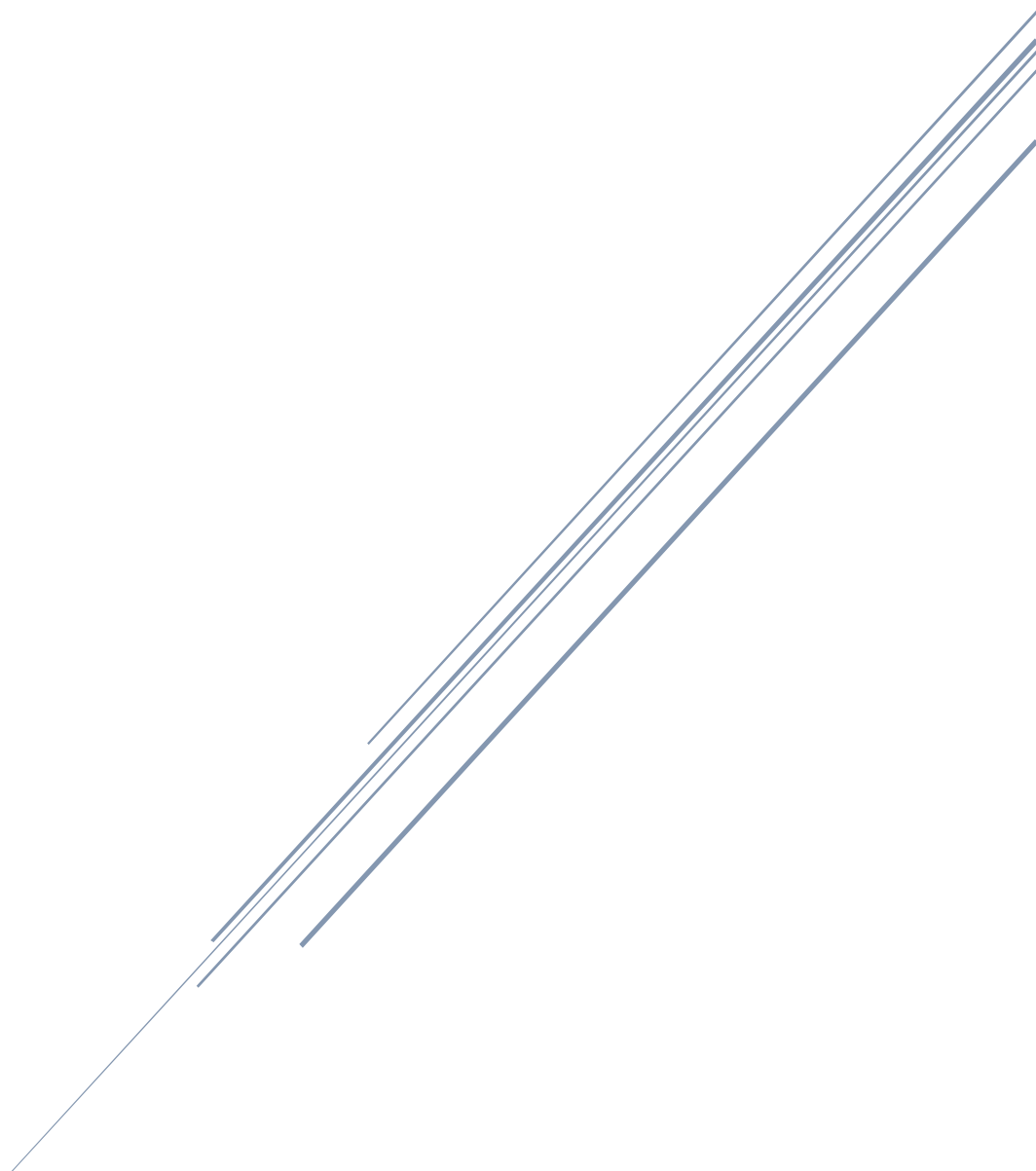




CHANGI AIRPORT GROUP FIRE SAFETY MANUAL



Airport Emergency Service
Sep 2023

Contents	0
Record of Amendments	2
Distribution List	3
Abbreviations	4
Foreword	6
PART ONE: FIRE SAFETY MANAGEMENT OF CAG OWNED / MANAGED PROPERTIES	9
Chapter 1 – General Fire Safety Duties and Responsibilities	9
Chapter 2 – General Fire Preventive Measures	12
Chapter 3 – Maintenance of Fire Detection and Protection Systems	18
Chapter 4 – Provision and Usage of Fire Extinguishers	21
Chapter 5 – Fire Safety Requirements for Renovations, Alterations, And Additions to Cag Owned / Managed Properties	28
Chapter 6 – Fire Emergency Plans for Cag Owned / Managed Buildings Including Those at CAC	33
Annex 1 – Emergency Contact Numbers	43
Annex 3 – Typical Floor Plans (Contact FPS for Details)	44
Annex 4 – Evacuation Drill Record Sheet	45
Annex 5 – Standard PA Announcement Texts During Activation of Fire Alarm	46
Annex 6 – Floor Register	49
Chapter 7 – Fire Safety Inspection on CAG Tenanted Premises By AES	50
PART TWO: FIRE SAFETY MANAGEMENT OF NON-CAG OWNED / MANAGED PROPERTIES	51
Chapter 8 – General Fire Safety Duties and Responsibilities	51
PART THREE: FIRE SAFETY MANAGEMENT OF OTHER SPECIFIC FIRE HAZARDS	56
Chapter 9 – Aircraft Fuel Servicing and Maintenance of Aircraft Fuel System	56
Chapter 10 – Airfield Vehicle Operations	68
Chapter 11 – Precautions During Battery Charging	71
Chapter 12 – Import, Transport, Storage and Dispense/Decant of Petroleum & Flammable Materials	75
Chapter 13 – Hot Works	77
Chapter 14 – Fire Precautions During Oxygen Charging and Storage	89
PART FOUR: APPENDICES	99
Appendix 1-1 – Fire Safety Do's and Don'ts	99
Appendix 1-2 – Consolidated Fire Safety Requirements for Compliance by CAG Tenants	102
Appendix 1-3 – Summary of Fire Safety Requirements for CAG – Managed Buildings	104
Appendix 1-4 – Sample of AES Service Charge Form	112
Appendix 1-5 – AESs Fire Alarm Isolation and Hot Work Manual Permits	113
Appendix 1-6 – Sample of Fire Alarm System Isolation/ Hot Work and Hot Work Enforcement Checklist	117
Appendix 1-7 – Kitchen Fire Safety Assessment Form	122
Appendix 1-8 – Kitchen Fire Suppression System Functional Test	125
Appendix 1-9 – AES Fire Prevention Circular	126
Appendix 2-1 – Fire Safety Requirements Involving Aircraft Fuel Servicing	127
Appendix 2-2 – Fire Safety Requirements Involving Airfield Vehicle Operations	129

Record of Amendments

S/No	Amendment No.	Date of Amendment	Reviewed By
1	01/1999	15 Apr 1999	OC(FS)
2	01/2000	01 Jul 2000	OC(FS)
3	01/2001	18 Aug 2001	OC(FS)
4	01/2002	9 Sep 2002	OC(FS)
5	01/2004	15 Mar 2004	OC(FS)
6	02/2004	7 Sep 2004	Supt (FS)
7	01/2005	1 Feb 2005	Supt (FS)
8	02/2005	1 Jul 2005	Supt (FS)
9	01/2006	27 Nov 2006	Supt (FS)
10	01/2008	30 May 2008	Supt (FS)
11	01/2009	1 Jul 2009	SO (FS)
12	01/2010	18 Nov 2010	1SO, FS
13	01/2011	14 Feb 2011	2SO, FS
14	01/2012	1 Nov 2012	1SO, FS
15	01/2014	1 Aug 2014	2SO, FPS
16	01/2016	1 Mar 2017	FWO Alex
17	01/2017	12 May 2017	SO, FPS
18	02/2017	22 Sep 2017	FWO Alex
19	01/2018	22 May 2018	FSSGT Yunos
20	01/2019	1 Aug 2019	FWO Gerald
21	02/2019	1 Dec 2019	FWO Ashraf
22	01/2020	1 Sep 2020	FWO Ashraf
23	02/2020	1 Dec 2020	FWO Ashraf
24	01/2021	17 Sep 2021	FWO Alex
25	02/2021	15 Nov 2021	FWO Alex
26	03/2021	10 Dec 2021	FWO Alex
27	01/2022	15 Nov 2022	FWO Alex
28	01/2023	31 Jan 2023	FWO Alex
29	02/2023	10 May 2023	FWO Alex
30	03/2023	30 Sep 2023	1SO Effendi, FWO Alex

Distribution List

The Fire Safety Manual is available online at <https://www.changiairport.com/en/conditions-of-use.html> for all Airport Users.

Abbreviations

A&A	-	Addition and alteration
AES	-	Airport Emergency Service
AO	-	Airport Operations
AO/FM	-	Airport Operation / Facilities Management
APD	-	Airport Police Division
ATC	-	Air Traffic Control
AVSEC	-	Aviation Security
AVTUR	-	Aviation Turbine Fuel
BCA	-	Building and Construction Authority
BCF	-	Bromochlorodifluoromethane
BS	-	British Standards
CAC	-	Changi Airfreight Centre
CAG	-	Changi Airport Group (Singapore) Private Limited
CAR	-	Central Announcement Room
CBD	-	Cargo Business Division
CAAS	-	Civil Aviation Authority of Singapore
CAES	-	Chief, Airport Emergency Service
CAFHI	-	Changi Airport Fuel Hydrant Installation
CCS	-	Casualty Clearance Station
CERT	-	Company Emergency Response Team
CP	-	Code of Practice
DECAM	-	De-centralized Alarm Monitoring
DTM	-	Duty Terminal Manager
DNATA	-	DNATA Singapore Pte Ltd
E&D	-	Engineering & Development
EN	-	European Standards
ERP	-	Emergency Response Plan
ES	-	Enterprise Singapore
FCC	-	Fire Command Centre
FPS	-	Fire Prevention Section
FPC	-	Fire Prevention Circular
F&B	-	Food & Beverages
FM	-	Facility Management
FMC	-	Fault Management Centre
FSC	-	Fire Safety Certificate
FSM	-	Fire Safety Manager
FSSD	-	Fire Safety and Shelter Department
Head, FPS	-	Head, Fire Prevention Section
HT	-	High Tension
IBMS	-	Integrated Building Management System

iFM	-	Integrated Facilities Management
KFSS	-	Kitchen Fire Suppression System
LEW	-	Licensed Electrical Worker
LORADS	-	Long Range Radar Station
LPG	-	Liquefied Petroleum Gas
LT	-	Low Tension
NFPA	-	National Fire Protection Association
MINDEF	-	Ministry of Defence
OC	-	Officer Commanding
OIC	-	Officer-In-Charge
PA	-	Public Address
QP	-	Qualified Person
SAA	-	Singapore Aviation Academy
SASCO	-	ST Aviation Services Company Pte Ltd
SATCC	-	Singapore Air Traffic Control Centre
SATS	-	Singapore Airport Terminal Services
SCDF	-	Singapore Civil Defence Force
SS	-	Singapore Standards
UL/FM	-	Underwriters Laboratories / Factory Mutual
URA	-	Urban Redevelopment Authority
WRO	-	Watch Room Operator (AES)

Foreword

Aims

Owing to the nature of airport operations, airport terminal buildings are generally atrium designed. As such buildings are large and spacious, any fire outbreak can spread rapidly. This coupled with the high number of passengers commuting through the airport daily, places airport buildings in the high fire load category. Because of the global nature of airport operations, a major fire outbreak will draw adverse publicity, both locally and overseas. In addition, a major fire could disrupt flying operations, resulting in high losses to the airport as well as the nation.

This manual contains fire safety procedures, which are based on existing regulations, and other codes already promulgated in Singapore. These procedures spell out the fire safety measures to be observed by airport operators and tenants so that standards of fire safety can be maintained at key buildings of Singapore Changi and Seletar Airports.

General Terms of Reference

This manual seeks to spell out: -

- a. The fire safety precautions that need to be provided at key buildings of the airports.
- b. The parties responsible for the implementation and compliance of these and other fire safety codes.
- c. The types of fire safety test and checks to be carried out by each concerned party
- d. The general procedures to be complied with in the event of a fire outbreak; and
- e. Other specific fire hazards.

This manual is intended to cover both CAG and non-CAG owned/managed buildings in the airport but are by no means exhaustive and where appropriate should be used in conjunction with the codes of other authoritative bodies such as the National Fire Protection Association (NFPA) and the Codes of Practice for Fire Precautions in Buildings by the Singapore Civil Defence Force (SCDF) and the Singapore Standards by Enterprise Singapore (ES)

AES Service Charge

All air carriers, ground handling agents, facilities managers, project/maintenance contractors, owners, tenants; or any contractors/sub-contractors engaged by them; and all parties operating or working in Changi Airport, the Changi Airfreight Centre or Seletar shall comply with all fire safety requirements, safety instructions, permit to work system and hot work procedures required by SCDF and as stipulated by CAG's Fire Safety Manual. Non-compliance to these procedures and guidelines resulting in false fire alarm activations and turnout of AES resources may result in a service charge being levied as per the schedule of rates listed in Para.3.3 below.

(See Appendix 1-4 – Sample of AES Service Charge Form).

To prevent abuse of AES resources, AES may levy a service charge on all airlines, air carriers, ground handling agents, cargo agents, facilities managers, project/maintenance contractors, owners, tenants; or any contractors/sub-contractors engaged by them; and all parties operating or working in Changi Airport, the Changi Airfreight Centre, or Seletar Airport for any of the following services:

- a. Removal of Fuel Hazards
- b. Refueling / Defueling Standby
- c. Explosives Escort
- d. Hot Work Standby
- e. First Aid Fire Appliances (FAFA) training
- f. False fire alarm activation turnout
- g. Vehicle escort
- h. Fire Patroller duties

The schedule of rates is listed in Table 1 below:

Table 1

S/No	Service	Charge*
i)	Fire Vehicle	\$600 per vehicle per hour or part thereof*
ii)	Sea Rescue Craft	\$1010 per vessel per hour or part thereof*
iii)	Fire Officer (SAEO)	\$100 per officer per hour or part thereof*
iv)	Firefighter (AEO)	\$60 per firefighter per hour or part thereof*
v)	Engineer and Technician	\$400/ 500 per team per incident*
vi)	Auxiliary Police	\$400 per team per incident*

**Excludes prevailing government taxes and the revised rates will be effective from 0000LT, 15 June 2017.*

Amendments

This manual will be reviewed from time to time. Suggestions to improve this manual are welcome. All proposed amendments can be emailed to fire.safety@changiairport.com or be submitted in duplicate, type-written in double spacing, and addressed to:

Head, Fire Prevention Section
Airport Emergency Service
Fire Prevention Section
Changi Airport Group (Singapore) Pte Ltd
Singapore Changi Airport
P O Box 168
Singapore 918146

PART ONE: FIRE SAFETY MANAGEMENT OF CAG OWNED / MANAGED PROPERTIES

Chapter 1 – General Fire Safety Duties and Responsibilities

1.1 General

- 1.1.1 The responsibility of ensuring that fire safety measures are observed at each airport building shall be that of the owner. In the case of CAG owned / managed properties, the respective head of division in charge of the leasing or occupying premises shall be responsible as the "owner". He should also exercise surveillance over the tenants and staff occupying such premises. The AES and E&D/ iFM shall be promptly notified of any suspected deficiencies.

1.2 Duties and Responsibilities of Divisions in CAG owned / managed properties

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

- a. Airport Emergency Service (Division of CAG)
 - i. Carry out FSM duties and responsibilities stipulated in the Fire Safety (Fire Safety Managers) Regulations Part III.
 - ii. Ensure that building owner appoint a FSM for CAG buildings which satisfy SCDF FSM appointment conditions.
- b. Airport Operations (Division of CAG)
 - i. AO/FM to ensure all portable fire extinguishers belonging to CAG are serviced annually in accordance to latest SS578.
 - ii. AO/FM will conduct regular servicing of the hose reel belonging to CAG in accordance to latest SS575.
 - iii. AO/FM will work with AES and other stakeholders to follow up on any observations relating to the cabinets that is used to house fire extinguishers and hose reels so that they are accessible for use during a fire.
 - iv. AO/FM should ensure that there are designated areas for the proper disposal of bulk rubbish at the airport terminals. These areas should not obstruct the means of escape.

-
- v. AO/FM to ensure the designated smoking areas are included as part of the building cleaning regimes.
 - c. Cargo Business Division (Division of CAG)
 - i. Overall coordination of for the cargo agent buildings during a fire/emergency; and
 - ii. Liaison of all Air Cargo Ops matters.
 - d. Commercial Division (Division of CAG)
 - i. Manage CAG tenants at the terminal buildings and CAC to ensure that they comply with fire safety precautions by obtaining Fire Safety Certificate (FSC).
 - ii. Ensure that the tenants at the terminal buildings and CAC observe the fire preventive measures listed in Chapter 2 of this Section and its appendices together with Schedule 3 of CAG Tenancy Agreement (where applicable)
 - iii. Ensure that all renovations, alterations and additions by tenants to CAG owned / managed buildings are authorised in accordance with Chapter 5 of this section.
 - iv. Ensure that all concessionaires/tenants at the terminal buildings and CAC managed by Commercial Division carry out tests on electrical wiring and systems as required in this manual and forward reports of these tests to the Engineering Division upon request; and
To act on errant tenants who do not take proactive actions to eliminate fire hazards within their premises.
 - e. Engineering & Development and IFM (Division of CAG)
 - i. Provide technical advice for fire detection and protection systems at all CAG owned / managed buildings in accordance with standards from Enterprise Singapore.
 - ii. Provide technical advice for electrical installation in all CAG owned / managed buildings and installations.
 - iii. To ensure that no bulk disposal of rubbish obstructs the means of escape in the CAC.

- iv. To ensure all CAG portable fire extinguishers located at CAC are serviceable and maintained regularly in accordance to latest SS578.
- v. To ensure that all CAG building hose reels located at CAC are inspected for their serviceability.
- vi. To ensure that all cabinets located at CAC that are used to house fire extinguishers and hose reels are accessible for use during a fire.
- vii. To ensure cigarette butt bins located at CAC that are placed at specified smoking areas are cleared of rubbish on a regular basis.

f. All Divisions & All Airport Staff

In addition to the above, each Division shall:

- i. Ensure that all electronic equipment and wiring in their premises are regularly checked and properly maintained.
- ii. Observe good housekeeping by separating combustible materials, e.g. thermal facsimile paper, diskettes, etc from electrical peripherals.
- iii. Exercise surveillance and act as appropriate on those occupants who do not comply and keep AES/E&D/iFM informed.
- iv. Ensure that its premises are adequately protected by fire extinguishers and other fire safety equipment based on the advice provided by AES in accordance with Chapter 4 of this Section.
- v. Ensure that all staff and occupants observe the Fire Preventive Measures listed in Chapter 2 of this section and its appendices together with Schedule 3 of CAG Tenancy Agreement (where applicable).
- vi. Appoint fire wardens / assistant fire wardens for its own premises and inform FPS of any changes to their appointed fire wardens / assistant fire wardens.
- vii. Ensure that its staff are familiar with the emergency evacuation plan.
- viii. Encourage its staff to attend relevant fire safety training at the Singapore Aviation Academy or conducted by FPS; and
- ix. Ensure all renovations, major alterations and additions have been approved by FSSD and AES.

Chapter 2 – General Fire Preventive Measures

2.1 Introduction

- 2.1.1 Singapore Changi Airport has a wide range of occupancies such as restaurants, duty-free shops, lounges, etc., and a large overall volume of combustibles such as alcohol, furniture, carpets etc. These together with the large number of aircraft passengers commuting through the airport daily result in a high fire load at the terminal buildings. Therefore, fire preventive measures need to be practiced by all staff, occupants and tenants of buildings at Changi Airport. Staff and tenants at Seletar Airport should also observe such safety standards.
- 2.1.2 Fire preventive measures may be grouped into distinct categories, such as fire detection and protection equipment, passive measures, housekeeping, electrical systems and wiring, and other hazards.

2.2 Training and Assessment of Fire Safety and Kitchen Fire Safety

- 2.2.1 Tenants with, and operators of, kitchen facilities with open flame cooking shall comply with the following:
- a. All managers and supervisors, or equivalent shall attend the AES Kitchen Fire Safety Assessment - Train the Trainer Session annually.
 - b. Trained managers and supervisor, or equivalent shall then train and assess their staff using the Kitchen Fire Safety Assessment Form on a monthly basis. [see **Appendix 1-7 – Kitchen Fire Safety Assessment Form**]
 - c. The required Kitchen Fire Safety Assessment form shall be kept by the managers and supervisors and shall be provided to AES upon request.
 - d. Employees of the tenant must have their staff's particulars documented in the tenant's staff register.
 - e. No stowage racks or other forms of obstructions are permitted to be installed or mounted between the cooker and the hood of the kitchen fire suppression system (KFSS) as such racks/obstructions may affect the activation of the kitchen fire suppression system.

- f. Tenants shall ensure their staff do not leave cooking unattended.

2.3 Fire Detection and Protection Equipment

- 2.3.1 All fire detection, gas detection and protection systems shall be installed, in accordance to the approved QP submission plan to SCDF. All system shall be maintained, serviced, and inspected in accordance with the latest SS/CP and relevant standards accepted by SCDF.
- 2.3.2 The fire protection systems shall have audible alarm bells or similar facilities to warn the occupants of the building in case of fire.
- 2.3.3 Fire alarm signal connection shall be made between the fire protection systems and the AES fire station and SCDF approved DECAM monitoring company.
- 2.3.4 The fire protection systems should be extended to new areas arising from building extension or floor alterations.
- 2.3.5 Fire hose reels should be able to provide full coverage over the whole of the floor area where they are installed and take into consideration the physical layout of the area covered.
- 2.3.6 Fire hose reels & extinguishers shall be free of obstructions.

