National University of Singapore
Faculty of Science, Department of Physics,

Centre for Ion Beam Applications (CIBA)

LABORATORY SAFETY MANUAL

COMREHENSIVE SAFETY MANAGEMENT SYSTEM (CSMS)
Procedure No. CIBA/CSMS/01

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1 General Requirement

University Safety and Health Policy

http://www.nus.edu.sg/osh/policies/health.htm

Objectives

The National University of Singapore (NUS) Safety & Health Policy is established for the purpose of protecting the safety and health of the University staff, employees and visitors.

Scope

This policy is applicable to all staff members, students, contractors and visitors in facilities under the administration of NUS. For facilities on campus that are not under the administration of NUS, the Safety Policy on Tenancy Agreement is applicable.

Policy Statements

The National University of Singapore is committed to ensuring a high standard of occupational safety and health in the workplace.

1. **Legal Compliance**
   NUS is committed to comply with all applicable occupational safety and health legislations, guidelines and standards that it subscribes and other corporate policies that it adopts.

2. **Occupational Safety and Health Management System and Programmes**
   The protection of the health and safety of NUS faculty, staff and students shall be achieved through the implementation of various issue-specific safety and health programmes and safety management systems at university, faculty and departmental levels.

3. **Proactive Identification and Control of Hazards**
   NUS will make all reasonable effort to provide safe and healthy workplaces – academic, research and administrative - for all staff members and students by proactively identifying and correcting safety and health hazards. Faculty, staff and students are encouraged to actively report and minimize hazards. NUS requires those who do business with the University to perform their work in a manner that protects the University from safety and health risks.

4. **Mandatory Safety Training**
   Staff and students shall be adequately trained to ensure their competency in the workplace. All staff are required to attend> Fire Safety Training. Where applicable, staff working in laboratories are required to attend Office of Safety, Health & Environment (OSHE) Laboratory Safety Training Courses and any other appropriate safety related training courses based on prevailing legislation & the findings of the risk assessments.

5. **Incident and Accident Investigation**
   All incidents and accidents are to be investigated to determine the root cause(s) so as to avoid a recurrence. Hence, all incidents and accidents in NUS laboratories where research or teaching are carried out must be reported.

6. NUS Lab Design Standard

All new infrastructure projects in NUS must be jointly approved by the Joint Safety Review Group (JSRG), which comprises representatives from OSHE, OED and the faculty safety officer or safety coordinator, before the project is approved for implementation. The JSRG will review all new projects based upon the NUS Lab Design Standard and other relevant local and international standards if necessary. (http://www.nus.edu.sg/osh/manuals/lab.htm)

7. Communication

This policy shall be communicated to all stakeholders of the University as well as providing information and safeguards for those on campus and in the surrounding community regarding environmental, safety and health hazards arising from operations at NUS.

8. Regular Review

The University Safety and Health Policy and program-based safety & health policies, and the safety management system shall be reviewed annually to ensure their relevance and effectiveness

Safety and Health Roles and Responsibilities in NUS

Overview

Good occupational safety & health practices are the responsibility of each faculty member, staff member and student. Line responsibility for good occupational safety and health practice begins with the supervisor in the workplace, laboratory or classroom and proceeds upward through the levels of management.

In academic areas, supervisors include Principal Investigators (PI), class instructors, lab directors, or others having direct supervisory authority. For administrative areas, the supervisors are the managers. Academic levels of management are the Heads of Department (HOD), Deans, Vice Presidents for Research, and the Provost. Administrative levels of management are Directors, Vice Presidents and Deputy President.

Employer's Responsibilities

Final responsibility for safety and health policy and program rests with the President of the University, who represents the University as the Employer. The President may delegate the authority and the responsibility needed by the Deans, Heads of Departments and Directors of corporate offices, to effectively supervise the occupational safety and health of staff under his or her management.

Managerial Responsibilities

All University management such as Head of Departments, Deans and Directors are responsible for providing leadership in safety & health. They are to ensure that:

- Individuals under their management have defined safety & health roles and responsibilities
- Individuals under their management have the authority to implement appropriate safety and health policies, SOPs and programs;
- Areas under their management have adequate resources and funding for safety and health programs, SOPs, and equipment based on risk priority;
- Areas under their management are in compliance with NUS safety and health policies, SOPs and programs.

Supervisor Responsibilities

All University supervisors are responsible for protecting the safety and health of employees and students under their supervision and within their area of management. This responsibility entails:

- Implementing NUS safety and health policies, Standard Operating Procedures (SOP) and programs;
- Ensuring that the workplace and equipment are safe and well maintained;
- Ensuring that their workplace is in compliance with NUS policies, programs and SOPs and applicable Safety & Health legislative requirements.
- Ensuring the competency of their staff by addressing their safety needs. Staff would need to participate in University safety training programmes and job specific training by their supervisor.
- Specifically, in the area of research, the Principal Investigator shall assume the responsibility for safety in his or her laboratories. The Head of Department shall be the person responsible for safety in teaching and other areas of work in his or her Department. For Adjunct Professors, it is the responsibility of the co-PI or Head of Department to ensure their compliance to University safety policies.

Employee and Student Responsibilities

Employees and students are responsible for:

- Keeping themselves informed of conditions affecting their safety and health;
- Participating in training programs provided by their supervisors, instructors and OSHE (if applicable);
- Adhering to safety and health practices in their workplace, classroom, laboratory and student residences;
- Report to their supervisors or instructors of serious hazards in the workplace, classroom or laboratory

Physics department has established and maintained its (OHS) Safety Management System (SMS). It includes a compilation of various types of documents, including Safety Management System descriptions, Laboratory Policies, SOPs, Standards of Performance, Laboratory Level required procedures, safety manuals, Program descriptions. The document addresses the external and internal requirements that apply to the department's works.

Objectives of Our Laboratory Safety Management System

This will serve to ensure a safe, productive and healthy work and study environment for all our members and colleagues-visitors in our vicinity as potential hazards and risks are identified and accidents are prevented.

Each of us strives to be adequately trained, alert and committed to fulfill all legislations and regulations and to comply with the most current policies and procedures of Singapore and the units within the National University of Singapore

The laboratory located _S7-01-01_ is currently established the minimum requirements of the Safety Management System based on the university, faculty and departmental guidelines.

SCOPE of RESEARCH ACTIVITIES

The Centre for Ion Beam Applications (CIBA) is a state-of-the-art research centre utilizing advanced high energy (MeV) ion beam techniques covering a wide range of disciplines, including biophysics, lab-on-a-chip technology, nuclear microscopy of degenerative diseases, microphotonics, advanced materials characterization and semiconductor micromachining.

2 Occupational Safety and Health Policy.

Physics department emphasizes its commitments to Occupational Safety and Health management and improvement through issuance of an Environmental, Safety, Security and Health Policy. This Policy is communicated to employees and guests through email, bulletin board and Physics Safety website.

The policy is developed and reviewed regularly and revised as and when necessary. It includes environmental, safety, security and health policy. It considers input from stakeholders by communicating this policy both internally and externally.

Physics Safety Policy came under important revision following the implementation of NUS Safety and Health Policies and Science Faculty Safety Policy in 2004. We aim to create a safe and healthy environment through awareness of policies and correct practices. Our vision is to achieve the highest level of safety standard in our department.

PHYSCIS DEPARTMENT SAFETY POLICY
(http://www.physics.nus.edu.sg/corporate/safety/safetypolicy.html)

We are committed to work closely with Office of Safety, Health and environment (OSHE), Faculty safety officer (FSO), Office of Estate and Development (OED), contractors and visitors. To fulfill the above objectives, we, including all Physics staff and students are called upon to play our parts in compliance with the following policies:

1) Safety & Health

We shall strive to ensure health and safety in research, teaching, procurement, commissioning of equipment/experiments/facilities that can be operated with sense of ease and security.

2) Accident Prevention.

We shall strive to eliminate any accident risk, accident and injuries through safe practices by ensuring safe and healthy working conditions.

3) Safety Compliance

We shall make every effort to comply (through regular and surprise safety inspections) with relevant laws and regulations related to Health, Safety and Environment (including NUS Safety and Health Policies, OSHE's SOPs, Faculty Safety Management system, MOM and department guidelines, and other rules and regulations).

4) Training & Education.

We shall equip our staff and students with safety knowledge, skill and competency by supporting and encouraging them to attend safety briefing, courses and seminars and induction programs organized by OSHE, Science Faculty and Department.

5) Innovation/Continual improvement

We shall review and improve our safety, health and environmental policy regularly and revised if necessary through regular meetings and by participating in OSHE's programs such as Safety Innovation Training Program (SITP), Annual Safety Performance Award and MOM safety competitions.

6) Environmental protection.

We shall strive for waste minimization and emissions through careful safety management (including recycling, central chemical procurement and others) to preserve local environment, save energy and natural resource to protect global environment. For example, we have twice yearly department/faculty housekeeping.

3 Planning

3.1 Planning for Hazard identification, Risk Assessment and Risk Control

The Physics Department has implemented the following procedure /programs for identifying the Occupational Safety and Health hazards and risks and necessary control of its current activities.

Define scope of work: Identify what work will be performed, where it will occur, the suitability of the workspace to be used, and processes to be conducted.

