

**To Be Rescinded**

1301:7-7-22 Welding or cutting, calcium carbide and acetylene generators.

(A) Section FM-2201.0 General

(1) FM-2201.1 Scope: All welding or cutting operations and equipment shall comply with this rule.

(2) F-2201.2 ~~Permit~~ APPROVAL required: ~~A permit~~ APPROVAL shall be obtained for welding or cutting operations, and the code official shall be notified in advance where such work occurs.

Exception: ~~A permit~~ APPROVAL shall not be required for the following conditions:

(a) where the welding or cutting is performed in areas approved for the purpose.

(b) for each welding or cutting job location where an approved permit system has been established for control of the fire hazards.

(B) Section FM-2202.0 Definitions

FM-2202.1 General: The following words and terms shall, for the purposes of this rule and as stated elsewhere in this code, have the meanings shown herein.

Fuel gas: Acetylene hydrogen, LP-gas, and other liquefied and nonliquefied flammable gases.

Machine: A device in which one or more torches utilizing fuel gas and oxygen is incorporated.

Manifold: An assembly of pipe and fittings for connecting two or more cylinders for the purpose of supplying gas to a piping system or directly to a consuming device.

(C) Section FM-2203.0 General requirements

(1) FM-2203.1 General: Welding and cutting conditions and operations shall comply with this rule and NFPA 51 and 51B listed in rule 1301:7-7-44 of the Administrative Code.

(2) FM-2203.2 Qualifications of operators: A permit for welding or cutting operations shall not be issued unless the individuals in charge of performing such operations are capable of performing such operations safely. Demonstration of a working knowledge of the provisions of this rule shall constitute acceptable evidence of compliance with this requirement.

(3) F-2203.3 Records: The permit holder shall maintain a record of all locations where welding or cutting operations are performed and shall have the record available for inspection by the code official.

(D) Section FM-2204.0 Fire safety requirements

(1) F-2204.1 Fire prevention: Welding or cutting operations shall be prohibited in areas not designed or approved for the purpose unless authorized by the owner.

(2) F-2204.2 Protection of combustibles: Where welding or cutting operations are performed above or within 35 feet (10668 mm) of combustible construction or material exposed to the operation, or within 35 feet (10668 mm) of the exposed floor, ceiling or wall openings, the following requirements shall apply:

(a) Such combustible construction or material shall be protected from sparks, hot metal or oxide by noncombustible shields or covers.

(b) Such floor, ceiling or wall openings shall be protected by noncombustible shields or covers.

(c) A fire watcher shall be in attendance to watch for fires, operate portable fire extinguishers or fire hose when necessary, and perform similar fire prevention duties. The fire watcher shall remain at least 30 minutes after the welding or cutting operations have been completed to ensure that a fire does not exist. A signed inspection report attesting to that fact shall be filed and available for inspection by the code official.

(3) F-2204.3 Fire extinguisher: At least one portable fire extinguisher with a minimum 2-A:20-B:C rating shall be kept at the location where welding or cutting is performed, and one portable fire extinguisher with a minimum 2-A:10-B:C rating shall be attached to all portable welding carts.

(4) F-2204.4 Prohibited locations: Welding or cutting shall not be performed in or near rooms or locations where flammable gases, liquids or vapors, lint, dust or loose combustible stocks are present where sparks or hot metal from the welding or cutting operations are capable of causing ignition or explosion of such materials.

(5) FM-2204.5 Precautions in welding: Welding and cutting shall not be performed on containers and equipment containing or having contained flammable liquids, gases or solids until the containers and equipment have been thoroughly cleaned, inerted or purged; except that hot tapping shall be permitted on tanks and pipe lines provided a permit is not required in accordance with paragraph (A)(2)(F-2201.2) of this rule.

(6) F-2204.6 Sprinkler protection: Automatic sprinkler protection shall not be shut off while welding or cutting work is performed. Where welding or cutting is performed close to automatic sprinklers, noncombustible barriers or damp cloth guards shall shield the individual sprinklers, but shall be removed when the work is completed.