2.4 Passive Measures

- 2.4.1 Means of egress shall be arranged so that the occupants can pass through an exit from the building or storey quickly and without obstruction.
- 2.4.2 Exit signs and directional exit signs shall be provided, adequately illuminated and displayed.
- 2.4.3 Escape routes shall always be kept clear and free of obstructions and be suitably marked.
- 2.4.4 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.

2.5 Housekeeping

- 2.5.1 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 only allowed at designated areas or rooms with suitable ashtrays or cigarette butt bins being provided. Cigarette butts shall be completely extinguished before being disposed in a proper manner.
 - c. Other than kitchens of restaurants where fire suppression systems are installed, there shall be no naked flame allowed, unless prior approval is sought from AES' FPS.
 - d. No burning of oil lamps, candles, joss sticks or any forms of offerings, shall take place, especially within the buildings and on the airside. Devotes working in the airport area are advised to use electrical or battery-operated joss sticks if they wish to perform their prayers.
 - e. Burning of offerings will only be permitted at burning sites designated by AES during the Lunar 7th month festival.

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- f. Where burning of any sort or Hot Work is required, the prior approval of AES Division shall be obtained.
 - g. In the case of restaurant cooker hoods – these shall be degreased/cleaned on a regular basis as appropriate. The schedule of cleaning shall be extended to AES and E&D/iFM upon request.
 - h. Frequency and method of rubbish and waste disposal should be adequate for the type of occupancy and activity being conducted.
 - i. Rubbish storage bins built of non-combustible materials shall be provided under cutting, boring and turning machines.
 - j. Used cleaning rags and other impregnated materials or waste cloths should be kept in non-combustible containers with self-closing and close-fitting lids.
 - k. No storage of flammable liquids shall be allowed. If required, the prior approval of AES Division shall be obtained.
 - l. Storage of approved quantities of flammable liquids shall comply with Part Three. Chapter 12
 - m. Where there is a possibility of a flammable liquid spill, tenant shall ensure they engage QP to assess and submit approved plan to SCDF with the provisions made as follows:
 - i. Ensure the spread of the spill is limited.
 - ii. Non-flammable absorbent material is available for immediate use.
 - iii. Ignition sources can be quickly removed, and the area is well ventilated.
 - iv. All packing materials should be neatly stacked in a separate storage area and not in passageways or aisles.
 - v. There shall be a minimum clear space of 0.5m between the top of storage piles and sprinkler heads or the ceiling. This clear space shall be at least 1m in warehouses.
 - vi. In storage areas, aisles shall be maintained for access and egress. These aisles should not be obstructed and should correspond as much as possible in width with the building entry/exit points.
 - vii. Provision shall be made for ready access to fire-fighting equipment.
 - viii. All fire and exit doors shall be kept clear such that stored material will not interfere with their operation.

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- ix. Storage shall not mix with other risks and there shall be separation between the two by fire rated walls, self-closing fire doors, etc.
 - x. Hazardous goods, such as gas cylinders and combustible liquids shall be separated from other stores, either by compartmentalisation or distance. Hazardous materials shall be indicated outside each store.
 - xi. Stores where hazardous materials are kept shall be clearly marked at the entrance with appropriate labels.
 - xii. A floor plan shall be made available at the fire indicator board for arriving emergency services in case of fire outbreak.

2.6 Electrical Systems and Wiring

2.6.1 Connections between wires and plugs should not be loose.

2.6.2 Conduits and raceways should be fastened into position and secured to outlet boxes, cabinets and other equipment.

2.6.3 All electrical boxes should be closed to prevent the possibility of contact with combustible materials.

2.6.4 All fixtures, switches and sockets should be well maintained.

2.6.5 Electrical equipment should not be improperly wired or with wiring that have become frayed or loose. All electrical appliances shall be of an approved type, correctly positioned and have well maintained flexible cords.

2.6.6 Electrical appliances and machinery should be operated by qualified persons and should not be left operating unattended.

2.6.7 Electrical equipment should not be left energised when not in use especially during after-working hours. They should be switched off when not in use.

- 2.6.8 Do not overload the electrical circuit by fitting many extension outlets. If necessary, more permanent power points should be added by a EMA Licensed Electrical Worker (LEW) of the appropriate grade.
- 2.6.9 With effect from 1 August 2014, all new lighting fixtures shall be installed with electronic ballast or LED type of lighting systems. Conventional ballast shall not be used in the terminal buildings lighting systems for any new installation. Users are also required to monitor the usage and life span of the lighting systems and change before its end of life.
- 2.6.10 LEW should be engaged to operate, maintain and repair electrical installation as per EMA guidelines.

2.7 Other Hazards

- 2.7.1 Some works carried out in the terminal buildings and other CAG owned / managed buildings are inherently hazardous. These include hot works and battery charging operations in which hydrogen is released in large quantities. Reference shall also be made to the appendices of this section together with Section C of this manual and Schedule 3 of CAG Tenancy Agreement (where applicable).

Chapter 3 – Maintenance of Fire Detection and Protection Systems

3.1 Introduction

- 3.1.1 This chapter spells out the maintenance procedures for fire detection and protection systems in all CAG owned / managed properties in the airport.

3.2 Duties and Responsibilities

- 3.2.1 E&D and iFM are responsible for maintaining the fire protection installations in optimum working condition except for those equipment/systems installed and maintained by the tenants/lessees as per recognised local or international fire safety standards or manufacturer's recommendations.
- 3.2.2 AO/FM is responsible for the maintenance of fire extinguishers and fire hose reels (up to the stop cocks).
- 3.2.3 Both E&D/ iFM and AO/FM are responsible to notify AES of any defects (and their status of rectification) that affect the operations of the fire protection installations, so that alternative arrangements as deemed necessary by the AES can be made.
- 3.2.4 Copies of all initial system commissioning, subsequent modification and commissioning and subsequent annual test reports on the fire protection systems carried out to comply with statutory requirements and shall be compiled and submitted to CAG upon request.

3.3 Inspection and Test Procedures

3.3.1 Fire alarm and detection systems

- a. Regular testing and inspection should be conducted as per latest Singapore Standard / Code of Practice guidelines.:

-
- i. If needed by, Fire detectors that are installed and maintained by tenants at their respective premises should be subject to random tests by E&D and iFM and/or its engaged M&E maintenance contractor(s).
 - ii. Checks should be conducted for obstructions such as partitions, racks, piled stocks or detectors located near air-conditioning/exhaust vents, in such a way as not to interfere with the effectiveness of the detectors' function.

3.3.2 Fire hydrants and dry rising mains

- a. Regular testing and inspection should be conducted as per latest Singapore Standard / Code of Practice guidelines.

3.3.3 Automatic fire sprinkler systems

- a. Regular testing and inspection should be conducted as per latest Singapore Standard / Code of Practice guidelines.

3.3.4 Gas Flooding Fire Protection Systems

- a. Regular testing and inspection should be conducted as per latest Singapore Standard / Code of Practice guidelines.

3.3.5 Fire Hosereels system

- a. Regular testing and inspection should be conducted as per latest Singapore Standard / Code of Practice guidelines.

3.3.6 Kitchen Fire Suppression System (KFSS)

- a. Restaurant / F&B operators are responsible to maintain the KFSS installed in their premises.
- b. Restaurant / F&B operators shall ensure that the KFSS is serviced annually with records updated for AES Fire Safety Inspection (**See Appendix 1-3 – Summary of Fire Safety Requirements for CAG Managed Buildings in particular point 8).**

-
- c. Tenants shall ensure that the kitchen fire suppression system is linked to the AES Fire Station through the building Fire Alarm Panel during the tenant Pre-Opening Inspection Testing that is coordinated by Commercial division.
 - d. As per **Appendix 1-7 - AES Fire Safety Circular 05/2011 dated 8 Sep 2011**, there shall be no open flame cooking/deep frying activities if the KFSS is not installed or available at the premises.
 - e. In addition to the fire extinguisher required for the F&B premises, all kitchen with open flame and/or deep-frying activities shall install at least one 75F rated fire extinguisher within 7 meters from the open flame and/or deep-frying activities or as recommended by a qualified person (reference to latest SS 578).
 - f. AES FPS will perform random assessments on F&B staff operating in their outlets/restaurants using **Appendix 1-7 Kitchen Fire Safety Assessment Form**.
 - g. AES FPS will also perform random functional checks on F&B operating with KFSS using **Appendix 1-8 Kitchen Fire Suppression System Function Test**.

3.3.7 Gas Pipes and Detection Systems

- a. Specific requirements on the above can be found in the renovation requirement as specific by CAG from time to time, but in general interlinking between gas solenoid valve, gas detection system and ventilation system shall be carried out by the tenant. The gas detector panel shall interface with the existing IBMS, and the tenant shall ensure that all gas detection systems (including link to Fault Monitoring Centre located at Changi Airport Terminal 3) are checked and serviced annually with records to be produced upon request by CAG.
- b. No liquefied petroleum gas (LPG) cylinder is allowed in the Changi Airport unless prior approval of SCDF and AES are sought.

Chapter 4 – Provision and Usage of Fire Extinguishers

4.1 Provision of Fire Extinguishers

- 4.1.1 Generally, provisions of fire extinguishers are in the form of portable handheld or trolley extinguishers.
- 4.1.2 Trolley fire extinguishers shall comply with the latest editions of NFPA10 Standard for Portable Fire Extinguishers or BS: EN 1866-1 Mobile fire extinguishers Characteristics, performance, and test methods.
- 4.1.3 All stated ratings of fire extinguisher shall be of latest SS578/ BS: EN standards unless otherwise stated.

4.2 Basic Type of Fire Extinguishers and Their Recommended Colours of Identification

<u>4.2.1 Type of fire extinguisher</u>	<u>Colour</u>
Water	Signal red
Foam	Pale cream
Dry Powder	French blue
Carbon dioxide	Black
Clean Agent/Halon*	Emerald green

**Note: Existing halon (BCF type) fire extinguishers may still be available although new replacement is discontinued.*

4.2.2 Fire Extinguishing Agents for the Various Classes of Fire

Classes	Type of fires	Suitable Extinguishing Agents
A*	Fires involving ordinary combustible materials like wood, paper, cloth, furnishing, plastics, rubber, etc., usually of an organic nature, in which combustion normally take place with the formation of glowing embers.	Water, multi-purpose powder types, foam, or clean agent
B	Fires involving flammable liquids, solvents, oils, paints, thinner and liquefiable solids	Powder, clean agent, carbon dioxide and mechanical foam such as aqueous film forming foam (AFFF). Note – When used in open areas, the powder type is recommended since in the open, both carbon dioxide gas and clean agent gas are less efficient.
C	Fires involving flammable gases	Clean agent, carbon dioxide or dry powder extinguisher
D	Fires involving combustible metals e.g. potassium, magnesium, titanium, sodium, lithium and zirconium	Extinguishers and extinguishing agents for the protection of Class D hazards shall be of types approved for use on the specific combustible metal hazard
F	Fires involving cooking media (vegetable or animal oils and fats) in cooking appliances	Class F extinguishers are recommended.

4.2.3 Classification of occupancy hazards

a. Low hazard

These occupancies consist of fire hazards having normally expected quantities of Class A combustible furnishings, and/or the total quantity of Class B flammables typically expected to be present is less than 5 litres in any room or area.

b. Medium hazard

These occupancies consist of fire hazards that only occasionally contain Class A combustible materials beyond the normal anticipated furnishings, and/or the total quantity of Class B flammables typically expected to be present is 5 litres to 20 litres in any room or area.

c. High hazard

These occupancies consist of fire hazards involving storage, packaging, handling, or manufacture of Class A combustibles and/or the total quantity of Class B flammables expected to be present is more than 20 litres in any room or area.

4.3 Strategic Location for Fire Extinguishers

4.3.1 A qualified person (QP) should be consulted to determine the most appropriate type of fire extinguishers are provided at suitable locations.

4.3.2 Fire extinguishers shall be conspicuously located in positions where they will be readily accessible and immediately available in the event of fire which must approved by a QP. The fire extinguishers shall be located in the following priority:

- a. Exit staircases (just beside the exit door but not inside exit staircase).
- b. Exits (for 1st storey).
- c. Common lobby or common corridor.
- d. Room exit / access doors.
- e. Internal corridor along path of escape.

4.3.3 In certain locations where visual obstruction cannot be completely avoided, fire extinguisher signs shall be provided to indicate the location.

4.3.4 Fire extinguishers provided to deal with special risk shall be sited near to the risk concerned, but not too near as to be inaccessible in case of fire. If the special risk is contained within a confined space, it is generally advisable to position the extinguisher outside that space.

4.3.5 Placement of fire extinguishers

- a. Shall be mounted on walls by the hangers or brackets supplied.
 - i. Handle shall not exceed 1.2m above the floor - extinguisher gross weight not exceeding 4kg.
 - ii. Handle shall not exceed 1.0m above the floor – extinguisher gross weight exceeding 4kg.

- iii. Cabinets, if permitted to house extinguisher, shall not be locked. Cabinet shall be in red colour or indicated with a fire extinguisher signage.
- iv. Free-standing fire extinguishers may be placed on shelves or on the floor if these extinguishers are designed for such form of placement on appropriately designed support to prevent accidental dislodgement.

4.3.6 Fire extinguisher size and placement for Class A hazards

- a. Fire extinguisher shall be located so that no person needs to travel more than 15 m to reach.
- b. Minimum sizes of fire extinguishers
 - i. For low hazard occupancy the minimum rating shall be 13A.
 - ii. For medium hazard occupancy the minimum rating shall be 21A.
 - iii. For high hazard occupancy the minimum rating shall be 34A.

4.3.7 Fire extinguisher requirements in new buildings under construction

- a. Under the Fire Code, clause 9.9.4.C.(1c), stipulates that “Within the hoarded area(s), 50kg fire extinguisher(s) in trolley shall be provided near the hoarding exit access door.
- b. Each fire extinguisher shall not cover more than 20m.
- c. Use of multiple smaller fire extinguishers to achieve the 50kg requirement is not permitted.

4.4 Inspection and Maintenance of Fire Extinguishers

4.4.1 **Inspection Procedures.** AO/FM/AES shall conduct regular patrol that shall include at least a check of the following:

- a. Fire extinguishers are 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. The content level is correct.
- f. Visual checks for obvious physical damages, corrosion, leakage or clogged nozzles.

- g. Pressure gauge reading is within the operative range or pressure gauge indicator is in the correct position.
- h. Essential parts, such as the discharge tube/horn are serviceable and not missing.

4.4.2 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).
- c. The class of fire for which it is suitable.
- d. Method of operation.
- e. Test and working pressures.
- f. The date of last service or expiry date of serviceability.

4.4.3 The discharge lever of fire extinguishers should have a safety pin secured with a plastic seal.

4.4.4 All fire extinguishers, except those that are empty, shall be always positioned upright.

4.4.5 All fire extinguishers shall be serviced annually by competent person(s) from organisations approved by the relevant authority and a label is attached to each extinguisher as proof.

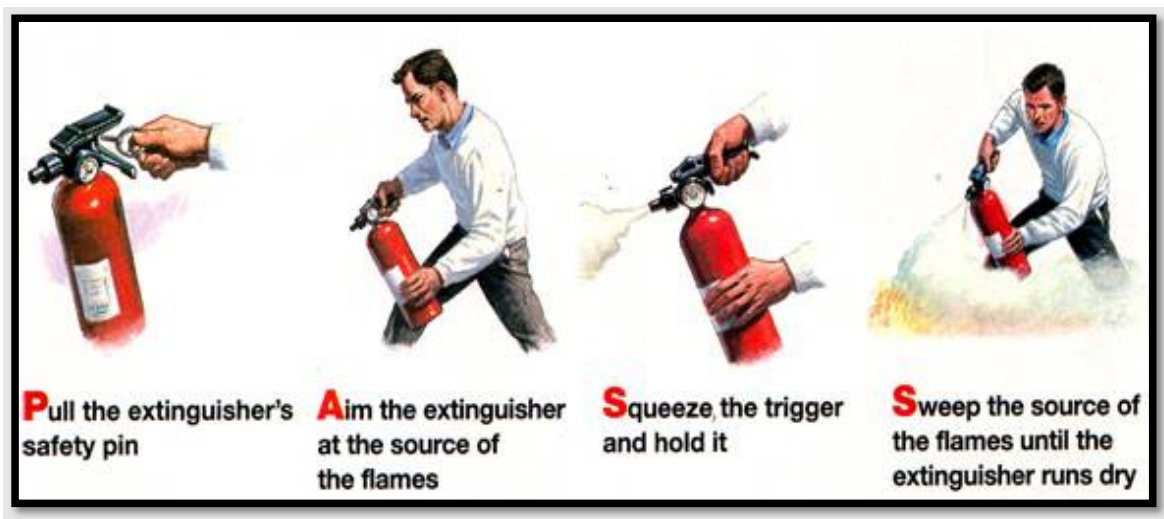
4.4.6 All extinguishers shall be hydrostatically tested at intervals not exceeding those specified in the latest SS578 as Table 5 (see below).

Table 5 – Hydrostatic test interval for extinguishers

Extinguisher type	Test interval (Years)
Cartridge operated water	5
Stored pressure water	5
Foam	5
AFFF (Aqueous Film Forming Foam)	5
Powder type with stainless steel body	5
Carbon dioxide	10
Powder type, stored pressure, with mild steel shells or aluminium body	5
Powder type, cartridge or cylinder operated, with mild steel body	5
Clean agent types	10

4.5 Usage of Portable Fire Extinguisher

- 4.5.1 When a fire is discovered, airport staff or members of public shall raise the alarm by activating the nearest fire manual call point or contact AES Hotline at 6541 2525. Within his/her means, take the nearest fire extinguisher in the area. Check the fire extinguisher to ensure that it has the correct pressure and suitability for the fire type.
- 4.5.2 Before attempting to put out the fire using the fire extinguisher, user shall ensure that he/she has an unobstructed exit path behind him before approaching the fire.
- 4.5.3 The following are simple steps (**P.A.S.S** method) to use the fire extinguisher:
- Pull** the pin at the top of the extinguisher. The pin releases a locking mechanism and will allow you to discharge the extinguisher.
 - Aim** at the base of the fire, not the flames. This is important - to put out the fire, you must extinguish the fuel.
 - Squeeze** the lever -. This will release the extinguishing agent in the extinguisher. If the handle is released, the discharge will stop.
 - Sweep** from side to side. Using a sweeping motion, move the fire extinguishers nozzle back and forth until the fire is completely put out. Operate the extinguisher from a safe distance, several feet away, and then move towards the fire once it starts to diminish. Be sure to read the instructions on your fire extinguisher - different fire extinguishers recommend operating them from different distances.



4.5.4 For trolley extinguishers, the method of application is similar to that of the portable fire extinguisher; the only difference would be a need to open a valve after pulling out the safety pin (Step 2 in the diagram below). Refer to the diagram below for the step-by-step description of how to operate the trolley fire extinguisher.



Chapter 5 – Fire Safety Requirements for Renovations, Alterations, And Additions to Cag Owned / Managed Properties

5.1 Objective

- 5.1.1 These requirements are intended to ensure that fire safety and the general safety of occupants are not compromised by any renovation, alteration and addition works to the existing configuration inside and outside buildings. Besides these requirements, reference shall also be made to the latest copy of the renovation requirement as specified by CAG from time to time and Schedule 3 and/or Fourth Schedule of CAG Tenancy Agreement (where applicable).
- 5.1.2 Compliance with the requirements listed hereunder shall be incorporated into the tenancy agreement and rest with the division responsible for coordinating the renovation, alteration or addition works, viz; Airport Operations, Cargo Business Division, E&D/ iFM, Commercial or People Team, and shall be based on Fire Safety Act, Codes of Practice or as advised by the SCDF and the relevant authorities.

5.2 General Requirements

- 5.2.1 In all renovations, alterations and additions to buildings, AES shall be consulted for changes made to fire safety measures, access for fire vehicles, escape routes and other fire precautions, The CAG project officer must ensure that the fire safety consultation reply from AES is filed for future reference.
- 5.2.2 This fire safety consultation reply is in addition to other requirements or approval by other CAG Divisions or other relevant authorities e.g. FSSD, BCA, URA etc.
- 5.2.3 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 AES for comments and approval. The co-ordinating division shall ensure that AES comments and/or requirements are complied with and to notify Head, Fire Prevention Section on the completion of such works.

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- 5.2.4 Permission or clearance from relevant authorities shall be sought and extended to AES. Where the approval of FSSD is not required, a copy of the waiver shall be attached to the floor plans extended to AES for their comments and approval.
- 5.2.5 Hoarding material used shall be of non-combustible material [i.e. Gypsum Board]. A copy of the hoarding material and its proof of its non-combustibility shall be submitted to CAG Permit to Work System.

5.3 Fire Alarm Isolation & Hot Work

- 5.3.1 All isolation of fire alarm system / draining of sprinkler system require “Isolation of Fire Alarm System/Draining of Sprinkler System” permit. The “Isolation of Fire Alarm System/Draining of Sprinkler System” permit shall be applied in this shall be done at least 14 working days before the work is expected to commence. When the work needs to be carried out urgently, CAG AES Division HQ [Tel No.: 6541 2535 (Changi)/6481 3377 (Seletar) during office hours] or Fire Station 1 [Tel: 6541 2526 (Changi)/6481 3377 (Seletar) during non-office hours] shall be notified and approval sought.
- 5.3.2 Hot works shall not be allowed without the approval of permit. Applications can be applied in <https://oc.changiairport.com>.
- 5.3.3 The fire alarm isolation and hot work permits lists the various fire safety requirements involving isolation of fire alarm system / draining of sprinkler system and doing hot works in CAG managed buildings. **(See Appendix 1-5 – AESs Fire Alarm Isolation and Hot Work Manual Permits)** The tenants shall not conduct any business operations at its tenanted premises, and the contractors and/or subcontractors engaged by the tenants shall not carry out any works in the tenanted premises, if such business operations or works (as the case may be) are not in compliance with any of the above-mentioned fire safety requirements. Non- compliance to the above-mentioned fire safety requirements resulting in false fire alarm activations and/or turnout of AES resources may result in a service charge being imposed on owners, tenants or any contractors or sub-contractors engaged by them as

listed in this Fire Safety Manual. **(See Appendix 1-4– Sample of AES Service Charge Form)**

- 5.3.4 Incumbent building maintenance contractors shall maintain constant supervision of all Fire Alarm isolations and forward photo evidence of start and normalization of Fire Alarm systems. All notifications to AES shall be sent to Fire Prevention Section duty officer mobile phone @ **9639 3843**.
- 5.3.5 CAG Project Offices shall ensure their contractor provide photo and video evidence of hot works commencement as well as ensure 30 minutes post hot work standby to Fire Prevention Section duty personnel mobile phone @ **9639 3843**. AES FPS will conduct un-announced checks at the hot work sites.

