



Guidelines for Occupational Safety and Health in the Dental Laboratory

Second Edition



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Oral Health Division
Ministry of Health Malaysia
December 2011

Published by

Oral Health Division
Ministry of Health Malaysia
Level 5, Block E10, Complex E, Precinct 1
Federal Government Administrative Centre
62590 Putrajaya
Malaysia

December 2011

Tel: + 603-88834215
Fax: +603-88886133
Website: <http://ohd.moh.gov.my>
Email: ohd@moh.gov.my

Citation:

Oral Health Division. Ministry of Health Malaysia. Second Edition,
December 2011



FOREWORD BY THE DIRECTOR-GENERAL OF HEALTH, MALAYSIA

Dental technologists, like other healthcare professionals, are exposed to health risks and hazards at their workplace. There is a need to ensure safety and health in dental laboratories. Hence, equipment and materials need to comply with good dental laboratory design as well as prescribed standards, rules and regulations. Such compliance goes a long way towards ensuring that dental appliances and prostheses are fabricated in a safe manner and will not pose as potential hazards to patients and personnel.

This document delineates the standards expected of dental laboratories and explains ways and means to address the risks and hazards that exist therein. It is thus a relevant reference not only for dental technologists but also for policy makers and other stakeholders with interests in both occupational and patient safety and health.

I take this opportunity to thank all dental officers and dental technologists involved in the preparation of this document.

Dato' Sri Dr Hasan bin Abdul Rahman
Director-General of Health, Malaysia

Acknowledgement

The members of the Oral Health Division, Ministry of Health Malaysia record their gratitude and appreciation to the following for their contribution:

- Members of the working group at the Oral Health Division, Ministry of Health Malaysia
- Dr Chew Yoke Yuen for proof-reading this document
- All other stakeholders who were involved directly or indirectly in the preparation of this document.

Working Group Members

Oral Health Division, Ministry of Health Malaysia

Advisor: Dato' Dr Norain binti Abu Talib

Members:

1. Dr Khairiyah binti Abd Muttalib
2. Dr Rusni binti Mohd Yusoff
3. Dr Mohd Rashid bin Baharon
4. Dr Mustaffa bin Jaapar
5. Dr Thaddius Herman Maling
6. Mr Abd Rahaman bin Jaafar
7. Mr Mohd Tohir bin Ibrahim
8. Mr Alias bin Suhud
9. Ms Sulhana binti Ismail
10. Mr Kang Boon Chye
11. Mr Roslan bin Murad
12. Mr Hamsa bin Mohamed

This document was also subjected to scrutiny and input from other stakeholders comprising the following:

1. Dr Sirajuddin Hashim Public Health Physician (Occupational Health), Disease Control Division, Ministry of Health Malaysia
2. Dr Muzafar Hamirudin President, Malaysian Dental Association
3. Dr Jaseema Begum Nazir Khan Department of Safety and Health, Ministry of Human Resources, Malaysia
4. Ms Hj Fatimah Nayan Tutor, Children's Dental Centre and Dental Training College Malaysia, Pulau Pinang
5. YM Raja Hj Ahmad Shah Raja Abd Rahman *Presiden, Persatuan Juruteknologi Pergigian Malaysia*
6. Ms Connie Wong Ching Ching Assistant Lecturer and Course Co-ordinator, Dental Technology Department, Dental Faculty, MAHSA University College, Kuala Lumpur
7. Mr Ramli Yamin Dental Technologist, Dental Technology Department, Dental Faculty, MAHSA University College, Kuala Lumpur
8. Mr Ooi Chok Seng Secretary, Malaysian Dental Technologist Association
9. Mr Khor Kuan Keong Member, Malaysian Dental Technologist Association

Contents

<i>Foreword by The Director-General of Health, Malaysia</i>	3
<i>Acknowledgement</i>	4
<i>Working Group Members, Oral Health Division, Ministry of Health Malaysia</i>	5
<i>Other Stakeholders</i>	6
1. Aim	8
2. Background	8
3. Policy Statements on Occupational Safety and Health in the Dental Laboratory	9
4. Responsibilities of Employers and Employees	10
5. Dental Laboratory Set-up	11
6. Hazard Identification and Risk Control	14
7. Risk Management Procedures	22
8. Training and Education	22
9. Conclusion	23
<i>Appendices</i>	24-40

GUIDELINES FOR OCCUPATIONAL SAFETY AND HEALTH IN THE DENTAL LABORATORY

1. AIM

The aim of this document is to assist dental technologists, policy makers and other stakeholders to ensure safety and health in dental laboratories. This document is applicable to all stakeholders with concerns in designing, managing and working in dental laboratories in public and private sectors.

2. BACKGROUND

The dental 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.

Dental technologists 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. The health effects of concern include potential adverse respiratory effects (from inhalation of dusts from grinding and polishing of metal alloys, resins, ceramics, plaster, and the abrasives used for polishing), dermatitis (from contact with acrylates and metals), neurotoxicity or disturbance of olfaction (by methyl methacrylates monomer), genotoxic damage in lymphocytes (possibly related to occupational exposure to chromium, cobalt, and nickel) and other health complaints caused by noise, vibration of handpieces, and long working hours.¹

¹ Chen et al. Workplace Air Quality and Lung Function among Dental Laboratory Technicians, Amer J Industrial Medicine 2006;49:85–92

The importance of occupational safety and health of workers, led to the enforcement of the Occupational Safety and Health Act 1994 (Act 514) on 25 January 1994². The Act aims to improve the standards of safety and health of workers and their clients. It also serves to make both employees and employers more aware of safety and health issues and to take steps to implement the necessary measures at all times.