(E) Section FM-2205.0 Gas welding and cutting

(1) F-2205.1 General: Devices or attachments mixing air or oxygen with combustible gases prior to consumption, except at the burner or in a standard torch or blow pipe, shall not be permitted unless approved.

(2) F-2205.2 ~~Permit~~ APPROVAL required for cylinder and container storage: ~~A permit~~ APPROVAL shall be required for the storage of cylinders or containers utilized in conjunction with welding or cutting operations where the storage exceeds 2,000 cubic feet (56 m<sup>3</sup>) of flammable compressed gas other than liquefied petroleum gas, 300 pounds (136 kg) of liquefied petroleum gas, or 6,000 cubic feet (168 m<sup>3</sup>) of nonflammable compressed gas.

(3) FM-2205.3 Storage of cylinders or containers: Fuel gas cylinders stored inside of structures, except those in use or attached ready for use, shall be limited to a total capacity of 2,000 cubic feet (56 m<sup>3</sup>) of gas or 300 pounds (136 kg) of liquefied petroleum gas. Storage exceeding 2,000 cubic feet (56 m<sup>3</sup>) total gas capacity of cylinders or 300 pounds (136 kg) of liquefied petroleum gas shall be located in a separate room in accordance with paragraphs (H)(4)(FM-2208.4) and (H)(4)(a)(F-2208.4.1) of this rule, or the cylinders shall be stored outside or in a separate structure.

(a) FM-2205.3.1 Inside storage: Separate rooms or structures for fuel gas storage shall be well-ventilated. Heating shall be by steam, hot water or other indirect means. All electrical wiring and equipment installed in outside generator structures or inside generator rooms shall comply with NFPA 70 listed in rule 1301:7-7-44 of the Administrative Code for class I, division 2, hazardous locations. Heating by flame or fire shall be prohibited in outside generator structures, inside generator rooms, and in any enclosure communicating with such structures or rooms. Sources of ignition shall be prohibited in outside generator structures and inside generator rooms.

(b) F-2205.3.2 Clearances: Cylinders permitted inside structures shall be stored at least 20 feet (6096 mm) from highly combustible materials and located where the cylinders will not be exposed to excessive rise in temperature, physical damage or tampering by unauthorized persons.

(c) F-2205.3.3 Oxygen cylinders: Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials, including oil or grease, by a minimum distance of 20 feet (6096 mm) or by a noncombustible barrier at least 5 feet (1524 mm) in height having a fire-resistance rating of at least one-half hour.

(i) F-2205.3.3.1 Storage: Oxygen cylinders shall not be stored in inside acetylene generator rooms.

(ii) F-2205.3.3.2 Storage separation: Oxygen cylinders stored in outside generator houses shall be separated from the generator and carbide storage rooms by a noncombustible partition having a fire-resistance rating of at least 1 hour. The partition shall be gas tight and without openings.

(d) F-2205.3.4 Acetylene cylinders: Cylinders of dissolved acetylene shall be stored with the valve end up to prevent solvent from being discharged as liquid.