Analyze hazards: Identify the significant OSH risks of all activities, research products, and services, equipment and the associated potential environmental impacts. Determine which of those risks are intolerable.

Risks Assessments

It is a requirement under the Workplace Safety & Health Act to do risk assessments before carrying out any procedure. "Standard Assessment" implies that the application of good laboratory practice is sufficient for the safe handling of materials but in the case of a "Special Assessment" the risks associated with the particular substance **as it is to be used**, the precautions to be taken in handling, measures for adequate control, the action to be taken in an emergency (for example a spillage) and the procedures for safe disposal all should be recorded.

Who makes the Assessment?

Involving students in preliminary assessment work for their own projects (i.e. researching information on substances and how they are used, identifying the measures necessary for adequate control *etc*.) is useful training. It is important to note that it remains the responsibility of the Supervisor to validate such Assessments and that the Regulations call for the Assessment to be made by a "competent person" who may not be the student.

Review of Assessments

As projects develop, the nature of the work and experimental techniques may change. Procedures not included in the initial Assessment should not be started without being assessed in the same way; regular review of Assessments is therefore required. In any case, all Assessments should be reviewed when necessary by the students and PIs annually. Each review of assessment is valid for 3years.

It is the responsibility of the Academic member of staff to see that all relevant Risk Assessments have been carried out for every research worker under his/her care and that all the appropriate safety documentation **has been completed irrespective of the nature of the research work.**

Safe Working Environment

The responsibility of a research Supervisor to maintain a safe working environment for research students extends to the physical fabric of the laboratory, *i.e.*, to the state of housekeeping in the

laboratory, the safety and testing of electrical equipment, the operation of safety equipment such as fume-hoods, glove-boxes *etc*., the level of lighting, the state of floors and so on. Although other people within the Department and University have the brief to maintain and repair much of this fabric, it remains the ultimate responsibility of the Supervisor to see that that students are not working in unsafe conditions or with unsafe equipment and that the appropriate people are informed when repairs are needed.

Emergency Equipment

Academics in charge of laboratories should ensure that all emergency equipment i.e. fire extinguishers, fire blankets, eye wash stations etc. are maintained in good working order and that new workers are informed of the location and means of operation of this equipment.

Inspections

Academics in charge of laboratories should carry out regular inspections of these laboratories to ensure that they are in a safe and acceptable state and that procedures recommended as a result of Risk Assessments are being followed.

Discipline

Where those being supervised show a persistent disregard for matters of safety, the Supervisor is advised to use University disciplinary procedures to ensure that the safety of the person concerned, and anyone else who might be adversely affected, is maintained.

Academic Visitors, Post-doctoral Fellows, Research Workers

Whilst these people may be expected to show a higher degree of skill and ability than an Undergraduate or Graduate student, it should be noted that they assume the status of employees and as such have the responsibility to obey all appropriate Regulations and to adhere to Departmental Safety Policies. Irrespective of competence or status, the appropriate activity Risk Assessments must be made and, for example, even very experienced laser users must be registered as users within the Department.

It is the responsibility of the Academic member of staff who invites an Academic Visitor or who engages a Post-doctoral Fellow to ensure that they are informed of their duties in these respects.

It is also the responsibility of the Academic member of staff who invites an Academic Visitor or who engages a Post-doctoral Assistant to ensure that the Head and the Departmental Safety Committee is informed of their presence in the Department especially if they arrive at times other than the normal start of Session.

Accidents and Incidents

It is the responsibility of the Academic Staff member in charge of a laboratory to report in writing any accidents or dangerous incidents, of which they are aware, occurring within that laboratory or involving

any student for whom they are the Supervisor. In the first instance any such accidents or dangerous incidents should be reported to the Departmental Safety Committee.

Safety Inspections/Audits

From time to time, areas within the Department of Physics are subject to inspections in respect of health and safety carried out by the Departmental Safety Committee or the Faculty Safety Officer. The aim of these inspections is to check the completeness of any Risk Assessments, for that area, to check that work procedures recommended as a result of such Assessments and Department safety policies are being adhered to and that the area is free of obvious avoidable hazards and constitutes a safe working environment. Written reports outlining the findings of such inspections and recommendations for improvement are sent to Supervisors responsible for those areas, who are then required to implement those recommendations.

Register 3.1a Project Risk Assessments

No	Name of Project	Doc No	Personnel I/C	Date of Approval by OSHE	Remarks
1	Three dimensional metamaterials fabricated using two photon lithography	OSHE/RA/03/04/FOSo-336	Andrew Bettiol	9 March 20011	
2	Development of novel methods of fabricating metallic nano injection molds for lab on chip biomedical sample preparation and DNA analysis applications	OSHE/RA/03/04/FOSo-162	Jeroen Van Kan	1 Sep 2009	
3	Ultimate beam focusing for MeV protons, the quest for sub 100nm beam spot size	OSHE/RA/3/04 / FOSo-188	Jeroen Van Kan	31 Mar 2010	
4	Integrated optical cells/particles sorter	OSHE/RA/03/04/FOSo-103	Andrew Bettiol	12 Feb 2009	

Register 3.1b Experimental/Equipment Risk Assessments

No	Name of Experiments/Equipments	Doc No	Personnel I/C	Date of Approval by PI	Next Revision Date
1	Maintenance of High Voltage Accelerator	CIBA/RA/Eq/001	Choo Theam Fook & Armin de Vera	12 Apr 2010	11 Apr 2013
2	CARBOLITE Tube furnace / Nikkon Optical microscope	CIBA/RA/Eq/002	Chan Taw Kuei	07 Apr 2010	06 Apr 2013
3	Nickel Plating Machine Maintenance	CIBA/RA/Eq/003	Armin de Vera	12 Apr 2010	11 Apr 2013
4	Sputtering System	CIBA/RA/Eq/004	Armin de Vera	12 Apr 2010	11 Apr 2013
5	Hot Embossing Machine	CIBA/RA/Eq/005		12 Apr 2012	11 Apr 2013
6	Spin Coating Machine	CIBA/RA/Eq/006	Malar/Liu Fan	12 Apr 2010	11 Apr 2013
7	Sample and chemical storage fridges	CIBA/RA/Eq/007	Ren Minqin	25 Aug 2011	11 Apr 2014
8	Polishing machine: Silicon polishing	CIBA/RA/Eq/008	Mallikarjuna Rao Motapothula	7 April 2010	06 Apr 2013
9	Femto-second laser applications	CIBA/RA/Eq/009	Yan Yuanjun; Yang Chengyuan; Vanga Sudheer Kumar	12 Apr 2010	11 Apr 2013
10	Polishing machine	CIBA/RA/Eq/010	Xiong Boqian/Malli	12 Apr 2010	11 Apr 2013
11	UV Exposure	CIBA/RA/Eq/011	P Malar/Liu Fan	12 Apr 2010	11 Apr 2013
12	Pirahna Etching	CIBA/RA/Eq/012	Dang Zhi Ya	31 Oct 2011	31 Oct 2014
13	Laser Writer	CIBA/RA/Eq/013	P Malar/Liu Fan	12 Apr 2010	11 Apr 2013
14	Gamma irradiation	CIBA/RA/Eq/014	Choo Theam Fook	12 Apr 2010	11 Apr 2013
15	two photon lithography	CIBA/RA/Eq/015	John/Prashant/ Sudheer /ChengYuan	01 Nov 2011	01 Nov 2014
16	Supercontinuum Laser Source	CIBA/RA/Eq/016	Sudheer /Prashant	01 Nov 2011	01 Nov 2014
17	Critical Point Dryer	CIBA/RA/Eq/017	Chen CeBelle	31 Oct 2011	31 Oct 2014
18	High Resolution RBS	CIBA/RA/Eq/018	Chan Taw Kuei	01 Nov 2011	01 Nov 2014
19	Optical Trapping; Micro-Photoluminescence measurements; Light coupling into waveguides	CIBA/RA/Exp/001	Andrew Bettiol	30 Apr 2008	30 Apr 2011
20	Low-level Gamma Spectroscopy	CIBA/RA/Exp/002	Chan Taw Kuei	01 Nov 2011	01 Nov 2014
21	Poly-dimethylsiloxane (PDMS) casting	CIBA/RA/Exp/004	Jereon Van Kan	12 Apr 2010	11 Apr 2013
22	Thin films used for sample preparation	CIBA/RA/Exp/007	Ren Minqin	12 Apr 2010	11 Apr 2013
23	Thin films used for sample preparation	CIBA/RA/Exp/008	Ren Minqin	12 Apr 2010	11 Apr 2013
24	General laboratory operations	CIBA/RA/Exp/012	Choo Theam Fook/Ren Minqin	12 Apr 2010	11 Apr 2013
25	General Laboratory Operations and Lab practices for ESP	CIBA/RA/Exp/013	Jereon Van Kan	12 Apr 2010	11 Apr 2013
26	Silicon Etching of selecting areas	CIBA/RA/Exp/014	Dang Zhiya	12 Apr 2010	11 Apr 2013
27	KOH etching	CIBA/RA/Exp/015	Dang Zhiya	12 Apr 2010	11 Apr 2013