Such concerns led the Ministry of Health Malaysia (MOH) and the Malaysian Dental Council (MDC) to issue the *Guidelines for Occupational Safety and Health in the Dental Laboratory* in 2002³. The rationale was to ensure that all health activities in dental laboratories are carried out in a safe and healthy environment for both health personnel and their clients, and in compliance with the requirements of existing laws. This document is a review of the 2002 Guidelines in line with current developments in dental laboratory technology and new findings on health and safety in the dental laboratory.⁴

3. POLICY STATEMENTS ON OCCUPATIONAL SAFETY AND HEALTH IN THE DENTAL LABORATORY

Dental technologists and other personnel in dental laboratories should work in an environment that is safe and healthy. They shall

1. practise a work culture that complies with relevant laws and regulations;
2. undergo training and acquire knowledge and skill through continuing education;
3. be exposed to basic training on regulations as well as healthy and safe work practices;

² Law of Malaysia. Act 514. Occupational Safety and Health Act 1994

³ Malaysian Dental Council. *Guidelines for Occupational Safety and Health in the Dental Laboratory*, 2002

⁴ Workplace Air Quality and Lung Function among Dental Laboratory Technicians. *Amer J Industrial Medicine* 2006;49(Iss 2):67–140

4. 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;
5. be cognisant with the required set-up and basic design prerequisites of dental laboratories, such as good ventilation and fire prevention features;
6. be equipped with knowledge on basic facilities and equipment commonly used in dental laboratories;
7. undertake preventive maintenance of equipment regularly as recommended by the manufacturers;
8. be provided with appropriate personal protective equipment (PPE) to be used at all times;
9. report, investigate and follow through every accident or incident that could cause or had caused injury or illness, and
10. review these guidelines once every 5 years or more frequently if necessary.

4. RESPONSIBILITIES OF EMPLOYERS AND EMPLOYEES

The Occupational Safety & Health Act 1994 (OSHA '94)² clearly defines the general duties of employers, employees and self-employed persons.

4.1 Responsibilities of Employers

Section 15 of the OSHA '94 states that "An employer of a place of work shall provide the safety and health officer employed by him adequate facilities, including training equipment, and appropriate information to enable the safety and health officer to conduct his duties as required under the Act". It shall be the duty of every employer 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 Employees

Section 24 of the OSHA '94 states that an employee is required to:

- take reasonable care for the safety and health of himself and of other persons who may be affected by his acts or omissions at work
- co-operate with his employer 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 employer.

5. DENTAL LABORATORY SET-UP

Proper and well-planned dental laboratories will ensure the health and safety of dental technologists. Factors such as demarcation of working areas, ventilation, dust control and lighting should be considered in any dental laboratory set up.

5.1 Designated Working Area

In general, it is recommended that dental laboratories have three (3) areas:

- Receiving area
- Production area (consisting of wet and dry areas)
- Delivery area

(a) Receiving Area

The receiving area is where cases from dental surgeries are received and where all items entering the laboratory are handled. The receiving area

should be equipped with running water, disinfectant bath(s) and hand washing facilities. All items should be disinfected in the receiving area and handled in an aseptic manner before transfer to the production area.

(b) Production Area

This area is where dental prostheses or appliances are constructed. There should be two sections, namely a wet area and a dry area.

- The wet area is where prosthetic work is undertaken with the use of water. This area should be designated for all work relating to casting of working and study models, model trimming, mounting, flasking, polymerisation and polishing of dental prostheses.
- The dry area is where prosthetic work, such as acrylic, alloy and ceramic procedures, is undertaken without the use of water.

(c) Delivery Area

The delivery area is where prostheses/appliances should be stored. This area should be supported with cleaning and disinfecting facilities. Prostheses should be disinfected before being sent to dental surgeries.

5.2 Ventilation

Generally, natural ventilation does not provide consistent air exchange controlling exposure to hazardous substances. Mechanical ventilation is more reliable as a means to addressing this problem. The venting of contaminated air at its source of generation will greatly limit its spread throughout the workplace.

The use of fume cupboards when handling volatile materials is recommended as the dental technologist is exposed to various hazardous fumes.

(a) Dust Control

Airborne particles of less than 5 microns are hazardous to health. These particles may contain silica, which is listed as a hazardous substance. Dental laboratory procedures such as trimming, grinding and polishing, sandblasting, investing and mixing generate dust. The use of dust extraction units along with personal face masks to filter dust is highly recommended.

Where possible, all related laboratory materials in specific procedures should be dampened to keep down dust exposures.

(b) Lighting

Common lighting problems include too much or too little light. A good lighting system eliminates shadows and highlights potential hazards. Poor lighting can adversely affect safety and may increase the risks of injuries in the dental laboratory and contribute to accidents and injury, sore and tired eyes, headaches and blurred vision.

Natural lighting or artificial light needs to be at appropriate levels for the tasks. Some activities in the dental laboratory will require lamps to provide adequate light on the work 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, and
- ensuring there is sufficient lighting of at least 1000 lux or 100 foot-candle (fc) as required in Regulation 29 (e), of the Factory and Machinery Act 1967.⁵

⁵Law of Malaysia. Act 139. The Factories and Machinery Act 1967. Factories And Machinery (Safety, Health and Welfare) Regulations, 1970.

6. HAZARD IDENTIFICATION AND RISK CONTROL

Hazards in the dental laboratory need to be identified 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 (Appendix 1).⁵ The recommended risk controls are as follows:

Equipment

All equipment should have **Planned Preventive Maintenance** (PPM) to prevent faulty and unsafe equipment.

