

Control of Air Contaminants

Part 12 of Title 12 of the Official Compilation of Codes, Rules, and Regulations of
the State of New York (Cited as 12 NYCRR 12)



As Amended

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INDUSTRIAL CODE RULE NO. 12 (12 NYCRR 12)

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PART 12

CONTROL OF AIR CONTAMINANTS

(Statutory authority: Labor Law §§27-a, 28, 29, 200, 299)

Subpart 12-1 General Requirements

Subpart 12-2 Specific Operations and Specific Control Requirements

Subpart 12-3 Evidence of Dangerous Air Contaminants

Historical Note: Part (§§12.1-12.29) amd. filed Jan. 18, 1971 eff. May 1, 1971. New Part substituted.

SUBPART 12-1

GENERAL REQUIREMENTS

Sec.

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§ 12-1.1 Finding of fact.

The board finds that every industry, trade, occupation and process involving the use or presence of materials that produce air contaminants may be hazardous to the lives, health and safety of the persons employed therein. The board, therefore, finds that special regulations are necessary for the protection of such persons.

§ 12-1.2 Application. (a) This Part (rule) applies to any industry, trade, occupation, process or place in the State of New York where air contaminants are generated, which is the subject of any of the provisions of the Labor Law pertaining to the protection of the lives, health and safety of employees or the public, except as otherwise provided by law, including but not limited to: factories; mercantile establishments; places of public assembly; amusement devices at carnivals, fairs and amusement parks; buildings, structures or areas where construction, excavation or demolition work is being performed; coin-operated machines performing a manufacturing process; ski tows and other passenger tramways; vehicular bridges and tunnels operated by bridge and tunnel authorities subject to the Public Authorities Law; but excluding any occupation or process performed on a farm as defined in this Part (rule).

(b) Specific provisions relating to the prevention and control of air contaminants cited in other Industrial Code Parts (rules) either existing or adopted in the future shall take precedence over this Part (rule), where such provisions are inconsistent with this Part (rule).

(c) The provisions of Industrial Code Part (Rule No.) 18 relating to exhaust systems shall apply to operations not specifically covered by other Industrial Code Parts (rules).

§ 12-1.3 Definitions.

As used herein and in connection with this Part (rule) the following terms mean:

(a) *Air contaminants*: Airborne substances, such as dust, fibers, fumes, gases, mists, vapors and other impurities.

(b) *Air mover*: Any device which produces forced air flow, such as a fan, ejector or natural draft stack.

(c) *Approved*: In respect to a device or material: in compliance with a subsisting resolution of approval adopted by the board; in respect to action by the board: made the subject of a resolution of approval.

(d) *Board*: The Board of Standards and Appeals of the State of New York.

(e) *Commissioner*: The Industrial Commissioner of the State of New York.

(f) *Confined space*: A tank, vault or similar enclosed structure or space with restricted means of egress, such as a manhole or trap door, which is so enclosed and of such volume that natural ventilation through openings provided will not prevent the accumulation of dangerous air contaminants nor supply sufficient oxygen to protect the life, health and safety of any person occupying such structure or space.

(g) *Control equipment*: Equipment used to prevent air contamination or reduce or remove air contaminants.

(h) *Dangerous air contaminants*: Air contaminants in concentrations tending to injure the health of persons. Air contaminants in quantities greater than 25 percent of the lower explosive level of any substance, mixture or compound which they may form.

(i) *Dilution ventilation*: A ventilation system other than local ventilation which reduces air contamination to safe levels by the introduction of uncontaminated air.

(j) *Dipping*: The application of industrial products coating material by means of total or partial immersion.

(k) *Employee*: A person employed; one who works for wages or salary in the service of another.

(l) *Exhaust system*: A ventilating system operating under negative pressure for the control of air contaminants.

(m) *Farm*: A tract or parcel of land and the buildings and structures thereon used for husbandry and the production and storage of agricultural and horticultural commodities including but not limited to the following: livestock; dairy; poultry; fur-bearing animals; fruit and truck farms; orchards; plantations; apiaries; and nurseries.

(n) *Fibers*: Particles produced by handling, cutting, stripping, spinning or weaving of cotton, wool, fur, asbestos or other material constituted of thread-like or slender elements.

- (o) *Flammable solid*: Any solid which will ignite and continue to burn when brought in contact with an open flame, glowing combustion or other source of ignition.
- (p) *Flammable liquid*: Any liquid having a flash point of 100 degrees Fahrenheit or less as determined by the Tagliabue closed-cup test.
- (q) *Flammable gas or vapor*: A gas or vapor, or mixture of gases or vapors, whose concentration is in excess of 25 percent of the lower explosive level.
- (r) *Impregnating*: The application of liquid material by permeation or saturation.
- (s) *Industrial products coating*: The application of paint and similar finishing material by dipping, impregnating, spraying or spreading, including operations incidental to such work and subsequent drying operations, where the finishing material contains flammable or toxic solvents or materials.
- (t) *Local exhaust ventilation*: A system for ventilation for collecting and removing air contaminants at the source of generation.
- (u) *Mechanical ventilation*: A system of ventilation having a power-driven air mover.
- (v) *Open surface tank operation*: An operation which involves the use of a tank containing liquid with the liquid surface directly exposed to the work atmosphere. Such operations may include but are not limited to washing, electroplating, anodizing, pickling, quenching, dyeing, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting and other similar operations.
- (w) *Personal respiratory protective equipment*: A respirator or other device worn for the purpose of preventing the wearer from inhaling harmful amounts of air contaminants.
- (x) *Practicable*: Capable of being done without disturbing essential functions or essential structural elements.
- (y) *Recirculation*: The return of part or all of the exhaust air to any space occupied by employees.
- (z) *Shall*: The word "shall" is always mandatory.
- (aa) *Spraying*: The application of any liquid material in the form of a mist.
- (bb) *Spreading*: The application of any liquid material to a surface by brush, roller, flow or similar method.
- (cc) *Sufficient oxygen*: A minimum of 20 percent oxygen by volume at Standard Temperature and Pressure conditions (S.T.P.), 70 degrees Fahrenheit and 14.7 psia.
- (dd) *Tumbling process*: Any process in which articles, pieces or parts are placed in a rotating barrel, drum, mill or cage for the purpose of removal of rust, scale, debris or dust as well as for the purpose of smoothing, polishing, burnishing or cleaning by means of agitation.
- (ee) *Work atmosphere*: The atmosphere to which an employee is exposed in the course of performing his work.

(ff) *Working area or space*: The area or space normally occupied or traversed by an employee while at work.

§ 12-1.4 Prevention of air contamination.

(a) *General*. All operations or processes which produce air contaminants shall be so conducted that the generation, release or dissemination of such air contaminants is kept at the lowest practicable level in compliance with this Part (rule) using proper control or protective procedures and equipment. All equipment used to effect compliance with this Part (rule) shall be maintained in good condition and in accordance with the requirements of the Labor Law and of the Industrial Code.

(b) *Responsibility of employers*. (1) Every employer shall effect compliance with the provisions of this Part (rule) relating to the prevention and removal of air contaminants, the storage and use of flammable liquids and the provision, installation, operation and maintenance of control or protective equipment.

(2) Every employer shall instruct his employees as to the hazards of their work, the use of the control or protective equipment and their responsibility for complying with the provisions of this Part (rule).

(3) No employer shall suffer or permit an employee to work in a room in which there exist dangerous air contaminants in a work atmosphere.

(4) No employer shall suffer or permit dangerous air contaminants to accumulate or remain in any place or area subject to the provisions of this Part (rule).

(c) *Responsibility of employees*. Every employee shall use the control and protective equipment provided for his protection and shall comply with all provisions of this Part (rule) relating to his personal conduct.

§ 12-1.5 Personal protective equipment.

(a) *Personal respiratory protective equipment*. (1) Use. Personal respiratory protective equipment shall not be used in lieu of other control methods, except for protection of employees in emergencies and in the repair, maintenance or adjustment of equipment or processes, or upon specific approval by the board.

(2) *Approval*. Personal respiratory protective equipment shall be of a type approved by the board for the particular class of substance or substances constituting the air contaminant.

Note: A list of approved respiratory protective equipment may be secured from the board.

(3) *Maintenance*. Personal respiratory protective equipment shall be stored in air-tight containers or cabinets or in an uncontaminated area. Such equipment shall be cleaned, serviced and repaired to maintain it in effective working condition and it shall be sterilized before use by any person other than the last wearer.

(b) *Goggles, masks and shields*. All employees exposed to air contaminants tending to injure or irritate the eyes shall be provided with and shall wear either safety goggles, close-fitting chemical goggles or an effective face mask or shield. An employee requiring prescription lenses in the normal performance of his work shall be supplied with prescription goggles or with goggles designed to fit over his regular spectacles.

(c) *Protective clothing.* All employees exposed to air contaminants which tend to cause skin irritation or skin diseases, or which can be absorbed through the skin in amounts tending to injure the health, shall be provided with appropriate clean, protective clothing, such as coveralls, coats, headgear, gloves, sleeves or aprons as needed or where suitable.

(d) *Emergency flushing facilities.* Emergency showers or other facilities for flushing the skin and body members shall be provided within 50 feet of the working position where employees may be exposed to sudden and severe concentrations of corrosive air contaminants.

