

Chapter Ind 21

SPRAY COATING

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SCOPE AND PURPOSE

Ind 21.01 Scope. These orders shall govern the use and control of all spray coating apparatus, in every place of employment; provided, however, that they shall not prohibit any farmer, horticulturist, fruit grower, or other person engaged in farming or fruit or vegetable growing, from using spray coating apparatus for the purpose of spraying trees, shrubs, and vines with chemicals to protect the same from disease; or prohibit any dairyman, creamery owner or operator or other person from using any spray coating apparatus to spray any building or part thereof with solutions composed of water and chemicals of recognized value in keeping said building in a sanitary condition.

Ind 21.02 Existing booths. These orders are not applicable to existing installations except where adequate protection to the health and safety of the operator or helper requires alterations. All such alterations shall show reasonably close adherence to the provisions of these orders.

Ind 21.03 Plans. Booth installations. Plans and specifications in duplicate shall be submitted to the industrial commission for approval before installing any spray booth.

DEFINITIONS

Ind 21.04 Definitions. (1) **APPARATUS, SPRAY COATING.** Any and all devices and equipment used in the application of finishing materials by a method employing air pressure.

(2) **APPROVED.** Of such design and arrangement as to meet the approval of the industrial commission of Wisconsin.

(3) **BOOTHS. CABINET, CANOPY, ROOM AND TUNNEL.** (a) *Cabinet booth.* An inclosure open on one side only and equipped with independent exhaust system.

(b) *Canopy booth.* An overhead dome inclosure open on all sides at the bottom and equipped with an independent exhaust system.

(c) *Room booth.* A room or inclosure equipped with an independent exhaust system.

(d) *Tunnel booth*. An inclosure with both ends open equipped with independent exhaust system.

(4) BREATHING ZONE. The immediate area around the mouth and nose of the operator while in a working position.

(5) CONTAMINATED AIRWAY. A contaminated airway in connection with any type of spray booth is any duct, chamber or space containing vapors or fumes of a deleterious, flammable or explosive character, or of other harmful nature, generated by spray coating operations.

(6) DISCHARGE ORIFICE. An opening through which ventilating air is discharged from a booth.

(7) DISCHARGE PIPE. An extension of the discharge orifice to convey spray-laden or contaminated air to the outside atmosphere.

(8) DISTRIBUTOR PLATES. Solid or perforated non-combustible plates placed in a booth to deflect and distribute air currents.

(9) EXHAUST SYSTEM. All equipment connected with the removal of ventilating air from the spray zone.

(10) INCOMBUSTIBLE MATERIAL. Material which cannot be burned.

(11) INSTALLATIONS, EXISTING AND NEW. (a) *Existing installations*. Installations in existence and use prior to the effective date of this code.

(b) *New installations*. Installations completed or the contracts for which are let after the effective date of these orders.

(12) LAMPS. EXTENSION, PORTABLE, EXPLOSION-PROOF AND VAPOR-PROOF. (a) *Extension lamp*. Lamp or extension cord not fixed, nor self-supporting, and not equipped with standard.

(b) *Portable, explosion-proof lamp*. A portable explosion-proof lamp is a lamp not fixed but with self-supporting, properly weighted stand, capable of being readily moved and having the lighting unit so designed and constructed that its use to provide artificial illumination at different points within any type of spray booth will not ignite any fumes, vapors, or residues formed in the process of coating objects with a spray gun.

(c) *Vapor-proof or vapor-tight lamp*. A lamp that is so inclosed that vapor will not enter the inclosure.

(13) { ORIFICE
OUTLET (See DISCHARGE ORIFICE)

(14) PLACE OF EMPLOYMENT. For purposes of administering this code a place of employment is any place where spray coating is being carried on for profit.

(15) PRESSURE, ATOMIZING AND PAINT. (a) *Atomizing pressure*. Pressure of the air used to atomize or break up the paint or other coating material.

(b) *Paint pressure*. Pressure in a closed tank bearing on the paint or other coating material to raise it to the spray gun level.

(16) PRESSURE REGULATOR. An instrument or device for regulating or controlling air pressure.

(17) **PRESSURE TANK.** A tank in which air pressure is used to develop pressure on paint or other coating material.

