



# Ground Operations Safety Manual

Changi Airport Group | PO Box 168, Singapore Changi Airport, Singapore 918146  
[www.changiairportgroup.com](http://www.changiairportgroup.com)

### Amendment Records

The amendments listed below have been incorporated into this copy of the Ground Operations Safety Manual.

Serial No.	Issue No.	Revision No.	Description of Change	Effective Date
1	0	0	Initial Issue	09 Jul 2014
2	0	1	Inclusion of Annexes IV to VI  Annex IV: Aircraft Engine Run-Up  Annex V: Compass Swing Calibration Check  Annex VI: General Guidelines on Washing of Aircraft Exteriors in Changi Airport	15 Aug 2014
3	0	2	Part 1 – Introduction <ul style="list-style-type: none"> <li>Revised text: Subsections 5.3 and 5.5.2</li> <li>Revised text and picture: Subsections 6.1</li> <li>Inserted Section 7: Equipment Staging Area (ESA)</li> <li>Amendment to section numbering: Sections 7 to 14 are now Sections 8 to 15 respectively</li> </ul>	08 May 2015
4	0	3	Part 8 – Ramp Supervision <ul style="list-style-type: none"> <li>Addition of Part 8 section on ramp supervision</li> <li>Addition of Annex VII on IGOM's recommendations</li> </ul>	18 Oct 2016
5	0	3	Part 5 – Aircraft Pushback <ul style="list-style-type: none"> <li>Addition text: Subsections 5.3.5 to 5.3.7</li> </ul>	18 Oct 2016
6	0	3	Part 6 – Aircraft Towing <ul style="list-style-type: none"> <li>Insert text: Subsections 6.4(i)</li> <li>Insert text: Subsections 6.4(m)</li> </ul>	18 Oct 2016
7	0	4	Part 9 – Training & Competency of GSP Personnel <ul style="list-style-type: none"> <li>Safety training programme</li> <li>Functional safety training programme</li> <li>Structure of training programme</li> <li>Documentation</li> </ul>	5 May 2017
8	0	4	Part 10 – Ground Service Equipment Maintenance <ul style="list-style-type: none"> <li>Preventive and corrective maintenance</li> <li>Treatment of unserviceable GSE</li> <li>Documentation</li> </ul>	5 May 2017

			<ul style="list-style-type: none"> <li>• Airfield Vehicle Permit requirements</li> </ul>	
9	1	0	<p>Part 1 – Introduction</p> <ul style="list-style-type: none"> <li>• Inserted section 1.3: Oversight Framework</li> <li>• Inserted section 1.4: Updating of GOSM</li> </ul> <p>Part 2 – Safety Management System</p> <ul style="list-style-type: none"> <li>• Added chapter on SMS</li> </ul> <p>Part 3 – Human Factors</p> <ul style="list-style-type: none"> <li>• Added chapter on human factors</li> </ul> <p>Part 4 – Safety Culture</p> <ul style="list-style-type: none"> <li>• Added chapter on safety culture</li> </ul> <p>Part 5 – General Safety Guidelines</p> <ul style="list-style-type: none"> <li>• Inserted subsection 5.1.2: Overlapping ERA &amp; “keep clear” zones</li> <li>• Inserted subsection 5.2.4: Mandatory deployment of wheel chocks/stabilizers</li> <li>• Inserted subsection 5.3.1: High visibility safety vest and raincoat specifications</li> <li>• Inserted subsection 5.4.1: Storm and lightning</li> <li>• Inserted subsection 5.4.2: Strong wind conditions</li> <li>• Inserted subsection 5.4.3: Low visibility conditions</li> <li>• Amended section 5.6: FOD</li> </ul> <p>Part 6 – Standard Operating Procedures</p> <ul style="list-style-type: none"> <li>• Added chapter on SOPs</li> </ul> <p>Part 7 – ADGS/ Manual Marshalling</p> <ul style="list-style-type: none"> <li>• Inserted section 7.3: Arrival OIC roles and responsibilities</li> </ul> <p>Part 8 – Operation of PLB</p> <ul style="list-style-type: none"> <li>• Amended section 8.2: Arrival handling</li> </ul> <p>Part 9 – Operation of GSE Associated with AHL</p> <ul style="list-style-type: none"> <li>• Inserted section 9.2: General safety instructions</li> <li>• Inserted section 9.3: GSE operations</li> <li>• Inserted section 9.6: Grounding of aircraft</li> </ul> <p>Part 10 – Aircraft Pushback</p>	17 Aug 2018

			<ul style="list-style-type: none"> <li>• Inserted section 10.3: Departure OIC roles and responsibilities</li> <li>• Amended section 10.4.2: Towbarless airtug operations</li> </ul> <p>Part 11 – Aircraft Towing</p> <ul style="list-style-type: none"> <li>• Amended section 11.2: Towing requirements</li> </ul> <p>Part 12 – Aircraft Fuelling</p> <ul style="list-style-type: none"> <li>• Inserted section 12.2: Fuelling Vehicles Safety Driving &amp; Parking Inside ERA</li> <li>• Inserted section 12.3: Pre-fuelling operations</li> <li>• Inserted section 12.4: Fuelling operations</li> </ul> <p>Part 13 – Training &amp; Competency of Personnel of GSPs</p> <ul style="list-style-type: none"> <li>• Inserted section 13.3: Refresher training requirements</li> <li>• Inserted section 13.5: Competency of trainer, assessor, buddy for OJT</li> </ul> <p>Part 14 – GSE Maintenance Programme</p> <ul style="list-style-type: none"> <li>• Inserted section 14.2: Preventive maintenance</li> <li>• Inserted section 14.5: Fire protection</li> </ul> <p>Part 15 – Contractor Management</p> <ul style="list-style-type: none"> <li>• Added chapter on contractor management</li> </ul>	
10	1	1	<p>Part 1 – Introduction</p> <ul style="list-style-type: none"> <li>• Revised text Subsections 1.4.2.1: GOSM updates</li> <li>• Inserted section 1.4.2.3: Incorporation of AONs</li> </ul> <p>Part 2 – General Safety Guidelines</p> <ul style="list-style-type: none"> <li>• Inserted section 5.2.1.2: Vehicle reverse sensors and in-vehicle camera</li> <li>• Revised text: subsection 5.3.2.1g),h)</li> <li>• Amended section 5.5.3.1: Removal of chocks</li> <li>• Revised text: Section 5.6.4.1 to 5.6.4.3</li> </ul>	04 Dec 2019

			<p>Part 3 – Standard Operating Procedures</p> <ul style="list-style-type: none"> <li>• Amended subsection 6.3.3.1: Pre-arrival</li> <li>• Amended subsection 6.4.3.1: Departure</li> </ul> <p>Part 4 – ADGS/ Manual Marshalling</p> <ul style="list-style-type: none"> <li>• Amended subsection 7.1k): Pre-arrival Handling</li> </ul> <p>Part 5 – Operation of PLB</p> <ul style="list-style-type: none"> <li>• Amended subsection 8.1c): Pre-arrival Handling</li> <li>• Amended subsection 8.3k): Departure Handling</li> </ul> <p>Part 6 – Operation of GSE Associated with AHL</p> <ul style="list-style-type: none"> <li>• Amended section 9.1: Introduction</li> <li>• Inserted subsection 9.2.1a): Valid AVP &amp; fire extinguisher</li> <li>• Inserted subsection 9.2.2c): Minimum Safe Distance</li> <li>• Inserted section: 9.3.7 – 9.3.9: Keep clear of refuelling hoses</li> <li>• Inserted subsection 9.3.7.1i): Operating towable skyloader</li> <li>• Inserted subsection 9.3.8.1g): Snail speed operation of loading GSEs</li> <li>• Inserted subsection 9.4e): Tail support stachion</li> <li>• Amended section 9.6.3: Removal of grounding cables</li> </ul> <p>Part 7 – Aircraft Pushback</p> <ul style="list-style-type: none"> <li>• Amended section 10.1: Pre-departure Handling</li> </ul> <p>Part 8 – Aircraft Towing</p> <ul style="list-style-type: none"> <li>• Amended section 11.1.1: Towing Operations</li> <li>• Inserted section 11.1.1: Maximum towing speed</li> <li>• Amended subsection 11.3.1g): Towing manoeuvring speed limit</li> </ul> <p>Part 9 – Aircraft Fuelling</p>	
--	--	--	---	--

			<ul style="list-style-type: none"> <li>• Amended subsection 12.1.2f): Reporting of fuel spills</li> <li>• Revised section 12.4: Fuelling operations</li> <li>• Revised section 12.5: Aircraft fuel spillage</li> </ul> <p>Part 10 – Training &amp; Competency of Personnel of GSPs</p> <ul style="list-style-type: none"> <li>• Inserted section 13.5.4: Currency of GSPs trainers</li> </ul> <p>Part 11 – Annex V: Washing of Aircraft Exteriors in Changi Airport</p> <ul style="list-style-type: none"> <li>• Revised section 1.1: Aircraft Stands fitted with grease/oil separators</li> </ul> <p>Part 12 – Annex VII: Exceptions to PLB wheel positions</p> <ul style="list-style-type: none"> <li>• Inserted section 1: PLB wheel positions for pre-arrival/arrival</li> <li>• Inserted section 2: PLB wheel positions for pre-departure/departure</li> </ul>	
11	1	2	<p>Part 1 – Introduction</p> <ul style="list-style-type: none"> <li>• Revised text subsection 1.4.1.1: Procedure to update GOSM</li> </ul> <p>Part 2 – Safety Management System</p> <ul style="list-style-type: none"> <li>• Revised text subsection 2.1.2: Introduction to SMS</li> </ul> <p>Part 3 – Human Factors</p> <ul style="list-style-type: none"> <li>• Revised text subsection 3.1.2: Introduction to Human Factors</li> </ul> <p>Part 4 – General Safety Guidelines</p> <ul style="list-style-type: none"> <li>• Inserted subsection 5.1: General Ramp Safety</li> <li>• Revised text subsection 5.1.2: “Keep Clear” Zones at aircraft stands</li> <li>• Inserted subsection 5.2.4: ERA and ESA of Multiple Aircraft Receiving Stand (MARS) Layout</li> <li>• Revised text subsection 5.3.1: Airfield Driving Permit and Airfield Vehicle Permit</li> </ul>	

			<ul style="list-style-type: none"> <li>• Amended subsection 5.3.2.2 g): Driving GSE in the ERA</li> <li>• Amended subsection 5.4.2.1 f): Contact ACC for any fuel spillages</li> <li>• Inserted subsection 5.5.1.1: Slippery apron surface</li> <li>• Updated Figure 1 and 2 in 5.6.5.2: Cone placement</li> <li>• Inserted subsection 5.7.1.4: Example of typical FOD</li> <li>• Revised text subsection 5.7.1.5: Responsibility to remove FOD</li> <li>• Inserted subsection 5.7.4: Responsible parties for FOD walks at stands</li> <li>• Revised text subsection 5.7.5: FOD checks prior to aircraft's arrival into stand</li> <li>• Revised text subsection 5.7.6: FOD checks prior to aircraft's departure from stand</li> </ul> <p>Part 5 – Operation of PLB</p> <ul style="list-style-type: none"> <li>• Amended subsection 8.2 n): Arrival Handling</li> <li>• Revised subsection 8.3 i) and j): Departure Handling</li> </ul> <p>Part 6 – Operation of GSE Associated with AHL</p> <ul style="list-style-type: none"> <li>• Inserted subsection 9.2.1 l): Towable GSE</li> <li>• Revised title of section 9.2.2</li> <li>• Inserted subsection 9.2.2 a): Opening of cargo hold doors with steps</li> <li>• Revised subsection 9.2.2 j) and k): Ramp safety in aircraft handling</li> <li>• Inserted section: 9.3.5 c) – 9.3.5 e): Unit Load Devices</li> <li>• Inserted section: 9.3.6 i): Mobile and non-motorised Pax steps/stairs</li> <li>• Inserted section: 9.3.7.1 j): Inspect for FOD when operating Belt/Skyloader</li> </ul> <p>Part 7 – Aircraft Pushback</p> <ul style="list-style-type: none"> <li>• Inserted section 10.2 a) to e): Departure Handling</li> </ul>	
--	--	--	---	--

			<p>Part 8 – Aircraft Towing</p> <ul style="list-style-type: none"> <li>• Inserted section 11.1.1 k): Reminder to responsible party to conduct pre-arrival FOD check</li> <li>• Inserted section 11.1.1 m) – n): Responsibility of towing crew to stop at lighted stop bar and red stop bar lights</li> <li>• Revised section 11.3.1 m): Taking reference from taxiway centreline</li> <li>• Revised section 11.6.1: Table on Incidents During Towing scenarios</li> </ul> <p>Part 9 – Fuelling Operations</p> <ul style="list-style-type: none"> <li>• Inserted in 12.1.1: Fuel Safety Zone diagram</li> <li>• Revised section 12.1.2 j), 12.2.1 i): Unobstructed vehicle escape route for Fuel truck/bowser</li> <li>• Amended subsection 12.1.2 f): Contact ACC for any fuel spillages</li> <li>• Removal of section 12.2.1 k) and j): Precautionary measures involving aircraft fuel servicing with passengers on board</li> <li>• Revised section 12.4.1: Fuelling operations</li> <li>• Inserted section 12.5.2: Activation of CAFHI Emergency Stop Button</li> <li>• Amended subsection 12.5.3: Contact ACC for any fuel spillages</li> <li>• Inserted section 12.6: Contingency procedure for unserviceable CAFHI Emergency Stop Button</li> </ul> <p>Part 10 – Training and Competency of Ground Service Providers</p> <ul style="list-style-type: none"> <li>• Inserted section 13.3.3: Retraining programme for staff/sub-contractors absent from operational duties for a prolong period</li> </ul> <p>Part 11 – Ground Support Equipment Maintenance Programme</p> <ul style="list-style-type: none"> <li>• Revised section 14.2.3.1: Documentation of GSE maintenance</li> </ul>	
--	--	--	---	--



			<ul style="list-style-type: none"> <li>• Inserted section 14.4.1: Storage and return to service plan for GSE suspended from operational use</li> </ul> <p>Part 12 – Annex I: Important Contact Information</p> <ul style="list-style-type: none"> <li>• Updated contact numbers</li> </ul> <p>Part 13 – Annex II: Aircraft Marshalling Signals</p> <ul style="list-style-type: none"> <li>• Removal of provision of aircraft marshalling signal details</li> <li>• Inserted a Note: To refer to IATA IGOM for aircraft marshalling signal details</li> </ul> <p>Part 14 – Annex III: Aircraft Engine Run-up</p> <ul style="list-style-type: none"> <li>• Inserted section Annex III, 1.2 e): Removal of safety cones before aircraft engine run-up</li> </ul> <p>Part 15 – Annex IV: Compass Swing Calibration Check</p> <ul style="list-style-type: none"> <li>• Amended all sections: Renaming of Taxiways</li> </ul> <p>Part 15 – Annex V: Washing of aircraft exteriors</p> <ul style="list-style-type: none"> <li>• Revised section 1 and 2 on aircraft stands and aircraft type compatibility for aircraft exterior washing</li> </ul> <p>Part 16 – Annex VI: A380 Stand Layout</p> <ul style="list-style-type: none"> <li>• Inserted A380 Stand Layout</li> </ul>	
--	--	--	--	--

<b>TABLE OF CONTENTS</b> .....	<b>1</b>
<b>Amendment Records</b> .....	<b>2</b>
<b>Glossary</b> .....	<b>13</b>
<b>1 Introduction</b> .....	<b>15</b>
1.1 Purpose and Scope.....	15
1.2 Applicability.....	15
1.3 Oversight Framework.....	16
1.4 Updating of Ground Operations Safety Manual .....	16
<b>2 Safety Management System</b> .....	<b>18</b>
2.1 Introduction to SMS.....	18
2.2 Components of a Safety Management System.....	18
<b>3 Human Factors</b> .....	<b>19</b>
3.1 Introduction to Human Factors.....	19
<b>4 Safety Culture</b> .....	<b>20</b>
4.1 Introduction .....	20
<b>5 General Safety Guidelines</b> .....	<b>21</b>
5.1 General Ramp Safety .....	21
5.2 Airside Locations .....	21
5.3 Operating Vehicles and Motorised Ground Support Equipment at The Apron.....	25
5.4 General Conduct of Ramp Personnel.....	28
5.5 Adverse Weather Conditions .....	30
5.6 Use of Aircraft Wheel Chocks and Safety Cones.....	31
5.7 Foreign Object Debris .....	35
<b>6 Standard Operating Procedures</b> .....	<b>41</b>
6.1 Introduction .....	41
6.2 Standardised Ramp Handling Procedure for Aircraft Arrival and Departure .....	41
6.3 Arrival OIC Roles and Responsibilities.....	42
6.4 Departure OIC Roles and Responsibilities.....	45
<b>7 Aircraft Docking Guidance System/ Manual Marshalling</b> .....	<b>50</b>
7.1 Pre-arrival Handling .....	50
7.2 Arrival Handling.....	50
<b>8 Operation of Passenger Loading Bridge</b> .....	<b>52</b>
8.1 Pre-arrival Handling .....	52

8.2	Arrival Handling.....	53
8.3	Departure Handling.....	53
<b>9</b>	<b>Operation of Ground Support Equipment Associated with Aircraft Handling and Loading .....</b>	<b>55</b>
9.1	Introduction .....	55
9.2	General Safety Instructions.....	55
9.3	GSE Operations .....	57
9.4	Aircraft Ground Stability .....	60
9.5	Low-wing aircraft (e.g. B737) .....	60
9.6	Grounding of Aircraft .....	60
9.7	Aircraft Departure.....	61
<b>10</b>	<b>Aircraft Pushback .....</b>	<b>62</b>
10.1	Pre-departure Handling .....	62
10.2	Departure Handling.....	62
10.3	Pushback Operations .....	63
10.4	Remote-Controlled Pushback Operation.....	64
<b>11</b>	<b>Aircraft Towing.....</b>	<b>66</b>
11.1	Towing Operations.....	66
11.2	Towing Requirements .....	67
11.3	Towing Manoeuvring .....	68
11.4	Radio Telephony Failure During Towing .....	69
11.5	Wingwalker .....	69
11.6	Incidents During Towing .....	69
<b>12</b>	<b>Aircraft Fuelling .....</b>	<b>71</b>
12.1	General Safety during Fuelling.....	71
12.2	Fuelling Vehicles Safety Driving & Parking Inside ERA.....	72
12.3	Pre-fuelling Operations .....	72
12.4	Fuelling Operations .....	73
12.5	Aircraft Fuel Spillage .....	74
12.6	Contingency procedure for unserviceable CAFHI Emergency Stop Buttons .....	74
<b>13</b>	<b>Training &amp; Competency of Personnel of Ground Service Providers .....</b>	<b>75</b>
13.1	Introduction .....	75
13.2	Programme Content .....	75
13.3	Refresher Training Requirements .....	77

13.4	Documentation .....	78
13.5	Competency of Trainer, Assessor, Buddy for the On-Job Training.....	78
13.6	Training for Aircraft Docking Guidance Systems/Manual Marshalling.....	79
13.7	Training for Passenger Loading Bridge Operations.....	79
<b>14</b>	<b>Ground Support Equipment Maintenance Programme .....</b>	<b>80</b>
14.1	General.....	80
14.2	Maintenance Programme .....	80
14.3	Fire Protection .....	81
14.4	Grounded GSE.....	81
<b>15</b>	<b>Contractor Management.....</b>	<b>82</b>
15.1	General.....	82
<b>ANNEX I - IMPORTANT CONTACT INFORMATION .....</b>		<b>83</b>
<b>ANNEX II - AIRCRAFT MARSHALLING SIGNALS.....</b>		<b>84</b>
<b>ANNEX III - AIRCRAFT ENGINE RUN-UP .....</b>		<b>85</b>
<b>ANNEX IV - COMPASS SWING CALIBRATION (CSC) CHECK .....</b>		<b>88</b>
<b>ANNEX V – GENERAL GUIDELINES ON WASHING OF AIRCRAFT EXTERIORS IN CHANGI AIRPORT ...</b>		<b>91</b>
<b>ANNEX VI - MARS LAYOUT AND A380 LAYOUT .....</b>		<b>92</b>
<b>ANNEX VII – EXCEPTIONS TO PLB WHEEL POSITIONS.....</b>		<b>93</b>