28	Removal of positive polymer resists (NanoStripper)	CIBA/RA/Exp/016	Jereon Van Ka	12 Apr 2010	11 Apr 2013
29	Optical Characterization of waveguides	CIBA/RA/Exp/017	Andrew Bettiol	12 Apr 2010	11 Apr 2013
30	Plasmonic microscope imaging	CIBA/RA/Exp/018	Andrew Bettiol	01 Nov 2011	01 Nov 2014
31	Chemical treatment of resist samples and handling of chemicals (clean room, ESP and Chemistry room)	CIBA/RA/Exp/019	P Malar/Liu Fan	12 Apr 2010	11 Apr 2013
32	Silver plating	CIBA/RA/Exp/020	John/Prashant	01 Nov 2011	01 Nov 2014
33	Microfluidics	CIBA/RA/Exp/021	Andrew Bettiol /Yan YuanJun	01 Nov 2011	01 Nov 2014
34	Chemical disposal	CIBA/RA/Exp/022	Malar/Armin	01 Nov 2011	01 Nov 2014
35	Removal of Protek photoresist	CIBA/RA/Exp/023	Malar/Armin	01 Nov 2011	01 Nov 2014
36	RBS measurement	CIBA/RA/Exp/002	Chan Taw Kuei;	30 Arp 2011	30 Arp 2014
37	High-resolution RBS	CIBA/RA/Exp/003	Chan Taw Kuei;	30 Apr 2011	30 Arp 2014
38	HF usage	CIBA/RA/Exp/024	Sara Azimi	01 Nov 2011	01 Nov 2014
39	HF transport	CIBA/RA/Exp/025	Sara Azimi	01 Nov 2011	01 Nov 2014
40	HF storage	CIBA/RA/Exp/026	Sara Azimi	01 Nov 2011	01 Nov 2014
41	HF spillage	CIBA/RA/Exp/027	Sara Azimi	01 Nov 2011	01 Nov 2014
42	HF disposal	CIBA/RA/Exp/028	Sara Azimi	01 Nov 2011	01 Nov 2014

-Risk Assessment form and examples (https://phyintra.science.nus.edu.sg/safetymain.htm)
-Standard operating procedures examples(https://phyintra.science.nus.edu.sg/safetymain.htm)
-Physics department safety inspection checklist:(https://phyintra.science.nus.edu.sg/safetymain.htm)

3.2 Legal and other Requirements

This describes the procedures and guidelines necessary to ensure change control for the processing of new or revised internal and external requirement documents. External requirement documents include NUS/OSHE/MOM/SCDF/NEA directives and other documents that impose requirements on the Laboratory (e.g., laws, regulations and other requirements to which Physics subscribes). Similarly, internal requirement comes from Physics department/laboratory specific safety policy/directives. Please refer to user-friendly legal register in http://www.nus.edu.sg/osh/legalreg.htm for more information. For In-house rules and regulation, please refer to http://www.physics.nus.edu.sg/corporate/safety/In-House-Rules%20and%20Regulations.doc

Summary of various legal Act, requirements & application

1. Fire Safety (Petroleum & Flammable Material) Regulations 2005

Summary of the Act

Under the Fire Safety (Petroleum and Flammable Materials) Regulations 2005, import, transport and storage of petroleum and flammable materials (P&FM) are under the SCDF licensing control. Anyone who intends to import, transport or store petroleum or flammable materials beyond the stipulated exemption quantities is required to obtain a licence from SCDF.

Administered by Singapore Civil Defense Force

SCDF adopts CP 40 for storage of flammable liquids, NFPA 55 for storage of compressed gas, NFPA 45 for lab-based chemical usage as basic design guidelines

Special guideline released for research laboratories after consultation with industries including NUS. Based on NFPA 45: Fire Protection for Laboratories using chemicals, NFPA 55: Storage, use and handling of compressed gases and cryogenic liquids in portable and stationary containers, cylinders and tanks

Requirements

Permit required for storage of PFM in the workplace. Supplier not permitted to sell PFM to users without PFM or quantities exceeding storage limit of PFM

Application

Limits per lab unit:

Flammable gases	170 L	For 50 sq m or less
Oxidizing gases	170 L	For 50 sq m or less
Toxic gases	7L	For 50 sq m or less
Flammable liquids excluding qty in cabinet	i. 30L ii. 1.6 L/m^2 or nor more than 350L	
Flammable liquids including qty in cabinet*	i. 3.2 /m^2 or nor more than 750L	

- not exceeding 250L per cabinet
- not more than 10% allowable quantity is on working bench
- Applies to sprinkler protected labs only. All quantity reduced by half for non-sprinkler lab.

- List of chemicals falling under regulation must be stored within maximum permissible limit and storage requirements stipulated by SCDF. https://wws.nus.edu.sg/osh/resources/fmlist.xls
- For NUS storage limits of PFMs, refer to https://wws.nus.edu.sg/osh/nus_manuals/guidelines/pfml.pdf

For more information
http://www.scdf.gov.sg/Building_Professionals/Fire_Safety_Licensing_and_Enforcement/index.html

2. Workplace Health & Safety (General Provision) Regulations 2006

- Stipulates that every person must take reasonably practical steps to ensure the safety and health of every workplace and worker.
- Requirement for awareness of hazardous substance and control measures to take.
- Requirement materials to be used within permissible exposure levels

For more details:
http://www.mom.gov.sg/publish/momportal/en/legislation/Occupational_Safety_and_Health/workplace_safety_and.html

Licence required: Autoclaves and pressure vessels of certain capacity, must have an authorized inspection tag by MOM (see department safety inspection checklist:
(https://phyintra.science.nus.edu.sg/safetymain.htm)

3. Workplace Health & Safety (Risk Management) regulations

Summary of the Act

The Workplace Safety and Health Act (WSHA) is an essential part of the new framework to cultivate good safety habits in all individuals so as to engender a strong safety culture in our workplace. It emphasized the importance of managing workplace safety and health proactively by requiring stakeholders to take reasonably practicable measures to ensure the safety and health of workers and other people that are affected by the work being carried out. The Workplace Safety and Health Act had come into effect on 1 March 2006.

Requirements

In every workplace, the principal shall conduct a **risk assessment** in relation to the safety and health risks posed to any person who may be affected by his undertaking in the workplace

The principal shall take all reasonably practicable steps to eliminate any foreseeable risk to any person who may be affected by his under taking in the workplace

Every principal shall maintain a record of any risk assessment conducted, any measure or safe work procedure implemented, submit the record when required and shall be kept for a period of no less than 3 years

Every principal shall review the risk assessment at least once every 3 years, upon the occurrence of any bodily injury to any person as a result of exposure to a hazard or when there is significant change in work practices.

1. Workplace Health & Safety (Incident Reporting) regulations

Summary of the Act

The regulations specify the responsibilities of the relevant parties to report accidents, dangerous occurrences and occupational diseases at work places.

Legal compliance to report any incidents and accidents

The requirement also encourages employer to take responsibility for monitoring workplace accidents, dangerous occurrences and occupational diseases and to take steps to prevent them.

Requirements

Incident involving the following must be reported as soon as reasonably practicable:

- workplace accident resulting in the death of an employee
- workplace accident resulting in the injury of an employee who is given 3 consecutive days of medical leave or hospitalized for at least 24 hours
- a subsequent death of an employee as a result of an injury at the workplace
- workplace accident which involves a self-employed person or member of public and results in his or her death or treatment in hospital for the injury
- dangerous occurrence
- occupational disease

Employer required to keep a record of any notifications and reports made and every record must be kept for at least 3 years

For more info: https://staffweb.nus.edu.sg/oshe/notice.htm

2. Workplace Health & Safety (First Aid) Regulations 2006

Provide requirements of first-aid facilities (first aid box, first aiders) in the workplace.

3. Environmental Pollution Control Act (Hazardous Substances)

Summary of the Act

Permit required for use, keep and in possession of hazardous substances (HS) in the schedule. Companies dealing with wide spectrum of hazardous substances for laboratory use are allowed to apply under *'Laboratory Reagents* Except Those in Annex I' in their Hazardous Substances Licence or Permit.

Requirements

Required to keep a record of the quantity of the HS
Storage of the HS

- for the approved purpose
- in the approved container
- in an area entry restricted to authorized personnel
- with labeling stated in the code of labeling

Personnel are to receive adequate instruction and training to understand the nature of all the HS being stored and the emergency response plan to be implemented in the event of any emergency involving any HS stored

Establish and keep up-to-date adequate emergency response plan to deal with any spillage

- Regulates purchase and use of toxic and environmentally hazardous chemicals
- The list of chemicals can be found here (http://app.nea.gov.sg/cms/htdocs/article.asp?pid=1428)
- For quantity limits, please visit (http://www.nus.edu.sg/osh/programme/envmgt/hazardlist2.htm)
- All hazardous chemicals must not be bought or used without approval and license applied for through Faculty Safety and Health Officers
- For more information http://app.nea.gov.sg/cms/htdocs/article.asp?pid=1439

4. Poisons Act

Summary of the Act

*The **Poisons Act** which was first gazetted in 1939, regulates the importation, possession and sales of potent medicinal substances (poisons) so as to prevent misuse or illicit diversion of poisons.* Poisons are listed under the Poisons Act and are identified by their chemical or generic names. The Poison Rules which are made under the Poisons Act serves to ensure the general safe handling of poisons

Requirement

The poison must be kept:

a. in a bottle or other vessel tied over, capped, locked or otherwise safely secured in a manner different from that in which bottles or vessels containing non-poisonous substances are secured in the same warehouse
b. in a bottle or other vessel readily distinguishable by touch from the bottles or vessels in which non-poisonous substances are kept in the same warehouse
c. in a bottle, vessel, box or package kept in a room or cupboard under lock and key set apart for the keeping or storage of dangerous substances

The list of poisons can be found here http://www.nus.edu.sg/osh/legislation/poisonlist.doc

- Records of Toxins and flammable chemicals must be kept.