(18) **RESPIRATORS, AIR LINE AND CHEMICAL CARTRIDGE.** (a) *Air line respirator.* A device consisting of a hood or head and face covering to which fresh air is fed creating a slight outward pressure excluding fumes and mist thus permitting breathing of uncontaminated air.

(b) *Chemical cartridge respirator.* A respirator which is equipped with a chemical cartridge or cannister which mechanically removes solid particles and chemically removes vapors from air being breathed.

(19) **SETTLING CHAMBER.** A space located in the exhaust air stream for the purpose of collecting solids in spray mist.

(20) **SPRAY GUN.** A mechanical device employing air pressure for the application of paints, varnishes, lacquers and similar finishing materials.

(21) **VACUUM TYPE. (Feed Cup).** (Sometimes erroneously referred to as siphon type). A type of materials container in which the liquid is drawn into the atomizing air stream by a partial vacuum created by the flow of air over the paint chamber outlet opening.

(22) **VENTILATING SYSTEM.** (See EXHAUST SYSTEM)

SPRAY COATING OF BUILDINGS, STRUCTURES AND OUTDOOR SPRAYING

Ind 21.05 Scope. The requirements of this section, sections Ind 21.05 to Ind 21.08, inclusive, shall apply to all spray coating operations on buildings, ships and structures of any kind or nature, and to all outdoor spray coating operations, but these requirements need not apply to spray coating operations in approved booths.

Ind 21.06 Equipment. (1) **TYPE OF EQUIPMENT.** Any type of equipment may be used except the vacuum type of more than one quart capacity.

Note: The vacuum type of spray coating apparatus is sometimes erroneously referred to as siphon type, suction type and ejector type.

(2) **CHARACTER OF EQUIPMENT.** All spraying equipment shall be complete in all details essential to effective operation and prevention of excessive mist.

Ind 21.07 Operation. (1) **NOZZLE DISTANCE FROM SURFACE.** During operation the nozzle of the spray gun shall not at any time be more than 18 inches from the surface being spray coated.

(2) **SCAFFOLDING.** When necessary, scaffolding or other approved support shall be used so that the maximum allowable distance between gun nozzle and surface being spray coated will not be exceeded.

Note: For safety in scaffold construction refer to the industrial commission's general orders on Safety in Construction.

(3) **MAXIMUM ALLOWABLE PAINT PRESSURE.** The paint pressure shall at no time exceed that necessary to produce a free flow of paint at the nozzle when the gun is operated independent of atomizing pressure.

Notes: 1. Testimony of spray gun manufacturers and observations have shown that excessive paint pressure over that actually necessary to produce this result requires a correspondingly higher atomizing pressure, resulting in excessive mist.

2. Exterior painting—Wind advantage. During exterior spray coating, the operator should at all times take advantage of draft and wind conditions, spraying with the air current whenever possible.

3. Interior painting—Natural ventilation. During interior spray coating of walls or structural members of a building, the operator should at all times produce and maintain all ventilation possible by opening doors and windows, spraying with the air current whenever possible.

(4) OPERATION AT DIFFERENT LEVELS. At no time shall 2 or more operators working at elevations differing more than 8 feet use paint from the same supply tank unless spray guns are equipped with paint pressure regulators.

Note: If this maximum allowable difference in working elevations were exceeded, the operators working at the lower levels would be subjected to excessive mist.

(5) EXCLUSION OF OTHERS. None other than spray operators and their helpers shall be permitted within a zone where a mist or deposit is apparent, unless such a person is protected the same as operators and helpers.

(6) CONTAMINATION OF ADJACENT AREAS. Proper precautionary measures shall be taken to prevent contamination of the atmosphere in adjacent occupied areas.

Ind 21.08 Protection of person. (1) NOSE AND MOUTH PROTECTION.

(a) The nose and mouth of each operator and of any other person in the area contaminated by spray, shall be protected with an approved respirator or other approved device furnished and maintained in a clean and efficient condition by the employer. In every case where interior spray coating is done, except when the operation is confined to an approved booth, an approved respirator, or an approved device having a source of fresh air supply independent of the interior being sprayed, shall be used by each employee in the contaminated area.

(b) Where air is supplied from outside the contaminated area, such air shall be obtained from such a source and conveyed in such a manner as to prevent the introduction of any hazardous gases, dusts, fumes, or vapors into the respirator.

