

MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

DIRECTOR'S OFFICE

OCCUPATIONAL HEALTH STANDARDS

Filed with the Secretary of State on December 15, 2015

These rules become effective immediately upon filing with the Secretary of State unless adopted under section 33, 44, or 45a(6) of 1969 PA 306. Rules adopted under these sections become effective 7 days after filing with the Secretary of State.

(By authority conferred on the director of the department of licensing and regulatory affairs by sections 14 and 24 of 1974 PA 154, MCL 408.1014 and 408.1024; and Executive Reorganization Orders Nos. 4996-4, 1996-2, 2003-1, 2008-4, and 2011-4, MCL 330.3104, 445.2001, 445.2011, 445.2025 and 445.2030)

R 325.52902, R 325.52904, R 325.52905, R 325.52906, and R 325.52907 of the Michigan Administrative Code are amended, R 325.52909, R 325.52910, R 325.52911, R 325.52912, R 325.52913, R 325.52920, R 325.52921, R 325.52922, R 325.52923, R 325.52924, R 325.52925, R 325.52926, R 325.52927, R 325.52930, and R 325.52931 are added, and R 325.52908 is rescinded as follows:

PART 529. WELDING, CUTTING, AND BRAZING

R 325.52902 Adopted and referenced standards.

Rule 2. (1) The American welding society standard/ANSI standard Z49.1 "**Safety In Welding and Cutting and Allied Processes,**" ~~safety in welding and cutting and allied processes~~, 1967 edition, is adopted by reference in these rules. This standard is available from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado, 80112, USA, telephone number: 1-800-854-7179 or via the internet at website: <http://global.ihs.com>; at a cost of \$96.00 as of the time of adoption of these rules.

(2) The United States department of health and human services, **C.F.R. Title title 42, chapter I—Public Health Service, Part 84—“Approval of Respiratory Protective Devices,” 42 C.F.R. §§ 84.1 to 84.1158 (2012)**, ~~public health service, part 84—approval of respiratory protective devices~~ is adopted by reference in these rules and is available for no cost at: www.ecfr.gov. ~~http://www.access.gpo.gov/nara/cfr/waisidx_09/42cfr84_09.html~~. **It is also available at the National Institute for Occupational Safety and Health (NIOSH) at www.cdc.gov/niosh/regulations.html.**

(3) The standards adopted **by reference in these rules** ~~in subrules (1) and (2) of this rule~~ are also available for inspection at the Department of Licensing and Regulatory Affairs, **MIOSHA Regulatory Services Standards Section**, 7150 Harris Drive, ~~P.O. Box 30643~~, Lansing, Michigan, 48909-8143.

(4) **The standards adopted by reference in these rules may be obtained from the publisher or may be obtained from the Department of Licensing and Regulatory Affairs, MIOSHA Regulatory Services Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143, at the cost charged in this rule, plus \$20.00 for shipping and handling.** ~~The following Michigan occupational safety and health standards are referenced in these rules. Up to 5 copies of these standards may be obtained at no charge from the Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143 or via the internet at website: www.michigan.gov/mioshastandards. For quantities greater than 5, the cost, as of the time of adoption of these rules, is 4 cents per page.~~

~~(a) General industry safety standard part 12 “Welding and Cutting,” R 408.11201 to R 408.11299.~~

~~(b) Occupational health standard part 301 “Air Contaminants,” R 325.51101 to R 325.51108.~~

~~(c) Occupational health standard part 381 “Ionizing Radiation,” R 325.60601a to R 325.60618.~~

(5) **The following Michigan occupational safety and health standards are referenced in these rules. Up to 5 copies of these standards may be obtained at no charge from the Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143 or via the internet at website: www.michigan.gov/mioshastandards. For quantities greater than 5, the cost, as of the time of adoption of these rules, is 4 cents per page.**

(a) General Industry Safety Standard Part 12 “Welding and Cutting,” R 408.11201 to R 408.11299.

(b) Occupational Health Standard Part 301 “Air Contaminants for General Industry,” R 325.51101 to R 325.51108.

(c) Occupational Health Standard Part 381 “Ionizing Radiation,” R 325.60601a to R 325.60618.

(d) Occupational Health Standard Part 430 “Hazard Communication,” R 325.77001 to R 325.77003.

R 325.52904 Operation and maintenance.

