从系统工程角度看实验室安全

– 莫纳什大学在实验室安全方面的管理经验分享

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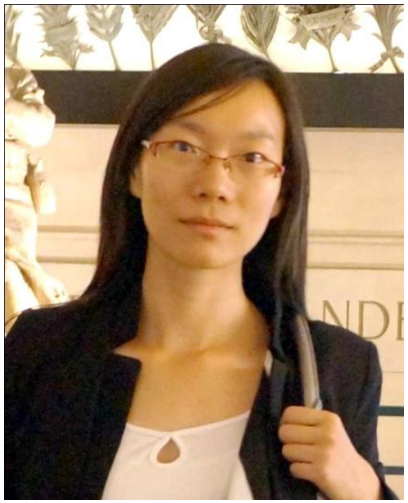
苏州大学　材料与化学化工学部　化工与环境工程学院

2014 .12



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- **博士**，化学工程，莫纳什大学，澳大利亚，2012
- **理学硕士**，微生物，西悉尼大学，澳大利亚，2009
- **应用科学硕士**，生物技术，西悉尼大学，澳大利亚，2007
- **工学学士**，生物工程，陕西科技大学，中国，2003

实验室安全管理经验：

2009.06-2012.03 莫纳什大学化工系生物技术与食品工程实验室 安全员

2010.06-2012.03 莫纳什大学化工系生物技术与食品工程实验室 主管

概要

一、绪论

1、实验室事故警示

2、完善规范（繁琐）的安全制度，培养安全意识

3、以人为本

4、应急事故处理知识

5、随处可见的安全标识（客梯旁的安全提示、紧急电话号码手册、消防逃生路线图、灭火器使用方法）

二、完善易得的文件资料

三、详尽的培训

1、入职培训（讲座 -> 手册 -> 测试）

2、入实验室培训

3、其他专门培训 （激光、辐射、生物安全、气瓶等）

四、安全委员会制度

一、绪论

1、实验室事故警示

1.1、诺贝尔化学奖获得者的眼睛

Special report in Nature (2006): How dangerous is chemistry? 441, 560-561 (1 June 2006) | doi:10.1038/441560ª

K. Barry Sharpless，2001年与William Knowles和野伊良治因不对称合成分享诺贝尔化学奖，Sharpless以他在不对称氧化反应方面的工作分享一半奖金。1970年，因核磁管爆炸失去一只眼睛。

经验教训：

- ❖ 正确操作、经培训上岗
- ❖ 任何时候在实验室都需做好防护措施

2、保护自己、同样也要保护工作伙伴

国内某高校，处理金属钠回流四氢呋喃剩下的瓶子底，在通风橱中用酒精洗瓶进行销毁。感觉到反应比较剧烈时，继续加了酒精并拉下了通风处的玻璃窗。随即爆炸起火。

事故原因：将水装在了酒精洗瓶里没有加以标记。

经验教训：

❖ 永远第一时间标注样品药、药品瓶、洗瓶、稀释液、缓冲液，标注内容包括：

- 样品名称、使用人、准备日期/开封日期

3、一流学府里的鬼楼

生物系做同位素标记实验时，本科生在处理样品时，把加入同位素标记的样品洒在了地上。处理过程中把样品液带出了同位素室，用纸巾吸干样品后，又拖地并且把拖地废水直接排进了下水道。