(2) CLEANSING OF RESPIRATORS. Every respirator shall be cleansed at least once each day. Where the filter type respirator is used, the filter shall be replaced not less than twice each working day, or oftener if necessary. In case of intermittent use of a filter type respirator, it shall be cleansed and filter replaced at least once each calendar day of use. Unless sterilized provisions shall be made to insure that the cleansed respirators are returned to the same individuals who used them prior to the cleansing.

Note: The following suggestions are offered in order to give information as to cleansing respirators: Remove head bands and filtering elements and thoroughly wash the respirators in warm soapy water. After this any one of the following solutions may be used for sterilizing purposes: (1) a solution of one part of formaldehyde solution in nine parts of water; (2) a solution of denatured alcohol; (3) a 2% solution of lysol; (4) a 3% solution of carbolic acid; (5) exposure at room temperature for 10 minutes in a moist atmosphere of antiseptic gas preferably formaldehyde; (6) scrub with a brush in a solution of 5 fluid ounces of cresolis compound and 4 gallons of water. Following this the respirators should be thoroughly rinsed with warm water and allowed to dry.

(3) **APPROVAL OF RESPIRATORS.** Every respirator or other such device used shall be such as to meet the approval of the industrial commission.

Note: The chemical cartridge respirator is the only one of the filter type that will be approved for use in spray coating.

(4) **HEAD PROTECTION.** The head shall be covered with a low fitting cap with visor.

(5) **BODY PROTECTION.** The body shall be covered with clothing as close fitting as possible consistent with comfort, paying particular attention to the fit at neck and wrists.

(6) **HAND PROTECTION.** The hands shall be protected by suitable gloves, preferably of the gauntlet type.

(7) **RESPONSIBILITY AND MAINTENANCE.** All protective clothing shall be furnished and maintained in a sanitary condition by the employer. A complete change shall be furnished at least once each week or oftener if necessary.

(8) **FACE AND NECK ANOINTED.** All exposed parts of the body shall be kept anointed with nonirritating, protective oil, grease or cream during spray coating operations.

(9) **WASHING FACILITIES.** Clean rags shall be furnished by the employer and washing facilities shall be provided in compliance with the general orders on Sanitation.

Note: The purpose of this is to eliminate the necessity of washing with turpentine or naphtha, the continued use of which is extremely irritating to the skin.

SPRAY COATING OPERATIONS INSIDE OF BUILDINGS

Ind 21.09 Scope. The requirements of sections Ind 21.09 to Ind 21.15, inclusive, shall apply to all spray coating operations inside of buildings, except the spray coating of walls, structural members and fixtures of a building or other structure.

Ind 21.10 Booths required. Spray coating of objects, except as noted in section Ind 21.09, with paint, varnish, lacquer, siliceous materials or other materials which may endanger the health of a person exposed thereto, or which would create a fire or explosion hazard shall be carried on only in suitable booths provided and maintained for such purposes. Whenever practicable, a cabinet booth shall be used. A tunnel booth, canopy booth or a room booth may be used only with the written permission of the industrial commission.

Exception No. 1: Large objects such as heavy machinery, large castings and structural members, not adaptable to booth spraying may be sprayed without booth protection provided that in such cases the requirements in sections Ind 21.05 to 21.08 are complied with and, provided further, that the room in which such spraying is done is cleaned periodically as often as is necessary to prevent accumulation of residue, but in no case shall more than 48 hours of actual spraying operations be permitted without thoroughly cleaning the room.

Exception No. 2: In any garage or other place where a spray gun is used intermittently to apply hazardous coating materials to spots on motor vehicles or other objects such intermittent spraying operations may be carried on without booth protection only when the following regulations are observed.

First. No more than one spray gun may be used at a time.

Second. In each eight hour day or shift the total time of actual spraying operations shall not exceed 30 minutes.

Third. No individual spraying job shall be greater in area than 10 square feet.

Fourth. During spraying operations the operator and every other person exposed to the contaminated area shall wear an approved respirator and be otherwise protected as specified in section Ind 21.08.

Fifth. Where spraying operations are carried on the room including floor, walls and ceiling as well as fixtures and equipment, shall be cleaned at intervals as often as necessary to prevent accumulation of residue in quantities to create a fire or explosion hazard but in no case shall more than a total of 48 hours of actual spraying be done without this thorough cleaning.