5. Chemical Weapons Convention

Summary of Act

The Chemical Weapons Convention (CWC), also known as the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on its destruction, entered into force on 29 April 1997. Singapore ratified this convention in May 1997.

The **Singapore National Authority for the Chemical Weapons Convention** is a national body responsible for the implementation of the treaty in Singapore. The **Chemical Weapons (Prohibition) Act** was passed by Parliament on 25th April 2000 and assented to by the President on 8th May 2000. It was later revised in 31st December 2001. *Licence required for the possession, use and storage of chemical defined in schedule 1, 2 and 3*

Requirement

The Principal Investigator (PI) will seek approval by OSHE prior to the purchase of any chemicals listed under the Chemical Weapons (Prohibition) Act.

PI must inform OSHE if he or she intends to use the chemicals of purposes either than those stipulated in the initial application

A copy of the MSDS provided by the supplier must be made available in hardcopy in the laboratory at all times.

The Principal Investigator must inform OSHE of the transfer of ownership of the scheduled chemicals .The Principal Investigator must inform OSHE of the loss of any scheduled chemicals within 24 hours.

These chemicals must be kept in a storage cabinet or fridge under lock and key. The key shall be kept by the Principal Investigator. Only personnel authorized by the Principal Investigator will be allowed to use the chemical weapon.

Inventory Control of Scheduled Chemicals

- The logbook system is implemented for each chemical weapon that is used in the laboratory.
- Inventory records shall be regularly updated
- The Chemical Weapon Logbook must contain the following information:
  - Name of chemical weapon in both common name and scientific name
  - Chemical weapon formula or composition
  - Date of purchase
  - Original quantity of chemical weapon purchased
  - Date of usage of the chemical weapon
  - Quantity of usage of the chemical weapon
  - Name of personnel using the chemical weapon
  - Activity level of the chemical weapon (radioactive source) and date of measurement if applicable
  - Location where the chemical weapon is kept
  - Name of person responsible of the chemical weapon
  - Name of person responsible for the key to where the chemical weapon is kept
  - Transfer of ownership or location record.

The list of chemicals can be found here
http://www.nacwc.gov.sg/word_doc/PDF/controlledchemicals_220606.pdf

- All chemicals must be stored, used and disposed in accordance to the requirements of the regulation.
- A copy of the act can be downloaded here http://agcvldb4.agc.gov.sg/act_body_c.html

6. Biological Agent & Toxins Act (BATA)

Summary of the Act

The Biological Agents and Toxins Act came into force on 3rd January 2006. *Under this Act, approval is required for the possession, import, handling and transportation of scheduled biological agents and toxins. that are known to be hazardous to human health in Singapore*

Requirement

License required for the importation, transportation and possession of biological agents listed in the First and Second schedule or inactivated form of these agents and toxins listed in the Fifth schedule

License required for the importation of agents listed in the Fourth schedule.

- Proper decontamination is required for all waste prior to disposal
- The BATA schedule for Biological Agents & Toxins is found :

http://www.nus.edu.sg/osh/_files/legislation/biological_agents_toxins060807.pdf

Licence : Agent specific licence issued by MOH to PIs

10. Radiation

a) Radiation Protection (Ionizing Radiation) Regulation

Radiation Protection (Transport of Radioactive Materials) Regulations

- Specifies requirements for use and storage of radioactive materials/ irradiation apparatus

- Research personnel using any radioactive material/irradiating equipment must be adequately trained in its handling, transportation and storage.
- Research personnel using any radioactive material/irradiating equipment must be medically certified & monitored

b) Radiation Protection (Non -Ionizing Radiation) Regulation

Laser class 3B and above and main laser user need licence yearly. Main laser user needs to go for medical checkup. Ultrasonic cleaner 50W and above needs licence.

- For more information http://app.nea.gov.sg/cms/htdocs/category_sub.asp?cid=263
- Department Safety Inspection checklist (https://phyintra.science.nus.edu.sg/safetymain.htm)

Register 3.2 Applicable Legal Requirements

No	Name of Activity	Applicable Acts/Regulation	Name of IC for Compliance
1	Laser licenses and main laser use	Radiation Protection Act (Chapter 262)	Asst. Prof Andrew Bettiol
2	AN-2500 Van de Graaf Accelerator & Singletron Accelerator	Radiation Protection Act (Chapter 262)	Choo Theam Fook
3	Flammable (PFM) Liquid Record: MAX allowance	Fire Safety (Petroleum & Flammable Material) Regulations 2005	Choo Theam Fook
4	Risk Assessments for equipments/ experiments by students	Workplace Health & Safety (Risk Management) regulations	Ren Minqin
5	Replenish on First Aid boxes bimonthly	Workplace Health & Safety (First Aid) Regulations 2006	Ren Minqin
6	First Aid course training for staff	Workplace Health & Safety (First Aid) Regulations 2006	OSHE
7	Physics Department Incident report	Workplace Health & Safety (Incident Reporting) regulations	Physics department Safety Comm.
8	Keep track on Chloroform stock	Poisons Act	Ren Minqin
9	Keep track on EPCA chemicals stock	Environmental Pollution Control Act (hazardous substances)	Ren Minqin
10	Keep track on SPF chemicals stock	Singapore Police Force Explosive Precursors List (SPF)	Ren Minqin

Register 3.3 Licenses & Calibration Reports

No	Name of Equipment	Doc No / Licence No	Start Date	Expiry Date	Name of IC for Compliance
1	AN-2500 Van de Graaf Accelerator	L3/01392/0004	1 Jan 2010	31 Dec 2011	Choo Theam Fook
2	Singletron Accelerator	L3/01392/0044	1 Apr 2009	31 Mar 2012	Choo Theam Fook
3	Laser Nd-YAG type/532nm/33mW	N2/01444/0057	1 Jan 2010	31 Dec 2010	Asst. Prof Andrew Bettiol
4	Laser GaAlAs type/473nm/23mW	N2/01444/0058	1 Jan 2010	31 Dec 2010	Asst. Prof Andrew Bettiol
5	Laser Nd-YAG type/1064nm/230mW	N2/01444/0059	1 Jan 2010	31 Dec 2010	Asst. Prof Andrew Bettiol
6	Laser GaAlAs type/405nm/50mW	N2/01444/0111	1 Jan 2010	31 July 2012	Asst. Prof Andrew Bettiol
7	Laser HeNe type/632.8nm/17mW	N2/01444/0061	1 Jan 2010	31 Dec 2010	Asst. Prof Andrew Bettiol
8	Laser GaAlAs type/488nm/40mW	N2/01444/0111	1 Sep 2009	31 July 2012	Asst. Prof Andrew Bettiol
9	Laser Nd:YVO4 type/532nm/10W	N2/01444/0114	1 Jan 2010	31 Dec 2012	Asst. Prof Andrew Bettiol
10	Laser Ti-Sapphire type/700-980nm/1.3W	N2/01444/0113	1 Jan 2010	31 Dec 2012	Asst. Prof Andrew Bettiol
11	Laser GaAlAs (class 3b) type/(1525-1575)nm/10mW	N2/01444/0085	1 April 2011	31 Mar 2012	Asst. Prof Andrew Bettiol
12	Fume Hood [asset no:8144004842-0]	FH150908-1	11 Sept 2009	10 Sep 2010	Choo Theam Fook
13	Fume Hood [asset no:8144004843-0]	FH150908-2	11 Sept 2009	10 Sep 2010	Choo Theam Fook
14	Fume Hood [asset no:8144005110-0]	FH150908-2	11 Sept 2009	10 Sep 2010	Choo Theam Fook
15	Gamma Chamber 4000A (Co-60: 6800Ci, Jan 1984)	L3/01392/0045	01 Jan 2011	31 Dec 2011	Choo Theam Fook
16					
17					
18					
19					
20					
21					
22					

Register 3.4 Laser Users, N3 Licenses

No	Name of Personnel	Doc No / Licence No	Start Date	Expiry Date	Name of PI
1	Asst. Prof Andrew Bettiol	N3/01444/0062	1 Jan 2010	31 Dec 2010	
2	Asst. Prof Van Kan Jeroen	N3/01444/0106	1 Aug 2009	31 Jul 2010	
3	Dr Chammika Udalagama	N3/01444/0139	1 Feb 2010	31 Jan 2011	Prof Frank Watt
4	Yan YuanJun	N3/01444/0111	1 Aug 2008	31 Jul 2009	Asst. Prof Andrew Bettiol
5	Vanga Sudheer Kumar	N3/01444/0147	1 Jul 2010	31 Jun 2011	Asst. Prof Andrew Bettiol
6	Mallikarjuna Rao	N3/01444/0096	15Apr 2009	31 Mar 2011	Prof Mark Breese
7	Xiong Boqian	N3/01444/0105	1 Aug 2009	31 Jul 2010	Prof Mark Breese
8	Choo Theam Fook	N1/01392/0016	1 Apr 2009	31 Mar 2010	A/P Sow Chorng Haur
9					
10					
11					
12					
13					