Rule 4. Workers assigned to operate or maintain arc welding equipment shall be familiar with the requirements of ~~general industry safety standard part~~ **General Industry Safety Standard Part 12** "Welding and Cutting," as referenced in **R 325.52902**. ~~325.52903, and R 325.52906 and R 325.52907 of this standard.~~

R 325.52905 Flash welding equipment.

Rule 5. (1) Flash welding machines shall be equipped with a hood to control flying flash. In cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, ventilation shall be ~~provided~~ in accordance with R 325.52907 **to R 325.52927** of this standard.

(2) Additional safety requirements for flash welding machines are contained in ~~general industry safety standard part~~ **General Industry Safety Standard Part 12** "Welding and Cutting," ~~R 408.11284 Flash Welding,~~ as referenced in **R 325.52902**. ~~325.52903.~~

R 325.52906 Protection of personnel **in confined spaces**.

Rule 6. Work in confined spaces **shall comply with all of the following:**

(a) As used in this standard, confined space is intended to mean a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment of a ship.

(b) ~~Ventilation.~~ Ventilation is a prerequisite to work in confined spaces. For ventilation requirements see R 325.52907 **to R 325.52927** of this standard.

(c) Additional safety requirements for working in confined spaces are contained in ~~general industry safety standard part~~ **General Industry Safety Standard Part 12** "Welding and Cutting," ~~R 408.11213 Working in Confined Spaces,~~ as referenced in **R 325.52902**. ~~325.52903.~~

R 325.52907 Health protection and ventilation.

Rule 7. (1) ~~General.~~ (a) Contamination. The requirements in this rule are based on the following ~~3~~ factors in arc and gas welding which govern the amount of contamination to which welders may be exposed:

(a)(i) Dimensions of space in which welding is to be done, (with special regard to height of ceiling).

(b)(ii) Number of welders.

(c)(iii) Possible evolution of hazardous fumes, gases, or dust according to the metals involved.

(2)(b) Screens. When welding must be performed in a space entirely screened on all sides, the screens shall be arranged so that no serious restriction of ventilation exists. It is desirable to have the screens mounted so that they are about 2 feet (0.61 m) above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.

(3)(c) Maximum allowable concentration. Local exhaust or general ventilating systems shall be provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in ~~occupational health standard part~~ **Occupational Health Standard Part 301** "Air Contaminants for **General Industry**," as referenced in **R 325.52902**. ~~325.52903.~~

(d) Precautionary labels. A number of potentially hazardous materials are employed in fluxes, coatings, coverings, and filler metals used in welding and cutting or are released to the atmosphere during welding and cutting. These include, but are not limited to, the materials itemized in subrules (5) to (12) of this rule. The suppliers of welding materials shall determine the hazard, if any, associated with the use of their materials in welding, cutting, and other uses. All of the following shall contain notices:

(i) All filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

CAUTION

~~Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. Use adequate ventilation. See ANSI Z49.1-1967 Safety in Welding and Cutting published by the American Welding Society.~~

(ii) ~~Brazing, also known as welding, filler metals containing cadmium in significant amounts shall carry the following notice on tags, boxes, or other containers:~~

WARNING

CONTAINS CADMIUM--POISONOUS FUMES MAY BE FORMED ON HEATING

~~Do not breathe fumes. Use only with adequate ventilation such as fume collectors, exhaust ventilators, or air-supplied respirators. See ANSI Z49.1-1967.~~

~~If chest pain, cough, or fever develops after use, call physician immediately.~~

(iii) ~~Brazing and gas welding fluxes containing fluorine compounds shall have a cautionary wording to indicate that they contain fluorine compounds. One such cautionary wording recommended by the American welding society for brazing and gas welding fluxes reads as follows:~~

**CAUTION
CONTAINS FLUORIDES**

This flux when heated gives off fumes that may irritate eyes, nose, and throat.

1. Avoid fumes--use only in well-ventilated spaces.
2. Avoid contact of flux with eyes or skin.
3. Do not take internally.

(2) Ventilation for general welding and cutting:

(a) General. The following mechanical ventilation shall be provided when welding or cutting is done on metals not covered in subrules (5) to (12) of this rule. For specific materials, see the ventilation requirements of subrules (5) to (12) of this rule.

(i) In a space of less than 10,000 cubic feet (284 m³) per welder.

(ii) In a room having a ceiling height of less than 16 feet (5 m).

(iii) In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.