事后处理：刨去一层地面，上下 水管道全部更换。

经验教训：

- 发生事故时、正确处理的知识与技能
- 汇报、汇报、再汇报

4、常州工程学院实验室爆炸

经验教训：

- 做实验前的安全检查，实验过程中不要擅离工作区域。

2、完善规范（繁琐）的安全制度，培养安全意识

3、以人为本

保护自己+保护他人

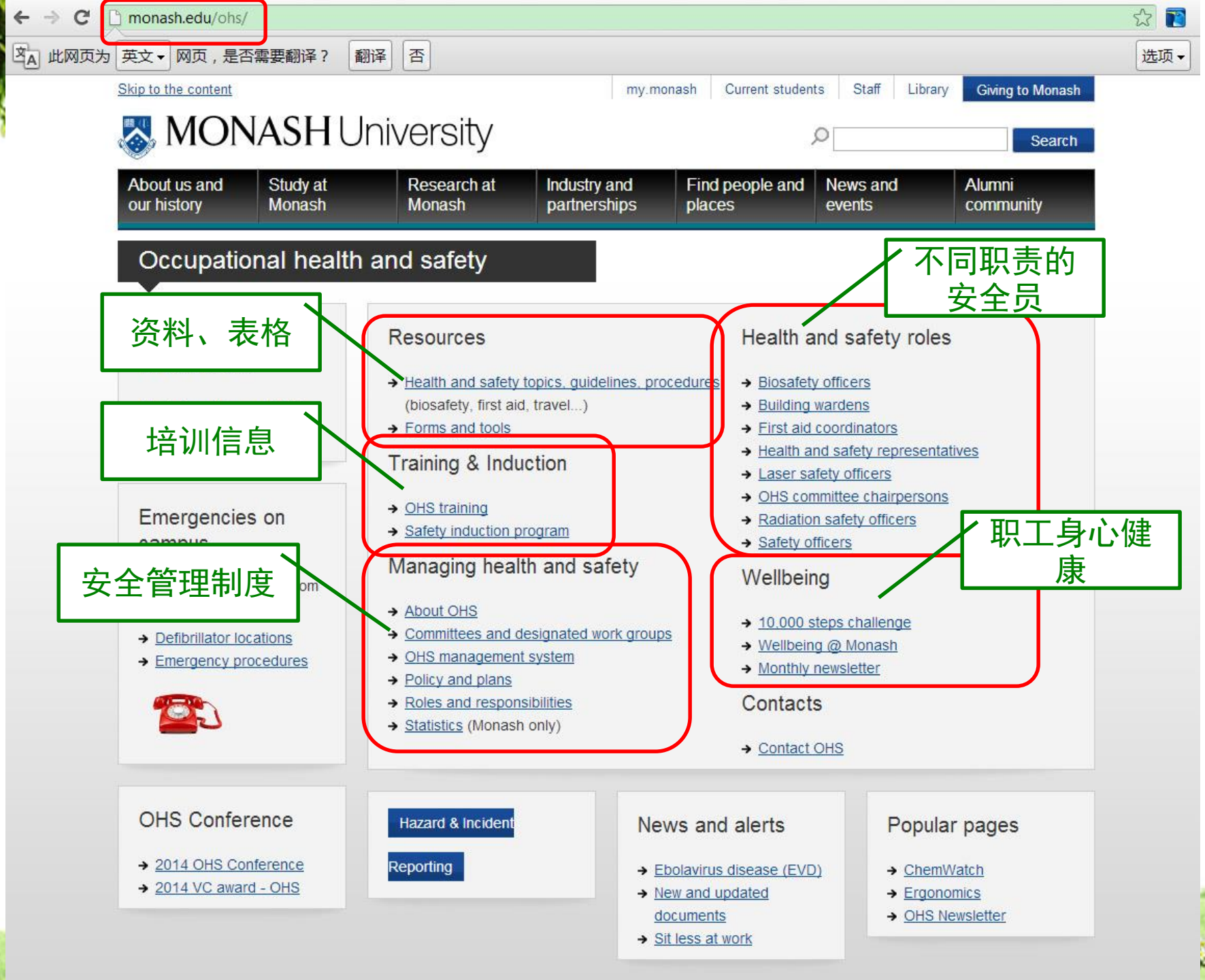
4、应急事故处理知识

e.g., 火灾应急：

保持冷静 -> 拉响警报 -> 平稳撤离 -> 用湿布、靠近地面、走楼梯

5、随处可见的安全标识（客梯旁的安全提示、紧急电话号码手册、消防逃生路线图、灭火器使用方法）

二、完善易得的文件资料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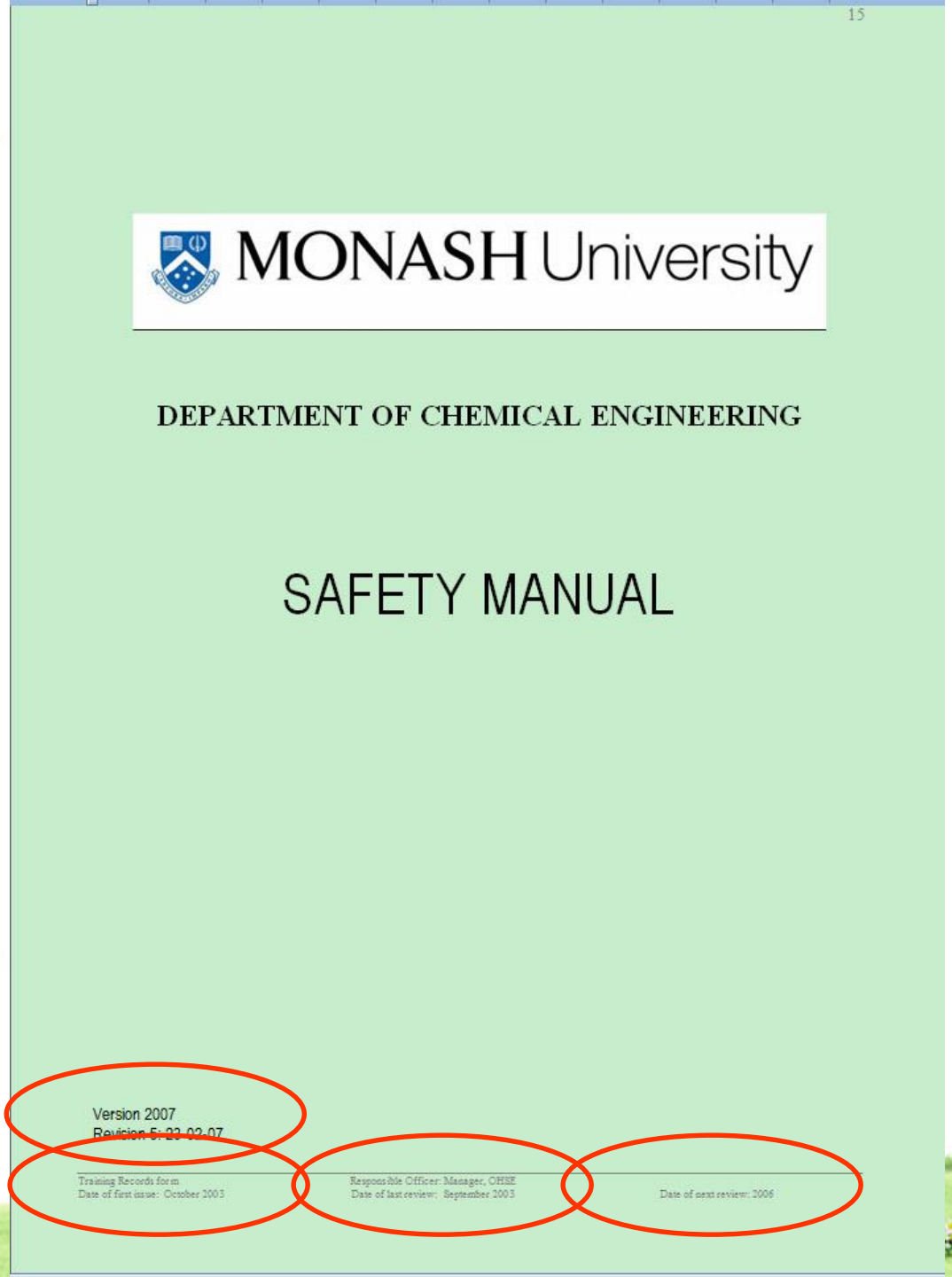
Occupational health and safety
资料、表格
培训信息
安全管理制度
不同职责的安全员
职工身心健康
Resources
Health and safety topics, guidelines, procedures (biosafety, first aid, travel...)
Forms and tools
Training & Induction
OHS training
Safety induction program
Managing health and safety
About OHS
Committees and designated work groups
OHS management system
Policy and plans
Roles and responsibilities
Statistics (Monash only)
Health and safety roles
Biosafety officers
Building wardens
First aid coordinators
Health and safety representatives
Laser safety officers
OHS committee chairpersons
Radiation safety officers
Safety officers
Wellbeing
10,000 steps challenge
Wellbeing @ Monash
Monthly newsletter
Contacts
Contact OHS
Emergencies on
Defibrillator locations
Emergency procedures
OHS Conference
2014 OHS Conference
2014 VC award - OHS
Hazard & Incident Reporting
News and alerts
Ebolavirus disease (EVD)
New and updated documents
Sit less at work
Popular pages
ChemWatch
Ergonomics
OHS Newsletter

