



Safe Working with Fibreglass



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1. INTRODUCTION

The essential materials used in fibre-reinforced plastics (FRP) processing are glass reinforcement, resin, accelerators, catalysts, mould release agents, fillers, pigments and cleaning agents. These materials can pose significant hazards to people at the workplace and the environment, if the materials and FRP construction is not carried out and managed correctly.

The objective of this document is to:

- a. Make people aware of the hazards these materials pose.
- b. Provide details of the applicable regulations, and the responsibilities of CSBP, the Contractor and employees.
- c. Advise how CSBP manages compliance in minimising any health risk to employees and others at the workplace, and risk to the environment from hazardous materials and chemical products.

This document should be read in conjunction with referenced documents in Section 3.

2. ACKNOWLEDGEMENTS

A significant amount of the information in this document has been based on publications by:

- Worksafe Western Australia, and
- Composites Institute of Australia Inc.

3. REFERENCED PUBLICATIONS

All materials, equipment and work covered by this document shall conform to the requirements of all Statutory Authorities having jurisdiction over the work site.

Should there be a conflict between the works, CSBP documents and Statutory Authority requirements the most stringent requirements shall prevail.

3.1 CSBP DOCUMENTS

CSBP-GM-10-020-04	Contractor's Site Instructions
CSBP-GM-11-030-01	Safety Management System
CSBP-GM-11-031-01	Personal Protective Equipment
CSBP-GM-11-031-05	Respiratory Protection
CSBP-GM-11-031-51	Work Permit System
CSBP-GM-11-031-23	STOP and Job Safety Analysis Risk Assessment
CSBP-GM-11-035-02	Basic Safety Rules
CSBP-GM-11-037-05	Control of Workplace Hazardous Material
CSBP-GM-13-060-13	Waste Management Plan
CSBP-GM-13-060-14	Solid Waste Management
CSBP-GM-13-060-15	Liquid Waste Management
CSBP-SF0733	Request for New or Alternative Chemical Product/Material

3.2 AUSTRALIAN STANDARDS

AS 1715	Selection, Use and Maintenance of Respiratory Protective Devices
AS 1716	Respiratory Protective Devices
AS 1940	The Storage and Handling of Flammable and Combustible Liquids
AS 2161.2	Occupational Protective Gloves – General Requirements
AS 2714	The Storage and Handling of Hazardous Chemical Materials – Class 5.2 Substances (Organic Peroxides)
AS 2865	Safe Working in a Confined Space
AS 3765	Clothing for Protection Against Hazardous Chemicals
AS 3780	The Storage and Handling of Corrosive Substances
AS 3833	The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers
AS 4081	The Storage, Handling and Transport of Liquid and Liquefied Polyfunctional Isocyanates

3.3 OTHER PUBLICATIONS

Department of Commerce Western Australia, Working with Fibreglass

<https://www.commerce.wa.gov.au/publications/working-fibreglass> Worksafe Western Australia, Code of Practice: Styrene.

Occupational Safety and Health Act

Occupational Safety and Health Regulations

Australian Dangerous Goods Code

Environmental Protection (Controlled Waste) Regulations 2001

CSBP Department of Environmental Protection Licence to Operate

4. DEFINITION OF TERMS

ADG CODE	Australian Code for the Transport of Dangerous Goods by Road and Rail referred to as the Australian Dangerous Goods Code
Competent	A person who has acquired through training and experience the knowledge and skills required to carry out the work safely.
DMA	Dimethylaniline
FRP	Fibre Reinforced Plastic
LSE	Low Styrene Emission
MEK	Methyl Ethyl Ketone
MEKP	Methyl Ethyl Ketone Peroxide
SDS	Safety Data Sheet(s)
Must	Mandatory action
PPE	Personal Protective Equipment
Shall	Mandatory action
Should	Preferred / recommended action
Toxic	Injurious to human health when swallowed, inhaled or otherwise absorbed into the body (poisonous)

5. FIBREGLASS PROCESSES

All FRP processes follow the same basic principle. Resin; fibreglass reinforcement and a catalyst are all applied to a mould where polymerisation takes place. During the fabrication of the composite products, the resin changes from liquid or paste to solid.