(b) Minimum rate. Such ventilation shall be at the minimum rate of 2,000 cubic feet (57 m³) per minute per welder, except where local exhaust hoods and booths under subrule (3) of this rule, or airline respirators approved by the national institute for occupational safety and health (NIOSH) under C.F.R. 42, part 84, as adopted by reference in R 325.52903 for such purposes are provided. Natural ventilation is considered sufficient for welding or cutting operations where the restrictions in subrule (2)(a) of this rule are not present.

(3) Local exhaust hoods and booths. Mechanical local exhaust ventilation may be by means of either of the following:

(a) Hoods. Freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of airflow sufficient to maintain a velocity in the direction of the hood of 100 linear feet (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3-inch (7.6 cm) wide flanged suction opening are shown in the following table:

Welding zone (inches from arc or torch)	Minimum airflow ¹ (cubic feet/minute)	Duct diameter (inches ²)
4 to 6	150	3
6 to 8	275	3 1/2
8 to 10	425	4 1/2
10 to 12	600	5 1/2
¹ When brazing with cadmium-bearing materials or when cutting on such materials, increased rates of ventilation may be required.		
² Nearest half-inch duct diameter based on 4,000 feet per minute velocity in pipe.		

(b) Fixed enclosure. A fixed enclosure with a top and not less than 2 sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet (30 m) per minute.

(4) Ventilation in confined spaces:

(a) Air replacement. All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All air replacing the ventilated air withdrawn shall be clean and respirable.

(b) Airline respirators. In circumstances for which it is impossible to provide such ventilation, airline respirators or hose masks approved for this purpose by NIOSH under C.F.R. 42, part 84, as adopted by reference in R 325.52903, shall be used.

(c) Self-contained units. In areas immediately hazardous to life, a full-facepiece, pressure-demand, self-contained breathing apparatus or a combination full-facepiece, pressure-demand supplied-air respirator with an auxiliary, self-contained air supply approved by NIOSH under C.F.R. 42, part 84, as adopted by reference in R 325.52903, shall be used.

(d) Outside helper. Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, hose masks with blowers or self-contained breathing equipment approved by the mine safety and health administration and NIOSH, a worker shall be stationed on the outside of such confined spaces to ensure the safety of those working within.

(e) Oxygen for ventilation. Oxygen shall not be used for ventilation.

~~(5) Fluorine compounds.~~~~(a) General. In confined spaces, welding or cutting involving fluxes, coverings, or other materials which contain fluorine compounds shall be done in accordance with subrule (4) of this rule. A fluorine compound is one that contains fluorine as an element in chemical combination, not as a free gas.~~~~(b) Maximum allowable concentration. The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, protection is desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that fluorides liberated are below the maximum allowable concentration, such protection is not necessary.~~~~(6) Zinc.~~~~(a) Confined spaces. In confined spaces, welding or cutting involving zinc-bearing base or filler metals or metals coated with zinc-bearing materials shall be done in accordance with subrule (4) of this rule.~~~~(b) Indoors. Indoors, welding or cutting involving zinc-bearing base or filler metals coated with zinc-bearing materials shall be done in accordance with subrule (3) of this rule.~~~~(7) Lead.~~~~(a) Confined spaces. In confined spaces, welding involving lead-base metals, erroneously called lead-burning, shall be done in accordance with subrule (4) of this rule.~~~~(b) Indoors. Indoors, welding involving lead-base metals shall be done in accordance with subrule (3) of this rule.~~~~(c) Local ventilation. In confined spaces or indoors, welding or cutting operations involving metals containing lead, other than as an impurity, or metals coated with lead-bearing materials, including paint, shall be done using local exhaust ventilation or airline respirators. Such operations, when done outdoors, shall be done using respirators approved for this purpose by NIOSH under C.F.R. 42, part 84, as adopted by reference in R 325.52903. In all cases, workers in the immediate vicinity of the cutting operation shall be protected by local exhaust ventilation or airline respirators.~~~~(8) Beryllium. Welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by occupational health standard part 301 "Air Contaminants," as referenced in R 325.52903. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.~~~~(9) Cadmium.~~~~(a) General. In confined spaces or indoors, welding or cutting operations involving cadmium-bearing or cadmium-coated base metals shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by occupational health standard part 301 "Air Contaminants," as referenced in R 325.52903. Such operations, when done outdoors, shall be done using respirators, such as fume respirators, approved for this purpose by NIOSH under C.F.R. 42, part 84, as adopted by reference in R 325.52903.~~~~(b) Confined space. Welding, also known as brazing, involving cadmium-bearing filler metals shall be done using ventilation as prescribed in subrule (3) or (4) of this rule if the work is to be done in a confined space.~~~~(10) Mercury. In confined spaces or indoors, welding or cutting operations involving metals coated with mercury-bearing materials including paint, shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by occupational health standard part 301 "Air Contaminants," as referenced in R 325.52903. Such operations, when done outdoors, shall be done using respirators approved for this purpose by NIOSH under C.F.R. 42, part 84, as adopted by reference in R 325.52903.~~~~(11) Cleaning compounds.~~~~(a) Manufacturer's instructions. In the use of cleaning materials, because of their possible toxicity or flammability, appropriate precautions such as manufacturers' instructions shall be followed.~~~~(b) Degreasing. Degreasing or other cleaning operations involving chlorinated hydrocarbons shall be located so that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation. In addition, trichloroethylene and perchloroethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.~~~~(12) Cutting of stainless steels. Oxygen cutting, using either a chemical flux or iron powder or gas-shielded arc cutting of stainless steel, shall be done using mechanical ventilation adequate to remove the fumes generated.~~~~(13) First-aid equipment. First-aid equipment shall be available at all times. All injuries shall be reported as soon as possible for medical attention. First-aid shall be rendered until medical attention is provided.~~**R 325.52908 Industrial applications. Rescinded.****Rule 1. (1) Transmission pipeline.****(a) General. The requirements of R 325.52906 and R 325.52907 of this standard and general industry safety standard part 12 "Welding and Cutting," R 408.11271 to R 408.11276 arc welding and cutting, as referenced in R 325.52903, shall be observed.****(b) Field shop operations. Where field shop operations are involved for fabrication of fittings, river crossing, road crossings, and pumping and compressor stations, the requirements of general industry safety standard part 12 "Welding and Cutting," as referenced in R 325.52903, R 325.52906, and R 325.52907 of this standard shall be observed.**

