

## **Dental Technology Laboratory Manual**



# **GUIDELINES FOR OCCUPATIONAL SAFETY AND HEALTH IN THE DENTAL TECHNOLOGY LABORATORY**

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## **PURPOSE OF THE DOCUMENT**

The purpose of this dental laboratory manual is to assist dental technology students, dental technologist and faculties of dental technology department to ensure safety in the dental technology laboratory

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# 1. ICONS USED IN THE MANUEL

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Throughout this document, the pictograms below are used to underline points or important notions

	Important information
	Good to know - Tricks
	<b>Risk</b> in front of a parameter setting or of a specific action
	Action to be avoided
	Mandatory action
	Sensitive or difficult procedure. To take into account necessarily
	Actions reserved for the Authorities
	Actions reserved for the Dental Laboratory working Group members

## **2. BACKGROUND**

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### **2.1 BRIEF DESCRIPTION**

The dental technology laboratory is a place where dental prostheses and appliances are constructed. Various types of materials and equipment used in the laboratory processes may be hazardous to the safety and well-being of users

### **2.2 DESCRIPTION OF FILED**

These categories of people therefore have multiple occupational exposures, which may have adverse effects on their health. The potential occupational risk factors include chemical, physical, psychological, ergonomic, and other job related factors

### **2.3 RATIONALE**

The rationale was to ensure that all health activities in dental technology laboratories shall carried out in a safe and healthy environment

## **3. POLICY STATEMENT ON OCCUPATIONAL SAFETY AND HEALTH IN THE DENTAL LABORATORY**

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### **3.1 SAFETY GUIDELINES**



All the members of the working group shall:

- Follow rules and guidelines and adhere a good work culture
- Continuing education to acquire knowledge and skill and need training
- Be equipped with knowledge and skills on the use of equipment, contents of materials and their usage, and safety measures to be observed in dental laboratories;
- Be equipped with knowledge on basic facilities and equipment commonly used in dental laboratories
- Undertake preventive maintenance of equipment regularly as recommended by the manufacturers
- Be provided with appropriate personal protective equipment (PPE) to be used at all times;

- Report, investigate and follow through every accident or incident that could cause or had caused injury or illness, and

## **4. RESPONSIBILITIES OF AUTHORITIES AND WORKING GROUP MEMBERS**

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### **4.1 RESPONSIBILITIES OF THE AUTHORITIES**

It shall be the duty of authorities to ensure, as far as is practicable, the safety, health and welfare at work of all his employees pertaining to

- The provision and maintenance of laboratory and systems of work
- The making of arrangements to ensure safety and absence of risks to health in connection with the use or operation, handling, storage of equipment, materials and substances, and

The provision of such information, instruction, training and supervision as is necessary



### **4.2 RESPONSIBILITIES OF DENTAL TECHNOLOGY LABORATORY WORKING GROUP MEMBERS**

- Take reasonable care for the safety and health of himself and of other persons who may be affected by his acts
- Co-operate with his authorities or any other person in the discharge of any duty or requirement imposed on the employer
- Wear or use at all times any personal protective equipment or clothing provided by the employer, and
- Comply with any instructions or measures on occupational safety and health instituted by his authorities

## **5. DENTAL LABORATORY SETUP**

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### **5.1 WORK STATION**

Here it is equipped with micro motor, suction, gas burner and air pressure. All the major works are done from this workstation. Each lab is equipped with seating chair

## **5.2 PLASTER LAB AND WORK AREA**

Here all the gypsum works and acrylisation works designed to do

## **5.3 CASTING ROOM**

All the casting related works designed to do from this area, which include burn out, casting, sandblasting. Finishing and polishing work

## **5.4 DIGITAL DENTAL LABORATORY**

All the digital dental works designed to do from this area

## **5.5 VENTILATION**

There shall be adequate ventilation in all the working rooms. Mechanical ventilation is more reliable as a means to ensure good ventilation. The venting of contaminated air at its source of generation will greatly limit its spread throughout the workplace

## **5.6 DUST CONTROL**

Airborne particles of less than 5 microns are hazardous to health. These particles may contain silica, which listed as a hazardous substance. The use of dust extraction units along with personal facemasks to filter dust is highly recommended and must be dampened to keep down dust exposures.