§ 12-1.6 General control requirements.

(a) *General control methods.* One or more of the following methods shall be used to prevent, remove or control dangerous air contaminants:

- (1) Substitution of a material or a method which does not produce dangerous air contaminants.
- (2) Local exhaust ventilation conforming to the requirements of Industrial Code Part (Rule No.) 18.
- (3) Dilution ventilation.
- (4) Application of water or other wetting agent.
- (5) Enclosure or isolation.
- (6) Other methods approved by the board.

(b) *Exhaust systems.* Every exhaust system required by this Part (rule) shall be constructed, installed, operated and maintained in compliance with the provisions of Industrial Code Part (Rule No.) 18 relating to exhaust systems.

Note: The discharge of effluents from sources of air contamination to the outer air shall be made in accordance with article 12-a of the Public Health Law, with the Environmental Conservation Law and with any rules or regulations promulgated thereunder.

(c) *Isolation or segregation of operations.* All processes or operations releasing or disseminating dangerous air contaminants shall be isolated, enclosed or otherwise segregated insofar as practicable.

(d) *Separation of different processes creating a hazard.* Where processes generate different air contaminants which could, if intermixed, result in a fire or explosion hazard, such contaminants shall be exhausted by separate systems so as to eliminate such possibility.

§ 12-1.7 Prevention of ignition.

(a) All processes or operations using or generating air contaminants which constitute a fire or explosion hazard shall be protected from sources of accidental ignition. Unless such processes or operations are isolated by tight partitions or enclosures they shall not be conducted within 20 feet of any materials, devices or operations which produce flames or sparks including, by way of illustration but not by way of

limitation, engines, motors, welding and soldering torches. All processes and operations within 20 feet of any spark or flame producing work such as welding shall be discontinued and all ignitable air contaminants, flammable liquids and accumulated flammable residue shall be removed from the area of the flame or spark hazard before such work is begun.

(b) Concentrations of vapors which may be present in enclosed areas shall be deemed to be flammable when any such concentration exceeds 25 percent of the lower explosive level.

§ 12-1.8 Operations using flammable liquids.

(a) *Use of flammable liquids.* (1) *Use of certain flammable liquids.* The use of flammable liquids for paint removal, cleaning or any other process in which they are unprotected and exposed shall be restricted to areas provided with mechanical ventilation creating an air movement of at least 100 feet per minute over the surface of the work while the work is being carried on. The use of benzene for such operations is prohibited. Any solvent used shall contain not more than 3 percent benzene as an impurity. Flammable liquids shall not be used to clean walls, ceilings or floors in a workroom.

(2) *Transfer of flammable liquids.* The transfer of flammable liquids shall be by means of a hose or pipe leading to the bottom of the vessel being filled, except for the filling of approved safety cans. When transferring such liquids from one metal container to any other metal container, the two containers shall be bonded together electrically and be properly grounded.

Exception: This paragraph does not apply to the filling of motor vehicle and industrial equipment fuel tanks.

(3) *Mixing and thinning of flammable liquids.* The mixing and thinning indoors of flammable liquids in unit quantities greater than 55 gallons shall be done only in a mixing or spraying room and in such manner and under such ventilation as will effect compliance with this Part (rule). Lesser quantities shall be mixed or thinned indoors only in such a room or within a hood, booth or working area provided with ventilation as specified in section 18.20 of Industrial Code Part (Rule No.) 18.

Exception: Quantities of five gallons or less may be mixed or thinned when natural ventilation will reduce the vapor concentrations to the limits as specified in Table I of this Part (rule) within five minutes.

(4) *Coating removal by use of solvents.* Such a process shall be provided with adequate exhaust ventilation while the removal of residue, paint or other material is being performed. The rate of ventilation shall be that specified in Industrial Code Part (Rule No.) 18.

Note: The use of benzene or carbon tetrachloride for such an operation is prohibited.

(5) *Cleaning solvents.* Flammable liquids used for cleaning permanent surfaces other than floors in a working space shall have a flash point above 100 degrees Fahrenheit. The use of benzene for this operation is prohibited. No flammable liquids shall be used to clean floors.

(6) *Tanks, troughs and mechanical application.*

(i) *Enclosed operations.* Enclosed operations involving the use of flammable liquids and any subsequent drying operations shall be mechanically ventilated to maintain the concentration of vapors within the enclosures below 25 percent of the lower explosive level. Necessary work openings of such enclosures shall have inward air flows maintained by mechanical ventilation. As an alternative

method, enclosed processes may be operated in an inert atmosphere. Where an inert atmosphere is used for an enclosed operation, adequate provision shall be made to insure that sufficient oxygen is available in the areas surrounding such enclosed operation. Any escape of the inert atmosphere to areas outside the enclosure shall not accumulate and create dangerous air contaminants.

(ii) *Fire protection.* Tanks and troughs containing flammable liquids shall be provided with heat-actuated automatically closing covers arranged so as not to interfere with exhaust ventilation. Where operations in such tanks and troughs are performed automatically the tanks and troughs shall be provided with approved fire extinguishing systems.

Note: For additional requirements concerning fire protection see paragraph 12-1.8(c)(1) of this Part (rule).

(iii) *Installation of tanks.* Tanks shall be arranged to prevent accidental tipping.

(iv) *Heating of liquids.* Devices used for heating flammable liquids shall be provided with an automatic temperature regulation device so arranged that the source of heat shall be automatically shut off when the temperature of the liquid rises above the normal operating temperature.

(b) *Storage of flammable liquids.* (1) *Enclosure of storage rooms.* The floor surfaces of rooms used for the storage of flammable liquids shall be of incombustible material and shall be waterproof. The room enclosure shall be of construction having the following minimum fire-resistive rating:

Walls	1 hour
Doors	3/4 hour
Windows	3/4 hour
Ceiling (if space above is occupied)	1 hour
Floor	1 hour

Note: For requirements concerning fire-resistive construction see Industrial Code Part (Rule No.) 7.

(2) *Location of storage rooms.* Storage rooms for flammable liquids shall be located at or above grade and an exterior wall of the building shall form at least one wall of the room. No opening in any storage room shall be located within 15 feet of any stairway, elevator shaft or building exit.

(3) *Floor drainage and door sills.*

(i) Floors of storage rooms containing flammable liquids shall be constructed so as to confine any spillage of flammable liquids. Solid floors shall be pitched at least one inch in 36 inches from the walls and entrances toward a drain which shall be provided to direct the liquid to a safe location outside the plant, such as a sump, tank or similar collecting basin. Every drain shall be equipped with a trap which shall be kept full of a suitable liquid and so maintained as to prevent back flow of flammable vapors. The drainage system from any room used for the storage of flammable liquids shall be isolated from the plant drainage system.

(ii) Sills or ramps of incombustible material at least three inches in height shall be provided at every door leading to a storage room. Alternatively, six inch deep by six inch wide gutters covered with substantial open gratings and leading to drains shall be provided at such passageways. Such gutters shall extend across the full width of the openings within the storage rooms.

(4) *Limitation of quantities.* No more than one day's supply or 220 gallons of flammable liquid, whichever is less, shall be kept in a workroom. Such supply, unless kept in closed drums or in original sealed containers not to exceed five gallons capacity, or in approved safety cans, shall be kept in cabinets as follows:

(i) Cabinets for storing quantities of flammable liquid not exceeding 110 gallons shall be of at least incombustible single wall construction and shall be vented to the outer air.

(ii) Cabinets for storing quantities of flammable liquid of more than 110 gallons but less than 220 gallons shall be of incombustible double wall construction with an air space of at least one and one-half inches or metal-covered wood construction throughout and shall be vented to the outer air at top and bottom.

(iii) Quantities exceeding 220 gallons shall be kept in a storage room as specified in paragraphs (1) through (3) of this subdivision. Doors to storage cabinets shall be kept closed and latched.

(5) *Containers.* Containers used for flammable or toxic liquids, whether or not they contain such material, shall be kept tightly covered when not in use or when being moved about with the exception of safety cans of any size and glass or plastic containers which are one quart or less in size (volume).

(c) *Other equipment requirements.* (1) *Fire protection equipment.*

(i) *Automatic sprinklers.* Automatic sprinkler systems with sufficient heads or outlets shall be provided in all working areas of buildings two stories or more in height where flammable liquids are used or stored.

Note: For sprinkler system requirements see Industrial Code Part (Rule No.) 20.

(ii) *Automatic extinguishers.* Dip tanks, drain boards, drip pans and drip troughs involving the use of flammable liquids shall be provided with approved automatic fire extinguishers except for the following:

(a) Those used in electrostatic finishing.

(b) Hand dipping tanks which with their associated drain boards, drip pans and drip troughs have a vapor surface area not greater than 16 square feet.

(iii) *Hand extinguishers.* There shall be provided adjacent to the inside or outside of each required exit from the room in which flammable liquids are being used or stored at least one hand fire extinguisher approved for the control of flammable liquid fires. Extinguishers containing carbon tetrachloride, methyl bromide or other toxic material are prohibited for this usage. In addition, there shall be at least one approved extinguisher for each 2500 square feet of floor area so located that a person shall not have to travel more than 50 feet to reach the nearest extinguisher. Extinguishers shall be easily accessible and protected from damage.

