

PAINT SPRAY BOOTHS

A COMPARISON OF AUSTRALIAN, NEW ZEALAND, UNITED KINGDOM AND UNITED STATES APPROACHES

Presented by:

Justin Collins, BSc, BA
WHS Technician, Coffey Environments
justin_collins@coffey.com
and

Peter Roy, BSc, MPH, CIH
Principal Consultant – Occupational Hygiene,
Coffey Environments
peter_roy@coffey.com

INTRODUCTION

We have investigated the varying strategies employed to control hazards for spray painters using exhaust ventilated paint spray booths across four countries: Australia, New Zealand, the UK and the USA.

Spray painting operations have a long history of occupational health and safety issues. Besides fire risks, the range of adverse health risks include: acute and chronic solvent neurotoxicity, central and peripheral neuropathies, acute and chronic dermatoses, allergic sensitisations, occupational asthma, and depending upon paint constituents and additives, liver and kidney damage and occupational cancers.

The Australian Context: Australian OH&S arrangements are being harmonised. Safe Work Australia is the independent statutory agency tasked with this responsibility and one of its key functions is to: *Prepare model codes of practice relating to OHS and, if necessary, revise them ...for adoption as codes of practice of the Commonwealth, each of the States and each of the Territories.* This current situation provides an opportunity for Australia to implement new OH&S best practice standards for spray painting booths.

A COMPARISON OF INTERNATIONAL PAINT SPRAY BOOTH REQUIREMENTS

	AS/NZS 4114*	NZ Spray Coating Regulations (1962)	UK – HSE 259 & Guide to Local Exhaust Ventilation (LEV)	USA – ANSI/MIRA 29.9-2007 Spray Finishing Operations	US DOL OSHA – Criteria for design and construction of spray booths 1926.69
Minimum Air Velocity for Downdraft Booths	0.25 m/s	0.5 m/s	NO	NO	100 feet/minute (0.5 m/s) & (0.3 m/s)
Minimum Air Velocity for Crossdraft Booths	0.5 m/s	0.5 m/s	NO	Cross draft in excess of 100 feet/minute to be avoided**	100 feet/minute (0.5 m/s) & (0.3 m/s)
Minimum Air Velocity Requirement for Electrostatic Spray Painting	0.4 m/s	NO	NO	NO	60 feet/minute (0.5 m/s) & (0.3 m/s)
Dilution Ventilation Requirements for Combustible Vapours	YES references AS 1375	NO	<25% of Lower Explosive Limit (LEL)	<25% of Lower Flammable Limit	Flammable vapours to be removed to safe location
Requirement for Negative Pressure in Booth Chamber	NO	NO	YES	Negative pressure in exhaust ductwork inside building required	NO
Negative Pressure Indicator (Gauge) Required	NO	NO	YES	NO	NO
Gauge or Alarm to Indicate if Booth Ventilation Airflow Drops	Spray system shuts down	NO	YES	YES	YES
Requirement for Chamber Purge Period After Spraying	Minimum 5 minutes	5 minutes	YES	NO	"for a sufficient time"
Clearance Time Tested and Displayed	NO	NO	YES	NO	NO

*AS/NZS 4114, Spray painting booths, designated spray painting areas and paint mixing rooms

SPRAY BOOTH VENTILATION REQUIREMENTS UNDER AUSTRALIAN STATE OR TERRITORY REGULATIONS

	Common-wealth	ACT	NSW	NT	QLD	SA	TAS	WA*
Minimum Air Velocity Requirement for Downdraft Booths	0.3 m/s	Min 20 ACHr** for any booth	NO	NO	0.3 m/s	NO	NO	0.25 m/s
Minimum Air Velocity Requirement for Crossdraft Booths	0.5 m/s	Min 20 ACHr** for any booth	NO	NO	0.5 m/s	NO	NO	0.5 m/s
Minimum Air Velocity Requirement for Electrostatic Spray Painting	0.4 m/s	Min 20 ACHr** for any booth	NO	NO	0.4 m/s	NO	NO	0.4 m/s
Dilution Ventilation Air Flow Requirements for Combustible Vapours	NO	NO	NO	NO	NO	NO	NO	YES references
Requirement for Negative Pressure in Booth Chamber	AS 1375	NO	YES	Negative pressure	NO	NO	NO	
Negative Pressure Indicator (Gauge) Required	NO	NO	NO	NO	NO	NO	NO	NO
Gauge or Alarm to Indicate if Booth Ventilation Airflow Drops	NO	NO	NO	NO	NO	NO	NO	NO
Requirement for Chamber Purge Period After Spraying	NO	NO	NO	NO	NO	NO	NO	Spray system shuts down
Clearance Time Tested and Displayed	NO	NO	As long as contaminant	NO	NO	NO	NO	Minimum 5 minutes
	NO	NO	NO	NO	NO	NO	NO	NO

*From AS/NZS 4114 ** Air Changes per hour

COMMENTS

In their document, Controlling isocyanate exposures in spray booths and spray rooms (2008), the Health and Safety Executive (HSE UK) states:

In the past, when commissioning spray booths and rooms, the emphasis has mainly been on the booth/room air-change rate and, in the case of booths, the velocity of air at fixed points around a vehicle in a booth/room.

Understanding of booths and rooms, and the most important factors that control exposure, has improved and now the emphasis is on measuring and knowing the booth/room clearance time and ensuring that it runs at slightly negative pressure so that it doesn't leak during spraying. An important test during commissioning is the smoke test to measure clearance time and ensure that the booth/room doesn't leak.

HSE requires that Booth Clearance Times be measured using theoretical smoke/fog machines and Dust Lamps (ie, Tyndall lamps or similar) to establish the time required for the booth chamber to clear and that the Booth Clearance Time be clearly posted on the booth.

