event occurs provided 7 days or more elapsed between the last 2 measurements
Above the AL but at or below the PEL	Not relevant for determining the next time exposure must be measured	6 months plus the time that elapses before the job is performed again
Above the PEL	Not relevant for determining the next time exposure must be measured	3 months plus the time that elapses before the job is performed again

Abbreviations: AL = action level
PEL = permissible exposure limit
(e)(4) = 1910.1018(e)(4)

v. 1910.1018(e)(6), Exposure monitoring – Accuracy of measurement.

Follow the sampling procedures established by the Oregon OSHA Laboratory (referenced as 'Lab' in remainder of document).

vi. 1910.1018(g)(1)(ii), Methods of Compliance – Controls.

Engineering and work practice controls are intended to reduce exposure to or below the PEL. If such controls cannot reduce exposure below the PEL,

they must still be used. These must be supplemented with respiratory protection and other necessary PPE to control exposures. Employee rotation is not required as a control strategy before respiratory protection is used.

vii. 1910.1018(m)(1), Hygiene facilities and practices – Change rooms.

1910.1018(m)(1) is interpreted to require change rooms for employees working in regulated areas; working with arsenic trichloride; working in contact with non-airborne granules of arsenic and arsenic-containing, inorganic compounds; or working in contact with a liquid solution containing an arsenic-containing, inorganic solute.

3. Inspection procedures.

a. Qualification of inspecting compliance officer.

Inspections to assess compliance with 1910.1018 must be conducted by an industrial hygienist. The compliance officers must have been instructed and trained in the proper use of powered, air-purifying respirators and must be aware of their limitations. As explained later in this directive, there are specific situations were PAPRs are suggested for use. Follow the instructions in Policy and Procedure 44, Respiratory Protection, prior to any use of respiratory protection.

b. Personal protective equipment and associated items that should be taken on inspection trips.

i. Respirators.

1. General.

Once the inside of a respirator gets contaminated with arsenic it should not be put back on until it has been decontaminated. Compliance officers should use this principle as the basis for determining the appropriate number of respirators to take on the inspection.

2. Inspections in copper, zinc or lead smelters.

a. Protection against arsenic trioxide and other solid aerosols only.

Take powered, air-purifying respirators with high-efficiency filters. The respirator and filter combination must be approved by the National Institute for Occupational Safety and Health (NIOSH) for protection against aerosols/particulates having permissible exposure limits of less than 50 micrograms per cubic meter.

3. Protection against a combination of arsenic trioxide aerosol and sulfur dioxide gas.

Take gas masks with Type "N" front- or back-mounted canisters containing high-efficiency filters and sorbent for acid gases. The mask, sorbent and filter combination must be approved by NIOSH for respiratory protection in atmospheres containing as much as 2-percent acid gases and also for protection against aerosols/particulates having permissible exposure limits of less than 100 micrograms per cubic meter.

4. Take the powered, air-purifying respirators specified under 3.b.i.2 of this directive on inspections involving any of the following substances :

iron diarsenide	ammonium monohydrogen orthoarsenate	lead orthoarsenate
ammonium dihydrogen orthoarsenate	lead arsenite	ammonium metaarsenite
lithium orthoarsenate	ammonium calcium arsenate	magnesium orthoarsenate
ammonium magnesium arsenate	magnesium orthoarsenite	arsenic
manganese monoarsenide	orthoarsenic acid	dimaganese arsenide
arsenic pentoxide	trimanganese diarsenide	arsenic trioxide
manganous arsenate	arsenic pentaselenide	mercurous monohydrogen orthoarsenate
arsenic disulfide	mercuric orthoarsenate	arsenic pentasulfide
nickel orthoarsenate	arsenic trisulfide	nickel arsenide
arsenic thioarsenate	platinum arsenide	arsenious selenide
potassium arsenate	barium orthoarsenate	potassium arsenite
barium arsenide	potassium thioarsenate	bismuth orthoarsenate
potassium thioarsenite	cadmium arsenide	silver orthoarsenate
calcium arsenate	silver orthoarsenite	calcium arsenide
sodium arsenate	calcium arsenite	sodium metaarsenite
chromium monoarsenide	sodium thioarsenate	cobalt orthoarsenate
strontium orthoarsenite	cobalt arsenic	sulfide strontium orthoarsenite
copper acetoarsenite	tin pyroarsenate	copper arsenate
tungsten arsenide	copper arsenite	zinc orthoarsenate
copper triarsenide	zinc arsenide	ferric orthoarsenate
zinc metaarsenite	ferric orthoarsenite	ferrous orthoarsenate
ferrous orthoarsenite.		

ii. Personal protective clothing.

1. General.

Protective clothing that is contaminated with arsenic should not be put back on. Compliance officers should use this principle as the basis for determining the appropriate number of sets of protective clothing to take on the inspection.

2. Inspections involving solid, arsenic-containing, inorganic chemicals.

   Take full-body protective clothing that is impervious to dust and fume. Impervious gloves, coveralls, caps or hoods and shoe coverlets constitute one example of a set of full-body protective clothing.