Vibration

Early symptoms of vibration disease include reduced blood circulation in the fingers, reduced sensitivity to pain, touch, vibrations and temperature. Grinding and polishing with vibrating tools after several years can lead to numbness and loss of fine control. Personnel are advised to avoid continuous use of laboratory hand pieces for long hours.

Noise

Various types of dental equipment emit noise which, under certain circumstances, can be harmful to hearing. Equipment that generate noise, such as dental polishing lathes and grinding machines, model trimmers, air compressors, dust extractors, and micromotors 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 stress⁶.

⁶Mojarad et al. Noise Levels in Dental Offices and Laboratories. J Dentist, Tehran University of Medical Sciences 2009; 6,(4):181-186

The use of appropriate ear protector such as ear plugs/ear muffs is recommended. It is also recommended to avoid continuous use of such identified equipment.

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 fire-proof materials.
- Gas regulators and tubing must be checked regularly to ensure optimal condition at all times
- Gas mains must be switched off after office hours.
- Inflammable items must be kept in safe places after use
- Each electrical appliance must use separate power points and be switched off after use
- Polymerisation work should be carried out during office hours; a timer must be used if the polymerisation process is continued after office hours
- Nonflammable burners (induction heaters) should be used
- All inflammable items must be stored away from sources of fire and in a well-ventilated room
- The use of camping gas and spirit lamp is not recommended.

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 be regularly checked as recommended by the manufacturer

- exercise caution when handling items that may cause burns or scalds such as during de-waxing.
- there should be clear safety signage such as 'CAUTION! 'HOT WATER' or 'DANGER'.

Sharp Objects

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

- Precaution must be exercised 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.

Electrocution

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

Check

- ✓ the appliance for obvious external damages or inadequate temporary repairs, including checking the connecting lead and plug.
 - ✓ that the inner cores of the connecting leads are not exposed and that the outer coverings are not cut, frayed, worn or otherwise damaged.
 - ✓ that sockets are not cracked or broken.
 - ✓ that the connection of the lead to the appliance is secure.
 - ✓ that the control knobs are firm and secure.
- Follow and keep the manufacturers' instructions on the use of equipment and materials; proper handling and use of appliances will ensure accidents are prevented.
 - Store electrical equipment safely away from wet or moist areas when not in use.
 - Switch appliances OFF and pull out the plug (not cord) when adjusting or cleaning.

- Never touch electrical appliances or switches with wet hands.
- Make sure flexible cords are fully unwound and kept clear of 'work traffic'.
- Avoid stacking power points and extension boards; arrange to have additional power points installed.
- Use a power board with separate switches and an overload switch.
- Do not use a wet cloth to clean power sockets.
- Shoes with rubber soles must be worn when handling or repairing electrical equipment.
- All 3-pin plugs must be detached from the socket before performing repair or maintenance work. If this is not possible, make sure that the unsafe machine is properly shut off and not started up again prior to the completion of maintenance or servicing work (e.g. a safety procedure such as A Lockout-Tagout (LOTO) or lock and tag is recommended).
- Equipment used in the dental laboratory must satisfy requirement of MS IEC 60601-1 or equivalent.
- All electrical equipment must be tested for safety during commissioning and maintenance work.

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 list of chemicals and materials that are potentially hazardous should be identified and maintained up to date along with the appropriate material safety data sheets (Appendix 2).⁷

⁷Chemical Assessment Chart. *Managing Safety in Dental Laboratories*. Pippa Wright Preventative Injury Planning Strategies P/L . ACDLA Queensland Australia, 2005

Acids

Mineral acid, gas and vapours may be released during casting and polymerization.

- Personnel handling acids must wear protective face shields and gloves.
- Acid residues must be disposed off through the septic tank or according to Environmental Quality Scheduled Wastes Regulations 2005.⁸

Methyl/Ethyl Methacrylate/Monomer

Methyl/Ethyl methacrylate/Monomer vapour may be released during mixing and packing process.

- Appropriate protective face masks and gloves must be worn when handling the material.
- Fumes extractor should be used 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.
- Complete curing cycle as manufacturer's recommendation should be followed

Chemical Dust

Common chemical dust found in dental laboratories include Plaster of Paris, silica, beryllium, acrylic and pumice. The following preventive steps should be taken.

- Face masks should be worn.
- Dust extractors must be used during trimming and polishing work.^{9,10}

⁸ Environment Quality Act 1974. Act 127. Environmental Quality Scheduled Wastes Regulations 2005.

6.3 Biological Hazards

Dental technologists are exposed to risks of viral, bacterial and fungal infections.

- Up-to-date immunisations are recommended to reduce risks of infection.
- All dental technologists should be vaccinated for Hepatitis B.
- Prosthetic appliances and dental equipment for repair should be decontaminated using suitable disinfectants.
- Dental technologists should adhere strictly to standard precautions on infection control in dental laboratories.

Dental laboratories must follow either one of the following procedures

- maintain an 'isolated area' whereby all prostheses, impressions and other processed work from the surgery are disinfected prior to being sent to the dental laboratory, or
- ensure that impressions from the surgery at every stage in the construction of prostheses, are sent directly to a specified receiving area and disinfected in the dental laboratory.

6.4 Ergonomic Hazards

Tasks involving repetitive procedures and holding constrained or awkward postures for long periods of time can result in risks to those working in the dental laboratory. Injuries relating to these risks may be short or long term.