Question:

Given that both AS/NZS 4114 and the older New Zealand Spray Coating Regulations (1962), require the booth extraction system to continue operating for a minimum period after spraying operations cease; what is the advantage of a Clearance Time Test and posting?

Answer:

Measuring and posting the Booth Clearance Time helps to ensure that:

- Spray painters do not remove their RPE while in the spray booth during the Clearance Period
- Other persons without RPE do not enter the spray booth during the Clearance Period

Requirements for Clearance Testing and Clearance Time posting are not included in AS/NZS 4114, nor are they included in any paint booth related Australian Code of Practice or Guidance document.

COMMENTS

It is evident some Australian States and Territories have little or no specific regulatory requirements for paint spray booths. Perhaps the easiest way to ensure spray booth compliance is for little in the way of compliance items to be required!

In Australia, only Western Australia references AS/NZS 4114 in its OS&H Regulations and Spray Booth Code of Practice.

AS/NZS 4114 is however, referenced in the following documents:

- WorkCover NSW Health and Safety Guide – Spray Painting
- Queensland Spray Painting Guide for Employers and Operators
- National Occupational Health and Safety Commission (NOHSC) National Guidance Material for Spray Painting, 1999

ASSESSMENT OF ISOCYANATE EXPOSURES

Whilst it is possible to monitor airborne isocyanate levels, the HSE suggests:

The only practical way of measuring a paint sprayer's (total) exposure to isocyanates, or [that of] anyone else using RPE, is by analysis of isocyanate metabolites in a urine sample. This method of biological monitoring was refined by HSE some years ago and has been tested and used extensively in MVR bodyshops (HSE SIM 03/2006/04).

Some Australian laboratories are planning to offer this analytical service in future.

WORK PRACTICES

Spray painters are prone to lifting full face respirators away from their face to check their painting, as a countermeasure, HSE recommends use of disposable "peel away" visor shields. HSE also recommends that painters wearing supplied air respirators be able to reach the booth exit while still "plugged in" to the breathing air system by ensuring compressed air connection points are located next to access doors.

In Australia, some practical guidance on spray painting work practices is available from:

- Queensland (QLD) Workplace Health & Safety – Spray Painting Guide for Employers and Operators
- New South Wales (NSW) Workcover, Health and Safety Guide – Spray Painting
- Western Australia (WA) Worksafe, Code of Practice – Spray Painting
- Western Australia (WA) Worksafe, Guidance Note – Controlling Isocyanate Hazards at Work

Also of note:

The ACT Scaffolding and Lifts Regulation 1950 - REG 83, includes a section on the duties of paint sprayers. Operators are required to adjust the atomisation pressure of their spray-gun to avoid "creating unclue airborne mist" and to "not test the spray-gun by spraying promiscuously about any room or place". Although the latter requirement may be awkwardly phrased, these are practical points.

Spray painting equipment exists that helps reduce overspray, eg, HVLP (high volume low pressure) spray guns.

Spray painting equipment design and air pressure limitation devices are also important to help prevent direct paint injection injuries.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Legislation across Australia requires appropriate PPE to be worn when required. For spray painting, besides a common need for respirators, protective clothing and appropriate gloves are also important protective measures to reduce risks of dermatoses and percutaneous absorption of paint components and VOC solvents.

Respiratory Protective Equipment (RPE)

All Australian jurisdictions require use of appropriate RPE when no other feasible means exist to control worker exposures to airborne agents.

Standards compliant RPE programmes include education and training, proper use and limitations: medical review and pulmonary function monitoring; fit testing; and maintenance, cleaning and storage.

However, in the authors' experience, a thorough implementation of all requirements (AS/NZS 1715: 2009 Selection, use and maintenance of respiratory protective equipment) is rarely evident in common practice, nor does such compliance appear to be strongly enforced.

IMPORTANT POINTS TO CONSIDER

Most firms using spray painting booths, eg, Spray and Blast operators, Panel Beaters, etc, typically have less than 10 employees and can "fly under the radar".

Adopting best practice also requires a practical and easy to implement approach that can be implemented by users to effectively and reliably reduce health and safety risks associated with spray painting.

Also, it is not evident that relevant OH&S information and practices are included in spray painter trades training programmes.



Justin Collins



Peter Roy



RECOMMENDATIONS

In the interim, Safe Work Australia should consider adopting the WA Code of Practice and AS/NZS 4114.

In terms of developing a new best practice Australia-wide Spray Painting Code of Practice, the authors recommend the following items be included:

- Instead of referencing a separate Standard (AS 1375) and applying nominal "safety factors" for booth dilution ventilation rates, specify booth ventilation system flowrate requirements to reliably maintain <25% LEL in the booth chamber and exhaust system (from HSE and ANSIA/ATA).
- Require all enclosed spray booths to maintain an internal negative pressure (-25 pascals) during operation to prevent leakage of contaminants into surrounding work areas (from HSE).
- Incorporate field smoke tests to visualise contaminant / leakage chamber pressurisation and to estimate Spray Booth Clearance Time; and conspicuously post the Booth Clearance Time on each operational paint booth (from HSE).
- Specify alarmed visual monitors for booth hood air flowrate and for hood filter pressure drop.
- As a requirement for commercial booth designers / fabricators, test and establish product-line booth chamber clearance times using more accurate tracer gas methods.
- Implement a requirement for periodic assessment and certification of spray booths by suitably competent persons (from HSE).
- Specify location of breathing air connection points at booth access / egress doors (from HSE)
- Implement Biological Monitoring (urine testing) as the preferred means to assess isocyanate exposures of paint sprayers (from HSE).
- Ensure that requirements are established for the inclusion of appropriate OH&S topics in painting trades training programmes.