PAINT SPRAY OPERATIONS
(COMMERCIAL BODY SHOPS FOR AUTOMOBILE AND TRUCK)

This bulletin has been developed to clarify the requirements of the Alberta Building Code 1997 and how they interrelate with NFPA-33, "Standard for Spray Application Using Flammable and Combustible Materials." This Standata deals with applications involving commercial bodyshops for automobile and truck only, and must be used in conjunction with the reference documents when designing these systems and the building facilities (see Appendix 'A'). For other applications refer to Information Bulletin 97-IB-005.

SEPARATION FROM REMAINDER OF THE BUILDING

An auto (truck) body shop must be separated form all other occupancies by a fire separation having a fire-resistance rating of at least 2 hours.

VENTILATION

General

During shop operation, the auto body shop area must be provided with a continuously operating mechanical ventilation system that provides a minimum of 3 air changes (outdoor air) per hour based on a height of 3.7 m (12 feet). This amount of dilution ventilation is primarily intended for preventing the accumulation of flammable vapours or mists. Additional ventilation or control measures will be required for other operations such as sanding to protect workers against exposure to harmful airborne contaminants. In any case, the amount of ventilation must adequately maintain the concentration level of all flammable vapours or mists below 25% of the lower explosive level (L.E.L.) of the respective solvent. Air is to be uniformly distributed to provide ventilation at all working levels and areas. An equivalent volume of heated make-up (replacement) air is required for the volume of air exhausted.

Spray Booth or Spray Room

The paint spray booth or room must be provided with mechanical ventilation whenever any spray operations take place.

ISSUE OF THIS INFORMATION BULLETIN IS AUTHORIZED BY THE DIRECTOR/ ADMINISTRATOR.

C.M. TYE

Alberta Municipal Affairs

Safety Codes Council

Booths

The following is the recommended average face velocity (calculated assuming the booth is empty and in the direction of air flow) across the cross-sectional area for the specific type of booth (see examples in Appendix "B"):

Crossdraft Booth	0.38 - 0.64 m/s	(75-125 F.P.M.)
Downdraft Booth (pit or raised floor)	0.18 m/s	(35 F.P.M.)
Semi-Downdraft Booth	0.25 m/s	(50 F.P.M.)

The pre-engineered downdraft booth (pit or raised floor) must be evaluated differently than the conventional crossdraft booths. The large mass of evenly distributed downward moving air inside the downdraft booth makes any small localized effects of turbulence caused by the act of spraying insignificant. Furthermore, with the object being painted located directly underneath the supply air and above the exhaust pit entrance, it is possible to create sufficient capture velocities to direct the paint overspray and solvent mists effectively into the pit opening. Semi-downdraft booths do not have the same air flow characteristics and therefore would require larger quantities of air.

Rooms

The ventilation systems for rooms in which spray paint operations are to take place must be designed so that adequate capture velocities can be maintained around the object being painted, and sufficient dilution ventilation air will be provided to adequately maintain the concentration level of all flammable vapours or mists below 25% of the L.E.L. of the respective solvent. The size and shape of the room, varying sizes of items that could be painted, the amount of airborne contaminants generated, and the positioning of the supply and exhaust air openings are determining factors for the ventilation air requirements. Therefore, design velocities have not been given here since each job will have to be assessed separately by the professional engineer designing the system.

Booths and Rooms

All spray paint booth and room ventilation systems must be designed by a professional engineer registered in the Province of Alberta. (Pre-engineered booths, for example the Binks and De Vilbiss booths are considered to meet the intent of this requirement when installed in buildings that conform to Sentence 2.3.3.1.(2) of the Alberta Building Code 1997). In buildings where engineering or architectural input is mandatory (Sentences 2.3.3.1.(3), (4) and (5) of the Alberta Building Code 1997), the professional in charge of the ventilation design for the building will need to evaluate the spray paint booth ventilation system in relation to the rest of the ventilation systems in the building.