Sixth. A reasonably accurate record shall be made of each separate spraying job done each calendar day. This record shall include name of spray gun operator, time of actual spraying operation; name of article or object spray coated and name of owner; approximate area in square feet of the spot or object spray coated and, in case of a motor vehicle, the license number. These records shall be kept on file and open during reasonable hours for examination by any deputy of the industrial commission.

Note: Failure to keep such records and to show them to any industrial commission deputy would constitute wilful violation of lawful orders of the commission and subject the violator to prosecution by the state attorney general for collection of the maximum penalties provided in the statutes.

Ind 21.11 Booth construction. (1) **CABINET BOOTHS.** (a) *Type of construction.* The floor, walls and roof of every cabinet booth shall be constructed of incombustible material in such a manner as to facilitate effective maintenance and control of required ventilation. If constructed of steel, except where ceramics only are applied, every such booth shall be kept thoroughly painted on the inside to minimize fire hazards from possible sparks.

(b) *Combustible floor covered.* If the building floor on which any cabinet booth is installed is of combustible material, the floor within the booth and for a distance of 4 feet in front of the booth shall be covered with incombustible material, preferably zinc or other non-sparking metal.

Exception: Small booths set on benches composed of or covered under such booths with incombustible material, and booths in which only ceramics are sprayed.

(c) *Deflector curtain.* Every cabinet booth over 4 feet wide (measured along the floor at the front of the booth) shall be constructed with fixed incombustible deflector curtain along the upper outer edge of the booth. Such curtain shall project downward from the inside top of the booth not less than 2½ inches nor more than 5 inches.

(d) *Inside smooth.* The inside of each cabinet booth shall be of reasonably smooth construction.

Notes: 1. In building a booth of steel in a manner to make it incombustible, metal studs and sheathing must be used. No wood is permitted in any portion of the walls, floors, ceiling or equipment of a new booth.

2. If the floor of the building is of combustible material, the floor of the booth and an adequate distance in front of the booth (usually 4 feet) will need to be protected by a covering of metal or an insert of reinforced concrete 1½ inches or more in thickness. It is advisable to consult the insurance carrier in any case so that accredited construction may be selected.

(2) **ROOM BOOTHS.** (a) *Constructed of incombustible material.* Every new room booth installation in a new building, including walls, floor and ceiling, shall be constructed of incombustible material and shall be separated from other portions of the building by means of fire-resistive partitions. Every window and every door in the walls of a new room booth shall be of fire-resistive construction.

(b) *Semi-fireproof construction.* Every room booth installed in an existing building shall have a fire-retardant floor, and the walls and ceiling shall be at least semi-fireproof construction as defined in the Building Code issued by the Industrial Commission.

(c) *Wallboard partition not permitted.* No wallboard of gypsum, sheet rock, fibre or other material can be used in the construction of any room booth except as described for semi-fireproof construction.

Note: Before constructing a spray booth in a building, it is advisable to consult the state building code so that the violation of general safety and fire protection requirements may be avoided. For example, the spray coating of automobiles is not permitted in a building having wood floors or wood walls, unless such building has been occupied for the housing, repairing or painting of automobiles continuously since September, 1918.

(3) **TUNNEL BOOTHS.** Every tunnel booth shall be constructed of incombustible material and shall be reasonably smooth on the inside. The ventilation of each tunnel booth shall be arranged so as to adequately protect persons within or in the immediate vicinity from the spray and fumes.

(4) **CANOPY BOOTHS.** Each canopy booth must be constructed of incombustible material; shall be reasonably smooth on the inside; and the ventilation shall be arranged so as to adequately protect persons under the canopy and in the immediate vicinity.

Ind 21.12 Equipment. (1) **ELECTRICAL EQUIPMENT.** (a) *Electrical devices outside of booths.* Electrical equipment other than approved portable lamps with approved extension cords shall not be installed inside of any spray booth. Lamps may be installed inside any spray booth or room where ceramics only are applied. Vapor-proof lamps may be installed outside of the walls or ceilings of booths provided the openings through which light rays are admitted to the booths are carefully fitted with panels of wired or other heat resisting glass so that the inside of each such booth will be reasonably smooth.

(b) *To comply with state electrical code.* All electrical equipment in connection with spray coating operations shall be installed, operated and maintained in accordance with all the requirements of the Wisconsin state electrical code applying to such locations.