三、详尽的培训

1、入职培训

讲座 -> 手册 -> 测试



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Name:_____
Supervisor:_____
Date: _____

Appendix 5 Safety Manual Quiz

1. Who is responsible for health and safety in the department?
   a. Safety Officer
   b. Vice Chancellor
   c. Head of Department
   d. Students
   e. All of the above

2. Which groups of personnel require safety induction and training?
   a. Research staff
   b. postgraduate staff
   c. Visitors and contractors
   d. General staff
   e. Anyone (staff or visitor) working in the department
   f. All of the above

3. When do contractors NOT need a safety induction?
   a. When they will be working unsupervised for less than one day in a laboratory
   b. When they will be working unsupervised for less than one hour
   c. Answers (a) and (b)
   d. Contractors must always receive a safety induction

4. The safety induction for contractors requires, at a minimum:
   a. Information on local emergency procedures and hazards
   b. The same induction given to staff in that area
   c. Contractor induction CD training
   d. No induction is required for technicians on regular service visits

5. Non-compliance with the safety requirements may result in:
   a. Formal advice to supervisor of non compliant person
   b. A written warning
   c. Exclusion from the equipment/lab involved
   d. Exclusion from all chemical engineering laboratories

6. The Safety Regulations in the Safety Manual cover (select all that apply):
   a. Laboratory procedures
   b. Emergency Procedures
   c. Bullying
   d. Threats to personal safety
   e. All of the above

2、入实验室培训

2.1、 risk management/危害控制

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Risk Management Programme

Occupational Health and Safety
AS/NZS 4801, OHSAS 18001
OHS20309
SAI Global

June 2010

Introduction

Monash University's Victorian campuses are all governed by the Victorian OHS Act 2004 and its subordinate regulations and codes of compliance. An inherent part of all OHS legislation is the requirement for workplaces to control the hazards its activities may pose to the health and safety of staff, visitors, contractors and students.

The Risk Management process outl designed to assist in the appropriate selection of is document outlines two processes the first bei ssment, the second being Control Banding. Both processes use a similar framework of **Hazard Identification**, **Control Determination**, **and Control Implementation**.

建立控制手段

确认危害

执行危害控制

The major hazard classes present at Monash University are:

1. Manual Handling
2. Physical
   - Equipment and Process
   - Lasers
   - Noise
   - Personal Interactions
3. Chemical Exposure
4. Biological Exposure (Micro / Animal & Insects)
5. **Radiation Exposure** (Process not covered in this document - Please refer all Risk Assessment Inquiries to the University's Radiation Protection Officer.)

The risks (likelihood of injury or illness) associated with hazards must be identified **and where possible eliminated**, or minimised so far as is practicable. Reduction of risk is best done using the Hierarchy of Controls. With the exception of Elimination, in most cases a combination or layering of primary and se afest option for reducing the risk of exposure to a hose which provide the first layer of protection, th or restrict the impact of the hazard on those associated with the work activity. *Primary controls* are described in the top section of the hierarchy and include *Substitution, Isolation and Engineering* controls. *Secondary controls* are less reliable and provide the last layer of those exposed to the hazard; these include *Administrative controls Protective Equipment.*

y of Controls is described below.