## **Glossary**

<b>ACC</b>	<b>Airside Control Centre</b>
<b>ADGS</b>	<b>Aircraft Docking Guidance System</b>
<b>ADP</b>	<b>Airside Driving Permit</b>
<b>AES</b>	<b>Airport Emergency Services</b>
<b>AMC</b>	<b>Airside Management Centre</b>
<b>APU</b>	<b>Auxiliary Power Unit</b>
<b>AVP</b>	<b>Airside Vehicle Permit</b>
<b>CAAS</b>	<b>Civil Aviation Authority of Singapore</b>
<b>CAFHI</b>	<b>Changi Airport Fuel Hydrant Installation</b>
<b>CAG</b>	<b>Changi Airport Group</b>
<b>CCTV</b>	<b>Closed-Circuit TeleVision camera</b>
<b>DAA</b>	<b>Delivery At Arrival</b>
<b>ERA</b>	<b>Equipment Restraint Area</b>
<b>ESA</b>	<b>Equipment Staging Area</b>
<b>ETA</b>	<b>Estimated Time of Arrival</b>
<b>FOD</b>	<b>Foreign Object Debris</b>
<b>FSM</b>	<b>Fire Safety Manual</b>
<b>FSZ</b>	<b>Fuelling Safety Zone</b>
<b>GOSM</b>	<b>Ground Operations Safety Manual</b>
<b>GPU</b>	<b>Ground Power Units</b>
<b>GSE</b>	<b>Ground Service Equipment</b>
<b>GHA</b>	<b>Ground Handling Agent</b>
<b>GSPs</b>	<b>Ground Service Providers</b>
<b>IATA</b>	<b>International Air Transport Association</b>
<b>IGOM</b>	<b>IATA Ground Operations Manual</b>

<b>JCPL</b>	<b>Joint Container Pallet Loader</b>
<b>MARS</b>	<b>Multiple Aircraft Receiving Stand</b>
<b>MDL</b>	<b>Main Deck Loader</b>
<b>PDA</b>	<b>Personal Digital Assistant</b>
<b>PEDs</b>	<b>Portable Electronic Devices</b>
<b>PLB</b>	<b>Passenger Loading Bridge</b>
<b>RT</b>	<b>Radio Telephony</b>
<b>SOPs</b>	<b>Standard Operating Procedures</b>
<b>TEP</b>	<b>Temporary Entry Permit</b>
<b>ULDs</b>	<b>Unit Load Devices</b>
<b>VHF</b>	<b>Very High Frequency</b>

## 1 Introduction

### 1.1 Purpose and Scope

- 1.1.1 With effect from 9 July 2014, the Ground Operations Safety Manual (GOSM) supersedes the Responsibilities of Ground Handling Personnel Manual.
- 1.1.2 The CAG Airside GOSM defines CAG's ground handling safety standards for GSPs at Changi Airport to ensure ground operation activities are safely accomplished. It defines the minimum ground handling standards and procedures to operate safely at Changi Airport.
- 1.1.3 In doing so, CAG seeks to mitigate safety risks of the following ground operational activities:
  - (a) Aircraft Power-In Arrival and Aircraft Power-Out Departure\*;
  - (b) Aircraft Powerback\*;
  - (c) Aircraft Marshalling;
  - (d) Operation of Passenger Loading Bridge;
  - (e) Operation of GSE Associated with Aircraft Handling and Loading;
  - (f) Aircraft Pushback;
  - (g) Aircraft Towing;
  - (h) Aircraft Fuelling.

**Note: \*Not applicable to Changi Airport**

**If any function is outsourced to an external third party, the GSP shall establish direct oversight to ensure that the function is conducted safely.**

### 1.2 Applicability

- 1.2.1 This document shall be used by GSPs at Changi Airport as one of the main documents in the conduct of ground handling functions.
- 1.2.2 The GSP shall notify CAG of any deviations from the published GOSM.
- 1.2.3 This document will provide the basis for which CAG airside inspections and audits will be conducted.
- 1.2.4 All standards in this document always contain the word "shall" to denote a requirement. For recommended practices, they will be represented by the word "should".

### **1.3 Oversight Framework**

1.3.1 The CAG oversight framework consists of safety inspections, performance reports and audits.

#### **1.3.1.1 Safety inspections**

1.3.1.1.1 Monthly inspections are conducted on the six activities stated in 1.1.3. Non-conformance to SOPs are identified and shared with GSPs. GSPs are required to follow up and revert with corrective actions.

#### **1.3.1.2 Performance reports**

1.3.1.2.1 The quarterly airside safety report summarizes the inspection performance of the GSPs and are shared with the GSPs' senior management.

#### **1.3.1.3 Audits**

1.3.1.3.1 All GSPs operating in Changi Airport shall attain a recognized industry standard certification (e.g. ISAGO, JIG).

1.3.1.3.2 The safety system audit will be conducted on a biennial basis (on alternate years with the GOSM update year) on GSPs with recognized industry standard certification. Otherwise, the audit will be conducted on an annual basis till the GSP attains its industry standard certification.

### **1.4 Updating of Ground Operations Safety Manual**

#### **1.4.1 Procedure**

1.4.1.1 The updating of the GOSM is scheduled biennially (on alternate years with the safety system audit year) and seeks consultation from respective subject matter officers for their relevant inputs. All relevant stakeholders' agreement should be obtained.

1.4.1.2 A gap analysis shall also be conducted with the IATA Airport Handling Manual (AHM) and IATA Ground Operations Manual (IGOM) published each year. The respective subject matter officers are required to identify the new updates relevant to their subject and engage the stakeholders on the appropriateness to incorporate in the GOSM before submitting their inputs to Airside Management.

#### **1.4.2 Incorporation of Airside Operations Notices and Airside Safety Notices**

1.4.2.1 All relevant Airside Operations Notices (AONs) and Airside Safety Notices (ASNs) will be included in the Ground Operation Safety Manual (GOSM) during the annual update.

1.4.2.2 Prior to the promulgation of the updated GOSM, the AONs and ASNs remain valid and all GSPs are required to comply with the stated safety procedures and requirements.



- 1.4.2.3 GSPs shall exercise due diligence to ensure prompt submission of evidence to CAG to demonstrate that they incorporate the content of AONs involving changes to ground handling procedures, to their SOPs and training materials when the AONs are published.

#### 1.4.3 Change Request

- 1.4.3.1 In situations where certain procedures and standards may have to change to cope with the new safety and operational challenges, the GSPs are welcome to propose any changes by writing in to CAG, Airside Management.

#### 1.4.4 References

- 1.4.4.1 The GOSM refers to the following documents:

- a) Airport Handling Manual, 40th Edition;
- b) Civil Aviation Authority of Singapore (Changi Airport) By-Laws 2009;
- c) IATA Ground Operations Manual (IGOM), 9<sup>th</sup> Edition;
- d) ISAGO Standards Manual, 9<sup>th</sup> Edition (Effective February 2018);
- e) EN ISO 20471:2013, New Standard for High Visibility Clothing.
- f) Airside Driving Theory Handbook, 4th Edition (English)

Link: [https://www.changiairport.com/content/dam/cacorp/documents/airsidedrivingcentre/Airside%20Driving%20Theory%20Handbook%204th%20Ed%202019%20\(Revised%20Map%20Sept%202020\).pdf](https://www.changiairport.com/content/dam/cacorp/documents/airsidedrivingcentre/Airside%20Driving%20Theory%20Handbook%204th%20Ed%202019%20(Revised%20Map%20Sept%202020).pdf)

- g) Fire Safety Manual (FSM) Sep 2020

Link: [https://www.changiairport.com/content/dam/cacorp/documents/firepreventionessentialdocuments/CAG%20Fire%20Safety%20Manual\\_Sep2020.pdf](https://www.changiairport.com/content/dam/cacorp/documents/firepreventionessentialdocuments/CAG%20Fire%20Safety%20Manual_Sep2020.pdf)

## **2 Safety Management System**

### **2.1 Introduction to Safety Management System**

- 2.1.1 The Safety Management System (SMS) is a framework of policies, processes, procedures and techniques for an organisation to monitor and continuously improve its safety performance by making informed decisions on the management of operational safety risks. Specifications for an SMS are derived from global standards as stipulated in ICAO Annex 19.
- 2.1.2 All GSPs operating in Changi Airport shall have an SMS. GSP may take reference from ICAO Annex 19 and Airport Handling Manual for details of a SMS. Refuelling agents (Into Plane Companies) are allowed to adopt a different safety framework e.g. Health, Safety, Security and Environment (HSSE), which serves the same purposes as an SMS.

### **2.2 Components of a Safety Management System**

- 2.2.1 The ICAO Annex 19 SMS framework specifies four components that make up the basic structure of an SMS.
  - 2.2.1.1 Component 1 – Safety policy and objectives, which detail the organizational and administration aspects of the SMS, including the assignment of roles and responsibilities.
  - 2.2.1.2 Component 2 – Safety risk management, which details the method of collecting safety information (hazard identification), assessing the safety risks and determination of any necessary control measures.
  - 2.2.1.3 Component 3 – Safety assurance, which details the monitoring of safety performance, particularly those actions associated with the outcome of safety risk management, and any actions taken to improve safety performance.
  - 2.2.1.4 Component 4 – Safety promotion, which details the processes in place to handle and disseminate safety information and maintain safety competence and awareness in key personnel.

### **3 Human Factors**

#### **3.1 Introduction to Human Factors**

3.1.1 Human factors is a science that pays attention to physical, psychological, and other human attributes to ensure that tasks are completed safely and efficiently with minimal risk to personnel and equipment. Most apron accidents and incidents involve to a certain degree human error or violation of company policies, processes or procedures. Examples of human factors for consideration are:

- a) Safety culture;
- b) Human performance limitations;
- c) Environmental considerations;
- d) Procedures, information, tools and task sign-off practices;
- e) Procedural non-compliance;
- f) Planning for tasks and equipment;
- g) Injury prevention;
- h) Fatigue/alertness management;
- i) Shift and task turnover;
- j) Error prevention strategies.

3.1.2 GSPs should incorporate human factors into their training.

## 4 Safety Culture

### 4.1 Introduction

- 4.1.1 Organisational safety culture sets the boundaries for acceptable behaviour in the workplace by establishing the behavioural norms and limits. These cultures provide the cornerstone for managerial and employee decision making.
- 4.1.2 Having a safety culture reflects senior management's commitment to safety. Senior management's attitude towards safety influences the employee's positive approach to safety and shared beliefs, practices and attitudes. The tone for safety culture is set and driven by the words and actions of senior management during implementation of a "Just Culture" process, which ensures fairness and open reporting in dealing with human error.
- 4.1.3 A positive safety culture demonstrates the following attributes:
  - a) Senior management visibly demonstrates their commitment to their Safety Management System;
  - b) Those in senior positions consistently foster a climate in which there is encouragement towards, comments and feedback from all levels of the organisation on safety matters;
  - c) There is an organizational policy regarding incident reporting (occupational and aviation safety) which encourages an open reporting culture where staff reports all safety events. There is a clear statement within the policy regarding management response to incidents, in particular whether it operates a just culture policy;
  - d) It provides a clear distinction between what are acceptable and what are unacceptable behaviours, and people are treated accordingly;
  - e) There is a requirement to communicate safety information at all levels of the organisation. A communication infrastructure is developed and implemented;
  - f) There are policies and procedures documenting the identification of the hazards and assessment of risks associated with these hazards exist and are accessible;
  - g) Personnel are trained and understand the safety event reporting policy within their organisation;
  - h) Lessons learned from previous incidents are shared and included in training content to promote improvement of the safety programme;
  - i) An employee feedback system is established as part of the safety management system.
- 4.1.4 GSPs should cultivate a safety culture as part of the SMS.

## 5 General Safety Guidelines

### 5.1 General Ramp Safety

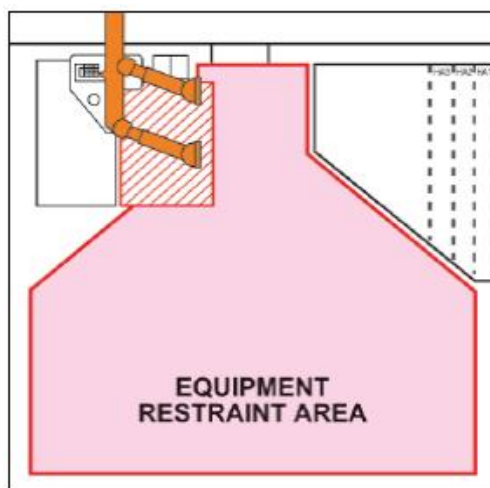
#### 5.1.1 Engine Danger Areas

- 5.1.1.1 Vehicles and personnel shall remain clear of aircraft danger areas when aircraft engines are running and/or the anti-collision lights are on.
- 5.1.1.2 In order to prevent incidents and accidents caused by aircraft engines, one shall never position yourself or equipment in the following critical areas before or during aircraft departure and arrival:
  - a) Engine intake area
  - b) Engine blast area
  - c) Propeller rotation area, where applicable
- 5.1.1.3 Make sure the engine intake/propeller rotation area is clear at all times when engines are running, or the engine start is about to begin

### 5.2 Airside Locations

#### 5.2.1 Equipment Restraint Area (ERA) & Equipment Restraint Line

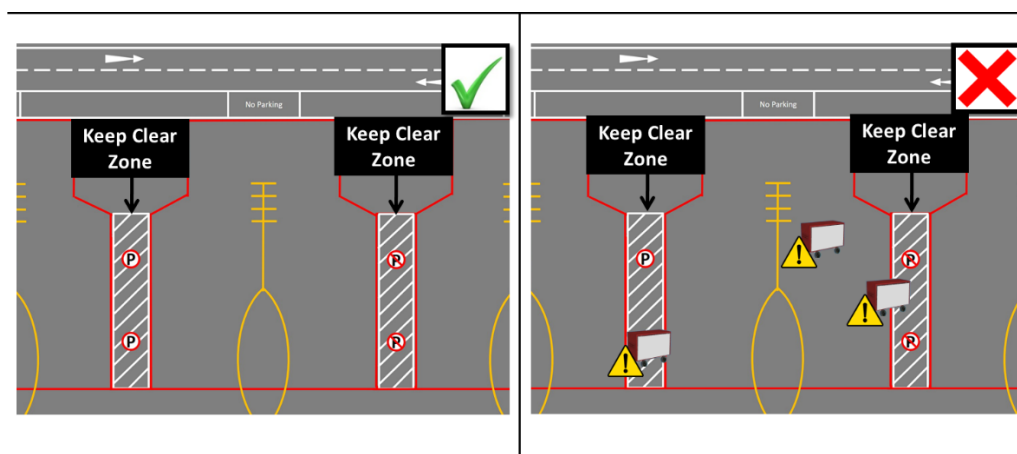
- 5.2.1.1 The ERA is defined as the area of the apron bordered by a red line. It shall be kept clear at all times for the safe movement of an aircraft in and out of the stand. Personnel, vehicles and/or GSE are only allowed to enter when servicing the aircraft or for other work purposes.



Sample of Equipment Restraint Area

## 5.2.2 “Keep Clear” zones at the aircraft stands

- 5.2.2.1 The “Keep Clear” zones shall be kept clear of personnel, vehicles and/or GSE at all times. Parking and staging is strictly prohibited.
- 5.2.2.2 The “Keep Clear” zones will be marked with white hatched lines and indicated as “No Parking”.

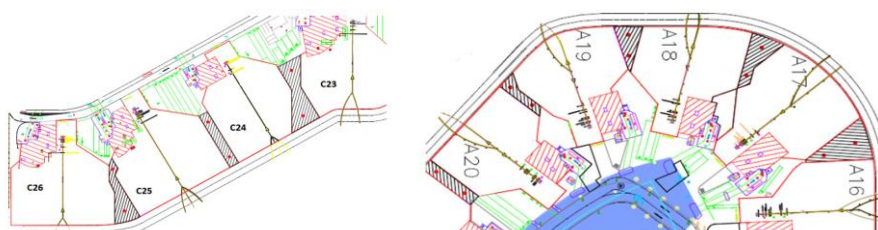


Sample of “Keep Clear” zones

- 5.2.2.3 Personnel who are handling aircraft operations at the aircraft stand and adjacent stands shall perform pre-arrival and pre-departure FOD checks\* and remove any FOD from the “Keep Clear” zone.

**\*Note: Refer to Section 5.6.4.1 – 5.6.4.3 for the conduct of FOD walk.**

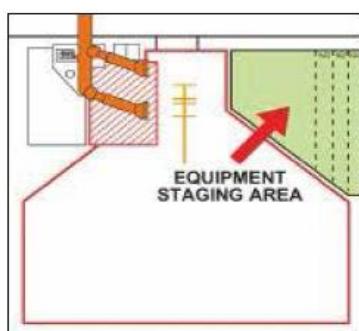
- 5.2.2.4 The ADGS operator/manual marshaller (i.e. Arrival OIC) and headset man (Departure OIC) shall ensure that the ERA and the adjacent “Keep Clear” zones are clear of any obstruction prior to arrival and pushback of aircraft.
- 5.2.2.5 Examples of aircraft stands with wider “Keep Clear” zones are depicted in the following:





### 5.2.3 Equipment Staging Area (ESA)

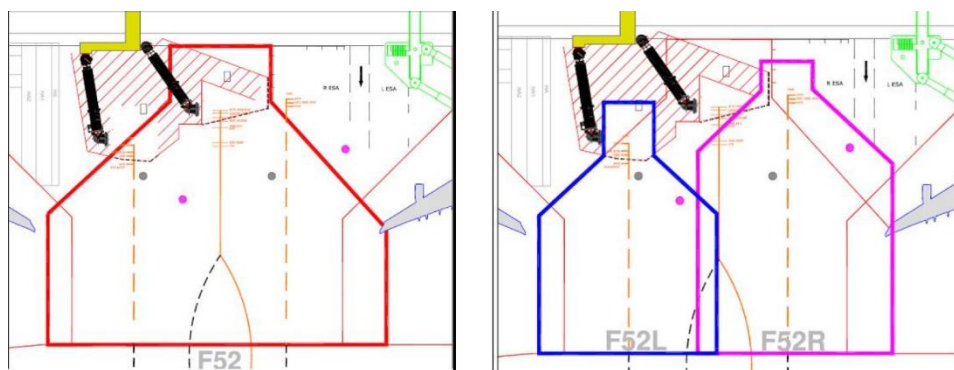
- 5.2.3.1 The ESA of an aircraft stand is demarcated by a continuous white line outlining the area where ground handling equipment or vehicles for the servicing of an aircraft be positioned at least 20 minutes before the arrival the aircraft. All vehicles must be lined up in an orderly manner at all times. All ground handling equipment or vehicles shall be removed from the ESA and returned to the designated parking area after aircraft servicing.



Sample of Equipment Staging Area

### 5.2.4 ERA and ESA of Multiple Aircraft Receiving Stand (MARS) Layout

- 5.2.4.1 Multiple Aircraft Receiving Stand (MARS) will be able to accommodate 2 smaller (Code C) aircraft or a single Code E aircraft at any one time.
- 5.2.4.2 There are 3 sets of ERAs and lead-in lines are marked on the apron for each MARS. The main ERA encompasses the whole parking stand for a Code E aircraft. The left and right ERA are smaller than the centre ERA and overlap with the centre ERA. They can accommodate one Code C aircraft each ERA.



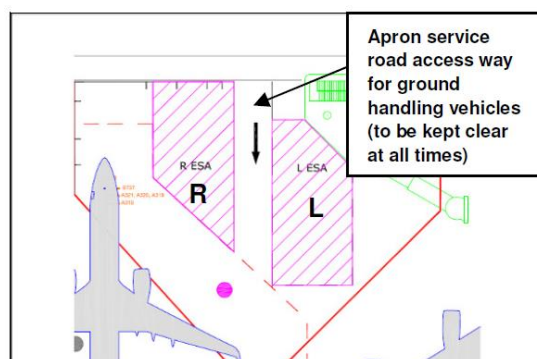
**Sample of MARS Layout: ERA of Code "E" (left) and ERA of 2 Code "C" (right)**

- 5.2.4.3 There will be 3 sets of ESA within a MARS.
- 5.2.4.4 The original ESA remains the same in size, however markings for designated equipment has been removed.



