

A Guide to the Factories and Industrial Undertakings (Spraying of Flammable Liquids) Regulations



Corrigendum to A Guide to the Factories and Industrial Undertakings

(Spraying of Flammable Liquids) Regulations (Year 2007 edition)

(19 April 2024)

Item	Section	Current Version	Amendment
1	6	<p>OFFENCES and PENALTIES</p> <p>6.1 A proprietor who permits or suffers any person to contravene Regulation 12 or who contravenes Regulation 4 to 12 shall be liable on conviction to a fine of \$50,000.</p> <p>6.2 Any person who contravenes Regulation 13 to 15 or who smokes or uses a naked flame inside any spraying room, spraying area, or within 6 metres of any spraying area, shall be liable on conviction to a fine of \$10,000.</p>	<p>OFFENCES and PENALTIES</p> <p>6.1 If regulation 4 or 8 is contravened, the proprietor of the industrial undertaking in respect of which the contravention occurs commits an offence and is liable on conviction to a fine of \$400,000.</p> <p>6.2 If regulation 5, 9, 10(1), (2) or (3), 11 or 12 is contravened, the proprietor of the industrial undertaking in respect of which the contravention occurs commits an offence and is liable on conviction to a fine at level 6 (currently \$100,000).</p> <p>6.3 A proprietor of an industrial undertaking who—</p> <ul style="list-style-type: none"> (a) contravenes regulation 6 commits an offence and is liable on conviction to a fine of \$400,000; (b) contravenes regulation 7 commits an offence and is liable on conviction to a fine at level 6 (currently \$100,000); or (c) permits or suffers a contravention of regulation 12 commits an offence and is liable on conviction to a fine at level 6 (currently \$100,000).

Item	Section	Current Version	Amendment
			<p data-bbox="963 170 1493 383">6.4 A person who contravenes regulation 13, 14 or 15 commits an offence and is liable on conviction to a fine at level 5 (currently \$50,000).</p> <p data-bbox="963 427 1493 763">6.5 A person who smokes or uses a naked flame inside any spraying room, spraying area or within a distance of 6 metres of any spraying area commits an offence and is liable on conviction to a fine of \$150,000.</p>

- End -

This guide is prepared by the
Occupational Safety and Health Branch, Labour Department

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(Spraying of Flammable Liquids)
Regulations**



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1 INTRODUCTION

1.1 In recent years, the process of spraying involving the use of flammable liquid has become widespread throughout industry. The three main spraying processes are:

- (i) The atomisation of a volatile liquid by a spraying gun normally under air pressure and its subsequent projection onto the article to be coated.
- (ii) The application of paint by electro-static means. The spraying gun is charged with a high voltage. When the paint droplets leave the nozzle of the gun, they carry a high electrical potential and are attracted to the earthed object to be painted.
- (iii) The atomisation of material by forcing it through a small orifice by means of hydraulic pressure. This is known as the airless spraying system.

The hazards of the spraying processes are:

* **Fire Hazard -**

In order to obtain high-gloss finishes or to speed up production, many of the substances sprayed are quick drying. This means that they are highly volatile and flammable. The fire hazard is increased when these substances are mixed with air in a finely divided state.

* **Health Hazard -**

Many of the volatile substances sprayed are toxic, while other solvents may be harmful to the lungs or to the skin. They are readily absorbed when the surrounding air is saturated. The air therefore needs to be changed continuously during spraying operations in order to remove the contamination and, in addition, proper care and protection are necessary in handling the coating substance.

1.2 This guide explains in simple language the main provisions of the Factories and Industrial Undertakings (Spraying of Flammable Liquids) Regulations which lay down the legal obligations of proprietors, and of persons employed, in any spraying process involving the use of a flammable liquid in industrial undertakings. The guide also provides practical advice to facilitate compliance with the regulations.

- 1.3 This guide should be read in conjunction with other publications relating to the Factories and Industrial Undertakings Ordinance (Sections 6A & 6B) which imposes general duties on proprietors and persons employed with regard to the health and safety at work in industrial undertakings.
- 1.4 While every care has been exercised in the preparation of this guide, the Factories and Industrial Undertakings (Spraying of Flammable Liquids) Regulations remain to be the sole authority for the provisions of the law explained.