- (4) F-2205.4 Moving of cylinders: When moving compressed gas cylinders by crane, suitable cradles shall be utilized to prevent the cylinder from dropping. Ordinary rope slings or electromagnets shall not be utilized.
- (5) F-2205.5 Position of cylinders: Fuel gas cylinders shall be placed with the valve end up whenever such cylinders are in use.
- (6) F-2205.6 Transfer of gases: The transfer of gases from one cylinder to another, or the mixing of gases in a cylinder shall be prohibited.
- (7) F-2205.7 Valve protection: When a cylinder is not in use the valve shall be closed, and the valve protection cap shall be in place and hand tight.
- (8) F-2205.8 Oxygen regulator: A cylinder or cylinder manifold for oxygen shall be provided with a pressure-regulating device intended for oxygen cylinders, and SHALL BE so ~~marked~~ IDENTIFIED IN AN APPROVED MANNER.
- (9) F-2205.9 Empty cylinders: Valves on empty cylinders shall be closed when the cylinders are in storage and during shipment.
- (10) F-2205.10 Pressure reduction: Fuel gas shall not be used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.
- (a) F-2205.10.1 Regulator attachment: Pressure-adjusting screws on regulators shall be fully released before the regulator is attached to a cylinder and the cylinder valve is opened.
- (b) F-2205.10.2 Regulator removal: A pressure reducing regulator attached to the cylinder valve or manifold shall be provided where fuel gas is taken from cylinders through torches or other devices equipped with shutoff valves.
- (11) F-2205.11 Valve operations: Valves on cylinders of compressed gas, when being opened, shall be opened slowly.
- (12) F-2205.12 Precautions: Cylinders, valves, regulators, hose and other apparatus and fittings for oxygen shall be kept free from oil or grease. Oxygen cylinders, apparatus and fittings shall not be handled with oily hands, oily gloves, or greasy tools or equipment.
- (13) FM-2205.13 Acetylene gases: Acetylene gas shall not be generated, piped (except in approved cylinder manifolds and cylinder manifold connections), or utilized at a pressure exceeding 15 psig (103 kPa) unless dissolved in a suitable solvent in cylinders manufactured in accordance with DOTn 49 CFR listed in rule 1301:7-7-44 of the Administrative Code. Acetylene gas shall not be brought

in contact with unalloyed copper, except in a blowpipe or torch.

(14) F-2205.14 Remote locations: Oxygen and fuel gas cylinders and acetylene generators shall be located away from the welding area to prevent such cylinders or generators from being heated by radiation from heated materials, sparks or slag, or misdirection of the torch flame.

(15) F-2205.15 Cylinders shutoff: The torch valve shall be closed and the gas supply to the torch completely shut off when gas welding or cutting operations are discontinued for any period of 1 hour or more.

(16) F-2205.16 Prohibited operation: Welding or cutting work shall not be supported on compressed gas cylinders or containers.

(17) F-2205.17 Tests: Tests for leaks in any piping system or equipment shall be made with soapy water. Flames shall be prohibited for leak testing.

(F) Section F-2206.0 Electric arc welding and cutting

(1) F-2206.1 General: The frame or case of electric arc welding or cutting machines, except internal combustion engine-driven machines, shall be grounded. Ground connections shall be mechanically strong and electrically adequate for the required current.

(2) F-2206.2 Return circuits: Welding current return circuits from the work to the machine shall have proper electrical contact at all joints. Periodic inspection of the electrical contact is required.

(3) F-2206.3 Disconnecting: All electrodes shall be removed from the holders when electric arc welding or cutting is discontinued for any period of 1 hour or more. The holders shall be located to prevent accidental contact, and the machines shall be disconnected from the power source.

(G) Section FM-2207.0 Calcium carbide systems

(1) F-2207.1 ~~Permit~~ APPROVAL required for storage: ~~A permit~~ APPROVAL shall be required for quantities of calcium carbide exceeding 200 pounds (91 kg).

(2) F-2207.2 Containers: Storage containers for calcium carbide shall be of metal of sufficient strength to ensure handling without rupture, and provided with a screw top or equivalent. Containers shall be of water-tight and air-tight construction. Solder shall not be utilized on joints in such a manner that fire will disrupt the package. Packages shall be ~~marked~~ IDENTIFIED as follows: "Calcium Carbide — Dangerous If Not Kept Dry."

(3) F-2207.3 Storage in structures: Storage of calcium carbide inside structures shall be in a dry, waterproof and well-ventilated location.

(a) F-2207.3.1 Permitted locations: Calcium carbide not exceeding 600 pounds (272 kg) stored inside a structure or in the same room with fuel gas cylinders shall not be stored with oxygen cylinders.