3. Inspections involving arsenic trichloride liquid, arsenic trifluoride liquid, or liquid solutions of arsenic-containing, inorganic compounds.

   a. Take full-body protective clothing that is impermeable to the liquid or solution of concern. Impermeable gloves, boots, coveralls and caps or hoods constitute one example of a set of full-body protective clothing.

   b. Representations of the permeabilities of materials that have tested best against arsenic trichloride and arsenic trifluoride liquids are planned for inclusion as later attachments to this directive.

   c. The types of material required for protection against liquid solutions of arsenic-containing, inorganic compounds depends upon the type of solution involved. Salt solutions require material impervious to the solvent; acid solutions require material impervious to acid; and basic solutions require material impervious to base.

iii. Eye and face protective devices.
Refer to the Technical Manual, Chapter VIII (Protective Equipment), and to 1910.1018(j)(1)(iii).

iv. Containers.

1. Take containers for depositing, storing and transporting the compliance officer's arsenic contaminated protective clothing and equipment. The containers must be impermeable to the contaminant of concern.

2. Use containers that close vapor tight for the following substances:

   a. Arsenic trichloride

   b. Arsenic trifluoride

   c. Arsenic pentafluoride

d. Arsenic tribromide

e. Arsenic triiodide

f. Arsenic monophosphide

g. Any other inorganic arsenic-containing compound that has a vapor pressure greater than 1 atmosphere.

c. Opening Conference.

i. Compliance officers will not interrupt opening conferences to make quick surveys of workplaces. This deviation from normal is for the protection of the compliance officers. Instead of immediately surveying the workplaces, compliance officers will attempt to acquire information during opening conferences that will help them predetermine the adequacy of their respirators and locations where they will be needed. The guidance provided in 5.d.(3)(b), (c), (d) and (e) of this directive is meant to assist the compliance officers in this respect. This guidance supplements the guidance presented in the FIRM and Technical Manual.

ii. Conduct the opening conference in an office in the plant reception area or at some other location away from potential exposure to arsenic or arsenic-containing, inorganic compounds. Request the attendance of personnel who can respond to questions concerning the following:

1. Monitoring of employee exposures and establishing regulated areas.

2. Maintenance of the exposure monitoring records.

3. Institution of work practices.

4. Institution and maintenance of engineering controls.

5. Development of the compliance program required under 1910.1018(g)(2).

iii. Obtain from the employer a diagram of the plant layout. If one is not available, develop one with the aid of the conference attendants. Ask them to discuss and explain operations that involve elemental arsenic or arsenic-containing, inorganic compounds and with their help represent the operations on the diagram. Discuss the engineering controls and the work practices that have been instituted and establish their effectiveness. Find out if there are any operations where the employer has difficulty in exposures. Examine and discuss the controlling compliance program required under 1910.1018(g)(2) with an aim toward gaining an insight into the employer's proficiency in and utilization of air contamination control technology.

iv. With the assistance of the conference attendants, use the employer’s exposure monitoring records to represent air concentration patterns on the

diagram of the plant layout. Draw in the regulated areas that have been established.

v. Review the sampling and analytical method to gain an impression of its accuracy. Look for clues that might indicate whether the employer is underestimating air concentrations. If any doubts arise about the analytical method used by the employer, contact the Lab.

d. Use of protective equipment, precautions and personal hygiene.

i. General.

1. Compliance officers should adhere to the respirator, protective clothing and equipment, and hygiene practice provisions of the standard.

2. Compliance officers that enter regulated areas or in some way get their protective clothing and equipment contaminated must remove this clothing and equipment in the employee's change room. If employees are not provided change rooms or the compliance officers judge that the permissible exposure limit is exceeded in the change rooms because they are not properly maintained, the compliance officers should remove their contaminated protective clothing and equipment in the outside air. If the latter situation exists, compliance officers should wear lightweight street clothes under their protective clothing.

3. Compliance officers should never put contaminated protective clothing and equipment back on. Once it is removed, it should be immediately placed in a container brought along on the inspection for this purpose.

ii. Respirators.

1. Compliance officers must use respiratory protection in areas the employer has designated as "regulated areas." They may limit their use of respiratory protection to these areas if they are confident, as a result of information acquired during the opening conference, that the employer has included and correctly demarcated all areas that should be "regulated areas."

2. If compliance officers are not confident that the employer has demarcated all areas that must be regulated, then they should also use respiratory protection in undemarcated areas whenever they are unsure of maintaining their 8-hour TWA exposure at or below the permissible limit.

3. Compliance officers must not remain in a contaminated atmosphere longer than their respiratory protective device safely permits.

4. Since compliance officers have no instrumental method for screening airborne concentrations of arsenic, they should be conservative about the time they spend in areas where high concentrations exist. Still, when compliance officers are sampling employee exposures in these areas, they should frequent the areas often enough to keep the sampling under surveillance.