Dental technologists can prevent ergonomic hazards by properly designing the job or work station and selecting the appropriate tools or equipment for that job. Based on information from the job analysis, an employer can

⁹ Department of Occupational Safety & Health, Ministry of Human Resources, Malaysia. Guidelines on the Use of PPE against Chemical Hazards, October 2005. Available at http://www.dosh.gov.my/Informasi/guidelines/ve_gl_ppe.pdf.

¹⁰ Guidelines on control of Chemical Hazardous to Health, Department of Occupational Safety and Health (DOSH) Malaysia 2001.

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 e.g. vinyl
- 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

Laboratory Layout (Workflow, Equipment and Furniture)

Layout and the location of equipment and materials determine how people position themselves. Consider:

- room to move around, to enable changing body position and reduce reaching
- work benches to be at a height appropriate for tasks
- height-adjustable chairs on slides or wheels with good back support
- foot rails to support feet
- equipment and materials within reach without having to twist or bend
- foot rails or stands to reduce stress on the lower back and to allow for shift of body weight when standing in one position for a long time.

Work Organisation

Dental technologists should vary tasks as much as possible to use different muscles and allow for tired muscles to recover. Consider

- alternating between sitting and standing, and

- alternating between tasks using different muscles.

Tools and Equipment

When selecting equipment, consider:

- the weight of the tool or appliance
- the shape and orientation of the handles and hand grips to eliminate awkward wrist position and allow easy grip, and
- use of appropriate equipment for the tasks at hand.

Skills and Experience

Dental technologists need to be aware of and should be trained in

- preferred work practices to include task variation
- how to avoid body movements and positions which may lead to long term injury
- how to adjust workstations to suit the individual to minimise risk of injuries.

6.5. Psychosocial Hazard

Occupational stress can be defined as the physiological and emotional responses that occur when workers perceive an imbalance between their work demands and their capability and/or resources to meet these demands.¹¹

Stress at the work place may be caused by workload, expanded scope of work and the environment. Dental technologists can take the following preventive steps:

- monitor themselves for signs and symptoms of stress
- practise stress-reducing techniques, proper diet and exercise.

¹¹ Workplace Health and Safety Queensland, Department of Justice and Attorney-General, Psychological Health For Small Business, 2010
<http://www.deir.qld.gov.au/workplace/resources/pdfs/psychhealth-smallbusiness.pdf>

- undergo training and continuing professional development (CPD) to improve knowledge and skill to cope with stress at work, and
- attend stress management courses.

7. RISK MANAGEMENT PROCEDURES

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.
- The fourth step is to review the effectiveness of control measures (refer to flow chart Appendix 3).¹²

Hierarchy of Control

Controlling exposures to occupational hazards is the fundamental method of protecting workers. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls (Refer Appendix 4).

8. TRAINING AND EDUCATION

As required by the Act, the employer and employee are required to undertake training and education in injury prevention and steps to work safely.

The training should include¹³:

¹² Hazard Management flow chart. *Managing Safety in Dental Laboratories.. Pippa Wright Preventative Injury Planning Strategies P/L . ACDLA Queensland Australia, 2005.*

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

Training Records

Training records should be maintained as proof of compliance with the OSHA Act 1994 and should include:

- Dates of training sessions
- Contents/summary of the sessions
- The names and qualifications of the persons conducting the courses
- The names of those attending the courses; and
- Evaluation of effectiveness.

9. CONCLUSION

The Occupational Safety and Health Act 1994 (Act 514) passed on 25 January 1994, is a legal document underlining government obligation to ensure the safety and health of workers. This document has been prepared to ensure compliance to this Act in cognisance of the fact that dental laboratories are places at high risk to occurrence of accidents where the health of the workers may be jeopardised. This document should be extended to all dental laboratories in the country to assist in standardising measures to ensure safety and health of personnel in dental laboratories.

“Tomorrow - your reward for working safely today”

~ Author Unknown

¹³ Best Practice Guidelines for Occupational Safety and Health in Dental Therapy Practice, Auckland Regional Dental Service, Waitemata District Health Board, August 2001.

Preferred Controls to Address Physical Hazards in Dental Laboratories

No	Equipment	Health Risk	Associated Risks	Preferred Controls
1.	Acrylic Polymerisation/ Curing Unit	No	<ul style="list-style-type: none"> • Danger of combustion/ electric shock • Scalding from hot water 	<ul style="list-style-type: none"> • Not to be switched on with little or no water/ earthed conductors • Wear apron, goggles and gloves
2.	Dewaxing Unit	No		
3.	Vacuum Mixer	May aggravate existing lung diseases	<ul style="list-style-type: none"> • Generates dust when pouring of investment material into bowl 	<ul style="list-style-type: none"> • Respiratory mask • Clean up all spills with a damp cloth
4.	Micromotor	Numbness Fumbling	<ul style="list-style-type: none"> • Bending of burs if put to high speed which may cause cuts/bruises • Trimming creates dust particles which may aggravate respiratory diseases and gets into eyes • Noise from the grinding/trimming 	<ul style="list-style-type: none"> • Make sure to turn to right speed • Respiratory mask and goggles/saline solution to rinse the eyes • Wear ear plugs/ muffs
5.	Bunsen Burner	May aggravate existing lung diseases	<ul style="list-style-type: none"> • Burns from accidentally having arm/s over the flame • Touching part of the Bunsen burner while it is still hot 	<ul style="list-style-type: none"> • Switch off Bunsen burners when not in used
6.	Plaster/Stone	May aggravate	<ul style="list-style-type: none"> • Generates dust 	<ul style="list-style-type: none"> • Respiratory mask • Clean up all spills with a damp

