



# **NUS FIRE SAFETY MANUAL**

## Contents

Contents Page

Records of Amendments

Abbreviations

Foreword

### **SECTION A : GENERAL FIRE PRECAUTIONS FOR NUS OWNED / MANAGED PROPERTIES**

Chapter 1 : General Fire Safety – Duties and Responsibilities

Chapter 2 : General Fire Prevention Measures

Chapter 3 : Maintenance of Fire Detection and Protection Systems

Chapter 4 : Provision and Usage of Portable Fire Extinguishers

Chapter 5 : Requirements for Renovations, Alterations and Additions  
to NUS owned / managed properties

### **SECTION B : GUIDELINES**

Appendix A-I : Fire Safety Dos and Don'ts

Appendix A-II : Consolidated Fire Safety Guidelines for NUS Tenants

Appendix A-III : Welding and Hot Works

Appendix A-IV : Fire Precautions during Oxygen Storage

Appendix A-V : Planning and Management Guide for Public Assembly  
Events

Appendix A-VI : Conditions for Fire Safety Clearance on Pyrotechnics  
and Fireworks Display

### **SECTION C : STANDARD OPERATING PROCEDURES FOR NUS BUILDINGS**

Chapter 1 : Procedures for Responding to Fire Outbreaks

Chapter 2 : Fire Emergency Plan (NUS Standard)

Chapter 3 : Fire Evacuation Procedures

Chapter 4 : Fire Evacuation Drills

**SECTION D : ASSEMBLY AREAS**

**SECTION E : GENERAL FIRE PRECAUTIONS FOR NON-NUS  
OWNED / MANAGED PROPERTIES AND LESEES  
OF NUS BUILDINGS**

Chapter 1 : General Fire Safety – Duties and Responsibilities

## **Abbreviations**

<b>NUS</b>	-	<b>National University of Singapore</b>
<b>OSHE</b>	-	<b>Office of Safety Health &amp; Environment</b>
<b>OED</b>	-	<b>Office of Estate and Development</b>
<b>BCA</b>	-	<b>Building Construction Authority</b>
<b>BCF</b>	-	<b>Bromochlorodiflouromethane</b>
<b>CO<sub>2</sub></b>	-	<b>Carbon Dioxide</b>
<b>CP</b>	-	<b>Code of Practice</b>
<b>DLP</b>	-	<b>Defects Liability Period</b>
<b>FSSD</b>	-	<b>Fire Safety and Shelter Department</b>
<b>LEW</b>	-	<b>License Electrical Worker</b>
<b>SMM</b>	-	<b>Senior Management Meeting</b>
<b>SPRING</b>	-	<b>Standards, Productivity and Innovation Board</b>

## **Foreword**

### **1. Aims**

- 1.1 The National University of Singapore at Kent Ridge has a sprawling campus occupying an area of 145 hectares. It has more than 200 buildings on site. Most of the buildings are large and they are interconnected; any fire outbreak can spread rapidly. This, coupled with the high number of staff and students working and studying in the University, places University buildings in the high fire load category. Because of NUS' global reputation as an academic institute, a major fire outbreak will draw adverse publicity, both locally and overseas. In addition, a major fire could disrupt research and teaching activities, resulting in high losses to the University and inconvenience to students and staff. Fire safety at NUS must therefore be at a high level.
- 1.2 This Manual contains fire safety procedures, which are based on existing regulations and other codes in Singapore. These procedures spell out the fire safety measures to be observed by staff, students and tenants so that a high standard of fire safety is maintained.

### **2. General Terms of Reference**

- 2.1 This manual states:
  - a. the fire safety precautions that need to be provided in NUS buildings;
  - b. the types of fire safety tests and checks to be carried out
  - c. the general procedures to be complied with in the event of fire; and
  - d. the parties responsible for the implementation and compliance with relevant fire safety legislation and other fire safety codes.
- 2.2 All staff, students and tenants are required to comply with the procedures and guidelines in this Manual.
- 2.3 This Manual covers both NUS owned/managed buildings and buildings owned by NUS, but occupied by tenants. Section A and Section B cover NUS owned/managed properties and the Fire Safety Guidelines for these buildings respectively. Section C and D cover the Standard Operating Procedures for NUS buildings and Assembly areas. Lastly,

Section E covers the general fire precautions for Non-NUS owned / managed properties and lessees of NUS buildings.

2.4 The stated in this manual are by no means exhaustive and where appropriate, it should be used in conjunction with the codes of other authoritative bodies such as the National Fire Protection Association (USA), Fire Prevention Association (UK), Code of Practice for Fire Precautions in Buildings (Singapore), and Singapore Standards and Codes of Practice (issued by SPRING Singapore) for:

- The Installation and Servicing of Electrical Fire Alarm Systems (CP 10 : 1993)
- Fire Hydrant Systems and Hose Reels (CP 29 : 1998)
- Bulk Liquid Oxygen Storage Installations on User Premises (CP 34 : 1985)
- The Storage of Flammable and Combustible Liquids (CP 40 : 1987)
- Safety in Welding and Cutting ( And other operations involving the use of heat) (CP 50 : 1997)
- Automatic Fire Sprinkler Systems (CP 52 : 1990)
- Use and Maintenance of Portable Fire Extinguishers (CP 55 : 1991)
- Electrical Installations (CP 5 : 1998)
- NFPA 45 Standard on Fire Protection for Laboratories using Chemicals 2004 Edition

### **3 Safety Inspections and rectification of shortcomings**

3.1 OSHE will carry out regular fire safety inspections. Occupants of premises in NUS owned / managed buildings are required to comply with the recommendations submitted in the Fire Safety Inspections Reports. These reports are also copied to the respective Dean or Directors of Administrative units.

3.2 After the inspection, departments will be given specified time to rectify any fire hazards discovered. OSHE will then carry out a re-inspection of the premises. If there are still outstanding issues, the Dean or Director and OED will be informed as to whether the shortcomings are serious or minor.

- 3.3 Some examples of fire safety shortcomings are:
- Removal of fire safety measures
  - Lack of maintenance of fire safety equipment
  - Obstructions of escape routes
- 3.4 If the shortcomings are serious, the occupier shall be given 14 days to rectify. If the shortcomings remain unrectified, a report would be submitted to Provost or President
- 3.5 Fire safety shortcomings in NUS owned / managed buildings are followed up at NUS Senior Management Meetings held regularly as necessary. In particular, the results of all checks conducted randomly by OSHE are followed up at this forum.

#### 4 **Amendments**

- 4.1 This Manual will be reviewed from time to time. Suggestions to improve this Manual are welcome and should be addressed to :

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Emergency Management Division  
Office of Safety, Health & Environment  
National University of Singapore  
No.2 Prince George's Park  
S(118401)  
Tel: 6516**7725**  
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## **SECTION A : NUS OWNED / MANAGED BUILDINGS**

### **CHAPTER 1 GENERAL FIRE SAFETY DUTIES AND RESPONSIBILITIES**

#### **1 General**

- 1.1 The Head of Department is responsible for ensuring that appropriate fire safety measures are taken in his/her Department. He should also exercise surveillance over the staff occupying such premises. The Dean shall be responsible for fire safety in all common areas in the Faculty. OSHE and OED shall be promptly notified of any suspected deficiencies.

#### **2 Duties and Responsibilities of NUS**

- 2.1 The duties and responsibilities of each division shall be as follows:

##### **I Office of Safety Health & Environment**

- (a) Promote fire safety in NUS and conduct fire safety inspections at least once a year and follow-up to ensure that fire hazards, if any, are abated;
- (b) Advise the NUS community on fire safety measures to be taken for NUS staff and student-organised events and then follow-up to ensure that safety measures are implemented;
- (c) Conduct annual briefings for the fire safety coordinators and fire wardens to update and familiarise them with their roles, the evacuation procedures, the escape routes, the assembly areas, etc
- (d) Provide advice and guidance to the NUS community on the establishment of fire evacuation plans and the conduct of annual fire evacuation drills for premises under their management.

## II Office of Estate and Development

- (a) Ensure that fire detection and protection systems at all NUS buildings are installed in accordance with relevant Singapore fire safety legislations, Singapore Standards and Codes of Practice.
- (b) Conduct tests and inspections on electrical circuits in all NUS buildings and installations. The tests and inspections to be conducted shall be as follows:
  - (i) Annually - Visual inspection on the electrical wiring terminations at the main LT switchboards in the LT switchrooms.
  - (ii) Annually - Thermal scanning of LT switchboards and automatic transfer switches in the LT switches
  - (iii) Every 5 years during LT/HT servicing - Meggar test on incoming and outgoing feeder cables to and from the main LT/HT switchboards in the LT/HT switchrooms
- (c) Conduct regular tests, inspections and maintenance of fire detection and protection systems in NUS buildings (including the fire protection/detection and gas detector systems installed and maintained by tenants and lessees) in accordance with the schedules spelt out in Chapter 3 and in accordance with the relevant CPs.
- (d) Ensure contractors do not obstruct fire detectors, sprinklers, other fire equipment or impede any access/escape route during renovation, alteration and addition, construction works and comply with fire safety requirements stipulated in this manual;
- (e) Ensure that all renovations, alterations and additions to buildings are properly authorised in accordance with Chapter 5 of Section A.
- (f) Advise the NUS community on fire safety measures before renovation, alteration or addition works are carried out at NUS owned / managed premises and then follow-up to ensure that they are incorporated;

- (g) Ensure that the buildings are adequately equipped with fire hosereels, fire extinguishers and other fire safety devices.

### III NUS Administrative and Academic Divisions

- (a) Exercise surveillance over the staff and occupants to ensure that they comply with the fire safety precautions and take actions as appropriate, on occupants who do not comply and keep OSHE/OED informed;
- (b) Ensure that the occupants in the buildings observe the fire prevention measures listed and submit their compliance with the list of fire safety Do's and Don'ts (See Appendix A-I).
- (c) Ensure that all renovations, alterations and additions to NUS buildings are properly authorised in accordance with the requirements stated in Chapter 5 of Section A;
- (d) Ensure that all electronic equipment and wiring are regularly checked and properly maintained;
- (e) Observe good housekeeping by separating combustible materials;
- (f) Appoint Fire Safety Coordinators and Fire Wardens for own respective division;
- (g) Establish a fire evacuation plan for their own respective division and conduct at least one evacuation drill annually based on the procedures spelt out in Section B, Chapter 2 and 3 respectively.
- (h) Ensure that its staff are familiar with the evacuation plan established; and
- (i) Nominate its staff to attend relevant fire safety training at OSHE.

### IV NUS Halls of Residence

- (a) The Hall Master shall ensure staff and students in their respective halls of residence comply with fire safety precautions. Actions to be taken by the Hall on student occupants who do not comply and the Hall shall keep OSHE / OED informed;

- (b) Ensure that the staff and students observe the fire prevention measures listed in Chapter 2 of Section A;
- (c) Observe good housekeeping by separating combustible materials at all times;
- (d) Appoint Fire Safety Coordinators and Fire Wardens for its own premises;
- (e) Establish a fire evacuation plan for own respective division and conduct at least one evacuation drill annually based on the procedures spelt out in Section B, Chapter 2 and 3 respectively; and
- (f) Ensure that its staff are familiar with the evacuation plan established.

V All Other Divisions

The Director or his designate shall:

- (a) Ensure that its premises are adequately protected by fire extinguishers and other fire safety equipment based on advice provided by OED or OSHE in accordance with Chapter 4 of Section A;
- (b) Ensure that its staff observe the fire prevention measures listed in Chapter 2 of Section A;
- (c) Appoint fire wardens / assistant fire wardens for its own premises;
- (d) Ensure that its staff are familiar with the evacuation plan established by NUS; and
- (e) Encourage its staff to attend relevant fire safety training at OSHE.