5. When inspections are being performed in copper, lead or zinc smelters, compliance officers should perform a sufficient amount of sampling with gas detector tubes to assess the need for respiratory protection against sulfur dioxide gas in addition to arsenic trioxide aerosol.

iii. Showering.

Compliance officers who enter regulated areas should shower in the employees shower prior to leaving the workplace for the day unless they find violations of sanitation regulations. If the compliance officers do not shower in the employees shower, they should go immediately to the place they are staying and shower.

e. Special air sampling consideration.

The level of potential airborne exposure of employees must be known in order to establish which type of respiratory protective device is required. When the compliance officer is concerned that the exposure may be too great for the respiratory protective devices in use, he or she should collect samples according to the sampling guidelines established by the Lab.

Arsenic has a very low PEL. To assist in obtaining as accurate exposure assessment as possible sample as long as possible on each sample up to eight hours.

f. Wipe testing and bulk sample collection.

i. Bulk samples and wipe tests are used for gathering evidence.

ii. Do not submit bulk samples for analysis or perform wipe tests unless you have considered what they are intended to prove.

iii. Bulk samples of a liquid or solid can be used to prove that elemental arsenic or an inorganic compound containing arsenic is present in it as an ingredient or as a contaminant. Unless the arsenic were bound in such a manner as to make the possibility of airborne exposure above the action level unlikely, the proof of its presence would establish the requirement to comply with the labeling provisions under 1910.1018(p)(1) and (3).

iv. Bulk solid samples should be approximately 5 grams in weight. Bulk liquid samples should be approximately 5 ml in volume. Liquid samples should be non-aqueous, such as paint. The Lab method is not applicable for drinking water.

v. The Lab does not require bulk samples in order to analyze samples of airborne elemental arsenic and arsenic-containing, inorganic compounds.

vi. Wipe tests can provide evidence that surfaces are contaminated with elemental arsenic or arsenic-containing, inorganic compounds. This evidence in conjunction with evidence that the surfaces are not maintained as free as practicable of this contamination establishes a violation of 1910.1018(k)(1).

vii. Perform wipe sampling on workplace surfaces which have frequent contact, and on lunch containers, lunch tables, chairs, drinking fountains, etc. Follow the wipe sampling procedures established by the Lab.

viii. Package the vials containing wipe test filters and all bulk samples for shipping in accordance with the instructions given in Section 1 of the Technical Manual.

ix. Send wipe test samples and bulk samples to the Lab for analysis.

g. Evaluation of compliance with 1910.1018(k)(1), Housekeeping — Surfaces.

i. Compliance with the requirement to maintain surfaces "...as free as practicable of accumulations of inorganic (compounds containing) arsenic (and of elemental arsenic)" should be evaluated by looking for anything the employer can do to cut down on contamination of the surfaces, such as improved work practices, improved engineering controls, more frequent cleaning, etc. The housekeeping plan required under 1910.1018(k)(4) should also be inspected.

ii. When the compliance officer has determined that the employer can reduce contamination of the surfaces, he or she will have to provide evidence that the substance on the surfaces is in fact elemental arsenic or an inorganic compound containing arsenic. Wipe samples would be one way of providing this evidence. Refer to the Laboratory Sampling Procedures for directions on taking wipe samples and submitting them for analysis.

h. Evaluation of availability of Medical Surveillance For Employees

i. Although, in accordance with 1910.1018(n), employers are required, to provide employees an opportunity for medical examinations, employees are not required to take them. Employers must continue to offer a medical examination to each authorized employee every time it comes due again, even if the employee has previously refused such an examination.

ii. Where authorized employees are not receiving medical examinations, investigate compliance with the requirement to provide employees an opportunity for medical examination by interviewing interested parties--for example, employees, employee representatives and employers. If any employees are apparently refusing medical examinations, investigate, with particular care, compliance with the requirement to inform employees of the purpose and elements of the medical examination. This last

requirement is found under 1910.1018(o)(1)(ii)(D). Where violations are found follow the grouping and classification guidance presented in sections 4 and 5of this directive and in Attachment 1 of this directive.

4. Classification of violations.

    a. The recommended classification of violations is listed in Attachment 1 with this directive. "Serious" classifications are designated by the letter "S" and "other" classifications are designated by the letter "O." The recommendations are subject to the discretion of the field manager. When a classification differs from the recommendation in Attachment 1, the case file should indicate the reasons. The majority of the recommended classifications are "serious" because of the severe impairment of health that may result as a consequence of the violations. Information on the health hazards associated with exposure to arsenic and arsenic-containing, inorganic compounds is presented in the preamble to the standard. See the Federal Register, May 5, 1978, Divisions III and IV under SUPPLEMENTAL INFORMATION.

    b. The recommended classifications assigned to specific entries under the "1910.1018" heading in Attachment 1 with this directive are what is deemed appropriate when that entry alone is violated. One condition for exception is denoted for entry (e)(5).