No	Equipment	Health Risk	Associated Risks	Preferred Controls
	Dispenser	existing lung diseases		cloth
7.	Light Curing Unit	No	<ul style="list-style-type: none"> • Danger of combustion • Pinch hazard from unit door • Danger of electric shock • Eye damage by looking at the lamp while in operation 	<ul style="list-style-type: none"> • Do not touch halogen lights • Carry device with door closed • Must not cover ventilation slots and avoid objects/ liquids getting into ventilation slots (and earthed conductors) • Tinted windows
8.	Hydraulic Bench Press	No	<ul style="list-style-type: none"> • Monomer from mixed acrylic in dough stage escaping 	<ul style="list-style-type: none"> • Should be done in the fume cupboard
9.	Vibrator	No	<ul style="list-style-type: none"> • Danger of combustion/ electric shock 	<ul style="list-style-type: none"> • Not to be left switched on for long hours
10.	High Speed Grinder with Suction Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> • Danger of combustion/ electric shock • Shattering of discs at high speed if not handled properly • Generates dust particles • Noise from trimming/ cutting • Generates heat that might burn the fingers 	<ul style="list-style-type: none"> • Not to be left switched on for long hours • Wear goggles • Wear respiratory mask • Wear ear plugs/ muffs • Not to hold onto work for long period of time under disc/ standby a bowl of water
11.	Burnout Furnace	May aggravate existing lung diseases	<ul style="list-style-type: none"> • Generates heat • Toxic fumes from wax 	<ul style="list-style-type: none"> • Wear leather gloves/ use metal tongs/ shaded goggles • Ventilate area well and/ use fume cupboards

No	Equipment	Health Risk	Associated Risks	Preferred Controls
12.	Electric Waxing Unit	No	<ul style="list-style-type: none"> Scalding if not positioned properly 	<ul style="list-style-type: none"> Place waxing handle into holder when not in use at all times
13.	Electric Dipping Pot	No	<ul style="list-style-type: none"> Danger of combustion/ electric shock Scalding from hot wax 	<ul style="list-style-type: none"> Not to be switched on with little or no wax in the metal pot Leave pot at a safe distance at working area
14.	Casting Machine	No	<ul style="list-style-type: none"> Splattering of molten metal 	<ul style="list-style-type: none"> Weigh mould proper or choose correct size ring to balance the device Wear gloves, aprons, shaded goggles
15.	Pressure Pot	No	<ul style="list-style-type: none"> Danger of explosion Malfunction 	<ul style="list-style-type: none"> Not to fill pot with excessive pressure Check seals, inlets and outlets periodically
16.	Model Trimmer (wet)	No	<ul style="list-style-type: none"> Generates dust and heat if water supply not turned on 	<ul style="list-style-type: none"> Turn on water supply
17.	Ceramic Furnace	No	<ul style="list-style-type: none"> Burns from ceramic stand 	<ul style="list-style-type: none"> Use tongs and ceramic tiles
18.	Thermoforming Unit	No	<ul style="list-style-type: none"> Burns 	<ul style="list-style-type: none"> Precaution
19.	Milling Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> Generates dust from milling 	<ul style="list-style-type: none"> Wear mask

No	Equipment	Health Risk	Associated Risks	Preferred Controls
20.	Model Electric Saw	Numbness due to the radiation wave EMS	<ul style="list-style-type: none"> Cuts on hands/fingers 	<ul style="list-style-type: none"> Make sure to stabilise work before cutting
21.	Agar Dispensing Unit	No	<ul style="list-style-type: none"> Burns 	<ul style="list-style-type: none"> Observe precaution
22.	Steam Cleaner	No	<ul style="list-style-type: none"> Scalding from the hot steam 	<ul style="list-style-type: none"> Right positioning of nozzle upon usage
23.	Electrolytic Polishing Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> Splashes from acid 	<ul style="list-style-type: none"> Wear gloves, goggles and protective aprons
24.	Fume Cupboard	No	<ul style="list-style-type: none"> Poor suction 	<ul style="list-style-type: none"> Check fume cupboard regularly
25.	Sandblasting Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> Generates dust 	<ul style="list-style-type: none"> Wear mask and goggles
26.	Lathe Polishing Unit	May aggravate existing lung diseases	<ul style="list-style-type: none"> Generates dust Creates splatter of pumice 	<ul style="list-style-type: none"> Wear mask and goggles Wear aprons
27.	Pindex Machine laser	No	<ul style="list-style-type: none"> Eye injury Finger injury 	<ul style="list-style-type: none"> Wear goggles Observe precaution
28.	Hardening Electric Oven	No	<ul style="list-style-type: none"> Burns 	<ul style="list-style-type: none"> Observe precaution
29.	Water Boiler	No	<ul style="list-style-type: none"> Scalding from hot water Danger of combustion 	<ul style="list-style-type: none"> Handle hot water with care using oven mittens

No	Equipment	Health Risk	Associated Risks	Preferred Controls
				<ul style="list-style-type: none"> • Not to be left switched on with little no water for long period of time
30.	Hydroflask	No	<ul style="list-style-type: none"> • Scalding from hot water 	<ul style="list-style-type: none"> • Handle hot water with care
31.	Laser	No	<ul style="list-style-type: none"> • Eye injury 	<ul style="list-style-type: none"> • Eye protection based on specific parameters of laser in use
32.	Ultrasonic cleaner	Numbness due to vibration	<ul style="list-style-type: none"> • May cause allergic reaction 	<ul style="list-style-type: none"> • Use gloves • Do not dip fingers into cleaning solution