2 INTERPRETATION

- 2.1 Certain terms used in the regulations have been defined to provide specific meanings which may be somewhat different from their literal meanings. They are reproduced below for ease of reference: **Reg.2**

‘flammable liquid’ means any liquid having a flash point below 32 °C;

‘flammable liquid spraying process’ means the application of a flammable liquid or of a mixture containing flammable liquid to an article by the atomisation of the liquid or mixture through the nozzle of a spraying apparatus under pressure;

‘F.R.P.’ (Fire Resisting Period) has the meaning assigned to it in regulation 182 of the Building (Construction) Regulations (Cap.123 sub. leg. B);

‘flash point’ means, in relation to any liquid, the lowest temperature, if any, at which such liquid will give off vapour which will ignite or explode if mixed with air and exposed to a naked light;

‘employee’ means a person employed in any spraying process involving the use of a flammable liquid;

‘spraying area’ means the area referred to in regulation 4(1)(b);

‘spraying room’ means the room referred to in regulation 4(1)(a);

‘open air’ means a space which:

- (a) is vertically uncovered and unobstructed;
- (b) is, in any horizontal dimension, not less than 1.3 metres; and
- (c) where such space is enclosed on four sides, has a horizontal area of not less than 0.1 square metre for every 600 millimetres of the mean height of the walls enclosing the space.

3 APPLICATION

- 3.1 The regulations apply to any spraying process conducted in an industrial undertaking involving the use of flammable liquid. The term 'industrial undertaking' is defined in Section 2 of the Factories and Industrial Undertakings Ordinance, Chapter 59. **Reg.3**

4 DUTIES OF PROPRIETORS

Construction of spraying room or spraying area etc.

Reg.4(1)(a)

- 4.1 Any flammable liquid spraying process shall be carried out in a room where the construction materials of floors, walls and ceilings shall have an F.R.P. of not less than 1 hour. As for windows and doors, the materials shall be capable of resisting the action of fire for a period not less than 30 minutes.

Common examples of construction materials having an F.R.P. of not less than 1 hour are as follows:

- * 100-millimetre thick solid reinforced concrete construction;
- * 100-millimetre thick (excluding plaster) brick of clay, or concrete;
- * 75-millimetre thick (excluding plaster) reinforced concrete walls or partitions;
- * 50-millimetre thick cellocrete wood wool slab with 12-millimetre plaster on each side.

Common examples of construction materials for windows and doors having an F.R.P. of not less than 1/2 hour are as follows:

- * A minimum of 44-millimetre thick solid timber door with timber door stops round the sides and the head of the frame;
- * A minimum of 6-millimetre thick wired glass and such glazed area in the door panel should be not more than 0.4 m²;
- * 50-millimetre thick cellocrete wood wool slab with 12-millimetre plaster on each side.

- 4.2 A spraying area shall be set aside if a spraying room is not provided. **Reg.4(1)(b)**
Spraying in such area shall be done inside a totally enclosed booth or cabinet. Openings of suitable size in the booth or cabinet are allowed for working or ventilation purposes.
- 4.3 All ducts, trunkings, hoods, booths, cabinets and casings used in connection with any spraying process shall be capable of resisting the action of fire for a period of not less than 1/2 hour. **Reg.4(2)**

- * As far as practicable, ducts and trunks should be constructed of the same material throughout. The type of fire-resisting material used should be strong and durable, such as galvanized sheet-iron or steel.
- * Ducts should be independent structures, and not built in the walls. Exhaust ducts should lead to the outside of the building as directly as possible, and never through intermediate rooms, smoke lobbies, corridors or staircases.
- * The type of booth selected will be determined by the class of work to be performed. In general, cabinet booths are selected for small and medium-sized articles, room booths for large articles, and tunnel booths for continuous processes. Spray booths should be substantially constructed of steel sheet, securely and rigidly supported, or of reinforced concrete or brick.

Ventilation

Reg.5

- 4.4 A spraying room or spraying area, including any spraying booth or cabinet, where flammable liquid spraying process is carried out shall be efficiently ventilated to open air by mechanical means so as to remove any flammable vapour, mist or spray arising from the spraying process.

Good ventilation which is essential in controlling the hazards from spraying process, has two main functions, namely:

- * to carry off and disperse the overspray, and
- * to reduce the concentration of flammable vapour in air by dilution to below the explosive level.

In a conventional cabinet-type spray booth, an air velocity of not less than 30 metres per minute into the open frontal area of the booth is sufficient for vapour removal (30 metres/min is just over 1.6 km/hr). The shallower the booth, the higher must be the face velocity because of rebound of the sprayed material from the work and from the back and sides of the booth. The duct opening of shallow booths should be at the rear and duly baffled to prevent direct spray from entering the pipe.

Sources of ignition and prohibition of smoking

Reg.6

- 4.5 Smoking, presence of naked flame or other means likely to ignite flammable vapour shall *NOT* be allowed inside any spraying room, spraying area or within 6 metres of any spraying area.

Notices to be displayed

Reg.7

- 4.6 At least two 'NO SMOKING - NO NAKED FLAMES 不准吸煙 – 不准點燃 無遮蓋之燈火' notices in English capital letters and Chinese characters of at least 100-millimetre high in red colour on a white background shall be prominently displayed in every spraying room and spraying area.