(2) *Electrical equipment.*

(i) *Wiring and equipment.* All electric wiring and electrical equipment shall be of good quality and be properly installed. Wiring within 10 feet of a working area or within a storage room shall be installed in sealed rigid metal conduit with explosion-proof fittings.

Exception: Operations not involving flammable solvents.

(ii) *Lighting.* Artificial lighting shall be by electricity. Lamps within areas where flammable liquids may be used or stored or where flammable vapors may be present shall be of the totally enclosed type and shall be protected against breakage either by location or by lamp guards. Lamp sockets shall be non-metallic shells and of the switchless type.

(iii) *Control equipment.* Switches and other control devices, unless explosion-proof, shall be located at least 10 feet from the working area and outside of storage rooms.

(iv) *Flexible electrical cords and portable lights.* Flexible electrical cords used in any area where flammable liquids are being used or stored or where flammable air contaminants may be present shall be of the three conductor, extra-heavy service type manufactured for the purpose and shall be fully insulated and grounded. All connections shall be explosion-proof. Portable lights used in such areas shall be shielded against breakage.

(v) *Other equipment.*

(a) All electrical equipment located in a storage room or the interior of coating hoods or their exhaust ducts shall be explosion-proof.

Exception: Air mover motors installed in compliance with subdivision (d), section 18.11 of Industrial Code Part (Rule No.) 18.

(b) Systems designed to salvage desposits by collecting them in flammable solvent shall have the controls so arranged that the solvent pump cannot operate unless the ventilating fan is operating.

(vi) *Grounding of equipment.* All mechanical equipment used for the application of flammable liquids and all booths, hoods, tanks, troughs, conveyors, fans, motor housings and all belts within a working area shall be grounded.

(3) *Heating.* Units used for comfort heating of any space to which this Part (rule) applies in which flammable liquids are used, handled or stored shall be confined to the use of low-pressure steam or hot water or indirect forced warm air. Direct warm air heating systems may be used subject to approval by the board. Heating units shall be kept free of deposits of flammable compounds.

(4) *Ventilation.* Rooms used for the storage of flammable liquids shall be provided with a minimum rate of ventilation of five cubic feet per minute per square foot of gross floor area and the ventilation shall be maintained during transfer of flammable liquids from one container to another. Where mixing and thinning operations are performed, the rate of ventilation shall conform to the requirements of section 18.20 of Industrial Code Part (Rule No.) 18.

(5) *Protection of adjacent occupancies.*

(i) *Wall or ceiling construction.* No employer shall suffer or permit flammable liquids to be used or dispensed in any room above or below or adjoining one in which there is an employee occupancy unless:

(a) the room is part of a building which is a fireproof building or a fire-resisting building complying with the provisions of Industrial Code Part (Rule No.) 7, or

(b) the walls and ceiling of the room within 20 feet horizontally of the working area are so constructed as to have a fire-resistance rating of at least one hour in accordance with Industrial Code Part (Rule No.) 7 and, if there be an employee occupancy below such room, the floor of the room within such distance is of incombustible material and is waterproof, or

(c) such room is equipped with automatic sprinkler protection conforming to the provisions of Industrial Code Part (Rule No.) 20.

(ii) *Wall openings.* Wall openings in every room in which flammable liquids are used, handled or stored shall be provided with approved three-quarter hour self-closing fire doors or with approved three-quarter hour fire windows. No such room shall have any window openings beneath or within 10 feet horizontally of any fire escape or required exterior stairway.

§ 12-1.9 Entering confined spaces.

(a) *General.* (1) Confined spaces where dangerous air contaminants have been present, are present or could be introduced from potential sources shall not be entered by any person for any reason until the atmosphere of such confined spaces has been tested and found free of dangerous air contaminants. Any such confined space shall be continuously maintained free of dangerous air contaminants during any period of occupancy. If, however, due to emergency conditions any such confined space cannot be cleared of dangerous air contaminants by mechanical ventilation or equivalent means, any person entering such confined space shall be provided with and shall use an approved air line respirator, approved hose mask or approved self-contained breathing apparatus.

(2) Whenever a confined space is to be entered, a person who has been designated as a safety monitor shall function as required by this Part (rule). A confined space shall not be entered unless there is at least one other person in addition to the required safety monitor ready to render assistance in an emergency when alerted. Such additional person shall be located within 100 feet unobstructed walking distance from and not more than one floor above or one floor below the access opening of such confined space. The assigned duties of such additional person shall be such that they will not prevent him from responding immediately to an emergency when alerted.

(b) *Preparation for entering a confined space.* Prior to entering any confined space the following steps shall be taken to insure the safety of the person entering:

(1) Any contents shall be removed, emptied or drained from the confined space insofar as is possible and the interior shall be purged by water or other equivalent means.

(2) The person entering the confined space or a designated qualified person shall lock out the circuit breakers or switches of all electrically operated equipment such as agitator drives, pumps and similar equipment which is connected to or affects the confined space and could affect the health and safety of any person in the confined space. The keys for such locks shall be retained by the person entering the confined space.

(3) All manhole and clean-out covers shall be removed and the openings maintained clear of any obstructions.

(4) All input lines which discharge into the confined space shall be disconnected and capped or provided with line blank flanges. The use of a single in-line valve shut-off is prohibited as the sole means

of isolating the confined space from any input line. However, the use of a double in-line valving arrangement with a vent in between the two valves is acceptable provided that dangerous air contaminants are not created by such venting.

(5) Tests in the confined space for the presence of dangerous air contaminants or lack of sufficient oxygen, or both, where the threat of each condition exists shall be made by a designated person who is qualified to conduct such tests by training and experience. Such tests shall be performed using calibrated equipment of a type suitable for the air contaminants involved. If such tests indicate that air contaminants in excess of the concentrations listed in subpart 12-3 of this Part (rule) are present in the confined space, the space shall be purged by mechanical ventilation until a subsequent test indicates that the air contaminant concentration is in compliance with subpart 12-3 of this Part (rule). If more than one type of air contaminant is known to be present or could be introduced in the confined space, additional tests shall be made for each contaminant. A confined space containing air contaminants which may develop an explosion hazard shall be purged by mechanical ventilation until tests indicate that the concentration of air contaminants in the confined space is not more than 25 percent of the lower explosive level of such air contaminants and that there is sufficient oxygen available in the confined space. In lieu of purging by mechanical ventilation, an inert atmosphere may be maintained in the confined space, provided that control devices are used to insure that combustion or ignition of material, including gases, cannot occur. Whenever an inert atmosphere is maintained in a confined space, every occupant shall be equipped with an approved self-contained breathing apparatus, an approved air line respirator or an approved hose mask. Every occupant shall leave the confined space immediately in the event of an interruption of the air supply to the breathing apparatus. The inert atmosphere shall be prevented from contaminating all other work areas, including the area of the access opening to the confined space and adjacent areas. Maintenance of the inert atmosphere shall in no way interfere with or prevent the emergency escape of an occupant from such a confined space.

(6) The mechanical ventilation system shall be so designed that the contaminants or contaminated air is transported to some safe location, without recirculation, and the replacement entry air does not contain dangerous air contaminants, but does contain sufficient oxygen. The provisions of this paragraph shall also apply to the exhausting of an inert atmosphere.

(7) Any person entering a confined space shall be provided with and shall use the following additional safety equipment:

(i) Where the least dimension of any access opening to a confined space is less than 24 inches, approved wrist straps or approved noose-type wristlets shall be worn. Where the least dimension of such access opening is greater than 24 inches, either an approved life belt, approved safety harness, approved wrist straps or approved noose-type wristlets shall be worn.

(ii) A lifeline, as specified by the provisions of Industrial Code Part (Rule No.) 23, shall be attached to such life belt, approved safety harness, approved wrist straps or approved noose-type wristlets with the other end securely anchored outside the confined space.

Exception: Where such a lifeline attached to approved wrist straps or approved noose-type wristlets interferes with the performance of the work duties of the person occupying the confined space, such lifeline complete with safety snaps may be disconnected from the wrist straps or wristlets provided the lifeline safety snap remains within three feet of the person in the confined space for quick attachment to the wrist straps or wristlets.

(iii) A safe means of ingress and egress, such as a portable ladder, provided such means will not obstruct the access opening.

(iv) An explosion-proof battery-operated portable light in good working order.

(v) Non-sparking striking, chipping, hammering or cutting tools and equipment where the confined space may contain explosive or flammable air contaminants.

(c) *Safety monitors.* (1) A person designated as a safety monitor shall be stationed at the access opening of any confined space while such space is occupied for any reason. The safety monitor shall maintain visual contact with every occupant in the confined space where the construction of the confined space permits, or shall have continuous knowledge of the activities and well-being of every occupant of the confined space via verbal communication or other positive means at all times. Such safety monitor may assist an occupant of a confined space in such light duties as handling tools or supplies or removing containers of refuse or debris provided that these tasks do not interfere with his primary duty as a safety monitor.

(2) The safety monitor shall be an alert, competent person, fully capable of quickly summoning the assistance of a person or rescue team for the administration of emergency first aid treatment if required.