Dental Laboratory Chemical Hazards, Risks and Control

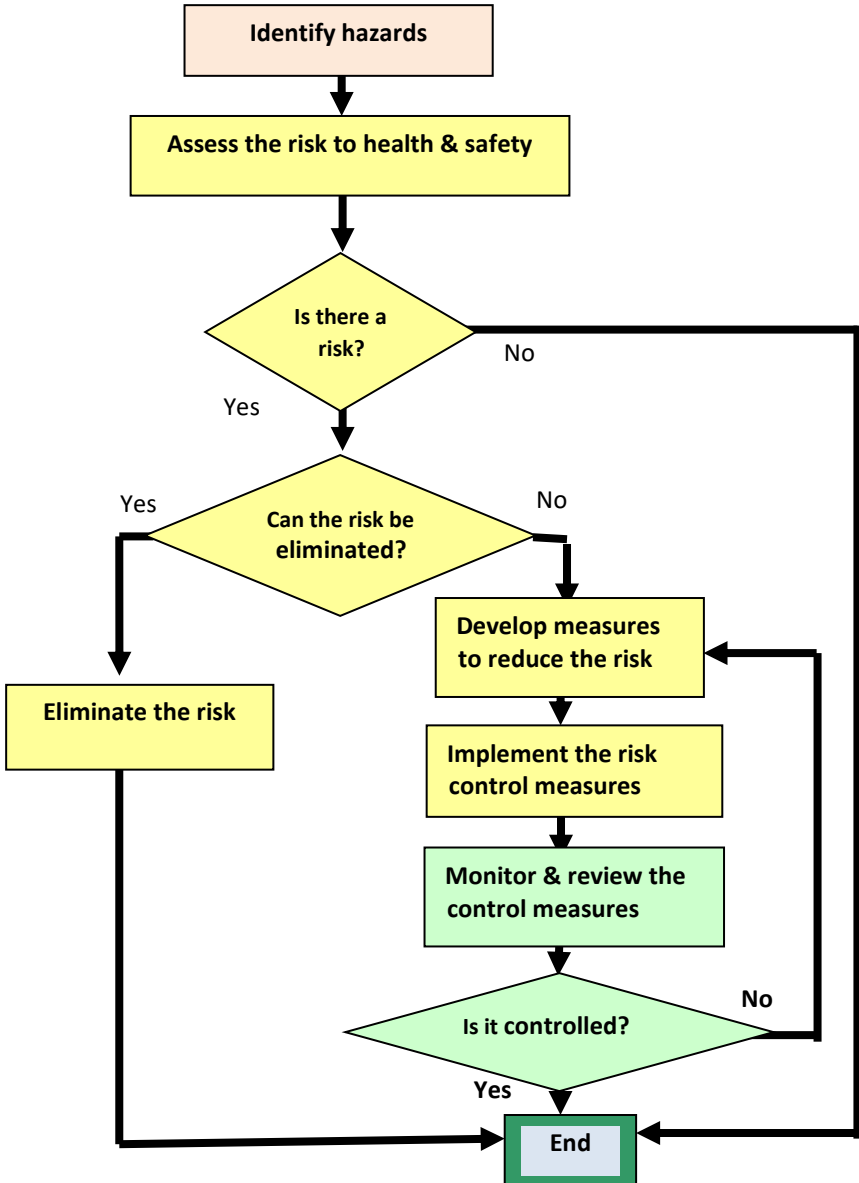
No.	Material	Hazardous Substance Element	Health Risk	Associated Risks with Substance	Preferred Controls
1.	Dental Acrylics	Methyl/Ethyl Methacrylate/ Monomers	<ul style="list-style-type: none"> Irritating to eyes, skin and respiratory system Numbness Long term sensitising may cause: <ul style="list-style-type: none"> Headaches Nausea Allergenic contact dermatitis Adverse effects on the nervous system 	<ul style="list-style-type: none"> Highly flammable Whitening fingers 	<ul style="list-style-type: none"> Ensure fire safety procedures Wear eye protection Wear Polyvinyl gloves / respiratory mask Ensure good ventilation
		Polymer	No	If product is spilled on the floor <ul style="list-style-type: none"> Slip/ trip/ fall 	<ul style="list-style-type: none"> Clean up all spills with care
2.	Tray Cleaner	Sodium carbonate Disodium metasilicate	<ul style="list-style-type: none"> Irritating to eye Irritating to the respiratory system 	<ul style="list-style-type: none"> Corrosive – may cause burns 	<ul style="list-style-type: none"> Wear eye protection/ respiratory mask Handle with care Consider Polyvinyl gloves

No.	Material	Hazardous Substance Element	Health Risk	Associated Risks with Substance	Preferred Controls
3.	Heat Shields, Crucibles	Asbestos	<ul style="list-style-type: none"> Inhalation of these fibres may cause fibrosis / lung cancer. 	<ul style="list-style-type: none"> Harmful if the integrity of the product is damaged – shards of fibres 	<ul style="list-style-type: none"> Monitor & review integrity of shields regularly on direct inspection. If integrity compromised – arrange for appropriate removal. Consider changing to asbestos-free heat protection
4.	Plaster & Stone	Calcium sulphate	<ul style="list-style-type: none"> May aggravate existing lung diseases 	<ul style="list-style-type: none"> Generates dust 	<ul style="list-style-type: none"> Wear respiratory mask Clean up all spills with a damp cloth.
5.	Disinfectants	Quaternary ammonium compounds	<ul style="list-style-type: none"> Irritating to the eyes Irritating to the skin 		<ul style="list-style-type: none"> Wear eye protection / Polyvinyl gloves
6.		Glutaraldehyde	<p>Known sensitising agent. Toxic substance</p> <ul style="list-style-type: none"> Irritating to eye Irritating to the respiratory system Irritating to skin 		<p>Avoid uncontrolled exposure times</p> <ul style="list-style-type: none"> Use Protective eye wear Polyvinyl gloves Respiratory mask