4 Implementation and Operation

4.1 Structure and Responsibility.

The process for identifying employee roles, responsibilities and authority is documented in the Roles and Responsibilities, which is provided and maintained through the Department Safety Website Description. This includes the following Occupational Safety and Health responsibilities for all staff:

- Perform work effectively, efficiently, and safely.
- Cooperate with and assist other staff
- Keep capabilities and qualifications current, including completing required training for assigned tasks and work location
- Comply with Laboratory policies, standards, and procedures, and regulatory requirements.
- Maintain awareness of environmental impact of work, and apply pollution prevention and waste minimization techniques.
- Identify potential hazards, environmental concerns, and unsafe conditions or practices in work or at work site, and implement or suggest controls to minimize risk
- Cease work activity, and/or issue a Stop Work Order upon observing imminent danger, and report the danger immediately to laboratory supervisors or Department Safety Committee.
- Respond to emergency situations, alarms, or occurrence in an appropriate manner.
- Adhere to instructions on location warning signs and postings.

Specialized roles are assigned on the department's safety organization chart (department safety web page-to be updated) that is issued by the Department Safety Committee annually and as needed when assignments change.

Everyone is ultimately responsible for the identification and reporting of hazards and risks. This is accomplished by the reporting any new experiments or modifications to existing experimental activities to the Lab Module Coordinator.

Register 4.1a Researchers

No	Name	Designation	Latest Training / Experience
1	Prof Frank Watt	Professor fellow	Sept 27 2007 dept safety training/workshop
2	Assoc Prof Thomas Osipowicz	CIBA director	Sept 27 2007 dept safety training/workshop
3	Prof Mark Breese	Professor	Sept 27 2007 dept safety training/workshop
4	Asst Prof Jeroen van kan	Asst Professor	Sept 27 2007 dept safety training/workshop; N3 License number: N3/01444/0106
5	Asst Prof Andrew Bettiol	Asst Professor	N3 License number: N3/01444/0062; Sept 27 2007 dept safety training/workshop
6	Dr. Chammika N.B. Udalagama (First Aider)	Research Fellow	Radiation Safety (non-ionizing); dept safety training/workshop, CIBA safety talk,
7	Dr. Ren Minqin	Research Fellow	Radiation Safety (non-ionizing), Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
8	Dr Piraviperumal Malar	Research Fellow	Faculty safety induction, Chemical Safety, Risk Management for Laboratories
9	Dr Chen CeBelle	Research Fellow	Faculty safety induction, Chemical Safety, Risk Management for Laboratories
10	Dr Pattabiraman Santhana Raman	Research Fellow	Faculty safety induction, Chemical Safety, Risk Management for Laboratories
11	Mr Armin Baysic De Vera	Research Assistant	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
12	Mr. Chan Taw Kuei	Research Fellow	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
13	Mr. Choo Theam Fook	Lab technologist	Radiation Safety (ionizing); Fire warden training; Sept 27 2007 dept safety training/workshop, CIBA safety talk

14	Ms Xiong Boqian (Aky)	Ph.D Student	Radiation Safety (non-ionizing); Fac Safety Induction 20 Aug 2007; N3 License number: N3/01444/0105, CIBA safety talk,
15	Mr Yan Yuanjun (John)	Ph.D Student	Radiation Safety (non-ionizing); Fac Safety Induction 20 Aug 2007; N3 License number: N3/01444/0111, CIBA safety talk,
16	Mr Chen Xiao (Kyle) (First Aider)	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
17	Mr Mallikarjuna Rao Motapothula	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
18	Mr Vanga Sudheer Kumar	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
19	Miss Sara Azimi	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
20	Miss Dang ZhiYa	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
21	Miss Song Jiao	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
22	Mr Liang Haidong	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
23	Mr Wang YingHui	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
24	Mr Yang ChengYuan	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
25	Mr Turaga Shuvan Prashant	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
26	Mr Yao Yong	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
27	Mr Liu Fan	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories

28	Mr Wu Jian Feng	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
29	Mr Liu NanNan	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
30	Mr Mi Zhao Hong	Ph.D Student	Faculty safety induction, Chemical Safety, CIBA safety talk, Risk Management for Laboratories
Ad-Hoc Visitors			
31			
32			

Register 4.1b Roles and Responsibility

Responsibilities	Details	Person In charge	Assistant(s)
Safety Lead	Person In charge of safety activities in the laboratory to communicate with PI, students and department safety committee to establish and maintain good safety management practice in the laboratory Keep all necessary safety records in the laboratory	Choo Theam Fook	Ren Minqin
Training	Each group leader within CIBA will be responsible for members of his own group.	Frank Watt Thomas Osipowicz Mark Breese Jeroen van Kan Andrew Bettiol	N/A
Inventory Management	Equipment (Fume hood, pressure vessel etc) ------ Chemicals ------	Choo Theam Fook Ren Minqin	N/A
Waste Disposal		Malar/Armin	Ren Minqin
Housekeeping		Thomas Osipowicz	All CIBA members

4.2 Training, Awareness, and Competence

A) Non-academic staff

It is mandatory for them to attend in-house safety training courses conducted by OSHE and external consultant. Each year they are expected to plan, schedule, discuss progress with their supervisors on the relevant training courses including NUS in-house safety training courses conducted by OSHE and external consultant. We have a 3-year recent safety course attendance record of non-aced staff. Their safety training record status is kept by the department training coordinator (Mrs Phua Swee Wah). Those who have attended before will be encouraged to attend safety refresher course after 3 years. Almost all safety committee members attended Internal safety audit course and OHS safety management system. Laboratory-in-charge should inform her as soon as possible if any of their staff do not attend the above safety courses.

B) Graduate student (GS) safety induction.

Every year, the department conducts twice yearly safety induction program in conjunction with Science Faculty with certificates given after passing the tests. Safety talks and videos shows (including our home-made laser and gas cylinder safety video and macromedia) were presented and shown by our department radiation safety experts (Prof Sow and Prof Thomas). Mr Teo Hoon Hwee sends graduate/Honours students for above safety training (App PSMS 4.4.2b). This is to ensure graduate students are trained and qualified to perform their job. Staff may join in. Laboratory in-charge should check their student safety training certificates and highlight immediately to Mr. Teo (for graduate students) and Mrs Lee Soo (for Honours students) those who do not attend the above safety training. Time spent in the training will count towards their laboratory demonstrator service.

C) Academic staff

PIs do risk assessments (RAs) and submit them to department, OSHE and relevant authorities for approval of research funds before they are allowed to commence on their projects. They are expected to send their staff for safety trainings relating to their research works. Specific training requirements are identified through experimental safety review and routine work planning. RAs, Standard operating procedures(SOPs), and Lab Safety Management System(SMS) training for lab-based staff and graduate students was conducted on September 27 2007 with follow up activities, including auditing by OSHE, Faculty Safety Committee, Physics PIs and external safety consultant auditors. All lab-based PIs are required to coordinate and submit their research group RAs, SOPs and SMS to the safety committee. Examples of these can found in Physics Intranet https://phyintra.science.nus.edu.sg/safetymain.htm which also contains other reference video (taken by Physics department), materials, including safety committee members assigned to assist specific labs. The aim of the whole program is to certify PIs that have effectively implemented the laboratory-based SMS (as part of legal compliance). New lab-based PIs and their staff/students/visitors are required to use this available resources for their lab management system.

D) Safety Training Access

Staff safety training course detail information and registration are available in the following websites: https://wws.nus.edu.sg/staff/ohr/training/index.htm and http://www.nus.edu.sg/osh/training/safety.htm. OSHE safety training videos https://share.nus.edu.sg/osh/video/default.htm. Safety committee has uploaded our home-made gas cylinder safety video and macromedia in our department safety website for continuous use by our department and bigger audience from outside. We have a small library of safety video CDs (including our home-made laser safety video) for NUS department use. From time to time to time, and Faculty organize OSHE safety seminars.

E) CIBA Safety Website: http://www.ciba.nus.edu.sg/other/other/safety.html

F) Others

We adopt OSHE SOPs for contractors and others so they are aware of the Occupational Safety and Health policy and their roles in Occupational Safety and Health management. SOP for control of contractors in labs:
https://wws.nus.edu.sg/osh/nus_manuals/sop/SOP_U04_Control_of_Contractors_Working_in_Labs.pdf.
Form on control of contractor:
https://wws.nus.edu.sg/osh/nus_manuals/sop/Forms_on_control_of_contractor_activities.pdf

4.3 Consultation and Communication

Communication and Consultation between staff, students and supervisors is a fundamental principle in OHSAS18001. Physics department transfers safety information to staff, students and visitors in many ways, including the posters in bulletin boards, briefings, emails, induction programs, department newsletters, websites, handbook, memos, safety competitions and others media.