An equivalent amount of heated make-up air, provided by mechanical means, is required to replace air exhausted through the booth or spray room. Proper air balancing of the ventilation systems is also required in order to ensure that the systems will perform as designed.

The exhaust stack of the spray paint exhaust system must be carefully designed and located so that re-entry of exhaust contaminants into the building or nearby buildings (through make-up air intakes or windows) shall be avoided. To ensure protection of workers health against exposure to harmful airborne contaminants workers engaged in spray painting or priming where isocyanates are used must be provided with approved, positive pressure, supplied air respiratory protective equipment. Consult your nearest Workplace Health and Safety office for applicable requirements.

PRIMING

Any poly isocyanate catalyzed priming must be done in booths or spray rooms that have mechanical ventilation to remove all flammable vapours and harmful airborne contaminants. Therefore, in some auto body shops it may be necessary to use the same paint spraying booth for both painting and priming operations (where poly isocyanates are involved).

FIRE PROTECTION

All spray areas are required to be provided with an automatic fire suppression system (normally a sprinkler system is used where adequate water supplies are present).

Exceptions to the above are paint spray booths for use in commercial autobody shops that are designed by a Professional Engineer and constructed in full conformance with the NFPA-33 requirements. Other pre-engineered booths approved by the local Group 4 - Safety Codes Officer may also be installed in autobody shops without fire suppression systems, as long as the requirements of NFPA-33 and the Alberta Building Code 1997 have been met, and that adequate ventilation is provided and maintained at all times during the operation. The above exception does not relate to other building fire suppression systems that may be required for other reasons. Example: some buildings are required to be fully sprinklered because of size, building construction requirements, or nature of the hazards. In this case only the sprinklers in the booths itself are exempted, not the sprinklers for the building as a whole. Note also that this exception will not apply to spray booths or rooms designed for applications other than commercial body shops for automobile and trucks.

PAINT/SOLVENT STORAGE AND MIXING

When mixing of paints is performed in a separate room, the room must be ventilated at a rate of at least 12 air changes per hour (based on the full room height). The exhaust air is to be taken from a point within 300 mm (12 in.) of the floor near a wall, with at least one make-up air inlet located near the opposite wall. The exhaust fan must have a rotating element of non-ferrous or non-sparking material, or the housing shall consist of or be lined with such material. Exhaust fan motors should be of explosion-proof characteristics, and must not be located within the exhaust air stream or in an area where flammable vapours may be present.

Where a separate room is not provided, mixing of paints shall be under a local exhaust hood designed to remove all flammable vapours. The safety requirements for the fan construction are

similar to those for the mixing room. The ventilation air quantities will depend upon many variables, and should be assessed on an individual job basis.

The paint, finishing materials and solvents must be stored in approved storage cabinets, or in a separate well-ventilated storage room separated from the remainder of the building by a 1 hour fire separation. For mixing rooms with doors communicating directly into a spray booth or room, follow additional specific requirements stipulated under NFPA - 33.

WHERE TO OBTAIN BUILDING PERMITS

In Alberta, to obtain a building permit related to spray painting applications, one of the following procedures must be followed dependent upon the municipality in which the building is located.

1. Non-Accredited Municipalities (municipalities where Alberta Labour is responsible to issue building permits)

   An Alberta Labour Contracted Accredited Agency will issue building permits for all construction (renovations/additions/new construction). A separate permit may be issued for the spray painting application or it may be included in the building permit for construction. In either case a Group 4B-Mechanical SCO (Safety Codes Officer) will be involved in the plans review and final inspection of the installation.

2. Accredited Municipalities (municipalities that issue building permits and have taken responsibility for all areas of the Alberta Building Code).