No.	Material	Hazardous Substance Element	Health Risk	Associated Risks with Substance	Preferred Controls
			Long term exposure <ul style="list-style-type: none"> • Headaches • Nausea • Asthma Allergic contact dermatitis		Identify sensitising symptoms early & isolate person from environment. Consider changing solution / product.
7.	Soft Reline – Primer	Toluene	<ul style="list-style-type: none"> • Harmful to eyes • Harmful to the respiratory system 	<ul style="list-style-type: none"> • Highly flammable 	<ul style="list-style-type: none"> • Fire safety procedures • Wear eye protection • Respiratory mask
8.	Electrolytic Polishing Solution	Sulphuric acid Ethylene glycol Calcium hypochlorite	Respiratory Irritation	<ul style="list-style-type: none"> • Corrosive agent • May cause burns if direct contact to skin 	<ul style="list-style-type: none"> • Handle with care • Consider Polyvinyl glove
9.	Metal Alloys	Cobalt Chromium Molybdenum Nickel Beryllium	<ul style="list-style-type: none"> • Inhalation of fumes may irritate / aggravate lungs causing chronic lung disease. • Chronic Beryllium Disease 	<ul style="list-style-type: none"> • Generates dust • Inhalation of dust may aggravate existing lung diseases • Creates fumes when heated 	<ul style="list-style-type: none"> • Respiratory mask • Clean up all spills with a damp cloth
10.	Grinding & Polishing Stones /	Aluminium oxide Silicon carbide Zinc Oxide	<ul style="list-style-type: none"> • May aggravate existing lung diseases • Inhalation of fumes 	<ul style="list-style-type: none"> • Generates dust • Creates fumes when heated 	<ul style="list-style-type: none"> • Respiratory mask • Clean up all spills with a damp cloth

No.	Material	Hazardous Substance Element	Health Risk	Associated Risks with Substance	Preferred Controls
	Wheels		may irritate / aggravate lungs causing chronic lung disease.		
11.	Casting Investment	Cristobalite Quartz	<ul style="list-style-type: none"> • May aggravate existing lung disorders • Long-term exposure may cause lung disease 	<ul style="list-style-type: none"> • May create silicogenic dust 	<ul style="list-style-type: none"> • Respiratory mask • Clean up all spills with a damp cloth
12.	Gases	Propane Butane Acetylene	<ul style="list-style-type: none"> • If left on within closed environment can cause asphyxia. 	<ul style="list-style-type: none"> • Highly flammable 	<ul style="list-style-type: none"> • Fire safety procedures • Always ensure cylinders are turned off after use
13.	Dental wax	Paraffin wax Petroleum wax	<ul style="list-style-type: none"> • Burning of creates fumes that may irritate the nose & throat 	<ul style="list-style-type: none"> • Direct skin contact with molten wax may cause thermal burns 	<ul style="list-style-type: none"> • Good ventilation system • Avoid direct handling when heated
14.	Acid	Hydrofluoric Acid Hydrochloric Acid	<ul style="list-style-type: none"> • Pulmonary oedema 	<ul style="list-style-type: none"> • Corrosive and destroy tissue 	<ul style="list-style-type: none"> • Protective eye wear • Respiratory mask • Handle with care • Consider Polyvinyl gloves • Adequate ventilation

Hazard Identification, Risk Assessment and Risk Control Process



HIERARCHY OF CONTROL

1. At the Source of the Hazard

a. Elimination

Getting rid of a hazardous job, tool, process, machine or substance is the best way of protecting workers.

b. Substitution

Sometimes doing the same work in a less hazardous way is possible. For example, a hazardous chemical can be replaced with a less hazardous one; alloys that contain beryllium should be substituted for non beryllium-containing alloys in dental work.

c. Isolation

If a hazard cannot be eliminated or replaced, it can sometimes be isolated, contained or otherwise kept away from workers.

2. Engineering control

Redesign

Jobs and processes can be reworked to make them safer. For example, containers can be made easier to hold and lift.

Automation

Dangerous processes can be automated or mechanised. For example, use of the automatic casting machine

Barriers

A hazard can be blocked before it reaches the dental technologist. For example, a glass shield on the laboratory practitioner's workstation can prevent eye injuries from excessive denture trimming. Proper equipment guarding will protect workers from contacting moving parts.

Absorption

Buffer zones can block or absorb noise, and lockout systems can isolate energy sources during repair and maintenance. Usually, it is more effective to keep the source hazard further away from workers.

Dilution

Some hazards can be diluted or dissipated. For example, ventilation systems can dilute toxic gases before they reach operators.

3. Administrative Controls

Safe Work Procedures

The employer is expected to ensure that workers follow these practices. Work procedures must be periodically reviewed and updated.

Supervision and Training

Initial training on safe work procedures and refresher training should be offered. There should be appropriate supervision to assist workers in identifying possible hazards and evaluating work procedures.