(c) *Electric wiring in approved metal conduit.* The electric wiring in connection with every spray booth shall be placed in approved metal conduit and shall be located outside the booth.

Exception: Where ceramics only are sprayed wiring may be open on the outside of the booth or may be inside the booth if placed in approved metal conduit.

(2) **GROUNDING.** All exposed noncurrent carrying metal parts of electrical equipment serving any spray booth, and all metal parts of the booth itself, unless only ceramics are applied, shall be bonded together and permanently and effectively grounded in accordance with the provisions of the Wisconsin state electrical code. Every belt running in or entering any contaminated airway of any spray booth shall, unless ceramics only are applied, be similarly grounded to prevent accumulation of static charges of electricity.

Notes: 1. Because there is a possibility of a static spark from the spray gun nozzle it is recommended that the gun be grounded.

2. A frequent cause of fire in a spraying room is the spark produced by the friction of steel on steel (or iron), or a flinty material on steel as obtains in the scraping and rubbing processes. Scrapers and rubbers should be of nonferrous and nonflinty material where possible. Users should thoroughly acquaint themselves with the spark-producing hazards of solids and fluids.

(3) **ILLUMINATION.** All booths shall be provided with illumination of an intensity of at least 5 foot candles measured on a horizontal plane 30 inches above the floor. The distribution of illumination shall

be reasonably uniform, avoiding objectionable shadows and sharp contrasts of brightness. To minimize glare, lamps shall be shaded in accordance with orders of the Industrial Lighting Code.

Note: The light required for a spray booth is the minimum intensity necessary for safety and would not be sufficient for close work. Probably 15 to 20 foot candles of light intensity should be provided for such work.

(4) **SPRINKLERS REQUIRED.** Every spray booth shall be equipped with one or more sprinkler heads to minimize fire hazards.

Note: The size of a spray booth of any type and the nature of the work and materials sprayed therein will determine the adequate number of sprinkler heads to be used.

(5) **FIRE EXTINGUISHERS.** Every spray booth except where ceramics only are sprayed shall be adequately equipped with fire extinguishers of suitable type for the nature of hazard and materials involved.

(6) **DISCHARGE ORIFICES.** (a) *Free passage of contaminated air.* Discharge orifices shall be provided for all spray booths and shall be of such size and arrangement in each case as to permit spray-laden or contaminated air to freely pass from the booth.

(b) *Uniform distribution of air movement.* Every booth of any type shall be tapered to the discharge orifice or be equipped with approved removable distribution plates or other approved means of securing reasonably uniform distribution of air motion through the booth, especially in the breathing zone.

Notes: 1. The purpose of the tapering of a booth to the discharge orifice or of equipping a booth with distribution plates is to distribute the air flow throughout the spray booth and thus protect the operator at all points in the booth.

2. Where a booth is tapered to the orifice, the angle of tapering should be not less than 45 degrees with the plane of the front of the booth. This arrangement is preferable where dust-producing coating material, such as lacquer, is sprayed. In such cases, the spray or mist should be removed from the booth through exhaust as quickly as possible.

(c) *Gathering of sticky materials.* Where the spray material is such that air-borne solids are of a sticky nature, distribution plates and settling chamber shall be provided and be so arranged as to assure deposits of as much as practicable of this material.

Notes: 1. Distribution plates of the filter type will aid in the deposit of spray material before it reaches the fan and exhaust duct. The water wash type of booth is very satisfactory for this purpose.

2. Distribution plates should be placed in a plane parallel to the rear wall and distant therefrom not less than one-fourth the minimum cross sectional dimension of the booth. The openings through the distribution plates should be spread over the cross sectional area and should be arranged in a manner to meet the approval of the industrial commission.

(7) **VENTILATION SYSTEM REQUIRED.** Every spray booth shall be suitably equipped and operated with an exhaust or ventilation system which shall protect operators, helpers, and other persons in the vicinity, from deposit or inhalation of the materials discharged from the spray apparatus, but the movement of air through the booth shall, in no case be less than 100 lineal feet per minute in the breathing zone. Every such system shall be of such type and arrangement that efficacy of operation will be maintained independent of weather conditions.

Notes: 1. Observations show that booth construction and arrangement, as well as the nature of the work done, have great influence on the amount of air necessary to effect the required protection.