~~(c) X-ray inspection. Requirements for X-ray inspections are contained in occupational health standard part 381 "Ionizing Radiation," R 325.60618, as referenced in R 325.52903.~~

~~(2) Mechanical piping systems.~~

~~(a) General. The requirements of general industry safety standard part 12 "Welding and Cutting," as referenced in R 325.52903, R 325.52906, and R 325.52907 of this standard shall be observed.~~

~~(b) X-ray inspection. Requirements for X-ray inspections are contained in occupational health standard part 381 "Ionizing Radiation," R 325.60618, as referenced in R 325.52903.~~

R 325.52909 Hazard communication.

Rule 9. (1) An employer shall include the potentially hazardous materials employed in fluxes, coatings, coverings, and filler metals, all of which are potentially used in welding and cutting, or are released to the atmosphere during welding and cutting, in the program established to comply with Occupational Health Standard Part 430 "Hazard Communication," as referenced in R 325.52902.

(2) An employer shall ensure that each employee has access to labels on containers of these materials and safety data sheets, and is trained pursuant to Occupational Health Standard Part 430 "Hazard Communication," as referenced in R 325.52902. Potentially hazardous materials shall include, but not be limited to, the materials itemized in R 325.52913 to R 325.52926.

(3) Additional considerations for hazard communication in welding, cutting, and brazing are as follows:

(a) Suppliers shall determine and shall label any hazards associated with the use of their materials in welding, cutting, and brazing pursuant to the Occupational Health Standard Part 430 "Hazard Communication," as referenced in R 325.52902.

(b) In addition to any requirements imposed by Occupational Health Standard Part 430 "Hazard Communication," as referenced in R 325.52902, all filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

**Do not use in areas without adequate ventilation.
See ANSI Z49.1- 1967 Safety in Welding, Cutting, and Allied Processes
published by the American Welding Society.**

(c) Where brazing or welding filler metals contain cadmium in significant amounts, the labels shall indicate the hazards associated with cadmium including cancer, lung and kidney effects, and acute toxicity effects.

(d) Where brazing and gas welding fluxes contain fluorine compounds, the labels shall indicate the hazards associated with fluorine compounds including eye and respiratory tract effects.

(4) Prior to June 1, 2015, employers may include the following information on labels in lieu of the labeling requirements in subrule (3) of this rule:

(a) All filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

CAUTION
Welding may produce fumes and gases hazardous to health.
Avoid breathing these fumes and gases. Use adequate ventilation.
See ANSI Z49.1-1967 Safety in Welding and Cutting
published by the American Welding Society.