An important element to stress is that the communication and consultation is open for two-way flow of ideas and knowledge. Everyone is encouraged to contribute questions, concerns, and comments and interaction with their supervisors. Vital or time sensitive safety information is conveyed by department/Lab wide emails and briefing.

Through feedbacks, staff/students are involved in the development and review of policies and procedures to manage risks; consulted where there are any changes that affect workplace health and safety; and represented on health and safety matters by participation in Department Safety Committee, inspections, competition and by participation in the work planning and control process.
There is also a feedback box location just outside department general office

4.4 Safety Awareness Communication to Members and Visitors

Objectives

This brief communication is directed at all users of Research Laboratories shown in Table 1, (from here on, will be designated as *the laboratory*), Department of Physics, National University of Singapore, under supervision of the Principal Investigators.

Research Laboratory	Location	Principle of Investigators
CIBA main lab (3.5 MV dynamitron ion accelerator)	S7-02-01 & 01-01	A/Prof Thomas Osipowicz & Assistant Prof Jeroen van Kan
CIBA van de Graaf Accelerator lab	S7-01-07	A/Prof Thomas Osipowicz
CIBA clean room	S7-01-01A	Assistant Prof Jeroen van Kan
CIBA/ESP nano fabrication lab	S7-01-08	Assistant Prof Jeroen van Kan
CIBA Chemistry lab	S7-01-09	A/Prof Thomas Osipowicz & Assistant Prof Jeroen van Kan
CIBA Thermal Processing lab	S7-01-16	Prof Mark Breese
CIBA Optical Material & Device lab	S11-02-09	Assistant Prof Andrew Bettiol

Table 1: CIBA research laboratories

The primary purpose of this communication is to raise the awareness and to instill a habitual consideration of safety among every user of *the laboratory*. Every user of *the laboratory* will have to read and endorse the document as an acknowledgement of his/her understanding of the content of this communication before the commencement of any experimental work in *the laboratory*.
Nobody will intentionally wish to hurt or harm others who are involved with the activities in the same laboratory; yet even a moment of forgetfulness or carelessness in the laboratory, by anyone, can lead to accidents and unwanted injuries. Therefore, it is the responsibility of each and every user of *the laboratory* to make a conscious effort to promote 'safety-first' ethics and practices. Such vigilance will help to minimize or eliminate the level of risk and potential accidents on a daily basis.

Steps to be considered seriously to ensure a safe working environment

Safety & Health

We shall make every effort to ensure the utmost health, safety and security procedures in all our group's activities, be it personal, work-related, or out with our laboratories**.** This shall involve our continual efforts to eliminate or minimizing the risk of accidents, and to abide by the laws and regulations of the department, the University, and the Country.

Competency: Safety means being competent in handling risky situations in the laboratory. It is mandatory that all members of *the laboratory* must pass the safety test conducted by the Department/Faculty/OSHE. The safety test provides the workers with the opportunity to study the various safety issues in detail. If in doubt, each worker is highly encouraged to review the risk assessments and MSDS.

Care: Safety begins with the exercise of care. Caring about one's own safety and the safety of others is of primary priority. Each member of *the laboratory* should only work in conditions that are deemed to be safe for oneself and for others. Leave no room for error. Carelessness is inexcusable. Death and serious injury can result out of negligence.

Information: Safety means gathering information on the agents, procedures and equipment needed so that each worker will have knowledge of the potential hazard that may arise from the experiments to be conducted. This means taking time to find the relevant information without cutting corners. MSDS of chemicals can be found online and in *the laboratory*. The MSDS website is available on the laboratory computer for easy access and consultation.

Anticipation: Safety means having the ability to anticipate any potential hazard concerning the equipment or/and chemicals that are employed in the experiment. This is therefore essential in the avoidance of accidents. Towards this end, each member of *the laboratory* is strongly advised to consult senior graduate students, research staff or the PI when there is doubt about carrying out an intended procedure. Do NOT carry out any procedure without having been through the training on how to use particular equipment correctly or execute the methodology with some level of confidence.

Planning: Safety means being able to plan an experiment thoroughly, identify the known hazards connected with it, and eliminate or minimise those hazards before the start of the experiment. This requires clear thinking and diligence. If there is any doubt, do not perform the procedure. Seek assistance from your mentor. Risk assessment on the specific methods must be duly completed and checked by the mentor. MSDS and SOPs must be read and fully understood for each agent, solvent, equipment and procedure that will be employed in an experiment.

Discipline: Safety means being totally disciplined in the execution of everyday tasks to prevent careless accidents or unfortunate incidents. Sloppiness and lazy work practice is unacceptable in *the laboratory*. Forgetfulness, irrespective of exhaustion, overwork, bad time management or personal problems will not be tolerated. Absolute discipline will lead to a safer working environment for all.

Protection: Safety means wearing adequate protective clothing in the laboratory.

1. Lab coats must be worn and buttoned up when working in *the laboratory*. They must be removed before entering the public areas. Lab coats must be worn inside the work area when you are carrying out experiments or transferring chemicals and biologicals.

2. Sandals, shorts and short skirts are inadequate and must not be worn in the laboratory.
3. Cotton clothing and leather shoes offer the best protection against chemical spills and fire. Being sensible is better than being sorry.
4. For general safety, long hair must be tied back.
5. Gloves, when worn for an experiment, must be removed before leaving *the laboratory*. Do not touch the telephone, a door handle or a computer keyboard whilst wearing gloves.
6. Safety glasses or goggles must be worn in the laboratory at all times.
7. Contact lenses should be worn with caution in the laboratory as chemical fumes may become trapped between the lens and eye causing permanent damage. Always wear goggles in the lab to prevent such damage.
8. Hands should be washed as a matter of course, before leaving the laboratory and before entering the public areas.
9. Consumption of food and drink are strictly not allowed in *the laboratory* under any circumstances.
10. Undergraduate doing experiment in the lab must be supervised at least by a senior graduate student.

Housekeeping: Safety means being able to work in a clean and systematic laboratory.
It is the responsibility of each individual user of *the laboratory* to ensure there is nothing left blocking the passageways, nothing is left balanced or stacked precariously, and all consideration for others has been taken within the daily routine of *the laboratory*. Good housekeeping is essential. Inspections will be carried out regularly.

Camaraderie: Safety means being able to remind each other about potential risks in the laboratory. A cordial and cohesive environment is highly encouraged in the research group. This will be particularly helpful to new members in the group who will need to familiarize themselves with the *modus operandi* of the laboratory, the department, the university and Singapore.

In-house check list:

Have you done?

☐ *Safety online multiple choice questions (passing score: 90%) http://www.ciba.nus.edu.sg/other/other/safety.html

☐ Laboratory Safety Manual (CIBA)

☐ *Record of attendance and Assessment Form by Faculty of Science Safety Orientation Training (http://www.ciba.nus.edu.sg/other/other/safety/orientation.pdf)

☐ *Safety and Health Induction Checklist: for New Laboratory users [Guidelines for Laboratory Supervisors/Principal Investigators] (http://www.ciba.nus.edu.sg/other/other/safety/checklist.pdf)

☐ *Exclusion of Liability and Indemnity Form for access to facility (http://www.ciba.nus.edu.sg/other/other/safety/facilityaccess.pdf)

***Note:** New users are required to submit the checklists and safety online MCQ to your principal investigator (supervisor) within 1 week of joining CIBA

For detailed documentation on all CIBA members, do refer to the **Safety Awareness Communication to Members and Visitor: Check List (Procedure No: CIBA/CSMS/02) booklet and safety training's records.**

4.5 Document and Data Control

The procedures for controlling documents and data are established, maintained and ensured they can be located. They are periodically reviewed, revised & approved. Only current versions are available and obsolete versions promptly identified and removed. NUS standard format for procedure writing is adopted:

a) Objective b) Scope c) Responsibilities d) Definition
e) Procedure f) Records g) Appendixes

This applies to documents as plans, manuals, procedures, and instructions that are internal to departments, or projects, but are not standard based documents. Documents of external origin (e.g., operating/maintenance manuals, safety plans, contractor procedures) that are necessary for the planning and operation of a system/process that have an Environmental, Safety and Health (ESH) impact are required to be controlled. The documents may prescribe design and manufacturing operations and processes; inspection and test procedures; installation, construction, operating and maintenance procedures; monitoring procedures, research procedures, and protocols. Internal controlled documents are reviewed for adequacy, approved for release by safety committee, and distributed to specific staff or used at the locations where the prescribed activity is performed.
The department safety committee establishes, approves and maintains the OHS documents and notifies the appropriate staff upon modification. They are reviewed regularly. Relevant documents are maintained, updated with controlled reference numbers.