    c. The 1910.1018 entries, (d); (e)(2); (e)(3)(ii) through (e)(3)(iv); (e)(5); (e)(6); (f)(1); (g)(1)(i) and (g)(1)(ii)(engineering and work practice controls requirements); (g)(2)(i), (g)(2)(iii); (g)(2)(ii); (h)(2); (h)(3)(i) and (h)(3)(ii); (h)(4); (j)(1)(i) through (j)(1)(iii); (j)(2)(i) through (j)(2)(iii); (m)(2)(ii); (m)(4); (n)(2); (n)(3); (n)(5); (n)(6); (o)(1); (q)(1)(i) through (q)(1)(ii)(E); (q)(2)(i) through (q)(2)(iii)(H); and (r)(2)(ii), are each comprised of sets of closely related requirements with one basic purpose. The classification of violation recommended for each of these entries is applicable when there is noncompliance with the basic purpose of the sets of requirements. For example, the classification of violation recommended for (n)(2) is appropriate if variations from the requirements in (n)(2) result in ineffective medical surveillance of employees. When there is compliance with only part of the requirements of these entries, professional judgment must be exercised to determine if there is sufficient compliance with the basic purpose to warrant a more lenient classification of violation than recommended.

5. Guidelines for determining items of the citation and when to establish correction dates.

    a. General.

        i. Some of the violations of individual requirements of 1910.1018 are grouped, as indicated in Attachment 1 with this directive, to form one item of the citation. If an individual requirement has been violated in more than one instance, then each instance of violation is specifically listed and incorporated into the same item of the citation.

ii. No more than one penalty may be proposed per item of the citation. Every individual instance of violation of every individual requirement of the standard must be specifically assigned a correction date. This applies regardless of whether or not grouping of violations is involved.

iii. Each employee exposure in excess of the permissible limit under 1910.1018(c) constitutes one instance of violation of 1910.1018(c) unless there is no related violation of 1910.1018 (g)(1) and (h). Refer to paragraph 6 of this directive for more detail.

iv. Each time an employee has eye or skin contact with a liquid, arsenic-containing, inorganic compound; a liquid solution containing an arsenic-containing, inorganic solute; granules of arsenic; or granules of an arsenic-containing, inorganic compound constitutes one instance of violation of 1910. 1018(m)(6).

v. The exposing of the eyes or skin of employees to an 8-hour TWA concentration of arsenic trichloride vapor in excess of 10 micrograms arsenic per cubic meter of air is also a violation of 1910.1018 (m)(6). Each such exposure constitutes one instance of violation of 1910.1018(m)(6).

vi. The exposing of the eyes or skin of employees to irritating amounts of an airborne, arsenic-containing, inorganic compound other than arsenic trichloride is another violation of 1910.1018(m)(6). Each such exposure constitutes instance of violation of 1910.1018(m)(6).

vii. Each work practice contributing to exposure in excess of the permissible limit under 1910.1018(c) constitutes one instance of violation of 1910.1018(g)(1)(i) or (ii) provided it is technically feasible to modify the work practice in a manner that will reduce the exposure.

viii. Each source of emission contributing to exposure in excess of the permissible limit under 1910.1018(c) constitutes one instance of violation of 1910.1018 (g)(1)(i) or (ii) provided it is technically feasible to reduce the emission by instituting one or more engineering controls.

ix. Each instance of violation of the engineering and work practice controls requirements of 1910.1018(g)(1) is to be listed on the citation. Specific dates are to be established for correcting each instance of violation.

b. Example of combining and grouping violations and establishing correction dates.

All instances of violation of 1910.1018(h)(1)(i) and all associated instances of violation of 1910. 1043(f)(4), (h)(2)(i), (h)(2)(ii) and (h)(2)(iii) are respectively combined. Each of these sets of combined instances of violation are then grouped to form one item of the citation and one penalty is proposed. All instances of violation of 1910.1018(c) are combined to form another item of the citation and another penalty is proposed. Each instance of violation of 1910.1018(h)(1)(i), each instance of violation of 1910.1018(f)(4), (h)(2)(i), (h)(2)(ii) and (h)(2)(iii) that is associated with the 1910.1018(h)(1)(i) violations, and each instance of

violation of 1910.1018(c) is listed on the citation and assigned an individual correction date. Of course, those violations of 1910.1018(h)(1)(i), (f)(4), (h)(2)(i), (h)(2)(ii) and (h)(2)(iii) that belong to the same instance will necessarily have the same correction date.

6. Association between 1910.1018(c) violations, 1910.1018(g)(1) violations and 1910.1018(h) violations.

    a. Where employee exposures to airborne compounds regulated under 1910.1018 are in excess of the permissible exposure limit and all technically feasible engineering and work practice controls as required under 1910.1018(g)(1) have not been instituted as early as possible, then 1910.1018(c) and 1910.1018(g)(1) are all violated regardless of whether or not there is compliance with all the respiratory protection requirements under 1910.1018(h).

    b. If all technically feasible engineering and work practice controls have been or are being instituted as early as possible, but employee exposures remain in excess of the permissible exposure limit, and if the employer is not in compliance with all of the respiratory protection requirements under 1910.1018(h), then 1910.1018(c) is violated. If, in the foregoing circumstance, the employer is in compliance with all the respiratory protection requirements under 1910.1018(h), then 1910.1018(c) is not violated.