5.4 Commencement of works

- 5.4.1 No work shall commence without the written permit from CAG Divisions.
- 5.4.2 Renovation, alteration, and/or addition works may commence when every proposed plan has been approved by AES together with the written permit from relevant authorities.
- 5.4.3 Fire extinguisher requirements in A&A hoarding workspace. [refer to clauses 4.3.7]
- 5.4.4 All works carried out shall comply with all statutory requirements imposed by the relevant authorities. The tenant shall indicate when the renovations would be completed and to arrange for Pre-Opening Inspection (POI) with CAG Project Officer and AES before commencement of business.
- 5.4.5 Upon AES's advice, if there are serious shortcomings, the co-ordinating division shall inform the tenant that he will not be allowed to resume operations until rectification is completed. Contingency arrangements by the co-ordinating division shall be made for critical business such as restaurants.

-
- 5.4.6 However, if the shortcomings are minor, the co-ordinating division shall inform the tenant that he will be given 7 days to rectify these, failing which CAG would do so at the tenant's cost with an administrative charge (as set by CAG Finance Division), if tenant unable to rectify within the given 7 days, they shall write to AES for extension.
- 5.4.7 Commercial Division (CAG) or coordinating division shall ensure that the tenant can only start operation after FSC is obtained from FSSD and meeting any additional Fire Safety Requirements from AES.
- 5.4.8 Tenants shall permit the Landlord (or any other authorised by the Landlord) to perform unannounced fire safety inspection of the premises at any time based on **Appendix 1-3 – Summary of Fire Safety Requirements for CAG Managed Buildings**, following which the Tenants and affected CAG division will receive a fire safety inspection report if any non-compliances are found.
- 5.4.9 Tenants shall rectify any non-compliance of fire safety requirements, procedures or measures listed in the fire safety inspection report within such time period stated in that fire safety inspection report according to the recommendation(s) mentioned by the Landlord. If any outstanding deficiencies are not rectified to the satisfaction of the Landlord as observed during the re-inspection after the stipulated period, the Landlord shall have the right to exercise its rights under the relevant tenancy agreement.
- 5.4.10 No flammable substance (needed for renovation, alteration, and/or addition works) shall be stored in the Airport. If required, the prior clearance of AES Division shall be obtained. It shall be brought to site and removed from the airport on the very same day.

5.5 After completion of works

- 5.5.1 The Division responsible for coordinating renovation, alteration and/or addition works shall, upon completion of such works, notify AES FPS.

- 5.5.2 Head, Fire Prevention Section or his representative shall follow-up to inspect the premises to confirm that all fire safety requirements set out prior to commencement of works were fully complied with.

Chapter 6 – Fire Emergency Plans for Cag Owned / Managed Buildings Including Those at CAC**6.1 Procedures for Alerting AES**

- 6.1.1 The fire alarm systems of all buildings at Changi and Seletar Airports are linked to the AES Fire Stations. Any person discovering an outbreak of fire, however small it may be, must notify the AES Hotline @ 6541 2525 and the nearby occupants immediately by activating the nearest fire alarm (break-glass) call point. The informants must contact the AES Hotline even if he/she had extinguished the fire before AES arrival.
- 6.1.2 In case a call point is not available, he shall then inform AES Hotline @ 6541 2525 (or 6481 3377 - in the case of Seletar Airport) of the following:
- a. Location of fire.
 - b. Nature of fire, if known.
 - c. Injury to personnel, if known.
 - d. Informant's particulars and contact number.
- 6.1.3 In case of fire outbreaks within ramp or remote aircraft parking areas where no fire alarm system is installed, AES shall be informed immediately by telephone.

6.2 OBJECTIVE

- 6.2.1 The objectives of this plan are:
- a. To ensure the safeguard of human lives in the event of fire outbreak.
 - b. To establish a systematic and orderly evacuation plan for all occupants and members of the public present in the building to escape to the designated Assembly Areas for the purpose of reporting and accounting.
 - c. To ensure prompt raising of the fire alarm and marshalling of first aid fire-fighting efforts.
 - d. To establish roles and responsibilities for each organization / agency involved in handling the fire emergencies.

-
- e. To ensure that the airport operations and business can be resumed as quickly as possible.
 - f. To control and prevent any further spread of fire, minimizing total property damage.

6.3 FIRE SAFETY COMMITTEE

6.3.1 The Fire Safety Committee duties will be covered by AES Fire Prevention Section to assist building owners in planning, organizing, and conduct of fire safety programs including fire evacuation drills in the premises, including the formulation of the premise Emergency Response Plan (ERP).

6.4 Fire Alarm

6.4.1 The evacuation concept is the “2 stage alarm” and total evacuation”. The sounding of the fire alarm (**lasting not less than 1 minute**) should be treated as an alert signal and occupants should standby for evacuation. Upon confirmation of a fire situation, the second continuous alarm is sounded, and immediate evacuation should be effected.

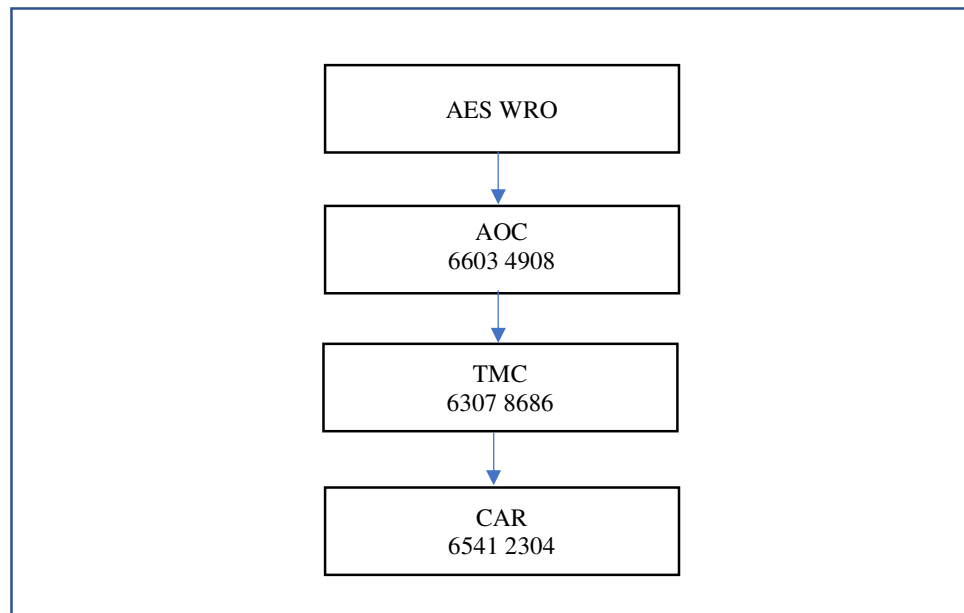
6.4.2 The fire alarm signal can be raised by one of the following means:

- a. Break glass alarm system, which require a person to break the glass of the nearest fire alarm call point.
- b. Automatic heat or smoke detection system.
- c. Automatic sprinkler system.
- d. Kitchen fire suppression system.
- e. Total gas flooding system.

6.4.3 1st Fire Alarm

- a. This is the alert signal. When the fire alarm is activated, the alarm bells on all floors within the affected fire alarm zone shall ring for not less than one minute before it is isolated. Simultaneously, an audio and visual signal will be registered at the fire alarm panel:

- b. The floor sub-panel will indicate the floor zone at which the alarm has been activated.
- c. The main alarm panel located at the Fire Command Centre (FCC), or its affected panel will indicate the floor on which the alarm has been activated.
- d. The fire alarm panels located at AES Watchroom (WRO) and Fault Management Centre (FMC) shall indicate which Fire alarm panel has been activated.
- e. AES Watchroom shall inform Airport Operation Centre (AOC) @ 6603 4908 and ensure that the following information are communicated to AOC:
 - i. Activated Fire Alarm (FA) zone; and
 - ii. Status of AES response, i.e. investigation in progress, confirmed fire, etc.
- f. AOC shall inform Terminal Management Centre (TMC) @ 6307 8686 and TMC to inform Central Announcement Room (CAR) @ 6541 2305 to broadcast a general alert announcement over the public address (PA) system (**See Annex 5 – TEXT 1**). Please note that this is applicable only for T1-T3 as T4 is using automated announcement system. Refer to communication flow chart below:



Communication Flow Chart

- g. M&E Maintenance Contractor shall silence the fire alarm bell after it has rung for not less than one minute.
- h. AES shall link up with the M&E Maintenance Contractor at the affected fire alarm panel.
- i. If it is confirmed to be false fire alarm activation, AOC shall inform Terminal Management Centre (TMC) @ 6307 8686 and TMC to inform CAR @ 6541 2305 to broadcast a general alert announcement over the **PA system (See Annex 5 – TEXT 2)**. Please note that this is applicable only for T1-T3 as T4 is using automated announcement system.

6.4.4 2nd FIRE ALARM

- a. This is the signal to commence total evacuation. The alarm bells on all floors (of the affected zone) shall ring continuously. Upon confirmation of a fire situation, up to the discretion of AES Ops Commander, the evacuation announcement (**See Annex 5 - TEXT 4**) shall be made via the FCC PA System.
- b. The rest of the floors shall be evacuated subsequently (if deemed necessary by the AES Ops Commander/SCDF). Notwithstanding the above, a total evacuation of the building may be declared in an extreme situation.

6.5 ACTION TO BE TAKEN IN EVENT OF AN OUTBREAK OF FIRE

6.5.1 Informant

- a. The person who discovers the fire shall immediately:
 - a. Raise the alarm by activating the nearest fire alarm “Break Glass” call point or call AES Hotline @ 6541 2525
 - b. Attempt to extinguish any incipient fire with the available fire extinguisher or fire hose reel without taking personal risk. Water shall not be used on fire involving energized electrical equipment. Electrical equipment shall be de-energized by turning off the main power supply.

6.5.2 All Tenants/Staffs

- a. Upon hearing the instruction to evacuate, all staff shall lock important files and cash, shut down machinery etc., and evacuate immediately guided by their respective fire wardens and/or assistant fire wardens.
- b. Appointed fire wardens and assistant fire wardens shall guide staff to the nearest exit immediately and evacuate together to the nearest designated assembly area.
- c. When evacuating, do not panic but quickly walk down the staircase by the nearest exit and proceed to the designated assembly area.
- d. Do **not** use lifts. The assembly areas are located at both the landside and airside outside of the terminal building. **(See Annex 2)**
- e. Airport staff (officers from Immigration and Checkpoints Authority (ICA), Security Screening Unit (SSU), Auxiliary Police, Ground Handling Agents, Airlines and concessionaire/shop, who are attending to the passenger and member of public at the time shall guide them to the nearest designated assembly area. **(See Annex 2)**
- f. The fire escape tunnels at Terminal 2, 3 & 4 should also be used for quick and direct evacuation of occupants to the assembly areas outside the terminal buildings.
- g. All staff **shall not** re-enter the building once evacuated unless instructed otherwise by the AES or SCDF officer(s) in attendance.

6.5.3 Fire Safety Manager or his representative (AES Ops Commander)

- a. In the event of an actual fire:
 - i. Ensure that AES crew is enroute to location.
 - ii. Proceed to affected fire alarm panel to determine the exact location of the alarm activation or directly to the affected area via the most expeditious route.
 - iii. Ensure that the first fire alarm bell has been isolated after ringing for not less than one minute.
 - iv. Ensure that the first alert announcement (**See Annex 5 – TEXT 1**) has been made by CAR @ 6541 2304 to affected zone.
 - v. Standby to receive status report from AES crew on the “fire” floor and assess the need to declare total evacuation of the area or the building.
- b. If AES crew reports that:
 - i. The situation is **under control**: Ensure that the broadcast announcement Text 3 (Refer to Annex 5) has been made by CAR @ 6541 2304.
 - ii. It is a **false alarm**: Ensure that the broadcast announcement Text 2 (Refer to Annex 5) has been made by CAR @ 6541 2304.
 - iii. **When evacuation** is necessary:
 - AES Ops Commander to proceed to affected building’s FCC to make the broadcast (**See Annex 5 – TEXT 4**) to the fire floor within the affected zone and its adjacent zone or “ALL CALL” button for full evacuation.
 - Ensure that the building evacuation status is monitored at the FCC using Floor Register (**See Annex 6 – Floor Registers**).
 - Report the condition of the fire and number of persons missing, if any, to the AES of SCDF officers upon his arrival at the FCC.
 - Ensure the smoke curtain system across the main atrium is activated to form a fire-resistant barrier across the atrium opening, to prevent rising smoke from entering the floor.
 - Ensure that the fire door release system is activated to shut the fire doors to form compartments, so as to curb rapid spread of fire.
 - Ensure that the lifts home within the building except for the fire lifts. All lifts will be homed to level 1.

6.5.4 Fire Warden / Assistant Fire Warden

- a. On hearing the instructions to evacuate, the appointed fire wardens shall: -
 - i. Alert everyone to evacuate in an orderly manner using the nearest exit when the instruction to evacuate is given.
 - ii. Check all offices, stores, toilets etc. to ensure that no one is left behind. Closed all doors after ensuring everyone have left the office.
 - iii. Ensure that the disabled, children, pregnant women etc. if present are given particular attention during evacuation.
 - iv. Leave the building after ascertaining that all the occupants of the floor have complied with his/her order.
 - v. At the assembly areas, appointed fire warden shall conduct roll call of their staff who have evacuated the terminal building. Fire Wardens shall report all missing persons to the officer in-charge at the assembly area who will in turn relay the information to Fire Command Centre.
 - vi. Inform AES or the security officer at the assembly areas immediately of any missing person.
 - vii. All evacuees shall be allowed to re-enter the building only when the “All Clear” signal is given by the AES Ops Commander/ SCDF officer.
 - viii. All transit evacuees and passengers shall only be allowed to enter the restricted areas subject to Airport Police clearance. All passengers and staff shall be subjected to undergo security screening at the Arrival / Departure staff entrances prior to entering the restricted area. This will be managed by Airport Police Division and Immigration Checkpoint Authority.

6.5.5 Airport Police Division

- a. In the event of fire outbreak, the roles of the Airport Police shall be as follows:
 - i. Security officers are to be deployed at the assembly areas and to facilitate evacuees to the designated Assembly Areas.
 - ii. Dispatch Police or Auxiliary Police resources to the scene.
 - iii. Assume initial control of situation until the arrival of AES Ops Commander.
 - iv. Establish liaison with the AES Ops Commander.
 - v. Ensure that all main entrances and exits to/from the building are adequately

manned to prohibit unauthorized entry and also to intensify patrolling in the vicinity of the building.

- vi. Direct SCDF OIC to the affected Fire Command Centre or the affect area on his arrival.
- vii. Control traffic movements to facilitate movement of evacuees at the assembly areas.

6.5.6 M&E Maintenance Contractor

- a. Activated by FMC.
- b. Response to the affected fire alarm panel
- c. Direct AES to the affected area.
- d. Assist AES at FCC to operate the fire alarm system as well as other building facilities' controls.
- e. Isolate the system during investigation and obtain AES approval to reset the system after investigation completed.

6.5.7 Airport Emergency Service (AES)

- a. Exercise command and control of evacuation and fire-fighting operations and take charge at the Fire Command Centre or the affect area.
- b. Handover command and control to the SCDF OIC upon SCDF arrival.
- c. Ensure that all evacuees are directed to the nearest assembly area if evacuation is required.

6.6 FIRE EVACUATION DRILLS

6.6.1 Fire evacuation drills shall be conducted at least twice a year for buildings appointed with Fire Safety Manager.

6.6.2 All occupants in the building/selected fire zone shall participate in the drill.

6.7 GENERAL

6.7.1 It is in the interest of everyone:

- a. How to report a fire – sound the alarm without delay and call the AES Hotline @ 6541 2525.
- b. What to do in the event of fire – avoid panic and confusion.
- c. The locations of nearby fire extinguishers and hose reels – learn the proper way to use them.
- d. Means of escape in case of fire and to keep staircases, landings, and other escape routes always clear of obstruction.

6.8 ANNEXES

Annex 1 – Emergency Contact Numbers

Annex 2 – Site Plan of Assembly Areas (Contact FPS for Details)

Annex 3 – Typical Floor Plans (Contact FPS for Details)

Annex 4 – Evacuation Drill Record Sheet

Annex 5 – Standard PA Announcement Texts During Activation of Fire Alarm

Annex 6 – Floor Register

Annex 1 – Emergency Contact Numbers

Agency	Contact Number
Airport Emergency Service, Hotline - Fire Station 1 Watch Room <ul style="list-style-type: none"> For fire calls For isolation, hot work and other matters 	6541 2525 6541 2526
Airport Emergency Service, Hotline – Fire Prevention Section	6541 2535/ 9639 3843
Airport Police Division (APD)	6546 0000
Ambulance Services <ul style="list-style-type: none"> For medical emergency 	6543 2223
Airside Management Centre (AMC) <ul style="list-style-type: none"> For airside accident & incident reporting For fuel spillage reporting For baggage incident 	6541 2275 6541 2275 6541 2273
Airside Control Centre (ACC)	6541 2151
Fault Management Centre (FMC) <ul style="list-style-type: none"> For defects & hazard reporting 	6541 2424
Airport Operations Centre (AOC)	6603 4908
Terminal Management Centre (TMC)	6307 8686
Central Announcement Room (CAR)	6541 2304

Annex 2 – Site Plan of Assembly Areas (Contact FPS for Details)

Annex 3 – Typical Floor Plans (Contact FPS for Details)

Annex 4 – Evacuation Drill Record Sheet

I, the undersigned, designated as coordinator of the fire drill held by _____ hereby certify that all the facts shown on the line or lines herein below opposite my signature are correct and further that each drill was successfully conducted in full compliance with the approved ERP.

Date of Drill	Time	Location	No. of participants	Evacuation Time	Name & Signature of Coordinator

Designation & Name: _____

Signature & Date: _____

Annex 5 – Standard PA Announcement Texts During Activation of Fire Alarm**Fire Evacuation Standard Announcement**

TEXT 1	<u>In the event of a fire alarm activation in the building</u> “Attention please, Attention please.” “The fire alarm has been activated and investigation is in progress. Please standby for further information.” If you see any danger, please inform our staff immediately and proceed to a safer location. (Announce Twice)
TEXT 2	<u>In the event of a false fire alarm</u> “Ladies and gentlemen,” “May I have your attention please”. The cause of the fire alarm has been investigated and is found to be a false alarm. We regret any inconvenience caused. Thank you. (Announce Twice)
TEXT 3	<u>In the event where evacuation is not required</u> “May I have your attention please.” The cause of the fire alarm has been investigated. The situation is now under control. We regret any inconvenience caused. Thank you. (Announce Twice)
TEXT 4	<u>In the event where evacuation is required Announcement to be made by AES Operations Commander</u> “Attention! Attention!” There is an emergency. Please leave the building immediately by the nearest exits. Remain calm and do not use the lifts.” (Announce Twice)

Testing of Fire Alarm in the Terminal Buildings**Announcements to be made by CAR upon request by M&E Maintenance Contractors*

TEXT 5	<u>Testing of Fire Alarm</u> “Attention please, Attention please.” “The fire alarm has been activated and investigation is in progress. Please standby for further information.” If you see any danger, please inform our staff immediately and proceed to a safer location. (Announce Twice)
TEXT 6	<u>Completion of testing of Fire Alarm</u> “May I have your attention please.” This is a test of the fire and voice evacuation system. Please do not be alarmed.” (Announce Twice)
TEXT 7	<u>Testing of the generator set</u> “Ladies and gentlemen.” “We are having a partial power failure. Sorry for the inconvenience.” (Announce Twice)

Fire Evacuation Drill in the Terminal Buildings**Announcements to be made by CSO, except for TEXT 9*

TEXT 8	<u>Pre-fire drill announcement (5 mins prior to activation)</u> “Attention please, Attention please” We will be conducting a fire drill for all participating airport staff in five minutes. All passengers and members of the public are advised not to be alarmed.” (Announce Twice)
TEXT 9	<u>Fire drill activation announcement</u> <u>Announcement to be made by AES Operation Commander]</u> “Attention please, Attention please. This is a fire drill for all participating airport staff. All participants are to remain calm and evacuate by the nearest exits. Do not use the lifts. All passengers and members of the public are advised not to be alarmed.” (Announce Twice)
TEXT 10	<u>Termination of Fire Drill announcement</u> “May I have your attention please”. The fire drill for airport staff is now terminated. We regret any inconvenience caused. (Announce Twice)

Annex 6 – Floor Register

To: Changi Airport Group (Singapore) Pte Ltd
 Airport Emergency Service
 P O Box 1
 Singapore Changi Airport
 Singapore 918141
 Fax No. 65457072

FLOOR REGISTER

Tenant Company Name:	
Building and Floor Level:	Unit/Room No:
Official Contact No	
Name of Fire Warden & Official Contact No:	
Name of Assistant Fire Warden & Official Contact No:	

(Please use a separate form for each level)

S/No	Name of Occupants / Staff	Evacuation Status (For official use during emergency)		
		Present	Absent	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Submitted By:				

Chapter 7 – Fire Safety Inspection on CAG Tenanted Premises By AES

7.1 To ensure a high level of fire safety, AES on behalf of the CAG as the landlord conducts unannounced fire safety inspections in many locations in Changi Airport based on **Appendix 1-3 – Summary of Fire Safety Requirements for CAG Managed Buildings**, following which the tenants and affected CAG division will receive a fire safety inspection report via email if any non-compliances are found.