Elimination:
Design out the risk, Don't use the equipment. Don't use the process

The best way to eliminate the risk is to design out, remove the hazard or discontinue the hazardous work activity.

Substitution:
Find a safer piece of equipment or better way to perform the process

Substitute the hazardous part of the work activity with a safer option.

Isolation:
Keep it away from people.

2、入实验室培训

2.1、 risk management/危害控制

2.2、MSDS

a. 学生对于所使用化学品危害的认识

b. 实验室管理老师对于学生使用的化学品危害的认识。

2.3、 Safe Work Instructions/安全工作流程

a. 每位学生进入实验室操作，或开始一项新项目时，应完成安全工作流程。

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EXAMPLE OF SAFE WORK INSTRUCTIONS FORMAT

SAFE WORK INSTRUCTIONS FOR ...RY/TECHNIQUE/PROCESS]

1. **Authorisation**
   For example:
   - Authorisation required to undertake t... machinery
   - Procedures and personnel that pro...
   - Training/supervision required for task...
   - Reference personnel

2. **Hazards & risks associated with equipment/machinery/technique/process**
   For example:
   Hazardous chemicals/radiation/biologic...
   produced, speed of operation, possibili...

3. **Before you start work:**
   For example:
   - Location of further information about the hazards, eg material safety data sheets, radiation safety manual, laboratory safety manu...
   - Preparation of area, materials, person...

4. **The environment where the task is to be u...**
   For example:
   Fume cupboard, glove box, local exhaust ventilati...

5. **Personal protective equipment to be used:**
   For example:
   Safety glasses/goggles/face shield; protective s...
   coat/back-opening gown; safety helmet/hair rest...

6. **Emergency procedures**
   For example:
   For chemical spill, power outage, explosion

7. **After hours access procedures**
   For example:
   Specific requirements to perform activities after ho...
   buddy system, etc

8. **Step by step procedures for task**
   For example:
   Process walk through - may itemise indiv...
   Use of flow diagrams, charts or other vie...

9. **Clean-up procedures**
   For example:
   Swarf removal, decontamination of glassw...
   carcass removal.

10. **Waste disposal procedures**
    For example:
    For chemical/biohazardous/radioactive waste, broken glassware, wood dust, rags

PREPARED BY: .....

SIGNED: ..... DATE: .....

授权

潜在危害

实验前准备工作

适当的工作环境

个人防护

事故紧急措施

非工作时间许可

工作任务详细说明

清洁流程

废弃物处理程序

2、入实验室培训

2.1、risk management/危害控制

2.2、MSDS

a. 学生对于所使用化学品危害的认识

b. 实验室管理老师对于学生使用的化学品危害的认识。

2.3、 Safe Work Instructions/安全工作流程

a. 每位学生进入实验室操作，或开始一项新项目时，应完成安全工作流程。

2.4、总结：

学生进入实验室之前所需要完成的文件工作：

实验室安全培训、危害控制、MSDS、安全工作流程

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LABORATORY INDUCTION

Lab Name: _____ **Supervisor:** _____

Room No: _____ **Building:** _____

Item	Details
Break Glass Alarm	
Red Emergency Phone	
Emergency Floor Plan	
MSDS Folder	
Safe Work Instructions	
Risk Assessments	
Spill Kit	
First Aid Kit	
Safety Shower	
Personal Protective Equipment	
Electrical isolation devices	
SO/HSR	
Emergency stop facilities	
Fire extinguishers	
Amenities	

Name of Lab Personnel Who can perform induction: _____

_____

_____

Name of Academic in Charge of Lab:_____

Signed: _____ **Date:** _____

MONASH University

Mandatory where the work/study includes exposure to the hazard

Courses are recommended where relevant to the work/study or role

* Course may be completed externally through an RTO (Registered Training Organisation) and evidence provided to SDU