(3) The safety monitor must be physically able to assist such summoned person or rescue team in the extrication of an occupant from a confined space under emergency conditions.

(4) The following emergency equipment shall be available to the safety monitor or rescue personnel for use if required.

(i) Approved air line respirator, approved hose mask or approved self-contained breathing apparatus.

(ii) Explosion-proof battery-operated portable light in good working order.

(iii) Safety equipment as specified in subpart 12-1, section 12-1.9, subdivision (b), paragraph (7), subparagraphs (i) and (ii) of this Part (rule).

(5) Such emergency equipment shall be located at the access opening of the confined space or not more than 15 feet from such opening.

(d) *Operations requiring continuous testing.* If the nature of the work to be performed produces or has the potential to produce dangerous air contaminants as specified in this Part (rule), continuous testing shall be performed. If such tests indicate evidence of dangerous air contaminants exceeding the concentrations listed in subpart 12-3 of this Part (rule) or in quantities greater than 25 percent of the lower explosive level, the occupants shall be ordered to evacuate the confined space immediately.

(e) *External alarm signal.* Outside of every occupied confined space there shall be an audible alarm signal device located within 15 feet of the access opening. Such device may be of the portable type and shall be maintained in good working order. When actuated, such audible alarm shall be louder than the general background noise level and should be capable of being heard clearly by any person located within 100 feet of the access opening. In case of an emergency in a confined space, the safety monitor shall immediately actuate the alarm signal. In no case shall the safety monitor or other rescue personnel enter the confined space without first actuating the alarm signal and, secondly, putting on his personal protective equipment.

(f) *Illumination.* There shall be installed and maintained an independent substitute emergency lighting system in addition to the principal lighting system in any area where a confined space is located and which is entered frequently for cleaning and maintenance purposes. Such substitute emergency lighting system shall operate automatically upon failure of the principal system and shall be capable of providing distinct illumination for a period of at least 30 minutes of all access openings of confined spaces as well as of the general surrounding area and exits. Whenever the principal lighting system fails, the confined spaces shall be evacuated immediately. Where any confined space is to be entered infrequently for inspection or similar purposes, sufficient quantities of battery-powered lights in good working order shall be provided to afford distinct illumination at every access opening and its surrounding area and exit. These lights shall be capable of providing illumination for a period of time of at least one hour.

§ 12-1.10 Maintenance and operation of equipment.

(a) *Equipment maintenance.* All equipment required by this Part (rule) shall be maintained in good repair and proper operating condition.

(b) *Floor maintenance.* The floor within and in the immediate vicinity of the working area shall be kept clean and clear of any waste material or any obstruction. Where dust may be created by dry sweeping, floors shall be wet down with a non-flammable wetting agent before sweeping.

(c) *Passage space.* A minimum passage space of three feet shall be provided for access to every working station.

(d) *Purging.* Exhaust systems shall continue in operation for a sufficient period of time after conclusion of operations to clear the air of dangerous air contaminants.

(e) *Containers.* (1) All tanks and containers used for flammable liquids shall be of incombustible material and shall be kept closed whether full or empty, except as may be necessary for operational purposes.

(2) Emptied drums or other containers shall not be stored indoors unless they have been purged of all contents constituting or creating dangerous air contaminants. Purging shall be done in a mechanically ventilated area if performed indoors. Compressed air shall not be used for purging containers.

(f) *Refuse material.* In the vicinity of every process or operation to which this Part (rule) applies there shall be provided metal containers with self-closing covers and bearing the notice "FLAMMABLE WASTE". Such containers shall be used for scrapings, sweepings and other waste containing or consisting of flammable material. Such refuse shall be disposed of at the end of each day by burying, burning or other safe treatment but no such refuse shall be burned in a furnace.

§ 12-1.11 Approved devices or materials.

Any device or material which the board has approved pursuant to section 27-a of the Labor Law for use in complying with this Part (rule) may be so used as if by this Part (rule) specifically authorized, any general or special provision of this Part (rule) notwithstanding.

§ 12-1.12 Severability.

If any provision of this Part (rule) or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of this Part (rule) which can be given effect without the invalid provision or application and to this end the provisions of this Part (rule) are declared to be severable.

Subpart 12-2

SPECIFIC OPERATIONS AND SPECIFIC CONTROL REQUIREMENTS

Sec.

- 12-2.1 Cutting, grinding and polishing wheels
- 12-2.2 Woodworking machines
- 12-2.3 Melting apparatus
- 12-2.4 Open surface tank operations
- 12-2.5 Tumbling processes
- 12-2.6 Abrasive blasting operations
- 12-2.7 Crushing, milling, screening, mixing and conveying
- 12-2.8 Welding, brazing, flame cutting and metallizing
- 12-2.9 Exhaust gases from motor vehicles operating in enclosed areas
- 12-2.10 Industrial products coating

§ 12-2.1 Cutting, grinding and polishing wheels.

Grinding, polishing, buffing, scratch brushing, abrasive cutting-off wheel and grinding or polishing belt strap operations generating dangerous air contaminants shall be provided with local exhaust ventilation and air cleaning devices.

- Exception:*
1. Wet grinding with other than sandstone wheels and wet polishing and buffing operations if enclosures are provided which prevent splash or dispersion of liquids, abrasive compounds or mists into the workroom.
 2. Intricate and precision grinding discs or wheels not over one inch in diameter.
 3. Grinding or polishing of articles and instruments made of gold or platinum.
 4. Intermittent tool grinding operations used for shop purposes only.

§ 12-2.2 Woodworking machines.

Woodworking operations generating dangerous air contaminants shall be provided with local exhaust ventilation and air cleaning devices.

§ 12-2.3 Melting apparatus.

Vessels operated at or in excess of the temperature of volatilization of toxic metals, alloys or compounds which generate dangerous air contaminants shall be provided with local exhaust ventilation. Vessels used for melting or cleaning such metals, alloys or compounds shall be provided with exhaust ventilation when operated in such a manner as to generate dangerous air contaminants. The combustion chamber, when operated in such a manner as to release dangerous air contaminants, shall be provided with local exhaust ventilation.

- Exceptions:* Portable receptacles or apparatus which have no fixed location and are used intermittently and which produce no dangerous air contaminants.

§ 12-2.4 Open surface tank operations.

(a) *General.* Open surface tank operations creating dangerous air contaminants shall be provided with ventilation to control such contaminants. (See Industrial Code Part [Rule No.] 18.)

(b) *Classes of operations.* Open surface tank operations are classified into groups in accordance with both hazard potential and rate of contaminant release as set forth in section 18.14 of Industrial Code Part (Rule No.) 18.

(c) *Humidity control.* When heat is added to the workroom to prevent the condensation of water vapor evaporated from open tanks into mist, such additional heat shall be so controlled that it does not raise the wet bulb temperature in the lower six feet of the workroom above 80 degrees Fahrenheit.

(d) *Clean-out doors.* Tanks or machines used for cleaning by solvents and having a surface vapor area of more than two square feet shall be equipped with suitable clean-out or sludge doors located near the bottom of each tank or still. Such doors shall be constructed and maintained so that there is no leakage of solvent when closed.

(e) *Solvent transfer.* (1) Transfer of flammable solvents from containers shall be by means of a hose or pipe leading to the bottom of the tank being filled. Containers between which the transfer is being made shall be electrically bonded and grounded with a resistance of less than 25 ohms.

(2) Volatile solvents shall not be stored or transferred in uncovered vessels.

(f) *Vapor phase degreasing.* (1) *Freeboard.* The level of the vapors shall be kept below the top edge of the tank by a distance equal to at least one-half the tank width or 36 inches, whichever is less.

(2) *Heating.*

(i) *Gas.* Where gas is used as fuel for heating, the combustion chamber shall be of tight construction, except for necessary combustion and flue openings. Mechanically ventilated flues shall be independent of the exhaust duct. Natural draft flues shall be provided with draft diverters. All flues shall be constructed of corrosion-resistant material.

(ii) *Electric.* Electric heating units shall be constructed of materials resistant to the tank contents and shall be constructed and installed so as to prevent hot spots.

(3) *Thermostatic control.* Every tank shall be provided with two thermostats, one of which shall be connected to control or shut off the source of heat when the contents reach a temperature not higher than 20 degrees Fahrenheit in excess of the boiling point of the solvent in its uncontaminated state and the other of which shall be located above the vapor zone and be adjusted to shut off the source of heat when the temperature in the zone of the thermostat is at the boiling point of the solvent.

(4) *Condensers.* Tanks shall be equipped with condensing or cooling surfaces consisting of pipes, coils, water jackets or any combination thereof located on at least two sides in the upper portion of the tank above the solvent liquid level. Water, refrigerant or other cooling media shall be circulated through the condenser whenever the tank is in operation.

(g) *Operation.* (1) Where tanks are provided with loading hoists, the hoists shall be designed to raise and lower the work at a speed not greater than 11 feet per minute.

(2) All products after immersion in solvents shall be held in the vapor zone of the tank and shall not be withdrawn from the tank until the product reaches the vapor temperature as evidenced by the stopping of vapor condensation on the product.

(3) Loading racks shall be of metal or equally impervious material.