7. Correction dates and penalties.

    a. Refer to the FIRM, the Technical Manual, and paragraph (3)(g) of this directive for guidance in establishing correction dates.

    b. Refer to the FIRM for guidance in determining penalties.

8. Follow-up inspection policy.

    After a determination has been made to cite, the Industrial Hygienist must prepare a schedule for follow-up inspection of the cited facility based on the employer's plan of abatement. Where a notice of contest has been filed, refer to the FIRM for guidance. When possible, reinspection visits to the facility should occur shortly after the scheduled implementation of each important step in the abatement plan. The goal of such follow-up inspections is to assess the extent of an employer's compliance with the interim steps set forth in his own abatement plan as well as compliance with correction dates in the citation. This schedule must become part of the file which must carefully record all the details of an employer's compliance under the standard as noted in each reinspection or other contact with the employer.

9. Effective Date

    This directive is effective immediately and will remain in effect until further notice.

History: Issued 4-1-1981 Revised 8-15-2000, 5-9-2017, 9-20-2018

ATTACHMENTS

ATTACHMENT 1

CITATION POLICY FOR INORGANIC ARSENIC

1910.1018	Instructions for grouping	Recommended Classification
(c) Permissible exposure limit	Violations of (c) are not grouped with other violations	S
(e)(1)(i) Exposure monitoring - General	Violations of the general requirements under (e)(1)(i) are not cited alone but instead are cited in conjunction with the joint violations of interrelated specific requirements under (e)(1)(iii), (e)(2), (e)(3), (e)(4), and (e)(6)	
(e)(1)(iii) Exposure monitoring - General	Violations of (e)(1)(iii) infer (e)(2), (e)(3), and/or (e)(4) violations. Violations of (e)(1)(iii) are grouped only with joint (e)(1)(i) violations if any of the employee exposures associated with paragraph (e) violations exceed the permissible exposure limit. Violations of (e)(1)(iii) are grouped with (e)(1)(i), (e)(2), (e)(3), (e)(4), (e)(5), and (e)(6) violations if no employee exposures associated with paragraph (e) violations exceed the permissible exposure limit.	S
(e)(2) Exposure monitoring – Initial monitoring	Violations of (e)(2) are grouped with (e)(1)(i) violations if any employee exposures associated with paragraph (e) violations exceed the permissible exposure limit. Violations of (e)(2) are grouped with (e)(1)(i), (e)(1)(iii), (e)(3), (e)(4), (e)(5) and (e)(6) violations if no employee exposures associated with paragraph (e) violations exceed the permissible exposure limit.	S
(e)(3)(i) Exposure Monitoring - Frequency	(e)(3)(i) is citable only as an adjunct to (e)(4)	
(e)(3)(ii) though (e)(3)(iv)	(e)(3)(ii) through (e)(3)(iv) S (e)(3)(iv) are grouped due to the close relationship. The only additional grouping of these violations is with joint (e)(1)(i) violations if any employee exposures associated with paragraph (e) violations exceed the permissible exposure limit. Violations of (e)(3)(ii) through (e)(3)(iv) are grouped	S

	with (e)(1)(i), (e)(1)(iii), (e)(2), (e)(3)(i), (e)(4), (e)(5), and (e)(6) violations if no employee exposures associated with paragraph (e) violations exceed the permissible limit.	
(e)(4) Exposure monitoring – Additional monitoring	Violations of (e)(4) are grouped only with joint (e)(1)(i) violations and joint (e)(3)(i) violations if any employee exposures associated with paragraph (e) violations exceed the permissible exposure limit. Violations of (e)(4) are grouped with (e)(1)(i), (e)(1)(iii), (e)(2), (e)(3), (e)(5), and (e)(6) violations if no employee exposures associated with paragraph (e) violations exceed the permissible exposure limit.	S
(e)(5) Exposure monitoring – Employee notification	Exposure Violations of (e)(5)(i) and (e)(5)(ii) are grouped due to the close relationship. Failure to perform any of the monitoring notification required under (e)(2), (e)(3) and (e)(4) is tantamount to violation of (e)(5). Violations of (e)(5) are not grouped with other violations if any employee exposures associated with paragraph (e) violations exceed the permissible exposure limit. Violations of (e)(5) are grouped with (e)(1)(i), (e)(1)(iii), (e)(2), (e)(3), (e)(4), and (e)(6) violations if no employee exposures associated with paragraph (e) violations exceed the permissible exposure limit. The (e)(5) violations should be classified as "other" when no employee exposures associated with the violations exceed the action level if one of the following conditions exists: Only (e)(5) of paragraph (e) is violated; or it is inappropriate, as established in the third sentence, to group (e)(5) violations with other paragraph (e) violations.	S
(e)(6) Exposure monitoring – Accuracy of measurement	Violations of (e)(6) infer (e)(2), (e)(3) and/or (e)(4) violations. Violations of (e)(6)(i) and (e)(6)(ii) are grouped due to the close relationship. The only additional grouping of (e)(6) violations is with joint (e)(1)(i) violations if any of the employee	S