**Sample of ESA for Code "E"**

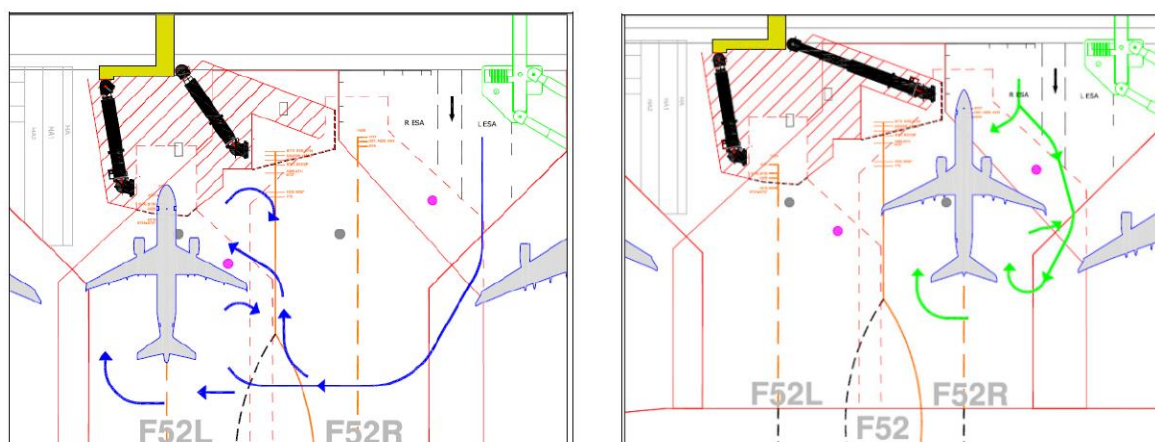
- 5.2.4.5 For the right and left parking stands, the respective ESAs (R-ESA and L-ESA) are located next to each other at the top right corner of the stand, separated by a service road.



**Sample of R-ESA and L-ESA for Code "C" aircraft**



- 5.2.4.6 For equipment servicing the left stand, they have to access the left through moving behind the aircraft parked in the right stand



**Sample showing the flow of GSE from L- ESA to L- ERA and R-ESA to R-ERA**

**Note:** Refer to Annex VI and VII for MARS layout and its PLB wheels position.

### 5.3 Operating Vehicles and Motorised Ground Support Equipment at The Apron

#### 5.3.1 Airfield Driving Permit (ADP) & Airfield Vehicle Permit (AVP)

- 5.3.1.1 For all Airfield Driving Permit (ADP) and Airfield Vehicle Permit (AVP) matters, please refer to CAG Airside Driving Theory Handbook (ADTH) and consult Airside Driving Centre.

#### 5.3.2 Safe driving and parking of ground support equipment inside ERA

- 5.3.2.1 The following precautions shall be observed before entering the ERA for aircraft servicing:
- Aircraft is at a complete stop;
  - Engines are switched off and spooling down;
  - Anti-collision lights are switched off;
  - Wheel chocks are positioned;
  - Grounding cables are connected on the nose and main landing gears;
  - Ground / Flight crew communication is established, and headset man gives the 'thumbs up' signal.

**Note: The above does not apply for GPU when aircraft's APU is unserviceable. The GPU should be positioned on the right-hand side of the nose wheel parallel to the aircraft centreline.**

#### 5.3.2.2 When operating GSE in the ERA:

- Do not approach the aircraft until all safety cones have been placed;
- Do not drive GSE more than 5 km/h;
- Do not operate vehicles or equipment while using hand-held PEDs (e.g. cell phone, laptops and tablets)

- d) Do not carry extra personnel during GSE movement unless that person is seated in a passenger seat provided in the vehicle or standing in a section of the vehicle which has been constructed for standing passengers;
- e) Do not drive the GSE across the path of embarking and disembarking passengers. Aircraft passengers always have right of way;
- f) Ensure a free passage is maintained for the fuel dispenser to be removed speedily;
- g) Drivers shall not drive over fuel hydrant pits, any hose or bonding cable used for refuelling of aircraft.
- h) Do not drive or park under the aircraft fuselage and / or wing

**Exceptions: GSE and vehicles needed for aircraft servicing (e.g. aircraft fuel dispenser, aircraft defueling truck, water servicing truck, toilet / lavatory servicing truck)**

**Note: Refer to CAAS By-Law No.11**

- i) Do not leave any vehicle unattended with its engine running;
- j) Do not drive GSE with lifting devices in the raised positions, except for final positioning of the GSE onto the aircraft;
- k) Use a guide person when reversing GSE to the aircraft; and
- l) After positioning on the aircraft, raise all safety rails on conveyor belts, loaders and other elevated devices;
- m) Make a minimum of one complete stop with all motorized vehicles / equipment prior to entering the ERA:
  - i. Conduct a “Brake Check” or “Safety Stop” by coming to a full and complete stop to confirm the serviceability of the brake system on the vehicle and to test the apron surface. This action shall be carried out even if there is no ERA marked on the apron;
  - ii. This stop shall be conducted at a distance no less than 5 metres from the aircraft.
- n) Manoeuvre GSE carefully to prevent personnel injury and / or aircraft damage;
- o) When reversing vehicles or equipment with limited rear-view visibility inside the ERA:
  - i. Be guided by an agent using standard IATA signals, and / or;
  - ii. Be assisted by means of a rear-view video or mirror.

**Note: Marshaller must position himself to the obstacle and maintain the line of sight with the driver.**

### 5.3.3 Breakdown of GSE within the ERA

5.3.3.1 In the event of a breakdown of a GSE within the aircraft stand, operators shall:

- a) Not leave the GSE unattended;
- b) Immediately inform CAG ACC; and
- c) Arrange for the immediate removal of the GSE and ensure that aircraft handling operations are not obstructed.

### 5.3.4 **Mandatory deployment of wheel chocks/stabilisers on motorised ground support equipment**

5.3.4.1 Correct deployment of wheel chocks/stabilisers on motorised GSE can prevent inadvertent rolling forward/backward of equipment, or when in-built braking mechanism malfunctions.

5.3.4.2 The following motorised GSEs shall at all times, be deployed with wheel chocks/stabilisers when docked onto the aircraft or when parked in the airside:

- a) Tractor;
- b) Water truck;
- c) Lavatory truck;
- d) Ballymore;
- e) Hi-Lift;
- f) Lower deck loader;
- g) Main deck loader;
- h) Ground power unit;
- i) Air starter unit;
- j) Fuel truck/Hydrant Dispensers;
- k) Air-conditioned unit (including towable unit);
- l) Belt loader (including towable belt loader);
- m) Passenger stairs (including towable passenger stairs).

5.3.4.3 Wheel chocks are to be used in pairs, positioned firmly and squarely against the centre of the tire. Improper positioning may reduce the effectiveness of the wheel chocks.



**Sample of proper wheel chock placement**

### 5.3.5 **Action when vehicle catches fire**

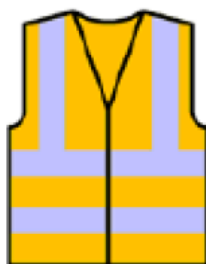
5.3.5.1 If possible, the operator should first attempt to move the vehicle away from the aircraft and building. The operator shall then carry out the following:

- a) Turn off engine;
- b) Switch off master switch if applicable;
- c) Get the passenger and himself out of the vehicle
- d) Attempt to put out the fire with the fire extinguisher on board without endangering oneself;
- e) Inform AES;
- f) Stay away from the vehicle and direct traffic away;

## 5.4 General Conduct of Ramp Personnel

### 5.4.1 High visibility safety vest & raincoat specifications

- 5.4.1.1 This paragraph shall be read in conjunction with CAAS By-Law 43: Safety vest and raincoat.
- 5.4.1.2 CAAS By-Law No 43(3) states that a high visibility vest shall be of a type approved by the airport licensee and shall comply with such requirements as the airport licensee may from time to time specify.
- 5.4.1.3 CAAS By-Law No 43(5) states that a high visibility raincoat or rain suit shall be of a type approved by the airport licensee and shall comply with such requirements as the airport licensee may from time to time specify.
- 5.4.1.4 Every person entering or performing work within the apron, including the aircraft stands, compass swing area, baggage sorting area, shall wear a high visibility safety vest at all times.
- 5.4.1.5 The specifications for the vest are:
  - a) Basic colour must be bright;
  - b) Yellow, orange and lime green are recommended;
  - c) Meets a minimum of Class 2 of the EN ISO 20471:2013 which requires a minimum of 0.5m<sup>2</sup> fluorescent material and 0.13 m<sup>2</sup> reflective surfaces;
  - d) Be imprinted with the company's logo for easy identification.



**Example of Class 2 high visibility safety vest**

**Note:** If the company uniform incorporates the safety vest requirements, the safety vest will not be required. However, the safety vest shall be worn if the uniform no longer meets the minimum requirements stipulated above.



**Example of uniform with high visibility safety vest requirements**

- e) The high visibility raincoat or rain suit shall meet the following specifications:
  - i. The raincoat or rain suit shall meet a minimum of **Class 3** of the new **EN ISO 20471:2013** which requires a minimum of 0.8m<sup>2</sup> fluorescent surface and 0.2m<sup>2</sup> reflective surfaces.
  - ii. It shall cover the torso and have minimally either sleeves with retro-reflective bands or full length trouser legs with retro-reflective bands.



**Example of Class 3 high visibility raincoat**

- f) If the raincoat or rain suit does not meet the above requirement, a Class 2 high visibility safety vest shall be worn over the raincoat or rain suit.

**5.4.2 Airside rules**

5.4.2.1 The following airside rules shall be adhered to:

- a) Do not smoke;
- b) Follow established procedures (i.e. no horseplay);
- c) Do not walk between ULDs or trailers;
- d) Do not maltreat GSE and to use GSE only for its intended purpose. Do not tow another GSE unless a suitable tow bar is used for that purpose;
- e) Observe the danger areas / hazards on the ramp and take the necessary precautions for personnel and aircraft safety;
- f) For any aircraft fuel spillage, please contact ACC immediately. Refer to the CAG FSM Chapter 9, on the reporting requirements for aircraft fuel spillages;
- g) For other hydraulic spillages, please contact AMC immediately;
- h) Ensure the ground below the PLB emergency stairs is kept clear of all obstructions;
- i) Do not litter or leave any refuse or FOD within the aircraft stand;
- j) Do not consume any food or beverage and do not feed any birds or animals;
- k) Do not use PEDs (e.g. cell phone, laptops and tablets) within 3 metres of FSZ when refuelling is in progress unless such device is intrinsically-safe certified;
- l) Do not walk over the refuelling hose.

**Note: Every time an aircraft is refuelled, fuel is pumped into the aircraft fuel tanks, expelling fuel vapours from the tanks through each wing vent (approx. 1 metre inside each wingtip). This vapour mixes with the surrounding air forming a flammable**

**environment. Introducing equipment which can produce spark risks can cause ignition of the vapour and flash fire that will burn people, the aircraft and equipment.**

## **5.5 Adverse Weather Conditions**

### **5.5.1 Storm and lightning**

- 5.5.1.1 Take extra care when walking or driving due to possible slippery apron surface.
- 5.5.1.2 Operators should wear a high visibility raincoat.
- 5.5.1.3 Personnel performing ground to flight deck communications shall use the wireless headset at all times
- 5.5.1.4 3-point grounding is a means of lightning protection for all personnel servicing the aircraft. Personnel shall ensure that the aircraft is grounded at 3 points at all times when the aircraft is parked at the aircraft stand.
- 5.5.1.5 3-point grounding is applicable to all aircraft types.

**Note: Boeing 737 only has 2 designated ground points. 2-point aircraft grounding shall be conducted when handling the Boeing 737 aircraft.**

### **5.5.2 Strong wind conditions**

- 5.5.2.1 During strong wind conditions, personnel shall ensure:
  - a) Aircraft landing gears are chocked;
  - b) All GSEs are properly secured;
    - i. Parking brakes are set on all parked GSE;
    - ii. Wheel chocks/stabilisers are deployed for GSE when docked onto aircraft or parked;
    - iii. Stabilisers of maintenance steps are fully engaged;
    - iv. Wheel chocks and securing chains are used when available;
    - v. Empty ULDs are secured;
  - c) All loose items such as cleaning tools are kept;
  - d) Equipment not required for the servicing of the aircraft are removed from the ERA;
  - e) Bypass pin is inserted only when aircraft is ready for pushback and/or towing operations;
  - f) Extreme care is taken when opening or closing aircraft doors.

**Note: Upon receiving the strong wind alert which is disseminated via the Flight Information Display System (FIDS) to the GSPs, operators should conduct a round of check to ensure that the standard precautions are being taken.**

### 5.5.3 Low visibility

5.5.3.1 During low visibility conditions, personnel shall ensure:

- a) Vehicle headlights are switched on
- b) Second level floodlights are switched on (if required);
- c) Cautious driving.

## 5.6 Use of Aircraft Wheel Chocks and Safety Cones

### 5.6.1 Use of aircraft wheel chocks

5.6.1.1 Sufficient numbers of serviceable chocks shall be provided for the arrival aircraft, considering the ramp and / or weather conditions.

5.6.1.2 Do not approach the aircraft until:

- a) Aircraft is at a complete stop;
- b) Engines are switched off and spooling down;
- c) Anti-collision lights are switched off;
- d) Wheel chocks are positioned;
- e) Grounding cables are connected on the nose and main landing gears;
- f) Ground/flight crew communication is established, and headset man gives the 'thumbs up' signal.

### 5.6.2 Placement of wheel chocks

5.6.2.1 Chocks shall be placed in accordance with airline requirements:

- a) Walk towards the main gear in the path parallel to the fuselage, avoiding engine intake areas;
- b) Remove any temporarily-placed nose gear chocks, if applicable;
- c) When placing chocks, stand well clear of the path of the tires. Approach/leave the main landing gear from the front or rear;
- d) Notify the flight deck when the chocks are placed.

### 5.6.3 Removal of wheel chocks

5.6.3.1 Remove chocks together with grounding cables when:

- a) After loading GSE have been disconnected from the aircraft including the PLB;
- b) Airtug is connected to the aircraft;
- c) Airtug parking brake is engaged;
- d) Aircraft parking brake is engaged.

**\*To note: Start the disconnection of the grounding cables from the aircraft grounding point before proceeding to the earth receptacle point.**

**\* To note: Grounding cable and chocks at nose landing gear may be removed earlier to facilitate the connection of towbarless air tug.**

- 5.6.3.2 When not in use, all unused chocks shall be removed from the aircraft stand and stowed away in their designated stowage areas.

#### 5.6.4 Use of safety cones

- 5.6.4.1 Safety cones are a caution indicator for operators to maintain a safety distance from certain parts of the aircraft to prevent collision by GSE.
- 5.6.4.2 Safety cones shall be orange in colour with reflective stripes. Cones shall not be used if it does not serve its intended purpose.
- 5.6.4.3 Prior to arrival of the aircraft, there shall be sufficient serviceable safety cones for the aircraft type to be handled.

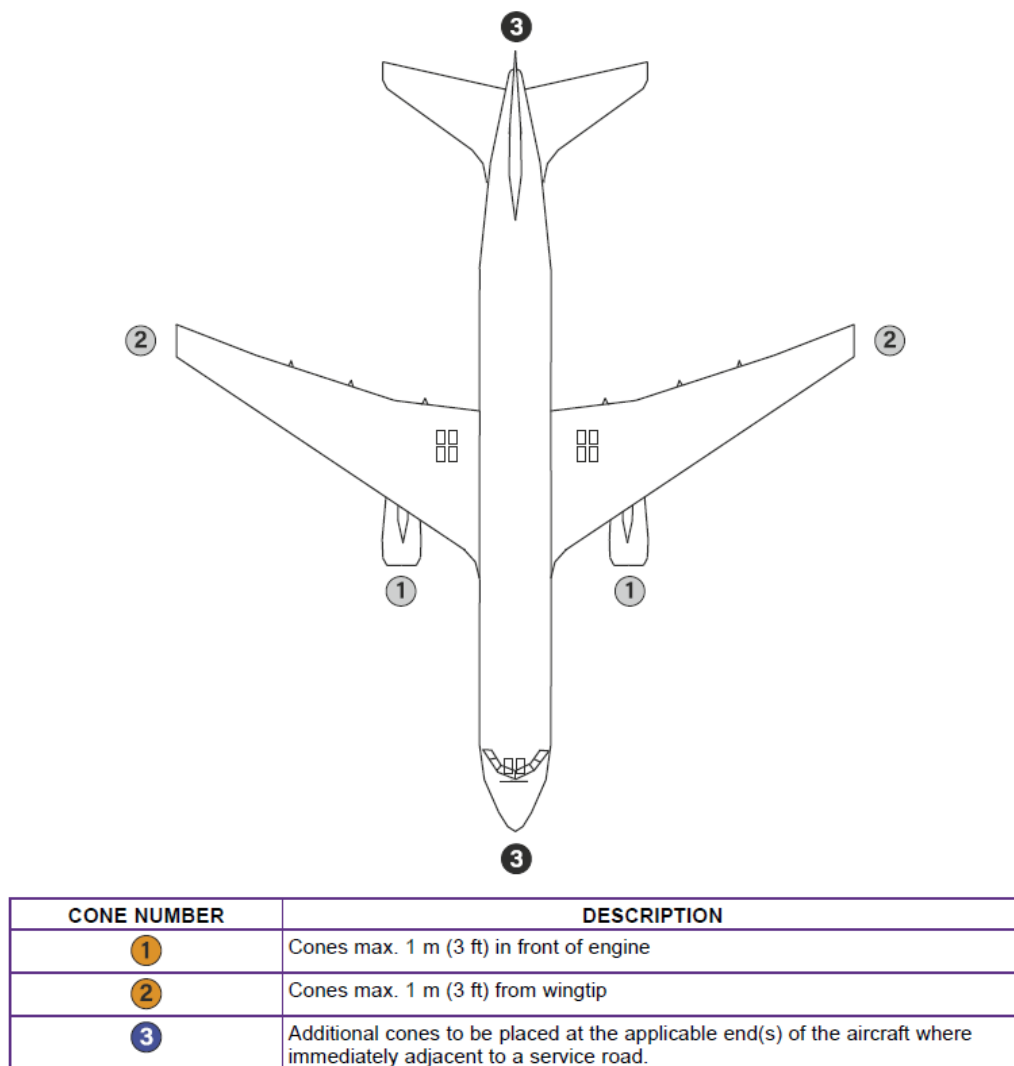
#### 5.6.5 Placement of safety cones

- 5.6.5.1 Do not approach the aircraft until:
- a) Aircraft is at a complete stop;
  - b) Engines are switched off and spooling down;
  - c) Anti-collision lights are switched off;
  - d) Wheel chocks are positioned;
  - e) Grounding cables are connected on the nose and main landing gears;
  - f) Ground / Flight crew communication is established, and headset man gives the 'thumbs up' signal.

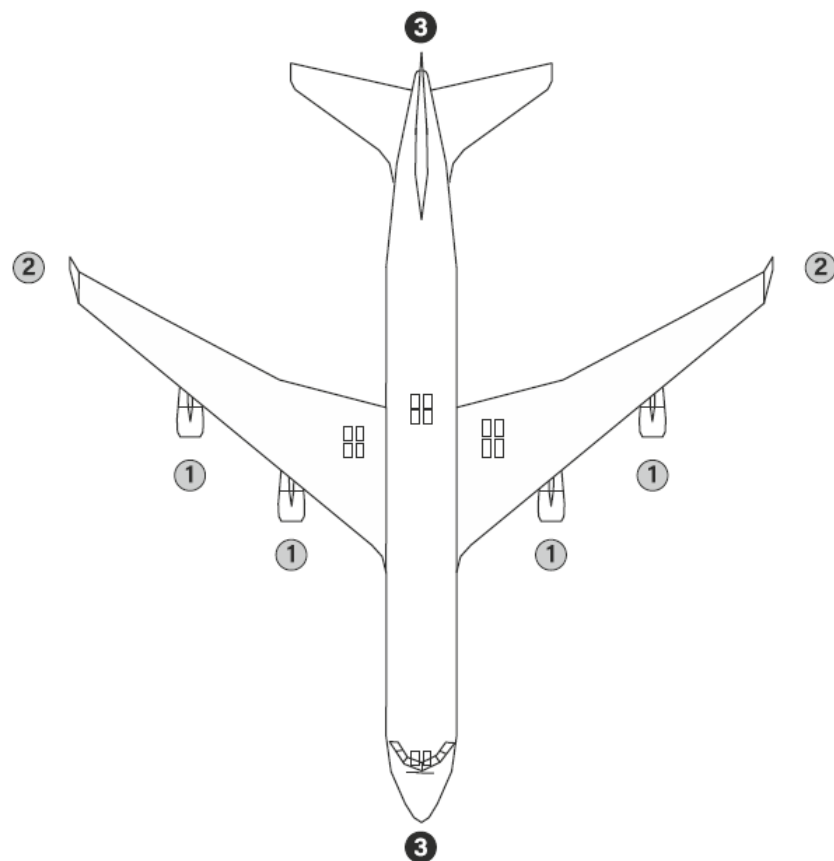
**Note: GSE to approach aircraft when safety cones are in position.**

- 5.6.5.2 Cone placement should be done according with the airlines' requirement or as recommended by IATA (IGOM Chapter 4.3), shown in Figure 1 and Figure 2 – within a maximum of 1 metre outward from the point of the aircraft being protected.
- 5.6.5.3 It is mandatory to place a safety cone under the tail of aircraft upon aircraft arrival (after thumbs-up) along with other current safety cones as recommended by IATA or as required by airlines.