Styrene Based Resins

In Western Australia, the wet spray-up or hand lay-up processes are most commonly used. These processes involve the application of styrene-based resin to a mould either by spraying or by rollers and brushes. Large amounts of styrene vapour are given off during the application and curing stages. As a result, laminators will be exposed to excessive amounts of styrene unless adequate ventilation is provided. A typical polyester resin contains 40-60% styrene.

Note: Typically, the spray-up process generates 2-3 times as much styrene vapour as the hand lay-up process.

5.1 PROCESS HAZARDS

Hazards during the manufacturing process are as follows:

- a. Health risk to workers arising from inhalation of dusts and absorption of chemicals
- b. Fire or explosion risk from the resins and solvents used and vapours generated
- c. Fire or explosion risk from dust generated during grinding, sanding and finishing stages
- d. Fire risk from spontaneous combustion of waste materials
- e. Explosion risk from mixing different chemicals together without referring and adhering to manufacturer's specific instructions.

6. HAZARDS OF MATERIALS USED IN FIBREGLASSING

The essential materials used in fibre-reinforced plastics processing (FRP) are glass reinforcement, resin, accelerators, catalysts, mould release agents, fillers, pigments and cleaning agents. These materials can cause significant hazards.

Material Safety Data Sheets (MSDS) of all materials to be used shall be made available at the workplace. Reference shall be made to the Supplier's MSDS and the product labels before they are used. Safety precautions specified on the MSDS and the product labels shall be adhered to.

Typical materials used are as follows.

GLASS REINFORCEMENT

Glass reinforcement is available as roving, chopped strand and woven mat.

RESINS AND GEL COATS

- **Epoxy Resins**

Commonly used for chemical resistance and in specialised composite areas e.g. aerospace.

- **Polyester Resins and Vinyl Ester Resins**

The most commonly used resins in Australian industry. Unsaturated polyester and vinyl ester resins evolve styrene monomer vapour during lay-up and during initial curing.

ACCELERATORS AND PROMOTERS

- **Cobalt Solutions**

- **Dimethylaniline (DMA)**

CATALYSTS AND CURING AGENTS

- **Methyl Ethyl Ketone Peroxide and Peroxides**

Unsaturated polyester resins and vinyl ester resins are cured by the action of catalysts, which are normally organic peroxides - the most common being Methyl Ethyl Ketone Peroxide (MEKP).



Incorrect proportion mixing with resin can generate a fireball

- **Polyamine and Polyamide Hardeners**

Polyamine and Polyamide hardeners are used to cure Epoxy resins.

- **Polyurethane Curing Agents**

These are normally polyfunctional isocyanates such as methylene diisocyanate (MDI) and toluene diisocyanate (TDI).

MOULD RELEASE AGENTS

Waxes, silicones, polymeric films and polyvinyl alcohol are used to facilitate removal of the cured composite product from its mould.

FILLERS AND PIGMENTS

Fillers such as calcium carbonate, talc, fumed silica etc., can be added to enhance the properties of the composite. Pigments may be added for colour.

CLEANING AGENTS

Solvents such as acetone and MEK are used in FRP manufacturing for cleaning purposes.

7. RESPONSIBILITIES

7.1 CSBP AND CONTRACTORS

Responsibility and duty of care to all workers, in relation to FRP processing shall be in accordance with the following:

- a. To provide and maintain a safe and healthy working environment
- b. To ensure that all applicable Australian Standards and legislative regulations are adhered to
- c. To provide instruction and training on health and safety issues to all employees
- d. To ensure appropriate and maintained personal protective equipment is used
- e. To ensure that approved procedures for FRP processing are followed
- f. To provide health surveillance to all workers involved with FRP work and if exposure levels could be exceeded.

7.2 EMPLOYEES OF CSBP AND CONTRACTORS

Responsibility of personnel involved in FRP processing shall be as follows:

- a. To comply and conform with instructions given to them regarding their own health and safety and that of others in the vicinity
- b. To comply with all standards, legislative regulations and procedures associated with FRP processing
- c. To wear, as instructed, all personal protective clothing and equipment provided
- d. To participate in pre-employment medical and annual check-ups, and as required blood and urine testing and biological-monitoring program.

8. HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL

Occupational Safety and Health Regulation 3.1 requires that the person responsible for the workplace must identify all hazards that a person at the workplace is likely to be exposed to, assess the risk and identify the means by which the risk may be reduced.

CSBP Guide Manual [Control of Workplace Hazardous Material](#) (CSBP-GM-11-037-05) outlines the process to be followed to minimise health risk to employees and others or the environment from hazardous materials and chemical products either manufactured or used at CSBP facilities. The requirements of this document shall be adhered to before any FRP work is carried out at any CSBP site.

8.1 METHOD STATEMENT

A Method Statement shall be prepared by the person responsible for carrying out the FRP work at CSBP and shall submit it to the CSBP Responsible Officer for approval. No activities shall commence without this approval.

The Method Statement shall include the following:

- a. Risk assessment and methodology for provision and maintenance of a safe working environment
- b. Personnel protective measures, ie training programs, personal protective clothing and equipment etc.,
- c. Material specifications and safety data sheets for all materials to be used.

Note: No chemical product shall be used on site until the CSBP Safety and Environmental Departments have granted approval.

- d. Equipment to be used
- e. Environmental monitoring and protective measures to be used
- f. CSBP manufacturing equipment and stored product protective measures
- g. Engineering controls, ie containment of dust, etc.,
- h. Methodology for surface treatment/repair to existing FRP product
- i. Application techniques and procedures
- j. Methodology and procedures for the safe disposal of waste and surplus materials
- k. Quality control measures and inspection “hold points” to be employed on the work.

8.2 MONITORING AND HEALTH SURVEILLANCE

- **Monitoring**

Occupational Safety and Health Regulation 5.22 states that (in relation to a hazardous substance) if the risk assessment indicates that monitoring is required employers, main contractors or the self-employed must ensure that:

- a. Appropriate monitoring is carried out
- b. A record of the results is kept

- c. Monitoring results are made available to each person who is likely to be exposed to the hazardous substance.

- **Health Surveillance**

CSBP and the Contractor shall provide health surveillance for their personnel who have been identified as being exposed to a hazardous substance in the workplace if there is a risk to their health. Health surveillance includes blood and urine testing in addition to general health.

Health surveillance is required for all personnel working with polyurethane resins and associated additives (isocyanate exposure) as follows:

- a. Maintain an occupational and medical history of the worker
- b. Conduct pre-employment medical and annual check-ups which include
 1. Completion of a standard respiratory questionnaire
 2. Physical examination of respiratory system and skin
 3. Standard respiratory function tests.

Exposure to solvents and substances, which are readily absorbed through the skin will not be detected by air monitoring or take into account the rate of respiration of the worker or the individual response to the inhaled substance. Repeated or prolonged skin exposure to solvents may result in chronic irritant dermatitis.

9. SAFE WORKING PRACTICES

9.1 STORAGE AND HANDLING OF HAZARDOUS MATERIALS

All hazardous materials shall be stored and handled in accordance with product labelling and the manufacturer's MSDS.

In general keep all containers tightly closed, away from sources of ignition and store in a cool, dry dark and well-ventilated area.



Keep away from direct sunlight and heat and segregate incompatible materials.

Emptied containers retain vapour and product residue and may therefore present explosive vapour and irritant / toxic material hazards. Observe all safeguards on labels and in the MSDS until container is cleaned, reconditioned or destroyed.



Do not cut or weld on or near emptied containers.

Disposal shall be in accordance with regulations. Refer to Section 9.7.

9.2 VENTILATION AND PERSONAL PROTECTION

Carefully planned and designed work place ventilation system, using fans, ducting, hoods and booths, and scrubbers and filters if contaminants are to be removed before air is discharged, is essential to ensure vapours are removed or reduced to levels that do not pose a hazard to workers.

Booth Ventilation is the most desirable form of effective vapour control as it ensures the hazardous activity is restricted to a designated area and it prevents the rest of the area from being contaminated. Fans are used to blow vapours away from the worker's breathing zone and towards an extraction system.