OHS training at Monash University

Occupational Health and Safety AS/NZS 4801, OHSAS 18001 OHSAS 18001 SAI Global

	First Aid and Emergency Response (Parasol)				Managing Safety & Hazards In the Workplace (NSCA)										OHS Specialised											Facilities Management Specialised				
	CPR Refresher (HTCPR201B) Includes anaphylaxis refresher	Fire Safety at Work (PRMPFES04B, PRMPFES05B)	Emergency Warden Training (PUAWER005B)	Level 2 First Aid (HLTFA301C) Includes anaphylaxis training	Essential OHS	Risk Management	Hazard & Incident Reporting and Investigation Awareness	Workplace Safety Inspections	Ergonomics and Manual Handling	Hazard Substances & Dangerous Goods Awareness	Hydrofluoric Acid safety	Breathing Apparatus (PUAFIR207B)	Health & Safety Representative/Deputy ##	Health & Safety Representative Refresher	Biosafety Module 1 (Microbiologicals)	Biosafety Module 2 (OGTR/AQIS)	Student Project Safety (Risk Management)	ChemWatch MSDS	Gas Cylinder & Cryogenics	Laser Safety (Prerequisite to Laser Safety Officer)	Laser Safety Officer (prerequisite laser safety)	Online Monash Safety Induction Program	Radiation Safety - Unsealed Sources (CD multimedia based)	Radiation Safety Officer	Radiation Safety Officer Refresher	Asbestos Awareness	Contractor Safety Induction	(Managing Risk) Safe Work Method Statement	Roadwork Safety	Roof Access Awareness
Course to be completed every	1 P/A	3y	3y	3y	3y	3y	3y	3y	3y	3y	3y	2y	On election *	1 P/A *	3y	3y	Before start	Once	3y	3y	3y	On start 3y	Before start	Before start	3y	3y	Before start	3y *	3y	3y *
Duration (D=Day / H= Hours)	2 H	2 H	2 H	2 D	3 H	3-4 H	1 H	1 H	3 H	1 H	1 H	1 D	5 D	2 D	2 H	1 H	2-3 H	2 H	Online self paced	2 H	1 H	30 min	5 H	2 D	3 H	2 H	40min	4 H	4 H	6 H
Staff with OHS Role																														
Biosafety officers																														
Emergency wardens																														
First aiders																														
First aid coordinators																														
Health & safety representatives																														
Laser safety officers																														
Radiation safety officers																														
Safety officers																														
OHS Committee Chairs																														
Staff/Students/Contractors																														
Deans/Divisional Directors																														
Senior managers																														
Supervisors (Academic Research / Professional Staff)																														
Technical staff (laboratory/studio/workshop)																														
Demonstrators/Tutors																														
Honours students																														
Postgraduate students																														
Contractors																														
Child care workers																														
Facilities & Services project staff & Safety officers only																														

- Prevention of Bullying & Occupational Violence now covered in Conflict Resolution/Unreasonable behaviour provided by SDU.
- Information sessions may be provided upon request to the OH&S banch however will not be considered as formal training

