Guideline
Spray Painting

February 2018

Background

Adelaide and Parafield Airports are classified as Commonwealth Places. Under the provisions of the *Commonwealth Places (Application of Laws) Act 1970* (Cth), State laws generally apply in these Commonwealth places subject to the condition that Commonwealth Law does not already cover the issue. Air emissions from spray-painting activities are not specifically covered by the *Airports (Environment Protection) Regulations 1997* and therefore this document refers to the state guidelines as developed by the South Australian Environment Protection Authority (EPA).

Under the building approval process building activities require approval from Adelaide Airport Limited/Parafield Airport Limited (AAL/PAL) as well as the Department of Infrastructure and Transport. Part of this process may require an Air Quality Assessment to be undertaken by a suitably qualified consultant to confirm acceptable air quality in the local environment of the proposed activity.

This guideline will be applicable to any operator that seeks building approval for a facility that is capable of spray-painting or surface coating on Adelaide or Parafield Airport land. It is also applicable to any temporary facility that is capable of spray painting. A temporary facility is one that is not permanent and isn't purpose built for spray painting. Further information on building activity on airport can be found in the Adelaide and Parafield Airports Building Activity Application Package. The flow chart contained within this document is a simplified approach to whether a full air emissions assessment should be carried out in order to seek approval for their activities. This guideline does not cover occupational, health and safety issues associated with spray painting within facilities as provisions set down by SafeWork SA cover this.

Also it is noted that the design, construction and testing of any spray booth will have to conform to AS/NZS 4114.1 and AS/NZS 4114.2:2003 "*Spray painting booths, designated spray painting areas and paint mixing rooms*".

Painting Locations

Ideally, all spray painting and surface-coating operations should occur in a spray booth fitted with an appropriately filtered exhaust system. Spray booths are enclosed or partially enclosed structures designed to prevent or reduce exposure to hazardous chemicals or vapours. A spray booth should be used when spray painting with a hazardous chemical, except when:

- The shape, size or weight of an article cannot be easily moved or fit into a booth; and
- The painting involves minor work such as spotting or touch-ups, for example, painting a scratch or stone chip on a car (painting a car panel with two-pack polyurethane paint would not be regarded as minor work).

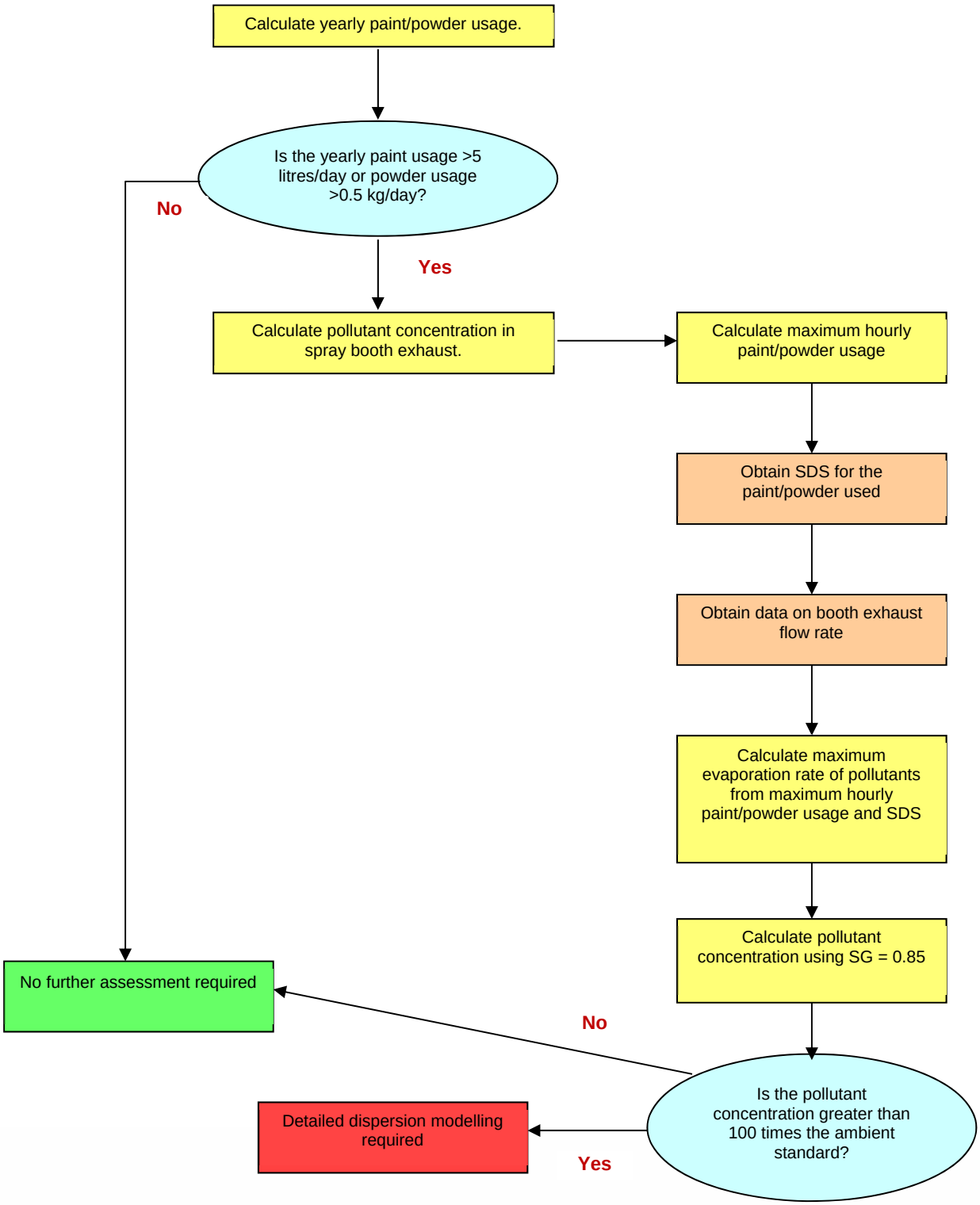
Spray booth calculation - simplified approach