(b) Brazing (welding) filler metals containing cadmium in significant amounts shall carry the following notice on tags, boxes, or other containers:

WARNING
CONTAINS CADMIUM--POISONOUS FUMES MAY BE FORMED ON HEATING
Do not breathe fumes.
Use only with adequate ventilation such as fume collectors, exhaust ventilators,
or air-supplied respirators.
See ANSI Z49.1-1967.
If chest pain, cough, or fever develops after use call physician immediately.

(c) Brazing and gas welding fluxes containing fluorine compounds shall have a cautionary wording to indicate that they contain fluorine compounds. Cautionary wording recommended by the American Welding Society for brazing and gas welding fluxes reads as follows:

<p>CAUTION CONTAINS FLUORIDES</p> <p>This flux when heated gives off fumes that may irritate eyes, nose, and throat.</p> <ol style="list-style-type: none"> 1. Avoid fumes--use only in well-ventilated spaces. 2. Avoid contact of flux with eyes or skin. 3. Do not take internally.
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R 325.52910 Ventilation for general welding and cutting.

Rule 10. (1) An employer shall ensure that mechanical ventilation is provided when welding or cutting is done on metals, not covered in R 325.52913 to R 325.52926, at any of the following:

- (a) In a space of less than 10,000 cubic feet (284 m⁽³⁾) per welder.
- (b) In a room having a ceiling height of less than 16 feet (5 m).
- (c) In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.

(2) For specific materials, see the ventilation requirements of R 325.52913 to R 325.52926.

(3) Minimum rate. The ventilation shall be at the minimum rate of 2,000 cubic feet (57 m⁽³⁾) per minute per welder, except where local exhaust hoods and booths under R 325.52911 or airline respirators approved by the national institute for occupational safety and health (NIOSH) under C.F.R. Title 42, Part 84, as adopted by reference in R 325.52902, for such purposes are provided. Natural ventilation is considered sufficient for welding or cutting operations where the restrictions in subrule (1) of this rule are not present.

R 325.52911 Local exhaust hoods and booths.

Rule 11. Mechanical local exhaust ventilation may occur by means of either of the following:

(a) Hoods. Freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of airflow sufficient to maintain a velocity in the direction of the hood of 100 linear feet (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3-inch (7.6 cm) wide flanged suction opening are shown in Table 1.

(b) Fixed enclosure. A fixed enclosure with a top and not less than 2 sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet (30 m) per minute.

TABLE 1		
Welding zone (inches from arc or torch)	Minimum airflow ¹ (cubic feet/minute)	Duct diameter (inches ²)
4 to 6	150	3
6 to 8	275	3 1/2
8 to 10	425	4 1/2
10 to 12	600	5 1/2
¹ When brazing with cadmium-bearing materials or when cutting on such materials, increased rates of ventilation may be required.		
² Nearest half-inch duct diameter based on 4,000 feet per minute velocity in pipe.		

R 325.52912 Ventilation in confined spaces.

Rule 12. (1) Air replacement. All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This subrule applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All air replacing the ventilated air withdrawn shall be clean and respirable.

(2) Airline respirators. In circumstances for which it is impossible to provide such ventilation, airline respirators or hose masks approved for this purpose by NIOSH under C.F.R. Title 42, Part 84, as adopted by reference in R 325.52902, shall be used.

(3) Self-contained units. In areas immediately hazardous to life, a full-facepiece, pressure-demand, self-contained breathing apparatus or a combination full-facepiece, pressure-demand supplied-air respirator with an auxiliary, self-contained air supply approved by NIOSH under C.F.R. Title 42, Part 84, as adopted by reference in R 325.52902, shall be used.

(4) Outside helper. Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, hose masks with blowers or self-contained breathing equipment approved by the mine safety and health administration and NIOSH, a worker shall be stationed on the outside of such confined spaces to ensure the safety of those working within.

(5) Oxygen for ventilation. Oxygen shall not be used for ventilation.

R 325.52913 Fluorine compounds.

Rule 13. (1) In confined spaces, welding or cutting involving fluxes, coverings, or other materials which contain fluorine compounds shall be done in accordance with R 325.52912. A fluorine compound is a compound that contains fluorine as an element in chemical combination, not as a free gas.