## **5.7 LIGHTING**

Good lighting is mandatory for proper working. To ensure proper color matching and to ensure good safety, a good lighting is necessary area. Other measures to improve effectiveness of lighting system include:

- replacing light bulbs as they age and lose light-emitting capacity and maintaining bulbs and tubes in a clean and efficient state
- keeping windows clean and using blinds or tinted windows to control glare

# **6. HAZARDS IDENTIFICATION AND RISK CONTROL**

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Hazards in the dental laboratory need to identify and the risks assessed and controlled. Hazards may be physical, biological, chemical, ergonomic or psychosocial

## 6.1 PHYSICAL HAZARDS

Physical hazards include injuries caused by use of equipment, vibration, dust, noise, fire, sharp objects, breakable and inflammable materials and electrocution

The recommended risk controls are as follows:

### 6.1(a) Equipment

All equipment should have Annual planned Maintenance (APM) to prevent faulty and unsafe equipment.

#### 1. Vibration

Continuous use with vibrating tools after several years can lead to numbness and fumbling, reduce blood circulation and reduce sensitivity of pain perception. All persons were advice to avoid continuous use of laboratory hand pieces for long hours.

#### 2. Noise

Certain types of dental equipment produce high sound and can be harmful to hearing. Equipment that generate noise, such as dental polishing lathes and grinding machines, model trimmers, air compressors, dust extractors, and micro motors may lead to health effects such as ringing in the ears, dizziness and sense of loss of balance, temporary hearing loss after work and noise-induced stress.

The use of appropriate ear protector such as ear plugs/ear muffs are recommend. It is also recommend avoiding continuous use of identified equipment.

#### 3. Fire

- Materials used in dental laboratories, such as butane gas and methyl acrylate, can be highly inflammable. Recommended risks controls are as follows.
- Dental laboratories must be equipped with fire extinguishers or other equipment as recommended by the Fire Department
- Worktops of dental laboratory workstations must be made of fireproof materials.
- Gas regulators and tubing must checked regularly to ensure optimal condition at all times
- Gas mains must switched off after office hours.
- Gas connection shall fixed with sensors and alarms
- Inflammable items must kept in safe places after use
- Each electrical appliance must use separate power points and be switched off after use

- Polymerisation work shall carried out during office hours; a timer must be used if the polymerisation process is continued after office hours
- Non-flammable burners (induction heaters) should used
- The use of camping gas and spirit lamp is not recommended

#### 4. Burns

- Equipment such as water boilers and polymerisation units can emit heat that can cause burns. Recommended risk controls are as follows:
- The safety valve of water boilers must regularly checked as recommended by the manufacturer.
- Exercise caution when handling items that may cause burns or scalds such as during de-waxing and shall be used with heat resistant gloves
- There should be clear safety signage such as ‘CAUTION! ‘HOT WATER’ or ‘DANGER’.

#### 5. Sharp Objects

Equipment such as sharp hand instruments, burs and stainless steel wires can cause injuries.

- Precaution must exercise when handling breakable and sharp objects
- Sharp objects should be disposed in sharps bins. Disposal of sharp objects must be handled properly so as not to endanger others.

#### 6. Electrocution

Almost all equipment in the dental laboratory uses electricity, thus electrocution is a possible hazard. Electrical equipment that used in the workplace must undergo regular visual inspections. Keeping a record of visual inspections shall recommended.

#### Check

- Proper maintenance and period check-up of electric wires, switches, knobs and sockets will ensure good safety
- Follow and keep the manufacturers’ instructions on the use of equipment and materials
- Store electrical equipment safely away from wet or moist areas when not in use.
- Don’t touch electrical equipment with wet hands or wet clothes to clean
- Shoes with rubber sole must worn when handling or repairing electrical equipment.

## 6.2 CHEMICAL HAZARDS

Chemical hazards are of major concern in the dental laboratory, knowledge of chemicals that present a hazard in their handling and use is essential.