2. From the standpoint of maintenance and fire-protection, the indirect type of exhaust unit seems preferable.

(a) *Fans.* 1. Each fan shall be of an effective type, capacity and performance in place so as to insure the required protection under all operating conditions, and every such fan located in a contaminated airway shall be constructed of such metals or combination of metals as to prevent sparking in practical operation, except that this latter equipment will not be required where ceramics only are applied.

2. Every fan shall be substantially mounted to maintain ample clearance in use even though the rotating parts become considerably out of balance due to deposits of paint or other cause.

3. Fan bearings shall be of the ring-oiling or other equally effective type and should be located outside of the contaminated airways, but in any case shall be arranged to be oiled from the outside.

(b) *Discharge pipes.* 1. Every discharge pipe and duct conveying spray-laden or contaminated air from a booth to the outside atmosphere or to an air cleansing device, shall be as short, direct and free from resistance to air flow as practicable, based on maximum air flow at low velocities; shall be provided with means of easy access or removal for cleaning, and shall be arranged to minimize fire hazards.

2. Each discharge pipe shall deliver to outside atmosphere above the roof of the building or to other means or device approved for the purpose.

3. The termination of each discharge pipe delivering to outside atmosphere shall be protected by a hood of the inverted cone type or other approved device from the detrimental effects of weather and hazards due to sparks from any source and shall be arranged so as to not constitute a nuisance or fire hazard in the neighborhood.

4. Every discharge pipe passing through a combustible wall, ceiling or roof shall be encased with incombustible material at least four inches thick, or with a double safety thimble made of two concentric rings of sheet metal with at least one inch open air space between them and with the outer ring covered with at least one-fourth inch asbestos.

5. There shall be no connection between the discharge or exhaust outlets of separate spray booths.

(8) **PRESSURE TANKS AND OTHER CONTAINERS.** (a) *Construction and approval.* Every pressure tank supplying a spray nozzle shall be so constructed and equipped as to meet the approval of the industrial commission and each tank of more than 2 gallons capacity shall be designed so that the bottom of the shell will not be subjected to wear when moved about on the floor.

Note: Approval by the Underwriters' Laboratories, Inc., will be accepted by the commission.

(b) *Gravity tanks closed type.* Other containers supplying spray nozzles shall be of a closed type or provided with metal covers kept in place. Those not resting on the floor shall be supported on metal brackets or be suspended by wire cables.

(c) *Capacity of gravity tanks limited.* No gravity tank of more than 10 gallons capacity shall be used to supply a spray nozzle.

(d) *Clamping devices for shipping drums used as pressure tanks.* Where the original shipping drum is used to supply a spray nozzle by the air pressure system the drum shall be clamped in a suitable device to prevent the drum from bursting.

(9) **PROTECTIVE CLOTHING REQUIRED.** The entire person, except face and neck of the spray operator and of his helper, shall be protected by suitable clothing and equipment during spraying operations.

Exception: Where ceramics only are applied.

Ind 21.13 Air supply. (1) **QUALITY.** Uncontaminated, tempered air shall be furnished and maintained within the breathing zone of each operator of every spray booth.

Note: See the Heating, Ventilation and Air Conditioning Code, also general orders on Dusts, Fumes, Vapors and Gases.

(2) **QUANTITY.** The air supplied to each room containing or constituting any spray booth shall be admitted by natural or mechanical means and the volume shall be at least equal to that removed from such an enclosure by the booth exhaust fan or other ventilation system.

Notes: 1. Where a cabinet booth is located in a building or room where the volume of properly tempered air exhausted through the booth is only a small portion of that available, and the withdrawal of this tempered air is such that it does not appreciably affect the air conditions or distribution in other working areas, it is not necessary to provide air supply for the booth exhaust other than through the general ventilation system. Often, however, means must be provided for supplying tempered air to replace that exhausted through the booth. This can be accomplished by natural or mechanical means. In any case the air from the source of supply (ordinarily outside the building) is caused to pass through, or in contact with heating units.

2. The air supply for the spray booth should be delivered at a point, or points, as far from the booth as other operations in the building will permit.

3. The air required to supply the exhaust or ventilation system in any room booth should be properly tempered, clean air from an outside source supplied directly to the room.

4. In any case the arrangements for the exhaust and supply of air should be such as not to produce an excessive draft or vacuum in any area outside of the booth.