Electrical equipment

Reg.8

- 4.7 All electrical equipment likely to be exposed to flammable vapour arising from a flammable liquid spraying process shall be so constructed, designed, installed and maintained as to prevent, so far as is reasonably possible, the ignition of the flammable atmosphere.

The following precautionary measures are recommended:

(a) Inside spraying rooms:

All electrical equipment, lighting fittings and installations should be of :

- (i) a flameproof type; or
- (ii) an intrinsically safe type; or
- (iii) positive pressurization design (i.e. the equipment is subject to positive air pressure so that any ingress of flammable vapours is impossible. As an additional safety measure when this design is adopted, the air supply must be interlocked with the electrical equipment so that in the event of a failure in the air pressure, the electrical equipment is automatically switched off).

(b) Within a spraying area:

(i) Inside spraying booths:

All electrical equipment, lighting fittings and installations should be the same as for spraying room mentioned above.

(ii) Within 6 metres of the open face of the spraying booths:

- (1) All lighting fittings should be in metal casings with strong glass covers.
- (2) All switches, sockets and motors should be of a totally enclosed type.

All electrical wiring in spraying rooms or booths and within 6 metres of the open face of such booths, should be run in metal conduits. The whole metal conduit system should be properly earthed. All joints should mechanically as well as electrically be made continuous by screwing or by substantial mechanical clamps.

It is both practical and economical to consider locating motors and electrical switches, fittings and installations outside the spraying room, or outside the spraying booths in the case of spraying area. The illustrations at appendix 1 provide an example of how this can be done.

Provision of fire extinguishing appliances

Reg.9

- 4.8 Portable fire extinguishing appliances of the type and quantity specified in the Schedule shown below shall be provided in every spraying room and spraying area, including any booth or cabinet within such area. All such fire extinguishing appliances shall be placed or fitted as to be readily available for use and shall be regularly checked, inspected and maintained to ensure their proper functioning in the event of fire.

SCHEDULE

Reg.9(1)

Type and quantity of fire extinguishing appliances as required by Regulation 9(1):

Type	Minimum capacity per appliance	Quantity
1. Bucket (galvanized iron) of sand AND	9 litres	Two
2. (a) Bromochlorodifluoromethane (B.C.F.)	1.4 kg	One for every room or area of 40 square metres or less.
or		
(b) Carbon dioxide	2 kg	One for every room or area of 33 square metres or less.
or		
(c) Dry Power (gas expelled)	2 kg	One for every room or area of 33 square metres or less.
or		
(d) Foam (chemical)	9 litres	One for every room or area of 40 square metres or less.

Storage of flammable liquid

Reg.10(1)-(4)

- 4.9 Any flammable liquid inside a spraying room or spraying area, including inside any booth or cabinet, shall be stored in a strong metal box, bin, tank or similar metal container fitted with a self-closing lid. The container for storage of flammable liquid shall be so designed, constructed, installed, placed and maintained as to avoid leakage. The words 'FLAMMABLE LIQUID 易燃液體' shall be inscribed in bold capital letters in English and in Chinese characters on the outside of the container and its lid be kept closed when flammable liquid spraying process is in operation. The quantity of any flammable liquid stored in accordance with this regulation shall be as small as reasonably practicable and shall be in accordance with the provisions of the Dangerous Goods Ordinance (Cap. 295) or any regulations made thereunder.

Cleanliness

Reg.11

- 4.10 Every spraying room, spraying area, booth or cabinet shall be kept clean and tidy. Immediate steps shall be taken to remove, contain, draw-off or treat any spilled flammable liquid. Deposit of solid waste residue shall be removed forthwith.

Booths must be cleaned regularly, in particular fan blades and exhaust ducting. A fan will lose efficiency very rapidly if overspray is allowed to accumulate on the blades. Spraying should not be done indiscriminately, nor should overspray be allowed to accumulate on the interior surfaces of the booth.

Disposal of cotton waste etc.

Reg.12

- 4.11 Cotton waste, cleaning rags or other materials which have come into contact, or become contaminated, with a flammable liquid in a spraying room, spraying area or in any booth or cabinet shall be contained in a strong metal box or container fitted with a self-closing lid. If not being stored in the above manner, they shall be removed to a safe place without delay.

Oil-soaked cotton waste or rags in heavy accumulation will be liable to spontaneous combustion and are potentially dangerous rapid-burning fuels. Every care should be exercised to effect safe disposal of them. Lids for metal boxes or containers holding such refuse should be properly hinged to the rim of the receptacles. Lids may be made of either spring-loaded action or gravitational pull (due to the weight of the lid itself) or foot-pedal leverage to obtain self-closing effect on the lids. Paper cartons, wooden boxes or plastic litter boxes should not be used for this purpose.

5 DUTIES OF PERSONS EMPLOYED

Removal of contaminated material etc.