Register 4.5 List Controlled Documents in the Laboratory

No	Name of Documents	Procedure No.	Person in charge
1	Comprehensive Safety Management System (CSMS)	CIBA/CSMS/01	Ren Minqin
2	Incident Reports	CIBA/CSMS/01	Choo Theam Fook
3	Emergency Procedures	CIBA/CSMS/01	Choo Theam Fook
4	CIBA Safety Multiple Choice Online Quiz	CIBA/CSMS/04	PIs
5	CIBA Safety Multiple Choice Online Quiz For External Collaborators' User/ Clean room User	CIBA/CSMS/05	Asst Prof Jeroen Van Kan

6	Licences	Safety Committee, Department of physics (Mr. Ng Tong Hoe)	Ng Tong Hoe (Department level) & Choo Theam Fook (CIBA level)
7	Risk Assessments (RA)	CIBA/CSMS/02	Ren Minqin
8	Standard Operating Procedures (SOP)	CIBA/CSMS/03	Ren Minqin
9	Inventory Records	Department of Physics kept record in SAP	Choo Theam Fook (Equipments); C Ren Minqin (Chemicals)
10	Waste Disposal records	Safety Committee, Department of physics (Mr. Wong How Kwong)	Wong How Kwong (Department level) & Chan Sook Fun (CIBA level)
11	Maintenance records	Log book	Choo Theam Fook

4.6 Operational Control

Establishing and implementing operational controls for activities that have substantial risk is documented in Risk Assessment form. Risk, in this context, is the product of several factors such as frequency, likelihood and severity. Points for frequency, likelihood and severity are used. A specific range of point values for risk is associated with one of five descriptive classes of risk: negligible, acceptable, moderate, substantial and intolerable.
Each experiment/equipment/facility within the Physics Department is expected to comply with the MOM/SCDFNEA/OSHE/department/lab specific SOPs.

Controls are needed to protect the health and safety of the staff and public by eliminating, reducing or mitigating hazards. These can include:

- Engineered controls (reducing chemical inventory or substitution, machine guards, fall protection barriers, exhaust ventilation control). These controls are given first priority for adoption and implementation;
- Administrative controls (training, which entails awareness training and job-specific training on OSH requirements to ensure competence commensurate with responsibilities; procedures including compliance with applicable Physics subject areas; emergency preparedness and response requirements; and stop work authority); and
- Personal Protective Equipment, which are deemed the last defense for controlling hazards and minimizing exposures to workers.

Implement controls: Establish and implement programs to achieve objectives. Define control, provide training, ensure procedures are followed, maintain records, and prepare OSH documents (e.g., work permits), complete reporting, and enact emergency preparedness and response measures.

Confirm Readiness: Conduct self-assessments, inspections (list to be updated checklist in https://phyintra.science.nus.edu.sg/safetymain.htm), audits, or reviews to determine that adequate controls are in place to allow work to proceed

Register 4.6a Equipment Register and Maintenance Schedule

No	Item	Qty	Maintenance Schedule	Personnel I/C
1	3.5 MV dynamitron ion accelerator	1	As & when required	Choo Theam Fook
2	Van Der Graff Accelerator	1	As & when required	Choo Theam Fook
3	Fume hoods	3	Annually	Choo Theam Fook
4	Cleanroom's air conditioner	1	Bi-monthly	Armin Baysic De Vera
5	Compressors	2	Annually	Choo Theam Fook
6	Lasers	8	As & when required	Asst. Prof Andrew Bettiol
7				
8				
9				
10				

Register 4.6b Standard Operating Procedures

No	Name of SOP	Personnel I/C	Date of Approval	Next Revision Date	Doc No.
1	Poly-dimethylsiloxane (PDMS) Casting	Jeroen Van Kan	31-Oct-11	13-Nov-14	CIBA/SOP/Exp/001
2	Piranha Ethching	Mark Breese /ZhiYa	31-Oct-11	31-Oct-14	CIBA/SOP/Exp/002
3	Standard Operating Procedure for Chemical Handling	Jeroen Van Kan	31-Oct-11	31-Oct-14	CIBA/SOP/Exp/003
4	Parallel UV Lithography	Jeroen Van Kan	14-Nov-08	13-Nov-11	CIBA/SOP/Exp/004
5	Re-fill of Liquid Nitrogen from Main tank to 35 L Dewar Storage vessel & Re-fill of Detector Dewar tank from Storage vessel	Armin/Raman	13-Jul-11	13-Jul-14	CIBA/SOP/Exp/005
6	Low Level Gamma measurement	Thomas /TK/Min	1-Jun-11	1-Jun-14	CIBA/SOP/Exp/006
7	3.5 MV dynamitron ion accelerator	Armin/Choo	31-Oct-07	13-Nov-11	CIBA/SOP/Eq/001
8	Van Der Graff Accelerator	Choo Theam Fook/Armin Baysic De Vera	31-Oct-07	13-Nov-11	CIBA/SOP/Eq/002
9	Spin coater	Jeroen Van Kan /LiuFan/YingHui	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/003
10	Magnetron Sputtering/ FCVA C.SY	Jeroen Van Kan/Malar/Armin	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/004
11	Hot Embossing Machine	Jeroen vanKan /Yinghui/Liufan	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/005
12	Refrigerators and -85°C freezer	Ren Minqin	30-Apr-08	13-Nov-11	CIBA/SOP/Eq/006
13	Grinding and polishing machine	Teo EeJin	30-Apr-08	13-Nov-11	CIBA/SOP/Eq/007
14	Laser Writing	Jeroen Van Kan	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/008
15	Plasma Cleaner	Jeroen Van Kan	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/009
16	Spin coater, SPIN150 (ESP lab)	Jeroen Van Kan	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/010
17	Femto-second laser	Andrew Bettiol	12-Apr-10	11-Apr-13	CIBA/SOP/Eq/011
18	Nickle Plating	Jeroen Van Kan	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/012

19	20 degree beamline	Jeroen/ Yaoyong/ Raman/YingHui/Liu Fan	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/013
20	10 degree beamline	Jeroen Van Kan/Malar	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/014
21	Optical Characterization of Waveguides	Vanga Sudheer Kumar	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/015
22	Plasmonic imaging microscope	Andrew Bettiol	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/016
23	Two photon lithography	Andrew Bettiol	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/017
24	Critical Point Dryer	Chen CeBelle	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/018
25	30 degree beamline	Frank Watt/Kyle	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/019
26	90 degree beamline	Thomas/TK	31-Oct-11	31-Oct-14	CIBA/SOP/Eq/020
27	Lab sign posting and labeling	Ren Minqin	21-Oct-04	by OSHE	OSHE/SOP/GL/01
28	Incident/ Accident Reporting and Investigation	Choo Theam Fook	2-Aug-06	by OSHE	OSHE/SOP/GL/02
29	Hazardous Substance Inventory Record	Choo Theam Fook/Ren Minqin	21-Oct-04	by OSHE	OSHE/SOP/GL/03
30	Project/Task Risk Assessment	PIs	22-Nov-05	by OSHE	OSHE/SOP/GL/05
31	Personal Protective Equipment	Choo Theam Fook / Ren Minqin	21-Oct-04	by OSHE	OSHE/SOP/GL/08
32	Electrical Safety in the Laboratory	Choo Theam Fook/Armin Baysic De Vera	21-Oct-04	by OSHE	OSHE/SOP/GL/10
33	Chemical Waste Disposal	Choo Theam Fook /P Malar/Armin	21-Oct-04	by OSHE	OSHE/SOP/CS/01
34	Chemical weapons (Prohibition) Act- Storage,Use & Disposal Requirement	Choo Theam Fook / Ren Minqin	16-Jun-05	by OSHE	OSHE/SOP/CS/02
35	Safe Operation of Fume Hood	Choo Theam Fook / Ren Minqin	21-Oct-04	by OSHE	OSHE/SOP/CS/03
36	Chemical Spill Response	Choo Theam Fook / Ren Minqin	21-Oct-04	by OSHE	OSHE/SOP/CS/04
37	Controls for Safe Use of Class 3b & 4 lasers	Andrew Bettiol	13-Mar-08	by OSHE	OSHE/SOP/RS/02

Register 4.6c Register for Medical Surveillance

No	Name of Activity	Type of Medical Examination Requires	Name of Researchers included in the medical surveillance program	Date of Medical Examination	Date of Next Examination
1	N/A				
2					
3					
4					
5					

4.7 Emergency Preparedness and Response

Physics Emergency Preparedness and Response System establishes and maintains plans and procedures to identify the potential for, and responses to, incidents and emergency situations and for preventing and mitigating the likely illness and injury that may be associated with them.

The system is developed for Physics Department for buildings/rooms/labs in S7L1-L3 (including Chemistry labs), S11, S12, S13L1-L5 It is reviewed twice annually and updated as required in compliance with the OSHE emergency procedures. S1A basement lab and S1A-01-07 are coordinated by DBS department (majority S1A block occupiers) Emergency Evacuation Plan.

Physics carries out 2 Emergency Evacuation Drills for relevant buildings and facilities yearly.
Participation in these drills is mandatory for all effected employees, students, visitors and guests on site. (refer to Dept Fire Plan-to be updated)
https://phyintra.science.nus.edu.sg/safetymain.htm
http://www.ciba.nus.edu.sg/people.html

Precautions	**Know** at least *two* routes from your workplace to an Exit. **Know the locations of**: **Telephones**, **Fire Extinguishers and Blankets**, **Fire Alarm Points, Safety Showers, Eye Wash Stations** and **First Aid Boxes.** **Know how to** contact Campus Security. **Know how to** switch off electricity, gas, water etc. in and around *your* workplace.
Evacuation Procedure	All test sounding of the alarms will be notified in advance. **In the event of an evacuation, follow the route given in the Dept of Chemistry Emergency Evacuation Route map. Never use a lift.** Assemble away from danger and clear of the building. Do not re-enter the building until you are told that it is safe to do so.
Fire	If the fire is clearly minor, tackle it with an extinguisher **but do not**

endanger yourself. Normally the sensors will detect any fire and the Alarm will operate automatically. Otherwise, operate the nearest Alarm Point and call Campus Security at **68741616**.