The municipality issued building permits for all types of construction work (renovations/additions/new construction). A separate permit may be issued for the spray painting application or it may be included in the building permit for construction. The municipality may hire private Accredited Agencies to deal with this aspect of the building code when it does not have staff certified to perform this type of compliance monitoring

APPENDIX A
Reference Materials Related to Design, Construction and Ventilation for Autobody Shops (Auto/Truck)

1. Industrial Ventilation - A Manual of Recommended Practice, 23rd Edition (1998)

   Committee on Industrial Ventilation
   American Conference of Government Industrial Hygienists (ACGIH)
   P. O. Box 16153
   Lansing, Michigan 48901, USA

2. Recommended Industrial Ventilation Guidelines (1976)

   National Institute for Occupational Safety and Health (NIOSH)
   U. S. Government Printing Office
   Washington, D.C. 20402, USA

3. An evaluation of Engineering Control Technology for Spray Painting (1981)

   National Institute for Occupational Safety and Health (NIOSH)
   Publication DHHS (NIOSH) 81-121
   U.S. Government Printing Office
   Washington, D.C. 20402, USA

4. Design, Construction and Ventilation of Spray Finishing Operations (1964)

   American National Standards Institute, Inc.
   Publication ANSI Z9.3-1964
   1430 Broadway
   New York, New York 10018, USA

5. Spray Booth Ventilation in Autobody Shops (1986)

   Alberta Occupational Health and Safety Bulletin
   Alberta Labour - Workplace Health and Safety

6. Isocyanates in Autobody Shops (1986)

   Alberta Occupational Health and Safety Bulletin
   Alberta Labour - Workplace Health and Safety

7. The NFPA - 33 (1995) “Standard for Spray Application Using Flammable and Combustible Materials” is available through:

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269, USA
Tel: 1-800-344-3555

For further information contact:

1. Alberta Municipal Affairs, Safety Services

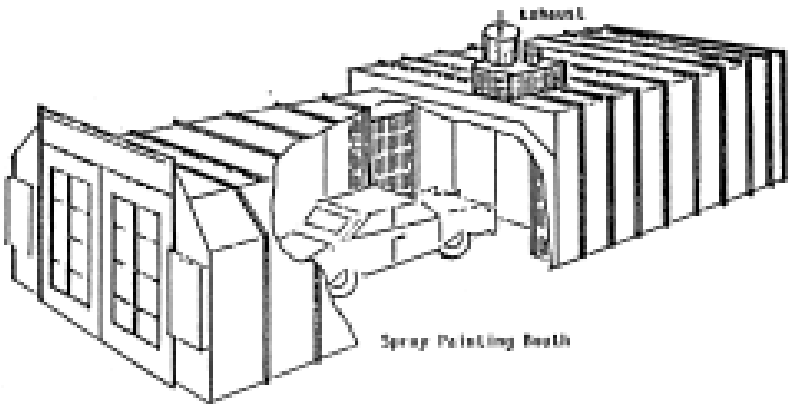
- Toll-free within Alberta: 1-866-421-6929

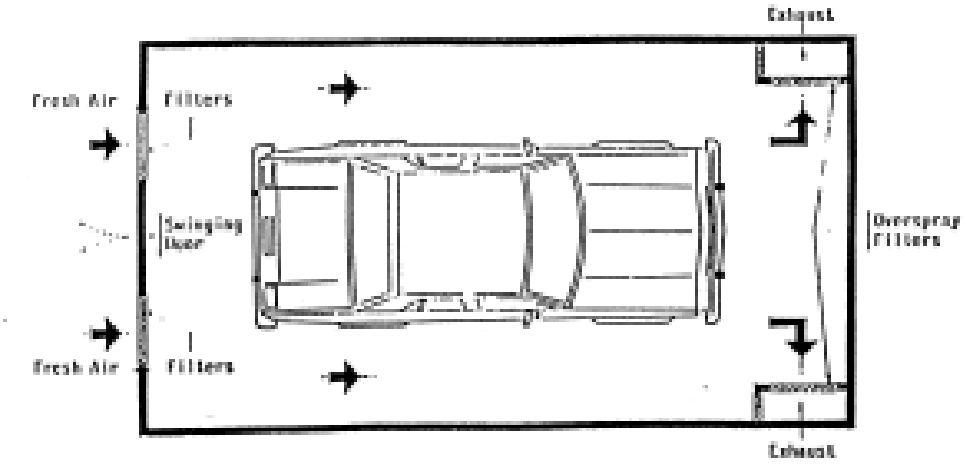
2. Alberta Human Resources and Employment - Workplace Health & Safety