(4) The horizontal cross section area of product or rack shall not be greater than two-thirds of the horizontal cross section area of the tank.

(h) *Welding and open flame work.* No work involving welding, open flames or other sources of ignition shall be done at or about any equipment for open surface tank operations unless such equipment has first been thoroughly cleaned of all flammable or volatile solvents and their vapors or is protected by distance or by shielding against accidental ignition or heating from such work.

(i) *Special precautions for cyanide.* (1) Where rinse, acid and cyanide tanks are so installed and used that any of them may be contaminated with cyanide or acid, such tanks shall be provided with local exhaust ventilation.

(2) Cyanide tanks shall not be provided with drains or overflows which will allow the tank contents to mix with liquid drained from other tanks either on the floor or in floor drains unless the cyanide drainage has been properly neutralized.

(3) Cyanide salts shall be stored in a locked enclosure and set above the level of any floor on which acid carboys are stored.

§ 12-2.5 Tumbling processes.

Tumbling processes creating dangerous air contaminants shall be provided with means to remove or control such contaminants at the point of generation.

Exception: The above does not apply to mills, drums, cages or barrels which are completely enclosed during rotation and which disseminate air contaminants only when being charged or discharged. Means shall be provided to control such contaminants.

§ 12-2.6 Abrasive blasting operations.

(a) *General.* Abrasive blasting operations creating dangerous air contaminants shall be enclosed as completely as practicable and shall be provided with local exhaust systems to remove the air contaminants.

Exception: Outdoor abrasive cleaning operations where the operator is furnished with and wears an approved air line respirator.

(b) *Operation.* Approved air respiratory protective equipment of the supplied air type shall be used by persons employed in abrasive blasting rooms or tunnels.

(c) *Air supply.* Air furnished to air line respiratory equipment shall be clean.

§ 12-2.7 **Crushing, milling, screening, mixing and conveying.**

Crushing, milling, screening, mixing and conveying and related processes creating dangerous air contaminants shall be enclosed and provided with local exhaust ventilation to remove or control the air contaminants at the point of generation.

§ 12-2.8 **Welding, brazing, flame cutting and metallizing.**

(a) *General requirements.* Welding, brazing, flame cutting and metallizing operations creating dangerous air contaminants shall be provided with ventilation to control such contaminants.

(b) *Classes of operations.* Operations involving welding, brazing, flame cutting and metallizing operations are divided into the following classes for the purposes of this Part (rule):

(1) *Class I-operations* in confined spaces involving toxic metals including but not limited to antimony, beryllium, cadmium, lead, mercury, selenium or tellurium, or involving fluorine or any alloy, compound or flux containing any one or combination thereof of other dangerous air contaminants.

(2) *Class II-operations* in confined spaces involving metals, alloys or compounds other than those listed in Class I.

(3) *Class III-operations* in unconfined spaces involving metals, alloys or compounds listed in Class I.

(4) *Class IV-operations* in unconfined spaces involving metals, alloys or compounds other than those listed in Class I.

(c) *Protection of operators.* (1) *Class I requirements.* Every employee required to work within a confined space where any Class I operation is performed shall be furnished an approved air line respirator or supplied air helmet, and the confined space shall be ventilated at a minimum rate of 1,000 c.f.m. per welder within the enclosure.

(2) *Class II requirements.* Every employee required to work within a confined space where any Class II operation is performed shall be furnished an approved air line respirator or supplied air helmet, or the confined space shall be ventilated at a minimum rate of 1,000 c.f.m. per welder within the enclosure.

(3) *Class III requirements.* Every Class III operation shall be provided with local exhaust ventilation.

(4) *Class IV requirements.* Every Class IV operation at a fixed location as part of a production process shall be provided with local exhaust ventilation where practicable. All other Class IV operations shall be provided with dilution ventilation.

Exception: The following Class IV operations are excepted from the above:

1. Spot welding.
2. Operations which are not usual shop practice.
3. Out-of-door operations.

§ 12-2.9 Exhaust gases from motor vehicles operating in enclosed areas.

Enclosed areas in which internal combustion motor vehicles are operated and release dangerous air contaminants shall be provided with means to remove or control the fumes, gases or vapors released or disseminated.

§ 12-2.10 Industrial products coating.

(a) *Where performed.* Coating shall be conducted in a ventilated hood, booth or enclosure complying with this Part (rule) and section 18.20 of Industrial Code Part (Rule No.) 18.

(b) *Vehicles.* Vehicles shall not be taken into or out of spray coating spaces under their own power, unless the exhaust system is operating.

(c) *Use of different types of coating materials.* Where different types of coating materials are used in the same booth or space, the booth or space shall be thoroughly cleaned of previous coating deposits before commencing the application of the new substance.

(d) *Sanding.* Sanding of surfaces containing lead or lead pigment shall be done either with sandpaper wetted with water or in an area provided with an exhaust system providing ventilation at a minimum rate of 150 f.p.m. in the breathing zone of the worker.

(e) *Cleaning of hoods and booths.* Exhaust fans and the interior of hoods, booths and ducts shall be maintained free of accumulations of coating material.

(f) *Lining of spray booths.* Material for lining of spray booths or hoods, if used, shall cover the inner sides of the booth or hood without overhanging and shall be maintained in contact with the walls of the booth or hood. Loose sections shall be removed or shall be reapplied to the wall surface.

(g) *Forced drying and baking.* (1) *Construction.* Ovens, cabinets, other enclosures and duct work used for forced drying or baking systems shall be constructed of incombustible material with expansion joints provided in the oven framing. Duct work shall be provided with two inches clearance or three-fourths inch of incombustible rigid insulation where the duct work passes through combustible walls, floors or roofs. The temperature of surfaces in contact with walls, floors or roofs shall not exceed 160 degrees Fahrenheit. The floor surface of the oven shall be of incombustible material and extend at least one foot beyond the oven outline. Interior surfaces shall be smooth.

(2) *Ventilation.*

(i) Ovens, cabinets and other enclosures used for such purpose shall be provided with mechanical ventilation to maintain the concentration of flammable vapors below 25 percent of the lower explosive level at all times. Ovens shall be exhausted mechanically so that an inward air flow shall be maintained through all openings to prevent escape of dangerous air contaminants. The fans of such exhaust ventilating and any recirculating systems shall be interlocked to the heat supply by means of approved air flow switches, so that the heat supply shall be cut off unless the fan maintains the required air flow. Conveyors shall be interlocked with the oven exhaust and any recirculating fans so that the conveyors cannot operate unless such fans are operating.

(ii) When persons are required to enter the drying enclosure, the concentration of air contaminants shall be maintained below the danger level by mechanical ventilation.

(3) *Explosion vents.* Ovens located inside buildings and in which flammable vapors or combustible gases may be present in amounts exceeding 25 percent of the lower explosive level shall be equipped with explosion relief panels to relieve internal explosion pressures. Such vents shall provide an unobstructed aggregate area of one square foot of panel opening to each 15 cubic feet of oven volume, allowance being made for access openings and doors arranged to yield easily to internal pressure. Relief panels shall, if practicable, be located in the top of the enclosure and be made of material other than glass, which shall yield easily to internal pressure. On long ovens, relief panels shall be distributed to provide effective explosion relief. Relief panels shall be located and arranged so as not to create a hazard to employees or to other work spaces. Panel edges shall be maintained free of condensate and other solid material to insure proper operation.

(4) *Controls.*

(i) Fan switches shall be interlocked with the fuel valve through a time delay arrangement to assure proper pre-ventilation before the fuel is ignited. Where necessary, enclosure doors shall have a limit switch interlock to prevent the time delay relay from operating unless the enclosure doors are open.

(ii) The fuel supply line shall be provided with a pressure switch to shut off the fuel supply when the fuel supply pressure is insufficient. The switch shall not reopen the fuel valve automatically.

(iii) An excess temperature limit switch shall be provided to cut off the fuel supply when oven temperature exceeds the safe limit. The switch shall not reopen the fuel valve automatically.

(iv) Combustion safeguards shall be provided to shut off the fuel supply in the event of pilot light or ignition failure.

(5) *Dampers.* Air supply or exhaust volume control dampers shall be adjusted properly and fixed securely. Dampers shall be designed to prevent full closure.

(6) *Combination booths.* Where coating and forced drying are done alternately in the same booth or enclosure, the following requirements shall be complied with:

(i) During coating operations, the drying apparatus and electrical connections and wiring thereto shall not be located within the coating enclosure nor in any location where coating residue may be deposited thereon.

(ii) Coating apparatus, drying apparatus and ventilating system of the coating enclosure shall be equipped with suitable approved interlocks so arranged that coating apparatus cannot be operated while drying apparatus is inside the coating enclosure and the coating enclosure shall be purged of coating vapors for a period of not less than three minutes before drying apparatus can be energized; the ventilating system shall continue in operation during the drying process and in the event of failure of the ventilating system, the drying apparatus shall shut off automatically.

(7) *Cleaning.* The inside surfaces of the drying enclosure shall be maintained clean. Cleaning tools shall be of nonferrous material.