**Figure 1: Cone Placement for Wing-Mounted Twin Engine Jet Aircraft.**



CONE NUMBER	DESCRIPTION
①	Cones max. 1 m (3 ft) in front of engine
②	Cones max. 1 m (3 ft) from wingtip
③	Additional cones to be placed at the applicable end(s) of the aircraft where immediately adjacent to a service road, and always on aircraft with low ground clearance (e.g. BAe-146, Avro RJ-85/100).

**Figure 2: Cone Placement for Wing-Mounted Four Engine Jet Aircraft (to insert tail cone)**

### 5.6.6 Removal of safety cones

- a) Do not remove until GSE and vehicular activities around the aircraft have ceased prior to departure of the aircraft (excluding the PLB);
- b) When not in use, the safety cones shall be placed at the designated storage area.

## 5.7 Foreign Object Debris

### 5.7.1 General term for FOD

- 5.7.1.1 Foreign Object Debris (FOD) is a general term which applies to all loose objects which endanger the safety of aircraft and therefore must not be left in any area where they would constitute a hazard.
- 5.7.1.2 Every individual has a responsibility to ensure that the risk of damage to aircraft from FOD is minimized.
- 5.7.1.3 All FOD must be removed and properly disposed of as soon as it is discovered.
- 5.7.1.4 Often the presence of FOD is due to the carelessness of personnel working in the airside or the failure to appropriately dispose waste from the airside. FOD are commonly left in aircraft movement areas by airside personnel or blown to aircraft movement areas from other airside areas.



Example of FOD found in the airside

### Example of Typical FOD commonly found at the aircraft stand areas

**Maintenance FOD** - this relates to objects, such as tools, materials or parts that are used for aircraft maintenance activities. Presently aircraft maintenance activities are being performed at the aircraft stand which require a variety of objects, such as rivets, washers, safety wire, nuts and bolts and rags that can become FOD if they are inadvertently left behind.

**Other typical FOD found at an aircraft stand** such as apron items (paper and plastic debris from catering and freight pallets, luggage parts (such as locks and zippers), cargo loads that may have fallen off their containers, debris and rubber chips from ramp equipment), concrete and asphalt chunks, rubber joint materials, paint chips, pieces of wood, fasteners and miscellaneous metal objects and plastic and/or polyethylene materials.

- 5.7.1.5 All personnel are responsible for removing FOD. “If you see it (FOD), remove it”. FOD found at the aircraft stand shall be properly disposed of in the yellow FOD bin provided at the aircraft stand.

## 5.7.2 CAG FOD management policy

- 5.7.2.1 FOD prevention is the duty and responsibility of everyone working in the airside in Changi Airport. This policy applies to all staff and airside agencies at Changi Airport.
- 5.7.2.2 All airside partners and personnel are responsible for managing waste generated by their operations and ensure that the airside areas they use are left in a state of cleanliness no worse than prior to their use.
- 5.7.2.3 If anyone witnesses any FOD safety risks, please report them to CAG Airside Management Centre (AMC).

## 5.7.3 Results of FOD

- 5.7.3.1 Foreign object debris may be ingested into aircraft engines, causing damage to critical engine parts. This is especially hazardous if it occurs in flight, particularly during the take-off phase.
- 5.7.3.2 In addition, FOD can cause damage to the tyres, undercarriage, control systems and other parts of the airframe. All such damage could lead to inflight failures.
- 5.7.3.3 Items such as rags and wireless headset unit, associated with engineering and servicing of aircraft, have been left in wheel bays and other ledges where they can subsequently fall out during take-off phase and create a hazard to subsequent aircraft landing or taking off on the runway.
- 5.7.3.4 Failure to maintain ground support equipment (i.e. where parts break off or fall out can also contribute to FOD) can likely cause damage to an aircraft particularly when its wheels run over it or when it is sucked up into an engine.

## 5.7.4 Responsible Parties for FOD walks at stands

- 5.7.4.1 The Responsible Parties (RP) to conduct the FOD checks in different aircraft movement scenarios mentioned in section 5.7.4.2 - 5.7.4.10 are defined as follow:

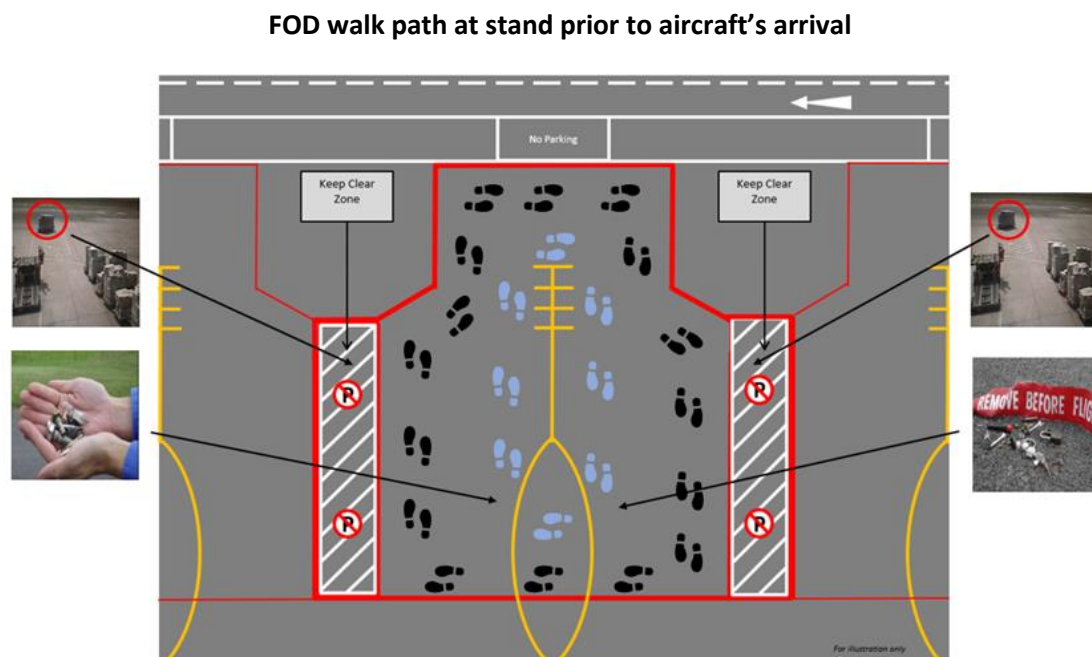
	Type of Aircraft Movement	Responsible Party
a)	Live Arrival	ADGS Operator / Manual Marshaller
	Towed-in arrival	Flight-in-Charge (FIC) or equivalent
b)	Live Departure and towed-out departure	Headset man

**Note:** The RP for live arrivals and live departures is also known as Arrival OIC and Departure OIC respectively in Chapter 6.

## 5.7.5 FOD Checks before live aircraft arrival or towing-in aircraft arriving into the stand

5.7.5.1 Prior to any live aircraft arrival or tow-in into the stand:

5.7.5.2 The RP shall conduct the FOD walk according to the diagram shown below.



5.7.5.3 The RP shall walk the path around the entire boundary of the ERA to ensure that this area, **including the Keep Clear Zones (KCZ)** are free of equipment, personnel, FOD and spillage. (See **black** foot prints in the above diagram and with reference to 5.7.5.5)

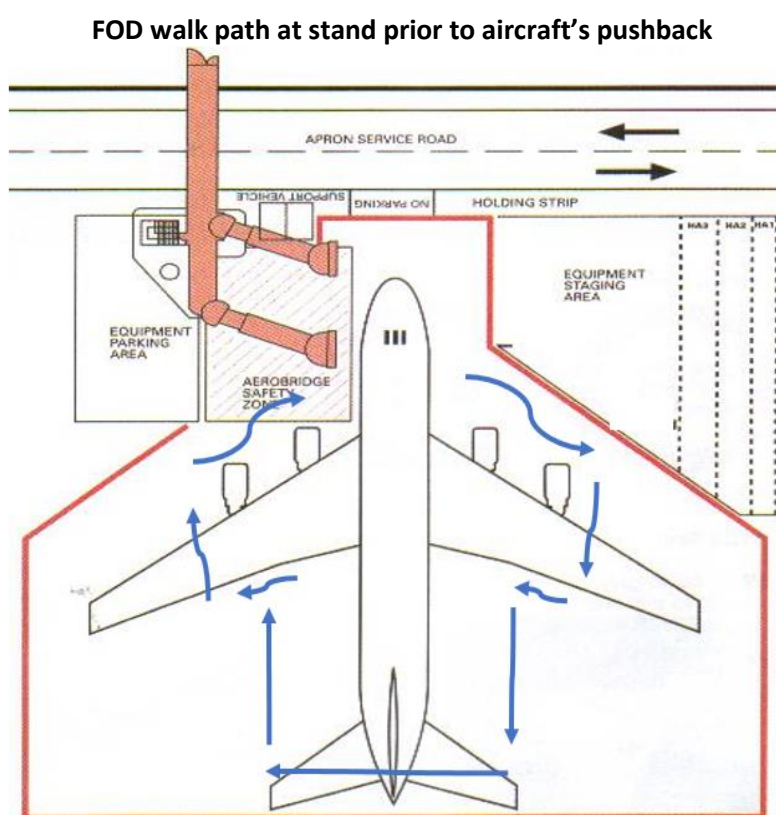
5.7.5.4 The RP shall also walk the path along the centreline of the aircraft stand to look out for any FOD that could cause damage to aircraft engines or tyres. The RP shall ensure that the path and area that the aircraft will be moving into is free of FOD. (See **blue** foot prints in the above diagram)

5.7.5.5 The RP is to look out for aircraft movement at the adjacent aircraft stands when carrying out pre arrival FOD check. If at the adjacent stand, an aircraft is about to pushback or if there is an arrival aircraft about to taxi in, the RP is to go back to the stand limit line and wait, until the aircraft has completed its pushback or has come to a complete stop. He then can resume his FOD check of the KCZs.

**Note: If there are equipment or hydraulic spillages found within the ERA, including the KCZs, the RP is to contact Airside Management Centre (AMC).**

## 5.7.6 Prior to a live aircraft departure or aircraft towing-out from the stand

- 5.7.6.1 The RP shall walk around the entire aircraft to ensure that there is no equipment, spillage, FOD and personnel within the ERA, including the KCZs. Such inspections are crucial and effective as they enable the GHAs to identify and eliminate unsafe conditions and prevent a FOD incident.
- 5.7.6.2 The RP shall also ensure that the path and area that the aircraft tyres would move over during pushback phase, is free of FOD. The RP must look out for any FOD that could cause damage to aircraft engines and tyres. Please see the arrows in the diagram below for the FOD walk pattern prior to aircraft pushback.



- 5.7.6.3 Any FOD found at the aircraft stand shall be properly disposed in the yellow FOD bin provided at every aircraft stand.
- 5.7.6.4 Any FOD found at the aircraft stand shall be properly disposed in the yellow FOD bin provided at every aircraft stand.
- Conduct routine checks on ground equipment and
  - In ramp areas ensure that anything carried in or on a vehicle is secured. Items such as safety cones and/or wheel chocks should not be left unsecured on GSEs when in operations.



Example of wheel chock left unsecured on airtug

### 5.7.7 Engine start

5.7.7.1 Qualified personnel should complete a final examination of the aircraft before engine start to confirm:

- a) Surface condition of the apron is adequate to conduct operations; and
- b) Apron is clear of items that might cause FOD.

### 5.7.8 Actions by Airline's Agent during refuelling with passengers on board

5.7.8.1 Personnel shall ensure the escape routes of passengers on board such as passenger stairs and bridges are clear of FOD.



Example of escape route to be kept clear of FOD

**5.7.9 What to do when carrying out regular activities at the airside**

- 5.7.9.1 Remove all items (including trash) generated from aircraft servicing from the aircraft stand immediately, unless with prior approval from CAG.
- 5.7.9.2 Always return all equipment to their designated positions after use. These include safety cones, aircraft wheel chocks, aircraft grounding cables and fire extinguishers.
- 5.7.9.3 Do not leave any personal belongings unattended anywhere, especially on the plinth area. Ensure that personal belongings carried on the person are well kept and secured and do not fall off onto airside areas.



Example of plinth area to be kept clean of FOD and equipment returned to their designated position



## **6 Standard Operating Procedures**

### **6.1 Introduction**

- 6.1.1 Standard Operating Procedures (SOPs) are the foundation of effective personnel coordination and a key component in team resource management and threat and error management.
- 6.1.2 GSPs shall establish and maintain SOPs for their various operations accordingly, and to ensure that they can be carried out effectively and safely.
- 6.1.3 The SOPs must be aligned to the operating procedures stated in the GOSM.
- 6.1.4 GSPs shall ensure that all personnel are trained in the relevant SOPs to maintain a standardised level of currency.
- 6.1.5 The SOPs shall be reviewed whenever there is a change to the operation.

### **6.2 Standardised Ramp Handling Procedure for Aircraft Arrival and Departure**

- 6.2.1 The standardised arrival and departure handling procedure was developed in collaboration with the Changi airside community. This standardised procedure seeks to improve ground operational safety by specifying the minimum standard operating requirements for ramp handling, and to reduce the complexity of ground handling operation by harmonising multiple stakeholders performing ground handling functions on the same aircraft.

### 6.3 Arrival OIC Roles and Responsibilities


- 6.3.1 The ADGS operator/ manual marshaller is recognized as the overall-in-charge for arrival phase of ground handling. He is empowered to point out any violation which could compromise safety and demand for violation to be corrected.

**Note: The OIC shall contact AMC if operators do not comply with safety procedures.**

- 6.3.2 The key safety responsibilities of the arrival OIC include the following:
- a) Ensure that the ERA and the adjacent keep clear zones are free of FOD, equipment and/or spillage;
  - b) Ensure that the ADGS is operating and displaying the correct aircraft type;
  - c) Ensure that the PLB is fully retracted in its “parked position” or at the “pre-position”;
  - d) Ensure all ground service equipment (GSE) and personnel are positioned outside of the ERA and the adjacent keep clear zones prior to aircraft arrival;
  - e) Ensure all personnel stay clear of the ERA until the nose wheels are chocked, grounded, anti-collision lights have been switched off and thumbs-up given.

#### 6.3.3 Details of the Standardized Arrival Procedure

##### 6.3.3.1 Pre-Arrival

Step	Action by	Duties
1	ADGS Operator	<p>Place two safety cones with a safety pole on them at the front of the ERA before conducting the FOD check</p>  <p>Example of how the safety cones and pole shall be placed</p> <ul style="list-style-type: none"> <li>a) No GSE &amp; personnel are allowed inside the ERA and “Keep Clear” zone.</li> <li>b) Clear all debris including small pieces e.g. metal parts, plastic paper etc inside the ERA and “Keep Clear” zone.</li> </ul>

		c) Secure loose items outside ERA.
2	ADGS Operator	Ensure that maintenance step is available for marshalling in case of ADGS failure (if applicable).
3	ADGS Operator	Check that sufficient numbers of serviceable chocks and grounding cables are available.
4	ADGS Operator	Passenger Loading Bridge (PLB) wheels must be in the designated parking boxes. <b>See Annex VII, Part (1) for exception cases</b>
5	ADGS Operator	Test for ADGS serviceability.
6	ADGS Operator/ Headset Man	Monitor ERA for infringement.

## 6.3.3.2 Normal Arrival (APU serviceable)

Step	Action by	Duties
1	ADGS Operator	Release dead man switch once aircraft stops at the designated stop line.
2	Headset Man/ Chock Bearer	Enter only after engine shutdown and are spooling down, anti-collision lights switched off. Approach aircraft from the nose gear in a path parallel to the fuselage, avoiding engine intake areas. <b>Warning:</b> Do not establish communications with the flight crew unless there is a tail pipe fire or engine is not shut down by more than a minute.
3	Chock Bearer	Chock aircraft: a) Nose gear: Maintain approximately 2-inch gap for forward and aft wheels (as appropriate).
4	Headset Man	Connect one end of the grounding cable to the earth receptacle on the ground, before connecting the other end to the aircraft nose landing gear (if applicable).
5a	Chock Bearer	Chock aircraft:

		a) Main gear: Maintain approximately 2-inch gap for forward wheels. No gap for aft wheels (as appropriate).
5b	Chock Bearer	Connect one end of grounding cable to the earth receptacle on the ground before connecting the other end to the aircraft main landing gears.
6	Headset Man	Establish communications and notify flight crew “chocks in place”.
7	Headset Man	Provide “thumbs-up” signal clearance for personnel and PLB. GSE to approach aircraft with safety cones in position.
8	Operators	Check for damage on the cabin/cargo door and surrounding area before docking GSEs and PLB.

## 6.3.3.3 Arrival (APU inoperative)

Step	Action by	Duties
1	ADGS Operator	Release dead man switch once aircraft stops at the designated stop line.
2	Headset Man	Approach aircraft from front of nose gear to establish communication with flight crew. a) Confirm APU u/s b) Remind flight crew parking brakes must be set and anti-collision lights must remain on.
3	Chock Bearer	Approach aircraft from front of nose gear to chock forward and aft nose wheels. <b>Warning:</b> Do not chock main gear yet.
4	Headset Man	Connect one end of the grounding cable to the earth receptacle on the ground before connecting the other end to the aircraft nose landing gear (if applicable).
5	Headset Man	Obtain clearance from flight crew to connect GPU.

		<b>Warning:</b> To avoid distraction, do not assist with GPU connection.
6	Headset Man/ Chock Bearer	Engines must be shut down and anti-collision lights switched off before signalling the chock bearer to chock and ground the main landing gears.
7a	Chock Bearer	Chock aircraft: Main gear: Maintain approximately 2-inch gap for forward wheels. No gap for aft wheels (as appropriate).
7b	Chock Bearer	Connect one end of the grounding cable to the earth receptacle on the ground before connecting the other end to the aircraft main landing gear.
8	Headset Man	Establish communications and notify the flight crew "chocks in place".
9	Headset Man	Provide "thumbs-up" signal clearance for personnel and PLB. GSE to approach aircraft with safety cones in position.
10	Operators	Check for damage on the cabin/cargo door and surrounding area before docking GSEs and PLB.

## 6.4 Departure OIC Roles and Responsibilities

- 6.4.1 The headset operator is recognized as the overall-in-charge for the departure phase of ground handling. He is empowered to point out any violation which could compromise safety and demand for violation to be corrected.

**Note: The OIC shall contact AMC if operators do not comply with safety procedures.**

- 6.4.2 The key safety responsibilities of the departure OIC include the following:
- Ensure that the PLB is fully retracted in its "parked position" or at the "pre-position";
  - Ensure all ground service equipment (GSE) and personnel are positioned outside of the ERA and the adjacent keep clear zones before aircraft pushback operation;
  - Ensure that the aircraft stand and adjacent keep clear zones are clear of FOD and/or spillage;
  - Ensure pushback path is clear of obstruction, aircraft and vehicle.

