



Regulations and standards for smoke/fire supplemental oxygen requirements

Sec. 25.1439 Protective breathing equipment.

- (a) If there is a class A, B, or E cargo compartment, protective breathing equipment must be installed for the use of appropriate crewmembers. In addition, protective breathing equipment must be installed in each isolated separate compartment in the airplane, including upper and lower lobe galleys, in which crewmember occupancy is permitted during flight for the maximum number of crewmembers expected to be in the area during any operation.
- (b) For protective breathing equipment required by paragraph (a) of this section or by any operating rule of this chapter, the following apply:
 - (1) The equipment must be designed to protect the flight crew from smoke, carbon dioxide, and other harmful gases while on flight deck duty and while combating fires in cargo compartments.
 - (2) The equipment must include-- (i) Masks covering the eyes, nose, and mouth; or (ii) Masks covering the nose and mouth, plus accessory equipment to cover the eyes.
 - (3) The equipment, while in use, must allow the flight crew to use the radio equipment and to communicate with each other, while at their assigned duty stations.
 - (4) The part of the equipment protecting the eyes may not cause any appreciable adverse effect on vision and must allow corrective glasses to be worn.
 - (5) The equipment must supply protective oxygen of 15 minutes duration per crewmember at a pressure altitude of 8,000 feet with a respiratory minute volume of 30 liters per minute BTPD. If a demand oxygen system is used, a supply of 300 liters of free oxygen at 70 deg. F. and 760 mm. Hg. pressure is considered to be of 15-minute duration at the prescribed altitude and minute volume. If a continuous flow protective breathing system is used (including a mask with a standard rebreather bag) a flow rate of 60 liters per minute at 8,000 feet (45 liters per minute at sea level) and a supply of 600 liters of free oxygen at 70 deg. F. and 760 mm. Hg. pressure is considered to be of 15- minute duration at the prescribed altitude and minute volume. BTPD refers to body temperature conditions (that is, 37 deg. C., at ambient pressure, dry).
 - (6) The equipment must meet the requirements of paragraphs (b) and (c) of Sec. 25.1441. [Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-38, 41 FR 55468, Dec. 20, 1976]

Sec. 25.1441 Oxygen equipment and supply.

- (a) If certification with supplemental oxygen equipment is requested, the equipment must meet the requirements of this section and Secs. 25.1443 through 25.1453.
- (b) The oxygen system must be free from hazards in itself, in its method of operation, and in its effect upon other components.
- (c) There must be a means to allow the crew to readily determine, during flight, the quantity of oxygen available in each source of supply.
- (d) The oxygen flow rate and the oxygen equipment for airplanes for which certification for operation above 40,000 feet is requested must be approved.



Sec. 25.1443 Minimum mass flow of supplemental oxygen.

- (a) If continuous flow equipment is installed for use by flight crewmembers, the minimum mass flow of supplemental oxygen required for each crewmember may not be less than the flow required to maintain, during inspiration, a mean tracheal oxygen partial pressure of 149 mm. Hg. when breathing 15 liters per minute, BTPS, and with a maximum tidal volume of 700 cc. with a constant time interval between respirations.
- (b) If demand equipment is installed for use by flight crewmembers, the minimum mass flow of supplemental oxygen required for each crewmember may not be less than the flow required to maintain, during inspiration, a mean tracheal oxygen partial pressure of 122 mm. Hg., up to and including a cabin pressure altitude of 35,000 feet, and 95 percent oxygen between cabin pressure altitudes of 35,000 and 40,000 feet, when breathing 20 liters per minute BTPS. In addition, there must be means to allow the crew to use undiluted oxygen at their discretion.
- (c) For passengers and cabin attendants, the minimum mass flow of supplemental oxygen required for each person at various cabin pressure altitudes may not be less than the flow required to maintain, during inspiration and while using the oxygen equipment (including masks) provided, the following mean tracheal oxygen partial pressures:
 - (1) At cabin pressure altitudes above 10,000 feet up to and including 18,500 feet, a mean tracheal oxygen partial pressure of 100 mm. Hg. when breathing 15 liters per minute, BTPS, and with a tidal volume of 700 cc. with a constant time interval between respirations.
 - (2) At cabin pressure altitudes above 18,500 feet up to and including 40,000 feet, a mean tracheal oxygen partial pressure of 83.8 mm. Hg. when breathing 30 liters per minute, BTPS, and with a tidal volume of 1,100 cc. with a constant time interval between respirations.
- (d) If first-aid oxygen equipment is installed, the minimum mass flow of oxygen to each user may not be less than four liters per minute, STPD. However, there may be a means to decrease this flow to not less than two liters per minute, STPD, at any cabin altitude. The quantity of oxygen required is based upon an average flow rate of three liters per minute per person for whom first-aid oxygen is required.
- (e) If portable oxygen equipment is installed for use by crewmembers, the minimum mass flow of supplemental oxygen is the same as specified in paragraph (a) or (b) of this section, whichever is applicable.