In some situations the concentration of a pollutant from the emissions from a spray booth may be sufficiently small that the Design Ground Level Concentrations (DGLCs) would be met without the need for verification through pollutant dispersion modelling. In general, the need for pollutant dispersion modelling may be waived if it can be shown that:

- The emission of each pollutant is released from a single point source and contains a concentration of no more than 100 times the DGLC, at the top of the stack;
- The proposed facility exists within flat terrain with no unusual meteorological factors; and
- The emission will be discharged from a stack that is:
  - at least three metres above the highest point within a 30 m radius,
  - has a discharge velocity no less than 10 m/s and
  - does not have a rain protector that interferes with the exit flow.

Spray booth calculation - simplified approach (cont.)

In order to calculate whether dispersion modelling can be waived the steps identified within the flow chart must be completed. To complete the flow chart technical data from the paint and exhaust manufacturers must be obtained. An example calculation is shown below.



Spray booth calculation - simplified approach (cont.)

Example Calculation for a large industrial site

Multiple personnel are painting at the same time with a two-pack paint. This example concludes that Paint Type A passes the simple calculation whilst Paint Type B requires a detailed assessment using dispersion modelling. The simple calculation requires that the concentration is no more than 100 times the DGLC at the top of the stack.

After calculating the maximum paint usage per hour, the SDS is used to calculate the individual emissions based on the percentages in the paint in litres per hour. The emissions in grams per hour are then derived from the specific gravity (if unknown a default of 0.85 kg/L can be used). To derive the concentration in the stack it is the mass emission rate divided by the mass flow rate.

$$\frac{Concentration\ (g/m3)\ =\ Max\ paint\ rate\ (L\ /h)\ x\ Pollutant\ (\%)\ x\ Specific\ Gravity\ (g/l)}{Mass\ f\ low\ rate\ (m3/h)}$$

If this concentration is no greater than 100 times the DLGC (as shown in Appendix B) then it passes the simplified approach, if not a detailed assessment is required. An example for two paint types is shown below.

PAINT TYPE	UNIT	PAINT TYPE A	PAINT TYPE B
Exhaust air flow	m3/hr	172000	172000
Number of people painting		8	8
Theoretical coverage (product data sheet)	m2/L	6.08	11.75
Paint application rate/person	m2/hr	30	30
Paint application rate/person (inc 30% waste)	L/hr	6.4	3.3
Maximum Paint application rate	L/hr	51.3	26.6
Pollutant Type	n-Butanol	Xylene	
Maximum Pollutant Content of paint from SDS PartA, PartB	%	0, 25	25, 50
Mix Ratio PartA: PartB		4:1	4:1
Equivalent Pollutant content for mixed paint	% v/v	5	30
Maximum Evaporation rate of pollutants	L/hr	2.6	8
Mass evaporation rates assuming SG = 0.85	g/hr	2180.9	6771.1
Concentration of pollutants in spray booth exhaust	mg/m3	12.7	39.4
DGLC value	mg/m3	0.9	0.35
Maximum concentration of pollutants allowable for the simplified approach to apply	mg/m3	90	35
Result		Acceptable	Not Acceptable

Airport obstacle clearance area

Whilst this guidance is related to spray painting facilities, it should be noted that if the proposed facility is likely to have an exhaust originating from a stack and the air volumes are large it may require a plume rise assessment under the Civil Aviation Safety Authority (CASA) Advisory Circular 139-05 *'Guidelines for Conducting Plume Rise Assessments'* June 2004.