Reg.13

- 5.1 Any person or employee who has used cotton waste, cleaning rag or other materials to remove, contain, draw-off or treat deposits or spills of any flammable liquid shall remove or dispose of such contaminated material in accordance with Regulation 12.

Employees' duties to comply with regulations etc.

Reg.14

- 5.2 Every employee shall make full and proper use of all ventilating equipment when spraying process is in operation.

The ventilation system should be kept in operation during spraying and for approximately 5 minutes after spraying is finished to ensure that all overspray is removed from the booth.

that all overspray is removed from the booth.

Reg.15

Employee's duty to report defects

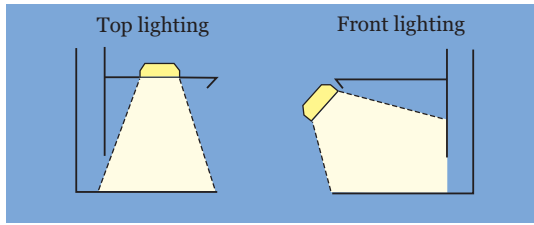
- 5.3 Every person and employee shall report to the proprietor any fault or defect in any ventilating apparatus, fire extinguishing appliance or any electrical appliance including any cable, wire switch or plug and in any pipe or conduit or container used for the storage or conveyance of any flammable liquid.

Reg.16

6 OFFENCES AND PENALTIES

- 6.1 A proprietor who permits or suffers any person to contravene Regulation 12 or who contravenes Regulation 4 to 12 shall be liable on conviction to a fine of \$50,000.
- 6.2 Any person who contravenes Regulation 13 to 15 or who smokes or uses a naked flame inside any spraying room, spraying area, or within 6 metres of any spraying area, shall be liable on conviction to a fine of \$10,000.

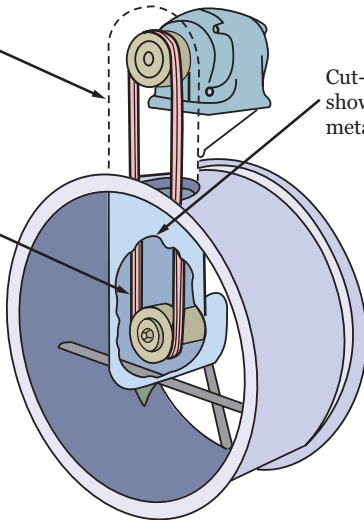
APPENDIX 1 - ILLUSTRATIONS



Examples of lighting arrangement outside spraying booth

Position of metal enclosure guard for external part of belts.

Belts enclosed in vapour-tight metal housing. (Conducting rubber belts or the use of conducting belt dressings, e.g. a mixture of glycerine and water or a graphitic compound, may be of value in minimising static electricity accumulation)

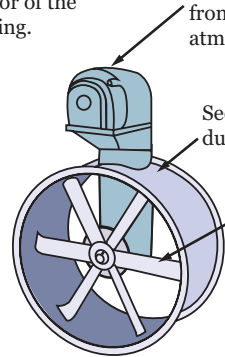


Cut-away section to show interior of the metal housing.

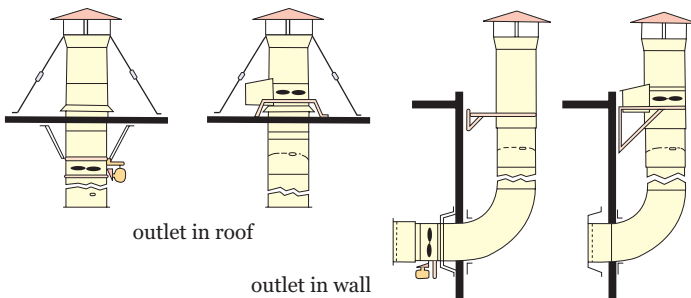
Motor placed in ventilated position outside the spraying room or booth away from the dangerous atmosphere

Section of exhaust duct or booth outlet

Non-sparking fan blades



Exhaust fan for mounting in exhaust duct or at booth exhaust outlet - in any position, horizontal or vertical.



Some methods of installing exhaust fan and motor at exhaust duct.

APPENDIX 2

Enquiries

If you wish to obtain further information about this guide or require advice on occupational safety and health, please contact the Occupational Safety and Health Branch of the Labour Department through:

Telephone : 2559 2297 (auto-recording after office hours)
Fax : 2915 1410
E-mail : enquiry@labour.gov.hk

Information on the services offered by the Labour Department and on major labour legislation can also be found by visiting our Homepage at <http://www.labour.gov.hk>.

You can also obtain information on the various services provided by the Occupational Safety and Health Council through its telephone hotline at 2739 9000.

Complaints

If you have any complaint about unsafe workplaces and practices, please call the Labour Department's occupational safety and health complaint hotline at 2542 2172.