7.2 Tenants shall rectify any non-compliance of fire safety requirements, procedures or measures listed in the fire safety inspection report issued within such time period stated in that fire safety inspection report according to the recommendation(s) mentioned by the Landlord. If any outstanding deficiencies are not rectified to the satisfaction of the Landlord as observed during the re-inspection after the stipulated period, the Landlord shall have the right to exercise its rights under the relevant tenancy agreement.

7.3 In addition to the fire safety inspection, fire safety patrols are conducted by AES at the terminal buildings and Changi Airfreight Centre. Any fire safety irregularity or deficiency is recorded on the respective CAG division for follow-up actions.

7.4 Besides the CAG Fire Safety Committee meeting, fire safety deficiencies in CAG owned/managed buildings are followed up at the various internal regular CAG meetings. The co-operation of all concerned is sought to promote a high standard of fire safety at Singapore Changi Airport and Seletar Airport.

PART TWO: FIRE SAFETY MANAGEMENT OF NON-CAG OWNED / MANAGED PROPERTIES**Chapter 8 – General Fire Safety Duties and Responsibilities****8.1 INTRODUCTION**

8.1.1 Besides CAG buildings (all Passenger Terminal Buildings, Megaplex 1, CAB “C”, “D” & “E”), all other buildings located within airport boundary having direct implication and impact are important to airport operations. Hence, there is equally a need to maintain high standards of fire safety at these buildings.

8.1.2 Furthermore, some of the companies of these buildings are engaged in ground servicing activities, which carry the risk of fire. There is a need to practice a high standard of fire safety to ensure the safety of passengers and no disruption to airport operations.

8.2 General Responsibilities

8.2.1 The owners of airport buildings which are neither CAG owned nor managed, shall be responsible in ensuring the following:

- a. Exercise surveillance over their staff and occupants to ensure that the Fire Prevention Section 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. The tests listed in Section A Chapter 1, para 2.1, sub-para-V (b) should be carried out.
- d. Test the safety devices of the electrical systems and wiring regularly and to ensure that they are adequate.
- e. Provide adequate fire extinguishers and hose reels in the premises in accordance with FSSD regulations and requirements. This fire protection equipment shall also be properly maintained in accordance with the relevant standards.

- f. All owners and tenants shall comply with the procedures and guidelines in this manual and shall take all reasonable measures to prevent false fire alarm activations in their demised premises.
- g. All building owners or its Fire Safety Managers are encouraged to provide AES FPS a copy of their ERP and conduct annual fire evacuation exercise to familiarize AES operations.

8.2.2 The specific duties and responsibilities of relevant building owners shall be as follows:

- a. Air Traffic Services Division (Division of CAAS)
 - i. Exercise surveillance over the staff and occupants at LORADS complex and the Control Tower to ensure that they comply with fire safety precautions and take appropriate action on those who do not comply and keep AES informed.
 - ii. Ensure that the staff and occupants at LORADS complex and the Control Tower observe the fire preventive measures listed in Section A of this manual and its appendices.
 - iii. Ensure that the LORADS complex and Control Tower are adequately protected by fire hose reels (Chapter 3 of Section A), fire extinguishers (Chapter 4 of Section A) and other fire safety equipment based on the advice provided by QP.
 - iv. Ensure that fire wardens are appointed for LORADS complex and the Control Tower at all times.
 - v. Establish evacuation plans for LORADS complex and the Control Tower based on the procedures spelt out in Section B, Chapter 2 and conduct at least one evacuation drill annually at the complex and tower in accordance with the requirements prescribed by the FSSD.
 - vi. Ensure that all pieces of electronic equipment installed in LORADS complex, the Control Tower and airfield installations are regularly checked and properly maintained; and

- vii. Ensure that all electronic safety devices, e.g. switch breakers installed to protect the electronic equipment in LORADS complex, the Control Tower and airfield installations are in working condition.
- b. Singapore Aviation Academy (Division of CAAS)
 - i. Exercise surveillance over the staff and occupants at the SAA to ensure that they comply with fire safety precautions. SAA FM to conduct regular fire safety inspections within SAA premises, especially on the tenanted premises and issue warning and take appropriate action to ensure tenants or users comply to fire safety requirements or rectify the fire safety hazards and keep AES informed.
 - ii. Ensure that the staff and occupants at the SAA observe the fire preventive measures listed in Section A Chapter 2 of this manual and its appendices (where applicable);
 - iii. Ensure that the fire protection system installed at SAA is regularly maintained and tested. SAA will ensure the term contractor for fire detection and protection systems is checked regularly and service reports are submitted and filed in the appropriate files.
 - iv. Ensure that all pieces of electronic equipment installed in SAA are regularly checked and properly maintained. SAA will inform the relevant party /parties to check their electronic equipment installed in SAA.
 - v. Ensure that fire wardens are appointed for the SAA as per SAA Fire Safety Committee recommendations; and
 - vi. Establish a fire evacuation plan for the SAA and conduct at least one evacuation drill annually at SAA as per established ERP.
- c. All non-CAG building owners

In addition to the above, each building owner shall:

 - i. Ensure that all electronic equipment and wiring in their premises are regularly checked and properly maintained.
 - ii. Observe good housekeeping by separating combustible materials, e.g. thermal facsimile paper, diskettes, etc from electrical peripherals.

- iii. Exercise surveillance and take appropriate action on those occupants who do not comply and keep AES informed.
- iv. Ensure that its premises are adequately protected by fire extinguishers and other fire safety equipment based on the advice provided by AES in accordance with Section A of this manual.
- v. Ensure that all staff and occupants observe the fire preventive measures listed in Section A of this manual and its appendices together with Schedule 3 of CAG Tenancy Agreement (where applicable)
- vi. Appoint fire wardens / assistant fire wardens for its own premises,
- vii. Ensure that its staff are familiar with the emergency response plan.
- viii. Encourage its staff to attend relevant fire safety training at the
- ix. Singapore Aviation Academy or other relevant institutions; and
- x. Ensure all renovations, major alterations and additions have been approved by FSSD.
- xi. It is recommended that a copy of their ERP and CERT setup be submitted to AES FPS so that AES Changi Operation will be familiar with its building's ERP for better collaboration.

8.3 Fire Preventive Measures

- 8.3.1 Owners of all non-CAG managed properties shall observe the Fire Preventive Measures listed in Part One - Chapter 2 and its appendices and Part Three of this manual.

8.4 Renovations, Alterations and Additions to Buildings

- 8.4.1 Owners of all non-CAG managed properties have to inform AES with regard to Fire Preventive measures, access for fire vehicles, escape routes and other fire precautions, and for all renovations, alterations and additions to their buildings.
- 8.4.2 These comments are in addition to other requirements or approval by the other CAG Divisions or other relevant authorities i.e. FSSD, BCA, URA etc.

- 8.4.3 Copies of the relevant floor plans indicating the extent of renovation, alteration, and/or addition works together with fire safety measures e.g. fire exits and signs, etc. shall be submitted to AES for comments.
- 8.4.4 The coordinating CAG division for the renovations, alterations, and/or additions, shall ensure that AES comments and/or requirements are complied with and notify Head, FPS (Dy Cmdr. Seletar in the case of Seletar) upon the completion of such works.
- 8.4.5 Permission or clearance from the relevant authorities shall be sought and copies extended to AES. Where the approval of FSSD is not required a copy of the waiver shall be attached to the floor plans extended to AES for information.
- 8.4.6 The owner of the building shall be responsible in maintaining the existing and the new fire protection installations, should there be any, in proper working order after the renovations, alterations and/or additions made to the building.

8.5 Emergency Response Plan and Fire Evacuation Exercises

- 8.5.1 It is the responsibility of the owners of major airport buildings not owned by CAG or lessees of CAG buildings to establish ERPs for all their premises and conduct fire evacuation exercises in accordance with the state requirement. It is recommended that a joint fire evacuation drill be conducted with AES at least once a year to exercise the tie-up between the building's CERT and AES.
- 8.5.2 The evacuation plan at Section B, Chapter 2 may be used as a guide and the AES may be consulted when the annual evacuation exercises are planned.

8.6 Other Hazards

- 8.6.1 All owners and lessees of airport buildings shall strictly observe the safety measures listed in Section A and its appendices together with those in Section C.

PART THREE: FIRE SAFETY MANAGEMENT OF OTHER SPECIFIC FIRE HAZARDS

Chapter 9 – Aircraft Fuel Servicing and Maintenance of Aircraft Fuel System

9.1 Scope

9.1.1 For the purpose of these regulations "Aircraft fueling" shall be regarded as including fueling and defueling, aircraft fuel tank calibration, aircraft fuel tests and the draining of fuel tanks. Generally, Aircraft fueling activities shall comply with the latest editions of NFPA 407 Standard for Fuel Servicing. AES shall conduct at least 3 random Aircraft Refueling Inspection (ARI) per month at the Airside based on Appendix 2-1 – Fire Safety Requirements involving Aircraft Fuel Servicing.

9.1.2 Operational requirements make it necessary for fueling crew to perform their duties efficiently and quickly under all types of weather conditions, at all hours, and concurrent with transport and military aircraft. These aggravate the situation and make it imperative to establish basic fire safety procedures. These regulations are intended to help prevent accidents. It is recognized that there are certain hazards (especially the operation and use of aircraft servicing equipment and ground power generators with internal combustion engines in close proximity to fueling operations), over which safety cannot be controlled without interference with operations. Therefore, specific caution is given in this Chapter with regard to these hazards.

9.2 Objective

9.2.1 These requirements are intended to represent a fire-safe practice for Aircraft fuel servicing operations on the ground.

9.3 The Different Types of Fuel and Their General Nature of the Hazards

9.3.1 Presently, the fuels used in aircraft are of three common types: -

- a. Aviation gasoline; now abbreviated AVGAS.
- b. Kerosene grade turbine; now abbreviated AVTUR.
- c. A wide blend of gasoline and kerosene fractions designated as AVTAG.

9.3.2 There are several grades of AVGAS used in reciprocating engines. These may be recognised by their different colours.

a. Grade identifications

115/145	Octane Grade	-	Purple
108/135	Octane Grade	-	Brown
100/130	Octane Grade	-	Green
91/98	Octane Grade	-	Blue
80/87	Octane Grade	-	Red

9.3.3 The flash point of AVGAS is approximately 40 degrees below zero centigrade. AVGAS is highly flammable.

9.3.4 The flash point of AVTUR (Jet-A1) has a minimum specification requirement of 38°C. AVTUR, when spilled on hot surfaces such as an exhaust pipe or over sun baked ramp, vaporizes sufficiently to form a combustible and highly hazardous vapor.

9.3.5 Because of its low volatility, AVTUR spill on unheated surfaces present a prolonged hazard by not evaporating quickly and completely at normal temperatures. As a result, the danger of fire is prolonged and special treatment of the spill is important.

9.4 Spillage Sizes

9.4.1 Fuel spills may vary in size and therefore in quantity too. But the hazards inherent in them vary only in small degrees. It is therefore important to consider spills as a potential fire source. All fuel spillage during aircraft refuelling, with or without

passengers on board, shall be reported to ACC immediately so that remedial action can be rendered immediately. As far as possible, in all cases of spillage, the entry of fuel into the airport drainage system shall be checked.

9.4.2 For all spillage, the immediate safety procedure is as follows:

- a. Stop the flow immediately by releasing the Deadman control. In the event that a spill continues from a hydrant system, the system emergency fuel shutoff shall be activated.
- b. Airside Management Centre (AMC) shall be notified immediately @ 6541 2275. AMC shall then inform AES subsequently.
- c. Prevent the movement of unauthorized persons or vehicles into the area.
- d. Inform the Airline representative who should use his discretion to determine if the operation already in progress can be continued safely or if it should be stopped until the emergency is over.
- e. Ensure, as far as possible, that activities in the vicinity including the movement of aircraft, vehicles, or ground equipment, are restricted so as to reduce the risk of igniting the fuel until the area is deemed safe by AES and airline rep / aircraft engineer.
- f. Passengers and crew on board aircraft shall be instructed not to smoke.
- g. Larger spills shall be blanketed with foam at the discretion of the AES Officer in attendance. In such cases, the passengers and crew on board should be directed to leave the aircraft at once and the aircraft shall be towed away to an uncontaminated area, if necessary.
- h. The final treatment for all fuel spillage, whether small or large, is by washing them up with water and detergent, or if necessary, with oil dispersant.
- i. The location of the spill, its direction of flow, the wind, etc. shall be taken into consideration when choosing the safest evacuation route.
- j. The fuel spillage shall be investigated by the airline or its engineering services to determine the cause and necessary corrective measures to be taken. Such information shall be provided to AES at fire.safety@changiairport.com or the AES investigating officer.

9.5 Disposition of the Aircraft

- 9.5.1 If the safety of an aircraft near a spillage is seriously jeopardised, the aircraft should be towed to an uncontaminated area before cleaning up shall be allowed to commence.
- 9.5.2 Aircraft on which fuel has been spilled shall be carefully inspected for any accumulation of fuel or fuel vapour. Any fuel discovered on the aircraft must be cleaned up, and the fuel vapour shall be cleared.
- 9.5.3 All out-going cargo, mail and baggage on the ramp at the time of the spill shall be examined carefully before they are placed on board. All traces of fuel contamination must be removed or allowed to evaporate.

9.6 Neighbouring Turbine Aircraft

- 9.6.1 No fueling shall be carried out within 46m directly downstream from the tail pipe of an operating turbo-jet engine, or within 23m directly downstream from an operating turboprop engine. Should a turbine-powered aircraft move within these distances, fueling shall be stopped at once. All refueling operations downstream of an operating wide-body aircraft shall be stopped until such time that the refueling can be carried out safely.

9.7 Static Electricity and Stray Current

- 9.7.1 Static electricity is a constant threat to safe fuelling. The presence of static electricity is not readily apparent until a discharge or spark occurs. The danger is increased during fuelling operations.
- 9.7.2 Generation of Static Electricity
- a. Static electricity may be generated during the course of fuelling as follows:
 - i. When fuel is pumped through a service hose,

- ii. When fuel is allowed to fall freely through the air from a filler spout into the dome of a truck, or from a tank or line draining into a container; and
 - iii. Turbulence in the fuel generates static electricity.
- b. In addition, static electricity may be present under the following circumstances:
- i. A charge may accumulate in an aircraft during flight or on the ground.
 - ii. Particles of rain or other liquid crystals of dust blowing across the aircraft can produce a very heavy charge of static electricity.
 - iii. The servicing vehicles, like any rubber-tyre vehicle may become electrified.
 - iv. Static electricity can also be built-up by induction from an electrically charged atmosphere.

9.7.3 Stray Electric Current

- a. Stray current may provide a source of ignition during fuelling operations.

9.7.4 Bonding

- a. Hydrocarbon fuels, such as aviation gasoline and Jet A, generate electrostatic charge when passing through the pumps, filters, and piping of a fuel transfer system. Splashing, spraying or free-falling of fuel will further enhance the charge. When charged fuel arrives at the receiving tank (cargo tank or aircraft-fuel tank) either of the following two possibilities can occur.
 - i. The charge relaxes harmlessly to ground; or
 - ii. If the charge on the fuel is sufficiently high, a spark discharge may occur. Whether or not an ignition will follow depend on the energy (and duration) of the discharge and the composition of the fuel/air mixture in the vapor space, i.e. whether the vapor is within its flammability range.
- b. The amount of charge on a fuel when it arrives at the receiving tank, and hence its tendency to cause a spark discharge, will depend on the nature and amount of impurities in the fuel, its electrical conductivity, the nature of the

filter media, and the relaxation time of the system. i.e. the residence time of the fuel in the system between the filter (separator) and the receiving tank. The time required for this charge to dissipate is dependent upon the conductivity of the fuel. The duration may be a fraction of a second or several minutes.

- c. No amount of bonding or grounding will prevent discharge from occurring inside a fuel tank. Bonding will ensure that the fuelling equipment and the receiving tank (aircraft or fueller) are at the same potential and to provide a path for the charges which are separated in the fuel transfer system, primarily the filter/separator and therefore to neutralise the charges in the fuel.
- d. For over-wing fuelling and top loading of cargo tanks, bonding will ensure that the fuel nozzle or the fill pipe is at the same potential as the receiving tank, so that a spark will not occur when the nozzle or fill pipe is inserted into the tank opening. For this reason, the bonding wire must be connected before the tank is opened.

9.7.5 Use of Chamois Filters

- a. The practice of using a chamois filter should be discouraged, as its use is extremely hazardous under any condition. Ordinary plastic funnels or other non-conducting materials can increase static generation. They must be properly bonded.

9.7.6 Aircraft Engines and Heaters

- a. Fuel servicing shall not be done on an aircraft until the aircraft's engine(s) has (have) been stopped (ignition OFF). Aircraft combustion heaters shall not be operated during fuelling operations.

9.8 Safeguard Against Incidents arising from Automotive Operation

- 9.8.1 No vehicle, other than those performing servicing functions, shall be permitted within 15m of the aircraft during fuelling operations. Hand brakes should be applied on vehicles before the driver leaves the cabin of his vehicle.
- 9.8.2 All vehicles performing aircraft servicing functions, other than fuel servicing (i.e. baggage trucks, air conditioning vehicles, etc) shall not be parked under aircraft wings while fuelling is in progress. The starting of equipment or any vehicle shall not be done whilst refuelling is in progress. Drivers shall be thoroughly instructed as to the hazards inherent in operating or parking of such vehicles in close proximity to fuelling operations. (Aircraft servicing normally requires mechanised equipment and it is most often impractical to suspend such operations during fuelling. Minimum precautions dictate superior apron vehicle maintenance and educating vehicle operators in recognising potentially hazardous conditions such as spills).

9.9 Prevention of Arcing of Electrical Circuits

- 9.9.1 Electrical circuits frequently produce arcs when switched on or off, when connections are made, or when equipment is not operated properly. The precautions are as follows:
- a. Aircraft batteries shall not be installed, removed, raised, or lowered during fueling.
 - b. Aircraft ground-power units should be located as far away from the fueling points as practical. These shall not be connected or disconnected during fueling. They should not be placed under the wings of aircraft or just aft of the trailing edge except when the design of the aircraft permits no other suitable location.
 - c. Electric hand lamps or flashlights used in the immediate proximity of the fueling operations shall be of the approved type.
 - d. No electrical tools, drills, buffers, vacuum cleaners, or similar tools likely to produce sparks or arcs shall be used during fueling operations.

- e. Aircraft electric switches, which control units in the wings or tank areas not needed for the fueling operations, should not be operated during fueling except in an emergency.
- f. Photographic flash bulbs shall not be used within 15m of the aircraft. Electronic flash shall not be used within 15m of fueling zones.

9.10 Elimination of Open Flames

9.10.1 Open flames may be used during maintenance work. The presence of the following is sometimes overlooked during aircraft fuelling operations:

- a. Flare-pots and similar open flame lights.
- b. Welding or cutting torches.
- c. Blow torches.
- d. Exposed flame heaters (liquid, solid or gaseous devices including portable and wheeled petrol or kerosene heaters).

9.10.2 No fuelling shall be done while any open flame device is in use within 15m of the aircraft.

9.10.3 There shall be no fuelling where the aircraft engine(s) or the aircraft combustion heater(s) is (are) running. These include wing and tail de-icing heaters. Engine ignition shall be switched off.

9.11 Control of Radar Equipment

9.11.1 The beam from radar equipment can cause ignition of flammable vapour-air mixture from inductive electric heating of solid materials or from electrical arcs or sparks from charge resonant conditions. The ability of an arc to ignite flammable vapour-air mixture depends on the total energy of the arc and the time lapse involved in the arc's duration, which is related to the dissipation characteristics of the energy involved. The intensity or peak power output of the radar unit is thus the key factor in establishing safe distances between the radar antenna and fuelling operations, fuel storage or fuel loading rack areas, fuel tank truck operations, or any operations where

flammable liquid or vapour may be present or created. Radar shall not be operated within 35m of fuelling.

9.12 Use of Communication Equipment

9.12.1 Communication equipment used during aircraft fuel servicing operations within 3m (10ft) of the fuelling equipment or the fill or vent points of aircraft fuel systems shall be intrinsically safe in accordance with UL913, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III Division 1, Hazardous (Classified) Locations.

9.13 Additional Precautions

9.13.1 Fuelling location

- a. All aircraft fuel servicing shall be done outdoor at least 15m from any building to minimise the danger of ignition of flammable vapour discharged during fuelling operations by sources of ignition likely to exist in such buildings. When it is necessary to perform fuelling operation under shelter, special permission must be obtained from the AES.

9.13.2 Concurrent operations

- a. Concurrent operations during fueling operations is allowed provided that equipment, other than that performing aircraft servicing functions, shall not be permitted within 15 m (50 ft) of aircraft during fuel servicing operations.
- b. AES may impose a service charge on airlines, ground handling agents, contractors or sub-contractors engaged by them for the provision of the fire vehicle based on the rates listed the Foreword.

9.14 Positioning of Aircraft Fuel Servicing Vehicles

- 9.14.1 Indiscriminate positioning of fuelling trucks, air conditioning plants, etc, near an aircraft where fuelling is in progress should be discouraged to avoid impedance to the rapid removal of the aircraft and other servicing vehicles in case of emergency.
- 9.14.2 A free passage shall always be maintained so as to allow the speedy removal of service vehicles, and also to allow for safety measures to be rendered quickly.
- 9.14.3 The handbrakes of aircraft fuelling vehicles shall be engaged by the drivers before they leave their driving position.
- 9.14.4 For over-the-wing fuelling, fuel servicing vehicles should be positioned forward of the trailing edge of the aircraft main plane, so that fuel spillage will flow behind the vehicles.
- 9.14.5 The structure of the aircraft's main-plane trailing edge is such that it is not meant to support the weight of a heavy hose. Therefore servicing (i.e., over-the-wing fuelling) shall only be over the leading edge.