## **CHAPTER 2 GENERAL FIRE PREVENTION MEASURES**

### **1 INTRODUCTION**

1.1 Fire prevention measures may be grouped into distinct categories; viz: fire detection and protection equipment, passive measures, housekeeping, electrical systems and wiring, and other hazards.

#### **1.2 Fire Detection and Protection Equipment**

- (a) Fire detection, gas detection and protection systems installed shall be maintained and regularly checked for serviceability.
- (b) The systems should have audible alarm or similar facilities to warn the occupants of the buildings in case of fire.
- (c) Connection should be made between the fire alarm systems and Campus Security Control Room.
- (d) The fire detection and protection systems should be extended to new areas arising from building extension or floor alterations.
- (e) Fire hosereels should be able to provide full coverage over the whole of the floor area where they are installed and taking into consideration the physical layout of the area.
- (f) Access to fire extinguishers and hosereels shall be free of obstructions at all times.

#### **1.3 Passive Measures**

- (a) Means of egress shall be so arranged that the occupants can pass through an exit from the building or storey quickly and without obstruction.
- (b) Suitable exit signs shall be provided, adequately illuminated and displayed.
- (c) Escape routes shall be kept clear and free of obstructions at all times and be suitably marked.
- (d) All emergency exit doors shall not be locked, otherwise there shall be provision for rapid operation of the locking device to

release the lock either by manual operation or automatically when the fire alarm is activated.

## 1.5 Housekeeping

Good housekeeping or maintenance of orderly cleanliness is a basic factor in fire safety. Good housekeeping practices, both indoors and outdoors, by disposal of unwanted combustibles, limitation or segregation of combustibles reduce the danger of fire, and they include the following:

- (a) Floors should be regularly swept or cleaned with non-flammable materials.
- (b) Smoking is not allowed in NUS buildings and operational areas.
- (c) Frequency, method of rubbish and waste disposal should be adequate for the type of occupancy and activity being conducted.
- (d) Rubbish storage bins made of non-combustible materials shall be provided and placed under cutting, boring and turning machines.
- (e) Used cleaning rags and other impregnated materials or waste cloths should be kept in non-combustible containers with self closing and close fitting lids.
- (f) All packing materials should be neatly stacked in a separate storage area and not in passageways or aisles.
- (g) There shall be a minimum clearance of 0.5m between the top of storage piles and sprinkler heads or the ceiling. This clearance space shall be 1.0m in workshops.
- (h) In storage areas, aisles shall be maintained for unobstructed access and egress. These aisles should correspond as much as possible to the width of the room's entry/exit points.
- (i) Provision shall be made for ready access to fire fighting equipment. A minimum 1.5m clearance must be maintained

- (j) All fire exits and escape routes shall be kept clear of obstructions. A minimum 3m clearance is to be maintained from fire exit staircases.
- (k) A floor plan shall be made available at the fire alarm panel board to facilitate the work of emergency services in case of fire outbreak.

## 1.6 **Electrical Systems and Wiring**

- (a) Connections between wires and plugs should not be loose.
- (b) Conduits and raceways should be fastened into position and secured to outlet boxes, cabinets and other equipment.
- (c) All electrical boxes should be closed to prevent the possibility of contact with combustible materials.
- (d) Overloading of electrical circuits is not allowed. All circuits should be protected by a appropriate fuse or circuit breaker.
- (e) All fixtures, switches and sockets should be well maintained.
- (f) Electrical equipment should be properly wired. Wiring should not be frayed or loose. All electrical appliances shall be of an approved type, correctly positioned and have well maintained flexible cords.
- (g) Electrical equipment should not be left energized when not in use especially during after-working hours. They should be switched off when not in use.
- (h) The use of multiple plugs drawing power from one socket is not recommended. If necessary, more permanent power sockets should be added by a Licensed Electrical Worker (LEW) of the appropriate grade.

## **CHAPTER 3 MAINTENANCE OF FIRE DETECTION AND PROTECTION SYSTEMS**

### **1 Introduction**

- 1.1 This chapter spells out the maintenance procedures for fire detection and protection systems in all NUS buildings.

### **2 Duties and Responsibilities**

- 2.1 Office of Estate and Development (OED) is responsible for maintaining fire protection installations in optimum working condition except for those equipment / systems installed and maintained by the occupants / tenants / lessees.
- 2.2. OED is responsible for installation, servicing, maintenance and repair works for fire alarm, sprinkler, hosereel and extinguisher.
- 2.3 All NUS divisions are responsible to notify OED of any defects (and their status of their rectification) that affect the operations of the fire protection installations, so that alternative arrangements can be made.
- 2.4 OED is responsible in compiling of all initial system commissioning, subsequent modification, recommissioning and annual test reports of fire detection and protection systems carried out to comply with statutory requirements and subjected to audit by OSHE.
- 2.5 OED is responsible in establishing an internal audit function to audit subcontracts for maintenance of fire detection and protection system.

### **3. Inspection and Test Procedures**

#### **3.1 Fire alarm and detection systems**

- 3.1.1 Regular testing and inspection shall be conducted as follows:

- (a) **Monthly Tests.** A check shall be made on the fire alarm and detection system to ensure that they are being continuously monitored.
- (b) **Monthly Test.** Check the battery voltage by operating the battery test switch and record voltage under load conditions in the log book.

- (c) **Monthly Tests.** Check battery terminals for cleanliness, ensure that they are capped with non-conducting material and to ensure that they are in good servicable condition; voltages, charging current, and electrolyte to ensure that they are at the correct levels (including simulation of fire alarm system).
- (d) **Annual Tests.** At least 20% of the detectors in an installation shall be checked each year. The selection of the detectors shall be made in such a way that all the detectors in an installation should have been checked once in any period of five years. The checking of detectors shall take in the form of either:
  - (i) the testing of a detector in place and testing the effectiveness of detectors (especially smoke/heat detectors) mounted near air conditioning /exhaust vents;
  - (ii) check for obstructions such as partitions, racks or piled stock which are erected/placed in such a way as to interfere with the effectiveness of the fire alarm/detection system; or
  - (iii) the removal of a detector and its replacement by a detector which has been checked and calibrated by qualified supplier.

In addition, the following checks shall also be conducted:

- (iv) Circuits requiring automatic voltage regulated supplies shall be checked to ensure correct operation and voltage output.
- (v) Where the heat sensitive element of thermal detectors or the enclosure of other detectors are found to be coated with paint or any other material likely to affect adversely the operation of the detectors, such materials shall be cleaned off or detectors replaced.
- (e) **Random Test.** Fire detectors that are installed and maintained by tenants at their respective premises shall be subject to random tests by tenants.
- (f) **Others.** Individual Dept Fire/Safety Officer to check for obstruction such as partitions, racks, piled stocks or detectors located near air-conditioning /exhaust vents, in such a way as to interfere with the effectiveness of the detectors' function.

### 3.2 Private fire hydrants and dry rising mains

- 3.2.1 Inspection, maintenance and testing of private fire hydrants shall be carried out at **least once a year** by OED. OED shall also ensure that all isolating valves for the systems that are kept locked in an "open" position.
- 3.2.2 Dry rising mains inlets, landing valves, drain valves, door hinges and locking arrangements to the inlet and landing valve boxes shall be inspected and undergo a thorough test **every six months**. Special attention should be given to all valves, spindles, glands and washers to ensure that they are in satisfactory conditions so that all equipment continue to be ready for immediate use.
- 3.2.3 In addition, wet tests to be carried out **annually** where the main can be checked for leaks.

### 3.3 Automatic fire sprinkler systems

- 3.3.1 Periodic testing of automatic fire sprinkler systems shall be carried out on a weekly, quarterly, annually and three yearly basis.

(a) **Weekly tests:** The following checks and tests should be made every week.

- (i) Check water level and automatic refilling facilities of all water storage tanks in the system.
- (ii) Check that all stop valves are secured in the open or closed position as appropriate. Particular attention shall be given to the main control valve, drain valve and test valve.
- (iii) Check and record the pressure at the installation gauge and water supply gauge and ensure that normal water pressure is being maintained.
- (iv) Check for correct operation of the water alarm bell.
- (v) Start all pumping units, by operating the test valve in a manner which will simulate the conditions and check correct cut-in pressure, pump gland operation, both local and remote pump run alarms, and pump priming water. (Note: on electric motor driven pumps, check the phase failure alarm and check that there is no excessive

vibration or noise. Pump shall be fully operational within 30 seconds.) For electrical pumps, run pumps for not less than 10 minutes and check for the correct running speed.

- (vi) Test the interchangeability and function of the duty and standby pumps.
  - (vii) After testing of the pumps and resetting of the systems, check and record the pressure at the installation gauge and water supply gauge to ensure that normal water pressure is being maintained.
  - (viii) Check that required spare sprinklers and sprinkler spanners are on hand.
  - (ix) Check pump room to ensure it is kept free of combustible materials and accessible at all times.
  - (x) Check the breeching inlet to ensure they are in good condition.
- (b) **Quarterly tests:** Tests to be carried out are as follows:
- (i) Electric powered pump – where secondary power supplies are provided, the pump shall be run off the secondary supply. The pump shall be run for not less than 5 minutes.
  - (ii) Test all water flow alarm switches by operation of a 10 mm test valve to simulate fire conditions. These may be tested as a weekly rotating basis; however, each switch must be tested yearly.
  - (iii) Operate and check to ensure that all isolating valves on the main connection, and any other water supply stop valves, are fully open.
  - (iv) Check to ensure that all water supply non-return valves are correctly seated.
  - (v) Clean the strainer and oil the external alarm water motor and gong.
  - (vi) User to check for obstructions such as partitions, racks or piled stock which are placed in such a way as to interfere with effectiveness of water discharging from sprinklers.

- (c) **Annual tests:** In addition to the normal weekly and quarterly tests, the following additional test shall be performed:
- (i) Carry out water supply periodic check test to ensure that the water supply satisfies the pressure/flow requirements appropriate to the hazard class.
  - (ii) Physical check of the internal mechanism of all pressure switches to ensure that all components are free of corrosion, securely mounted and in working order.
  - (iii) With electrical equipment isolated from all power supplies, the motor starter should be cleaned and the condition of all heavy-current carrying contacts checked. Any item showing signs of water or corrosion shall be immediately repaired or replaced.
  - (iv) Run electric pump for a minimum period of 10 minutes under full load conditions and check the load current per phase for variation from original test readings.
  - (v) Examine all pipes and hangers for corrosion and mechanical damage. Clean, paint and replace as required. Loose hangers shall be replaced or refastened.
  - (vi) Oil or grease all valve stems. Completely close and re-open the valve to test its operation and distribute the lubricant.
  - (vii) Check all gauges with an inspection gauge.
- (d) **Three-yearly test:** In addition to normal annual tests, every three years, overhaul all stop, alarm, non-return and pressure-reducing valves. Replace all damaged and worn parts as necessary. Where investigations suggest that sediments may have collected in the pipework, all system pipework should be flushed. Conditions that may indicate the need for investigation include the following:
- (i) Discharge of obstructive material during routine water tests.
  - (ii) Foreign material in sprinkler pumps or in check valve.
  - (iii) Heavy discoloration of water during drain tests.
  - (iv) Plugging of sprinklers.