	exposures associated with paragraph (e) violations exceed the permissible exposure limit. There is additional grouping of (e)(6) violations with (e)(1)(i), (e)(1)(iii), (e)(2), (e)(3), (e)(4), and (e)(5) violations if no employee exposures associated with paragraph (e) violations exceed the permissible exposure limit.	
(f)(1) Regulated area – Establishment	Violations of (f)(1) are not grouped with other violations	S
(f)(2) Regulated area – Demarcation	Violations of (f)(2) are not grouped with other violations	S
(f)(3) Regulated area – Access	Violations of (f)(3) are not grouped with other violations	S
(f)(4) Regulated area – Provision of respirators	Violations of (f)(4) that are joint violations of (h)(1)(i) are grouped with (h)(1)(i) violations and associated (h)(3) violations	S
	Violations of (f)(4) that are joint violations of (h)(1)(ii) are grouped with (h)(1)(ii) violations and associated (h)(3) violations	
	Violations of (f)(4) that are joint violations of (h)(1)(iii) and (g)(1)(ii) are grouped with (h)(1)(iii) and (g)(1)(ii) violations and associated (h)(3) violations	
	Violations of (f)(4) that are joint violations of (h)(1)(iv) are grouped with (h)(1)(iv) violations and associated (h)(3) violations	
	Violations of (f)(4) that are not joint violations of (h)(1)(i) are grouped with associated (h)(3) violations	
(f)(5) Regulated area-- Prohibited activities.	Violations of (f)(5) are not grouped with other violations.	S
(g)(1)(i) and (g)(1)(ii) Methods of compliance – Controls (engineering and work practice controls requirements).	Violations of the engineering and work practice controls requirements under (g)(1)(i) and (g)(1)(ii) are grouped due to the close relationship. There is no additional grouping of these violations.	S
(g)(1)(ii) Methods of compliance – requirement Controls (respiratory protection requirement).	Violations of the respiratory protection requirement under (g)(1)(ii) are grouped with (h)(1)(iii) violations, joint (f)(4) violations and associated (h)(2)(i) violations.	S

(g)(1)(ii) Methods of compliance – Controls (other personal protective requirement).	The general requirement under (g)(1)(ii) to use other necessary personal protective equipment is interrelated with specific personal protective requirements under (j)(1). When the aforementioned (g)(1)(ii) requirement is violated, either all or part of (j)(1)(i) through (j)(1)(iii) or (j)(1)(iv) are jointly violated. Therefore, individual violations of this (g)(1)(ii) requirement are not cited alone but instead are cited either in conjunction with joint violations of (j)(1)(iv). These joint violations are grouped with associated (m)(6) violations.	
(g)(2)(i) and (g)(2)(iii) Methods of compliance – Compliance program.	Violations of (g)(2)(i) and (g)(2)(iii) are grouped due to the close relationship. There is no additional grouping of these violations.	S
(g)(2)(ii) Methods of compliance – Compliance program.	Violations of (g)(2)(ii)(A) through (g)(2)(ii)(G) are grouped due to the relationship. The (g)(2)(ii) violations are grouped in turn with (g)(2)(iv) violations.	S
(g)(2)(iv) Methods of compliance – Compliance.	Violations of (g)(2)(iv) are grouped with (g)(2)(ii) violations.	S
(h)(1)(i) Respiratory protection – General.	Violations of (h)(1)(i) are grouped with joint (f)(4) violations and with associated (h)(2)(i) violations.	S
(h)(2)(i) – Respirator program.	Violations of h(2)(i) are grouped with joint (f)(4) violations and associated (h)(1)(i) violations	S
(j)(1)(i) through (j)(1)(iii) Protective work clothing and equipment – Provision and use.	Violations of (j)(1)(i) through (j)(1)(iii) are grouped due to the close relationship. These clothing violations are grouped in turn with joint violations of the requirement and under (g)(1)(ii) to use other necessary personal protective equipment and with associated violations of (m)(6).	S
(j)(1)(iv) Protective work clothing and equipment –Provision and use.	Violations of (j)(1)(iv) are grouped with joint violations of the requirement under (g)(1)(ii) to use other necessary personal protective equipment and with associated violations of (m)(6).	S
(j)(2)(i) through (j)(2)(iii) Protective work clothing and	Violations of (j)(2)(i) through (j)(2)(iii) are grouped due to the close relationship. There is no additional grouping of these	S