(h) *Lighting.* Illumination of hazardous areas through panels of transparent material is permitted only under the following conditions:

- (1) Fixed lighting units shall be used as the source of illumination.
- (2) The panel shall effectively isolate the hazardous area from the area in which the lighting unit is located.
- (3) The transparent panel shall conform to subdivision (a) of section 18.20 of Industrial Code Part (Rule No.) 18.
- (4) The installation shall be such that the normal accumulation of hazardous residue on the exposed surface of the panel will not be raised to a dangerous temperature by heat radiation or conduction from the source of illumination.

(i) *Electrostatic apparatus.* (1) *Installation and use.* The installation and use of electrostatic apparatus shall comply with other applicable provisions of this Part (rule) and with the following requirements:

- (2) *Approval required.* Only approved electrostatic apparatus shall be used.
- (3) *Conductive coatings.* This method shall not be used for spraying conductive coatings.
- (4) *Hand operations.* Manually operated spray guns or atomizers shall not be used in an electrostatic field unless they are approved.
- (5) *Location.* Electrostatic apparatus and devices used in connection with paint spraying, dipping or other coating operations shall have transformers and power packs located outside spray booths or enclosures and areas subject to paint deposit.
- (6) *Supports.* Electrodes and electrostatic atomizing heads shall be rigidly supported and permanently installed and shall be effectively insulated from ground.
- (7) *Clearance.* Space of at least twice the sparking distance shall be maintained between articles being finished and electrodes, electrostatic atomizing heads or conductors.
- (8) *Articles on conveyors.* Articles on conveyors shall be so arranged and supported as to maintain the required clearances.
- (9) *Automatic controls.* Electrostatic apparatus shall be equipped with automatic controls arranged to make the entire equipment dead if the ventilation of the spraying or drying area falls below a velocity of 100 feet per minute, or if an article on the conveyor projects into the required clearance, or if the conveyor stops.
- (10) *Guarding and isolation of process.* The electrical field and all parts of the equipment carrying high potential shall be located, guarded and fenced off to provide safe isolation of the process. Guards and fences shall be of conducting material and shall be grounded.
- (11) *Signs.* A suitable sign stating the sparking distance shall be posted conspicuously near the assembly. Signs designating the process zone as dangerous by reason of fire and accident hazard shall be posted.
- (12) *Insulators.* Insulators shall be acceptable to the commissioner for the potential used and shall be maintained clean and dry.

Subpart 12-3

EVIDENCE OF DANGEROUS AIR CONTAMINANTS

Sec.

12-3.1 General

§ 12-3.1 General.

The existence of air contaminants consisting of or deriving from the substances named in the following tables in relative quantities greater than those set forth as to each substance shall constitute prima-facie evidence that such contaminants are dangerous air contaminants, except when they exist only momentarily and infrequently. Prima-facie evidence as to whether such contaminants in momentary and infrequent occurrences, or other air contaminants not named in the tables or lesser concentrations than those set forth in the following tables contending to injure the health of employees shall include an opinion to that effect by a physician representing the industrial commissioner.

Note: Petitions for variations pursuant to section 30 of the Labor Law from administrative orders issued on the basis of prima-facie evidence of dangerous air contaminants will be decided by the board after review of reports of air tests and field investigations submitted to the board by the commissioner and a hearing which the petitioner will attend. The petitioner will be given opportunity to submit testimony, data and test results at the hearings to support his variation request.

TABLE I – Threshold Limit Values (T.L.V.)
(in alphabetical order)

<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
* Abate	---	15
Acetaldehyde	200	360
Acetic acid	10	25
Acetic anhydride	5	20
Acetone	1,000	2,400
Acetonitrile	40	70
Acetylene dichloride, see 1,2 Dichloroethylene		
Acetylene tetrabromide	1	14
Acrolein	0.1	0.25
Acrylamide-skin	---	0.3
Acrylonitrile-skin	20	45
Aldrin-skin	---	0.25
Allyl alcohol-skin	2	5
Allyl chloride	1	3
C Allyl glycidyl ether (AGE)	10	45
Allyl propyl disulfide.....	2	12
2-Aminoethanol, see Ethanolamine		
2-Aminopyridine	0.5	2
Ammonia.....	50	35
Ammonium sulfamate (Ammate).....	---	15
n-Amyl acetate.....	100	525
sec-Amyl acetate	125	650
Aniline-skin	5	19
Anisidine (o, p-isomers) –skin.....	---	0.5
Antimony & compounds (as Sb).....	---	0.5
ANTU (alpha naphthyl thiourea).....	---	0.3
Arsenic & compounds (as AS)	---	0.5
Arsine.....	0.05	0.2
Azinphos-methyl-skin	---	0.2
Barium (soluble compounds).....	---	0.5
C Benzene (benzol) –skin	25	80
Benzidine-skin	---	A

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

(b) Approximate milligrams of particulate per cubic meter of air.

(d) An atmospheric concentration of not more than 0.02ppm, or personal protection may be necessary to avoid headache.

* 1969 addition.

** Registered trade name.

A No exposure or contact permitted by any route (respiratory, oral or skin).

C Ceiling limit which shall not be exceeded even momentarily or infrequently.

A¹ No exposure or contact permitted by any route (respiratory, oral or skin).

A² No TLV recommended pending termination of toxicity or products, but air concentrations should be minimal.

TABLE I – Threshold Limit Values (T.L.V.)
(in alphabetical order)

<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
p-Benzoquinone, see Quinone		
Benzoyl peroxide.....	---	5
Benzyl chloride.....	1	5
Beryllium.....	---	0.002
Biphenyl, see Diphenyl		
Boron oxide.....	---	15
*Boron tribromide.....	1	---
C Boron trifluoride.....	1	3
Bromine.....	0.1	0.7
*Bromine pentafluoride.....	0.1	---
Bromoform-skin.....	0.5	5
Butadiene (1,3-butadiene).....	1,000	2,200
Butanethiol, see Butyl mercaptan		
2-Butanone.....	200	590
2-Butoxy ethanol (Butyl Cellosolve) –skin.....	50	240
Butyl acetate (n-butyl acetate).....	150	710
sec-Butyl acetate.....	200	950
tert-Butyl acetate.....	200	950
Butyl alcohol.....	100	300
sec-Butyl alcohol.....	150	450
tert-Butyl alcohol.....	100	300
C Butylamine-skin.....	5	15
C tert-Butyl chromate (as CrO ₃ –skin).....	---	0.1
n-Butyl glycidyl ether (BGE).....	50	270
Butyl mercaptan.....	10	35
p-tert-Butyltoluene.....	10	60
Cadmium (Metal dust and soluble salts).....	---	0.2
Cadmium oxide fume.....	---	0.1
Calcium arsenate.....	---	1
Calcium oxide.....	---	5
*Camphor.....	2	---
Carbaryl (Sevin **).....	---	5
Carbon black.....	---	3.5
Carbon dioxide.....	5,000	9,000
Carbon disulfide-skin.....	20	60
Carbon monoxide.....	50	55
Carbon tetrachloride-skin.....	10	65
Chlordane-skin.....	---	0.5

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

(b) Approximate milligrams of particulate per cubic meter of air.

(d) An atmospheric concentration of not more than 0.02ppm, or personal protection may be necessary to avoid headache.

* 1969 addition.

** Registered trade name.

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C Ceiling limit which shall not be exceeded even momentarily or infrequently.

A¹ No exposure or contact permitted by any route (respiratory, oral or skin).

A² No TLV recommended pending termination of toxicity or products, but air concentrations should be minimal.

<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Chlorinated camphene-skin	---	0.5
Chlorinated diphenyl oxide.....	---	0.5
*Chlorine	1	---
Chlorine dioxide	0.1	0.3
C Chlorine trifluoride	0.1	0.4
C Chloroacetaldehyde	1	3
alpha-Chloroacetophenone (phenacylchloride).....	0.05	0.3
Chlorobenzene (monochlorobenzene).....	75	350
o-Chlorobenzylidene malononitrile (OCBM).....	0.05	0.4
Chlorobromomethane.....	200	1,050
2-Chloro-1, 3 butadiene, see Chloroprene		
Chlorodiphenyl (42% Chlorine) –skin	---	1
Chlorodiphenyl (54% Chlorine) –skin	---	0.5
1, Chloro, 2, 3, epoxypropane, see Epichlorhydrin		
2, Chloroethanol, see Ethylene chlorohydrin		
Chloroethylene, see Vinyl chloride		
C Chloroform (trichloromethane).....	50	240
1-Chloro-1-nitropropane.....	20	100
Chloropicrin	0.1	0.7
Chloroprene (2-chloro-1, 3-butadiene) –skin	25	90
Chromic acid and chromates (as CrO ₃).....	---	0.1
Chromium, sol. chromic, chromous salts (as Cr).....	---	0.5
Metal and insoluble salts	---	1
Coal tar pitch volatiles (benzene soluble fraction, anthracene, BaP, phenanthrene, acridine, chrysene, pyrene).....	---	0.2
Cobalt, metal fume and dust.....	---	0.1
Copper fume	---	0.1
Dusts and mists.....	---	1
Cotton dust (raw).....	---	1
Crag ** herbicide.....	---	15
Cresol (all isomers) –skin	5	22
Crotonaldehyde	2	6
Cumene-skin.....	50	245
Cyanide (as CN) –skin.....	---	5
*Cyanogen.....	10	---
Cyclohexane.....	300	1,050
Cyclohexanol.....	50	200
Cyclohexanone	50	200
Cyclohexene.....	300	1,015
Cyclopentadiene.....	75	200

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

(b) Approximate milligrams of particulate per cubic meter of air.