### 3.4 Gas/Vapour Flooding Fire Protection Systems

Gas/vapour fire protection system refers to FM200, Inergen, NAF S3 systems which are replacements for Halons. A systematic maintenance programme shall be established for proper operation of such systems. The preventive maintenance schedule shall include the monthly, semiannually, two-yearly and five-yearly inspections and maintenance as follows:

- (a) **Monthly Inspection.** Check to ensure correct pressure gauge reading, correct setting and accessibility of all operating controls, and serviceability of indicators. Carry out visual inspection on its instruction signs, warning signs, blinking evacuation signs, beacon lights, manual activation switch, pipeline system and nozzles,.
- (b) **Semiannually Inspection.** Weigh agent supply cylinders to ascertain nett weight of agent by subtracting empty weight (as stamped on the cylinder) from the gross weight. If the agent nett weight is less than 95% of the original charge nett weight, replace cylinder with fully charged cylinder. Inspect cylinders and equipment for damaged or missing parts, viz:
  - (i) Flexible actuation hoses for loose fittings, damaged threads, distortion, cracks, dirt and frayed wire braid;
  - (ii) Agent supply cylinder pressure operated control heads for physical damage, deterioration, corrosion, distortion, cracks, dirt and loose couplings;
  - (iii) Agent supply cylinder electric control heads for physical damage, corrosion, or dirt and check control heads flexible electrical line for wear and damage;
  - (iv) Agent supply cylinder and valve assembly for leakage, physical damage such as cracks, dents, distortion, and worn parts and check burst disc and pressure gauges for damage;
  - (v) Agent supply cylinder brackets, straps, cradles and mounting hardware for loose, damaged, or broken parts and check cylinder brackets, straps, and associated parts for corrosion, oil, grease, grime, etc;
  - (vi) Flexible discharge hoses for loose fittings, damaged threads, cracks, rust, kinks, distortion, dirt and frayed wire braid;

- (vii) Nitrogen actuation line (if used) and support brackets for continuity, physical damage, loose fittings, distortion, cracks, or cuts;
  - (viii) Discharge nozzles for dirt and physical damage;
  - (ix) All manual pull stations for cracks, broken or cracked glass plate, dirt or distortion and signs of physical damage; and
  - (x) Pressure switches for deformations, cracks, dirt or other damage.
- (c) **Monthly Inspection.** Perform pressure switch test and electric control heads test for proper operation.
- (d) **Two-yearly Inspection.** Remove nozzles from piping and all pressure operated control heads from agent supply cylinders, open distribution valves and blow out distribution piping with air or nitrogen or ensure that it is not obstructed.
- (e) **Five-yearly Inspection.** Conduct hydrostatic pressure test on agent supply cylinders and flexible hoses as necessary.

### 3.5 Hosereels

3.5.1 OED shall conduct annual servicability check of the hosereels.

3.5.2 Ensure that the inlet valve, the automatic on/off valve (if any), glands, tubing and shut-off nozzle are sound and free from leaks, and also to ensure that the outlet of the nozzle is not choked.

3.5.3 Some nozzles, in addition to giving a jet stream, are also capable of producing a cone spray. In these cases, the correct functioning of each role should be checked.

3.5.4 **Once a year** the hose shall be completely run out and subject to operational water pressure test to ensure that the hose is in good condition and that all couplings are water-tight. A flow test should be carried out to ensure that a discharge of at least 0.4 litres per second is achieved from the hosereel at the highest floor level on each rising main

**CHAPTER 4**  
**PROVISION AND USAGE OF PORTABLE FIRE EXTINGUISHERS**

**1. Provision of Portable Fire Extinguishers**

1.1 Classification of portable fire extinguisher provided shall be selected such that the nature of processes and contents within the building concerned can be effectively protected. The size, quantity and siting of these portable fire extinguishers shall comply with the requirements under the respective call of occupancy hazard.

**2. Basic Types of Fire Extinguisher and their Recommended Colours of Identification**

2.1	<u>Types of fire extinguisher</u>	<u>Recommended Colour</u>
	Water	Signal red
	Dry powder	French blue
	Carbon dioxide	Black

**2.2 Fire Extinguishing Agents for the Various Classes of Fire**

<u>Class</u>	<u>Description</u>	<u>Suitable Extinguishing Agents</u>
A	Fires involving solids of Carbonaceous nature (excluding metals) e.g. wood, cloth, paper, rubber, plastic etc	Water, Dry Chemical
B	Fires involving liquids, liquifiable solids and flammable gases e.g. petrol, diesel, kerosene, wax and LPG etc	Dry Chemical, CO <sub>2</sub> ,
C	Fires involving energized electrical Equipment etc	Dry Chemical, CO <sub>2</sub> ,
D	Fires involving metal e.g. magnesium, sodium, lithium, etc	Class D

### 3. **Strategic Location for Fire Extinguishers**

3.1 The right types of fire extinguisher are to be provided at suitable locations. The general factors to be considered for choosing a location to install a fire extinguisher are as follows:

- (a) Fire extinguishers shall be conspicuously located in positions where they will be readily accessible and immediately available in the event of fire. Preferably they will be located near to room exits, corridors, stairways, lobbies and landings.
- (b) In large rooms and in certain locations where visual obstruction cannot be completely avoided, signs shall be provided to indicate the location.
- (c) Wherever possible, portable fire extinguishers should be grouped at "fire points".
- (d) If wall mounted, fire extinguishers should be mounted not more than 1.5m above the floor, measured from carrying handle, at a location where it is conspicuous and accessible.
- (e) The maximum distance of travel from any location within the building to a "fire point" should not exceed 15m for general-purpose buildings.

### 4. **Inspection and Maintenance of Fire Extinguishers**

4.1 **Inspection Procedures.** OED shall conduct annual inspections which include at least a check of the following:

- (a) Fire extinguishers are located in their designated locations.
- (b) There is no obstruction to access or visibility.
- (c) The operating instructions on the label attached to each fire extinguisher are legible and facing outward.
- (d) Seals and tamper indicators are not broken or missing.
- (e) Determine fullness by weighing or "hefting"
- (f) Visual checks for obvious physical damages, corrosion, leakage or clogged nozzles.

- (g) Pressure gauge reading is within the operative range indicating correct working pressure.
  - (h) Essential parts, such as the discharge tube/horn are serviceable and not missing.
- 4.2 Each fire extinguisher shall be clearly marked with the following information:
- (a) The extinguishing medium contained in the extinguisher.
  - (b) Type (e.g gas cartridge or stored pressure type)
  - (c) The class of fire for which it is suitable
  - (d) Method of operation
  - (e) Test and working pressure
  - (f) The date of last service or expiry date of serviceability
- 4.3 The discharge lever of fire extinguisher should have a safety pin secured with a seal or tamper indicator.
- 4.4 All fire extinguishers, except those that are empty, shall be positioned upright at all times.
- 4.5 All fire extinguishers shall be serviced **annually** by competent personnel from organisations approved by SCDF and a label is attached to each extinguisher as proof.

**CHAPTER 5**  
**REQUIREMENTS FOR RENOVATIONS, ALTERATIONS AND ADDITIONS**  
**TO NUS BUILDINGS**

**1 Objective**

- 1.1 These requirements are intended to ensure fire safety and general safety of occupants are not compromised by any renovation, alteration or addition to the existing configuration inside and outside buildings.
- 1.2 Compliance with the requirements listed hereunder shall be incorporated into the tenancy agreement and rest with the department responsible for coordinating the renovation, alteration or addition works, and shall be based on Fire Safety Act, Codes of Practice or as advised by the OSHE.

**2 General Requirements**

- 2.1 All renovations, alterations and additions to buildings shall meet the requirements stated in OED's Safety Management System under clause 3, with regards to fire safety requirements. This compliance is in addition to other requirements or approval by other relevant authorities. e.g. FSSD, BCA, etc.
- 2.2 Copies of the relevant floor plans indicating the extent of renovations, alterations, and/or additions; together with fire safety measures, e.g fire exits and signs, etc shall be extended to OSHE upon request when necessary.
- 2.3 When contractor takes over the premise for renovation work, the contractor is responsible for the necessary fire safety measures within this premise. Upon handing over of premise to end users, the contractor is still responsible for the fire protection installations for one year of Defects Liability Period (DLP). After DLP, OED (Estate Maintenance) will be responsible to maintain the installations in working order.
- 2.4 A Qualified Person (consultant) is responsible to ensure the necessary submissions to authorities are cleared for the proposed work. Permission or clearance from relevant authorities shall be sought and extended to OED.

**Commencement of works**

- 2.5 OED will arrange with the user for the handing over of premise from user to contractors for their preparation to start site work. In the case

of tenancy renovations, the relevant lease agreement clauses stipulated the necessary clearance from OED on their renovation plans before actual work.

- 2.6 All works would have to be compiled to the OED Safety Management System. Refer to the webpage below:  
<http://www.nus.edu.sg/oed/forms/PDFS/sms/SafetySpecs04.pdf>

## SECTION B : FIRE SAFETY GUIDELINES

### APPENDIX A-I FIRE SAFETY DOS AND DON'TS

1. **Do not** use cardboard boxes, wooden crates or other receptacles that are made of combustible material as makeshift rubbish bins at your workplace.  
**Do** provide and use proper rubbish bins, preferably those made of non-combustible material, like metal.
2. **Do not** accumulate unwanted items at your workplace.  
**Do** dispose of unwanted items at regular intervals to ensure good housekeeping at your workplace.
3. **Do not** use corridors, walkways or passageways that form part of the emergency route at your workplace for storage.  
**Do** keep corridors, walkways and passageways free of obstructions.
4. **Do not** remove ceiling boards or use ceiling void (i.e space above suspended ceiling) for storage.  
**Do** ensure that all ceiling boards are in place, not missing, or damaged
5. **Do not** paint over smoke/heat detectors and sprinkler heads or hang objects on them  
**Do** ensure that the detectors and sprinkler heads are not painted over or obstructed with objects.
6. **Do not** stack up items to a height less than 0.5m from sprinkler heads.  
**Do** ensure that there is clear headroom of 0.5m between stacked goods and sprinkler heads.
7. **Do not** use fragile containers to store flammable liquids or keep flammable substances in places where large amounts of heat will build up or near an ignition source.  
**Do** store flammable liquids in proper, unbreakable containers and keep flammable substances in well-ventilated places and away from any ignition source.
8. **Do not** seal up ventilation openings or leave a non-working/inoperable ventilation fan unrepaired.  
**Do** ensure ventilation openings are not sealed up and have defective ventilation fans repaired quickly.
9. **Do not** use candles or other naked flame for lighting purposes, especially during a power failure.  
**Do** make available battery operated portable torchlights as a back up.

10. **Do not** smoke anywhere on campus building.  
**Do** observe "No-smoking" rule strictly in your premises.
11. **Do not** leave electrical appliances or equipment continued to be energized when they are not in use, especially after office/working hours.  
**Do** switch off at the mains all electrical appliances or equipment that are not in use, especially after office/working hours.
12. **Do not** put any liquid or thing that is flammable or combustible near an electrical socket, switchboard or an enclosure containing electrical components.  
**Do** ensure that electrical socket, electrical switchboards and the enclosures of electrical components are kept clear of flammable or combustibles substances and liquids.
13. **Do not** use electrical equipment that has poor wiring such as frayed cables and loose conditions.  
**Do** ensure that the wiring is in good condition and for any defect, get a licensed electrician to check and rectify it immediately.
14. **Do not** overload the electrical circuit by drawing current from one power outlet to multiple electrical appliances or equipment simultaneously.  
**Do** use one power outlet for one electrical equipment or appliance, whenever possible.
15. **Do not** use electrical closets or compartments that house dry riser inlets/outlets, hose reel, telecom riser ducts etc for storage.  
**Do** ensure that the closets and compartments are clean and free of obstructions at all times.
16. **Do not** use staircases as rest areas or storage areas.  
**Do** keep staircases free of obstructions at all times.
17. **Do not** burn joss sticks, oil, incense fragrance sticks, incense paper and other offerings used in religious ceremonies in the premises.  
**Do** use joss sticks, lamps and candles that are electrical or battery operated.