### A. Acids

Mineral acid, gas and vapours may release during casting and polymerization. - Personnel handling acids must wear protective face shields and gloves. - Acid residues must be disposed through the septic tank

### B. Methyl/Ethyl Methacrylate/Monomer

- Methyl/Ethyl methacrylate/Monomer vapour may release during mixing and packing process.
- Appropriate protective facemasks and gloves must worn when handling the material.
- Fumes extractor should use during the mixing and packing process.
- Alternative processes using thermoforming and light cure units are encouraged for the preparation of special trays and denture bases.

### C. Chemical Dust

Plaster of Paris, silica, beryllium, acrylic and pumice are the common dusts. The following preventive steps should take.

- Facemasks should worn.
- Dust extractors must use during trimming and polishing work

## 6.3 BIOLOGICAL HAZARDS

Dental technologists should adhere strictly to standard precaution on infection control in dental laboratories. Dental laboratories must follow either one of the following procedures like using chemicals or UV sterilization

## 6.4 ERGONOMIC HAZARDS

Dental technologists can prevent ergonomic hazards by properly designing the job or workstation and selecting the appropriate tools or equipment for that job. Based on information from the job analysis, an employer can establish procedures to correct or control risk factors.

These include attention to:

- working posture and movement
- workplace layout (workflow) , equipment and furniture

- work organisation - tools and equipment
- skills and experience Working Posture and Movement Consider
- using non-slip footwear and flooring materials which contribute to standing comfort
- choosing a variety of tasks which offer postural changes
- adjusting the height of the chair or stool to give maximum arm support, and
- positioning to see the task with your head upright and facing downward

## **7. RISK MANAGEMENT PROCEDURE**

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The legal and moral obligation of employers to control hazards within the dental laboratory makes it essential to either eliminate the risks or control the risks.

- The first step is to identify the hazards.
- The next step is to assess the risk.
- The third step is to suggest control measures for the risk by using the hierarchy of control.

## **8. TRAINING AND EDUCATION**

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All persons working in dental technology laboratory are required to undertake training and education in injury prevention and steps to work safely. The training should include:

- Emergency procedures; eg. Basic Life Support, First aids
- Cross infection control procedures;
- Working with hazardous substances; and
- Best practice.

## 9. PREFERRED CONTROL TO PREVENT HAZARDS IN DENTAL LABORATORY

	Equipment	Health Risk	Associated risks	Preferred
1.	Acrylic Polymerization/ Curing Unit	No	<ul style="list-style-type: none"> <li>• Danger of combustion/ electric shock</li> <li>• Scalding from hot water</li> </ul>	<ul style="list-style-type: none"> <li>• Not to be switched on with little or no water/ earthed conductors</li> <li>• Wear apron, goggles and gloves</li> </ul>
2.	Dewaxing Unit	No		
3.	Dewaxing Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Not to be switched on with little or no water/ earthed conductors</li> <li>• Wear apron, goggles and gloves</li> </ul>	<ul style="list-style-type: none"> <li>• Not to be switched on with little or no water/ earthed conductors</li> <li>• Wear apron, goggles and gloves</li> </ul>
4.	Dewaxing Unit	Numbness Fumbling	<ul style="list-style-type: none"> <li>• Not to be switched on with little or no water/ earthed conductors</li> <li>• Wear apron, goggles and gloves</li> </ul>	<ul style="list-style-type: none"> <li>• Make sure to turn to right speed</li> <li>• Respiratory mask and goggles/saline solution to rinse the eyes</li> <li>• Wear ear plugs/ muffs</li> </ul>
5.	Bunsen Burner	May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Burns from accidentally having arm/s over the flame</li> <li>• Touching part of the Bunsen burner while it is still hot</li> </ul>	<ul style="list-style-type: none"> <li>• Switch off Bunsen burners when not in used</li> </ul>
6.	Bunsen Burner	May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Generates dust</li> </ul>	<ul style="list-style-type: none"> <li>• Respiratory mask</li> <li>• Clean up all spills with a damp cloth</li> </ul>
7.	Light Curing Unit		<ul style="list-style-type: none"> <li>• Danger of combustion</li> <li>• Pinch hazard from unit door</li> </ul>	<ul style="list-style-type: none"> <li>• Do not touch halogen lights</li> <li>• Carry device with door closed</li> <li>• Must not cover ventilation slots and</li> </ul>