Job Rotations and Other Procedures

This can reduce the time that workers are exposed to a hazard. For example, workers can be rotated through jobs requiring repetitive tendon and muscle movements to prevent cumulative trauma injuries. Noisy processes can be scheduled when no one is in the workplace.

Housekeeping, Repair and Maintenance Programmes

Housekeeping includes cleaning, waste disposal and spill clean-up. Tools, equipment and machinery are less likely to cause injury if they are kept clean and well maintained.

Hygiene

Hygiene practices can reduce the risk of pathogen and toxic materials being absorbed by workers or carried home to their families. Street clothing should be kept in separate lockers to avoid being contaminated by work clothing. Eating should be forbidden in the dental laboratory.

Medical Surveillance

Dental technologists should regularly undergo specific medical examinations, with the aim of assessing their fitness for work. The emphasis is on lung function, skin disorders, ear, nose, and throat disorders, hearing, and peripheral circulation. During the check-ups, they should also be educated about the potential health hazards, recognition of early health effects, and safety practice. It is the responsibility of the employer to ensure their dental technologist undergo medical examination as prescribed by medical officer

4. Personal Protective Equipment

Personal protective equipment (PPE) and clothing is used when other control measures are not feasible and where additional protection is needed.

Items of personal protection, including gloves, eye protection, mask, and protective clothing should be removed before leaving the dental laboratory.

Gloves

Gloves must always be worn whenever there is a risk of contacting blood and/or saliva. Single-use gloves should be changed or discarded, e.g. if they are torn or damaged, and before using the telephone.

Recommendations for using disposable gloves are:

- If handling a new case, wear new gloves.
- Gloves are not to be washed or reused.
- Wash hands before and after use of gloves.
- Gloves are potentially infected material and therefore must be disposed of carefully.
- Gloves should be removed carefully to avoid contamination of hands and other surfaces.
- Handle sharp instruments carefully to avoid punctures.
- Gloves are worn for all decontaminating procedures.
- There must be care with latex gloves as these are highly inflammable.

Eye Protection

Good eyesight is essential for dental technologists to work effectively. Care must be taken to protect the eyes from damage.

Eyes can be physically damaged and infected if hit by small particles, such as acrylic fillings and metal dust projected from hand pieces or dental lathes. These can cause conjunctivitis, abrasions of the cornea or more serious deep penetrating injuries.

Chemicals, including acid solutions, sodium hypochlorite, and disinfectant solutions can cause serious chemical burns of the eye. Materials used in the dental laboratory such as acids and alkaline are also particularly hazardous and can cause serious eye damage. Methyl methacrylate monomer can cause a painful reaction if splashed into the eye. Dental plaster and stone contain small quantities of lime and quartz that can also damage eyes. Recommendations for protective eyewear are:

- Dental technologists must wear eye protection during laboratory procedures while using rotary instruments and cutting wires

- Re-useable eye protection must be cleaned and disinfected with water and detergent after use
- Protective eye protection must be close fitting with protective side shields.

Masks

Infections of the respiratory system and damage caused by dust and other chemicals are hazards for all dental laboratory staff. Recommendations for wearing masks are:

- Use disposable masks
- Hold masks at the edge only and avoid touching other parts
- Masks should not be in contact with the mouth as moisture will reduce its filtration effectiveness
- Masks must be put on before gloves
- Masks must be changed once moist or visibly soiled
- Masks must be removed and discarded as soon as possible after use.

Gowns, Plastic Aprons and Footwear

To protect street clothing from contamination and soiling, it is recommended that

- Protective clothing such as gowns are worn and these should be changed at least daily or when visibly soiled during a session
- Gowns should be removed before leaving the laboratory area
- Gowns should definitely not be worn while eating food.
- Protective clothing must be laundered separately from street clothes using a strong detergent or bleach.
- Plastic aprons may be worn to protect clothing when there is a risk of large amounts of splash as may occur when cleaning instruments and equipment manually (by hand).
- Footwear worn by dental technologists should be enclosed and must be capable of protecting feet from injury, especially from sharp instruments that may be accidentally dropped.

Hearing Protection

It is important to ensure that personal hearing protectors will provide wearers with reliable adequate protection. Personal hearing protectors should be used when levels of excessive noise cannot be reduced by using other control measures.

- Use ear muffs or ear plugs.
- Ensure hearing protection meets the Standards approved by DOSH.

5. First Aid Kits

A first-aid box should be available in the dental laboratory and should be kept fully stocked. One person should be appointed to look after it, and take charge in an emergency to call for an ambulance.

The smaller office might not need a trained first-aider but bigger laboratories should have an appropriate number of trained first-aiders, depending on the risks involved, the accidents likely to arise, the size and location of the office, the distribution of employees and the distance from external medical services.¹⁴

6. Accident Reporting

The Occupational Safety and Health Act 1994 (OSHA '94) requires an employer to notify the nearest occupational safety and health office of any accident, dangerous occurrence, occupational poisoning or occupational disease which has occurred or is likely to occur at the place of work.

Further details on the latest requirements may be obtained from the Occupational Safety and Health (Notification of Accident, Dangerous

¹⁴Guidelines on First-Aid in Workplace (2nd Edition) 2004. Department of Occupational Safety & Health, Ministry of Human Resources, Malaysia.
<http://www.dosh.gov.my/Informasi/GarisPanduan/GarisPanduan7.pdf>

Occurrences, Occupational Poisoning and Occupational Diseases) Regulations, 2000¹⁵.

“Personal protective equipment is self-defence” ~ Author unknown

¹⁵ <http://www.moh.gov.my/forms?offset=10>