### 6.4.3 Details of the Standardized Departure Procedure

#### 6.4.3.1 Departure

Step	Action by	Duties
1	Operators	FOD Check <ul style="list-style-type: none"><li>a) Ensure all GSE are positioned outside the ERA and “Keep Clear” zone.</li><li>b) Clear all debris including small pieces e.g. metal parts, plastic paper etc inside the ERA and “Keep Clear” zone.</li><li>c) Secure loose items outside ERA</li></ul>
2	Headset Man/ Airtug Driver	Verify that the tow bar / towbarless airtug is suitable for the specific aircraft type.
3	Headset Man	Conduct briefing for airtug driver, chock bearer, wingwalker and tail marshaller (where applicable): <ul style="list-style-type: none"><li>a) Standard/alternate pushback directional instructions.</li><li>b) Airtug must not be left unattended with engine running and be aware of the location of emergency stop button.</li><li>c) Point out tow bar shear pin location and confirm it is not sheared.</li><li>d) Maintain a slow speed during pushback operation.</li><li>e) Observe all towing angle limitations</li><li>f) To stop only at the designated stop point.</li><li>g) Avoid braking abruptly when navigating a curved path.</li><li>h) Emergency procedure for airtug driver on driving away and for headset man when tow bar completely separates from aircraft.</li></ul> <p><b>Warning:</b></p> <p>Applying aircraft park brakes with airtug still connected will cause major damage.</p>

		Failure to move off with tow bar completely separated from aircraft will cause personnel injury and aircraft damage.
4	Headset Man	Confirm and establish headset communications with the flight crew.
5	Headset man	Confirm all GSEs have been disconnected from the aircraft. <b>Note:</b> Only full ground support equipment can remain connected for APU inoperative aircraft.
6	Headset Man	Ensure all personnel not involved in pushback remain clear of the departing aircraft, outside the ERA.
7	Headset Man	Insert the correct nose gear steering bypass pin prior to tow bar/ towbarless airtug connection to the aircraft.
8	Headset Man	Confirm with flight crew that aircraft parking brakes are set.
9	Headset Man	Ensure that the airtug and tow bar is fully secured to the nose landing gear and confirm that the parking brakes are set on the airtug.
10	Headset Man	Walk around check to confirm: a) All gear groundlock pins are removed. b) All pax steps or PLB are removed from the aircraft and are fully retracted in the designated parking boxes. <b>See Annex VII, Part (2) for exception cases</b> c) All aircraft doors and panels are closed. Special attention to be given to cargo and pax doors and that there is no damage to aircraft after doors are closed.
11	Headset Man/ Chock Bearer	For towbarless airtug operation, grounding cable and chocks at the nose gear may be removed for the purpose of the towbarless airtug connection. Ensure that towbarless airtug is fully engaged to the landing gear and

		confirm that the towbarless tractor's parking brakes are set.
12	Chock Bearer	Remove all grounding cables and chocks.
13	<b>Applicable if APU is inoperative. If N.A, follow proceed to step 14</b>	
13a	Operator	ACU to be removed from ERA (as per instruction from flight deck crew as required).
13b		Anti-collision light switched on.
13c	Operator	Disconnect and remove GPU from ERA after ASU starts aircraft engine.
13d	Operator	Disconnect and remove ASU from ERA; check that aircraft service panel for ASU is closed.
14	Headset Man	Notify the flight crew "chocks removed".
14a	Headset Man/ Airtug Driver	Headset man to provide pushback directional hand signals in conjunction with verbal communication to airtug driver.
14b	Headset Man/ Airtug Driver	Ensure the aircraft pushback path is clear of any obstruction.
14c	Headset Man	Commence pushback when aircraft parking brake is released, and clearance is given by flight crew.
14d	Headset Man/ Airtug Driver	Request for "green" to be switch-on during inclement weather or poor visibility (if necessary).
15	Chock Bearer	Place 1 chock at forward nose wheel after pushback and remove only after disconnection of headset.
16	Airtug Driver	Position the airtug in the aircraft's path and be visible to the flight crew (if possible) after the tow bar has been disconnected from the airtug.
17	Headset Man	Remove the nose gear steering bypass pin.
18	Headset Man	Disconnect the headset and close the access panel on the aircraft once the approval to disconnect has been given by flight crew.  <b>Note:</b>



		When disconnecting headset, notify the flight crew by saying "Headset man disconnecting now. See you on the left/right").
19	Headset Man	Remove nose wheel chock.
20	Airtug Driver	Drive airtug to the left/right of aircraft and position beside headset man and chock bearer.
21	Headset Man	Once eye contact has been made with the flight crew, give the "All Clear to Taxi" signal by waving the steering bypass pin to the flight crew.
22	Headset Man	Remain in position until an acknowledgement from the flight crew is received and the aircraft begins to taxi.

**Note: For details on Towable ACU, ASU, GPU operations, please refer to IATA IGOM.**

## **7 Aircraft Docking Guidance System/ Manual Marshalling**

### **7.1 Pre-arrival Handling**

- a) Arrive at the aircraft stand at least 15 minutes prior to aircraft's ETA;
- b) Conduct a serviceability check on the ADGS at least 15 minutes prior to aircraft ETA;
- c) Be aware of the aircraft type assigned to the stand and press the 'confirm' button on the ADGS control panel;\*
- d) Upon arrival at the stand, check that all equipment is properly secured and positioned in the ESA. The surrounding area must be free from any FOD and the stand must clear of oil / fluid / fuel spillage;
- e) The ERA must be clear of personnel and equipment. Maintain a constant lookout of the ERA and refrain from using mobile devices unnecessarily;
- f) Conduct the FOD walk and cover the ERA boundary and adjacent keep clear zones.
- g) Ensure sufficient serviceable wheel chocks and safety cones are provided;
- h) Manual marshallers shall stand by with marshalling bats or wands (to be illuminated in low visibility / night operations) and marshalling platforms (if required) in the event that manual marshalling is required;
- i) The space fronting aircraft stands, either "No Parking Area" or holding strip, may be used to perform manual marshalling;
- j) The ADGS operator is highly recommended to perform a second FOD walk at five minutes before the aircraft's ETA;
- k) The PLB shall be fully retracted and parked at its designated parking box.

**See Annex VII, Part (1) for exception cases\***

**A chock may be positioned at least 1 metre away from the edge of the designated stop line to serve as a guidance marker for aircraft nose wheel stop position.**

### **7.2 Arrival Handling**

- a) Inform FMC immediately if the ADGS is faulty;
- b) In the event where the ADGS is not available or unserviceable, perform manual marshalling using the correct marshalling signals to guide the aircraft into the stand. (refer to IATA IGOM for the standard marshalling signals);
- c) Do not guide any aircraft for other aircraft stands other than the assigned one;
- d) Guide only the assigned aircraft type and airline at the aircraft stand a complete stop at the designated aircraft type stop line;

**Note: In the event that an incorrect airline or aircraft type attempts to enter the aircraft stand, release the deadman switch immediately to stop the aircraft from turning or taxiing further into the aircraft stand. Operator shall contact their own operations control centre for the next course of action.**

- e) The ERA must be clear of any obstruction;

- f) If the aircraft overshoots / undershoots the designated stop line by more than 0.5 metres (approximately the length of 2 feet, personnel shall arrange for an airtug to reposition the aircraft;
- g) After the aircraft comes to a complete stop with its engines shut down and anti-collision lights OFF, personnel can then proceed to place chocks and grounding cables on the aircraft;
- h) If at any time during aircraft movement the ADGS operator / manual marshaller is unsure or identifies an imminent danger, STOP the aircraft by giving the 'STOP' signal with the use of wands or by releasing the deadman switch on the ADGS control panel.

## 8 Operation of Passenger Loading Bridge

### 8.1 Pre-arrival Handling

- a) Arrive at the stand at least 15 minutes prior to aircraft's ETA;
- b) Ensure that no FOD, GSE or any obstacles are within the red hatched area beneath the PLB and in the surrounding area of the parking stand;
- c) Ensure that the PLB is fully retracted and parked at its designated parking box;  
**See Annex VII, Part (1) for exception cases**
- d) If the wheels of the PLB are extended beyond the designated parking box, inform ADGS operator NOT to activate ADGS and DO NOT RETRACT THE PLB. Instead, alert FMC and the PLB maintenance staff will respond;
- e) Ensure that the passageway within the PLB is free of FOD prior to aircraft arrival;
- f) Ensure that all safety chains (located in the cab, Tunnel 'A' and PLB entrance) are secured and hooked;
- g) Conduct a serviceability check of the PLB and check for 'No Go' items, the PLB is considered unserviceable if any of the following is faulty:
  - i. Emergency stop;
  - ii. Selector key switch;
  - iii. Power on button;
  - iv. Cabin closure (condition and padding);
  - v. Horizontal drive button;
  - vi. Vertical drive button;
  - vii. Cab rotation button;
  - viii. Closure drive button;
- h) In the event where the PLB is unserviceable:
  - i. Inform CAG FMC immediately.
  - ii. If the maintenance staff is unable to rectify the PLB fault upon reaching the site, he shall inform the PLB operator.
  - iii. The PLB operator shall inform his operations control centre and wait for further instructions if he is to hold the flight, or disembark passengers via passenger step, or reposition the aircraft to the next nearest available contact stands.
  - iv. Inform the airside officer / operations supervisor of the incoming flight and request for a passenger step to be dispatched to the stand;
- i) Activate the switches for air conditioning and lighting in the PLB prior to aircraft arrival. Keep the roller shutter/ bi-fold doors closed until the PLB is docked;
- j) Be aware of the incoming aircraft type and position the height of the PLB accordingly;
- k) Position the PLB wheels in the wheels positioning box after performing the serviceability checks;
- l) Standby a marshaller to be deployed on Apron ground in the event when PLB malfunctions. In the event that the auto-dock function is unserviceable and the PLB operator must manually dock the PLB to the aircraft, the PLB operator would have to ensure that a marshaller is positioned on the apron ground to guide him in his docking operation.

## 8.2 Arrival Handling

- a) Keep the PLB roller shutter/bi-fold doors closed until the PLB is docked;
- b) No other personnel shall be present in the cab during docking. All other personnel shall stand behind the safety chains behind the operator;
- c) Commence PLB docking operation only after receiving the thumbs-up signal from the headset man;
- d) Check the aircraft fuselage for any damage before proceeding to dock the PLB. If any damage is spotted, do not dock the PLB towards the aircraft. Inform CAG AMC immediately;
- e) For safety concerns, conduct visual inspections of the apron operation area through the CCTV screen while operating the PLB. In the event where the auto-dock function is unserviceable and the PLB operator must manually dock the PLB to the aircraft, ensure that a marshaller is positioned on the apron ground to guide him in his docking operations;
- f) In the event the PLB operates abnormally during auto-dock mode, release the auto-dock button immediately to abort operation. If the PLB does not stop immediately and continues moving, press the red emergency button to cease all electrical supply to the PLB immediately;
- g) Stop the PLB 0.5 metres from the aircraft to make final adjustments before docking;
- h) Adjust and maintain the height between the PLB cab floor and the aircraft door sill based on the height indicated by the height indicator located on the right of the bumper;
- i) Activate the auto-leveller after docking to the aircraft. (The auto-leveller is to be engaged prior to opening the aircraft door);
- j) For A380 aircraft, ensure that the correct docking sequence is executed (i.e. L1 / L3 and lastly L2);
- k) Ensure that the cabin closure is extended towards the aircraft door;
- l) After all checking sequence is completed and the “auto-leveller” has been activated, remove the key from the operation console;
- m) Unhook the safety chains located in the cab and Tunnel ‘A’;
- n) When the PLB is docked to the aircraft, the PLB operator shall attend to the PLB when the auto-leveller alarm is activated.

**Note: For A380 aircraft, the docking of the PLB L2 arm is to be done only after the PLB L1 arm and PLB L3 arm has been docked to the aircraft.**

## 8.3 Departure Handling

- a) Ensure that a marshaller is deployed on apron ground to assist with the PLB retraction;
- b) Perform a check to ensure that no FOD, GSE or any obstacles are within the red hatched area beneath the PLB and in the surrounding area of the parking stand prior to operating the PLB;
- c) Check the fuselage of the aircraft for any damage before proceeding to retract the PLB from the aircraft. If any damage is spotted, do not retract the PLB. Inform CAG AMC immediately;
- d) Ensure that all safety chains are hooked up and secured prior to retracting the PLB;

- e) Ensure that the aircraft door is completely closed prior to disengaging the auto-leveller and retracting the canopy;
- f) Conduct clearance checks and ensure that the marshaller is present before the bridge is retracted;
- g) Ensure weather closure is retracted before retracting the PLB;
- h) Ensure that the PLB roller shutter/bi-fold doors are closed before retracting the PLB
- i) PLB operator retracts 0.5 metres manually before setting to Auto-retract function;
- j) If the Auto-retract function is unserviceable and the PLB operator must manually retract the PLB from the aircraft, the PLB operator would have to ensure that a marshaller is positioned on the apron ground to guide him in his retracting operation.
- k) Retract the PLB to the designated parking box position before the start of pushback.

**See Annex VII, Part (2) for exception cases**

**Note: For A380 aircraft, the PLB L2 arm is to be retracted first before retracting the PLB L1 arm and the PLB L3 arm.**

- l) Set the PLB to the default height at the designated parking box;
- m) Turn the keys to 'OFF' position and remove from the instrument console;
- n) Ensure the emergency button is depressed;
- o) Remain on the bridge until the aircraft is pushed back;
- p) Clear all debris on the passageway.
- q) Ensure that the PLB wheels are parked within the designated parking boxes;
- r) Inform FMC when:
- s) PLB is unable to be retracted or
- t) PLB operates abnormally during auto-retract mode (release the auto-retract button immediately to abort operation and to stop the PLB first)
- u) In the event where the PLB is unable to be retracted from the departing aircraft, inform FMC;
- v) If there is a need for PLB towing, the PLB operator (in the presence of the CAG PLB maintenance contractor) shall ascertain that:
  - i. The aircraft cabin door is shut;
  - ii. No passengers are in the PLB.
  - iii. Airline representative is informed;
  - iv. Seek the assistance of a tractor driver to tow the PLB.

## **9 Operation of Ground Support Equipment Associated with Aircraft Handling and Loading**

### **9.1 Introduction**

- 9.1.1 All self-propelled GSE interfacing with the aircraft should have an aircraft proximity system facility.

### **9.2 General Safety Instructions**

#### **9.2.1 Basic operating requirements for GSE**

- a) All motorised GSE shall be issued with a valid CAG's AVP and equipped with a valid fire extinguisher. The validity of the fire extinguisher must be clearly displayed on the extinguisher.
- b) Check equipment prior to initial use (with reference to 9.3.1, 9.3.2 or 9.3.3)
- c) Do not drive GSE with lifting devices in the raised position, except for final positioning onto the aircraft;
- d) Do not operate the platform while in motion;
- e) All GSE shall not touch the aircraft. When positioning GSE, a safety clearance must be maintained between the GSE and the aircraft;
- f) All safety rails must be fully retracted/lowered during positioning;
- g) Do not leave any vehicle unattended with its engine running.

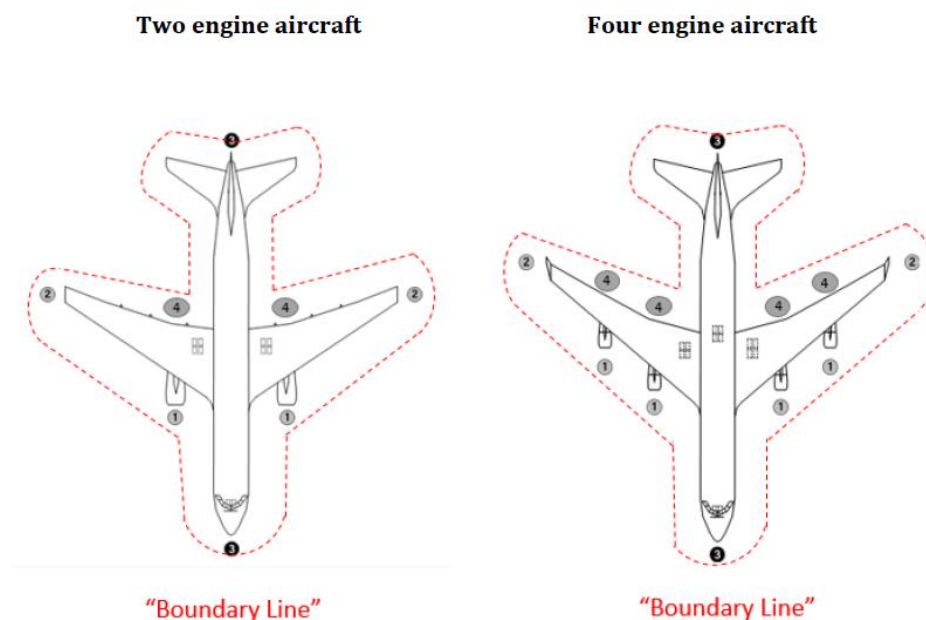
**Note: GPUs and ACUs may be left running unattended with its engine running.**

- h) Do not use faulty GSE;
- i) Do not transport wheel chocks and / or safety cones placed on the roof top of GSE such as tractors and covered trolleys. Top of containers shall be free of baggage / cargo / mail;
- j) When handling smaller aircraft such as A320 and B737 etc (i.e. Code A to C), do not tow more than 2 baggage trolleys / carts and dollies within the ERA for positioning for unloading / loading of baggage / cargo purposes;
- k) Deploy stabilizers and parking brakes when GSE is stationary.
- l) Towable Air Start Units (ASU), PCA, and GPU shall not be connected to the tow vehicle and aircraft at the same time. Before towing the unit away, the operator shall make sure the unit is disconnected from the aircraft.

#### **9.2.2 Ramp safety in aircraft handling**

- a) If using access steps to open and close cargo hold doors, position and remove the steps in a straight line. Do not move or re-position the steps while a staff member is on the steps.
- b) Do not drive GSE faster than walking speed;
- c) Make two safety stops;
  - i. One complete stop prior to entering the ERA;
  - ii. One complete stop as a brake check, at no less than 5 metres from the aircraft.

- d) GSE travelling along a parked aircraft must keep at least 1 metre away. Reference point shall be used to gauge the minimum safety distance. Safety cones placed along various parts of the aircraft (maximum 1 metre away from the aircraft) are examples of reference points for drivers.



- e) Marshalls are to be deployed when reversing GSE towards the aircraft;
- f) Ensure all vehicles and equipment used for the handling of aircraft are pre-positioned in an orderly manner within the ESA prior to aircraft's ETA;
- g) Ensure no parts of the vehicles and equipment are protruding into the ERA demarcated in red. All vehicles and equipment are to be parked orderly within the ESA and shall not protrude into the ERA demarcated in red;
- h) The equipment shall not be parked in an area that will be affected by jet blast or cause obstruction to:
- i. Arriving aircraft;
  - ii. Vehicular traffic lanes;
  - iii. Adjacent stands.
- i) Strictly no personnel, vehicle and / or equipment are allowed in the ERA prior to aircraft arrival;
- j) Check the surrounding area to ensure there is no FOD on all equipment, in the ERA and the adjacent keep clear zones.
- k) All persons and GSE not involved in the aircraft departure operation are to remain outside of the ERA; and
- l) The ground personnel performing the final check on the aircraft shall check to ensure that all aircraft servicing panels and / or hatches are closed and latched.



### **9.3 GSE Operations**

#### **9.3.1 Pre-operation equipment inspection (motorised GSE)**

- a) Conduct visual checks for damage, cracks or abnormal wear;
- b) Brakes are operational;
- c) Illumination & indication lights are functional;
- d) Warning systems are functional;
- e) Steering is functional;
- f) No fluid and/or oil leaks;
- g) No bald tyres;
- h) Rubber bumpers are in good condition.

**Note: Not applicable to refuellers/hydrant dispensers.**

#### **9.3.2 Pre-operation equipment inspection (non-motorised GSE)**

- a) Conduct visual checks for damage, cracks or abnormal wear;
- b) Stabilisers and braking mechanisms are functional;
- c) No bald tyres.

**Note: Not applicable to refuellers/hydrant dispensers.**

#### **9.3.3 Pre-operation equipment inspection (applicable to refuellers/ hydrant dispensers only)**

- a) Conduct visual checks for damage, cracks or abnormal wear;
- b) Brakes are operational;
- c) Illumination & indication lights are functional;
- d) No fluid and/or oil leaks;
- e) No bald tyres.

#### **9.3.4 Load carried by GSE**

- a) All load carried by the vehicle shall be secured at all times;
- b) The use of plastic sheeting over the top of the load is acceptable however, it shall always be placed underneath the cargo net and be adequately tucked into the edges of the load to prevent it from becoming potential FOD during transportation or strong wind conditions.

#### **9.3.5 Unit Load Devices**

- a) ULDs refer to baggage and cargo containers. Do not store ULDs on the ground and always use a suitable ULD base support system;
- b) All non-motorised GSE such as container/pallet dollies, trolleys and maintenance steps are to be secured with built-in braking mechanisms or/and chained to the D-ring when parked (if available)
- c) Unit Load Devices (ULDs) shall be secured on dollies (or trailers/trucks)
- d) Pallet and container dollies may only be towed with the turntables in the locked position ("straight ahead") and rotated only when at the loading and unloading phase.