18. **Do not** wedge open any fire door or exit staircase.  
**Do** ensure fire doors are kept closed but unlocked at all times.
19. **Do not** obstruct the access to a fire hose reel or fire extinguisher.  
**Do** keep the hose reel cabinets and fire extinguishers free from any obstructions.

**APPENDIX A-II**  
**CONSOLIDATED FIRE SAFETY GUIDELINES FOR NUS TENANTS**

1. Tenants shall ensure that the fire-fighting installations and /or equipment such as sprinklers, dry riser breaching inlets and outlets, hosereels, and fire extinguishers in their premises are accessible (unobstructed) at all times. They are provided solely for the purpose of fire fighting and shall not be misused or vandalized.
2. Tenants shall ensure that the fire-fighting equipment like fire hosereels, fire extinguishers, sprinklers, fire suppression system and fire protection system in their premises are checked and serviced at least once a year by trained persons of approved organisation, authorized by the relevant authorities. A label certifying that the equipment is checked and serviced shall be attached to the same.
3. Tenants shall ensure that the staircases, passageways, exits, etc. that forms part of the emergency staircase route in their premises are unobstructed at all times. Exit signs are to be lit at all times. Exit doors shall not be locked or obstructed in any way when the premises are occupied.
4. Tenants shall take proper precautions to prevent fire in their premises. Tenants shall adhere to the list of fire safety dos and don'ts in Appendix A-I .
5. Tenants shall ensure that no burning of candles, oil lamps, incense fragrance sticks, joss sticks, etc. on the premises
6. For tenants co-sharing the building with NUS Departments, the tenants shall take part in the annual fire evacuation drill organized by the building owner. Tenants shall appoint their own fire wardens, whose primary duty is to ensure all their staff are evacuated safely during an emergency. Tenants shall submit to OSHE by 31 January of each calendar year the names and contact numbers of their appointed fire wardens and floor registers listing the names of their staff. Subsequently, should the tenants make any changes to the appointed fire wardens or floor registers, the tenants concerned shall write to update OSHE with those changes no later than 30 days.
7. The preferred ratio of fire wardens to staff (occupants) is 1: 20. Tenants shall send their appointed fire wardens to attend training and briefings organized by OSHE.
8. All hot works that generate heat or sparks require prior notification to OED.

9. Where due to renovation or A & A works, tenants require the fire detection and /or protection systems in their premises to be temporarily isolated, notification approval and written approval shall be sought from OED. The approval will be subject to conditions as deemed fit by OED.
10. Tenants shall ensure that their staff are aware of the need for them to notify Campus Security and Singapore Civil Defence Force immediately at Tel: 65161616 and 995 respectively upon discovery of a fire outbreak on their premises. The emergency numbers shall be prominently displayed on the telephones. All fires, however small, shall be reported to Campus Security and OSHE.
11. Tenants shall take all reasonable measures to prevent false alarm in their premises. They shall work closely with OED and OSHE on this.

## **APPENDIX A-III WELDING AND HOT WORKS**

### **1 Scope**

- 1.1 The procedures in this Appendix are to protect persons from injury and illness, and property from damage by fire or from improper handling of the equipment.
- 1.2 The requirements listed in this Part is in addition to the Singapore Standard CP 50: 1997.

### **2 Welding and Cutting Operations**

- 2.1 When portable cutting or welding equipment is used, the main danger is that combustible materials may be ignited by sparks, hot metal, heat conduction, the flame, or the electric arc itself. Other fire risks associated with the different types of equipment are flashback fires from gas equipment and the accidental arcs from stray current in electric arc welding equipment.
- 2.3 The hazards associated with welding and cutting processes are:
  - (a) High temperatures such as oxy-acetylene 3,101.7°C (5,615°F), oxy-propane 2,776.7°C (5,030°F) and flames that may easily cause ignition of nearby combustible material.
  - (b) Flexible rubber hoses carrying flammable gas to the blow-torch are prone to damage by sharp edges or hot surfaces.
  - (c) Assembled equipment has many joints, which can leak hazardous substances if not properly designed or installed, and hoses improperly secured to connectors may whip off under pressure and cause injury.
  - (d) High pressure energy is stored in cylinders and this stored energy can be devastating when released in an uncontrolled manner.
  - (e) Leakages, even if they are minor, can give rise to fire, explosion and other hazards especially in unventilated spaces.
  - (f) Oxygen enrichment may cause most materials normally accepted as non-combustible to ignite and burn rapidly with just one spark, e.g. asphalt with ignition temperature of 485°C (905°F).

- (g) Oxygen deficiency can cause immediate unconsciousness resulting in death.
- (h) Incorrect operations can cause the flame to flashback into the hose causing it to rupture, start a fire, explode or burn internally. Flashback arrestors shall be fitted at both ends of the hoses to prevent this.
- (i) During welding and flame cutting operations, toxic hazards can arise from fumes and gases especially metal fumes, deriving from zinc, cadmium, copper, iron and lead, are dangerous.
- (j) Poor ventilation may cause build-up of toxic gases, fumes and explosive mixtures of flammable gases.
- (k) Unsecured gas cylinders may be knocked over and there is risk of damage to the regulator causing a release of flammable gas.
- (l) Operators are exposed to stray sparks and heat.

### 3 **Responsibilities**

- 3.1 The following guidance is for cutters, welders, their supervisor and those managing property where welding or cutting work is done. These guidelines should be complied with as far as possible.
- 3.2 The Department, shall be responsible for planning and control as follows:
  - (a) Recognise its responsibility for safe usage of cutting and welding equipment on its property
  - (b) Designate / establish approved area for cutting and welding works.
  - (c) Designate an individual to be responsible for authorising cutting and welding operations. The individual must be aware of the hazards involved and be familiar with the standard for cutting and welding processes.
  - (d) Ensure that only approved apparatus; such as torches, manifolds, regulators or pressure reducing valves are used.
  - (e) Ensure cutters, welders and supervisors are suitably trained in the safe operation of equipment and processes.

- (f) Advise staff and students about flammable materials and hazardous conditions in the vicinity.
- (g) Authorise/permit, such hot works to be carried out after having obtained OED's approval in the form of the Hot Work Approval and keep OSHE informed. The hot work permit shall be valid for a certain period and be certified that:
  - (i) Area is safe before work commences;
  - (ii) Precautions are taken as hot work is in progress; and
  - (ii) Check for smoldering materials is done half-an-hour after completion.

3.3 The Supervisor of welding and/or cutting operations shall:

- (a) Be responsible for the safe handling of welding and cutting equipment, and safety in welding and cutting process.
- (b) Determine combustible materials and hazards in the work location.
- (c) Protect combustibles from ignition by:
  - (i) having the welding or cutting works moved to a location free from dangerous combustibles; or
  - (ii) having the combustibles moved to a safe distance from the works; or
  - (iii) having the combustibles properly shielded against ignition e.g protect floor impregnated with paint, grease or oil; and
  - (iv) ensuring that welding or cutting works are scheduled that operations which might expose combustibles to ignition do not coincide with the welding or cutting works.
- (d) Secure authorisation for cutting or welding operations from the designated management and assure himself of the following:
  - (i) The cutting and welding equipment used is in satisfactory operating (mechanical and electrical) condition and in good repair.
  - (ii) The floor is swept clear of combustible waste and storage.

- (iii) All combustibles shall be relocated at least 12m from the work site. Where relocation is impracticable, irremovable combustibles shall be protected with flameproof covers/non-combustible screen, or shielded with metal or other appropriate guards or curtains.
  - (iv) Wall or floor openings, gaps within 12m of this site shall be tightly covered with non-combustible materials to prevent passage of sparks to adjacent areas.
  - (v) Where cutting or welding is done near walls, partitions, ceilings, or roofs of combustible construction, fire resistant shields or guards shall be provided.
  - (vi) Cutting or welding on pipes or other metal in contact with combustion walls, partitions, ceiling or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.
  - (vii) Portable fire extinguishers, appropriate for the classes of fires that may break out, shall be suitably placed at the work area.
  - (viii) All welders/cutters shall be fully trained and aware of the fire risks involved.
  - (ix) All persons are suitably protected against heat, sparks, slags etc.
  - (x) Ensure adequate ventilation to prevent build up of flammable or toxic fumes.
  - (xi) Ensure non-combustible containers are available for placing hot tools after use. The container shall be made of electrically insulated material if arc electrical welding equipment is used.
- (e) Ensure that the cutter or welder secures his approval and that conditions are safe before starting operations.
  - (f) Ensure that fire protection and extinguishing equipment e.g. hoses, reels, extinguishers, etc; are properly located at the site.

3.4 The Cutter or Welder shall:

- (a) Handle his equipment safely and use it so as not to endanger lives or property.
- (b) Have approval of his supervisor before he starts to cut or weld.
- (c) Not to cut or weld where conditions are not safe.
- (d) Continue to cut or weld only so long as conditions are unchanged from those under which approval was granted.
- (e) Watch for fire in all exposed areas and try to extinguish them first within the capacity of the equipment available or otherwise sound the alarm.
- (f) All fire occurrences shall be reported to Campus Security and OSHE.
- (g) Check for smouldering materials half-an-hour after completion of work.

4. **General Fire Prevention**

Cutting or welding shall be permitted in a fire-safe area and if it is to be carried out within a building, it shall be done in a specific area designed or approved for such works. These areas should be non-combustible or fire resistive construction, free of combustibles and flammable contents, and segregated from adjacent areas.

4.2 Cutting or welding shall not be permitted under the following situations:

- (a) Confined area with little ventilation and no easy means of escape
- (b) In a sprinklered building where the sprinkler system is impaired.
- (c) Where there is presence of explosive atmospheres (mixtures of flammable gases, vapours, liquids or dusts with air), or uncleaned or improperly prepared tanks or equipment, which previously contained such gases or materials.
- (d) In areas near the storage of large quantities of exposed, readily ignitable materials.

- 4.3 The area shall be inspected by the individual responsible for authorising cutting and/or welding operations to ensure that it is fire safe before cutting or welding is permitted. He shall:
- (a) Determine the precautions to be followed in granting authorisation to proceed with the works in the form of a written permit.
  - (b) Be familiar with the standard for cutting and welding processes.
  - (c) Have fire-extinguishing equipment readily available and be trained in its safe and proper use.
  - (d) Familiar with facilities for sounding an alarm in the event of fire outbreak.
  - (e) Look out for fires in all exposed areas and try to extinguish them first when within the capacity of the equipment available or otherwise sound the alarm.
  - (f) Remain on site for at least half-an-hour after completion of cutting or welding operations to detect and extinguish possible smouldering fires. All cylinders shall be returned to a safe store.

## 5. **Safe Cutting and Welding Practices**

### 5.1 With Gas Cutting and Welding

- (a) All gas cylinders shall be clearly marked to indicate content.
- (b) The cylinders shall be clamped or chained and supported to ensure they remain in an upright position.
- (c) Valve protection caps, where the cylinder is designed to accept a cap, shall be in place, hand-tight except when cylinders are in use or connected for use.
- (d) Both the fuel and oxygen hoses must be fitted with non-return valves and at both ends of hoses with flash back arrestors.
- (e) Equipment shall be checked for damage before use.
- (f) Soapy water may be used for leakage test.
- (g) Replace leaking hose immediately.
- (h) Damaged equipment shall not be used.

- (i) Observe correct ignition procedure.
- (j) Open cylinder valves slowly.
- (k) Cylinder valves should not be lubricated.
- (l) Cylinder valve shall be kept clean.
- (m) Where key-operated cylinders are being used, key should be left on the spindle. This will allow cylinders to shut quickly if necessary.
- (n) The cylinders must be stood as far as possible from hot work area.
- (o) Cutting and welding nozzles must be kept clean and free of blockage.
- (p) Never release oxygen in the air deliberately or inadvertently. Be aware that excess oxygen in confined space increases danger to fire and explosion.