The risk posed by an exhaust plume to an aircraft during low-level flight can be managed or reduced if information is available to pilots so that they can avoid the area of likely air disturbance. As a result of this, CASA requires the proponent of a facility with an exhaust plume, which has an average vertical velocity exceeding the limiting value (4.3 m/s at the aerodrome Obstacle Limitation Surface (OLS) or at 110 metres above ground level anywhere else) to be assessed for the potential hazard to aircraft operations.

If exhaust from the proposed facility is likely to not meet the 4.3 m/s criteria, a full plume rise assessment must be carried out in accordance to the Advisory Circular 139-05. This is unlikely for a paint facility as the air flow and temperatures are generally low, however this needs to be considered.

The lowest OLS at the airport is defined as an inner horizontal surface at 45 m. As a guide a sample calculation for a typical spray booth stack located in this area has been conducted. This sample calculation shows the plume centerline has reached zero vertical velocity at a height of 30 m. It should be noted that if any facility has exit velocities, stack diameters or stack heights significantly greater than the values shown it may require further consideration.

Example Calculation of Maximum Plume Rise

Parameter	Value
Stack Velocity	10 m/s
Stack Diameter	0.3 m
Ambient Temperature	272 K
Stack Temperature	293 K
Stack Height	12 m
Terminal plume rise height	~30 m

Control methods for spray painting of air frames

SafeWork Australia (2011) sets down some guidance for operations not occurring in a spray booth and is summarised as follows. Where it is not practicable to do the spray painting in a booth and it is carried out in a building or structure other than a confined space, the building or structure should use a mechanical exhaust system to prevent the build-up of flammable or toxic fumes.

For intermittent light or electrostatic coating applications, it is acceptable that the air is filtered using a suitable dry disposable filter. Regular applications of large quantities must be done in a dedicated spray booth with an efficient wet collection device.

A spray painting exclusion zone should be designated around the area where the spray painting is carried out. In general, the exclusion zone should have at least six metres horizontal and two metres vertical clearance above and below the place where the paint is being applied. However, in deciding where to establish an exclusion zone and how big it should be, you should consider:

- The nature of the substances being sprayed;
- The type of process being used;
- The workplace environment, including wind speed, temperature and humidity; and
- The location of other people.

Once a spray paint exclusion zone is established, a number of procedures should be used to control risks, including:

- Physical barriers and warning signs to prevent unprotected persons from entering the exclusion zone;
- Use of High Volume Low Pressure (HVLP) electrostatic spray guns is mandatory;
- Shrouding the area where spraying is to occur to prevent spray drift in walkways, public areas and air conditioning intake vents;
- Removing hazardous chemicals that are not needed for spray painting work, to reduce unnecessary exposure and fire or explosion risks;
- Removing stored wastes, like solvent-soaked rags and waste paint, to control fire or explosion risks;
- Removing electrical and ignition sources from within the exclusion zone to control fire and explosion risks;
- Restricting spraying when wind speeds are likely to spread spray drift; and
- Restricting spraying when there is a close proximity to adjacent premises.

Only the spray gun and the cables connected to it should be in the exclusion zone. All other electrical equipment should be placed outside the zone or enclosed separately in a fire-resistant structure unless the equipment is suitably certified for use in an area in which an explosive atmosphere may be present.

Changing, washing and eating areas should be separated from the spray zone to reduce the risk of cross contamination and protect others.

The spray painter should be wearing an appropriate filter mask for the substance being used. Persons other than the spray painter should not enter the exclusion zone during a spray-painting operation unless equivalent personal protective equipment is worn. A sign stating “SPRAY PAINTING AREA - AUTHORISED PERSONNEL ONLY” should be prominently displayed at the exclusion zone.

Operators must advise AAL /PAL and immediate neighbours in writing at least 10 business days prior to commencing airframe spray painting.

References

Safe Work Australia (March 2015) Spray Painting and Powder Coating Code of Practice

SA EPA Assessment of surface coating – painting and powder coating (EPA 680/17) Updated September 2017

SA EPA Air & Noise Guidelines 'Spray Coating Activities – Control of Air and Noise Emissions' (EPA 100/12) Updated August 2012

Environmental Protection (Air Quality) Policy 2016.

SA EPA Ambient Air Quality Assessment (August 2016)

Civil Aviation Safety Authority Advisory Circular AC 139-5(1) Plume Rise Assessments (November 2012)

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