- e) During transportation the load on trolleys and dollies shall be properly secured by using appropriate locks, stops, rails, curtains and straps.

#### 9.3.6 Mobile and non-motorized passenger steps/stairs

- a) Check that the passenger stairs are serviceable and the condition of the rubber bumpers before use;
- b) Passenger stairs shall be outside the ERA before aircraft arrival and departure
- c) Move the passenger stairs slowly toward the aircraft, avoiding any aircraft sensors or protrusions, until either the protective bumpers just touch the aircraft or the equipment's proximity sensors stop the movement.
- d) If the passenger steps / stairs are towed (non-motorized equipment), disconnect them from the tractor and manually position them toward the aircraft;
- e) Drivers shall not drive steps and stairs over fuel hydrant pits, any hose or bonding cable used for refuelling of aircraft;
- f) Maintain adequate clearance between the passenger stairs and the underside of the cabin door, or as directed by the cabin door markings to prevent damage.
- g) Make sure any slide rails and canopies on the passenger step platform are fully retracted during positioning.
- h) Extend side rails after the cabin door has been opened;
- i) If equipped with stabilisers, ensure they are deployed before the steps is used for servicing. Deploy other safety devices, if fitted
- j) Close the cabin door before removing the passenger stairs.
- k) After the cabin door has been closed, confirm there is no staff on the stairs prior to retracting stabilizers.
- l) If passenger stairs are towed when removed from the aircraft, manually position them clear of the aircraft to a suitable position before connecting them to the tractor.

**Note: Aircraft cabin door shall not be in open position without any GSE (platform or PLB) securely positioned at the door.**

#### 9.3.7 Belt loader/skyloader

##### 9.3.7.1 When operating the belt loader / skyloader:

- a) Check that the rubber bumpers are in good condition before deploying;
- b) Position and remove the equipment in a straight line with the cargo hold door at a 90° angle to the aircraft fuselage till clear of aircraft engine;
- c) The rubber bumpers must never contact with the aircraft and always maintain a safety gap between the equipment and aircraft at all times when docking;
- d) Drivers shall not drive over fuel hydrant pits, any hose or bonding cable used for refuelling of aircraft;
- e) Raise / extend the side handrails after the equipment is positioned;
- f) Do not sit or stand on the conveyor belt during GSE movement and when the conveyor belt is in operation (up or down);
- g) When placing items on the conveyor belt, ensure they are stable and will not fall off;
- h) Do not overload

- i) For a towable skyloader, disconnect them from the tractor first before manually positioning them towards the aircraft; and
- j) To inspect the baggage loading and unloading areas every time an aircraft is serviced as luggage parts such as baggage wheels, zippers, bag locks and name tags were common FODs.

### **9.3.8 ULD Loader/ JCPL/ MDL**

#### **9.3.8.1 When operating loading GSEs:**

- a) Check that the rubber bumpers are in good condition before deploying;
- b) Check that the GSE is serviceable before use;
- c) Never drive the GSE under the aircraft wings;
- d) Drivers shall not drive over fuel hydrant pits, any hose or bonding cable used for refuelling of aircraft;
- e) Do not use the JCPL / MDL to transport ULDs across the ramp;
- f) When reversing from aircraft, do so in a straight line with the cargo hold door at a 90° angle to the aircraft fuselage till clear of aircraft engine;
- g) Driver to use snail speed when docking and reversing from the aircraft.
- h) Maintain a safety gap between the equipment and aircraft when docking.

### **9.3.9 Elevating equipment**

#### **9.3.9.1 When operating elevating equipment:**

- a) The final position of the GSE must allow for a safe working area while in the raised position at the aircraft door to prevent personnel and objects from falling;
- b) Maintain a safety gap between the equipment and aircraft when docking;
- c) Check for any obstructions over both sides of the GSE before lowering;
- d) Engage stabilizers and parking brakes when equipment is stationary;
- e) Use a guide person when vision is restricted. The guide person shall be in a position to accurately judge clearances and communicate signals to the driver/operator. Stop immediately if visual contact with the guide person is lost;
- f) Close and secure all doors when servicing is complete.
- g) Drivers shall not drive over fuel hydrant pits, any hose or bonding cable used for refuelling of aircraft.

### **9.3.10 Potable Water Servicing and Toilet Servicing**

- a) Wear PPE at all times;
- b) After servicing, the fitting caps and service panel door must be closed and latched;
- c) Report any spillage on the aircraft stand to his supervisor for cleaning arrangement.
- d) Drivers shall not drive over fuel hydrant pits, any hose or bonding cable used for refuelling of aircraft;

**Note: Refer to the operating airline's GOM for specific instructions as per aircraft type.**

#### **9.4 Aircraft Ground Stability**

- a) In general, when loading, load forward holds before aft holds;
- b) When offloading, offload aft holds before forward holds;
- c) To avoid “tail-tipping” during ground operations, sequential loading / unloading instructions shall be followed in accordance to airlines’ requirements;
- d) Supervision personnel shall observe the aircraft ground stability during ground operations.
- e) For cargo aircraft, a tail support stanchion or nose tether may be required to be fitted during loading and offloading

#### **9.5 Low-wing aircraft (e.g. B737)**

- a) To prevent damage to low wing aircraft, baggage tractors should stop about 1 metre from the belt loader / skyloader and unhook the baggage trolleys;
- b) Move the tractor away and position the carts;
- c) When removing the baggage trolleys, the tractor should be positioned pointing away from the aircraft wing and the baggage trolley pulled to the tractor;
- d) Tractors shall never drive under the aircraft wings.

#### **9.6 Grounding of Aircraft**

##### **9.6.1 Introduction**

- 9.6.1.1 It is mandatory to ground the aircraft at three points at all times when the aircraft is parked at the aircraft stand, as a means of lightning protection for all apron staff servicing the aircraft.
- 9.6.1.2 The practice of 3-point aircraft grounding is applicable to all aircraft types, except for Boeing 737. Boeing 737 only has 2 designated ground points, 2-point aircraft grounding should be carried out when handling the Boeing 737 aircraft.
- 9.6.1.3 All airside personnel are to exercise responsibility when using the aircraft grounding cables, and to always return them to their designated position after use.

##### **9.6.2 Connection of grounding cables**

- a) Headset man to ensure that grounding cables are connected at the nose and two main landing gears before proceeding to connect the headset transceiver to establish communications with the cockpit pilot.
- b) When connecting the grounding cable, one should always connect one end of the grounding cable to the earth receptacle point before connecting the other end to the aircraft grounding point

##### **9.6.3 Removal of grounding cables**

Remove grounding cables together with chocks when:

- a) After loading GSE have been disconnected from the aircraft including the PLB
- b) Airtug is connected to the aircraft

- c) Airtug parking brake is engaged
- d) Aircraft parking brake is engaged

**\*To note: Start the disconnection of the grounding cables from the aircraft grounding point before proceeding to the earth receptacle point.**

**\*To note: Grounding cables and chocks at nose landing gear may be removed earlier to facilitate the connection of towbarless air tug.**

## **9.7 Aircraft Departure**

### **9.7.1 Removal of wheel chocks**

9.7.1.1 Remove the chocks only when:

- a) After loading GSE have been disconnected from the aircraft including the PLB;
- b) Airtug is connected to the aircraft;
- c) Airtug parking brake is engaged;
- d) Aircraft parking brake is engaged.
- e) Do not leave wheel chocks on the ramp. When not in use, stow them in their designated stowage place at the aircraft stand.

### **9.7.2 Removal of safety cones**

9.7.2.1 Safety cones can be removed with PLB still attached to aircraft. Headset man must be attentive at this time to avoid any ERA infringement and vehicle failure to give way to aircraft cases.

## 10 Aircraft Pushback

### 10.1 Pre-departure Handling

- a) Ensure that the surface condition is safe to conduct the pushback operation i.e. clear of oil spill and other FOD;
- b) Ensure all the aircraft service doors / panels are closed and locked;
- c) Only the required equipment and personnel involved are in the ERA;
- d) Ensure that the PLB is fully retracted and wheels are parked correctly within the designated parking boxes.

**See Annex VII, Part (2) for exception cases**

- e) Ensure that the pushback path is clear of obstructions.

### 10.2 Departure Handling

- a) Check pushback procedures of the designated aircraft stand prior to performing pushback;
- b) All ground crew responsible for aircraft pushback are to familiarise themselves with the pushback procedures in CAG SWEET, AOCS (Airport Operations Central System) or displayed at the aircraft stand, so as to manoeuvre the aircraft for a safe breakaway on the taxilane/taxiway;
- c) If there are any inconsistencies or ambiguities between the different sources of pushback procedures, the CAG SWEET version shall be deemed most accurate;
- d) The flight deck crew and headset man should read back the pushback instruction or acknowledge in a manner to clearly indicate that they understood and will comply with the given instruction;
- e) Whenever the pushback crew is in doubt, the team is to stop the pushback operation immediately and seek verification before continuing;
- f) Establish and maintain communication with the flight crew via headset throughout the whole operation;
- g) Remain clear of the hazard zones such as aircraft nose gear, aircraft engines and near the airtug or tractor;
- h) Use standard phraseology for all verbal communication between the flight deck or brake operator and ground personnel. Provision should be made for a back-up communication system in the event of a failure of the primary system;
- i) Use standard hand signals for manual communications;
- j) During the pushback, align the aircraft such that the taxiway centreline is in between the aircraft main landing gears to provide sufficient wing and tail clearance;
- k) Spread out the braking process over as long a distance as possible, brake lightly and progressively while reducing speed as gradually as possible;
- l) Avoid abrupt turning of the steering wheel as this can potentially be a skid trigger. Always observe gentle and gradual steering during towing;
- m) Do not brake abruptly when navigating a curved path or making a turn during towing. Driver should decelerate gradually while still on the straight path in anticipation of the turn (or curve);

- n) If the aircraft is to be pulled forward after pushback and engines started, take special precautions to reduce the risk of the aircraft's engine thrust causing damage to the nose gear and tow bar when stopping the aircraft at the end of the manoeuvre;
- o) If a revised instruction is received after pushback operation has commenced, inform the flight deck crew to seek clearance from Changi Tower to tow the aircraft back to the original parking stand. A new pushback clearance from ATC is required before commencing the pushback operation.

## **10.3 Pushback Operations**

### **10.3.1 Airtug and tow bar operations**

- a) Ensure chocks are in place till clearance is given by the person in-charge and the correct bypass pin is installed before connecting the tow bar to the aircraft's nose gear;
- b) First detach the tow bar from the airtug before connecting it to the aircraft's nose gear;
- c) When connecting the tow bar back to the airtug, do not straddle the tow bar. Face the airtug with both legs on one side of the tow bar;
- d) Do not leave the airtug connected to the aircraft unattended with engine running. Ensure that the tow bar wheels are fully retracted before commencing pushback;
- e) If GPU is connected to the aircraft, confirm with the flight crew that it is not in use before removing it;
- f) Perform the pushback at no more than 5 km/h. In the event of poor surface or bad weather conditions, perform the pushback at a slower speed;
- g) Before disconnecting the tow bar at the end of push, position the chock at the front of the nose gear. Once clearance signal is given, display the bypass pin to the flight deck when they are cleared of taxiway;
- h) Remain on standby at the stand until the aircraft taxis away on its own.

### **10.3.2 Towbarless airtug operations**

- a) Ensure chocks are in place till clearance is given by the person in-charge and the correct bypass pin is installed before connecting the tow bar to the aircraft's nose gear;
- b) Align the towbarless airtug with the aircraft nosewheel prior to connection;
- c) Ensure that the aircraft nose wheels are safely locked in the towbarless airtug locking mechanism when connected to the aircraft;
- d) Ensure that nose gears are lifted well above ground before commencing pushback;
- e) When the pushback is completed, inform the flight deck to set the aircraft parking brakes before disconnecting the towbarless airtug;
- f) Do not leave the airtug connected to the aircraft unattended with engine running;
- g) Perform the pushback at no more than 5 km/h. In the event of poor surface or bad weather conditions, perform the pushback at a slower speed;
- h) After disconnecting the airtug at the end of push, position the chock at the front of the nose gear;

- i) After disconnecting the towbarless airtug from the nose gear, position the airtug such that it is visible from the cockpit before removing the bypass pin;
- j) Once clearance signal is given, display the bypass pin to the flight deck when they have cleared from the taxiway;
- k) Remain on standby at the stand until the aircraft taxis away on its own.

**Note: In adherence to aviation lighting luminance standards, some embedded lights/cat eye devices in the airfield cannot be completely flushed to the ground. While these are safe for drive-over by normal aircraft and vehicles; the cradle of towbarless airtug – if incompletely lifted off the ground – may damage these embedded lights.**

- l) Ensure that cradle of the towbarless airtug is always fully lifted off the ground, except at the point when the airtug is connected to a stationary aircraft due for pushback;
- m) Fully lift the cradle immediately after disconnecting from the aircraft; and prior to moving off from the taxiways or ERA.



**Cradle not fully lifted**



**Cradle fully lifted**

#### 10.4 Remote-Controlled Pushback Operation

- a) Pre-position remote-controlled airtug (e.g. Mototok tug) near the nose landing gear. DO NOT engage the remote-controlled airtug to the aircraft nose gear wheels until all ground support equipment and the PLB is removed and aircraft parking brakes are set;
- b) Align and engage the remote-controlled airtug to the nose gear wheels when PLB is disconnected and all ground support equipment are cleared. Raise the nose wheel with the aircraft brakes set;
- c) When flight crew receives clearance for the pushback, headset man shall ensure all chocks and grounding cables are removed before informing flight crew to release aircraft parking brakes;
- d) Face the aircraft and do not walk in the path of the remote-controlled airtug pivot area during pushback;
- e) Do not leave the remote-controlled airtug connected to the aircraft unattended with engine running;
- f) Perform the pushback at no more than 5 km/h.
- g) After disconnecting the remote-controlled airtug at the end of push, position the chock at the front of the nose gear;
- h) After disconnecting the tug from the nose gear, position the remote-controlled airtug such that it is visible from the cockpit before removing the bypass pin;



- i) Once clearance signal is given, display the bypass pin to the flight deck when they are cleared from the taxiway;
- j) For the safety of the operator, remote-controlled pushback should not be performed in the event of lightning warning;
- k) Remain on standby at the stand until the aircraft taxis away on its own;
- l) Ensure that the stand is clear of FOD for the next aircraft. If FOD is of suspected aircraft parts, inform the ground engineer immediately.

## 11 Aircraft Towing

### 11.1 Towing Operations

11.1.1 An overall-in-charge shall be identified for aircraft towing operation. The assigned personnel is usually the flight deck engineer. The overall-in-charge shall brief all other personnel involved in the operation of their responsibilities:

- a) Ensure the latest aerodrome map is used by the towing crew;
- b) Ensure the towing crew is familiar with the taxiway layout of the airport;
- c) Personnel should be instructed on the hazards associated with aircraft movement operations e.g. engine ingestion, nose-wheel movement, aircraft track, visibility;
- d) Personnel performing the functions required by the operation shall be positioned away from hazard zones;
- e) Only those persons required to perform operating functions are in the operating area;
- f) Communication with the flight deck or brake operator should, if possible, be achieved in a manner that eliminates the need for personnel to walk near the aircraft nose-gear or the airtug during the operation e.g. use of flexible cord to airtug driver, or cordless system;
- g) Standard phraseology should be used for all verbal communication between the flight deck or brake operator and ground personnel;
- h) Provision should be made for a back-up communication system in the event of a failure of the primary system;
- i) Standard hand signals should be used for manual communications;
- j) Prior to moving an aircraft all personnel involved in the operation shall be briefed and agreed on how communication should be performed and towing manoeuvred;
- k) The headset man is to also inform the RP (defined in 5.7.4.1) to perform the pre-arrival FOD check of the stand that the aircraft is to be towed into; and
- l) Personnel performing marshalling or wing-walking functions shall, use either high visibility wands or bats. Lighted wands shall be used during low visibility / night operations
- m) It is the responsibility of the aircraft towing crew to stop before the lighted stop bar before the taxiway junctions and seek further instructions from Changi Tower if unsure of which direction/or turns to take; and
- n) It is also the responsibility of the aircraft towing crew to stop at the stop bar when the red stop bar lights are illuminated.
- o) Please refer to the table below for the aircraft towing speed limit to be adhered:

Maximum Aircraft Towing Speed Limit	
Type of Airtug	Maximum Speed Limit
Conventional	15km/hr
Towbarless	25km/hr

- p) In adverse weather conditions or when making turns, reduce towing speed.

- q) Avoid abrupt turning of the steering wheel as this can potentially be a skid trigger. Always observe gentle and gradual steering.
- r) Do not brake abruptly when navigating a curved path or making a turn during towing. Decelerate gradually while still on a straight path in anticipation of a turn.
- s) Observe towing angle limitation as sharp angle between the tug and the towbar during pushback or towing can damage towbar or aircraft.
- t) The general area of the operation shall be kept clear of GSE;
- u) Towing crew shall never enter runways and rapid exit taxiways;
- v) Towing crew shall request for follow-me service when required to do so;
- w) Towing crew shall always seek clarification if doubtful of towing instructions;
- x) Towing crew shall inform ACC if they are unable to execute an instruction / face difficulty in executing an instruction;

**Note: The brake operator/ flight deck engineer shall possess the Aircraft Radio Operator Approval (AROA) or other equivalent certification.**

## **11.2 Towing Requirements**

- a) When towing an aircraft into the designated stand, check that there is no FOD in the ERA and overlapping ERA/Keep Clear zones. The surface condition shall be safe for flight operations;
- b) Prior to commencement of a towing operation, establish communications between the airtug operator and the flight deck and/or brake operator;
- c) When communication is lost during a towing operation, stop movement immediately;
- d) Ensure hydraulic system pressure for aircraft braking and/or the brake accumulator is within required pressure range;
- e) Ensure any required electrical systems for towing are energized;
- f) Ensure all gear safety pins/sleeves are installed, and after tow, ensure all pins are removed and stowed;
- g) Ensure that the brake operator in the cockpit is qualified;
- h) Establish communication with the brake operator by means of the interphone system;
- i) Ensure that wheel chocks are positioned at the end of the manoeuvre, prior to disconnecting the towbarless airtug or tow bar.

**Caution: Inform the brake operator / flight crew and/or contact the maintenance department for technical inspection if you observe any type of excessive fluid leakage; notice any signs of unmarked aircraft damage; observe any fault, failure, malfunction or defect which you believe may affect the safe operation of the aircraft for the intended flight.**

### 11.3 Towing Manoeuvring

11.3.1 The towing manoeuvring procedure is similar for all aircraft types. The following minimum safety precautions and procedures shall be followed prior to and during aircraft towing operations:

- a) Align the towbarless airtug and tow bar combination to the aircraft centreline before the aircraft movement;
- b) Raise the tow bar wheels completely before the start of aircraft movement (if used);

**Caution: If the headset man is not in the airtug/towbarless airtug, he shall stay clear of the nose gear when the aircraft is moving and remain clear of the hazard zones during operation and avoid walking backwards when dispatching the aircraft.**

- c) Prior to the aircraft movement, make sure that the parking brakes are released, and the anti-collision lights are switched on;
- d) Wait for the authorization of the flight crew or brake operator before moving the aircraft;
- e) Start the pushback operation on a straight line;
- f) Keep the manoeuvring speed at minimum and apply the vehicle brakes gently;
- g) Do not exceed the towing speed limit as regulated; 25km/h for towbarless airtug and 15km/h for conventional airtug;
- h) Use relevant apron lines as guidance during manoeuvring to ensure safe obstacle clearance;
- i) Align the aircraft such that the taxiway centreline is in between the aircraft main landing gears to provide sufficient wing and tail clearance;
- j) Maintain a safety distance between vehicle;
- k) Stop 50 metres before a taxiway intersection, if a stop is required;
- l) Avoid sharp turns, which results in excessive tire scrubbing;
- m) Towing crew may take reference from the Taxiway centre-line;
- n) Do not stop abruptly;
- o) When arriving at the allocated position, move the aircraft in a straight line for a few meters to ensure that the nose wheels are in the straight-ahead position. This relieves any tensional stress applied to landing gear components and tires;
- p) Apply the airtug parking brake after a complete stop;
- q) Headset man shall ensure that the aircraft stops at the designated aircraft-type stop bar;
- r) Upon completion of the towing, headset man shall ensure that chocks are placed at the aircraft wheels and cones placement done in accordance with the airline's requirements or as recommended by IATA (IGOM)

#### **11.4 Radio Telephony Failure During Towing**

- 11.4.1 If 3-way communications between cockpit / headset man and airtug / towbarless airtug operator is not established, towing cannot commence. Towing team shall inform CAG ACC to facilitate the tow with a "Follow-Me" car.