9.15 Manning of Fuelling Equipment

- 9.15.1 Adequate manpower shall be constantly available to shut the flow of fuel quickly from the servicing equipment (i.e. vehicles, hydrants, pits or cabinets) in case of emergency.
- 9.15.2 Fuel nozzles used in over the wing fuelling hose assemblies shall be designed so that nozzles will close, and the flow of fuel will stop when the hand of the operator is removed. Blocking nozzles in an open position is prohibited even if it is only momentarily. Only competent and qualified operators shall be permitted to operate the equipment.

9.15.3 It is recommended that other aircraft servicing personnel not engaged in fuelling operations be trained in the operation of emergency fuel shut off controls in the event of a spill or other hazardous conditions.

9.15.4 Kinks and short loops in fuelling hoses should be avoided. The kinked fuel hose shall not be allowed to drag along the ground. The hose should not be stretched with the complete weight of the hose off the ground as this place extra strain on the nozzle coupling.

9.16 Loose Objects

9.16.1 Persons involved in fuelling operations shall not carry in their breast pockets loose objects, e.g. tools, cigarettes, matches, cigarette lighters, etc, because there is the possibility of these items falling into the fuel tank. It is advisable to have the pockets on shirts and uniform sewn shut or removed completely.

9.16.2 Should there be an occasion of any object getting into the aircraft fuel tank, such object shall be removed before further flight. The supervisor in charge must be notified immediately.

9.17 Lightning Storms

9.17.1 Extreme caution should be taken during fuelling operations when lightning or electrical storm is imminent. Operations shall be suspended during severe disturbances and shall be determined by the ground handlers or refuellers.

9.18 Provision of Fire Extinguishers for aircraft fuel servicing and maintenance of aircraft fuel system

9.18.1 Adequate serviceable fire extinguishers [at least 2 x 9kgs ABC Dry Powder – with minimum 20-B:C rating (UL/FM) or 144B rating each] are available at both sides of the refuelling bowser.

- 9.18.2 Since the quick and effective use of fire extinguishers is of vital importance, all fuelling crew shall be trained to use fire extinguishers correctly and effectively and training records shall be produced upon request by CAG or any other relevant agencies.
- 9.18.3 The ground engineer or the appointed ground handling agent shall ensure that during any aircraft servicing operation, including aircraft fuel servicing, there shall be at least one trolley extinguisher located at the aircraft bay (fixed or remote). The trolley extinguisher shall be positioned not more than 61 metres away from the refuelling site (reference to NFPA 410: Standards on Aircraft Maintenance, Para 10.2).
- 9.18.4 With effect from 1 August 2014, any new replacement trolley extinguisher shall have a minimum listed rating of 233B or 80-B (UL/FM) located at the aircraft parking bay (fixed or remote).

9.19 Defueling Requirements

- 9.19.1 Defueling operations present greater fire hazards due to the more difficult procedures that are involved in the draining operations.
- 9.19.2 Therefore, the safeguards listed in the para 7 of this chapter regarding electrostatic bonding and grounding should not be overlooked. Their application is equally important.
- 9.19.3 Variations between different types of aircraft preclude the establishment of standard procedures but the same principles should apply in all cases.

Chapter 10 – Airfield Vehicle Operations

10.1 General

10.1.1 Fire mishaps can result in disastrous consequences especially at the apron area as flammable aviation fuel fumes can be present. Thus, it is imperative that all Airfield Vehicle are maintained fire hazard free at all times. AES shall conduct at least **15 random** Airfield Vehicle Inspection (AVI) on a monthly basis with proper recordings to ensure Airside vehicles driving in the apron are compliant to airside rules and regulations (**See Appendix 2-2 – Fire Safety Requirements involving airfield vehicle operations**). Reference should also be made to the latest edition of CAG By-Laws for the latest requirements on airfield vehicle operations.

10.1.2 Some common causes of vehicle fires are:

- a. Electrical short-circuiting.
- b. Poor maintenance of battery and wiring system.
- c. Long running engine, resulting in engine overheating.

10.2 Actions when vehicle catches fires:

10.2.1 Park vehicle to the side immediately; away from aircrafts and buildings (Air-tug driver shall attempt to disconnect vehicle from aircraft and attempt to move it to a safe distance if safe to do so):

- a. Turn off engine.
- b. Get the passengers and yourself out of the vehicle.
- c. Attempt to put out the fire with the fire extinguisher(s) onboard, without placing yourself in danger.
- d. Inform AES Hotline immediately @ 6541 2525; and
- e. Stay away from the vehicle and assist to direct incoming traffic away.

10.3 AES recommends Airside Operators to prevent vehicle fires by

- a. Regular vehicle maintenance, especially for older vehicles. Particular attention should be given to the electrical systems of the vehicle, e.g. wiring connection of battery compartment.
- b. Ensuring that a fire extinguisher is constantly available in the vehicle.
- c. Turning off the engine before leaving the vehicle.
- d. Ensuring a strict no smoking policy.
- e. Always checking your vehicle for leakage of fluid before starting the engine.
- f. Ensuring that the coolant container is filled up.

10.4 Fire Extinguisher for Airside Vehicles

10.4.1 All Airside Vehicles, except for refueling vehicles and aircraft tow tugs, shall be equipped with at least one fire extinguisher with a capacity of not less than 1.0 kg and with a minimum rating of not less than 21B (UL/FM). The extinguishers must be securely mounted on a suitable bracket affixed to a readily accessible position. Refueling vehicle shall be equipped with sufficient extinguishers meeting requirements stated in Section C, Chapter 1, para 18.

Note: Respective owners are responsible to ensure that all fire extinguishers placed in their airside vehicles remained serviceable.

10.5 Fire Extinguishers for Aircraft Tow Tugs

10.5.1 All tow tugs must have at least one fire extinguisher with minimum rating of not less than 21B and a minimum total capacity (extinguishing agent) of not less than 6.8kg. Fire extinguisher(s) must be easily accessible and free from any obstructions.

10.5.2 Extinguisher combination can be one of the following *:

- a. 1x6kg + 1x1kg
- b. 1x4kg + 1x3kg
- c. 1x9kg

**Regardless of the number of extinguishers, each shall meet the rating of at least 21B)*

***Note:** Respective Ground Handling Agents are responsible to ensure that all fire extinguishers placed in their aircraft tow tugs remained serviceable at all times.*

Chapter 11 – Precautions During Battery Charging

11.1 General

11.1.1 In view of the various hazards associated with the use of lead acid electric vehicles and equipment in the passenger terminal buildings, only electric vehicles and equipment using **sealed** lead acid batteries (commonly known as ‘maintenance free’, ‘dry’ or ‘dry cell’ batteries) shall be allowed to be used and charged in the passenger terminal buildings. Existing electric vehicles and equipment using **flooded** or **non-sealed** lead acid batteries (commonly known as ‘wet’ or ‘wet cell’ batteries) will not be allowed to be used in the passenger terminal buildings and are to be replaced or converted.

11.1.2 Although the present system of charging wet batteries is considered safe, the release of hydrogen during the charging process may give rise to a fire outbreak. As such, the following precautions shall be observed whilst charging accumulators.

11.1.3 Reference shall also be made to the latest editions of NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems and SS 563 - Code of Practice for the design, installation and maintenance of emergency lighting and power supply systems in buildings.

11.2 Electric Vehicles (EVs) Charging Station

11.2.1 Any charging station installations for EVs, shall be treated as an electrical installation or a part of an electrical installation and shall comply with the Electricity Act (Cap. 89A), the Electricity (Electrical Installations) Regulations and the SS CP 5.

11.2.2 The EV shall be connected to the EV supply equipment so that in normal use conditions, the conductive energy transfer function operates safely.

11.2.3 A cord extension set shall not be used in addition to the cord preset for the connection to the EV supply equipment.

- 11.2.4 Adaptors between EV socket-outlet and EV plug shall only be used if specifically designated and approved by the vehicle manufacturer or by the EV supply equipment manufacturer and in accordance with national requirements. (User information shall be provided by the manufacturer on the EV supply equipment, charging station or in a user's manual. The user manual shall also include information about local usage restriction).
- 11.2.5 All EV supply equipment deployed shall be suitable for EVs without the need for an external ventilating equipment.
- 11.2.6 A means of emergency switching complying with Clause 463 of SS CP 5 shall be provided to isolate the electricity supply (mains) for the EV charging station in a case of electric shock, fire or explosion. The device for emergency switching shall be provided with a means to prevent accidental operation and suitable for outdoor and other adverse environmental conditions at site. The equipment shall be part of the EV Charging Station.
- 11.2.7 Charging cable for connection between charging station and EV should be flexible and possess the mechanical characteristics equivalent to those of IEC 60245-6 cable type for harsh mechanical environments, exposure to oil, chemicals, UV, abrasion, crush, impact, fire, etc.
- 11.2.8 An emergency disconnection device shall be installed to isolate the a.c supply network (mains) from the d.c electric vehicle charging station in case of risk of electric shock, fire or explosion. The disconnection device shall be provided with a means to prevent accidental operation.

11.3 Precautions

- a. Charging room should be cool and well-ventilated (outdoors where practicable), away from manufacturing and service areas.
- b. The design of battery room ventilation shall be in accordance with BS EN IEC 62485-2 & BS EN IEC 62485-3.

- c. For mechanically ventilated battery rooms, the ventilation requirement shall be based on the above mentioned, or 6 air change per hour, whichever is higher.
- d. Batteries should stand on non-porous, non-combustible, non-conducting surface (e.g. slate, glazed tiles, etc.) which must be kept dry.
- e. All woodwork must be treated with acid resisting paint.
- f. Batteries should be spaced at least 25 mm (one inch) apart.
- g. Batteries shall not be charged at an excessive rate. Booster, if used, shall be switched off after completion. Do not leave charging unattended especially overnight.
- h. All connections must be properly and firmly made.
- i. Terminals must be clean, highly greased and capped with insulating material.
- j. Charging circuit shall be correctly fused.
- k. Plant/equipment shall be switched off before making or breaking battery connections.
- l. Bulk storage of electrolytes shall be in separate compartments.
- m. Charging of lead acid and alkaline shall be carried out independently.
- n. Finger-rings, wrist watches, waist chains, etc. should not be worn while working near battery terminals because a short circuit may cause an arc or result in severe burns.
- o. Wrenches and other hand tools must be used carefully to avoid shorting.
- p. Brushes used to clean batteries shall have neither a metal frame nor wire bristles.
- q. All foreseeable potential fire hazards must be identified. No flammable or combustible materials, other than those which form parts of the vehicle and their associated chargers, should be stored within charging area.

11.4 Fire Safety Management

11.4.1 Development of an emergency action plan to protect life and property and ensure business continuity.

11.4.2 Fire Risk Assessment (RA) for the area in which the charging process is to be carried out shall be satisfactorily completed. The Fire RAs must also include the possibilities for deliberate fire setting.

11.4.3 Staff, other staff on site or any other personnel who may be called upon during any emergency should be made aware of the location of the charging area, the means for isolating the power and actions to be taken during an emergency.

11.4.4 All relevant staff / EV drivers should be trained on the safe usage of the EV chargers.

11.4.5 No attempt should be made to use the charging point other than for charging batteries designed for its intended use.

11.4.6 No attempt should be made to modify the charging equipment for any other use or to charge a vehicle for which it is not designed or intended for.

11.4.7 Checks should be made to ensure that chargers and associated equipment have not been damaged and that associated instructions remain clearly legible. These checks should be recorded and maintained by the charging station owner.

11.4.8 When a charger is found to be faulty, operations should cease immediately until satisfactory repairs have been made by a competent engineer. Appropriate signages must be placed to inform users to prevent any further usage of the faulty charger.

11.4.9 Emergency numbers must be made available at the charging stations and visible to users.

11.5 Location

11.5.1 Advice and approval shall be sought and obtained from CAG on the location of battery charging rooms.

11.5.2 Fire safety measures shall be recommended by Head, FPS. Tenants shall comply with these strictly.

Chapter 12 – Import, Transport, Storage and Dispense/Decant of Petroleum & Flammable Materials

12.1 Import, Transport, Storage and Dispense/Decant of Petroleum & Flammable Materials

12.1.1 Flammable liquids pose a serious fire hazard if they are improperly stored or handled. They can be easily ignited, with a spark for example, and can cause fire to spread quickly especially if the liquid is spilled or exposed to heat. Any storage of flammable/combustible liquids shall have the prior approval of SCDF. AES shall also be kept in the loop for all storage of flammable/combustible liquids. . For fire safety requirements related to the storage of flammable liquids, reference can be made to the following documents:

- a. Fire Safety Act - Fire Safety (Petroleum and Flammable Materials) Regulations
- b. Latest SS 532 - Code of practice for the storage of flammable liquids

12.1.2 SCDF issues a licence for the import, transport and storage of petroleum Singapore according to their class and quantity below:

- a. Class 0 - Liquefied Petroleum Gas (e.g. LPG)
- b. Class I - flash point less than 23°C (e.g. petrol, AVGAS, CNG)
- c. Class II - flash point between 23- 61 °C (e.g. Jet A fuel)
- d. Class III - flash point between 61-93 °C (e.g. diesel)

12.1.3 All storage of petroleum and flammable materials, regardless of quantity stored, have to comply with SS 532 and indicated in building plans submitted to SCDF for approval. Storage licence is not required if the quantity stored is below the licence exemption quantity in the tables below but conditions of 'Minor Storage' as per SS 532 shall be met.

a. Class 0 Petroleum

Purpose	Exemption Quantity
For private use in a private dwelling house	Not more than 30 kg in not more than 2 cylinders
For use in an eating place	Not more than 30 kg per stall in the eating place (whether occupied or not), subject to a maximum quantity of not more than 200 kg to be stored at that eating place
For use in a restaurant	Not more than 200 kg
For use in a factory	Not more than 300 kg per factory

b. Any Other Classes of Petroleum

Purpose	Exemption Quantity		
	Class I	Class II	Class III
For private use in a private dwelling house or for use in any business other than in a factory	Not more than 20 L	Not more than 200 L	Not more than 1500L
For use in a factory	Not more than 400 L	Not more than 1000 L	Not more than 1500 L

12.1.4 For conditions on the minor storage and decanting of diesel in CAG buildings, reference can be made to the latest SS 532. Tenants are still required to inform CAG AES FPS before proceeding to store and dispense / decant diesel in their units to avoid contravening SCDF regulations and CAG tenancy agreements.

Chapter 13 – Hot Works

13.1 Scope

13.1.1 The procedures in this Appendix are for the protection of persons from injury and illness and the protection of property from damage by fire or from improper handling of equipment.

13.1.2 The requirements listed in this Part shall be in addition to the latest SS510 Code of practice for safety in welding and cutting (and other operations involving the use of heat) and the Hot Work Permit Form sample in **Appendix 1-5 – AES Fire Alarm Isolation and Hot Work Manual Permits**

13.2 Welding and Cutting Operations

13.2.1 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.

13.2.2 No hot work which generates sparks such as welding, cutting and grinding shall be permitted within 3m from the safety net.

13.2.3 No hot work within 75 meters from any aircraft unless the aircraft parking bay(s) is/are closed (Permit to be obtained from Apron Control Management Service (ACMS) @ 6541 2274/ 2144.

13.2.4 The hazards associated with welding and cutting processes are:

- a. High temperatures such as for 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 materials.

- b. Flexible rubber hoses carrying flammable gas to the blowtorch 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. A great deal of 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 make the flame flash back 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.

13.3 Responsibilities

- 13.3.1 The following guidance is for cutters, welders, their supervisors and those managing the property where welding or cutting work is being done. These guidelines should be complied with as far as possible. The tenants shall not conduct any business operations at its tenanted premises, and the contractors and/or subcontractors engaged by the tenants shall not carry out any works in the tenanted premises, if such business operations or works (as the case may be) are not in compliance with any of the above-mentioned guidelines.

13.3.2 The “Owner” Division, as Management, 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 required 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. Select contractors who have suitably trained personnel to perform the hot works and who have an awareness of the magnitude of the risks involved.
- g. Advise workers about flammable materials and hazardous conditions in the vicinity.
- h. Authorise /permit, such hot works to be carried out after having obtained AES Division’s approval in the form of the Hot Work Approval and keep the AES Division informed. The hot work permit shall be valid for a certain period and be certified that:
 - i. Area is safe before work commences.
 - j. Precautions are taken as hot work is in progress; and
 - k. Check for smouldering materials is done half-an-hour after completion.

13.3.3 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 processes.
- 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 work; or

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- 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 so scheduled that operations which might expose combustibles to ignition, (e.g. doping, spray painting, battery charging), do not coincide with welding or cutting works.
- d. **Secure authorisation** for cutting or welding operations from the designated management representative and assure themselves 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 for a radius of 12m from the welding or cutting operations. Combustible floors shall be kept wet, covered with damp sand, or protected by fire resistant shields or non-combustible sheets. Where floors have been wetted down, personnel shall be protected from electric shock.
 - iii. **All combustibles shall be relocated at least 11m 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. Edges of covers at the floor shall be tight to prevent sparks from getting under them. This is also important where several covers are used to protect a large pile.
 - iv. **Wall or floor openings, gaps within 11m of the site shall be tightly covered with non-combustible** materials to prevent passage of sparks to adjacent areas.
 - v. Ducts and conveyor systems that might carry spark to distant combustibles shall be suitably protected by a fire damper or other means or be shut down.
 - vi. Where cutting or welding is done near walls, partitions, ceilings or roofs of combustible construction, fire-resistant shields or guards shall be provided. If welding is to be done on a metal wall, partition, ceiling or roof, precautions shall be taken to prevent ignition of combustibles on the other side due to conduction or radiation of heat. If possible, combustibles shall be removed from the near side of the metal walls, partition or work

- pieces. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided.
- vii. Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceiling or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.
 - viii. Cutting or welding of tanks, vessels, plant or equipment which had previously contained flammable substances, vapours, liquids or dusts, shall be cleaned and purged properly prior to the cutting or welding works. These containers shall also not be refilled until the metal has cooled down.
 - ix. Portable fire extinguishers, appropriate for the classes of fires that may break out, shall be suitably placed at the work area. Where hose-lines are available, they shall be connected and ready for use.
 - x. All welders / cutters shall be fully trained and aware of the fire risks involved.
 - xi. All persons are suitably protected against heat, sparks, slags, etc.
 - xii. Ensure adequate ventilation to prevent flammable or toxic fumes build up
 - xiii. 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. hose reels, extinguishers, etc; are properly located at the site.
 - g. The Fire Patroller with portable fire extinguisher shall not be more than 15m from the welding or cutting works. If necessary, another Fire Patroller shall oversee the adjacent welding or cutting works, so that the required distance can be maintained.
 - h. Ensure that Fire Patrollers are present for every welding or cutting works. Hot works shall be stopped if a Fire Patroller is not present.

13.3.4 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 together with the Fire Patroller, try to extinguish them first when within the capacity of the equipment available or otherwise sound the alarm.
- f. All fire occurrences shall be reported to the AES Division.
- g. Check for smouldering materials half-an-hour after completion of work.

13.4 General Fire Prevention

13.4.1 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 of non-combustible or fire-resistive construction, free of combustibles and flammable contents, and segregated from adjacent areas.

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

- a. The area is not authorised by management.
- b. In a sprinkler protected 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.

13.4.3 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.

13.5 Safe Cutting and Welding Practices

13.5.1 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 to check for leakage.
- g. Replace leaking hose immediately.
- h. Damaged equipment shall not be used.
- i. Repair or replace damaged equipment before commencing the hot works.
- j. Observe correct ignition procedure.
- k. Open cylinder valves slowly.
- l. Cylinder valves should not be lubricated.
- m. Cylinder valve shall be kept clean.
- n. When key-operated cylinders are being used, key should be left in position on the spindle. This will allow cylinders to shut quickly if necessary.

- o. The cylinders must be stood as far as possible from hot work area.
- p. Cutting and welding nozzles must be kept clean and free of blockage.
- q. Never release oxygen in the air deliberately or inadvertently. Be aware that excess oxygen in confined space increases danger of fire and explosion.

13.5.2 With Electric Arc Cutting and Welding

- a. Easily accessible isolation switch shall be available.
- b. Separate earth conductor shall be used to earth the metal work and welding set.
- c. Welding earth shall be protected from mechanical heat damage or inadvertent disconnection.
- d. All electrical components shall be regularly inspected and tested.
- e. Damaged equipment shall not be used.
- f. Repair or replace damaged equipment before commencing the hot works.
- g. Damaged cables shall not be used.
- h. Replace damaged cables immediately.
- i. Welding current shall be as low as possible.
- j. Avoid exposed metals parts in equipment and which may induce accidental arcs.

13.5.3 Fire-Fighting Arrangement

- a. Qualified Fire Patrollers equipped with the appropriate fire extinguisher shall be available during the hot work process.
- b. Fire involving electric arc welding equipment can be extinguished with dry chemical or carbon dioxide extinguishers.
- c. Heated cylinders shall be cooled by copious water spray from a safe distance.
- d. Remove other cylinders to a safe place in the open and away from aircraft.
- e. In case of leaking cylinders becoming ignited, turn off cylinder valves and try to extinguish the fire. ***DO NOT EXTINGUISH FIRE BEFORE SHUTTING THE VALVE.***
- f. Evacuate if flame is impinging on the cylinder.