			<ul style="list-style-type: none"> <li>• Danger of electric shock</li> <li>• Eye damage by looking at the lamp while in operation</li> </ul>	avoid objects/ liquids getting into ventilation slots (and earthed conductors) • Tinted windows
8.	Hydraulic Bench Press		<ul style="list-style-type: none"> <li>• Monomer from mixed acrylic in dough stage escaping</li> </ul>	<ul style="list-style-type: none"> <li>• Should be done in the fume cupboard</li> </ul>
9.	Vibrator		<ul style="list-style-type: none"> <li>• Danger of combustion/ electric shock</li> </ul>	<ul style="list-style-type: none"> <li>• Not to be left switched on for long hours</li> </ul>
10	High Speed Grinder with Suction Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Danger of combustion/ electric shock</li> <li>• Shattering of discs at high speed if not handled properly</li> <li>• Generates dust particles</li> <li>• Noise from trimming/ cutting</li> <li>• Generates heat that might burn the fingers</li> </ul>	<ul style="list-style-type: none"> <li>• Not to be left switched on for long hours</li> <li>• Wear goggles</li> <li>• Wear respiratory mask</li> <li>• Wear ear plugs/ muffs</li> <li>• Not to hold onto work for long period of time under disc/ standby a bowl of water</li> </ul>
11	Burnout	Furnace May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Generates heat</li> <li>• Toxic fumes from wax</li> </ul>	<ul style="list-style-type: none"> <li>• Wear leather gloves/ use metal tongs/ shaded goggles</li> <li>• Ventilate area well and/ use of fume cupboards</li> </ul>
12	Electric Waxing Unit	No	<ul style="list-style-type: none"> <li>• Scalding if not positioned properly</li> </ul>	<ul style="list-style-type: none"> <li>• Place waxing handle into holder when not in use at all times</li> </ul>
13	Electric Dipping Pot	No	<ul style="list-style-type: none"> <li>• Danger of combustion/ electric shock</li> <li>• Scalding from hot wax</li> </ul>	<ul style="list-style-type: none"> <li>• Not to be switched on with little or no wax in the metal pot</li> <li>• Leave pot at a safe distance at working area</li> </ul>

14.	Casting Machine	No	<ul style="list-style-type: none"> <li>• Splattering of molten metal</li> </ul>	<ul style="list-style-type: none"> <li>• Weigh mould proper or choose correct size ring to balance taring device</li> <li>• Wear gloves, aprons, shaded goggles</li> </ul>
15.	Pressure Pot	No	<ul style="list-style-type: none"> <li>• Danger of explosion</li> <li>• Malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Not to fill pot with excessive pressure</li> <li>• Check seals, inlets and outlets periodically</li> </ul>
16.	Model Trimmer (wet)	No	<ul style="list-style-type: none"> <li>• Generates dust and heat if water supply not turn on</li> </ul>	<ul style="list-style-type: none"> <li>• Turn on water supply</li> </ul>
17.	Ceramic Furnace	No	<ul style="list-style-type: none"> <li>• Burns from ceramic stand</li> </ul>	<ul style="list-style-type: none"> <li>• Use tongs and ceramic tiles</li> </ul>
18.	Thermoforming unit	No	Burns	Precaution
19.	Milling unit	May aggravate existing lung diseases	Generates dust from milling	Wear mask
20.	Model Electric Saw	Numbness due the radiation wave EMS	<ul style="list-style-type: none"> <li>• Cuts on hands/fingers</li> </ul>	<ul style="list-style-type: none"> <li>• Make sure to stabilize work before cutting</li> </ul>
21.	Agar Dispensing Unit	No	<ul style="list-style-type: none"> <li>• Burns</li> </ul>	<ul style="list-style-type: none"> <li>• Precaution</li> </ul>
22.	Steam Cleaner	No	<ul style="list-style-type: none"> <li>• Scalding from the hot steam</li> </ul>	<ul style="list-style-type: none"> <li>• Right positioning of nozzle upon usage</li> </ul>
23.	Electrolytic Polishing Unit		<ul style="list-style-type: none"> <li>• Splashes from acid</li> </ul>	<ul style="list-style-type: none"> <li>• Wear gloves, goggles and protective aprons</li> </ul>
24.	Fume Cupboard	No	<ul style="list-style-type: none"> <li>• Poor suction</li> </ul>	<ul style="list-style-type: none"> <li>• Check fume cupboard regularly</li> </ul>
25.	Sandblasting Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Generates dust</li> </ul>	<ul style="list-style-type: none"> <li>• Wear mask and goggles</li> </ul>