- Toll-free within Alberta: 1-866-415-8690
- Edmonton and surrounding area: (780) 415-8690

APPENDIX B
Typical Design Details of Spray Painting Finishing Booths (Automobile/Truck)

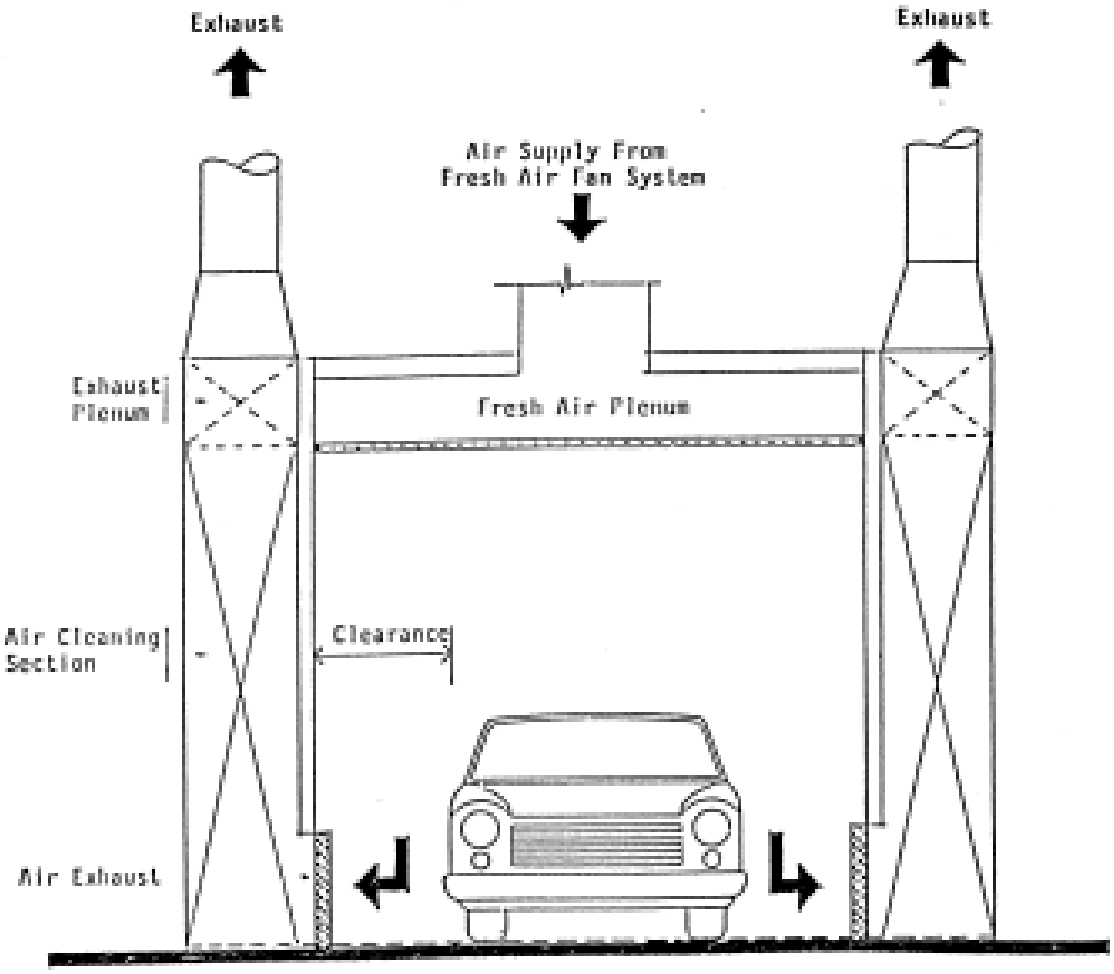