(b) FM-2207.3.2 Storage over 600 pounds to less than 5,000: Calcium carbide exceeding 600 pounds (272 kg) but less than 5,000 pounds (2270 kg), shall not be stored in a structure containing other occupancies, unless in an acetylene generator room or separate room compartment in a one-story structure without a basement located below the calcium carbide storage. Such rooms shall be separated from the remainder of the structure by fire-resistance rated construction in accordance with the building code listed in rule 1301:7-7-44 of the Administrative Code. Openings to the remainder of the structure shall be protected by approved self-closing fire doors. Adequate ventilation shall be provided, and the storage room shall not be occupied for any other purpose.

(c) F-2207.3.3 Storage exceeding 5,000 pounds: Calcium carbide exceeding 5,000 pounds (2270 kg) shall be stored in structures not exceeding one story in height without a basement and not occupied for another purpose, or in outside acetylene generator houses. The location of such storage structures shall be outside congested mercantile and manufacturing districts. A fire wall with no openings or penetrations shall separate a noncombustible storage structure from any other attached one story structure. Openings shall not be permitted in exterior walls of a noncombustible storage structure and an adjacent one story structure when the distance between such exterior walls is less than 10 feet (3048 mm). Combustible storage structures shall not be located within 20 feet (6096 mm) of any other one- or two-story structure nor within 30 feet (9144 mm) of any other structure exceeding two stories.

(H) Section FM-2208.0 Acetylene generators

(1) F-2208.1 ~~Permit~~ APPROVAL required: ~~A permit~~ APPROVAL shall be required for the operation of an acetylene generator with a carbide capacity exceeding 5 pounds (2.27 kg).

(2) F-2208.2 Generators to be approved: Acetylene generators shall be of an approved type and plainly marked with the rate in cubic feet of acetylene per hour ( $m^3/s$ ) for which the generators are designed, the amount or weight of carbide necessary for a single charge, the manufacturer's name and address, and the name or number of the type of generator.

(3) FM-2208.3 Stationary generators: Stationary generators shall be installed in either a well-ventilated, one-story, noncombustible outside generator structure or a well-ventilated room or compartment of adequate size constructed in accordance with paragraph (H)(4)(FM-2208.4) of this rule. Where installed in accordance with paragraph (H)(4)(FM-2208.4) of this rule, the room or compartment shall be located in either a one-story structure or on the top floor or roof of a multistory structure. The storage of fuel gas cylinders in such rooms or compartments shall not exceed a total capacity of 2,000 cubic feet ( $56 m^3$ ) of gas other than liquefied petroleum gas or 300 pounds (136 kg) of liquefied petroleum gas.

(4) FM-2208.4 Inside generator rooms or compartments: The fire-resistance rating of the walls, floors and ceilings of inside generator rooms or compartments shall comply with the building code listed in rule 1301:7-7-44 of the Administrative Code. At least one wall of an inside generator room shall be an exterior wall.

(a) F-2208.4.1 Openings: Openings from a generator room or compartment to other parts of the structure shall be protected by approved self-closing fire doors of the swinging type and shall close into a rabbet, or shall otherwise be constructed tight to prevent passage of flame around the edge. Ready access to exit doors shall be provided in case of an emergency. Windows, where provided, shall be constructed of wired glass in approved metal frames with fixed sash.

(b) F-2208.4.2 Exterior walls: A portion of the exterior wall equal to not less than 10 percent of the combined areas of the enclosing walls shall be of light noncombustible material, such as single-thickness, single-strength glass.

Exception: The following shall be approved in part or entirely provided the required percentage of explosion-venting area is provided: single-thickness, single-strength window glass skylights; lightly fastened roof hatch covers; swinging doors in exterior walls opening outward; sheet metal siding; or lightly fastened roofs.