26	Lathe Polishing Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> <li>• Generates dust</li> <li>• Creates splatter of pumice</li> </ul>	<ul style="list-style-type: none"> <li>• Wear mask and goggles</li> <li>• Wear aprons</li> </ul>
27	Pindex Machine laser	No	<ul style="list-style-type: none"> <li>• Eye injury</li> <li>• Finger injury</li> </ul>	<ul style="list-style-type: none"> <li>• Wear goggles</li> <li>• Precaution</li> </ul>
28	Hardening electric oven	No	Burns	Precaution
29	Water boiler	No	<ul style="list-style-type: none"> <li>• Scalding from hot water</li> <li>• Danger of combustion</li> </ul>	<ul style="list-style-type: none"> <li>• Handle hot water with care using oven mittens</li> <li>• Not to be left switched on with little no water for long period of time</li> </ul>
30	Hydro flask	No	<ul style="list-style-type: none"> <li>• Scalding from hot water</li> </ul>	<ul style="list-style-type: none"> <li>• Handle hot water with care</li> </ul>
31	Laser	No	<ul style="list-style-type: none"> <li>• Eye injury</li> </ul>	<ul style="list-style-type: none"> <li>• Eye protection based on specific parameters of laser in use</li> </ul>
32	Ultrasonic cleaner	Numbness due to vibration	<ul style="list-style-type: none"> <li>• May cause allergic reaction</li> </ul>	<ul style="list-style-type: none"> <li>• Use gloves</li> <li>• Don't dip fingers</li> </ul>

## 10. DENTAL LABORATORY CHEMICAL HAZARDS ,RISK AND CONTROL

	Material	Hazardous substances/ element	Health Risk	Associated Risks with Substance	Preferred Controls
1	Acrylics	Methyl/Ethyl Methacrylate/Monomers	<ul style="list-style-type: none"> <li>• Irritating to eyes, skin and respiratory system</li> <li>• Numbness</li> <li>• Long term sensitising may cause: <ul style="list-style-type: none"> <li>↳ Headaches</li> <li>↳ Nausea</li> </ul> </li> <li>• Allergenic contact dermatitis</li> <li>• Adverse effects on the nervous system</li> </ul>	<ul style="list-style-type: none"> <li>• Highly flammable</li> <li>• Whitening fingers</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure fire safety procedures</li> <li>• Wear eye protection</li> <li>• Wear Polyvinyl Alcohol gloves / respiratory mask</li> <li>• Ensure good ventilation</li> </ul>
		Polymer	Inhalation cause respiratory symptoms	If product is spilled on the floor	• Clean up all spills with care
2	Heat shields, Crucibles	Asbestos	• Inhalation of these fibres may cause fibrosis / lung cancer.	• Harmful if the integrity of the product is damaged – shards of fibres.	• Monitor & review integrity of shields regularly on direct inspection. If integrity compromised –