CROSS FLOW SPRAY PAINTING BOOTH



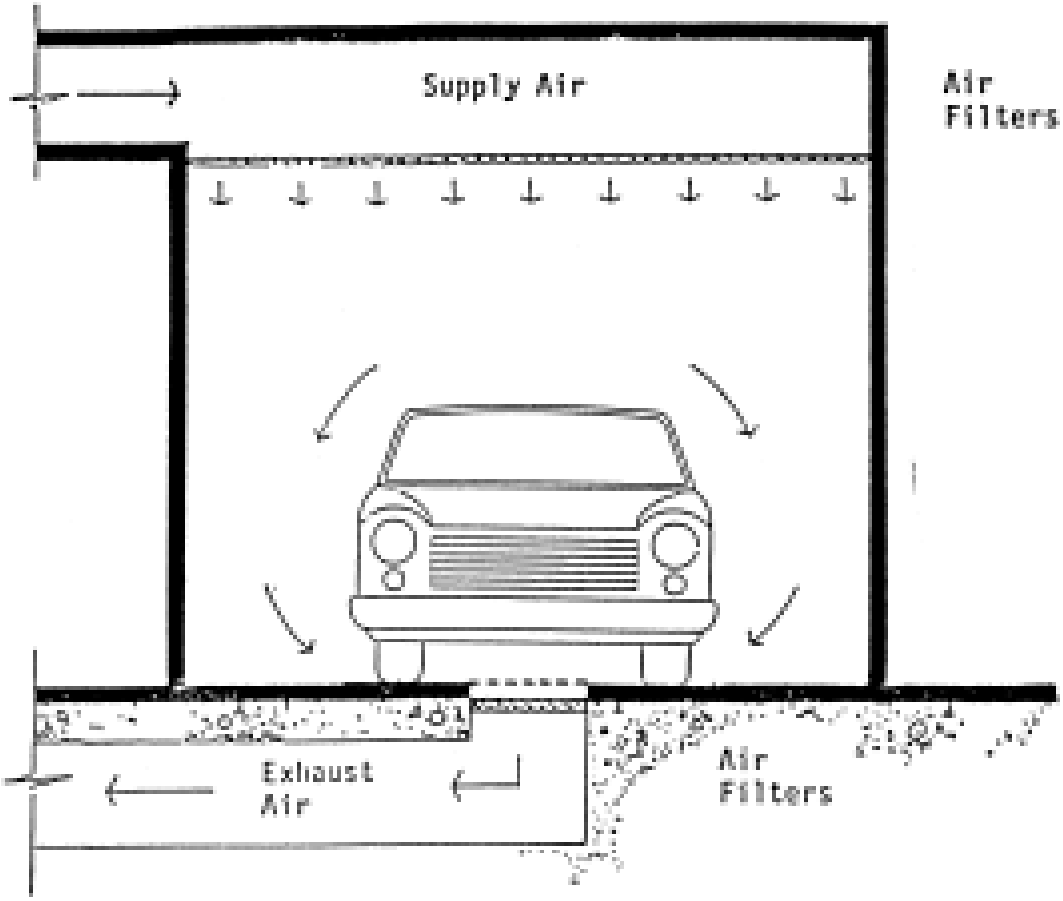


- May have solid wall of filters on exhaust end
-- Must have make-up air in shop. Capacity of make-up air should equal exhaust capacity of booth