(d) An atmospheric concentration of not more than 0.02ppm, or personal protection may be necessary to avoid headache.

* 1969 addition.

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A¹ No exposure or contact permitted by any route (respiratory, oral or skin).

A² No TLV recommended pending termination of toxicity or products, but air concentrations should be minimal.

<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
2,4-D.....	---	10
DDT-skin	---	1
DDVP-skin	---	1
Decaborane-skin	0.05	0.3
Demeton ** -skin.....	---	0.1
Diacetone alcohol (4-methyl-2-pentanone).....	50	240
1,2 Diaminoethane, see Ethylenediamine		
Diazomethane	0.2	0.4
Diborane.....	0.1	0.1
C 1,2-Dibromoethane (ethylene dibromide)-skin	25	190
Dibutyl phosphate.....	1	5
Dibutylphthalate.....	---	5
C o-Dichlorobenzene.....	50	300
p-Dichlorobenzene.....	75	450
Dichlorodifluoromethane.....	1,000	4,950
1,3-Dichloro-5, dimethyl hydantoin	---	0.2
1,1-Dichloroethane	100	400
1,2-Dichloroethane	50	200
1,2-Dichloroethylene.....	200	790
C Dichloroethyl ether-skin.....	15	90
Dichloromethane, see Methylenechloride		
Dichloromonofluoromethane.....	1,000	4,200
C 1,1-Dichloro-1-nitroethane.....	10	60
1,2-Dichloropropane, see Propylenedichloride		
Dichlorotetrafluoroethane.....	1,000	7,000
Dieldrin-skin.....	---	0.25
Diethylamine.....	25	75
Diethylamino ethanol-skin.....	10	50
C Diethylene triamine-skin	10	---
Diethylether, see Ethyl ether		
Difluorodibromomethane.....	100	860
C Diglycidyl ether (DGE)	5.5	2.8
Dihydroxybenzene, see Hydroquinone		
Diisobutyl ketone	50	290
Diisopropylamine-skin	5	20
* Diphenyl amine.....	---	10
Dimethoxymethane, see Methylal		
Dimethyl acetamide-skin	10	35
Dimethylamine.....	10	18
Dimethylaminobenzene, see Xylidene		

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

(b) Approximate milligrams of particulate per cubic meter of air.

(d) An atmospheric concentration of not more than 002 ppm, or personal protection may be necessary to avoid headache.

* 1969 addition.

** Registered trade name.

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Dimethylaniline (N-dimethylaniline)-skin.....	5	25
Dimethylbenzene, see Xylene		
Dimethyl 1, 2-dibromo-2, 2-dichloroethyl, (Dibrom).....	---	3
Dimethylformamide-skin.....	10	30
2,6 Dimethylheptanone, see Diisobutyl ketone		
1,1-Dimethylhydrazine-skin.....	0.5	1
Dimethylphthalate.....	---	5
Dimethylsulfate-skin.....	1	5
Dinitrobenzene (all isomers)-skin.....	---	1
Dinitro-o-cresol-skin.....	---	0.2
Dinitrotoluene-skin.....	---	1.5
Dioxane (Diethylene dioxide)-skin.....	100	360
Diphenyl.....	0.2	1
* Diphenyl Amine.....	---	10
Diphenylmethane diisocyanate (see Methylene bisphenyl isocyanate) (MDI)		
Dipropylene glycol methyl ether-skin.....	100	600
Di-sec, octyl phthalate (Di-2-ethylhexylphthalate).....	---	5
Endrin-skin.....	---	0.1
Epichlorhydrin-skin.....	5	19
EPN-skin.....	---	0.5
1,2-Epoxypropane, see Propyleneoxide		
2,3-Epoxy-1-propanol, see Glycidol		
Ethanethiol, see Ethylmercaptan		
Ethanolamine.....	3	6
2 Ethoxyethanol-skin.....	200	740
2 Ethoxyethylacetate (Cellosolve acetate)-skin.....	100	540
Ethyl acetate.....	400	1,400
Ethyl acrylate-skin.....	25	100
Ethyl alcohol (ethanol).....	1,000	1,900
Ethylamine.....	10	18
Ethyl sec-amyl ketone (5-methyl-3-heptanone).....	25	130
Ethyl benzene.....	100	435
Ethyl bromide.....	200	890
Ethyl butyl ketone (3-Heptanone).....	50	230
Ethyl chloride.....	1,000	2,600
Ethyl ether.....	400	1,200
Ethyl formate.....	100	300
Ethyl mercaptan.....	10	25
Ethyl silicate.....	100	850

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

(b) Approximate milligrams of particulate per cubic meter of air.

(d) An atmospheric concentration of not more than 0.02ppm, or personal protection may be necessary to avoid headache.

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Ethylene chlorohydrin-skin	5	16
Ethylenediamine	10	25
Ethylene dibromide, see 1, 2-Dibromoethane		
Ethylene dichloride, see 1, 2-Dichloroethane		
C Ethylene glycol dinitrate and/or Nitroglycerin-skin	0.2(d)	1
Ethylene glycol monomethyl ether acetate, see Methyl cellosolve acetate		
Ethylene imine-skin	0.5	1
Ethylene oxide	50	90
Ethylidene chloride, see 1, 1-Dichloroethane		
N-Ethylmorpholine-skin	20	94
Ferbam	---	15
Ferrovandium dust	---	1
Fluoride (as F)	---	2.5
Fluorine	0.1	0.2
Fluorotrichloromethane	1,000	5,600
C Formaldehyde	5	6
Formic acid	5	9
Furfural-skin	5	20
Furfuryl alcohol	50	200
Gasoline	---	A
Glycidol (2, 3-Epoxy-1-propanol)	50	150
Glycol monoethyl ether, see 2-Ethoxyethanol		
Guthion **, see Azinphosmethyl		
Hafnium	---	0.5
Heptachlor-skin	---	0.5
Heptane (n-heptane)	500	2,000
Hexachloroethane-skin	1	10
Hexachloronaphthalene-skin	---	0.2
Hexane (n-hexane)	500	1,800
2-Hexanone	100	410
Hexone	100	410
sec-Hexyl acetate	50	300
Hydrazine-skin	1	1.3
Hydrogen bromide	3	10
C Hydrogen chloride	5	7
Hydrogen cyanide-skin	10	11
Hydrogen fluoride	3	2
Hydrogen peroxide, 90%	1	1.4
Hydrogen selenide	0.05	0.2

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Hydrogen sulfide.....	10	15
Hydroquinone.....	---	2
* Indium and compounds (as In).....	---	0.1
C Iodine.....	0.1	1
Iron oxide fume.....	---	10
* Iron salts, soluble (as Fe).....	---	1
Isoamyl acetate.....	100	525
Isoamyl alcohol.....	100	360
Isobutyl acetate.....	150	700
Isobutyl alcohol.....	100	300
Isophorone.....	25	140
Isopropyl acetate.....	250	950
Isopropyl alcohol.....	400	980
Isopropylamine.....	5	12
Isopropylether.....	500	2,100
Isopropyl glycidyl ether (IGE).....	50	240
Ketone.....	0.5	0.9
Lead.....	---	0.2
Lead arsenate.....	---	0.15
Lindane-skin.....	---	0.5
Lithium hydride.....	---	0.025
L.P.G. (Liquified petroleum gas).....	1,000	1,800
Magnesium oxide fume.....	---	15
Malathion-skin.....	---	15
Maleic anhydride.....	0.25	1
C Manganese.....	---	5
Mercury-skin.....	---	0.1
Mercury (organic compounds)-skin.....	---	0.01
Mesityl oxide.....	25	100
Methanethiol, see Methyl mercaptan		
Methoxychlor.....	---	15
2-Methoxyethanol, see Methyl cellosolve		
Methyl acetate.....	200	610
Methyl acetylene (propyne).....	1,000	1,650
Methyl acetylene-propadiene mixture (MAPP).....	1,000	1,800
Methyl acrylate-skin.....	10	35
Methylal (dimethoxymethane).....	1,000	3,100
Methyl alcohol (methanol).....	200	260
Methylamine.....	10	12

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees Centigrade and 760 mm. Hg pressure.

(b) Approximate milligrams of particulate per cubic meter of air.

(d) An atmospheric concentration of not more than 0.02 ppm, or personal protection may be necessary to avoid headache.