13.6 Additional Safety Requirements for Hot Works on the Ramp / Apron

13.6.1 Hot works that are performed on the ramp or apron will pose even greater fire hazards because it is where aircraft fuel servicing operations are normally carried out. Should a fire occur in this area, it will jeopardize the nearby aircraft and passengers alike. To safeguard lives and property, the following additional safety measures shall be implemented for hot works that are carried out in the ramp / apron area:

Type of Hot Work	Additional Risk Control Measurements for Hot Work Located Near to Aircraft Parking Bay and or Operation Areas
1. Acetylene welding	a. Observe a <u>75m</u> separation ¹ from aircraft. If the hot work is supervised by a qualified safety officer (Registered with Ministry of Manpower), the 75m can be reduced to 50m. b. Engage a certified fire patroller to standby at the hot work location, each fire patroller shall only be permitted to cover 15-meter radius of the hot work activities. Contractors shall engage additional fire patrollers if there are multiple hot work location at worksites. c. Contractors shall submit their Method Statement and Risk Assessment for their hot works to CAG project officer and AES to review the work processes. d. If the hot work is <u>less than 75m</u> from the aircraft, the applicant shall apply for aircraft bay closure prior to the commencement of the work. e. If (d) cannot be achieved, applicant shall. i. Only adopt cold cutting method.
2. Shielded arc welding	
3. Thermo-plastic painting using LPG	
4. Thermo-plastic painting using non-gaseous fuel	
5. Metal grinding	

	<ul style="list-style-type: none"> ii. The hot work shall be fully enclosed by non-combustible material ('fire box') to shield the hot work area. The firebox shall be constructed such that hydro-carbon vapours cannot permeate into the firebox. iii. Install area gas/ vapor detection system with warning around the hot work location². The warning shall be activated when the gas / vapour is detected. iv. Engage an Emergency Response Services company accredited by the SCDF to provide firefighting and fire protection services throughout the duration of the hot works. v. Deploy 1 x 45-litres AFFF Premix Foam Trolley Fire Extinguisher at the hot work location. vi. The fire watcher shall standby the charged line of the AFFF TFE at all times during hot works such that the extinguishing agent can be discharged immediately when there is a fire.
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Note¹: *Separation is the distance between the hot work location and the tip of the aircraft wing.*

Note²: *Hot work shall stop immediately when the area gas/ vapor detection system warning is activated.*

- 13.6.2 The specific location where the welding is being done shall be roped-off or otherwise segregated by physical barrier to prevent unintended entry into the welding area. A placard reading shall be prominently displayed.

“WELDING OPERATIONS IN PROGRESS”.

- 13.6.3 Welding generating equipment shall be placard as follows.

**“WARNING – KEEPS CLEAR OF AIRCRAFT ENGINES
AND FUEL TANK AREA”.**

- 13.6.4 Welding equipment shall have no electrical components (other than flexible lead cables) within 45 cm (18 inches) from the floor. The ground leads should be as close to the area to be welded as possible and clamps used on such ground leads should be of the 'C' clamp type, not the clip type. Components, which could produce arcs, sparks or hot metal, under any condition of operation, should be of the totally enclosed type or should have suitable guards or screens. The inert gas cylinder should be securely fastened to prevent tipping and the regulator and gauge shall be in proper working condition.

13.7 Precautions for Aircraft

- 13.7.1 It is recommended that where welding is to be carried out on an aircraft in a hangar, the aircraft should be in towable condition, with its parking brakes off, the wheels chocked, and it is hooked on to a tow tug. Any equipment, which could obstruct prompt removal of the aircraft, should be cleared away. Where practicable, a qualified operator should be pre-designated to operate the tow tug and mechanics assigned to remove the wheel chocks and to operate controls in the cockpit. It is

recognised that under many conditions, the aircraft being worked upon may not be mobile, and when this is true it is of even greater importance to follow the other precautions given in this Chapter.

13.8 Supervision of Hot Works

13.8.1 The supervisor shall be responsible for fire safety during hot works.

13.8.2 A checklist shall be maintained in order to eliminate all hazards and possible ignition sources when aircraft welding is to be carried out. The supervisor shall be thoroughly familiar with each aircraft to be welded so that he has proper knowledge of the flammable vapour sources and combustible materials on the aircraft. Prior to starting any welding operation, the supervisor in charge of the project shall inspect the area to see that all safety requirements have been complied with and all necessary steps have been taken to ensure that welding works can be conducted safely.

Chapter 14 – Fire Precautions During Oxygen Charging and Storage

14.1 Scope

14.1.1 This Chapter describes the hazards associated with the handling of breathing oxygen aboard aircraft and describes the recommended procedures for safe charging. Reference should also be made to the latest edition of NFPA 410: Standard on Aircraft Maintenance.

14.2 General

14.2.1 Currently, aircraft breathing oxygen systems may utilize either gaseous or liquid oxygen.

14.2.2 Gaseous oxygen is colorless, odorless, 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.

14.2.3 Liquid oxygen is a light blue, transparent liquid, which flows like water. It boils at minus 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 vaporizing oxygen to expand will result in the attainment of extremely high pressures (in the order of 40,000 psi).

14.3 Hazards

14.3.1 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 or charged.

14.3.2 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.

14.3.3 In addition to aggravating the fire hazard, liquid oxygen can cause severe burns (frostbite) when in contact with the skin because of its low temperature.

14.3.4 Only corrosion resistant tubing, pipes and fittings suitable for the class of oxygen service it is intended to provide, shall be used.

14.4 Precautions for Charging Operations

14.4.1 Because of the possibility of fire or explosion involving large quantities of oxygen, such factors as the presence of other aircraft, vehicles, valuable structures, utilities, and people in the vicinity; and the accessibility of the aircraft to fire-fighting equipment, shall be considered when choosing sites for oxygen charging.

14.4.2 Where it is necessary to conduct gaseous oxygen system recharging or filling in a hangar or building, it must be done under controlled conditions.

14.4.3 Liquid oxygen recharging shall not be conducted indoors under any condition. Wherever possible, at least 15m separation shall be maintained between any point of filling and other aircraft, structures, etc.

14.4.4 Avoid liquid oxygen charging operations within range of any drainage system elements, such as catch basins, through which a liquid oxygen spill could enter the drainage system. Such systems may contain combustible materials, which could be extremely hazardous when in contact with the liquid oxygen in confined space.

14.4.5 Good housekeeping is necessary in the vicinity of oxygen charging operations. This is particularly true with combustibles like grease, lubricating oil, asphalt, etc.

- 14.4.6 Prohibit open flames (including smoking) within 15m of charging equipment.
- 14.4.7 Do not permit aircraft servicing or maintenance operations, which may inherently or accidentally introduce ignition source of combustibles simultaneously with oxygen charging operations. These include fueling, fuel and hydraulic system repairs, use of flammable cleaning fluids, de-icing fluids, etc.
- 14.4.8 Do not operate electrical system switches, connect or disconnect ground power generators during oxygen charging operations.
- 14.4.9 Use only charging equipment, containers, etc., suitable for the specific aircraft breathing oxygen system involved. Identify each container by its marking before connecting to the aircraft system. Never interchange equipment with equipment intended, or used, for other gases.
- 14.4.10 High-pressure commercial containers 122.4 Bar (1800 psi or higher) must be connected through a pressure regulator to service low pressure aircraft systems. Failure to use a high-pressure regulator specific for oxygen service is extremely dangerous.
- 14.4.11 Oxygen charging hoses shall be kept clean, capped when not in use and clearly marked or tagged.

"FOR OXYGEN USE ONLY"

- 14.4.12 Electro-statically ground the aircraft and electro-statically bond the oxygen charging equipment to a suitable and safe part of the aircraft, when removing or replacing oxygen bottles on the aircraft.
- 14.4.13 Never permit oil, grease or other readily combustible substances to come in contact with containers, flasks, valves, regulators, fittings or any other part of the aircraft oxygen system or charging equipment. Do not handle oxygen equipment with oily gloves, tools or perform charging operations wearing oily or greasy clothing.

- 14.4.14 Keep protective caps on equipment in position as long as possible and replace as soon as possible. Before charging, inspect all connections for cleanliness. If dust, dirt, grease or any other contaminant is found, it shall be removed with detergent or solvent approved for oxygen service. Bleed a small amount of oxygen through hose or valve outlet before connecting to the fill fitting to eliminate foreign material, which may escape external inspection.
- 14.4.15 Use only lubricating and thread compounds specifically approved for oxygen service under pressures and temperatures involved. Do not use oil or grease.
- 14.4.16 Use only valve packing and transfer hose gaskets, which are suitable for oxygen service.
- 14.4.17 Avoid damaging oxygen containers, hoses, flasks, converter, etc. Secure equipment so that it cannot fall or roll.
- 14.4.18 Do not tamper with safety devices or the identifying markings, symbols and nameplates.
- 14.4.19 Do not direct gaseous oxygen at the body or clothing or allow liquid oxygen to contact the body or clothing because of the possibility of both fire and personal injury.
- 14.4.20 Desiccant cartridges are sometimes required to assure only dry oxygen is introduced. Check on the need for such cartridges and be sure that drying medicine is fresh. Only desiccant cartridges with filters shall be used.
- 14.4.21 Before commencing charging, turn all oxygen regulators in the aircraft to the "OFF" position.
- 14.4.22 Ensure that threaded fittings on regulators, containers, valve outlets, hoses, etc. correspond to each other. Never force connections, which do not fit. Fittings with worn or damaged threads should be replaced.

14.4.23 After connecting containers or charging hoses to the oxygen-fill fitting system, check the connections for gas tightness by audible and visual means. If a leak is suspected, test with a solution that is specially approved for oxygen service.

14.4.24 Close all charging equipment discharge valves when charging is completed.

14.5 Gaseous Oxygen (specific cautions)

14.5.1 Open container charging valves slowly. Rapid opening and subsequent sudden and fast discharge of oxygen can cause dangerous heating, which could result in a fire or explosion of the combustibles within the system. Container valves should be fully opened to prevent leakage around the valve stem. (See Para 6.7: liquid oxygen).

14.5.2 Never use wrenches, hammers, or other tools to force container valves. If a container valve cannot be hand operated, it shall be considered defective and returned to the supplier.

14.5.3 Charge the oxygen bottles to the established pressure having set the supply regulating valve to the proper setting.

14.5.4 When removing oxygen containers from aircraft for recharging, (a condition found particularly where high-pressure containers are employed), close the container valve and release all oxygen in the lines at an oxygen station before attempting container removal. It is vitally important that this discharge be done slowly, as sudden release of oxygen might readily create a serious fire hazard. Before removing the container from the aircraft, disconnect, cap the container valve outlet, and plug all distribution lines.

14.6 Liquid Oxygen (specific cautions)

- 14.6.1 Do not permit liquid oxygen to contact any part of the body or clothes. It can cause severe skin injury and make clothing highly combustible. Do not handle liquid oxygen lines with bare hands.
- 14.6.2 Personnel should wear protective clothing while handling liquid oxygen equipment. Such protective clothing includes the following:
- a. Safety goggles or a clear plastic face shield.
 - b. Clean, dry leather, rubber-coated cotton or canvas gloves. It is recommended that these gloves be loose fitting without wrist gauntlets.
 - c. Clean overalls with long cuff-less sleeves or rubber apron. In cold weather, a clean rubber raincoat, preferably without pockets, may be worn over jackets or coats.
 - d. Shoes should preferably be of the high-top type with cuff-less trousers outside the shoes.

NOTE: If liquid oxygen is spilled on clothing the clothing shall be removed immediately and thoroughly aired before re-use.

- 14.6.3 Personnel who have handled liquid oxygen should refrain from smoking for at least 15 minutes after leaving the charging area.
- 14.6.4 Exercise care that no moisture is introduced into a liquid oxygen system and that there is no moisture in fill fittings or nozzles where it may be entrained into the system during transfer operations. Dry, oil-free air, oxygen, or nitrogen may be used to eliminate moisture before introduction of liquid oxygen.
- 14.6.5 Because of its low temperature, liquid oxygen must be handled in equipment constructed of materials suitable for the service. Ordinary rubber or plastic hoses, gaskets, seals, etc. for example are unsuitable.

- 14.6.6 If it is necessary to transfer liquid oxygen from one container to another, care is needed to avoid splashing. Cool the receiving container gradually to avoid breakage. Fragile containers such as glass should not be used. The container must be clean.
- 14.6.7 When transferring liquid oxygen, do not leave valves open all the way, open them wide and then immediately close them about one-quarter turn; otherwise they may freeze in the open position. (See paragraph 5.1 for gaseous oxygen).
- 14.6.8 Use pressure relief devices on all lines in which liquid oxygen may be trapped between closed valves and on closed containers.
- 14.6.9 Avoid spilling liquid oxygen on pavement. A fire or an explosion can result if pavement has combustibles (e.g. asphalt) or if it is porous and is impregnated with combustibles (e.g. concrete contaminated with oil).
- 14.6.10 Because of its low temperature and expansion characteristics, liquid oxygen can spall pavement. If a spill occurs, stop the flow of the liquid and where possible, allow the liquid to spill some brief time to evaporate. Do not walk on spilled liquid oxygen or roll equipment over.
- 14.6.11 Variances in the design of aircraft systems and charging equipment may require deviations. Observe the equipment manufacturer's instructions closely.
- 14.6.12 Under normal circumstances, oxygen re-charging is not permitted to be carried out on the aircraft at the parking apron. Approval from CAES is required if such operation needs to be performed due to unavoidable circumstances.

14.7 Fire Protection for Oxygen Charging Operations

- 14.7.1 In case of fire, shut off the oxygen supply to the fire.

14.7.2 A fire involving combustible materials in an oxygen filled atmosphere should be treated as a fire involving combustibles in normal air atmosphere.

14.7.3 If liquid oxygen is involved it is normally desirable, where practical, to allow the fire to burn until the liquid oxygen present in the fire area is evaporated, following which the ignited combustible materials should be attacked with the appropriate extinguishing agent.

14.7.4 Remember that oxygen can combine with a number of combustible materials in a manner to cause an explosion. Liquid oxygen, as a vigorous combustion-supporting substance, cannot be effectively smothered or 'blanketed' by carbon dioxide or foam used as the extinguishing agent.

14.8 Storage of Oxygen Charging Equipment

14.8.1 Gaseous breathing oxygen is generally received in high-pressure cylinders or containers. The cylinders must be stored and transported to the charging site where they are used to charge the aircraft oxygen system storage containers. In some instances, the aircraft system storage containers may be received for charging and in such cases, the containers must be stored after charging until they are transported to the aircraft and interchanged with empty containers in the aircraft system.

14.8.2 Liquid oxygen is generally received in a tank car or truck and transferred to a storage vessel. It is then transferred as needed to a mobile charging vehicle and transported to the charging site where it is used to charge the converter in the aircraft system.

14.8.3 Oxygen cylinder storage

- a. Cylinder should be stored in a specifically assigned location and protected against tampering by unauthorized individuals. Oxygen cylinders shall not be stored in aircraft servicing and maintenance areas of aircraft hangars and should, preferably be stored in a separate building.
- b. Oxygen cylinders shall not be stored near flammable materials (such as petroleum products), other readily combustible substances, or in the same

area as compressed combustible gases. Empty and full cylinders should be stored separately with empty cylinders clearly marked.

- c. Each cylinder should be clearly marked to indicate its content. Breathing oxygen cylinders should not be mixed with other oxygen cylinders.
- d. Cylinders shall be stored so that they are never allowed to reach a temperature exceeding 52°C. When stored in the 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.
- e. 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.
- f. 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. When transported on hand/power trucks or tractors, cylinders should be secured in the upright position.

14.8.4 Liquid oxygen storage

- a. Liquid oxygen shall be stored outdoors or in a detached non-combustible structure if the quantity exceeds one day's need. Smaller quantities should be located outdoors, in a detached non-combustible structure or in a cut-off room provided the cut-off room has effective ventilation and necessary doorways protected by fire doors with ramps or curbs to prevent entrance of flammable liquids and exit of liquid oxygen.
- b. Storage areas shall be reserved for liquid oxygen storage and be clearly placard.
"OXYGEN - NO SMOKING & NO OPEN FLAMES" or equivalent.
- c. The construction and occupancy of liquid oxygen storage areas shall be strictly non-combustible and have no floor drains. Wall scuppers (not connected to drainage systems) are recommended.

14.9 Miscellaneous Cautions

- 14.9.1 Never use oxygen as a substitute for compressed air. It is very dangerous to use oxygen for pneumatic tools, for pressuring containers, for paint spraying, for blowing out pipelines, etc.
- 14.9.2 Never attempt to mix gases in an oxygen container.
- 14.9.3 Only corrosion resistant tubing, pipes and fittings shall be used.
- 14.9.4 Liquid oxygen charging operations are not regarded as more hazardous than gaseous oxygen charging operations. However, a spill of liquid oxygen introduces a new hazard, which must be specifically safeguarded. AES shall be informed of liquid oxygen spills.
- 14.9.5 Aircraft oxygen cylinders shall be removed and taken away from aircraft parking areas for charging. On-site charging at the aircraft is not permitted.

PART FOUR: APPENDICES**Appendix 1-1 – Fire Safety Do's 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 parts of the emergency escape route at your workplace for storage.

Do keep corridors, walkways and passageways free of obstructions.
4. **Do not** leave food or edibles accessible to wildlife.

Do ensure food and other edibles are inaccessible to wildlife by using proper storage facilities.
5. **Do not** remove ceiling boards or use ceiling void (i.e. space above suspended ceiling) for storage.

Do ensure all ceiling boards are in place, not missing, or damaged and refrain from using ceiling voids for storage purpose.
6. **Do not** paint over smoke/heat detectors and sprinkler heads or hang objects on them.

Do ensure the detectors and sprinkler heads are not painted over or obstructed with objects.
7. **Do not** stack up items to a height less than 0.5m (or 1 m for warehouse) from sprinkler heads.

Do ensure that there is clear headroom of 0.5m (or 1 m for warehouse) between stacked goods and sprinkler heads.
8. **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.

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9. **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 fan repaired quickly.
10. **Do not** use candles or other naked flame for lighting purposes, especially during a power failure.
- Do** make available battery-operated portable torches as a backup.
11. **Do not** smoke in “No-smoking” areas.
- Do** observe “No-smoking” rule strictly in your premises.
12. **Do not** use or operate dirty or greasy equipment/machinery.
- Do** have the equipment/machinery cleaned and serviced regularly.
13. **Do not** leave heavy machinery operating or running unattended.
- Do** ensure that machines that are in use are always tended by qualified operators.
14. **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.
15. **Do not** put any liquid or thing that is flammable or combustible near an electrical switchboard or an enclosure containing electrical components.
- Do** ensure that the electrical switchboards and the enclosures of electrical components are kept clear of flammable or combustible substances and liquids.
16. **Do not** dispose of oil-soaked rags in combustible receptacles.
- Do** dispose of oil-soaked rags in self-closing metal bins.
17. **Do not** use electrical equipment that has poor wiring such as frayed cables and loose connections.
- Do** ensure the wiring is in good condition and for any defect, get a licensed electrician to check and rectify it immediately.
18. **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 appliance or equipment, wherever possible.
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19. **Do not** allow electrical fitting works to be carried out by non-qualified or unauthorized personnel.
- Do** engage licensed electricians for all electrical fitting works.
20. **Do not** use electrical closets or compartments that house dry riser inlets/outlets, hose reels, telecom riser ducts etc., for storage.
- Do** ensure that the closets and compartments are always clean and free of obstructions.
21. **Do not** use staircases as rest areas or storage space.
- Do** keep staircases free of obstructions at all times.
22. **Do not** burn joss stick, oil, 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.
23. **Do not** cook in the premises using open-flame stove or electrical hot-plate except for areas that are allowed for cooking such as kitchens and food stalls.
- Do** use microwave or electrical oven for heating up food only.
24. **Do not** pour water onto cooking oil fire.
- Do** switch off the electrical/ gas supply and put off the fire with nearby fire extinguisher.
25. **Do not** wedge open any fire door.
- Do** ensure fire doors are kept closed but unlocked at all times.
26. **Do not** obstruct the access to a fire hose reel or a fire extinguisher.
- Do** keep the hose reel cabinets and fire extinguishers free from any obstruction.
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Appendix 1-2 – Consolidated Fire Safety Requirements for Compliance by CAG Tenants

- 1 Tenants shall ensure that the fire-fighting installations and/or equipment such as fire sprinklers, dry riser breeching inlets and outlets, hose reels, and fire extinguishers in their demised premises are always accessible (unobstructed). They are provided solely for the purpose of firefighting and shall not be misused or vandalized.
- 2 Tenants shall ensure that the fire-fighting equipment like fire hose reels, fire extinguishers, kitchen fire suppression system (for food outlets and restaurants) in their demised premises are checked and serviced at least once a year by trained persons of approved organizations, 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 staircases, passageways and exits, etc. that form parts of the emergency escape route in their demised premises are always unobstructed. Exit signs are always to be lit. Exit doors shall not be locked or obstructed in any way when the premises are occupied. Where exit doors are required to be locked for security reason, they shall be linked to the fire alarm system which, upon its activation, will automatically unlock the exit doors for immediate access.
- 4 Tenants shall take proper precautions to prevent fire in their demised premises. Tenants shall always adhere to the list of fire safety dos and don'ts in **Appendix 1-1**.
- 5 Tenants shall ensure no burning of candles, oil lamps, joss sticks, incense paper, etc. on the demised premises without prior written approval of the Landlord.
- 6 Except for approved eateries or restaurants, Tenants shall ensure no open flame cooking is always allowed on the demised premises. The use of microwave ovens for warming of food is allowed.
- 7 Tenants shall ensure no flammable liquids, gases or other hazardous substances (e.g. toxic, corrosives) are stored in the demised premises unless with the prior written approval of the Landlord and subject to strict compliance with all conditions set by the Landlord and with the relevant codes of practice issued by Enterprise Singapore and requirements of the relevant authorities including but not limited to the Ministry of Environment & Water Resources and the Fire Safety and Shelter Department (FSSD). Tenants shall also provide to the Landlord the Safety Data Sheets (SDS) for the hazardous materials.
- 8 Tenants shall take part in the fire evacuation drills organized by the Landlord. Every tenant shall appoint at least one fire warden per unit on every floor/level, whose primary duty is to ensure all their staff are evacuated to safety during an emergency. Tenants shall also send their appointed fire wardens to attend the annual fire warden briefing organized by the Landlord.