(5) F-2208.5 Portable generators: The minimum volume of rooms containing portable generators shall be 35 times the total gas-generating capacity per charge of all generators in the room. The gas-generating capacity in cubic feet per charge shall be assumed to be four and one-half times the weight of carbide per charge in pounds. The minimum ceiling height of rooms containing generators shall be 10 feet (3048 mm). An acetylene generator shall not be moved by derrick, crane or hoist while charged.

(6) F-2208.6 Protection against freezing: Generators shall be located where water will not freeze. Common salt such as sodium chloride or other corrosive chemicals shall not be utilized for protection against freezing.

(7) F-2208.7 ~~Permit~~ APPROVAL required for cylinder storage: ~~A permit~~ APPROVAL shall be required for the storage of cylinders utilized in conjunction with welding or cutting operations where the storage exceeds 2,000 cubic feet (56 m<sup>3</sup>) of flammable compressed gas other than liquefied petroleum gas, 300 pounds (136 kg) of liquefied petroleum gas, or 6,000 cubic feet (168 m<sup>3</sup>) of nonflammable compressed gas.

(a) FM-2208.7.1 Storage of cylinders: Cylinders of fuel gases stored inside a structure, except cylinders in use or attached ready for use, shall be limited to a total capacity of 2,000 cubic feet (56 m<sup>3</sup>) of gas or 300 pounds (136 kg) of liquefied petroleum gas. For storage exceeding 2,000 cubic feet (56 m<sup>3</sup>) total gas capacity of cylinders or 300 pounds (136 kg) of liquefied petroleum gas, a separate room or compartment as required by paragraph (G)(3)(b)(FM-2207.3.2) of this rule shall be

provided, or the cylinders shall be kept outside or in a special structure. Structures, rooms or compartments provided for such storage shall be well-ventilated and without open-flame heating or lighting devices.

(b) FM-2208.7.2 Oxygen cylinders: Cylinders of oxygen stored inside of structures shall comply with the requirements for oxygen manifolds in paragraph (I)(2)(FM-2209.2) of this rule.

(I) Section FM-2209.0 Piping manifolds and hose systems for fuel gases and oxygen

(1) F-2209.1 General: Except as herein provided, piping shall be of steel, wrought-iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing. Piping and fittings shall be of approved types, except that piping and fittings shall be a minimum standard weight for sizes not exceeding 6 inches nominal.

(a) Acetylene piping shall be of steel or wrought-iron pipe only.

(b) Oxygen piping at pressures exceeding 700 pounds per square inch (4827 kPa) shall be of stainless steel or nonferrous tubing.

(i) F-2209.1.1 Joints: Joints in steel or wrought-iron pipe shall be: welded; threaded or flanged fittings; rolled, forged or cast steel; or malleable iron fittings. Joints in brass or copper pipe shall be welded, brazed, threaded or flanged. Joints in seamless copper, brass or stainless steel tubing shall be brazed or by approved gas-tubing fittings. Socket-type joints in brass or copper pipe or in seamless copper, brass or stainless steel tubing, shall be brazed with silver-brazing alloy or similar high melting-point filler. Cast-iron fittings shall be prohibited. Threaded connections in oxygen piping shall be tinned, or coated with litharge and glycerine, or other joint compounds approved for oxygen service and applied only to male threads.

(ii) F-2209.1.2 Protection: Piping shall be protected against physical damage, and allowance made for contraction, expansion, jarring and vibration. If located underground, piping shall be below the frost line and protected against corrosion. Low points in piping shall be provided with drip pots and drain valves with the drain valves closed with screw caps or plugs.

(iii) F-2209.1.3 Testing: All piping shall be tested to one and one-half times the maximum working pressure without leaking. The testing medium for oxygen lines shall be oil free.

(iv) F-2209.1.4 Painting: All buried pipe and tubing and outdoor ferrous pipe and tubing shall be covered or painted with a suitable corrosion-resistant material.