Sec. 25.1445 Equipment standards for the oxygen distributing system.

- (a) When oxygen is supplied to both crew and passengers, the distribution system must be designed for either-- (1) A source of supply for the flight crew on duty and a separate source for the passengers and other crewmembers; or (2) A common source of supply with means to separately reserve the minimum supply required by the flight crew on duty.
- (b) Portable walk-around oxygen units of the continuous flow, diluter- demand, and straight demand kinds may be used to meet the crew or passenger breathing requirements.

Sec. 25.1447 Equipment standards for oxygen dispensing units. If oxygen dispensing units are installed, the following apply:



- (a) There must be an individual dispensing unit for each occupant for whom supplemental oxygen is to be supplied. Units must be designed to cover the nose and mouth and must be equipped with a suitable means to retain the unit in position on the face. Flight crew masks for supplemental oxygen must have provisions for the use of communication equipment.
- (b) If certification for operation up to and including 25,000 feet is requested, an oxygen supply terminal and unit of oxygen dispensing equipment for the immediate use of oxygen by each crewmember must be within easy reach of that crewmember. For any other occupants, the supply terminals and dispensing equipment must be located to allow the use of oxygen as required by the operating rules in this chapter.
- (c) If certification for operation above 25,000 feet is requested, there must be oxygen dispensing equipment meeting the following requirements:
 - (1) There must be an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated, and at least two oxygen dispensing units connected to oxygen terminals in each lavatory. The total number of dispensing units and outlets in the cabin must exceed the number of seats by at least 10 percent. The extra units must be as uniformly distributed throughout the cabin as practicable. If certification for operation above 30,000 feet is requested, the dispensing units providing the required oxygen flow must be automatically presented to the occupants before the cabin pressure altitude exceeds 15,000 feet. The crew must be provided with a manual means of making the dispensing units immediately available in the event of failure of the automatic system.
 - (2) Each flight crewmember on flight deck duty must be provided with a quick-donning type oxygen dispensing unit connected to an oxygen supply terminal. This dispensing unit must be immediately available to the flight crewmember when seated at his station, and installed so that it: (i) Can be placed on the face from its ready position, properly secured, sealed, and supplying oxygen upon demand, with one hand, within five seconds and without disturbing eyeglasses or causing delay in proceeding with emergency duties; and (ii) Allows, while in place, the performance of normal communication functions.
 - (3) The oxygen dispensing equipment for the flight crewmembers must be: (i) The diluter demand or pressure demand (pressure demand mask with a diluter demand pressure breathing regulator) type, or other approved oxygen equipment shown to provide the same degree of protection, for airplanes to be operated above 25,000 feet. (ii) The pressure demand (pressure demand mask with a diluter demand pressure breathing regulator) type with mask-mounted regulator, or other approved oxygen equipment shown to provide the same degree of protection, for airplanes operated at altitudes where decompressions that are not extremely improbable may expose the flightcrew to cabin pressure altitudes in excess of 34,000 feet.
 - (4) Portable oxygen equipment must be immediately available for each cabin attendant. [Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-41, 42 FR 36971, July 18, 1977; Amdt. 25-87, 61 FR 28696, June 5, 1996]

Sec. 25.1449 Means for determining use of oxygen. There must be a means to allow the crew to determine whether oxygen is being delivered to the dispensing equipment.

Sec. 25.1450 Chemical oxygen generators.

- (a) For the purpose of this section, a chemical oxygen generator is defined as a device which produces oxygen by chemical reaction.
- (b) Each chemical oxygen generator must be designed and installed in accordance with the following requirements:



- (1) Surface temperature developed by the generator during operation may not create a hazard to the airplane or to its occupants.
- (2) Means must be provided to relieve any internal pressure that may be hazardous.
- (c) In addition to meeting the requirements in paragraph (b) of this section, each portable chemical oxygen generator that is capable of sustained operation by successive replacement of a generator element must be placarded to show—
 - (1) The rate of oxygen flow, in liters per minute;
 - (2) The duration of oxygen flow, in minutes, for the replaceable generator element; and
 - (3) A warning that the replaceable generator element may be hot, unless the element construction is such that the surface temperature cannot exceed 100 degrees F. [Amdt. 25-41, 42 FR 36971, July 18, 1977] Sec. 25.1451 [Removed. 55 FR 29786, July 20, 1990]

Sec. 25.1453 Protection of oxygen equipment from rupture. Oxygen pressure tanks, and lines between tanks and the shutoff means, must be—

- (a) Protected from unsafe temperatures; and
- (b) Located where the probability and hazards of rupture in a crash landing are minimized.