					<p>arrange for appropriate removal.</p> <ul style="list-style-type: none"> <li>• Consider changing to asbestos free heat protection</li> </ul>
3	Gypsum products	Calcium sulphate	<ul style="list-style-type: none"> <li>• May aggravate existing lung diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Generates dust</li> </ul>	<ul style="list-style-type: none"> <li>• Wear Respiratory mask</li> <li>• Clean up all spills with a damp cloth</li> </ul>
4	Electrolytic Polishing Solution	Sulphuric acid Ethylene glycol Calcium hypochlorite	Respiratory Irritation	<ul style="list-style-type: none"> <li>• Corrosive agent</li> <li>• May cause burns if direct contact to skin</li> </ul>	<ul style="list-style-type: none"> <li>• Handle with care</li> <li>• Consider Polyvinyl glove</li> </ul>
5	Metal alloys	Cobalt Chromium Molybdenum Nickel Beryllium	Inhalation of fumes may irritate / aggravate lungs causing chronic lung disease. • Chronic Beryllium Disease	<ul style="list-style-type: none"> <li>• Generates dust</li> <li>• Inhalation of dust may aggravate existing lung diseases</li> <li>• Creates fumes when heated</li> </ul>	<ul style="list-style-type: none"> <li>• Respiratory mask</li> <li>• Clean up all spills with a damp cloth.</li> </ul>
6	Grinding & Polishing stones / wheels	Aluminium oxide Silicon carbide Zinc Oxide	<ul style="list-style-type: none"> <li>• May aggravate existing lung diseases</li> <li>• Inhalation of fumes may</li> </ul>	<ul style="list-style-type: none"> <li>• Generates dust</li> <li>• Creates fumes when heated</li> </ul>	<ul style="list-style-type: none"> <li>• Respiratory mask</li> <li>• Clean up all spills with a damp cloth.</li> </ul>

			irritate / aggravate lungs		
7	Casting Investment	Cristobalite Quartz	<ul style="list-style-type: none"> <li>• May aggravate existing lung disorders</li> <li>• Long-term exposure may cause lung disease</li> </ul>	<ul style="list-style-type: none"> <li>• May create silicogenic dust</li> </ul>	<ul style="list-style-type: none"> <li>• Respiratory mask</li> <li>• Clean up all spills with a damp cloth</li> </ul>
8	Gasses	Propane Butane Acetylene	If left on within closed environment can cause asphyxia.	Highly flammable	<ul style="list-style-type: none"> <li>• Fire safety procedures</li> <li>• Always ensure cylinders are turned off after use</li> </ul>
9	Dental Wax	Paraffin wax Petroleum wax	<ul style="list-style-type: none"> <li>• Burning of creates fumes that may irritate the nose &amp; throat</li> </ul>	<ul style="list-style-type: none"> <li>• Direct skin contact with molten wax may cause thermal burns</li> </ul>	<ul style="list-style-type: none"> <li>• Good ventilation system</li> <li>• Avoid direct handling when heated</li> </ul>
10	Acid	Hydrofluoric Acid Hydrochloric Acid	<ul style="list-style-type: none"> <li>• Pulmonary oedema</li> </ul>	<ul style="list-style-type: none"> <li>• Corrosive and destroy tissue</li> </ul>	<ul style="list-style-type: none"> <li>• Protective eye wear</li> <li>• Respiratory mask</li> <li>• Handle with care</li> <li>• Consider Polyvinyl gloves</li> <li>• Adequate ventilation</li> </ul>

11	Disinfectants	Quaternary ammonium compounds	Irritating to the eyes Irritating to the skin		<ul style="list-style-type: none"> <li>• Wear eye protection / Polyvinyl gloves</li> </ul>
		Glutaraldehyde	<p>Known sensitising agent.</p> <p>Toxic substance</p> <ul style="list-style-type: none"> <li>• Irritating to eye,</li> <li>• Irritating to the respiratory system</li> <li>• Irritating to skin</li> </ul> <p>Long term exposure</p> <ul style="list-style-type: none"> <li>• Headaches</li> <li>• Nausea</li> <li>• Asthma</li> </ul> <p>Allergic contact dermatitis</p>		<p>Avoid uncontrolled exposure times</p> <ul style="list-style-type: none"> <li>• Wear Protective eye</li> <li>• Polyvinyl gloves</li> <li>• Respiratory mask</li> </ul> <p>Identify sensitising symptoms early &amp; isolate person from environment.</p> <p>Consider changing solution / product.</p>
7	Soft reline primer	Toluene	Harmful to eyes Harmful to the respiratory system	<ul style="list-style-type: none"> <li>• Highly flammable</li> </ul>	<ul style="list-style-type: none"> <li>• Fire safety procedures</li> <li>Wear eye protection</li> <li>Respiratory mask</li> </ul>

-----THE END-----