#### **11.5 Wingwalker**

- 11.5.1 If wingwalkers are deployed, the wingwalkers or other assist personnel shall:
- a) Take instructions from the responsible ground crew;
  - b) Use proper hand marshalling signals (with reference to IATA IGOM) with either high visibility wands or bats. Lighted wands shall be used during low visibility / night operations
  - c) Be clear of engine hazard zones;
  - d) Ensure the aircraft movement path is clear of any obstructions, other aircraft, vehicles etc;
  - e) Provide "Safe to Proceed" clearance signals at all times to the headset man by using a distinct "Pendulum" motion of the arm;
  - f) Continue to monitor the aircraft path until the aircraft is stopped;

#### **11.6 Incidents During Towing**

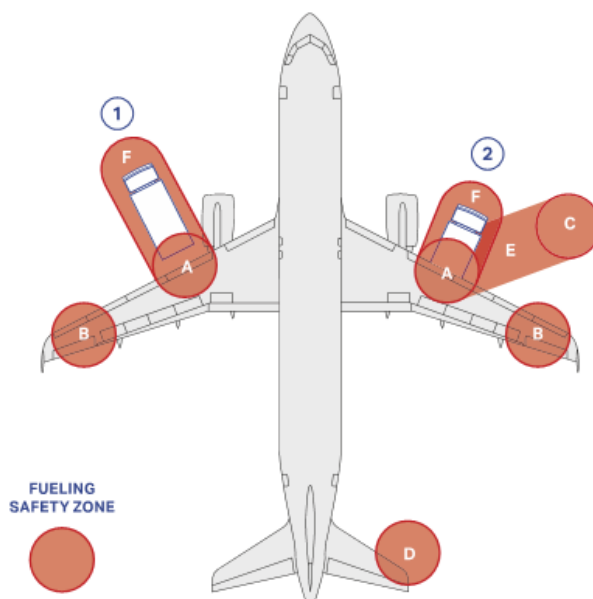
- 11.6.1 The airtug driver and brake operator shall continuously keep each other informed of any incident that happens during towing. Please see table below as reference to the IATA IGOM.

Brake Operator	Airtug Driver
<b>VHF Communication Failure</b>	
	<ul style="list-style-type: none"> <li>• Stop aircraft / airtug set immediately.</li> <li>• Apply airtug parking brake.</li> <li>• Advise Towing Regulation and wait for assistance (Follow me before completing the towing).</li> </ul>
<b>Airtug Failure</b>	
<ul style="list-style-type: none"> <li>• Inform CAG ACC.</li> <li>• Apply parking brake.</li> <li>• Listen to VHF and wait for assistance.</li> </ul>	<ul style="list-style-type: none"> <li>• Stop aircraft / airtug set.</li> <li>• Inform CAG ACC.</li> <li>• Apply airtug parking brake.</li> <li>• Chock the aircraft.</li> <li>• Listen to VHF.</li> </ul>
<b>Coupling Break Off</b>	
<ul style="list-style-type: none"> <li>• Brake the assembly by stepping on both brake pedals progressively.</li> <li>• As soon as the aircraft is at a standstill, apply the parking brake before releasing the pedal.</li> </ul>	<ul style="list-style-type: none"> <li>• Inform Brake Operator immediately</li> <li>• Do not apply airtug brakes.</li> <li>• Follow the aircraft path attentively and stop the airtug according to the aircraft position.</li> <li>• Chock the aircraft.</li> </ul>
<b>Airtug Fire</b>	
<ul style="list-style-type: none"> <li>• Inform AES and CAG ACC. <ul style="list-style-type: none"> <li>• Apply parking brake.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Inform the Brake Operator.</li> <li>• Stop aircraft / airtug set immediately.</li> <li>• Move airtug away as rapidly as possible.</li> <li>• Fight the fire, using the fire extinguisher.</li> <li>• Chock the aircraft.</li> </ul>
<b>Aircraft Fire</b>	
<ul style="list-style-type: none"> <li>• Inform AES and CAG ACC.</li> <li>• Apply the parking brake.</li> <li>• Evacuate the aircraft using on-board means, if required.</li> </ul>	<ul style="list-style-type: none"> <li>• Stop aircraft / airtug set immediately.</li> <li>• Move airtug away as rapidly as possible.</li> <li>• Chock the aircraft, where possible.</li> </ul>

## 12 Aircraft Fuelling

### 12.1 General Safety during Fuelling

12.1.1 The Fuelling Safety Zone (FSZ) is defined as an area of at least 3 metres in any direction from any centre point of all fuel vent exits, refuelling plugs, aircraft refuelling ports, fuel hydrants, fuel hoses and fuelling truck (fuel dispenser).



REFERENCE	DESCRIPTION
A	Aircraft refuelling port/plug
B	Fuel vent exit
C	Fuel hydrant pit
D	Fuel vent exit (according to the aircraft type)
E	Hoses
F	Fuel truck or hydrant dispenser
1	Fuel Truck
2	Hydrant Dispenser

12.1.2 The responsible ground personnel / refuelling operator is to ensure that he:

- Is issued with a valid CAG's ADP to drive and operate that specific equipment type;
- Wears a high visibility safety vest at all times;
- Does NOT smoke;
- Observes ramp safety rules (e.g. No horseplay on the job);
- Observes the danger areas / hazards on the ramp and take the necessary precautions for personnel and aircraft safety.
- Is aware of contacting ACC immediately at for any aircraft fuel spillage. Refer to the CAG FSM Chapter 9, on the reporting requirements for aircraft fuel spillages.
- Is aware of the location of the nearest emergency stop button;
- Does not litter or leave any refuse or FOD within the aircraft stand;

- i) Shall not consume any food or beverage and shall not feed any bird or animal;
- j) Checks that there is an unobstructed vehicle escape route for fuel truck/bowser.

12.1.3 The fuelling operator shall ensure that the fuelling vehicle:

- a) Is issued with a valid CAG's AVP and equipped with a valid fire extinguisher and current inspection tags;
- b) Has "no smoking" signs on both sides;
- c) Has externally mounted emergency engine stop controls clearly identified;
- d) Is fitted with aircraft wing proximity sensors on the elevating platform;
- e) Is equipped with spill containment kit.

## 12.2 Fuelling Vehicles Safety Driving & Parking Inside ERA

12.2.1 The following precautions shall be taken when operating fuelling vehicles within the ERA:

- a) Only move fuelling vehicles towards the aircraft when all the following criteria is met:
  - i. Aircraft has come to a complete stop;
  - ii. Engines have been switched off and are spooling down;
  - iii. Anti-collision lights are switched off;
  - iv. Wheel chocks are positioned; and
  - v. Ground / Flight Crew communication has been established and headset man has given the 'thumbs up' signal.
- b) Do not approach the aircraft until all safety cones have been placed;
- c) Fuelling vehicle is moved forward into fuelling position;
- d) Do not drive fuelling vehicles more than 5 km per hour;
- e) Test the brakes as soon as possible and before leaving the depot. Perform brake test before entering ERA. The approach to an aircraft shall be such that collision will be avoided in the event of vehicle brake failure;
- f) Do not use handheld PEDs (e.g. cell phone, laptops and tablets) when operating vehicles or equipment;
- g) Do not carry extra personnel during movement of fuelling vehicles unless that person is seated in a passenger seat provided in the vehicle or standing in a section of the vehicle which has been constructed for standing passengers;
- h) Do not drive the fuelling vehicles across the path of embarking and disembarking passengers. Aircraft passengers always have right of way;
- i) Checks that there is an unobstructed vehicle escape route for fuel truck/bowser;
- j) Do not leave any vehicle unattended with its engine running;

## 12.3 Pre-fuelling Operations

12.3.1 The fuelling operator shall ensure:

- a) Vehicle stabilizers are fully in contact with the tarmac before mounting on the elevating platform to connect the fuelling hose to aircraft coupling;
- b) Fuelling vehicle is positioned correctly to ensure that strain is not applied to fuelling hoses when connected to the aircraft;



- c) Bonding/grounding connections are established between fuelling vehicle and aircraft before fuelling operations;
- d) Lanyard connected to the hydrant pit valve is free of obstruction and readily accessible to the fuelling operator and ground personnel;
- e) Hydrant pit valve is identified by a four-winged flag, cone or equivalent;

## **12.4 Fuelling Operations**

### **12.4.1 The fuelling operator shall:**

- a) Use hand held dead man device throughout the operation and remains outside the vehicle cab at all times;
- b) Ensure fuelling hoses have sufficient length to allow the fuelling platform to be fully lowered while hoses/coupling are connected to the aircraft;
- c) Ensure fuelling hoses are not entangled on equipment during movement of fuelling platform;
- d) Ensure that fuelling platform is not raised or lowered when refuelling operations are taking place;
- e) Ensure that fuelling vehicle has interlock mechanisms to prevent vehicle from moving while hoses are connected to the aircraft;
- f) Exercise extreme caution when fuelling an aircraft during lightning and thunderstorms;
- g) Conduct post fuelling operations 360 degree walk to ensure all hoses are disconnected and stowed correctly;
- h) Clear FOD if any.

### **12.4.2 The refuelling operator shall shut down the refuelling operation whenever:**

- a) Any fuel is discovered to be leaking or spilling from fuel servicing equipment or hoses;
- b) Vehicle drives over any hose or bonding cable laid on the apron used for refuelling aircraft;
- c) Anyone is using PEDs (e.g. cell phone, laptops and tablets) within 3 metres of FSZ when refuelling is in progress, unless such device is intrinsically-safe certified;

**Note: Refuelling operations to be suspended during severe thunderstorms according to respective fuelling companies' guidelines.**

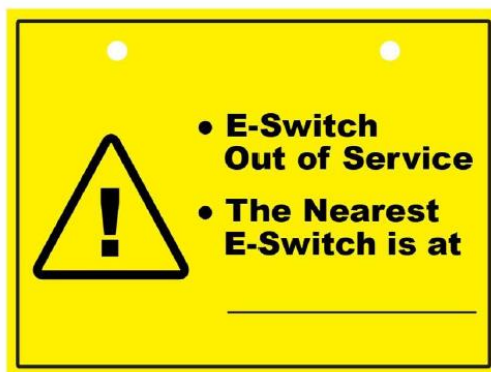
## 12.5 Aircraft Fuel Spillage

- 12.5.1 In the event of an overflow or leakage of fuel, the aircraft fuelling operator shall stop the fuel flow by releasing the Deadman switch and pulling the lanyard to shut off the hydrant pit quick release valve. If necessary, to activate the emergency stop button.
- 12.5.2 The emergency stop button should be activated only when there is a need to shut down aviation fuel supply to the airport, such as but no limited to, due to uncontrolled fuel spillage or major fire near fuel infrastructure (e.g. fuel pits). The personnel/operator who activated the button should also immediately or as reasonably practical call the CAFHI control room to inform CAFHI of the location and nature of the incident.
- 12.5.3 For any aircraft fuel spillage, please contact ACC immediately. Refer to the CAG FSM Chapter 9, on the reporting requirements for aircraft fuel spillages.

## 12.6 Contingency procedure for unserviceable CAFHI Emergency Stop Buttons

- 12.6.1 CAFHI currently maintains a network of Emergency Stop Buttons (ESBs) around the Changi Airport airside. The ESBs are a safety measure to deactivate the flow of aviation fuel in the event of an uncontrollable fuel spillage or other safety incident that requires fuel supply to be shut off
- 12.6.2 If a CAFHI ESB is not working and cannot be fixed immediately, CAFHI will display a sign on the relevant ESB to state that it is out of order. The sign will also state the location of the next available ESB(s) with the contact number to call and this sign will be removed once the ESB has been fixed.
- 12.6.3 In the event of an emergency near the out-of-order ESB that requires fuel supply to be shut off, airside users should call the CAFHI control room
- 12.6.4 Airside users may also choose to activate the nearest available working ESB as indicated on the sign. A sample of the sign that CAFHI will display is provided below.

### Sample of CAFHI sign to notify users of out-of-order emergency stop buttons



## **13 Training & Competency of Personnel of Ground Service Providers**

### **13.1 Introduction**

- 13.1.1 The objective of training is to ensure that personnel are equipped with the requisite skills, knowledge and attitude to complete their tasks in a safe and efficient manner.
- 13.1.2 To ensure safety, quality and proficiency on the airside, the GSP shall minimally cover all the safety standards and procedures stated in this Ground Operations Safety Manual (GOSM) which are relevant to the job scope of the operator.
- 13.1.3 Additionally, general safety guidelines as stated in Chapter 5 of GOSM and human factors topics such as communication, stress, fatigue and situational awareness should be included.

### **13.2 Programme Content**

#### **13.2.1 General**

- 13.2.1.1 The following safety training programme applies to personnel performing the following functions on the ramp:
  - a) Refuelling;
  - b) Line maintenance;
  - c) Ground handling operations;
  - d) Operation of vehicles and GSE e.g. tractors, belt loaders;
  - e) Supervision of ground handling operations.

#### **13.2.2 Safety training programme**

- 13.2.2.1 The safety training programme shall have topics covering all the following:

##### **13.2.2.2 Safety Regulations**

- a) Airside regulations;
- b) Safe working and operating procedures.

##### **13.2.2.3 Hazards**

- a) Aircraft and vehicle movements;
- b) Jet blast;
- c) Aircraft fuelling and fuel spills;
- d) Adverse weather conditions.

##### **13.2.2.4 Human factors**

- a) Communications;
- b) Stress;
- c) Fatigue;
- d) Situational awareness.

##### **13.2.2.5 Airside Markings and Signage**

- a) Roadways;

- b) Aircraft parking stands.

#### 13.2.2.6 Foreign Object Debris

- a) Be aware of the different type of FOD and the potential hazards posed by FOD;
- b) FOD prevention;
- c) How to report FOD; and
- d) FOD removal where possible and feasible



Removal of FOD

#### 13.2.2.7 Personal Protection Equipment (PPE)

- a) Hi-visibility safety vest;
- b) Protective gears.

#### 13.2.2.8 Emergency Situations and Reporting Procedures

- a) Fuel/hydraulic spillage;
- b) Vehicular incident;
- c) Aircraft incident.

### 13.2.3 Functional safety training programme

13.2.3.1 Personnel shall, as appropriate to their job function, receive training on the following applicable subjects:

#### 13.2.3.2 Aircraft Handling and Loading

- a) Operating procedures;
- b) Aircraft movement operations;
- c) Securing of load, ULD, pallet/container dollies and baggage trolleys;
- d) Docking and operation of equipment.

#### 13.2.3.3 Aircraft Ground Movement

- a) Operating procedures;
- b) Aircraft movement operations;
- c) Operation of equipment including (dis)connection procedures;
- d) Airfield layout;
- e) Standard phraseology.

13.2.3.4 Passenger Loading Bridge

- a) Operating procedures;
- b) Emergency switches and cut-offs.

13.2.3.5 Aircraft Docking Guidance System/Marshalling

- a) Operating procedures;
- b) Use of Aircraft Docking Guidance System
- c) Hand signals

13.2.3.6 Refuelling

- a) Operating procedures;
- b) Safety during aircraft refuelling.

**13.2.4 Structure**

13.2.4.1 Training should be a combination of theoretical and practical skills training to verify the learners understanding of, and ability to complete the task being trained.

13.2.4.2 There shall be an evaluation at the end of the training for the following ground handling activities:

- a) Aircraft docking guidance system/ manual marshalling;
- b) Operation of passenger loading bridge;
- c) Operation of motorised ground support equipment used for aircraft handling and loading;
- d) Aircraft pushback;
- e) Aircraft towing;
- f) Aircraft fuelling.

**13.3 Refresher Training Requirements**

13.3.1 The GSP shall clearly state down the competency which requires refresher training. There shall be a system and process to track and make sure that all staff attend the required refresher training on time.

13.3.2 The GSP shall have a system and process to track all the staff training record and make sure that only trained staff are deployed for operations. This requirement also applies for the contractors engaged by the GSP. The GSP shall be able to demonstrate that they have oversight on the contractors training and make sure that only trained contractors are being deployed for operations.

13.3.3 GSP shall have a retraining programme for staff/sub-contractors who are absent from operational duties for a prolong period of time. The purpose is to ensure the competency of staff/sub-contractors prior to redeployment. GSP may take reference from the relevant IATA materials to design their retraining programme.

## **13.4 Documentation**

### **13.4.1 Training materials**

13.4.1.1 The GSP must be able to demonstrate that the relevant standard operating procedures have been suitably translated into training materials for effective delivery to the staff. The training materials should also include risk communication components whenever applicable, that is to say, explain to staff the risk and hazards involved when certain procedures or steps are not being followed.

13.4.1.2 There shall also be a system for updating and documentation control of training material. Changes to processes or equipment shall be communicated to relevant personnel and appropriate additional information and training shall be delivered.

### **13.4.2 Training records**

13.4.2.1 All training programmes must be documented including:

- a) Description of the content of the training programmes;
- b) Induction, “on the job” and refresher/recurrent courses;
- c) Records of completed training;
- d) Schedule of planned training courses.

13.4.2.2 The GSP shall have a system in place for the retention of training records for a period stipulated by the GSP.

13.4.2.3 All training, assessments and competencies shall be documented in a timely and consistent manner.

13.4.2.4 The record shall identify the date when the particular subject matter has been delivered to the learner.

13.4.2.5 Training content and records shall be made available for review by Chang Airport Group when required.

## **13.5 Competency of Trainer, Assessor, Buddy for the On-Job Training**

13.5.1 Theoretical and practical skills training shall be conducted by personnel who have demonstrated the skills to deliver the training effectively, and who have competence (knowledge, skill and experience) in the subjects to be instructed.

13.5.2 Assessments shall be conducted by persons who have appropriate knowledge, skills and experience in the functions being assessed.

13.5.3 For training which has an on-the-job training (OJT) component, the ground service providers (GSPs) should also establish clear criteria in the selection of the OJT mentor, trainer and assessor.

13.5.4 Trainers shall keep themselves current in the subjects that they are required to conduct training on

### **13.6 Training for Aircraft Docking Guidance Systems/Manual Marshalling**

13.6.1 Initial training of ADGS and manual marshalling shall comprise of both theory and practical components.

13.6.2 Operators shall have experience operating the ADGS and conducting manual marshalling on live flights under trainer or mentor supervision before operating independently.

13.6.3 Operators who are qualified to operate the ADGS and conduct manual marshalling shall undergo refresher training every two (2) years. All training records shall be retained by the GSP and provided to CAG upon request.

### **13.7 Training for Passenger Loading Bridge Operations**

13.7.1 All PLB operators must be licensed by CAG to operate the PLB and hold a valid Class 'A' ADP. Operators shall be conversant with emergency procedures and comply with SOPs located next to all PLB consoles and other instructions which may be issued by CAG. Operators are to use the "Auto-Dock" function of the PLB console, if the PLB console is equipped with this function.

13.7.2 Operators who are qualified to operate the PLB shall undergo refresher courses every two (2) years and get their Class "A" renewed with ADC. All training records shall be retained by the GSP and provided to CAG upon request.

## **14 Ground Support Equipment Maintenance Programme**

### **14.1 General**

- 14.1.1 A GSE is any piece of mobile equipment, whether or not powered or self-propelled, purpose designed, built and used for ground handling, servicing or field maintenance of aircraft on the ramp.
- 14.1.2 The GSP shall have a maintenance programme that ensures that GSE remains safe to operate and in good condition. The GSP shall have a system in place that prevents operation of any equipment that is not deemed to be in a safe and serviceable condition.
- 14.1.3 If the GSP outsources the maintenance functions to external organizations, the GSP retains overall responsibility of such functions, and must demonstrate processes for monitoring the applicable external organizations.