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- 9 Tenants shall submit to the Landlord by 31 January of each calendar year the names and contact numbers of their appointed fire wardens, assistant fire wardens and the floor registers listing the names of their staff occupying the demised premises. Subsequently, should the tenants make any changes to the appointed fire wardens, assistant fire wardens or floor registers, the tenants concerned shall write to update the Landlord with those changes no later than 30 days.
- 10 All hot works that generate heat or sparks require the prior written approval of the Landlord. Tenants shall apply for online approval at the CAG website or alternatively apply manually using the prescribed application form available on the CAG website. The approval will be subject to such conditions as deemed fit by the Landlord.
- 11 Where due to renovation or A&A works, Tenants require the fire detection and/or protection systems in their demised premises to be temporarily isolated, written approval shall be sought from the Landlord, through AES FPSS. Tenants shall apply for the approval using the prescribed application form available on the CAG website. The approval will be subject to such conditions as deemed fit by the Landlord.
- 12 Tenants shall ensure that all their staff are aware of the need for them to notify the Airport Emergency Service (AES) Division Hotline - WRO immediately at Tel: 6541 2525 upon discovery of a fire outbreak on their demised premises. The fire emergency number shall be prominently displayed at the strategic locations on the demised premises. All fires, however small, shall be reported to AES.
- 13 Tenants shall take all reasonable measures to prevent false fire alarm in their demised premises. If the Airport Emergency Service (AES) is activated by a false fire alarm activation that is not due to technical fault of the fire alarm system but due to the negligence or vandalism by the tenant, the tenant concerned shall pay the service charge levied by the Landlord as stipulated in the foreword.

Appendix 1-3 – Summary of Fire Safety Requirements for CAG – Managed Buildings

Date:

To: Head [Fire Prevention Section]

Through: OPC 'A', 'B', 'C' Coy*

**CHANGI AIRPORT GROUP
AIRPORT EMERGENCY SERVICE
FIRE SAFETY INSPECTION CHECKLIST**

Location of Inspection*:

T1/ T2/ T3/ T4/ T4 Ramp Tower/ CAB C/ CAB D/ CAB E/ Megaplex 1/ ECC2/

Others: Please specify:

Date & Time of Inspection:**Inspecting Officer
(Designation/ Name):****Tenant and Unit No:****Official Telephone No:****E-Mail address:****Inspection carried out in the
presence of:****Type of occupancy*:**

Office/ Shop/ Lounge/ F&B outlet/ Warehouse/ M&E Room/

Others: Please specify:

**Name of Manager/ Staff to
contact in case of fire:****Protection System*:**Sprinkler/ Gas Flooding System / Smoke Detector/ Heat Detector/ Flame Detector/
Wet Chemical System/ Gas Detection System/ Kitchen Fire Suppression System

Others: Please specify:

**Please circle where applicable*

<i>Please Tick \checkmark: C: Compliance/ NC: Non-Compliant/ NA: Not Applicable</i>						
1	Fire Detection and Protection Systems	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
1.1	A clear space of 0.5m (Warehouse - 1m) is maintained between the top of storage goods and false ceiling or lowest M&E System.				Goods to be removed immediately	
1.2	Objects are not hung on the sprinkler heads.				Objects to be removed immediately	
1.3	Detectors/sprinklers are not covered.				Obstruction to be removed immediately	
1.4	Detectors are not loose from mounting or damaged.				To be rectified	
1.5	Detectors/sprinklers are not painted over.				Paint to be removed from detectors/sprinklers	
1.6	MCP shall be free from any physical and visual obstruction and intact with proper casing, the breakglass shall be aligned and not tampered				Objects to be removed immediately	

2	Passive Fire Safety Measures	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
2.1	Access to EXIT doors and escape routes are not obstructed.				Objects to be removed immediately.	
2.2	EXIT doors are not locked or latched. (Unless linked to fire alarm or a one-way lock mechanism door)				EXIT doors to be unlocked immediately	
2.3	EXIT signs are lighted. [unless self-luminous exit sign (affixed with a radioactive symbol)]				EXIT signs to be lighted	
2.4	Fire doors are kept closed at all times (unless linked to fire alarm system)				Fire door to be closed immediately.	
2.5	Fire Shutters are not obstructed				Obstruction to be removed immediately.	

3	Fire extinguisher / Hosereel (Serviced Annually)	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
3.1	Fire extinguishers are visible, unobstructed or clearly indicated when enclosed in a cabinet.				Extinguishers to be correctly installed	
3.2	Fire extinguishers are fully charged, within servicing period (annually) and labelled.				Extinguishers to be replaced / serviced.	
3.3	Adequate fire extinguishers are available in the premises.				To provide additional fire extinguishers as per recommended calculations.	
3.4	Hosereel, dry riser or their cabinets shall not be obstructed or used as storage place.				Obstructing or stored items to be removed.	
3.5	Hosereels are within servicing period (annually)				Hosereels to be serviced.	
3.6	Hosereel signage is installed on the cabinets.				To install hosereel signage.	
3.7	Fire extinguisher / Hosereel cabinets are in good condition.				Cabinet to be fixed.	
3.8	DR Landing valve cabinets to have at least one standby fire hose				Missing hose(s) to be replaced.	

4	Housekeeping of premises	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
4.1	No accumulation of rubbish inside the premises, at the doorway, passageway and stairwells.				Rubbish to be cleared immediately.	
4.2	Goods are not stacked haphazardly in the storeroom.				To tidy the goods in the store.	

5	Prohibited items in premises	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
5.1	Flammable liquids are not stored in the premises. (Except with official AES approval)				To remove flammable liquids immediately	
5.2	LPG cylinders are not kept in the premises.				To remove LPG cylinders immediately	

5.3	No burning / naked flame (oil lamp, candle etc.)				To remove or change to electrical type	
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6	Electrical fixture	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
6.1	Electrical fixtures, switches and sockets and exposed wiring are not defective or damaged.				Defective / damaged electrical switches or sockets to be rectified.	
6.2	Access to Distribution Board (DB) is not obstructed and closet is not used for storage purposes.				To remove obstruction or objects immediately	
6.3	"DB Closet" signage posted.				To fix signage.	
6.4	Electrical cords / wires are to be secured in conduits / trunking.				Electrical wires to be covered by trunking.	

7	Mechanical & Electrical Room	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
7.1	Diesel Tank Room: -					
	a) No presence of oil or leakage				To be cleaned.	
	b) Fueling inlet padlocked.				To be padlocked.	
	c) "No Smoking" signs are displayed.				To display "No Smoking" signs.	
	d) Ventilation system is functioning.				To rectify the fault.	
7.2	Generator Room: -					
	a) Battery bank terminals are protected by rubber covers.				To provide rubber covers for the terminals.	
	b) No accumulation of oil at fuel pump.				To be cleaned.	
7.3	HT/LT Switch Room: -					
	Insulation mat provided.				To provide insulation mat.	
7.4	Battery Room: -					
	a) Ventilation system is functioning.				To rectify the fault.	

	b) Battery & battery charging equipment in good condition.				To be serviced	
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8	Restaurant / Kitchen Cleaning of Cooker Hood / Ducts (Regular Basis)	C	NC	NA	Corrective Action(s) for non- compliance (if any)	Done
8.1	Cooker hood is clean & free from grease				To be cleaned	
8.2	Cooker hood filters are clean & free from grease				To be cleaned	
8.3	Record of cleaning				To be produced for AES sighting	

9	Restaurant / Kitchen Fire Suppression System (Serviced Annually)	C	NC	NA	Corrective Action(s) for non- compliance (if any)	Done
9.1	Discharge nozzles with nozzle seal/cap				To replace the seal/ cap	
9.2	Discharge nozzles are free from grease				To be cleaned	
9.3	Regulated actuator assembly is visible and free from obstructions				To remove obstruction	
9.4	Service label is attached.				To attach service label	
9.5	Fusible links are free from grease				To be cleaned	
9.6	Combustible items are not to be placed near cooking area which may result in fire.				To remove combustible item.	
9.7	No obstructions (e.g., Shelves) located within the cooking area affecting the effectiveness of the KFSS.				To remove obstruction.	
9.8	Remote manual pull station (MPS) is not obstructed and tampered seal is intact.				To remove obstruction & replace seal.	
9.9	Supply lines / pipe fittings are visually connected.				To be inspected by maintenance contractor.	
9.10	Linkage to Fire Station & FMC.				To be tested by maintenance contractor.	
9.11	The KFSS last service date is within the limit				To service the KFSS	

9.12	Model / Type of Kitchen's Fire Suppression System:	
9.13	Name of Service & Maintenance Company:	
9.14	Date of Service:	Telephone No:
9.15	Maintenance Staff Name:	

10	Restaurant / Kitchen Piped Gas System (Serviced annually)	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
10.1	Bypass valve is padlocked				To padlock bypass valve	
10.2	Gas detectors are free from grease				To be cleaned	
10.3	Gas detectors are not damaged				To be checked by maintenance contractor	
10.4	Record of inspection by Licensed Gas Worker (LGW)				To be produced for AES sighting	
10.5	Piped Gas System is linked to FMC				To be checked by maintenance contractor	

11	Restaurant / Kitchen Non-CAG Fire Alarm Panel (Serviced Annually)	C	NC	NA	Corrective Action(s) for non-compliance (if any)	Done
11.1	Linkage to Fire Station & FMC				To be checked by maintenance contractor	
11.2	Name of Service & Maintenance Contractor Company:					
11.3	Date of service:	Telephone No:				
11.4	Maintenance staff name:					

12	Restaurant / Kitchen Fire Warden -
12.1	Appointed Fire Warden(s): Yes / No
12.2	Name of Fire Warden (s):
12.3	Number of Appointed Fire Warden (s) engaged:
12.4	Number of Staff(s) engaged:

13	Fire Safety Awareness
13.1	AES hotline [65412525] was displayed prominently: Yes / No
13.2	Staff was able to provide the AES emergency hotline [65412525] when questioned: Yes / No
13.4	Staff was able to demonstrate "PASS" method with a fire extinguisher correctly: Yes / No
13.5	Staff was able to identify the nearest MCP and explain its usage: Yes / No
13.6	Staff was able to explain on the Evacuation Procedures, Evacuation Route and the locations of the Emergency Assembly Area: Yes / No
13.7	Appointed Fire Warden(s) was able to explain his/her duties in an event of fire and evacuation: Yes / No

14	Kitchen Fire Safety (Where Applicable) -
14.1	Staff was able to identify the Kitchen Fire Suppression System Manual-Pull station(s): Yes / No
14.2	Staff was able to demonstrate the correct steps for KFSS Manual Operations: Yes / No
14.3	Staff was able to explain the hazards of unattended cooking: Yes / No
14.4	Staff was able to list out the step "turning off" gas valves for stall closing: Yes/ No
14.5	Staff is aware of the requirements on having a minimum of two (02) operators on duty - (One to manage the stall front and another to manage the cooking area.) when cooking is involved: Yes / No
14.6	Staff was able to explain the potential risks of fire when leaving the pilot light on standby. Yes/ No

14.7	Staff was able to demonstrate the required steps during an event of a kitchen fire (activating the KFSS using the Manual-pull): Yes / No
14.8	Staff was able to explain the hazards of pouring water onto cooking oil fire. Yes/ No

15	Observations / Remarks (Include photo of findings)	Recommendations

Appendix 1-4 – Sample of AES Service Charge Form

AGREEMENT FOR THE PROVISION OF SPECIAL SERVICE						Service Charge No.																																																																							
CHANGI AIRPORT GROUP (SINGAPORE) PTE LTD PO Box 168, Singapore Changi Airport, Singapore 918146 UEN / GST Registration No.: 200910817N			AIRPORT EMERGENCY SERVICE Telephone No.: 66034953 Telefax No.: 65457072																																																																										
(A) PARTICULARS OF COMPANY Name of Company / Section : _____ Address : _____ Tel : _____ Name of authorised person : _____ Designation : _____ Employment Pass : _____ Contact No. : _____			(B) PARTICULARS OF CALL / ACTIVATION Date : _____ Time of call / activation : _____ Name of caller : _____ Aircraft Registration No. : _____ Location : _____ Time service started : _____ Time service ended : _____ Total service time : _____		(C) SERVICES TO BE PROVIDED <input type="checkbox"/> Removal of Fuel Hazards <input type="checkbox"/> Refuelling / Defuelling Standby <input type="checkbox"/> Explosives Escort <input type="checkbox"/> Hot Work Standby <input type="checkbox"/> First Aid Fire Appliances (FAFA) training <input type="checkbox"/> False Fire Alarm Activation Turnout <input type="checkbox"/> Vehicle Escort <input type="checkbox"/> Fire Patroler Duties <input type="checkbox"/> Others (Specify below) _____																																																																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6" style="text-align: left;">(D) DETAILS OF SERVICES & CHARGES</th> <th style="text-align: left;">(E) PAYMENT DETAILS</th> </tr> <tr> <th style="width: 5%;">Item (1)</th> <th style="width: 20%;">Type of Service (2)</th> <th style="width: 15%;">Rate per hour or part thereof (3)</th> <th style="width: 15%;">No. of Hours Service Required (4)</th> <th style="width: 10%;">Units Required (5)</th> <th style="width: 10%;">Amount (\$) (6)</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Fire Vehicle</td> <td>\$600</td> <td></td> <td></td> <td></td> <td rowspan="6"> CAG Bank Details Bank Name: DBS Bank Ltd Bank Address: 12 Marina Boulevard @ MBFC Tower 3 Singapore 018962 Account Name: Changi Airport Group (Singapore) Pte Ltd Account No: 003-909094-S Bank Code: 7171 Branch Code: 003 Swift Code: DBSSSGSG Email address for remittance advice: changi.collection.office@changiairport.com Note: Please provide clear description of payment by indicating service charge no. Cash payment can be made at the below location: Singapore Changi Airport 4th Storey, Terminal 2 Unit no. 046-038 Changi Airport Group (S) Pte Ltd Finance Collection Office </td> </tr> <tr> <td>2</td> <td>Sea Rescue Craft</td> <td>\$1010</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Fire Officer (SAEO)</td> <td>\$100</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>Firefighter (AEO)</td> <td>\$60</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>Engineer and Technicians</td> <td>\$400 / \$500</td> <td></td> <td>1 team</td> <td></td> </tr> <tr> <td>6</td> <td>Auxiliary Police</td> <td>\$400</td> <td></td> <td>1 team</td> <td></td> </tr> <tr> <td colspan="5"></td> <td style="text-align: right;">Amount</td> <td></td> </tr> <tr> <td colspan="5"></td> <td style="text-align: right;">GST @ 8%</td> <td></td> </tr> <tr> <td colspan="5"></td> <td style="text-align: right;">Total Amount Payable</td> <td></td> </tr> </tbody> </table>						(D) DETAILS OF SERVICES & CHARGES						(E) PAYMENT DETAILS	Item (1)	Type of Service (2)	Rate per hour or part thereof (3)	No. of Hours Service Required (4)	Units Required (5)	Amount (\$) (6)		1	Fire Vehicle	\$600				CAG Bank Details Bank Name: DBS Bank Ltd Bank Address: 12 Marina Boulevard @ MBFC Tower 3 Singapore 018962 Account Name: Changi Airport Group (Singapore) Pte Ltd Account No: 003-909094-S Bank Code: 7171 Branch Code: 003 Swift Code: DBSSSGSG Email address for remittance advice: changi.collection.office@changiairport.com Note: Please provide clear description of payment by indicating service charge no. Cash payment can be made at the below location: Singapore Changi Airport 4th Storey, Terminal 2 Unit no. 046-038 Changi Airport Group (S) Pte Ltd Finance Collection Office	2	Sea Rescue Craft	\$1010				3	Fire Officer (SAEO)	\$100				4	Firefighter (AEO)	\$60				5	Engineer and Technicians	\$400 / \$500		1 team		6	Auxiliary Police	\$400		1 team							Amount							GST @ 8%							Total Amount Payable	
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(F) CONFIRMATION & AGREEMENT (1) We confirm that we have received the service(s) at (C) & (D)(2). Accordingly, we will pay the sum set out in D(6) to CAG for the completion of the service(s). (2) We acknowledge that:- (a) the services are to be provided or have been provided on the basis that the Changi Airport Group (Singapore) Pte Ltd shall not be liable for any death or injury to any person or damage to any property. Any death, injury or damage to property shall be borne by us. (b) we shall indemnify and hold harmless the Changi Airport Group (Singapore) Pte Ltd, its employees or agents in respect of any liability, loss, claims or proceedings whatsoever arising under any statute or common law in respect of death, injury or damage to any property movable or immovable, arising out of or in the course of or by reason of the services performed as stated herein.						(G) AUTHORISATION OF SERVICE(S) I hereby authorise the service(s) to be provided and to be charged according to the rate stipulated in (D)(3) above. I also certify that the service(s) have been duly completed. <div style="display: flex; justify-content: space-between;"> <div> Name and Signature of Duty Airport Emergency Service Officer </div> <div> Date & Time </div> </div>																																																																							

Appendix 1-5 – AESs Fire Alarm Isolation and Hot Work Manual Permits



FIRE ALARM ISOLATION PERMIT

Permit No:

(To be filled by AES Division)

This form may take you 5 minutes to fill in.

PART 1 : To be filled by Applicant

Full Name:	Office Mobile Contact No:
Designation:	Email Address:
Name & Address of Company:	
Type of System Isolation (Please Circle) Smoke Detector / Heat Detector / Beam - Type Smoke Detector / Fire Sprinkler / Total Gas Flooding System / Fire Hose reel / Manual Call Point / Kitchen Fire Suppression System / Fire Alarm Panel / Others - State system type: _____	
Isolation Area: (Please Circle)	AOM/ FM Work Permit No:
T1/ T2/ T3/ T4/ Ancillary Bldg/ Others - Please specify:	
Purpose for Isolation/ Scope and detail of work:	
Location (Unit No/ Grid Lines):	
Date of Isolation:	Duration: From hrs To hrs

a) To be submitted at least 3 working days before works.

b) No extension of isolation is allowed unless approval from CAAS/CAG project officer, and AES has been obtained.

PART 2: Compulsory

Project Officer (CAAS/CAG Project Only)	
Full Name/ Div/ Designation	Office Mobile No:
Signature and Date:	
Joint Site Inspection (Contractor and Building Maintenance Officer)	
Date & Time of Joint Site Inspection:	Fire Alarm Panel:
	Affected Zone/ ACV:
Name of Building Maintenance Contractor:	Name of Contractor :
	Emergency Mobile Contact No :
Signature & Date	Signature & Date

In case of fire, Please call Airport Emergency Service at 65412525

CAG Fire Safety Requirement/ Rules and Regulations	
1	No concurrent Isolation of Fire Detection and Protection System within individual work area.
2	All application for isolation permit shall come with location layout plan and approved fire protection plan by QP, if applicable.
3	For hot work, no concurrent isolation of Fire Detection and Protection System within individual work area unless permission is granted by AES.
4	To contact Fire Station 1 (65412526) before commencement and after completion of work. Approved isolation permit shall be prominently displayed at the entrance of the work area.
5	No extension of isolation is allowed unless approval from CAAS/CAG project officer, and AES has been obtained.
6	Main contractor shall brief all sub-contractors on CAG fire safety requirements. Main contractor shall be held responsible for any non-compliance to the CAG fire safety requirement at the work area.

Confirmation & Agreement:

This is to certify that:

1. The isolation is required by us and the location where the isolation of building protection system is to be carried out; and
2. The fire safety regulations, directions and requirements stipulated above are complied with and the isolation carried out in accordance with the current CAG Fire Safety Manual, Singapore Standard CP52, Code of Practice for Automatic Fire Sprinkler System and Singapore Standard SS 645, Code of Practice for Installation and Servicing of Electrical Fire Alarm System.

I/We accept any stop work order(s) and/or an AES service charge (as per schedule of rates in fire safety manual) which may be issued to us by AES for any violation, fire outbreak or false fire alarm activation due to negligence or ignorance to the above aerodrome fire safety requirements

Indemnity:

I/We hereby indemnify and hold harmless the Changi Airport Group (Singapore) Pte. Ltd., its employees or agents in respect of any liability, loss, claims or proceedings whatsoever arising under any statute or common law in respect of personal injury (including death) of any person or damage to any property movable or immovable, arising out of or in the course of or by reason of the services performed at my/our request as stated herein.

Full Name:

Signature and Date:

Signature of representative authorized to sign for and on behalf of the above named company

PART 3: Joint Approval

The above mentioned work is :		<input type="checkbox"/> Approved	<input type="checkbox"/> Not Approved	by AES Officer
Remarks: _____ To comply with ALL AES Requirements, Rules and Regulations				
_____ AES Officer Name & Designation		_____ Signature and Date		
The above mentioned work is :		<input type="checkbox"/> Approved	<input type="checkbox"/> Not Approved	by CAAS/CAG Engineer
Remarks: _____				
_____ CAAS/CAG Engineering Officer Name & Designation		_____ Signature and Date		

PART 4: To be filled by Requesting Contractor & Respective Building Maintenance Contractor

a) Requesting contractor shall submit the completed application form to respective Building Maintenance Contractor (BMC) at least one day before isolation date. It is mandatory to sign in and sign out with BMC before and after works to ensure no miscommunication during fire alarm isolation/ normalisation.	
b) BMC shall also send photo evidence to the mobile phone of the duty FP officer at 9639 3843 before commencement and after completion of Isolation work.	
c) Confirmed isolation/ draining of fire sprinkler has been carried out before commencement of work.	

Requesting Contractor Name, Signature and Date	Respective Building Maintenance Contractor Name, Signature and Date

In case of fire, Please call Airport Emergency Service at 65412525



HOT WORK PERMIT

Permit No:
(To be filled by AES Division)

This form may take you 5 minutes to fill in.

PART 1: To be filled by Applicant

Full Name :	Office Mobile Contact No:
Designation:	Email Address:
Name & Address of Company:	
Hotwork site (Please Circle)	AOM / FM Work Permit No:
T1 / T2 / T3 / T4 / Auxiliary Bldg/ Others - Please Specify :	
Type of work to be performed:	
Location (Unit No / Grid Line / Aircraft Parking Bay):	
Date of Hot Work:	Duration From hrs To hrs
CAG/ CAAS Project Officer Name :	Signature and Date:

- a) To be submitted at least 3 working days before works.
b) No extension of isolation is allowed unless approval from CAAS/CAG project officer, and AES has been obtained.