Personnel working inside a mould, tank or enclosed structure can result in high exposure to styrene or other harmful vapours. Essential requirement in ventilation of confined spaces is that fresh air must be supplied to move from behind or above the operator. Extraction should move the contaminated air away from the operator. There should be airflow from inlet to outlet and the fresh air and extraction systems must be placed in such a position to create this flow. To check that the airflow pattern through the confined space is correct, air current tubes should be used to enable the airflow to be seen. Australian Standard 2865 and Company Guide Manual [Confined Spaces \(CSBP-GM-11-031-52\)](#), for ensuring the health and safety of personnel required to enter or work in confined spaces shall be followed at all times.

When mixing and handling resins, curing agents and solvents, the safety precautions specified in the Material Safety Data Sheet for each component shall be adhered to. Suitable protective clothing, gloves, goggles, respiratory devices and barrier creams shall be used where required, in accordance with Australian Standards and Company Guide Manual [Personal Protective Equipment \(CSBP-GM-11-031-01\)](#).



It is extremely important to avoid inhaling vapours and to avoid skin and eye contact with chemicals. Ensure that appropriate Personal Protective equipment is used.

Respiratory devices shall be worn where required, in accordance with Australian Standards and Company Guide Manual [Respiratory Protection \(CSBP-GM-11-031-05\)](#).

In conjunction with the work practices specified in Section 9.1 and 9.2 the following shall be followed:

- a. Eye and skin protection must be worn when decanting and using resin, promoters, catalyst and cleaning solvents
- b. Decant and mix under a fume hood or a well-ventilated work area
- c. Clean up all spills immediately
- d. Use safety cans for solvents
- e. Ensure there is adequate forced ventilation of work area. Vapours from solvents are heavier than air; extraction should draw air from the floor level

- f. Avoid inhalation of vapours when cleaning tools. Use as little solvent as possible, work outside or in a fume hood and complete the task as quickly as possible. Containers filled with cleaning agent must be covered
- g. To avoid inhalation of dust when grinding, use Company approved dust masks
- h. Frequent hand washing is essential especially prior to meal breaks. Use hot running water, soap and a nailbrush.
- i. Work clothing should be changed daily.



Smoking, eating, drinking and storing food in fibre-reinforced plastic work areas is forbidden.

9.3 FIRST AID

First aid treatment following contact with FRP materials shall be in accordance with the manufacturers supplied SDS. As a guide typical treatment is as follows:

HAZARDOUS SUBSTANCE	FIRST AID TREATMENT	
Glass fibres	Eye	<ul style="list-style-type: none"> • Irrigate carefully with plenty of water. Refer to Section 10.4.
	Skin	<ul style="list-style-type: none"> • Wash skin with plenty of water. Refer to Section 10.4.
Resins Accelerators Catalysts Cleaning Agents	Eye	<ul style="list-style-type: none"> • Immediately and carefully irrigate with plenty of water. Ensure irrigation under eyelids by occasionally lifting them. Do NOT try to remove contact lenses unless trained. Refer to Section 10.4. • Seek immediate medical assistance.
	Skin	<ul style="list-style-type: none"> • Immediately wash affected area with soap and water. Remove contaminated clothing and footwear. Ensure contaminated clothing is thoroughly washed before using again. Refer to Section 10.4. • Seek immediate medical assistance.
	Inhaled	<ul style="list-style-type: none"> • Remove from exposure into fresh air. • If breathing abnormal give respiratory aid. • Keep warm, comfortable and at rest. • Seek immediate medical assistance.
	Ingested	<ul style="list-style-type: none"> • Wash mouth out with water and give water to drink as slowly as can be tolerated (3-5 glasses), provided the victim is completely conscious. • Do NOT induce vomiting. • Lean victim forward to reduce the risk of aspiration. • Keep warm, comfortable and at rest. • Seek urgent medical assistance.

9.4 SAFETY SHOWERS

Safety showers and eye washing facilities shall be provided in close proximity to the work place where chemicals are handled and used. If contamination occurs, irrigate the eyes and/or wash the contaminated area for at least 20 minutes under the shower. Remove contaminated clothing in the shower and wash underlying skin.

In the case of peroxide contact, the eye should be flushed continuously until medical treatment is available.