(2) Maximum allowable concentration. The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, protection is desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that fluorides liberated are below the maximum allowable concentration, such protection is not necessary.

R 325.52920 Zinc.

Rule 20. (1) In confined spaces, welding or cutting involving zinc-bearing base or filler metals or metals coated with zinc-bearing materials shall be done in accordance with R 325.52912.

(2) Indoors. Indoors, welding or cutting involving zinc-bearing base or filler metals coated with zinc-bearing materials shall be done in accordance with R 325.52911.

R 325.52921 Lead.

Rule 21. (1) In confined spaces, welding involving lead-base metals, erroneously called lead-burning, shall be done in accordance with R 325.52912.

(2) Indoors. Indoors, welding involving lead-base metals shall be done in accordance with R 325.52911.

(3) Local ventilation. In confined spaces or indoors, welding or cutting operations involving metals containing lead, other than as an impurity, or metals coated with lead-bearing materials, including paint, shall be done using local exhaust ventilation or airline respirators. Such operations, when done outdoors, shall be done using respirators approved for this purpose by NIOSH under C.F.R. Title 42, Part 84, as adopted by reference in R 325.52902. In all cases, workers in the immediate vicinity of the cutting operation shall be protected by local exhaust ventilation or airline respirators.

R 325.52922 Beryllium.

Rule 22. Welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by Occupational Health Standard Part 301 "Air Contaminants for General Industry," as referenced in R 325.52902. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.

R 325.52923 Cadmium.

Rule 23. (1) In confined spaces or indoors, welding or cutting operations involving cadmium-bearing or cadmium-coated base metals shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by Occupational Health Standard Part 301 "Air Contaminants for General Industry," as referenced in R 325.52902. Such operations, when done outdoors, shall be done using respirators, such as fume respirators, approved for this purpose by NIOSH under C.F.R. Title 42, Part 84, as adopted by reference in

R 325.52902.

(2) Confined space. Welding, also known as brazing, involving cadmium-bearing filler metals shall be done using ventilation as prescribed in R 325.52911 or R 325.52912, if the work is to be done in a confined space.

R 325.52924 Mercury.

Rule 24. In confined spaces or indoors, welding or cutting operations involving metals coated with mercury-bearing materials including paint, shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by Occupational Health Standard Part 301 "Air Contaminants for General Industry," as referenced in R 325.52902. Such operations, when done outdoors, shall be done using respirators approved for this purpose by NIOSH under C.F.R. Title 42, Part 84, as adopted by reference in R 325.52902.

R 325.52925 Cleaning compounds.

Rule 25. (1) Manufacturer's instructions. In the use of cleaning materials, because of their possible toxicity or flammability, appropriate precautions such as manufacturers' instructions shall be followed.

(2) Degreasing or other cleaning operations involving chlorinated hydrocarbons shall be located so that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation. In addition, trichloroethylene and perchloroethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.

R 325.52926 Cutting of stainless steels.

Rule 26. Oxygen cutting, using either a chemical flux or iron powder or gas-shielded arc cutting of stainless steel, shall be done using mechanical ventilation adequate to remove the fumes generated.

R 325.52927 First-aid equipment.

Rule 27. First-aid equipment shall be available at all times. All injuries shall be reported as soon as possible for medical attention. First aid shall be rendered until medical attention is provided.

INDUSTRIAL APPLICATIONS

R 325.52930 Transmission pipeline.

Rule 30. (1). When transmission pipelines are involved, the requirements of R 325.52906 to R 325.52927 of this standard and General Industry Safety Standard Part 12 "Welding and Cutting," as referenced in R 325.52902, shall be observed

(2) Where field shop operations are involved for fabrication of fittings, river crossing, road crossings, and pumping and compressor stations, the requirements of R 325.52906 to R 325.52927 of this standard and General Industry Safety Standard Part 12 "Welding and Cutting," as referenced in R 325.52902, shall be observed.

(3) Requirements for X-ray inspections are contained in Occupational Health Standard Part 381 "Ionizing Radiation," as referenced in R 325.52902.

R 325.52931 Mechanical piping systems.

Rule 31. (1) When mechanical piping systems are involved, the requirements of R 325.52906 to R 325.52927 of this standard and General Industry Safety Standard Part 12 "Welding and Cutting," as referenced in R 325.52902, shall be observed.

(2) Requirements for X-ray inspections are contained in Occupational Health Standard Part 381 "Ionizing Radiation," as referenced in R 325.52902.