(See the Heating, Ventilation and Air Conditioning code for the general ventilation requirements).

(3) **DIRECTION OF AIR FLOW IN BOOTHS.** The direction of air flow in any booth shall be from the operators and helpers toward the objects or work being spray coated and thence to the discharge orifice of the booth.

Ind 21.14 Operation. (1) **LOCATION OF WORK.** The portion or portions of every object to be spray coated shall be inside the booth during spray operations, and shall be arranged so as to permit easy access and manipulation, and so that the direction of spray will be toward the booth discharge orifice.

(2) **EXCLUSION OF OTHERS.** No person other than spray operators or helpers shall be permitted in the contaminated area within any spray booth during spraying operations.

(3) **MATERIALS SPRAYED ALTERNATELY.** There shall be no spray coating of lacquers in any spray booth in which oils, varnishes or paints are used, unless the booth and all parts, including all equipment, are thoroughly cleaned between operations so that there will be no mixture of the different ingredients at any time.

Exception: Parts and equipment located in the air stream beyond the water curtain of any approved water wash booth.

Note: A number of fires in connection with spray coating operations have been traced to the mixtures of lacquers with oil paints and varnishes in spray booths. In some of these cases the fires started spontaneously in the containers for the collected mixtures of lacquer paints and varnish materials which had been allowed to stand for only short periods of time and in others ignition occurred on the booth walls. It is essential that the material re-

moved from the booth and equipment be disposed of immediately by burning in appropriate and isolated containers. Do not put such paint on a hot fire as there is danger of explosion.

(4) **MOTOR VEHICLES.** Motor vehicles except caterpillar tractors shall not be self-propelled into or out of spray booths.

Note: The ignition key should be removed before pushing a motor vehicle into a booth and should not be replaced until the vehicle is out of the booth.

Ind 21.15 Maintenance. (1) **CLEANLINESS.** (a) *Booths periodically cleaned.* Every booth in which spray coating is done shall be cleaned thoroughly at reasonably frequent intervals but in no case shall a booth be used more than 48 hours of spraying operations without cleaning.

Exception: Parts and equipment located in the air stream beyond the water curtain of any approved water wash booth.

Notes: 1. Each fan should be cleaned at regular intervals because deposits of spraying materials seriously reduce the efficiency of the fan and constitute a fire hazard except when spraying ceramics. Likewise, air passages, chambers and ducts should be cleaned regularly for the same reasons.

2. Experience and good practice indicate that heavy paper held in place on the interior of the booth by a light coating of grease, greatly facilitates cleaning and reduces the burden of cleaning operations. Where lacquer is applied the use of grease should be avoided and if the construction and location of a booth are such as to permit of washing with mop or sponge or flushing with water, the use of a liquid soap solution on the clean walls will make it possible to clean or wash down the walls very easily.

3. Distribution plates and similar removable parts should be cleaned in an isolated or protected location to reduce the fire hazard.

4. Only nonsparking tools should be used for cleaning or making repairs.

(b) *Spray rooms periodically cleaned.* Each room in which a spray booth is located shall be thoroughly cleaned at least once every year where spray coating is done regularly or at least once every 2 years where spray coating is done intermittently.

(c) *Clothing periodically cleaned.* The protective clothing worn during spray operations shall be thoroughly and regularly cleaned.

Notes: 1. The United States Bureau of Public Health Service has found that the fine dust arising from clothing soiled in painting operations constitutes a serious health hazard.

2. See also, the commission's general orders on Sanitation.

(2) **EFFECTIVENESS.** Every booth installation shall be complete in all details and shall be maintained in good working order during operations.

(3) **STORAGE OF MATERIALS.** (a) *Volatile liquids.* The main supply of solvents, paints, lacquers and other volatile materials shall be stored in a location remote from the spraying process preferably in an outside oil house or especially constructed room. Each container for such material to be used in the vicinity of the booth shall be tightly covered when not in use.

Note: The amounts of flammable liquids permitted in paint shops, garages or factories under the Flammable Liquids code varies according to classification, nature of building and kind of business. Therefore, the code on flammable liquids should be carefully read and its regulations followed especially as to location and construction of storage rooms.

(b) *Booths not store rooms.* No material or equipment shall be stored in any spray booth.

Note: Isolated mixing rooms and pipe line circulating systems are recommended in every case where the spraying operations are extensively continuous.