(2) FM-2209.2 Manifolding of cylinders: Oxygen manifolds shall not be located in an acetylene generator room. Oxygen manifolds shall be located at least 20 feet (6096 mm) away from both highly flammable material, such as oil or grease, and combustible gas cylinders, unless the



combustible gas cylinders are separated by a fire-resistance rated partition constructed as required by paragraph (G)(3)(b)(FM-2207.3.2) of this rule.

(a) F-2209.2.1 Aggregate capacity: The aggregate capacity of oxygen cylinders connected to one manifold inside a structure shall not exceed 6,000 cubic feet (168 m<sup>3</sup>). Where more than one such manifold is located in the same room, the manifolds shall be separated a minimum of 50 feet (15240 mm).

(b) FM-2209.2.2 Separate locations: An oxygen manifold connected to cylinders with an aggregate capacity exceeding 6,000 cubic feet (168 m<sup>3</sup>) shall be located outside, in a separate structure, or in a separate room constructed in accordance with paragraph (G)(3)(b)(FM-2207.3.2) of this rule. Combustible material shall not be located within 20 feet (6096 mm) of the manifold.

(c) F-2209.2.3 ~~Marking~~ IDENTIFICATION of manifolds: Oxygen manifolds with service pressures not exceeding 200 psig (1379 kPa) shall be ~~marked~~ IDENTIFIED as follows:

"Low-Pressure Manifold  
Do Not Connect High-Pressure Cylinders  
Maximum Pressure 250 psig"

(d) F-2209.2.4 Fuel gas cylinders: The aggregate capacity of fuel gas cylinders connected to one manifold inside a structure shall not exceed 3,000 cubic feet (84 m<sup>3</sup>) of gas or 300 pounds (136 kg) of liquefied petroleum gas. Where more than one such manifold is located in the same room, the manifolds shall be separated a minimum of 50 feet (15240 mm).

(e) FM-2209.2.5 Outside location: A fuel gas manifold connected to cylinders with an aggregate capacity of more than 3,000 cubic feet (84 m<sup>3</sup>) of gas or 300 pounds (136 kg) of liquefied petroleum gas, shall be located outside, in a separate structure, or in a separate room constructed in accordance with paragraph (G)(3)(b)(FM-2207.3.2) of this rule.

(3) F-2209.3 Hose and hose connections: All hose shall be capable of withstanding a hydrostatic pressure of at least 800 psi (5516 kPa).

(a) F-2209.3.1 Ruptured hose: A single hose with more than one gas passage permitting the flow of one gas into the other gas passage in the event of a hose wall failure shall be prohibited.

(b) F-2209.3.2 Identification: All single and double hose, except as provided for herein, shall be identified by an exterior surface color as follows: green for oxygen hose, red for acetylene, LP-gas and other fuel gases, and black for inert gases and air.

(c) F-2209.3.3 Integral lengths: Where two hoses are joined by a web to form integral lengths of a double hose, the color of both hoses shall be red. The exterior surface of the oxygen hose shall be

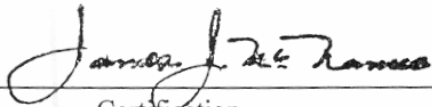
smooth to the touch. The fuel gas hose shall be corrugated or ribbed.

(d) F-2209.3.4 Taping: When parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, there shall be at least one foot (305 mm) between taped sections and the taped section shall not exceed 2 inches (51 mm) in length.

(e) F-2209.3.5 Clamps: Hose connections shall be clamped or otherwise securely fastened to withstand, without leakage, twice the service pressure but not less than a pressure of 300 psi (2069 kPa).

(f) F-2209.3.6 Inspection: All hose shall be inspected frequently for leaks, burns, wear, loose connections or other defects rendering the hose unfit for service. Where the hose shows excessive wear or has been subjected to flashback, the hose shall be inspected and tested at twice the service pressure but not less than a pressure of 200 psi (1379 kPa) before being returned to service. Defective lengths of hose shall be discarded.

Effective: March 30, 1998



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Certification

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