Note: Where it is not practicable to provide an eye wash facility, portable eye wash bottles shall be provided. Care must be taken to ensure they are protected from contamination such as dust and that the solution is changed at the interval recommended by the supplier.

9.5 FIRE PRECAUTIONS

The following fire precautions must be observed at all times.

- a. Styrene, acetone and MEK are volatile, flammable solvents. Strict fire precautions must be observed
- b. Dust produced by grinding is highly flammable – meticulous housekeeping is essential. Surfaces shall be vacuum cleaned, not swept
- c. Promoters and catalysts will react violently and spontaneously. The promoter must be stored, decanted or added at a point remote from the catalyst. Add promoter to resin and mix, then add catalyst
- d. Catalyst (MEKP) may cause spontaneous combustion with organic material such as rag. Cleaning rag must be disposed of under water in a ‘wet bin’
- e. In all work areas, identify the nearest fire extinguisher prior to commencing work.



Strictly no smoking allowed in the work area or chemical storage areas.

9.6 HOUSEKEEPING

A clean and tidy work place shall be maintained at all times. Particular attention shall be given to the following:

- a. Ensure work place area floors are of sound construction suited to the process, kept free of all obstructions and are cleaned regularly
- b. Provide two (2) 'wet' and one (1) 'dry' waste bin for each 40 square metres of floor space
- c. No more than a day's or a shift's supply of materials should be kept at the work area
- d. Put all waste (off cuts, process waste, excess packaging material etc) into the appropriate and labelled bins
- e. Immediately clean up spilled chemicals and put the contaminated cleaning rags into the appropriate 'wet' bin
- f. Do not use previously contaminated rags and do not use the same cleaning rag on more than one type of chemical
- g. The rags used to clean spillages of promoter and accelerators must be placed in a 'wet' bin quite separate from the rags used to clean up spillages of catalysts.



AT no TIME must the promoter contaminated rags be allowed to come into contact with the catalyst contaminated rags.

- h. Empty all bins at the end of each shift or as soon as full, whichever comes first. The two types of bins shall remain separate throughout the disposal stage, be emptied into separate transport bins and be disposed of appropriately, by licensed carriers.
- i. Thoroughly clean all working areas at the end of each shift
- j. Ensure there is clear access to exits, fire extinguishers and fire-fighting equipment at all times
- k. Ensure there is good air space around stored materials and components
- l. Inspect exhaust ducting, rafters, and projections etc., weekly and clean way dust deposits.
- m. Inspect concealed spaces and keep clear of wastes
- n. Maintain lights in good condition
- o. Hand-mix resins in a well-ventilated area and only mix the necessary amount.

Note: Because of the potential hazard, only competent personnel shall carry out resin mixing.

9.7 WASTE DISPOSAL

All waste generated on site must be tracked to its final destination. CSBP is required to report the waste volumes and types to PACIA, and in accordance with NPI regulatory requirements.

All waste must be disposed in accordance with CSBP Department of Environmental Protection “Licence to Operate”, Controlled Waste Regulations and Department of Mineral and Petroleum Resources Regulations.

Prior to disposal on site of non-standard wastes, a [Waste Disposal and Storage Form](#) (CSBP-SF2250) must be completed, submitted and disposal approval granted by either:

- a. Environment Department representative, or
- b. Site Waste Management contractor.

Approval for disposal shall be in accordance with the site Waste Management plan, Solid and Liquid Waste Management Procedures. Refer to the following documents for further information:

- [CSBP Waste Management Plan](#) CSBP-GM-ENV-060-01
- [Solid Waste Management](#) CSBP-GM-ENV-060-02
- [Liquid Waste Management](#) CSBP-GM-ENV-060-03

Contaminated water from the “wet” bins shall not be discharged to sewers, drains, waterways or poured onto the ground to evaporate or soak away. Contaminated water or liquids shall be held in labelled containers that are sealed and held in a bunded area on site until approval to dispose is granted.

Excess chemicals left over at the end of the job should be removed from site. CSBP encourages all work on site that reduces wastes. Where possible recover or re-use all wastes, for example:

1. Acetone waste can be reduced by distillation to recover the acetone for re-use
2. Resin drums and containers may be suitable for recycling if they are sealed immediately after becoming empty.