## 5.2 Fire Fighting Arrangement

- (a) Qualified staff equipped with appropriate fire extinguisher shall be available during the hot work process.
- (b) Heated cylinders shall be cooled by copious water spray from a safe distance.
- (c) Remove other cylinders to a safe place in the open and away from affected cylinder.
- (d) In case of a leaking cylinder becoming ignited, turn off cylinder valves and try to extinguish the fire. (DO NOT EXTINGUISH THE FIRE BEFORE SHUTTING THE VALVE)
- (e) Evacuate if flame is impinging on the cylinder.

## **APPENDIX A-IV FIRE PRECAUTIONS DURING OXYGEN STORAGE**

### **1 Scope**

- 1.1 This Chapter describes the hazards associated with the storage of oxygen and recommends procedures for safe storage.

### **2 General**

- 2.1 Currently, NUS may utilise either gaseous or liquid oxygen.
- 2.2 Gaseous oxygen is colourless, odourless, tasteless and non-toxic. It constitutes about 21 percent of normal air by volume and is about 10 percent heavier than air. Above its critical temperature (-82.4°C) or oxygen can exist only as a gas regardless of the pressure exerted upon it.
- 2.3 Liquid oxygen is a light blue, transparent liquid, which flows like water. It boils at -147.2°C at standard atmospheric pressure. If a volume of liquid oxygen is confined and allowed to warm to room temperatures, the attempt of the vapourising oxygen to expand will result in the attainment of extremely high pressures (in the order of 40,000 psi).

### **3 Hazards**

- 3.1 Both gaseous and liquid oxygen are stable, non-flammable substances, but they vigorously support combustion and increase the intensity of fires. This makes it necessary to keep concentrations of oxygen separated from combustibles and from any source of ignition. Therefore, the highest standard of housekeeping is essential in areas where oxygen is stored.
- 3.2 Physical damage to, or a failure of oxygen cylinders, valves or plumbing can result in explosive rupture in oxygen system components causing danger to life, limb and property.
- 3.3 In addition to aggravating with fire hazard, liquid oxygen can cause severe burns (frostbite) when in contact with the skin because of its low temperature.
- 3.4 Only corrosion resistant tubings, pipes and fittings suitable for the purpose it is intended to shall be used.

#### 4 **Oxygen cylinder storage**

- 4.1 Cylinders should be stored in a specifically assigned location and protected against tampering by unauthorised individuals.
- 4.2 Oxygen cylinders shall not be stored near flammable materials, other readily combustible substances, or in the same area as compressed combustible gases. Empty and full cylinder should be stored separately with empty cylinders clearly marked. "Full / In Use / Empty" cylinder tags from the supplier shall be used.
- 4.3 Each cylinder should be clearly marked to indicate its content. Breathing oxygen cylinders should not be mixed with other oxygen cylinders.
- 4.4 Cylinders shall be stored so that they are never allowed to reach a temperature exceeding 52°C. When stored in open they should be protected against direct rays of the sun in localities where extreme temperatures prevail, and from the ground beneath to prevent rusting.
- 4.5 Cylinders should be protected against abnormal mechanical shock liable to damage the cylinder, valves or safety devices. Valve protection caps should also be used when cylinders are not connected in use.
- 4.6 When moving cylinders, care should be exercised to prevent dropping, which may cause damage to the cylinder, valve or safety devices. Lifting magnets, slings of rope/chain, or any other device in which the cylinders themselves form a part of the carrier should not be used for hoisting oxygen cylinders.
- 4.7 Do not store oxygen and acetylene cylinders together. A minimum distance of 6m shall separate the two. If a separation distance of 6m cannot be met, a non-combustible barrier at least 1.5m (5 feet) high having a fire resistance rating of at least ½ hour shall be erected between the two storage areas to reduce the hazards.

## **APPENDIX A-V PLANNING AND MANAGEMENT GUIDE FOR PUBLIC ASSEMBLY EVENTS**

### **1.0 OBJECTIVE**

The guide is to assist all persons planning public assembly events in the National University of Singapore (NUS), both academic and administrative, to take necessary fire safety precautions. The Guideline is based on the requirements in the Code of Practice for Fire Precautions in Buildings 2002 and Fire Safety Act. Where appropriate, other local legislation and relevant information should be referred.

### **2.0 SCOPE**

These guidelines are applicable to all departments under the management of the National University of Singapore (NUS).

### **3.0 DEFINITION**

**Personnel:** Include all staff and students of NUS.

**Door:** Includes any shutter, cover or other form of protection to an opening in any wall or floor of a building or in the structure surrounding a protected shaft, regardless of whether the door is constructed of one or more leaves.

**Exit:** A means of escape from the interior of the building to an exterior space which is provided by the use of the following whether singly or in combination: exterior door openings, exit staircases, exit ramps or exit passageways. In the case of an exit leading to a separate building, exits also include linkways, walkways, bridges and balconies. Exits do not include access stairs, aisles, corridor doors or corridors and access doors to rooms or spaces in occupancy areas.

**Exit Door:** A door provided at the doorway of an exit for the passage of people, forming part of the integrity of the exit, including the exterior door opening.

**Exit Access:** That portion of a means of escape that leads to an exit. It includes the room and building spaces that people occupy, the doors along the escape routes, lobbies, aisles, passageways, corridors, access stairs and ramps that will be traversed in order to reach an exit.

**Exit Access Door:** A door which provides access to a room or space (excluding toilet cubicle, bedroom, storeroom, utility room, pantry and the like) or installed across the escape path leading to an exit. Exit access door shall comply with all requirements of an exit door and need not have fire resistance rating, unless it is specified.

**Exit Passageway:** A horizontal extension of a vertical exit viz exit staircase or a passage leading from a courtyard to an open exterior space, complying with the requirements of Cl.3.8 for protected shafts in respect of fire resistance ratings for enclosure walls, floors, ceilings and doors, that serves as a required exit.

**Exit Staircase:** A staircase which has its enclosure constructed of non-combustible material having a fire resistant of not less than the minimum period require by Cl.3.3, for Elements of Structure for the part of the building in which it is situated.

**Public Assembly:** Assembly occupancies include but are not limited to, all buildings or portions of buildings, used for gathering together **50 or more persons** for such purposes as deliberation, worship, entertainment, eating, drinking, amusement or awaiting transportation (*NFPA 101 Life Safety Code*)

**Tents:** Tents are considered buildings and meet most of the requirements as buildings.

#### 4.0 FIRE HAZARDS

A fire hazard is anything that can increase the likelihood of a fire. Examples of fire hazards are:

- a. Unauthorized Alterations to Buildings
  - i. Such alterations may jeopardize the original fire protection systems of the building; and
  - ii. hinder access to escape routes and fire safety equipment
- b. Overcrowding
  - i. Exceeding the permissible maximum crowd capacity in the building/ venue
- c. Removal of Fire Safety Measures
  - i. Removing any vital fire fighting equipment like hose reels, fire extinguishers from where they are installed
- d. Obstruction of Escape Routes

- i. stacking of goods / items along common corridors, escape passageways or staircase
- ii. locking up the exit doors when the premise are occupied / used.
- iii.

## **5.0 Fire and Life Safety Planning and Management Information**

### **5.1 Types of Activity allowed**

Subject approvals from the relevant University authorities, the following temporary events / activities are allowed and permissible in National University of Singapore.

- Exhibitions
- Sales
- Ad-hoc entertainment / performance shows (subjected to approval)
- Controlled cooking using microwave heater

### **5.2 Type of Activity disallowed**

Based on safety considerations, the following types of events / activities are not allowed in all buildings within the National University of Singapore.

- Activities which require the use of open flame, explosive, flammable liquids, gases or substances.

### **5.3 Large Scale Activities**

All activities intended to, or that have the potential to, attract large crowds must be coordinated through the following University Departments. These include but not limited to: Office of Student Affairs, Office of Estate & Development, Campus Security & Carpark, Office of Safety Health & Environment.

### **5.4 Room Capacity**

Information on hall/room/building capacities can be obtained from OED Space Planning Unit, Office of Estate & Development and/or the building owner itself. The occupant load is the maximum capacity based on the net floor area. Stages and other obstructions, seating arrangements and the use of tables will decrease the capacity. The type of event is also a determining factor. When planning for an event, consider the following:

<i>Usage</i>	<i>Minimum area per person</i>
Concentrated (concerts, dances, lectures)	7 sq ft per person
Less concentrated (exhibits)	15 sq ft per person
Fixed seats	No of fixed seat
Stage (persons on stage)	15 sq ft per person

## **5.5 Exits**

The number of exits required is based on the capacity

Number of occupant	Minimum numbers of exits
50 – 200	2
201 – 500	2
501 – 1000	3
Exceeding 1000	4

## **5.6 Tents/Marquees**

Please refer to the detailed information in the Tent Guidelines.

## **5.7 Evacuation Notices**

The person in charge of the event is required to call the attention of everyone present, immediately before the beginning of an event, to the location of exits and to state the exits are not locked. He/she must also announce the following: "For your own safety, look for the nearest exit. In case of emergency, walk; do not run to the exit."

The requirements must also be coupled with the following:

- a. Notices displayed on fixed sign visible in the area used
- b. Notices shown on screen

## **5.8 Open Fires (Outdoor)**

Any open fire, require an Open Fire Permit from Office of Safety Health & Environment. Open fires are limited to dimensions of 5' x 5' x 5' and must be at least 50 feet (15 meters) from buildings and other exposures. It is restricted to the hours between 9:00am – 10:00pm. Other environmental restrictions apply. Refer to the Open Fire Permit at the end of this section.

## **5.9 Pyrotechnics and Fireworks**

The indoor and outdoor use of pyrotechnics and fireworks is strictly regulated and licensed by Singapore Police Force in consultation with Singapore Civil Defence Force.

Conditions for Fire Safety Clearance for Pyrotechnics and Fireworks Display are attached at the end of this section.

## **5.10 Event Staff/Crowd Managers**

Crowd Managers are responsible for maintaining clear exits, assuring that there is no overcrowding, initiating a fire alarm if necessary, directing occupants to exits, and general fire and life safety awareness. A minimum of 1 crowd manager is required for every 250 occupants. Crowd managers may comprise of ushers, staff and/or students. Office of Safety Health & Environment is available to provide training.

## **5.11 Pre and Post Event Procedures**

The organizer shall be responsible for completing a pre and post event check. The self check form is COMPULSORY for all organizers, who are required to ensure that they complied with the safety requirements listed. At the end of the event, the organizers are also required to conduct a post event check. Items to check for include unnecessary electrical equipment turned off and any obvious hazardous conditions.

## **5.12 Generators**

Generators must meet all electrical requirements including proper grounding. It must be located so that exhaust does not enter buildings. General safety guidelines on generator include steel fencing equipped with a portable fire extinguisher (at least 2.5kg ABC Dry Chemical).

## **5.13 Medical and Ambulance Service**

Medical service such as First Aider, is required for events based on type of event and anticipated crowd size. The number of first aider is 1: 100, as determined by the Workplace Safety & Health Act. Events of over 2000 persons require a minimum of one private ambulance. Events of over 7000 persons require a minimum of 2 private ambulances.