### **14.2 Maintenance Programme**

- 14.2.1 The GSP shall ensure that the maintenance programme includes the following:
  - a) Preventive maintenance that is conducted minimally in accordance with OEM requirements;
  - b) Corrective maintenance

#### **14.2.2 Periodic checks/servicing**

- 14.2.2.1 This inspection shall be performed minimally in accordance to the schedule recommended by OEM, including necessary servicing and/or replacement of components.
- 14.2.2.2 The GSP shall have in place a defect reporting process, including corrective action plans to address GSE faults.

#### **14.2.3 Documentation**

- 14.2.3.1 The GSP shall ensure that maintenance records are retained according to the stipulated period by the GSP.
- 14.2.3.2 GSP should also trend repair and maintenance data.

#### **14.2.4 Treatment of Unserviceable GSE**

- 14.2.4.1 The GSP shall ensure that unserviceable GSE is removed from operations for repair and/or maintenance. The unserviceable GSE shall be indicated with out of service markers to ensure it is not being used for operations.



### **14.3 Fire Protection**

- 14.3.1 Fire is one of the most dangerous threats to an aircraft. GSPs shall ensure that GSEs are equipped with fire protection systems.

**Note: Operators shall not leave equipment unattended with engine running (with the exception of GPU).**

### **14.4 Grounded GSE**

- 14.4.1 GSP shall have a storage and return to service plan for GSE which have been suspended from operational use. The purpose is to ensure the serviceability of these suspended GSE before returning them back to operations. GSP may take reference from the relevant IATA materials to design their maintenance programme.

## **15 Contractor Management**

### **15.1 General**

- 15.1.1 Contractor management is the managing of outsourced work performed for an individual company.
- 15.1.2 If any part of the ground handling functions is outsourced to an external third-party, i.e. contractors, the GSP shall establish direct oversight to ensure that the function is conducted safely.
- 15.1.3 All safety information promulgated by CAG must also be disseminated to their contractors.
- 15.1.4 The GSP shall ensure that all contractors are trained before deployment. There shall be a process to monitor their training records to make sure that they also attend the necessary refresher training.
- 15.1.5 The GSP shall always maintain an updated list of contractors and to provide to CAG upon request.
- 15.1.6 The GSP shall inform CAG at least two weeks in advance of any planned changes in contractor or deployment of existing contractors. For example, changes in provision of handling services to airlines.

## ANNEX I - IMPORTANT CONTACT INFORMATION

### CONTACT INFORMATION



Airside Control Centre

6541 2151



Airport Information

6595 6868



Airside Management Centre

6541 2275/2273

*To report Airside incident /  
accident*



Medical Emergency

6543 2223



Fault Management Centre

6541 2424

*To report building fault and  
hazard*



Fire Safety

6541 2535



Airport Police

6546 0000



Airport Emergency / Fire  
Services

6541 2525



CAFHI

6546 4316/7

## **ANNEX II - AIRCRAFT MARSHALLING SIGNALS**

Give marshalling hand signals from a position forward of the aircraft while facing and within view of the pilot.

Use illuminated torch lights / wands to improve the visibility of the hand signals in the following situations:

- Insufficient apron lighting
- Poor visibility
- Night conditions
- When required by local Airport Authorities or regulations.

The hand signals are illustrated with the use of wands. The meaning of the signals remains the same with bats, gloves and illuminated torch lights.

**Note: Please refer to IATA IGOM latest edition for guidance on Aircraft Marshalling Signals.**

## **ANNEX III - AIRCRAFT ENGINE RUN-UP**

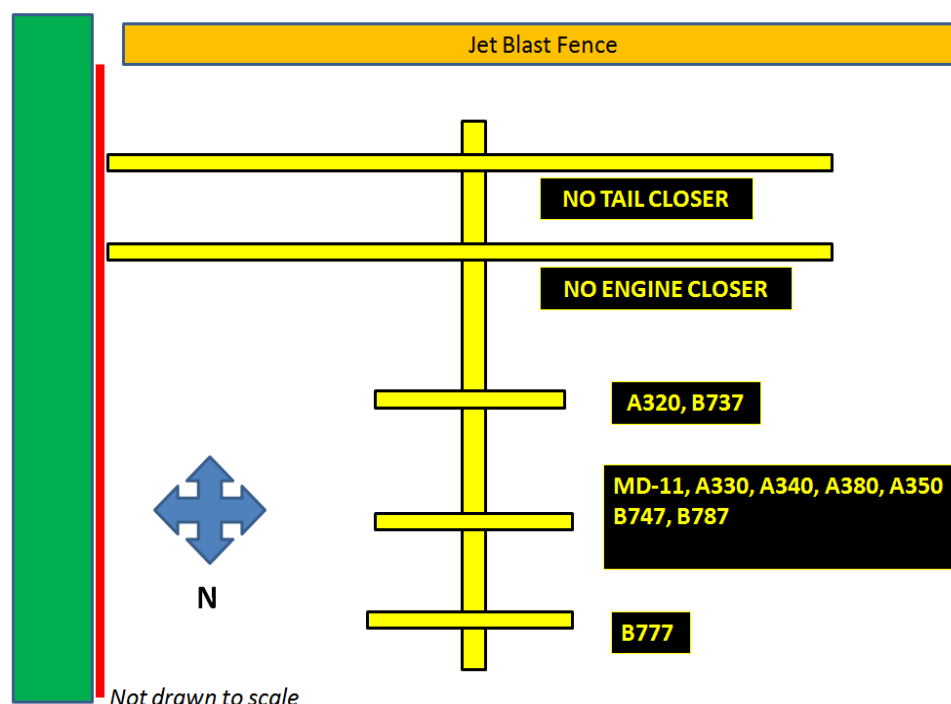
### **1 Conditions and Responsibilities for Engine Run at Aircraft Stands**

- 1.1 Aircraft engine run-up on the aircraft stands including the engine run-up stands is subject to the approval from CAG Airside Control Centre.
- 1.2 It is the responsibility of the person conducting the engine run-up to ensure all equipment, vehicles and personnel are well clear of the slipstream and blast areas prior to commencement of and during the run-up. The personnel is to discontinue the run when any movement, including aircraft, behind the aircraft conducting the run is detected. In addition, the personnel is also to ensure the following during the engine run-up:
- a) The aircraft wheels are adequately chocked, and the aircraft cannot move forward under any circumstances;
  - b) Where the engine run is carried out at the contact gates, the passenger loading bridge shall be retracted from the aircraft;
  - c) The aircraft anti-collision lights are activated and remain on during the entire ground run period; and
  - d) The engine run is carried out in accordance to the permitted duration and power (e.g. idle power).
  - e) All the safety cones around the aircraft shall be removed before conducting the aircraft engine Run-Up
- 1.3 When ready to start, the person intending to conduct the engine run-up shall call the CAG Airside Control Centre for approval on radio frequency VHF 121.9 MHz and thereafter, maintain a continuous listening watch until the engine run-up operation is completed.
- 1.4 The Duty Airside Controller may, even after approval has been granted, request the engine run-up to be discontinued if other operations of the airport are affected.

### **2 Location of Engine Run-up**

- 2.1 Subject to the approval from CAG Airside Control Centre, engine run may be carried out at the following aircraft stands at Changi Airport:
- (a) Contact gates – idle power engine run on one engine for up to 5 minutes only;
  - (b) Remote stands except stands 400 to 404 – idle power engine run up to 5 minutes only;

- (c) Remote stands 400 to 404 – idle power permitted up to **5** minutes provided there is no aircraft parked at aircraft stands D41 to D47;
- (d) Engine run-up stands 606 and 609 – up to take-off power engine run for all aircraft types.



Please refer to the above diagram on the ground markings for positioning the nose wheel for the various aircraft types operating into Changi to conduct engine ground runs.

### 3 Read back of Engine Run Approval

- 3.1 The person conducting the engine run-up is required to read back the approval granted by Airside Control Centre. The read back is deemed to be his acknowledgement for the approval and condition of the run-up granted and his acceptance of the conditions and responsibilities stated in the paragraphs above.

### 4 Safety measures before and during engine run at 609

- 4.1 Prior to commencement of aircraft engine run, the Engineer responsible for the engine run shall turn on the anemometer to check the wind speed and direction to confirm that the wind direction indicator does not fall within the coloured zones as indicated on the anemometer.

- 4.2 In the event that the wind direction falls within the coloured zones and the wind speed exceeds the limit indicated, the red warning light will be activated. The engineer shall then reduce engine power to idle or lower and inform Airside Control Centre on the change in engine power.

## **ANNEX IV - COMPASS SWING CALIBRATION (CSC) CHECK**

- 1 The compass swing calibration (CSC) site located on taxiway P behind stands 304 and 305 has been in operation since 10 April 2004.
- 2 **Operating Hours of the CSC**
  - 2.1 The use of the CSC is allowed only between 0200LT and 0600LT.
- 3 **Advance Booking**
  - 3.1 Airlines, aircraft operators or its handling agents are to provide at least 3 working days' notice in writing to CAAS Changi Tower and CAG Airside Control Centre for booking of the CSC site. Urgent requests with at least 1 working days' notice in writing would be facilitated on a case-by-case basis.
  - 3.2 Booking for the CSC site is subjected to acceptance by CAAS Changi Tower and CAG Airside Control Centre. Airlines, aircraft operators or its handling agents should not assume that their booking in writing is accepted and they are to call the CAG Airside Control Centre at least 24 hrs before the planned compass swing check to confirm acceptance of the booking.
- 4 **Towing of Aircraft to CSC Site**
  - 4.1 Prior to the approved time for compass swing calibration checks, the towing crew shall contact CAG Airside Control Centre on VHF 121.9 MHz for approval to tow the aircraft to the CSC site. CAG Airside Control Centre shall coordinate the towing request with Changi Tower.
  - 4.2 Upon reaching the CSC site on taxiway P, the towing crew shall hold the aircraft with its nose wheel at the stop line position on the centreline of taxiway P between Q1 and taxilane Q3, depending on its direction of tow.
  - 4.3 The towing crew shall inform CAG Airside Control Centre that the aircraft has stopped at the designated stop line position on the CSC site and request for permission to commence compass swing operation.
  - 4.4 Upon receiving the clearance from CAG Airside Control Centre, the towing crew shall immediately place an obstruction marker on each of the stop lines before intersections of the taxiway P and taxilane Q3 / taxiway P. Each obstruction marker shall consist of:
    - (a) A safety cone with a red fixed light mounted in a conspicuous position on it. ;
    - (b) A chequered flag of at least 0.5m square and red, orange or yellow or any one of these colours in combination with white mounted on the safety cone; and



## **5      Closure of Taxiway P**

- 5.1      The portion of taxiway P between taxilane Q1 and taxilane Q3 shall be deemed closed once permission has been granted by CAG Airside Control Centre to commence compass swing calibration checks.

## **6      Compass Swing Operations**

- 6.1      It is the responsibility of the towing crew to ensure that:
- (i)      The aircraft does not collide with any aircraft or vehicles during the process of towing and during the CSC operations; and
  - (ii)     The CSC site is cleared of obstructions prior to commencing the compass swing calibration check.
- 6.2      The towing crew shall also ensure that the tow tug adheres strictly to the circle (marked in broken white lines) in order to ensure that the towing aircraft is cleared of the aircraft parked on stand 303 and 306.
- 6.3      The towing crew shall maintain continuous listening watch on VHF 121.9 MHz throughout its compass swing calibration check.
- 6.4      The towing crew shall also ensure that continuous communication link
- is established between the engineer in the cockpit and the tow-tug driver throughout the compass swing calibration check.

## **7      Aircraft Movement on Taxiway N**

- 7.1      When a B744 (code E) is carrying out the compass swing within the calibration site, **only** aircraft types up to B744 (code E) can taxi on taxiway N and there is **no** clearance for A380 (code F) aircrafts to taxi on taxiway N.
- 7.2      When an A380 (code F) is carrying out the compass swing within the calibration site, there is **no** clearance for B744 (code E) or another A380 (code F) aircraft to taxi on taxiway N..
- 7.3      During B744 aircraft compass calibration checks, when notified by CAG Airside Control Centre that there is an expected A380 (code F) aircraft movement on taxiway N., the towing crew shall immediately position the nose wheel of the aircraft on the semi-circle closer to the parking stands 304 & 305 in order to maintain maximum separation from taxiway N.
- 7.4      During A380 aircraft compass calibration checks, when notified by CAG Airside Control Centre that there is an expected B744 (code E) or A380 (code F) aircraft movement on taxiway N., the towing crew shall immediately position the nose wheel of the aircraft on the semi-circle closer to the parking stands 304 & 305 in order to maintain maximum separation from taxiway N.

- 7.5 Please see the summary of the safety separation on aircraft carrying compass swing and aircraft taxiing along **Taxiway N**.

<b>Aircraft Type in CSC site</b>	<b>Safety Separation from a B744 on Taxiway N</b>	<b>Safety Separation from a A380 on Taxiway N</b>
B744 / Code E	Yes	No *
A380 / Code F	No *	No *

- \* The aircraft in the CSC site is to be positioned within the darker portion of the circle to provide safety separation from the specific aircraft type.

- 7.6 Airline, aircraft operator or its handling shall be aware that the compass swing calibration check maybe subjected to disruptions from time to time owing to aircraft movements on taxiway N

## **8 Completion of Compass Swing Operation**

- 8.1 Upon completion of the compass swing calibration check, the aircraft must be positioned on the centreline of taxiway P between taxiway Q1 and taxilane Q3.
- 8.2 The obstruction markers (stated in para 4.4) are to be removed before calling CAG Airside Control Centre on VHF 121.9 MHz for clearance to be towed from the CSC site. The direction which the aircraft is facing (East or West) should be reported when requesting for the towing clearance.

## **ANNEX V – GENERAL GUIDELINES ON WASHING OF AIRCRAFT EXTERIORS IN CHANGI AIRPORT**

### **1      Washing of Aircraft Exteriors in Changi Airport**

1.1      Washing of aircraft exteriors are categorised under 2 types of aircraft washing i.e. normal aircraft washing (with water only) and aircraft washing using chemicals/detergent.

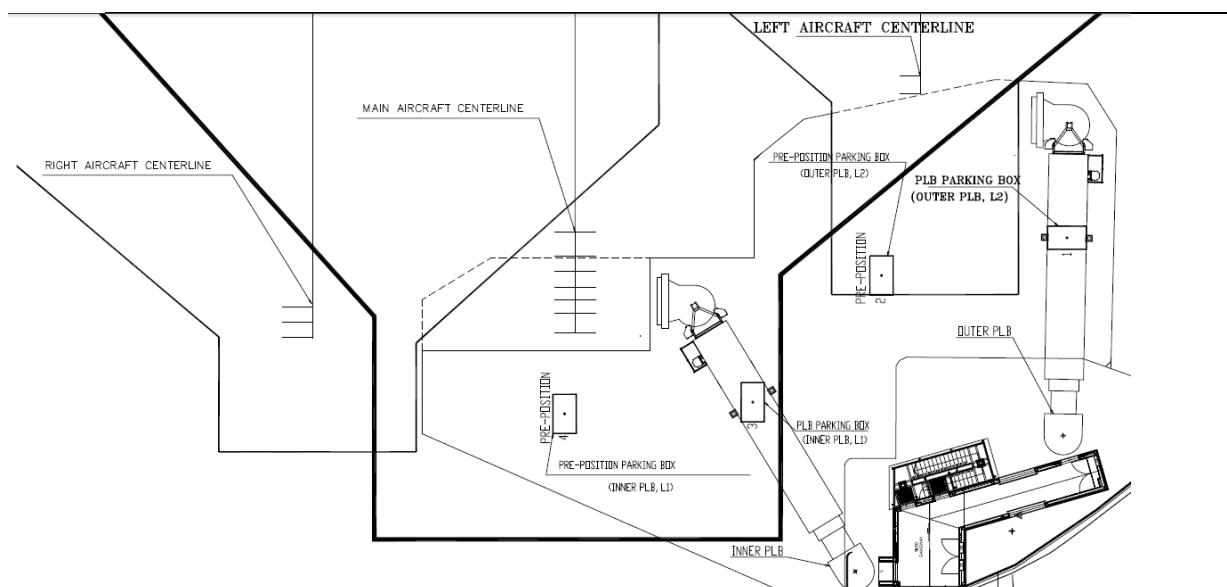
1.2      Aircraft washing using only water are allowed at any of the aircraft stands while those washings using both water and chemicals/detergent are allowed only at those aircraft stands fitted with grease / oil separators.

2          The Aircraft Stands fitted with grease/oil separators are:

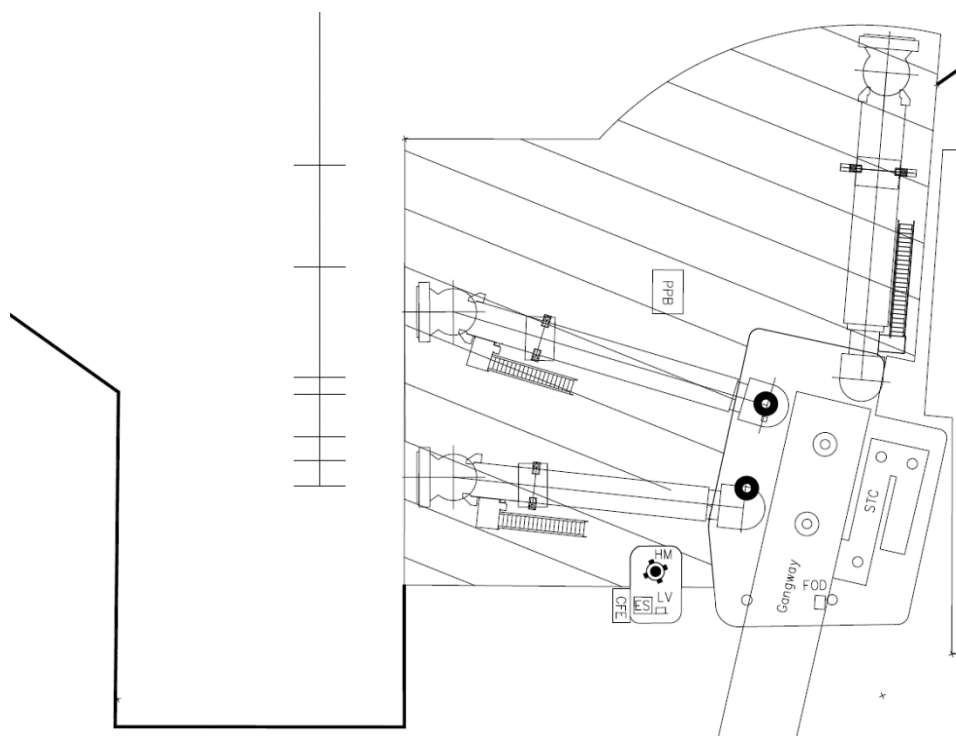
<b>Location</b>	<b>Aircraft Stands</b>
Terminal 1 Contact Stands	Nil
Terminal 2 Contact Stands	Nil
Terminal 3 Contact Stands	A3, A4, A16, A17, A18, A19, B3 and B4 ( 8 stands)
Terminal 4	G18 and G19 (2 stands)
Remote Stands	205, 206, 207, 208 and 209 461, 462, 463, 464, 465, 466, 467, 468, 469, 471, 472, 473, 474 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486 and 487 (31 stands)
Cargo Stands	503, 504, 505, 506, 507, 508, 510, 511, 512, 513, 514, 515, 516 517, 600 and 605 (16 stands)

## ANNEX VI - MARS LAYOUT AND A380 LAYOUT

MARS Layout



A380 Layout



## **ANNEX VII – EXCEPTIONS TO PLB WHEEL POSITIONS**

**The following exceptions apply for:**

### **(1) Pre-Arrival/Arrival Phase**

- i. For A380 aircraft type, the wheels of the PLB L3 arm must be in the pre-position box.
- ii. For code E aircraft in the MARS Centreline Stand, the wheels of the PLB L2 arm must be in the pre-position box.
- iii. For code C aircraft in the MARS Right Stand, the wheels of the PLB L1 arm must be in the pre-position box.  
(See Annex VI for the MARS and A380 layout)

### **(2) Pre-Departure/Departure Phase**

- i. For A380 aircraft type, the wheel of the PLB L3 arm is to be in the pre-position box
- ii. For code E aircraft in the MARS Centreline Stand, the wheels of the PLB L2 arm must be in the pre-position box.
- iii. For code C aircraft in the MARS Right Stand, the wheels of the PLB L1 arm must be in the pre-position box.  
(See Annex VI for the MARS and A380 layout)
- iv. PLB Operator is to retract the PLB from the aforementioned pre-position box to the park box after the aircraft is fully out of the ERA.