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Methyl amyl alcohol, see Methyl isobutyl carbinol		
Methyl (n-amyl) ketone (2-Heptanone).....	100	465
C Methyl bromide-skin.....	20	80
Methyl butyl ketone, see 2-Hexanone		
Methyl cellosolve-skin	25	80
Methyl cellosolve acetate-skin.....	25	120
C Methyl chloride.....	100	210
Methyl chloroform.....	350	1,900
Methylcyclohexane.....	500	2,000
Methylcyclohexanol.....	100	470
o-Methylcyclohexanone-skin	100	460
Methyl ethyl ketone (MEK), see 2-Butanone		
Methyl formate	100	250
Methyl iodide-skin	5	28
Methyl isobutyl carbinol-skin	25	100
Methyl isobutyl ketone, see Hexone		
Methyl isocyanate-skin	0.22	0.05
C Methyl mercaptan	10	20
Methyl methacrylate	100	410
Methyl propyl ketone, see 2-Pentanone		
C * Methyl silicate.....	5	---
C alpha-Methyl styrene.....	100	480
C Methylene bisphenyl isocyanate (MDI).....	0.02	0.2
Methylene chloride (dichloromethane).....	500	1,740
Molybdenum (soluble compounds).....	---	5
(insoluble compounds).....	---	15
Monomethyl aniline-skin	2	9
C Monomethyl hydrazine-skin.....	0.2	0.35
Morpholine-skin	20	70
Naphtha (coal tar).....	100	400
Naphthalene	10	50
beta-Naphthylamine.....	---	A
Nickel carbonyl.....	0.001	0.007
Nickel, metal and soluble compounds.....	---	1
Nicotine-skin	---	0.5
Nitric acid	2	5
Nitric oxide.....	25	30
p-Nitroaniline-skin	1	6
Nitrobenzene-skin	1	5
p-Nitrochloro-benzene-skin	---	1
Nitroethane	100	310
C Nitrogen dioxide.....	5	9

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Nitrogen Trifluoride.....	10	29
C Nitroglycerin-skin	0.2	2
Nitromethane.....	100	250
1-Nitropropane	25	90
2-Nitropropane	25	90
N-Nitrosodimethyl-amine (Dimethyl-Nitrosoamine)-skin.....	---	A
Nitrotoluene-skin	5	30
Nitrotrichloromethane, see Chloropicrin		
Octachloronaphthalene-skin	---	0.1
Octane	500	2,350
Oil mist (mineral)	---	5
Osmium tetroxide.....	---	0.002
Oxalic acid.....	---	1
Oxygen difluoride	0.05	0.1
Ozone	0.1	0.2
Paraquat-skin.....	---	0.5
Parathion-skin	---	0.1
Pentaborane.....	0.005	0.01
Pentachloronaphthalene-skin	---	0.5
Pentachlorophenol-skin	---	0.5
Pentane.....	1,000	2,950
2-Pentanone	200	700
Perchloroethylene.....	100	670
Perchloromethyl mercaptan.....	0.1	0.8
Perchloryl fluoride	3	13.5
Petroleum Distillates (naphtha).....	500	2,000
Phenol-skin	5	19
p-Phenylene diamine-skin.....	---	0.1
Phenyl ether (vapor).....	1	7
Phenyl ether-Biphenyl mixture (vapor).....	1	7
Phenylethylene, see Styrene		
Phenyl glycidyl ether (PGE).....	10	60
Phenylhydrazine-skin	5	22
Phosdrin (Mevinphos ^{**})-skin	---	0.1
Phosgene (carbonyl chloride).....	0.1	0.4
Phosphine	0.3	0.4
Phosphoric acid.....	---	1
Phosphorus (yellow).....	---	0.1

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Phosphorus pentachloride.....	---	1
Phosphorus pentasulfide.....	---	1
Phosphorous trichloride.....	0.5	3
Phthalic anhydride.....	2	12
Picric acid-skin	---	0.1
Pival** (2-Pivalyl-1, 3-indandione).....	---	0.1
Platinum (soluble salts).....	---	0.002
Polytetrafluoroethylene decomposition products	---	A ²
Propane	1,000	1,800
beta-Propiolactone	---	A ¹
* Propargyl alcohol-skin.....	1	---
n-Propyl acetate.....	200	840
Propyl alcohol.....	200	500
n-Propyl nitrate.....	25	110
Propylene dichloride.....	75	350
Propylene imine-skin	2	5
Propylene oxide	100	240
Propyne, see Methylacetylene		
Pyrethrum.....	---	5
Pyridine.....	5	15
Quinone.....	0.1	0.4
* RDX-skin	---	1.5
Rhodium, Metal fume and dusts	---	0.1
Soluble Salts	---	0.001
Ronnel.....	---	15
Rotenone (commercial)	---	5
Selenium compounds (as Se).....	---	0.2
Selenium hexafluoride.....	0.05	0.4
Silver, Metal and soluble compounds.....	---	0.01
Sodium fluoroacetate (1080)-skin	---	0.05
Sodium hydroxide	---	2
Stibine.....	0.1	0.5
Stoddard solvent.....	500	2,900
Strychnine.....	---	0.15
C Styrene monomer (phenylethylene).....	100	420
Sulfur dioxide.....	5	13
Sulfur hexafluoride	1,000	6,000
Sulfuric acid	---	1
Sulfur monochloride	1	6
Sulfur pentafluoride	0.025	0.25

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Sulfuryl fluoride	5	20
Systox, see Demeton**		
2, 4, 5, T	---	10
Tantalum.....	---	5
TEDP-skin	---	0.2
Teflon ** decomposition products	---	A ²
Tellurium.....	---	0.1
Tellurium hexafluoride.....	0.02	0.2
TEPP-skin	---	0.05
C Terphenyls	1	9
1, 1, 1, 2-Tetrachloro-2, 2-difluoroethane	500	4,170
1, 1, 2, 2-Tetrachloro-1, 2-difluoroethane	500	4,170
1, 1, 2, 2-Tetrachloroethane-skin	5	35
Tetrachloroethylene, see Perchloroethylene		
Tetrachloromethane, see Carbon tetrachloride		
Tetrachloronaphthalene-skin	---	2
Tetraethyl lead (as Pb)-skin	---	0.075
Tetrahydrofuran.....	200	590
Tetramethyl lead (TML) (as Pb)-skin	---	0.075
Tetramethyl succinonitrile-skin	0.5	3
Tetranitromethane.....	1	8
Tetryl (2, 4, 6-trinitrophenylmethylnitramine)-skin	---	1.5
Thallium (soluble compounds)-skin	---	0.1
Thiram.....	---	5
Tin (inorganic compounds, except SnH ₄ and SnO ₂)	---	2
Tin (organic compounds).....	---	0.1
Titanium dioxide	---	15
Toluene (toluol)	200	750
C Toluene-2, 4-diisocyanate	0.02	0.14
o-Toluidine-skin	5	22
Toxaphene, see Chlorinated camphene		
Tributyl phosphate.....	---	5
1, 1, 1-Trichloroethane, see Methyl chloroform		
1,1, 2-Trichloroethane-skin	10	45
Trichloroethylene.....	100	535
Trichloromethane, see Chloroform		
Trichloronaphthalene-skin	---	5
1, 2, 3-Trichloropropane	50	300
1, 1, 2-Trichloro 1, 2, 2-trifluoroethane	1,000	7,600

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<i>Substance</i>	<i>ppm^(a)</i>	<i>mg/M³^(b)</i>
Triethylamine.....	25	100
Trifluoromonobromomethane.....	1,000	6,100
2, 4, 6-Trinitrophenol, see Picric acid		
2, 4, 6-Trinitrophenylmethylnitramine, see Tetryl		
Trinitrotoluene-skin	---	1.5
Triorthocresyl phosphate	---	0.1
Triphenyl phosphate.....	---	3
* Tungsten and compounds, as W soluble.....	---	1
Insoluble	---	5
Turpentine	100	560
* Uranium (natural), soluble and insoluble compounds, (as U).....	---	0.2
C Vanadium (V ₂ O ₅ dust).....	---	0.5
(V ₂ O ₅ fume).....	---	0.1
Vinyl benzene, see Styrene		
C Vinyl chloride	500	1,300
Vinylcyanide, see Acrylonitrile		
Vinyl toluene.....	100	480
Warfarin	---	0.1
Xylene (xylol)	100	435
Xylidine-skin.....	5	25
Yttrium.....	---	1
Zinc chloride fume	---	1
Zinc oxide fume	---	5
Zirconium compounds (as Zr).....	---	5

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TABLE II – MINERAL DUSTS

<i>Substance</i>	<i>Million Particles Per Cubic Foot*</i>
Asbestos.....	5
Dust (nuisance, no free silica).....	50
Graphite (natural).....	15
Mica (below 1% free silica).....	20
Portland cement.....	50
Silica –	
Class I**.....	50
Class II**.....	20
Class III**.....	10
Class IV**.....	5
Slate (below 1% free silica).....	50
Soapstone (below 1% free silica).....	20
Talc (below 1% free silica).....	20
Tremolite.....	5
Total dust (below 1% free silica).....	50

*Using the light field low-power method of counting as described in the U.S. Public Health Report 47 No. 12, March 12, 1932, pp. 669-672 or its equivalent and a standard type impinger or other equivalent instrument for taking atmospheric dust samples.

** *Class I Rock.* Any rock formation uniformly containing up to and including 5%, by weight, of free silicon dioxide.

** *Class II Rock.* Any rock formation uniformly containing more than 5%, up to and including 10%, by weight, of free silicon dioxide.

** *Class III Rock.* Any rock formation containing more than 10%, up to and including 40%, by weight, of free silicon dioxide.

** *Class IV Rock.* Any rock formation more than 40%, by weight, of free silicon dioxide.