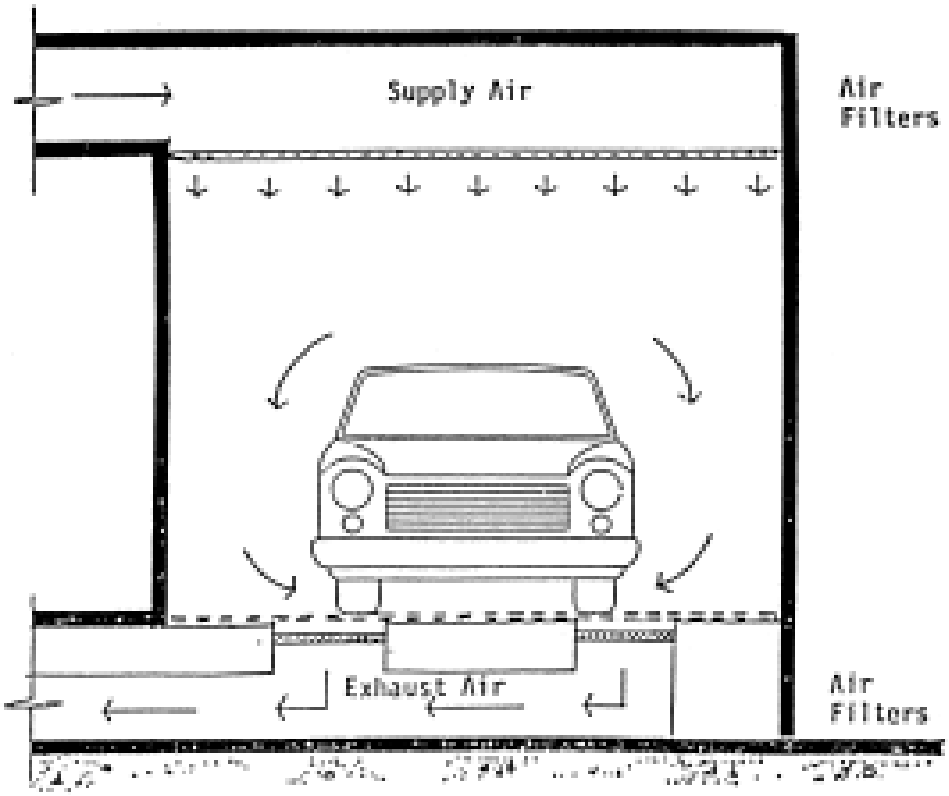
SEMI DOWNDRAFT SPRAY PAINTING BOOTH



DOWNDRAFT BOOTH WITH PIT



DOWNDRAFT BOOTH WITH RASED FLOOR



APPENDIX C
Definitions

1. **Spray Area:** An area in which dangerous quantities of flammable or combustible vapours, mists, residues, dusts or deposits are present due to the operation of spray processes.

   A spray area shall include:

   (a) The interior of spray booths and rooms except as specifically provided in Section 11-3 of NFPA- 33(1995).

   (b) The interior of ducts exhausting from spraying processes.

   (c) Any area in the direct path of spraying operations.

   The authority having jurisdiction many, for the purpose of this standard, define the limits of the spray area in any specific case. The “spray area” in the vicinity of spraying operations will necessarily vary with the design and arrangement of equipment and method of operation. When spraying operations are strictly confined to predetermined spaces which are provided with adequate and reliable ventilation, such as a properly constructed spray booth, the “spray area” will ordinarily not extend beyond the booth enclosure. When, however, spraying operation are not confined to adequately ventilated spaces the “spray area” may extend throughout the entire room containing spraying operations.

2. **Spray Booth:** A power-ventilated structure provided to enclose or accommodate a spraying operation, to confine and limit the escape of spray, vapour and residue, and to safely conduct or direct them to an exhaust system. Spray booths are manufactured in a variety of forms, including automotive refinishing, downdraft, open-face travelling, tunnel, and updraft booths.

3. **Spray Room:** A power-ventilated fully enclosed room used exclusively for open spraying of flammable or combustible materials. The entire spray room is spray area. A spray booth is not a spray room.