SAFETY

Most paints contain inflammable solvents and some contain materials which can harm the skin, or damage the health if swallowed or inhaled. Whilst most countries have developed regulations to control labelling, storage and use of toxic or hazardous material as yet there is no agreed international code or system.

Two major classes of risk must be controlled and precautions defined which will reduce the risk to acceptable levels:

a) Health risks, these include:-

1. Gases or vapours. these could include solvent evaporation during the drying period, or perhaps formed during heating of the painted object.
2. Liquids in the paint. these might be solvents, or perhaps binders, which may be toxic if swallowed or inhaled as spray droplets, or dermatitis or toxic in contact with the skin.
3. Powders or dusts. these can be formed during heating painted objects (e.g. flame cutting or welding painted steel), or be resent in powder formed during sanding operations, or in spray mist.

b) Fire or explosion risks, these include: -

1. Fire risk during storage or transport. most paints other water based products can be ignited and will support flame.
2. Explosion hazard during application. inflammable solvents in mixture with oxygen in air can explode within certain concentration limits if ignited or detonated.

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When paints containing solvents are applied in enclosed or confined spaces, two hazards can exist, explosion and toxicity and precautions must be taken to eliminate them.

General aspects of explosion hazards

the nature of this hazard is explained in detail hereunder.
the essential precaution to be taken is that sufficient ventilation air must be provided to maintain the ratio of vapour/air at no more than 10% of the lower explosive limit. If the flash point of solvent is above the working temperature, then an explosion cannot occur. However, it may still be necessary to ventilate to provide a clean working atmosphere or to eliminate toxic hazard.

An explosion is simply very rapid burning of a flammable mixture (in the case of paint, it is the burning of solvent vapour in oxygen contained in the air). The speed of combustion is so great that there is extremely rapid development of heat and pressure (6 to 9 times the original pressure). This can lead to destruction of the compartment and injury to work people. three factors must be present to create an explosion.

A. The mixture of vapour and air must be between the lower explosive limit (**LEL**) and the upper explosive limit(UEL).
B. the mixture must be at a temperature above the flash point temperature of the vapour.
C. A source of ignition with high enough temperature and energy must be present to initiate the explosion reaction.

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General aspects of toxic hazard

Many solvents used in paint have some degree of toxicity and it is necessary to provide sufficient ventilation air to maintain safe atmosphere below the threshold limit value (TLV). With many common solvents this may be impractical when applying large volumes of paint in a short time. in such cases ventilation to give a clear visibility and safety from explosion will still be necessary.
It will also be necessary to provide operators in the compartment with fresh air masks or hoods. barrier creams and protective clothing may also be necessary. Full details are given below and data for calculation of **raq** (required air quantity) are also provided.
It is necessary to keep certain rules when using any paint since all can be harmful (even ordinary emulsion paints are dangerous if swallowed!). The following are basic safety precautions:

Inhalation of dust and fumes

This must be avoided by the use of ventilation or extraction.

- Products should be used in well ventilated areas
- Forced ventilation or fresh air masks should be used in confined spaces.
  A face mask should be worn when spraying, sanding or blast cleaning

Skin contact

Some substances used in paint may cause irritation after repeated or prolonged contact with the skin and in susceptible Cases there is a risk of dermatitis.

- Operatives with a history of skin sensitivity should not be employed in processes where skin contact can occur
- Prolonged or repeated contact of paint with the skin should be avoided

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- Barrier or repeated contact of paint with the skin should be avoided
- Gloves should be worn
- Do not wash hands with solvent
- Use a proprietary hard cleanser

Ingestion

The ingestion (swallowing) of paint must always be avoided.

- Food should not be brought into or consumed in the work area where coatings are stored or used
- Thorough washing of hands and face is essential after applying paint, particularly before eating or smoking
- If paint or thinners should accidentally be swallowed, seek medical attention immediately

Eye protection

Steps should be taken to prevent material the eyes.

- Goggles should be worn whenever necessary
- If the eyes become contaminated they should be irrigated with water: seek medical attention immediately

Emergency procedure

It may be necessary to enter an atmosphere which is unsafe. (you may have to rescue somebody). Before entering a confined Space or tank ensure that:

- You wear breathing apparatus
- You wear a lifeline
- The lifeline is properly tended
- A watch is kept on you
- A means of communication exists
- A system of signals is agreed

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- You and everybody else involved understand the signals.