Escape of Toxic Material

Leave the area immediately. Close all doors on exit. **Operate the nearest Fire Alarm Point**. Warn people to avoid the affected area and inform Campus Security at **68741616**.

Aiding an Injured Person

Either phone for a First Aider or if more serious call Campus Security at 1616 first, then a First Aider. **Even if the Alarms sound, do not attempt to move the injured person out of the building unless there is imminent danger.** Stay with the injured person until help arrives. If the injury is slight they should be taken by taxi with a First Aider in attendance or, if the injury is more serious, by Ambulance.

Flood

If it is obvious, stop the leak; phone Campus Security at 1616. Warn people in labs below to safeguard papers and equipment. **Do not attempt to move wet electrical equipment until it is disconnected from the mains.**

Failure of Mains Service

Failure of fume-hood, gas, water, electricity or lift during working hours, call Maintenance Response Centre at 1515. **Out of hours, call Campus Security at 1616.**

Emergency Telephone

Security	**68741616**
Maintenance Response Centre	1515
Police	999
Fire/Ambulance	995

Basic First Aid

If anyone becomes unconscious following an injury, call 1616 (security) if after office hours

Cuts

Control the bleeding by applying pressure over the wound with a pad of paper tissue or towel roll.
Do not attempt to remove any broken glass etc.
Seek medical attention.

Avoid contact with blood

Burns

Douse the burn with copious amounts of cold water e.g. under a running tap.
Do not attempt to remove anything sticking to the burn.
Seek medical attention.

Chemicals

On Skin: Wash off with copious amounts of water. Seek medical attention if necessary.

In Eyes: If available use an eye-wash spray with the eyelids held open. Otherwise use a cold running tap. Seek medical attention if necessary.

Inhaled: If possible, move to fresh air. Seek medical attention.

Swallowed: Seek medical attention. Identify the chemical.

Electricity
Switch off power. Call 68741616 for help.

Other injuries - falls, blows
Call for medical attention.

First Aiders: Dr Chammika Udalagama & Mr Chen Xiao, Kyle

In the event of a serious injury, use the emergency number 1616 which accesses University Security on a 24 hour line.

For minor injuries, First Aiders may be called.

IN CASE OF SEVERE ACCIDENT, RING 1616 FIRST.

First Aid Boxes

First Aid Boxes should be kept stocked according to the list posted on the front or within the box. First Aid Boxes are available in CIBA main laboratory (S7-01-01, accelerator control station's shelf), CIBA Van-de-Graff laboratory (S7-01-07, control station), CIBA Chemical laboratory (S7-01-09) and CIBA Optical Material and Devices Lab (S11-02-09).

Emergency (Fire) Alarms

The buildings in the Chemistry Department are equipped with a fire detection system that will sound the alarms if a sensor detects flame, heat or smoke or if the break-glass alarm button is activated.

There is unfortunately a high incidence of false alarms on campus due to ageing and defective fire detectors. **In the event of an alarm, spend a few seconds** only in turning off heating equipment or making your experiment safe before leaving the building by the route that has been described to you. Do not use the lifts. Assemble at the designated area for a roll-call.

Do not attempt to enter the building until you have been told it is safe to do so.

Emergency Telephone Numbers

CAMPUS SECURITY	6874-1616
Science campus security	6516-2365
Faculty safety Officer	65161310 / 92316256
Nearest Hospital (NUH)	6772-5000
Fire/Ambulance	995
Police	999

Register 4.7a List of Members and Emergency Contact Numbers

No	Name	Contact Number
1	Professor Frank Watt	6516 2815
2	Principal Investigator: A/P Thomas Osipowicz	6516 6745
3	Principal Investigator: Prof Mark Breese	6516 2624
4	Principal Investigator: Asst Prof Jeroen Van Kan	6516 6978
5	Principal Investigator: Asst Prof Andrew Bettiol	6516 4138
6	Lab Technologist: Choo Theam Fook	6516 2998/2639
7	Research Fellow: Dr. Chammika N.B. Udalagama	6516 4136
8	Research Fellow: Dr. Ren Minqin	6516 2638
9	Research Fellow: Dr. Chen CeBelle	6516 4137
10	Research Fellow: Dr. Piraviperumal Malar	6516 2638
11	Research Fellow: Dr. Pattabiraman Santhana Raman	6516 4137
12	Research Assistant: Mr. Chan Taw Kuei	6516 2998
13	Research Assistant: Mr. Armin Baysic De Vera	6516 2998
14	Ph.D Student: Ms. Xiong Boqian (Aky)	6516 7954
15	Ph.D Student: Mr. Yan Yuanjun (John)	6516 5916
16	Ph.D Student: Ms. Sara Azimi	65167954
17	Ph.D Student: Mr Chen Xiao (Kyle)	6516 7954
18	Ph.D Student: Mr Mallikarjuna Rao Motapothula	6516 7954
19	Ph.D Student: Mr Vanga Sudheer Kumar	6516 5916
20	Ph.D Student: Dang Zhi Ya	65168341
21	Ph.D Student: Song Jiao	65168341
22	Ph.D Student: Liang Hai Dong	65168341
23	Ph.D Student: Wang Ying Hui	65168341

24	Ph.D Student: Liu Fan	65164953
25	Ph.D Student: Liu NanNan	65167954
26	Ph.D Student: Yao Yong	65167954
27	Ph.D Student: Wu Jian Feng	65168341
28	Ph.D Student: Yang Cheng Yuan	6516 5916
29	Ph.D Student: Turaga Shuvan Prashant	6516 5916
30	Ph.D Student: Mi Zhao Hong	65168341
31		

Safety Committee:

No	Name	Contact Number (6516-XXXX)
1	Chairman (A/P Johan R C Van Der Maarel)	4396(o) 8842(L)
	Advisor (Asst Prof Yan Jie)	2620 (o), 2629(L)
	Advisor (A/P Ramanathan Mahendiran)	2616 (o)
2	Co-Chairman (Mr Teo Hoon Hwee) Graduate student safety training)	4122(T L), 3249 (res Lab)
3	Asst Co-Chairman (Mr Wu Tong Meng) Fumehood certification,	2634 (T L)
4	Secretary (Lee Soo Mien) (Hon Student safety training)	2823
5	Mrs Phua Swee Wah (staff safety training)	8679
6	Mr Choo Theam Fook (radioactive material store/wastes)	2998, 2639
7	Mr Lim Bun Siang	2634, 2824
8	Mr Wong How Kwong (chemicals/waste disposal)	2999
9	Mr Ng Tong Hoe (Laser related licence, medical test, ultrasonic cleaner licence, radioactive material store/disposal)	2632
10	Mr Foong Chee Keong (pressure vessel licence)	2630

Register 4.7b Emergency Equipment and Maintenance Schedule

N	Item	Qty	Maintenance	Personnel I/C

o			Schedule	
1	Safety Eyewash	1	Weekly	Ren Minqin
2	Safety Shower	1	Monthly	Ren Minqin
3	Fire Extinguisher	3	Annually	OED
4	Emergency Spill Kit	3	Once used	Ren Minqin
5	First Aid Box	4	Monthly	Ren Minqin
6				
7				

5 Accidents, incidents, non-conformance; and corrective and preventive action.

Register 5.1 Accident / Incident

Accident / Incident Description	Date	Corrective Action
No accidents to date		

The Physics Department /Labs follow closely OSHE SOPs which includes Identifying, Reporting, Investigation, Non-conformance and Corrective and Preventive Action. Safety committee also conducts investigation following accident, incidents and near-miss, and proposed appropriate corrective/preventive actions. Lab-wide corrective actions are followed with re-inspection for non-conformance.

Corrective / preventive actions includes

a) to be reviewed before implementation (risk assessment)
b) appropriate to magnitude of problems
c) commensurate with risk
e) confirm effectiveness
f) changes documented

Accident Incident reporting SOP:
https://wws.nus.edu.sg/osh/nus_manuals/sop/SOP_U02_Incident_and_Accident_Reporting_and_Investigation.pdf

6 Attachments

Your submissions should include the following relevant/applicable attachment files (softcopy) used by your lab:

1. Standard Operating Procedures
   a. University/ Faculty procedures
   b. Departmental SOP
   c. Laboratory specific SOPs
2. Risk Assessments
3. Inventory Records

Attachment files:

	Name of attachment file	
4. Standard Operating Procedures **a.** University/ Faculty procedures .... **b.** Departmental SOPs ---------- ..... **c.** Laboratory specific SOPs ----------	Pdf of CIBA SOPs 2011	
5. Risk Assessments ----------	Pdf file of CIBA RA 2011	
6. Licences (Scanned copies)	Pdf file of CIBA Licences	
7. Inventory Records ----------	Pdf file of CIBA Chemicals Inventory lists	

---------- **END** ----------