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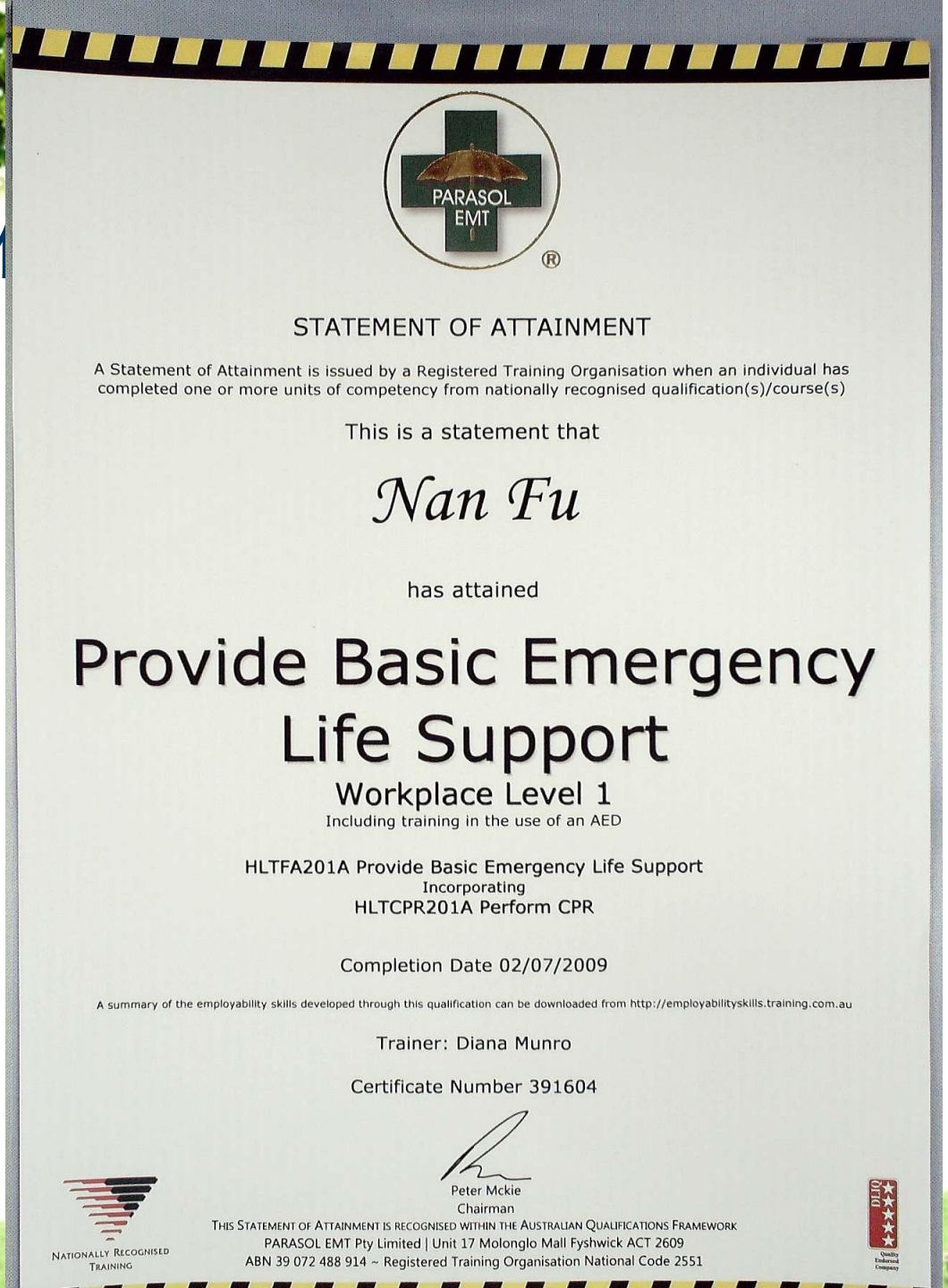

PARASOL EMT ®

STATEMENT OF ATTAINMENT

A Statement of Attainment is issued by a Registered Training Organisation when an individual has completed one or more units of competency from nationally recognised qualification(s)/course(s)

This is a statement that

Nan Fu

has attained

Provide Basic Emergency Life Support

Workplace Level 1

Including training in the use of an AED

HLTFA201A Provide Basic Emergency Life Support
Incorporating
HLTCPR201A Perform CPR

Completion Date 02/07/2009

A summary of the employability skills developed through this qualification can be downloaded from http://employabilityskills.training.com.au

Trainer: Diana Munro

Certificate Number 391604

Peter Mckie
Chairman

NATIONALLY RECOGNISED TRAINING

THIS STATEMENT OF ATTAINMENT IS RECOGNISED WITHIN THE AUSTRALIAN QUALIFICATIONS FRAMEWORK
PARASOL EMT Pty Limited | Unit 17 Molonglo Mall Fyshwick ACT 2609
ABN 39 072 488 914 ~ Registered Training Organisation National Code 2551

四、安全委员会制度

1、在系、院、学校各层面上，分别由下级单位派出安全员，组成安全委员会，对事故及安全隐患进行讨论，形成文件，并最终执行。

2、定期巡检

3、例会

4、事故汇报制度&即时更新的安全规范

谢谢大家!

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