equipment – Cleaning and replacement.	violations.	
(j)(2)(iv) Protective clothing and equipment – Cleaning and replacement.	Violations of (j)(2)(iv) are not grouped with other violations.	S
(j)(2)(v) Protective work clothing and equipment – Cleaning and replacement.	Violations of (j)(2)(v) are not grouped with other violations.	S
(j)(2)(vi) Protective work clothing and equipment – Cleaning and replacement.	Violations of (j)(2)(vi) are not grouped with other violations.	S
(j)(2)(vii) Protective work clothing and equipment – Cleaning and replacement.	Violations of (j)(2)(vii) are not grouped with other violations.	S
(j)(2)(viii) Protective work clothing and equipment – Cleaning and replacement.	Violations of (j)(2)(viii) are not grouped with other violations.	S
(k)(l) Housekeeping – Surfaces.	Violations of (k)(1) are not grouped with other violations.	S
(k)(2) Housekeeping – Cleaning floors.	Violations of (k)(2) are not grouped with other violations.	S
(k)(3) Housekeeping – Vacuuming.	Violations of (k)(3) are not grouped with other violations.	S
(k)(4) Housekeeping – Housekeeping plan.	Violations of (k)(4) are not grouped with other violations.	S
(k)(5) Housekeeping – Maintenance of equipment.	Violations of (k)(5) are not grouped with other violations.	S
(m)(1) Hygiene facilities and practices – Change rooms.	Violations of (m)(1) are not grouped with other violations.	S
(m)(3) Hygiene facilities and practices – Lunchrooms.	Violations of (m)(3) are not grouped with other violations	S
(m)(5) Hygiene facilities and practices – Vacuuming clothes.	Violations of (m)(5) are not grouped with other violations	S
(m)(6) Hygiene facilities and practices –Avoidance of skin irritation.	Violations of (m)(6) that are associated with violations of all or part of (j)(1)(i) through (j)(1)(iii) are grouped with these violations and with associated violations	S

	of the requirement under (g)(1)(ii) to use other necessary personal protective equipment. Violations of (m)(6) that are associated with violations of (j)(1)(iv) are grouped with (j)(1)(iv) violations and with associated violations of the requirement under (g)(1)(ii) to use other necessary personal protective equipment.	
(n)(1)(i) Medical surveillance – General – Employees covered.	Violations of the general requirements under (n)(1)(i) are not cited alone but instead are cited in conjunction with the joint violations of the interrelated specific requirements under the rest of paragraph (n).	
(n)(1)(ii) Medical surveillance – General – Examination by physician.	Violations of (n)(1)(ii) are grouped with joint (n)(1)(i) violations.	S
(n)(2) Medical surveillance – Initial examinations.	Violations of (n)(2)(i) through (n)(2)(ii)(D) are grouped due to the close relationship. These violations are grouped in turn with joint (n)(1)(i) violations.	S
(n)(3) Medical surveillance – Periodic examinations.	Violations of (n)(3)(i) through (n)(3)(iii) are grouped due to the close relationship. These violations are grouped in turn with joint (n)(1)(i) violations.	S
(n)(4) Medical surveillance – Additional examinations.	Violations of (n)(4) are grouped with joint (n)(1)(i) violations.	S
(n)(5) Medical surveillance – Information provided to the physician	Violations of (n)(5)(i) through (n)(5)(v) are grouped due to the close relationship. These violations are grouped in turn with joint (n)(1)(i) violations.	S
(n)(6) Medical surveillance – Physician's written opinion	Violations of (n)(6)(i) through (n)(6)(iii) are grouped due to the close relationship. These violations are grouped in turn with joint (n)(1)(i) violations.	S
(o)(1) Employee information and training – Training program.	Violations of (o)(1) through (o)(1)(ii)(F) are grouped due to the close relationship. There is not further grouping of (o)(1) violations.	S
(o)(2)(i) Employee information and	Violations of (o)(2)(i) are not grouped with other violations.	O

training – Access to training materials.		
(o)(2)(ii) Employee information and training – Access to training materials.	Violations of (o)(2)(ii) are not grouped with other violations.	O
(p)(1)(i) Signs and labels-- General.	Do not cite (p)(1)(i)	
(p)(1)(ii) Signs and labels – General.	Violations of (p)(1)(ii) that relate to (p)(2)(i) are grouped with (p)(2)(i) violations; violations of (p)(1)(ii) that relate to (p)(3) are grouped with (p)(3) violations.	S
(p)(2)(i) Signs and labels – Signs.	Violations of (p)(2)(i) are grouped with related (p)(1)(ii) violations.	S
(p)(2)(ii) Signs and labels – Signs.	Violations of (p)(2)(ii) are not grouped with other violations.	S
(p)(3) Signs and labels – Labels.	Violations of (p)(3) are not grouped with other violations.	S
(q)(1)(i) through (q)(1)(ii)(E) Recordkeeping – Exposure monitoring	Violations of (q)(1)(i) through (q)(1)(ii)(E) are grouped due to the close relationship. There is no additional grouping of these violations.	O
(q)(1)(iii) Recordkeeping – Exposure monitoring	Violations of (q)(1)(iii) are not grouped with other violations.	O
(q)(2)(i) through (q)(2)(iii)(H) Recordkeeping – Medical surveillance.	Violations of (q)(2)(i) through (q)(2)(iii)(H) are grouped due to the close relationship. There is no additional grouping of these violations.	O
(q)(2)(iv) Recordkeeping – Medical surveillance.	Violations of (q)(2)(iv) are not grouped with other violations.	O
(q)(3)(i) Recordkeeping – Availability	Violations of (q)(3)(i) are not grouped with other violations.	O
(q)(3)(ii) Recordkeeping – Availability	Violations of (q)(3)(ii) are not grouped with other violations.	O
(q)(3)(iii) Recordkeeping – Availability	Violations of (q)(3)(iii) are not grouped with other violations.	O
(q)(4)(ii) Recordkeeping – Transfer of records.	Violations of (q)(4)(ii) are not grouped with other violations. Violations of (q)(4)(ii) cannot occur before the employer ceases to do business. When (q)(4)(ii) is violated, a citation is issued	O