## 6.0 APPLICATION

- a. Organizers of events and activities in NUS must obtain approval from Office of Safety Health and Environment and Campus Security on the event's safety and security arrangements. Application to OSHE and Campus Security must be at least two weeks before the event.
- b. Submission, must be made through the online Event Risk Assessment Form (ERAF), which will include the following:
  - 1 copy of layout / sketch plan
  - Other relevant information pertaining to the event / activity
- c. The following information / details should be included in the plans:
  - Areas used should be marked or coloured on the layout plan;
  - Details of the temporary structure to be constructed, evacuation routes, exits, location of fire fighting protection equipment, electrical layout etc.
- d. ERAF can be processed by submitting online at:

<https://stuweb.nus.edu.sg/osh/emergency/Lists/ERAFS/NewForm.htm>

## 7.0 SAFETY GUIDELINES

- 7.1 Activity conducted **indoors**:
  - a. All materials and equipment shall not obstruct any exit corridors and exit passageways where people will evacuate in the event of an emergency;
  - b. All materials and equipment shall not obstruct any exit doors and exit staircase.
  - c. All materials and equipment shall not obstruct any fire extinguishers and hoses.
  - d. Dry chemical fire extinguisher(s) (4.5kg) of the PSB approved type must be provided at the area throughout the duration of the activity. The number of extinguisher will have to depend on the nature of activity, as advised by OSHE.
  - e. The electrical cables shall be insulated and secured to prevent any trips or falls.
  - f. There must be clearance space of 500mm from the ceiling for stacking & display of items.
  - g. There must be clearance space of 500mm below any smoke/heat detector.

- h. The type of materials used for construction of temporary booths shall be non-combustible material or treated with fire retardant materials (if possible)
- i. All exit doors shall remain unlocked and in closed position during the operating hours of the event.

7.2 Activity conducted **outdoors**:

- a. The electrical outlets used, should be water-proof or splash-proof when in outdoors.
- b. Dry chemical fire extinguisher(s) (4.5kg) of the PSB approved type must be provided at the area throughout the duration. The number of extinguisher will have to depend on the nature of activity, as advised by OSHE.
- c. Portable generators are required to be enclosed with wire fencing and equipped with a dry chemical fire extinguisher (4.5kg)
- d. A safety radius of at least the height of any heavy structure (float vehicle etc) must be maintained.
- e. The area within the safety radius must be cordoned and access must be restricted.

8.0 **MISCELLANEOUS**

- a. The number of people expected for the activity/event shall not exceed the occupancy load of the building/area.
- b. Smoking is not permitted at all times and this must be ensured by the event organizers.
- c. Event organizers and coordinators should be familiar with the evacuation route and assembly area in case of emergency.
- d. General garbage should be placed in a thrash bag and disposed through approved contractors.
- e. Measures are to be taken not to allow overflow of the garbage from the thrash bag and littering is strictly not allowed. If possible place environmental awareness posters as a reminder for keeping the area neat and tidy.
- f. Toxic and hazardous wastes are to be properly stored and disposed off through approved vendors. Ensure all safety precautions are taken while handling these wastes.

- g. All wooden pallets, cardboard boxes and similar items are to be stored and disposed off properly. If possible, recycling is to be encouraged.
- h. Wherever possible, use recycled materials and always conserves energy during the event
- i. Toilets and other facilities should be maintained for its hygiene
- j. Prevent water stagnation during and after the event.
- k. Report of any potential dangers in the event site to organizer, Campus Security, OSHE and OED (if required).

## 9.0 REFERENCES

- a. Code of Practices for Fire Precautions in Buildings 2007 Volume 3
- b. Guidelines from Fire Safety and Shelter Department
- c. Singapore Standard Code of Practice for Scaffolds CP 14 :1996\
- d. University of Maryland Fire and Life Safety Planning and Management Guide for Public Assembly Events
- e. Workplace Safety & Health Act



**FIRE PREVENTION INSPECTION CHECKLIST**  
Office of Safety Health & Environment

Note: This document includes a checklist to assist the inspector in assessing potential fire hazards. Briefly describe any discrepancy which requires corrective action in the "Other Findings & Corrective Actions" section at the end of the inspection checklist.

**Building / Area Inspected :**

**Date / Time of Inspection :**

<i>Subject</i>	<i>What to look for?</i>	<i>In Order</i>	<i>Not In Order</i>	<i>N.A</i>
<b>EXIT /FIRE DOORS</b>	1. Do the fire doors swing outward?			
	2. Is the fire door fitted with an automatic door closer?			
	3. Is the fire door in close position?			
	4. Are the exits and fire doors clear of any obstruction?			
	5. Is the fire door locked?			
<b>STAIR CASES</b>	6. Are the staircases clear of any obstruction?			
<b>CORRIDORS/ PASSAGEWAYS</b>	7. Are the corridors / passageways clear of obstacles, storage & debris?			
	8. Are the corridors / passageways at least <b>1.0m</b> wide?			
<b>FIRE EXTINGUISHERS</b>	9. Are the extinguishers in their proper type, capacity, location, fully charged & within date of service?			
	10. Are the extinguishers securely mounted or in an approved cabinet (not more than 1.5m above ground)			
	11. Is there any obstruction?			
<b>HOSEREELS</b>	12. Are the hose reels working?			
	13. Is the nozzle & hoses satisfactory?			
	14. Is there any obstruction?			
	15. Is the control valve working?			
	16. Are the hose reels serviced annually?			
<b>EXIT SIGNS</b>	17. Is the exit sign visible?			

	18. Is the exit sign illuminated?			
	19. Is exit directional sign adequate?			
FIRE ALARM SYSTEM	20. Is the main / sub-alarm panel in order?			
	21. Is there any obstruction?			
	22. Is it fire alarm system maintained?			
DETECTOR/SPRINKLERS	24. Is there a clearance space of <b>500mm</b> below the detector?			
HYDRANT	25. Is the hydrant obstructed?			
	26. Is the pit cover obstructed?			
ELECTRICAL HAZARDS	27. Is there any extension cords in use in place of permanent electrical installations?			
	28. Is there any spliced or frayed cords/wires?			
	29. Is there any broken or faulty switch/outlets?			
	30. Is the electrical panel overloaded/obstructed?			
	31. Is there adapters in use, other than approved type with "Safety Mark" label?			
HOUSE KEEPING & STORAGE	32. Are all the flammable/combustible liquids properly stored in approved cabinets?			
	33. Is there any combustible material stored near ignition source?			
	34. Is there any accumulation of combustible materials?			
	35. Are there any illegal cooking facilities / naked lights?			
	36. Is the fire engine access way obstructed?			
OTHERS	37. Is a printed copy of the FEP readily available for reference?			
	38. Is the FEP updated?			

**Other Findings & Corrective Actions**

**INSPECTION SUMMARY**

Pass       Reinspection      Propose Date of Reinspection : \_\_\_\_\_

<b>Name of Building Representative</b>	
<b>Name of OED Representative</b>	
<b>Name of Inspector</b>	

\_\_\_\_\_  
**Signature of Inspector**

\_\_\_\_\_  
**Date**



**EVENT INSPECTION CHECKLIST**  
Office of Safety Health & Environment

<b>Title of Event</b>		<b>Location of Event</b>		
<b>Name of Event Director</b>		<b>Duration of Event</b> Date from : _____ to _____ Time from : _____ to _____		
<b>CHECKLISTS</b>		<b>YES</b>	<b>NO</b>	<b>REMARKS</b>
1. Exit announcement read and displayed visible in the event area?				
2. All exit doors clear and obstructed?				
3. Exit paths clear and obstructed all the way to outside?				
4. Electrical wires taped down or otherwise secured?				
5. Aisles clear and obstructed?				
6. Exit lights on and unobstructed?				
7. Emergency lights unobstructed?				
8. Floor layout and setup approved?				
9. Fire protection equipment (fire manual call point, alarm bells, speakers, extinguishers, hosereel, alarm panels) unobstructed?				
10. Use of pyrotechnics approved?				
11. Crowd managers in place? 1 : 250 (crowd manager : people)				
12. Tents/marquees approved?				
13. Ambulance and/or medical services in place? 1 : 100 (first aider : people) 1 : > 2000 (ambulance : people) 2 : > 7000 (ambulance : people)				
<b>Any other additional information.</b>				
-----				
<b>INSPECTION SUMMARY</b>				
<input type="checkbox"/> Pass <input type="checkbox"/> Reinspection				
<b>Name of Inspector</b>		<b>Department</b>		<b>Date of Inspection</b>
_____		_____		_____
<b>Signature</b>	<b>Organisation Stamp</b>	<b>Date</b>		



**OPEN FIRE PERMIT**  
Office of Safety Health & Environment

**INSTRUCTIONS:** Fill out the top part of the form. Return the form to Office of Safety, Health & Environment for signature and issuance of permit.

**DETAILS OF EVENT**

Event: \_\_\_\_\_ Date: \_\_\_\_\_  
Location: \_\_\_\_\_ Time: \_\_\_\_\_  
Sponsor: \_\_\_\_\_

1. Obtain approval from Office of Estate & Development on usage of open space  
**Name of Authorizing Officer** : \_\_\_\_\_  
**Date approval obtained** : \_\_\_\_\_
2. Obtain approval from Campus Security on car park facilities and space  
**Name of Authorizing Officer** : \_\_\_\_\_  
**Date approval obtained** : \_\_\_\_\_
3. Ensure that arrangements have been made to comply with the following:
  - a. Burning may occur only between 9:00am – 10:00pm.
  - b. A fire shall not be more than 5 feet by 5 feet by 5 feet in dimension and shall not burn longer than 3 hours.
  - c. Fuel for fire shall consist of seasoned dry fire wood or planks and shall be ignited by a small quantity of paper and/or kerosene.
  - d. A cleared area of 15 meters must be maintained from the fire to all exposures (to include vehicles, buildings and vegetation).
  - e. A minimum of two (2) 13a fire rating fire extinguishers must be retained at the fire site.
  - f. The fire must be supervised by at least two (2) persons who remain in constant attendance during the event.
  - g. Prior to leaving the area, an inspection of the area shall be made to assure that the fire is completely extinguished.
  - h. The fire may be ordered extinguished if hazardous condition is determined by Office of Safety, Health & Environment, Campus Security and Singapore Civil Defence Force.

**PERSON(S) SUPERVISING EVENT:**

Name: \_\_\_\_\_ Handphone: \_\_\_\_\_  
Name: \_\_\_\_\_ Handphone: \_\_\_\_\_

**DECLARATION BY EVENT DIRECTOR**

I hereby declare that I shall assume responsibility for ensuring public safety during the course of my event and be bound by the conditions issued upon approval of this application.

\_\_\_\_\_  
Name & Signature of Applicant Date

**FOR OFFICIAL USE**

Approval has been granted by the Office of Safety, Health & Environment for the maintenance of an open fire as described herein, subject to the requirements outlined above.

\_\_\_\_\_  
Authorizing Signature Organization Stamp Date

**APPENDIX A-VII**  
**CONDITIONS FOR FIRE SAFETY CLEARANCE ON PYROTECHNICS AND**  
**FIREWORKS DISPLAY**

**Conditions for Fire Safety Clearance on Pyrotechnics and Fireworks Display**

1. For any fireworks displays which are executed **indoors**:
  - a. The highest point of the effect produced by the fireworks must not:
    - i. exceed 3m from its point of discharge where the height of the ceiling does not exceed 10m; or
    - ii. exceed 5m from its point of discharge where the height of the ceiling exceeds 10m.
  - b. The highest point of the effect produced by the fireworks must not be less than 1.5 m from any structure directly above the effect produced whether it is a permanent or a temporary structure.
2. For any fireworks display which are executed **outdoors**:
  - a. A safety radius of at least twice the height of the highest point of the effect produced must be maintained measured horizontally from the firing point;
  - b. In the presence of any structure, a further 6m must be added to the safety radius as stated in 2a.
3. All combustible materials within the safety radius must be removed to prevent from ignition during the display.
4. The area within the safety radius must be cordoned and access to be controlled.
5. Dry chemical fire extinguishers of the PSB approved type must be provided at least one for every 15m at the display area throughout the duration of the display

## SECTION C : STANDARD OPERATING PROCEDURES FOR NUS BUILDINGS

### CHAPTER 1 PROCEDURES FOR RESPONDING TO FIRE OUTBREAKS

#### 1 Actions to be taken in the event of fire

- 1.1 The fire alarm system of all buildings in NUS are linked to the Campus Security Control Room. Any person discovering an outbreak of fire, shall alert Campus Security and the nearby occupants immediately by activating the nearest fire alarm (break-glass) call point.
- 1.2 He/she shall then inform SCDF at telephone no: 995 and Campus Security at telephone no: 6874 1616 (or ext 1616 if an internal phone is used) of the following:
  - (a) Location of fire
  - (b) Nature of fire, if known
  - (c) Injury to personnel, if known
  - (d) Informant's particular and contact number
- 1.3 He/she shall then attempt to put out the fire **without taking any personal risk.**

**CHAPTER 2**  
**SAMPLE FIRE EMERGENCY PLAN (NUS STANDARD)**

**Requirement**

All buildings with two stories and above, or with more than twenty occupants in the building are required to formulate their Fire Emergency Plan.