You must also make sure that:

- A back- up or rescue squad is squipped to render assistance
- Resuscitation equipment is on hand

If you hand to keep watch or tend a lifeline:

- Keep a careful watch on your men below

If you cannot see them:

- Call out to them from time to time
- Make sure they answer

If they do not answer repeated calls or if they show signs of drunkenness or unusual behavior:

- Raise the alarm immediately
- Do not attempt to rescue the victim by yourself
- Do not become a victim

Basic identification colours according to ISO recommendation R508

Green……Water in liquid state……Ral 6010

Silver-grey……Steam…….. ..Ral 9006

Brown……..Mineral, vegetable and animal oils:
combustible liquids…… Ral 8001

Yellow- ochre…… .Gases in either gaseous or
liquefied condition (except air) ……..Ral 1004

Violet……..Acids and alkalies……Ral 4001

Light blue……..Air……...Ral 5012

Black…… Other liquids…… ……... Ral 9005

Method of application:

At the user' s choice the basic identification colour should be:

- Painted on the pipe over the whole length
- Painted on the pipe as a band over a length of 150 mm, depending on the diameter of the pipe
- Applied by wrapping around the pipe an adhesive band of the

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basic identification color.

This basic identification colour should be placed at all junctions, at both sides of valves, service appliances, bulkheads, wall penetrations and at any at other places where identification of the fluid is necessary.

Valves may be painted with the identification colour with the following exception. If the pipeline has been provided with the safety colour for fire fighting, the valves should be painted red.

For example: valves in fire – extinguishing steam or water pipelines or in water flooding pipeline should be painted red.

Direction of flow

When it is necessary to know the direction of flow of the fluid, this should be indicated by an arrow situated in the proximity of the basic identification colour and painted white or black in order to contrast clearly with the basic identification colour. If a label, plate or sign, with a codified indication is attached to the pipe, the direction of flow may be shown by the pointed end of this label, plate or sign.

Safety – code indications according to ISO recommendation R508

The application of code indications should be determined by the user. code indications should be placed at all junctions, at both sides of valves, service appliances, bulkheads, well penetrations,etc.

Safety – code indications are:

- The safety colours:
- Red, for firefighting……Ral 3000
- Yellow, with black diagonal stripes, for warning of danger…… Ral 1018
- Auxiliary blue in conjunction with the green basic to denote

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pipes carrying fresh water, either potable or non – potable…… Ral 5010

- Information regarding the nature of fluid for which the following systems may be used:
- Name in full in national language, e, g.: fresh water
- Abbreviation in national language, e, g.: fw
- Chemical symbol, e, g.: H_2O

Method of application:

If a safety colour is applied, this colour should be:

- Painted on the basic identification colour, in the case of a pipe painted over the whole length:
- Painted between two basic identification colour bands, each of a length of about 150 mm, depending on the diameter of the pipe:
- Applide by wrapping around the pipe an adhesive safety colour Band between two basic identification colour bands, each of a length of about 150 mm, depending on the diameter of the pipe.

Further possible code – indications, such as information regarding the fluid should be placed on the basic identification colour or next to the basic identification colour band. This information should be either in white or in black in order to contrast clearly with the colour of the pipe or with the basic identification colour and should be placed directly on the pipe or on a label, plate or sign, fixed to the pipe near the basic identification colour. The label plate or sign should be of the same colour as the safety colour, if this colour is applied.

Ventilation is not only necessary for reasons of safety. The quality of a coating system is greatly affected by the amount and type of any residual solvent in the coating when the resinous binder cures or dries.

Adhesion, water resistance, mechanical and chemical properties can all be adversely affected when solvents are trapped. Very slow evaporation of trapped solvents can also develop internal

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stresses due to shrinkage.

The ventilation must be maintained throughout the application process and for a period after application is completed. Product data sheets mention any special ventilation requirements. Hot ventilation air can cause skin curing of epoxy coatings and although it may be necessary to produce a dry substrate before painting, hot ventilation air should be replaced by cool dry ventilation air as soon as possible after application of any coat is completed. Ventilation air should be directed to the base of the talk or compartment and should also be extracted by exhaust fans of correctly balanced capacity.

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