	for intent of retrieving the records.	
(r)(1) Observation of monitoring – Employee observation.	Violations of (r)(1) are not grouped with other violations.	O
(r)(2)(i) Observation of monitoring – Observation procedures.	Violations of (r)(2)(i) are not grouped with other violations.	S
(r)(2)(ii) Observation of monitoring – Observation procedures.	Violations of (r)(2)(ii)(A) through (r)(2)(ii)(C) are grouped due to the close relationship There is no additional grouping of (r)(2)(ii) violations.	O

1910.1018 INSTRUCTIONS FOR GROUPING RECOMMENDED
ATTACHMENT 2

Industry Profile

1. Introduction

This attachment lists some types of establishments where the potential for exposure to airborne arsenic and arsenic-containing, inorganic compounds exist. The information is intended to afford regional and area offices assistance in programming inspections to assess compliance with 1910.1018. The inspections need not be restricted to the types of establishments listed if the Field Offices have knowledge of other relevant establishments.

2. Some Types of Establishments Where Exposure to Arsenic and/or Arsenic-Containing, Inorganic Compounds Occur

a. Primary copper, lead, zinc and gold smelters.

b. Secondary lead and copper smelters.

c. Loaders and unloaders of carriers of bulk arsenic ore and bulk arsenicals. Carriers involved are as follows:

(1) Sea freighters.

(2) Railcars.

(3) Highway bulk carriers.

d. Manufacturers of arsenical herbicides. Some examples of these products are as follows:

(1) Sodium arsenite.

(2) Monosodium methylarsonate (MSMA).

(3) Disodium methylarsonate (DSMA).

(4) Dimethylarsinic acid (cacodylic acid).

e. Manufacturers of arsenical pesticides. Some examples of these products are as follows:

(1) Calcium arsenate.

(2) Copper acetoarsenite (Paris green).

(3) Magnesium arsenate

(4) Sodium arsenite

(5) Zinc arsenate

(6) Zinc arsenite

(7) Zinc fluoroarsenate

f. Manufacturers of desiccants.

Example: Orthoarsenic acid.

g. Manufacturers of wood preservatives.

Some examples of these products are as follows:

(1) Ammoniacal copper arsenite

(2) Chromated copper arsenate.

(3) Mixture of chlorinated arsenate, fluoride and phenolic salts in aqueous solution.

(4) Zinc-chromium arsenate

(5) Copperized zinc-chromium arsenate

(6) Fluorochrome arsenate phenol

h. Manufacturers of feed additives.

Some examples of these products are as follows:

(1) Arsenic acid.

(2) 3-Nitro-4-hydroxyphenylarsonic acid.

(3) 4-Nitrophenylarsonic acid.

(4) 4-Ureido-1-phenylarsonic acid.

i. Manufacturers of pharmaceuticals for use in veterinary medicine.

Some examples of these products are as follows:

(1) Acetarsamide

(2) Carbarsone.

(3) Dichlorophenarsine.

(4) Lead arsenate

(5) Melarsonyl.

(6) Neoarsphenamine

(7) Thiacetarsamide (Caparsolate).

j. Manufacturers of glass that use arsenic trioxide as a refining agent and a decolorizer.

k. Manufacturers of alloys of nonferrous metals and arsenic. Some examples of products manufactured from these alloys are as follows:

(1) Lead shot.

(2) Cable sheathing (lead and arsenic).

(3) Battery grids (lead and arsenic).

(4) Battery electrodes (lead and arsenic).

(5) Speculum metal.

(6) Boiler tubes (Copper and arsenic).

(7) Arsenic bronze.

(8) Special solders such as used on body joints and seams in the automobile industry.

(9) Arsenic brass.

(10) Arsenical Babbitt.

l. Users of solders that contain arsenic as a component in the alloy.

Example: Automobile and truck body manufacturers.

m. Manufacturers and/or users of arsenic-based flotation reagents.

n. Miscellaneous.

Arsenic and/or arsenic-containing, inorganic compounds are used in each of the following types of establishments. However, every employer does not necessarily use them.

(1) Leather tanneries.

(2) Manufacturers of ceramics and ceramic or vitreous enamel.

(3) Manufacturers of analine colors.

(4) Manufacturers of pyrotechnics.

(5) Manufacturers of semiconductors.