**FIRE EMERGENCY PLAN**

**1 OBJECTIVE**

- a. Purpose
- b. Fire Safety Committee
- c. Signal for Fire Alarm

**2 ACTIONS TO BE TAKEN IN THE EVENT OF FIRE DURING OFFICE HOURS**

- 2.1 Informant
- 2.2 All Staff
- 2.3 Fire Safety Coordinator / Assistant Coordinator
- 2.4 Fire Wardens / Assistant Fire Wardens
- 2.4 Campus Security

**3 FIRE OCCURRING OUTSIDE OFFICE HOURS**

**4 PEOPLE WITH DISABILITIES**

**5 DUTIES AND RESPONSIBILITIES**

- 5.1 Fire Safety Coordinator / Assistant Coordinator
- 5.2 Fire Wardens / Assistant Fire Wardens
- 5.3 Campus Security

**6 FIRE EVACUATION DRILLS**

**7 APPENDICES**

## 1 Objective

1.1 The purpose of a Fire Emergency Plan is :

- a. To safeguard human lives in the event of fire.
- b. To establish a systematic and orderly evacuation plan.
- c. To ensure prompt raising of the fire alarm and marshalling of first aid fire fighting efforts.

1.3 The Fire Safety Committee is formed in the building for achieving the above objective. It comprises the following appointment holders:

**(See Appendix A for Name list and Contact Numbers of Fire Safety Committee)**

- a. Coordinator / Assistant Coordinator
- b. Fire Wardens / Assistant Fire Wardens
- c. Campus Security

1.4 The **Signal for Fire Alarm** for fire is a continuous ringing note resounding from the electrically operated bells on every storey of the building. The fire alarm signal can be raised by:

- a. Break-glass alarm system
- b. Automatic heat and smoke detector system
- c. Automatic sprinkler system

## 2. Actions to be taken in the event of a fire during office hour

2.1 Informant

The person who discovers the fire shall immediately:

- a. Raise the alarm by activating the nearest fire alarm "break-glass" call point.
- b. Notify Campus Security (Tel No: 6874 1616) and Singapore Civil Defence Force (Tel No: 995) of the activation of fire alarm and state the following:
  - i. Location of the fire
  - ii. Nature of fire, if known
  - iii. Injury to personnel, if known

iv. Informant's particulars and contact number

The caller shall not replace the telephone set until the address has been repeated by the operator at the SCDF Control Room.

c. Attempt to extinguish any incipient fire with the available fire fighting equipment and **without taking personal risk.**

## 2.2 All Staff

a. Upon hearing the fire alarm, all staff shall stop their work, lock important documents, close doors, shut down electrical equipment etc and evacuate immediately guided by their respective Fire Wardens.

b. When evacuating, do not panic but quickly walk down the staircase by the nearest exit and proceed to the assembly point. **Do not use lifts.**

c. The assembly point is located at the XXXX. ***(See Appendix B for Site Plan of Assembly Point)***

d. All staff/guests/customers/visitors shall not re-enter the building once at the assembly point unless instructed otherwise by the Civil Defence Officer in attendance.

## 2.3 Building Fire Safety Co-ordinator / Assistant Co-ordinator

On hearing the fire alarm,:

a. Proceed to the fire alarm main panel and check the location of the alarm. ***(See Appendix XXXX for location of Main Fire Alarm Panel)***

b. Ensure that the Campus Security and Singapore Civil Defence Force (SCDF) have been notified if there is a fire outbreak.

c. Proceed to the assembly point and obtain the floor evacuation status reports from the Fire Wardens.

a. Await the arrival of the responding crew from the Campus Security and Singapore Civil Defence Force at the main entrance of the building and report to the officer-in-charge the status of the evacuation. ***(See Appendix F for Building Evacuation Status Chart)***

## 2.4 Fire Warden / Assistant Fire Warden

On hearing the fire alarm:

- a. Check sub alarm panel at assigned floor for location of fire. ***(Location of sub alarm panels are indicated in the floor plans with a <symbol>)***
- b. Conduct physical check/verification of fire. Attempt to extinguish any incipient fire with the available fire fighting equipment and **without taking personal risk.**
- c. Report to Coordinator if fire occurs on his/her floor
- d. If fire occurs on his floor, to evacuate the entire floor occupants immediately using nearest exit
- e. If fire is not on his floor, prepare and alert everyone on his storey to evacuate in an orderly manner.
- f. Alert everyone on his floor to evacuate in an orderly manner using the nearest exit.
- g. Check all classrooms, laboratories, offices, stores, toilets etc to ensure that no one is left behind.
- h. Ensure that the disabled, children, pregnant women etc if present in their storey, are given particular attention during evacuation.
- i. Leave the building after ascertaining that all the occupants of the floor have complied with his order.
- j. On reaching the assembly area, conduct a roll call of the staff/students/guests/visitors present and report to the Fire Safety Coordinator in person of the evacuation status. ***(See Appendix E for Floor Register)***
- k. Ensure that no one re-enters the building until it is safe to do so.

## 2.5 Campus Security

- a. Campus Security shall ensure that security personnel are deployed at the ground floor staircase exits to guide staff/students/guests/visitors to the designated assembly area when the fire alarm is activated.

- b. Ensure that all main entrances and exits to/from the building are adequately manned to prohibit unauthorised entry and also to intensify patrolling in the vicinity of the building.
- c. Ensure that security personnel are detailed to direct traffic to facilitate the movement of evacuees at points where they cross roads to reach assembly point.

### **3 Fire occurring outside office hours**

- 3.1 In the event of an outbreak of fire after normal working hours, the informant shall confirm with Campus Security and the Singapore Civil Defence Force and notify the Department Fire Safety Coordinator or the Assistant Coordinator of the fire:
- 3.2 If the fire fighting team is available, they shall proceed to fight the fire from a safe distance with the available fire fighting equipment and attempt to extinguish or control the fire **without taking personal risk.**

### **4 PEOPLE WITH DISABILITIES**

- 4.1 People with disabilities, particularly those who require wheelchairs or aids for walking may require assistance to evacuate the building or be aware the alarms are sounding.
- 4.2 If such people are with a group's members, the group should assist the person to evacuate and the Coordinator should be informed of the event at the assembly point. The Coordinator should also be informed when the person is safely evacuated.
- 4.3 If insufficient people are available to offer effective assistance, the disabled person should be taken to a refuge area that is safe and that they can easily be rescued from.
- 4.4 Disabled people trapped and alone in a building should shut themselves in a room with a telephone and dial **68741616** to inform the Campus Security of their situation and location.

## 5 Duties and Responsibilities

### 5.1 Faculty / Department Fire Safety Co-ordinator and Assistant Co-ordinator

- a. Represent the management of the building in respect of all fire safety matters.
- b. Has the full responsibility for :
  - i. Establishment of a Fire Safety Committee
  - ii. Training of the employees
  - iii. Preparation, drafting and putting into force the Fire Emergency Plan
- c. Ensure that the approved Fire Emergency Plan is abided by all staff of the building.
- d. Ensure that exits, fire prevention and fire fighting systems are in good order through regular inspections.
- e. Record the date and time of each evacuation drill conducted on a form. This form must be kept in the office of the Coordinator for verification purposes. **(See Appendix D for Evacuation Drill Record Sheet)**
- f. Appoint one person as the acting Co-ordinator during his absence from the building.
- g. Responsible for the formation and training of a fire fighting team within the building from amongst responsible employees who are physically fit to perform this function.
- h. Ensure that exit doors are kept closed and unlocked during business hours and that hallways, corridors, lobbies and staircases are kept free from obstruction at all times.

### 4.2 Fire Warden / Assistant Fire Warden

- a. Be familiar with the Fire Emergency Plan and means of escape of the building **(Refer to respective Floor Plan for Fire Escape Route)**
- b. Be familiar with the operation of the fire alarm system and the use of first aid and fire fighting equipment.

- c. Acquaint any new employees with the Fire Emergency Plan including his/her specific role (if any) during an emergency.
- d. Liaise and co-ordinate with each other.

#### 4.3 Campus Security

- a. Be familiar with the Fire Emergency Plan.
- b. Ensure that the security personnel are well versed with their roles as described in the Fire Emergency Plan.

### 4 Fire Evacuation Drills

- 5.1 Fire evacuation drills shall be conducted at least once a year.
- 5.2 All personnel in the building shall participate in the drill.

### 5 General

Remember, it is in your interest to know :

- 6.1 How to report a fire – sound the alarm without delay.
- 6.2 To know what to do in the event of a fire – to avoid panic and confusion.
- 6.3 To know the location of nearby fire extinguishers and hose reels – learn the proper way to use them.
- 6.4 Means of escape in case of fire and to keep staircases, landings and other escape routes clear of obstruction at all time.

### 6 Appendices

- Appendix A – Names and Contact Numbers of Committee Members
- Appendix B – Site Plan of Assembly Point
- Appendix C – Typical Floor Plan (Include location of Extinguishers, Hosereels, Alarm Panels, Manual Callpoint & First Aid Boxes)
- Appendix D – Evacuation Drill Record Sheet

- Appendix E – Floor Register
- Appendix F – Building Evacuation Status Chart

\*Specimen attached

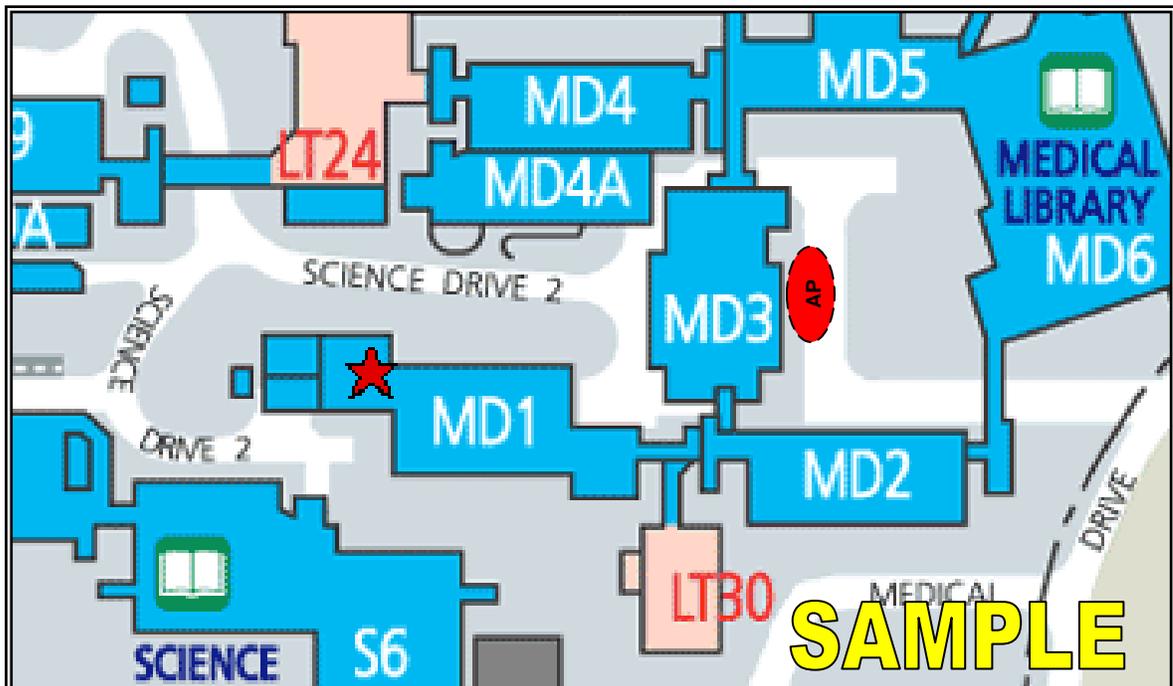
**NAMES AND CONTACT NUMBERS OF FIRE SAFETY COMMITTEE MEMBERS**