PART 2: Required precaution and safeguard checklists (To be filled by Applicant) Please tick if in compliance with the fire safety regulations, directions and requirements. Please cross for non-compliances. Where items are not applicable, please indicate NA.

Fire Detection and Protection Systems	
<input type="checkbox"/>	No concurrent isolation of Fire Detection and Protection System within individual work area unless permission is granted by AES.
Equipment	
<input type="checkbox"/>	All equipment shall be in good mechanical and electrical conditions. Gas welding equipment shall have flashback arrestors at both ends of the hoses. The gas cylinders shall maintain upright & secured at all times.
<input type="checkbox"/>	Flexible gas hoses, all joints and the main cylinder valve shall be thoroughly checked for any leakage.
Within 35 ft (11 m) of Hot Work	
<input type="checkbox"/>	No combustible or flammable materials / substances.
<input type="checkbox"/>	Floor shall be swept clean of all debris and combustibles materials. Combustible floors shall be wet down, covered with damp sand, sheet metal or other non-combustible material. All edges of covers shall be flushed or sealed tight to prevent any sparks from going underneath.
<input type="checkbox"/>	All evacuation paths are to be remained clear and workers are to be familiarised with the Evacuation Route according to Evacuation Procedures
<input type="checkbox"/>	All combustible walls / partitions shall be protected by fire-resistant shields and openings tightly covered. Combustible and flammable liquids shall be protected with covers, guards or metal shield and fire-resistant covers shall be suspended beneath work to collect sparks.
<input type="checkbox"/>	All compressed gas cylinders shall be properly sited and secured.
Within 9 ft (3 m) of Hot Work	
<input type="checkbox"/>	No Hot Work to be carried out within 3 meters radius of an air return duct unless special arrangements are made.
<input type="checkbox"/>	No hotworks such as welding, cutting and grinding shall be permitted within 3m from the safety net
Hot Work on Wall or Ceiling	
<input type="checkbox"/>	Walls or ceilings shall be covered with non-combustible materials. All combustibles beneath shall be removed to a safe location away from the hotworks.

In case of fire, Please call Airport Emergency Service at 65412525

Hot Work on Indoor Aircon Space	
<input type="checkbox"/>	Indoor spaces shall be cleared of flammable and combustible materials. If combustibles cannot be removed, cover them with fire resistant blankets or shield. For hotworks in indoor spaces, the premises shall be ventilated so that fumes will not be circulated into the non-work spaces.
Hot Work on Enclosed Space (Tanks, Containers, Ducts, Dust Collectors, etc).	
<input type="checkbox"/>	Enclosed space shall be clear of all combustibles and shall be purged of flammable liquids / vapours.
Hot Work on the Apron / Ramp	
<input type="checkbox"/>	Distance between hot work location and aircraft parking bay is _____ meters.
<input type="checkbox"/>	No hot work within 75 meters (50 meters if supervised by MOM registered Safety Officer) from any aircraft unless the aircraft parking bay(s) is/are closed (Permit to be obtained from Airside Operations at 6541-2257 (For Seletar Airport: 6481- 5077).
Others	
<input type="checkbox"/>	Main contractors are to brief all sub-contractors on AES fire safety requirements and shall be held accountable / responsible for their actions.
<input type="checkbox"/>	No extension of hotwork timing is allowed unless a joint approval from the CAAS/CAG project officer and AES has been sought.
Fire Patrolter Information (SAA Trained)	
Full Name:	Date of certificate issued:
<p>* To be present for monitoring of Hot Work during and 30 minutes after hot work is completed.</p> <p>* Supplied with appropriate fire extinguisher(s), standing by within 15 meters from hot work site.</p> <p>* Trained in use of fire fighting equipment and in raising fire alarm.</p> <p>* To inform Fire Station 1 at 6541-2526 (For Seletar Airport: 6481-1246) before commencement and after completion of hot work.</p> <p>* To send photo & video evidence to the mobile phone of the duty FP officer at 9639 3843 before commencement and after completion of hot</p> <p>* To display hot work sign or warning sign boards.</p> <p>* To ensure that hot work permit and fire patrolter certificate is prominently displayed.</p>	
Remark(s) if any:	
Confirmation & Agreement:	
<p>This is to confirm that:</p> <p>1. The hot work is required by us and the location where the hot work is to be carried out; and</p> <p>2. The fire safety regulations, directions and requirements stipulated above are complied with and the hot work carried out in accordance with the current CAG Fire Safety Manual and the Singapore Standard SS510, Code of Practice for Safety in Welding and Cutting.</p> <p>I/We accept any stop work order(s) and/ or an AES service charge(s) (as per schedule of rates in fire safety manual) which may be issued to us by AES for any violation, fire outbreak or false fire alarm activation due to negligence or ignorance to the above aerodrome fire safety requirements.</p>	
Indemnity:	
<p>I/We hereby indemnify and hold harmless the Changi Airport Group (Singapore) Pte Ltd, its employees or agents in respect of any liability, loss, claims or proceedings whatsoever arising under any statute or common law in respect of personal injury (including death) of any person or damage to any property movable or immovable, arising out of or in the course of or by reason of the services performed at my / our request as stated herein.</p>	
Full Name:	Signature and Date:
Signature of representative authorized to sign for and on behalf of the above named company	
PART 3: To be filled by AES Division	
<p>The above-mentioned work is <input type="checkbox"/> Approved <input type="checkbox"/> Not-Approved by AES Officer</p> <p><input type="checkbox"/> Both smoke/heat detector and sprinkler system isolated</p> <p><input type="checkbox"/> To confirm with Airside Operations at 6541-2257 (For Seletar Airport: 6481-5077) for the closure of aircraft parking bay and its adjacent bays.</p>	
Remarks <i>To comply with ALL AES Requirements, Rules and Regulation</i>	
AES Officer Name & Designation:	Signature & Date:

In case of fire, Please call Airport Emergency Service at 65412525

Appendix 1-6 – Sample of Fire Alarm System Isolation/ Hot Work and Hot Work Enforcement Checklist

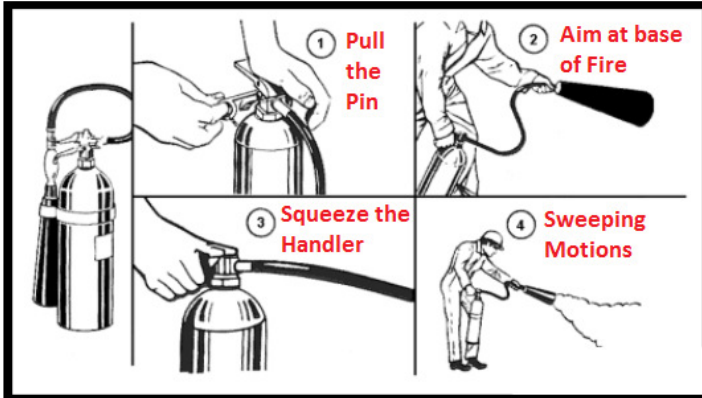


AIRPORT EMERGENCY SERVICE FIRE PREVENTION SECTION

Contractor – Fire Alarm System Isolation - Checklist

Checklist Completed By (Site Supervisor):

Date of Isolation:

S/no	Remarks	Tick Box
1	All affected Fire Alarm Systems have been clearly identified?	
2	Familiarize yourself with the Emergency Evacuation Plan, exit route and alarm locations in the building where isolation activities are being performed	
3	Ensure that an appropriate fire extinguisher is readily available in the isolation area.	
4	Verify with the Building M&E contractor which Fire Alarm Panel they will be isolating and to inform Fault Management Centre (FMC) and Fire Station1 and Fire Station 2.	
5	Verbally communicate to all employees that isolation activities are being conducted in the area.	
6	Ensure that there are no flammable liquids at the work area if the water sprinkler is being <u>drained</u> .	
7	Ensure all Fire Protection System is appropriately isolated inside and outside of the hoarding area. Ensure that all fire alarm devices around the area which possible resulted in false alarm activation are also being isolated prior to conducting work.	
8	DO NOT leave the isolation areas until the Fire Alarm Panel is normalized and remain in the work area for least 30 minutes after isolation is completed	
9	Ensure FMC, Fire Station 1 and Fire Station 2 are informed when the isolation activities are completed	
10	 <p>Understanding the Method for Operating an Fire Extinguisher - PASS</p>	



AIRPORT EMERGENCY SERVICE FIRE PREVENTION SECTION

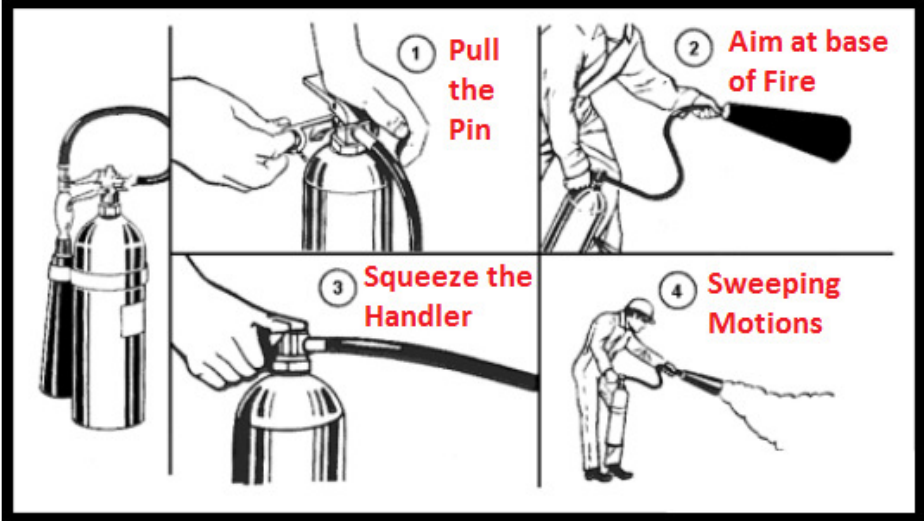
Contractor – Hot Work Checklist

Checklist Completed By (Site Supervisor/ Fire Patroller)

Name of Hot Work Supervisor:

Date of Hot Work:

S/no	Remarks	Tick Box
1a	Site supervisor shall perform self-checking on hot work equipment/environment and provide video evidence to AES Duty Fire Prevention Officer at 96393843 prior to hot work commencement.	
1b	For hot work commenced at location below 75-meter radius from aircraft parking stand where bay closure is NOT permitted: Site supervisor shall perform self-checking on the hydro-carbon vapor every 4 hours. If there are shift changing or break during the hot work operation, the site supervisor shall perform a new hydro-carbon vapor check and refill this hot work checklist when the hot work resumed.	
2	Ensure no combustible material around the hot work site.	
3	Worker shall familiarize with the Emergency Evacuation Plan, exit route and locations in the building where hot work operations performed.	
4	Ensure that an appropriate fire extinguisher is readily available in the hot work area.	
5	Verify with the Hot Work Operator what type of hot work activity they will be conducting and take necessary precautions prior to the start of the work.	
6	Verbally communicate to all employees that hot work activities are being conducted in the area.	
7	Ensure that there are no flammable materials near the work area. Flammable materials must be relocated at least 35 ft (11 meter) from the work area	
8	Ensure that there is no safety net near to the hot work area. All safety net must be at least 3m away	
9	Assist the Hot Work Operator with identifying holes in the floor or walls where hot sparks and slag can enter. Ensure that these locations are covered prior to the hot work.	
10	Position in a manner that allows you to remain visible to the Hot Work Operator and other employees and personnel who may enter the work area.	
11	Monitor sparks and slag produced by the hot work and ensures that they do not land near to the flammable materials or other employees working in the area.	
12	Prevent anyone attempting to pass through the work area unless the hot work can be suspended temporarily.	
13	Alert the Hot Work Operator if employees enter the work area and suspend hot work activities until the area is clear again.	
14	DO NOT leave your post until you are relieved by another trained fire patroller. In the event of an emergency, hot work activities must be suspended immediately.	
15	Remain in the work area for least 30 minutes after hot work is completed.	

16	<div data-bbox="349 191 1268 709"></div> <p data-bbox="435 716 1187 743">Understanding the Method for Operating an Fire Extinguisher - PASS</p>	
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AIRPORT EMERGENCY SERVICE



HOT WORK ENFORCEMENT CHECKLIST

Date of Inspection		Time of Inspection	
*Location of Hot Work	Aircraft/ Hangar/PTB/ Others		
	Specific Location _____		
*Type of Hot Work	Aircraft Welding, Cutting/ Structural Welding/ Others		
	Specific Types of Hot Work _____		

* Please circle the right description

Please mark (✓) where applicable

S/No	Check Items	Yes	No	NA
1	Permit Authorisation			
1.1	Valid Hot Work Permit has been obtained and displayed at the worksite?			
	Approved Hot Work Permit Number:			

S/No	Check Items	Yes	No	NA
2	Work Site			
2.1	Availability of First Aid Fire Protection Equipment? i.e., Hosereel/ Fire Extinguisher			
2.2	All combustible materials have been placed at a safe distance from the work (Within 11 meter of hot work areas)?			
2.3	All welding equipment are in good working condition and free from cracks and other defects.			
2.4	Flashback arrestors are securely fitted at both ends of the welding hoses.			
2.5	Qualified Fire Patroller(s) standby on site with a 9 KG ABC Dry Chemical fire extinguisher within 15 meters from the hot work site?			
	Name of Fire Patroller:			
	Date of Certificate Issuance:			

S/No	Check Items	Yes	No	NA
3	For Structural Hot Work and Aircraft Welding on the Apron and Hangar			
3.1	Is the hot work area 75 meters away from the tip of the adjacent aircraft wing?			
3.2	If hot work is less than 75 meters (50 meters if supervised by MOM registered Safety Officer) from tip of the adjacent aircraft wing, has a permit been obtained from Airside Operations showing that the adjacent aircraft parking bay(s) is/are closed. (Permit to be obtained from Airside Operations at 6541-2257 (For Seletar Airport: 6481- 5077)).			

Enforcement Result

Please mark (✓) where applicable

	Pass
	Failed, Suspension to Operation due to fire safety
Remarks:	

Name of Enforcement Officers:	Signature and Date:

Appendix 1-7 – Kitchen Fire Safety Assessment Form

Date:

To: Head [Fire Prevention Section]

CHANGI AIRPORT GROUP (SINGAPORE) PTE LTD
AIRPORT EMERGENCY SERVICE
KITCHEN FIRE SAFETY ASSESSMENT

Summary of Assessment		
Date		
Terminal		
Unit/ Stall Number		
Staff Name		
Assessor		
Assessment Outcome		/ 21%

Competency Elements	
CE1	Kitchen Fire Extinguishing System
CE2	Checks on Validity and Serviceability
CE3	Cleanliness of Kitchen Hood
CE4	Workplace Occurrence Prevention

Performance Criteria	Evidence	Score		Remarks	
		1	-1		
1.1 Understanding the kitchen fire extinguishing system	In the assessment, the kitchen staff was able to:				
	a	Identify the location of the portable fire extinguisher.			
	b	Demonstrate the Pull, Aim, Squeeze, Sweep (PASS) method.			
	c	Identify the location of Kitchen Fire Suppression System (KFSS) manual pull station.			
	d	Describe the purpose of the KFSS which is to activate extinguishing agent if the cooking space within the KFSS catches fire.			
	e	Demonstrate the activation of the KFSS by pulling the pin and pull the handlebar.			
	f	Identify the location of the nearest manual call point.			

Performance Criteria		Evidence	Score		Remarks
			1	-1	
2.1	Serviceability and validity of fire extinguishing system are current	In the assessment, the kitchen staff was able to:			
		a	Identify the date of last servicing for the fire extinguisher on the service label.		
		b	Identify the date of last servicing for the fire extinguisher KFSS on the service label.		

Performance Criteria		Evidence	Score		Remarks	
			1	-1		
3.1	Cleanliness of the kitchen hood	In the assessment, the kitchen staff was able to demonstrate:				
		a	The kitchen hood is clean and grease free.			
		b	The discharge nozzle with seal cap and grease free.			
		c	The KFSS fusible link is grease free.			
		d	The gas detector is grease free.			
		e	The sprinkler pendant is clean.			

Performance Criteria		Evidence	Score		Remarks	
			1	-1		
4.1	Protection against work occurrence	In the assessment, the kitchen staff was able to:				
		a	Explain the potential hazards of obstructed fire exits and passageway which may result in getting trapped and unable to evacuate.			
		b	Explain the hazards of unattended cooking which may result in fire.			
		c	Explain the hazards of leaving the pilot light / small fire for standby which may result in fire.			
		d	Explain the need to turn off gas valve before closing the stall to prevent gas leak and fire.			
		e	Explain the hazards for placement of oil tin near the fire area which may result in fire.			
		f	Explain the hazards of pouring water onto cooking oil fire.			
		g	Read off the AES hotline – 6541 2525.			
		h	Identify the nearest emergency assembly area.			

Appendix 1-8 – Kitchen Fire Suppression System Functional Test

Date:

To: Head [Fire Prevention Section]

CHANGI AIRPORT GROUP (SINGAPORE) PTE LTD
AIRPORT EMERGENCY SERVICE
KITCHEN FIRE SUPPRESSION SYSTEM FUNCTIONAL TEST

Date	
Terminal	
Outlet Name	
Unit Number/ Stall Number	
Conducted by	

1. Important Note:

a	To inform FMC before/after KFSS testing
b	Ensure that all systems are normalized after testing completed.
c	Valid isolation permit prior to testing

2. Functional Test

S/No	Performance Criteria & Evidence	Please <input checked="" type="checkbox"/>			Remarks
		Yes	No	NA	
a	To activate Fusible Link system				
b	To activate Manual Pull system				
c	Fresh Air Cut Off				
d	Exhaust Fan Cut Off				
e	Gas/Electric Cut Off				
f	Fire Alarm received by FCC				
g	Fire Alarm received by FMC				Name
h	Fire Alarm Received by Fire Station 1				Name
i	Fire Alarm Received by Fire Station 2				Name
j	Alarm reset and restore back to normal. System Running?				

Remarks:

Serviced By (Contractor): <div style="text-align: right;"><i>Name & Signature</i></div>	Witnessed By (Tenant): <div style="text-align: right;"><i>Name & Signature</i></div>

Appendix 1-9 – AES Fire Prevention Circular

Please refer to:

<https://www.changiairport.com/corporate/e-services/documents.html>

Appendix 2-1 – Fire Safety Requirements Involving Aircraft Fuel Servicing

Date:

To: Head [Fire Prevention Section]

Through: OPC 'A', 'B', 'C' Coy*

**AIRCRAFT REFUELING INSPECTION**

Date & Time of Inspection:	Refueling Location - Aircraft Parking Bay No:
Name of Refueling Company:	Name of Refueling Operator:
Refueler Vehicle Registration No:	Airfield Driving Permit Number:
Aircraft Type and Aircraft Registration No:	Location of Nearest Emergency Fuel Shut Off Control:

Please Tick (✓) - C: Compliance, NC: Non-Compliant, NA: Not Applicable

1. Precautionary Measures - Aircraft Parking Bay					
S/No	Item	Status			Remark
		C	NC	NA	
1.1	The accessibility to the aircraft by fire vehicles is established during aircraft fuel servicing.				
1.2	All handheld communication devices used within 3 m from the fuel vent shall be intrinsically safe.				
1.3	Availability of at least 01 x 45 litres serviceable trolley fire extinguisher standby at the aircraft parking bay.				
2. Precautionary Measures - Fuel Bowser / Dispenser					
2.1	Availability of at least 02 x 9kg serviceable ABC dry powder fire extinguishers at both sides of the refueling bowser / dispenser.				

3. Precautionary Measures - Nearby Environment					
3.1	No hot work activities within 50 / 75 meters of aircraft refueling operations. (For 50m, a MOM approved Safety Officer shall be present).				
4. Knowledge of AES Hotline and Emergency Hotline Decal					
4.1	Prominent display of in-vehicle decal showing AES Hotline 6541-2525.				
4.2	The operator knows the AES Hotline Tel 6541-2525 and that he must call AES if he sees a fire or after he put out a fire. (Qn1: Who and what number do you call if you see a fire? Ans 1: AES. 6541-2525 (Qn2: Do you need to call anyone after you have put out a fire? Who and what number do you call? Ans2: Yes. AES. 6541-2525)				
4.3	The operator is able to identify the nearest Emergency Stop Button.				

Remarks and Other Observation:**Rank and Name of Inspector:****Signature and Date:****Designation and Name of Duty Officer****Signature and Date:**

Appendix 2-2 – Fire Safety Requirements Involving Airfield Vehicle Operations

Date:

To: Head [Fire Prevention Section]

Through: OPC 'A', 'B', 'C' Coy*

**AIRFIELD VEHICLE INSPECTION**

Date & Time of Inspection:	Location:
Name of Driver/ Operator:	Name of Company:
Airfield Driving Permit No:	Contact No:
Type of Vehicle/ Equipment:	Vehicle/Equipment Registration No:

Please Tick (✓) - C: Compliance, NC: Non-Compliant, NA: Not Applicable

Please Mark (✓) C: Compliance, NC: Non-Compliance, NA: Not Applicable					
S/No	Item	Status			Remark
		C	NC	NA	
1. Engine					
1.1	No visible fuel leak observed during the inspection.				
2. Wiring					
2.1	No fray wire observed in driver cabin.				
3. Fire Extinguisher					
3.1	Availability of at least 1.0 kg serviceable fire extinguisher.				
4. Knowledge of AES Hotline and Emergency Hotline Decal					
4.1	Prominent display of in-vehicle decal showing AES Hotline 6541-2525.				

4.2	<p>The operator knows the AES Hotline Tel 6541-2525 and that he must call AES if he sees a fire or after he put out a fire.</p> <p>(Qn1: Who and what number do you call if you see a fire? Ans 1: AES. 6541-2525)</p> <p>(Qn2: Do you need to call anyone after you have put out a fire? Who and what number do you call? Ans2: Yes. AES. 6541-2525)</p>				
Remarks and Other Observation: 					
Rank and Name of Inspector: 			Signature and Date: 		
Designation and Name of Duty Officer 			Signature and Date: 		