<b>Name</b>	<b>Designation</b>	<b>Contact no.</b>
	Fire Safety Coordinator	
	Assistant Fire Safety Coordinator	
	Fire Warden <location of floor>	
	Fire Warden <location of floor>	
	Fire Warden <location of floor>	
	Fire Warden <location of floor>	
	Fire Warden <location of floor>	
	Assistant Fire Warden <location of floor>	
	Assistant Fire Warden <location of floor>	
	Assistant Fire Warden <location of floor>	
	Assistant Fire Warden <location of floor>	
	Assistant Fire Warden <location of floor>	

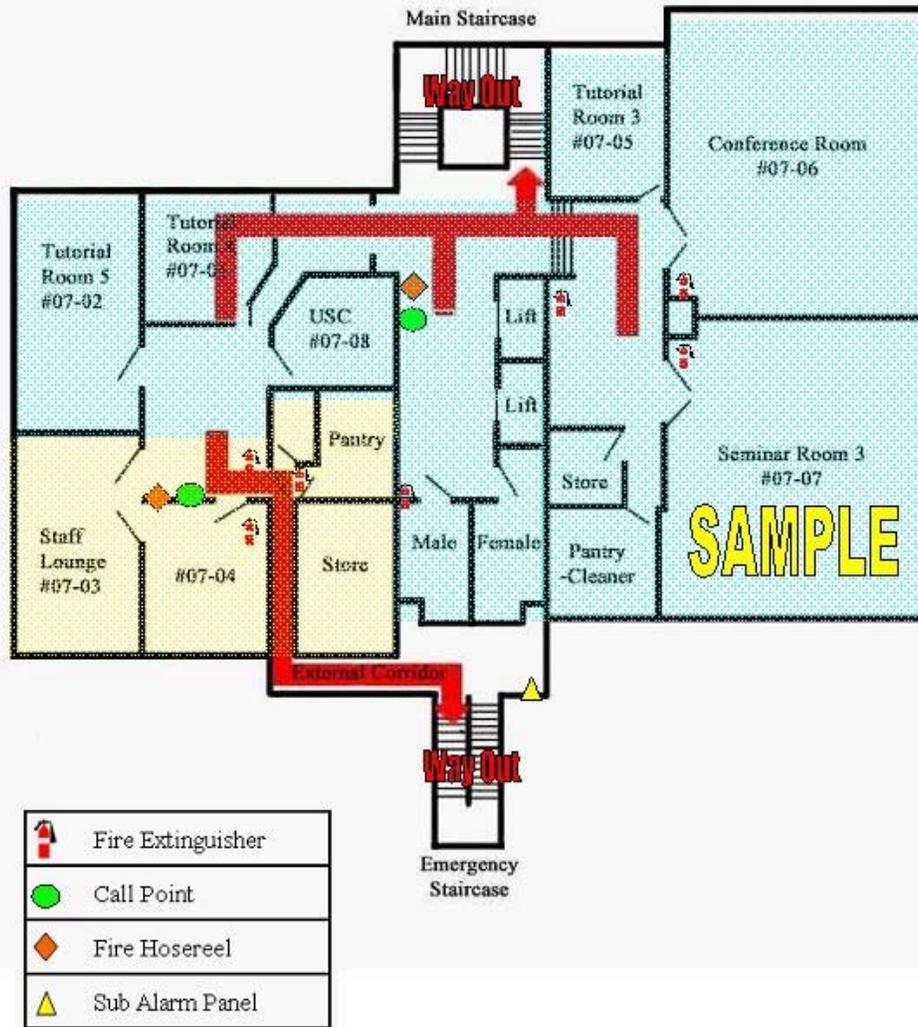
**SITE PLAN OF ASSEMBLY POINT**



ASSEMBLY POINT (LOCATION)



# LEVEL 1 – FIRE ESCAPE ROUTE









## **CHAPTER 3 FIRE EVACUATION PROCEDURES**

### **1 Action to take on hearing the alarm**

1.1 In the event of an outbreak of fire within a building, the procedure to take are as follows:

- (a) He/she shall stop all work, keep all important documents and shut off all electrical equipment if possible.
- (b) He/she shall remain alert in his/her area and wait to be guided by the Fire Warden.
- (c) He/she shall leave the building immediately using the nearest safe exit route and report to the designated Assembly Area.
- (d) Upon reaching the assembly area, he/she shall wait there for further instructions.

### **2. Others**

2.1 Do not stop to collect your personal belongings

2.2 Do not use lifts

2.3 Do not re-enter the building unless authorised to do so

## **CHAPTER 4 FIRE EVACUATION DRILL**

### **1 Objective**

To provide standardised information and procedures regarding fire drill in National University of Singapore (NUS) buildings.

### **2 Scope**

All fire drills to be conducted in NUS buildings.

### **3 Responsibilities**

#### **3.1 Owner/ Management of NUS buildings**

- (a) All buildings with two stories and above, or with more than twenty occupants in the building are to conduct annual fire evacuation drill. If there is more than one department within a building, the Faculty Fire Safety Coordinator(s) shall coordinate and plan such drills. Fire drill to be conducted at least once a year.
- (b) Ensure that all personnel in building participate in the fire drills
- (c) Setup a fire safety committee to facilitate fire drill.

### **4 Definition**

Fire drill: An exercise to establish a systematic and orderly evacuation of building occupants whereby to ensure the safeguard of human lives in the event of fire.

### **5 Procedure**

- 5.1 Department needs to notify Office of Safety, Health and Environment (OSHE) of the fire drill one month in advance.
- 5.2 Department would submit their Fire Emergency Plan (FEP) to OSHE for review prior to the fire drill.
- 5.3 Once the FEP has been approved, department can fix a date, time and venue for the fire drill.
- 5.4 Department has to notify OSHE, Campus Security, Office of Estate Development (OED), neighbouring departments and/or fire alarm vendor of the fire drill one week in advance.

- 5.5 Campus Security would provide security & traffic facilitation and Office of Estate Development (OED) or fire alarm vendor would provide lift and fire alarm activation.
- 5.6 Department is to prepare the following equipment before the fire drill:
- (a) Red arm bands for staff who have been delegated to perform the role of fire warden or assistant fire warden. Arm bands can be collected from OSHE.
  - (b) Fluorescent vest for Fire Safety Coordinator. Vests are also issued by OSHE.
  - (c) 01 x Loud hailer
- 5.7 A qualified person from OSHE will be present to observe and evaluate the conduct of the fire drill. A Fire Evacuation Drill Analysis Form (FEDAF) will be completed by OSHE. (See Appendix 1 for Fire Evacuation Drill Analysis Form)
- 5.8 After the fire drill, department is to hold debrief with the Fire Safety Committee regarding feedback and improvement.

## **6 Record**

- 6.1 OSHE will document a copy of the form and forward another copy to Head of Department/Administrative Units for reference. One copy of the report will also be sent to building fire safety coordinator for documentation and follow up if any

## **7 Appendices**

Appendix I : Fire Evacuation Drill Analysis Form



**FIRE EVACUATION DRILL ANALYSIS FORM**  
Office of Safety Health & Environment

Date of Drill
---------------

Building Name		Building No.	
Address			
Fire Safety Coordinator			
Previous Evacuation Timing (if any)	Time Initiated	Time Completed	
Fire Wardens reported to Assembly Point and performed duties. <b>YES / NO</b> If No, Which floors or areas did not _____			
<b>Evacuation Checklist</b>		<b>N.A</b>	<b>YES</b>
		<b>NO</b>	
1. Occupants/staff exited using the nearest exit?			
2. Occupants/staff responded and reported to Assembly Point			
3. Persons with disabilities are accounted for?			
4. Visitors and students were properly directed?			
5. Could the alert announcement be heard over PA system?			
6. Accounted for missing personnel?			
7. The alarm was audible throughout the area?			
8. All fire doors (escape staircase only) closed?			
9. All auto locking and door release working?			
10. No unauthorized re-entry?			
<b>Comments on all NO marks. Include additional remarks about the drill</b>			
<b>Please rate the overall effectiveness of the drill</b>		<b>GOOD</b>	<b>FAIR</b>
		<b>POOR</b>	
1. Speed of Evacuation			
2. Effectiveness of Procedures			
3. Communication during Drill			
<b>Signatures</b>			
Drill conducted by:			
_____			
Building Fire Safety Coordinator			
Drill assessed by:			
_____			
Evacuation Assessor (Office of Safety, Health & Environment)			

## **SECTION E : GENERAL FIRE PRECAUTIONS FOR LESSEES OF NUS BUILDINGS**

### **CHAPTER 1 GENERAL FIRE SAFETY – DUTIES AND RESPONSIBILITIES**

#### **1 INTRODUCTION**

- 1.1 It is important to maintain a high standard of fire safety in NUS buildings which are leased to third parties. Fires in these buildings will have an impact on the NUS community.
- 1.2 Majority of these buildings are also engaged in research works, which carry the risks of fire.

#### **2 General Responsibilities**

- 2.1 The Lessee shall be responsible in ensuring the following:
  - (a) Exercise surveillance over their staff and occupants to ensure that the fire prevention measures listed in Section A Chapter 2 are complied with.
  - (b) Maintain and test the protection systems installed in the buildings regularly in accordance with the Codes of Practice.
  - (c) Maintain and check the electrical systems in the buildings regularly. Test the safety devices of the electrical systems and wiring regularly and also to ensure that they are adequate.
  - (d) Arrange for loss prevention checks, which shall be carried out at their premises at least once annually.
  - (e) Provide adequate fire extinguishers and hosereels in the premises in accordance with FSSD regulations and requirements. These fire protection equipment shall also be properly maintained in accordance with the relevant standards.

## **Fire Prevention Measures**

- 2.2 Owners and lessees of these buildings and managed properties shall comply with the Fire Prevention Measures listed in Section A Chapter 2.

### **3 Fire Evacuation Plan and Exercises**

- 3.1 It is the responsibility of the lessees to establish fire evacuation plans for all their premises and conduct fire evacuation exercises at least once a year to test the effectiveness of the plans.
- 3.2 The evacuation plan at Section C, Chapter 2 may be used as a guide.
- 3.3 The owner of these buildings are required to extend a copy of their evacuation plans to OSHE and Campus Security together with the names of fire wardens.
- 3.4 Fire wardens shall, if so required, nominate Assistant Fire Wardens for the areas under their charge.

### **4 Other Hazards**

- 4.1 All owners and lessees shall strictly comply with the safety measures listed in the Appendices of Section B. In addition, a few activities and processes carried out on or in the proximity can be hazardous. Hence, the following appendices on fire safety measures are in this Manual for owners to comply.

Appendix A-III : Welding and Hot Works

Appendix A-IV : Fire Precautions during Oxygen Storage

Appendix A -V : Planning and Management Guide for Public Assembly Events