



# Runway Incursion Hazards and Mitigations

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# Safety Management System of AAHK



# Airfield Operations & Safety Committee

- Membership:

Airport Authority, Civil Aviation Department (ATC, Airport Standard, Flight Standards), Airlines Operators, Pilots' Association, Government Flying Services, Maintenance Franchisees, Bird Consultant

- Terms of Reference

- Improve visual aids and airfield facility to enhance safety and efficiency
- Review of airfield/aircraft incidents
- Coordinate safety improvement works
- Review low visibility operations procedures
- Update major runway construction works

# Runway Incursion

## Risk Identification & Mitigation

	Potential Hazard	Cause	Existing					Risk Reduction				
			F	C	R	Existing Protection	Recommendation/ Action	F	C	R	Comments	Hazard Controller
1.	Communication Hazards	Poor English; Wrong terminology; Poor equipment	4	5	A	Internal Training	Training & Certification by AAHK	2	4	B 2	Random audit by AAHK	AAHK
2.	Construction Hazards	Uncoordinated works; Poor worksite demarcation;	3	5	A	Works Method Statement in compliance with ICAO	Airfield Committee; Works Permit System; Escorter Training; Daily coordination meetings.	2	4	B 2	On-site inspection to confirm compliance to works conditions.	AAHK
3.	Visibility Hazards	Poor visibility due to weather	4	5	A	Minimize ground movement	LVO Procedure; Road restriction programme; Escort service to aircraft of taxiing ad on tow.	2	4	B 2	Regular review of the procedure with the Committee	AAHK
4.	Signage Hazards	Too complicated; Faded out markings; Blocked by glasses; Power supply failure to the signboard	3	5	A	Comply with ICAO	Pilots reports; Daily inspections; Monthly glass cutting programme;	2	4	B 2	Regular review of the procedure with the Committee	AAHK
5	Operational Hazards	Maintenance vehicles RFF vehicles	4	5	A	Training	Vehicle Transponder Requirement;	2	4	B 2	Regular equipment check;	AAHK
6	Airport Design Hazards	Too many intersections; Too many cross-runway aircraft	3	5	A	ATC Control	AIC; Airport Circulars; Pilot familiarization.	2	4	B 2	Regular review of the procedure with the Committee	AAHK

# Communication Hazards

## ***Factors that can result in confusion and unintended actions***

- Lack of vehicle driver proficiency in:
  - ATC terminology and instructions
  - Communication techniques
  - English Language
- Multiple tower / ground frequencies
  - Delayed response from tower

# Communication Mitigation

- To achieve required standards
  - Establish minimum language standards
  - Use standard phraseology
  - Develop radio operating procedures
    - When in doubt seek clarification
  - Require regular training and testing
- Use separate Tower / Ground frequencies
  - A frequency of local language, i.e. Cantonese, for aircraft towing at HKIA

# Standard Training Materials



Letter	Spoken as	Pronunciation	Letter	Spoken as	Pronunciation
<b>A</b>	ALFA	AL-fa	<b>N</b>	NOVEMBER	no-VEM-ber
<b>B</b>	BRAVO	BRAH-voh	<b>O</b>	OSCAR	OSS-cah
<b>C</b>	CHARLIE	CHAR-lee	<b>P</b>	PAPA	pah-PAH
<b>D</b>	DELTA	DEL-tah	<b>Q</b>	QUEBEC	key-BECK
<b>E</b>	ECHO	ECK-oh	<b>R</b>	ROMEO	ROH-me-oh
<b>F</b>	FOXTROT	FOKS-trot	<b>S</b>	SIERRA	see-AIR-rah
<b>G</b>	GOLF	GOLF	<b>T</b>	TANGO	TANG-go
<b>H</b>	HOTEL	hoh-TELL	<b>U</b>	UNIFORM	YOU-nee-form
<b>I</b>	INDIA	IN-dee-ah	<b>V</b>	VICTOR	VIC-tah
<b>J</b>	JULIETT	JEW-lee-ETT	<b>W</b>	WHISKY	WISS-key
<b>K</b>	KILO	KEE-loh	<b>X</b>	X-RAY	ECKS-RAY
<b>L</b>	LIMA	LEE-mah	<b>Y</b>	YANKEE	YANG-key
<b>M</b>	MIKE	MIKE	<b>Z</b>	ZULU	ZOO-loo

<b>Numeral Element</b>	<b>Number or Pronunciation</b>
0	ZE-ro
1	WUN
2	TOO
3	TREE (or THREE)
4	FOW-er
5	FIFE
6	SIX
7	SEV-en
8	AIT
9	NIN-er
Decimal	DAY-SEE-MAL
Hundred	HUN-dred
Thousand	TOU-SAND (or THOUSAND)



Phrase	Meaning
<b>ACKNOWLEDGE</b>	Let me know that you have received and understood this message.
<b>AFFIRM</b>	Yes.
<b>APPROVED</b>	Permission for proposed action granted.
<b>BREAK</b>	I indicate the separation between portions of the message. (To be used where there is no clear distinction between the text and other portions of the message.)
<b>CANCEL</b>	Withdraw the previously transmitted clearance.
<b>CHECK</b>	Examine a system or procedure. (No answer is normally expected).
<b>CLEARED</b>	Authorized to proceed under the conditions specified.
<b>CONFIRM</b>	Have I correctly received the following...? or Did you correctly receive this message?
<b>CONTACT</b>	Establish radio contact with....
<b>CORRECT</b>	That is correct.
<b>CORRECTION</b>	An error has been made in this transmission (for message indicated). The correct version is....
<b>DISREGARD</b>	Consider that transmission as not sent.
<b>GO AHEAD</b>	Proceed with your message.
<b>HOW DO YOU READ</b>	What is the readability of my transmission?

## TMR Telephony Phraseologies

### 5.1 **Apron Control, (Airfield 1).**

“(Airfield 1), Apron Control, go ahead.”

**Apron Control, (Airfield 1), R/T Testing, 1-2-3-4-5, 5-4-3-2-1, how do you read.**

“(Airfield 1), Apron Control, reading you 5.”

### 5.2 **(Airfield 1), Apron Control.**

“Apron Control, (Airfield 1), go ahead.”

**(Airfield 1), Apron Control, (CX123) on final for Stand (E3).**

“Apron Control, (Airfield 1), (CX123) for Stand (E3), roger.”

### 5.3 **(Airfield 1), Apron Control.**

“Apron Control, (Airfield 1), go ahead.”

**(Airfield 1), Apron Control, check progress of (CX123) on Stand (E3).**

“Apron Control, (Airfield 1), (CX123) tractor in position. Both airbridges retracted. Waiting clearance from ATC, expect 5 minutes.”

### 5.4 **(Airfield 1), Apron Control.**

“Apron Control, (Airfield 1), go ahead.”

**(Airfield 1), Apron Control, check clearance of Stand (E3) for (CX123) on final.**

“Apron Control, (Airfield 1), roger.”

# Certification System of HKIA

- Training & Certification of Radio Transmission Techniques for:
  - Airfield operators
  - Runway Maintenance personnel
  - Aircraft towing crews
- Biennial Recertification

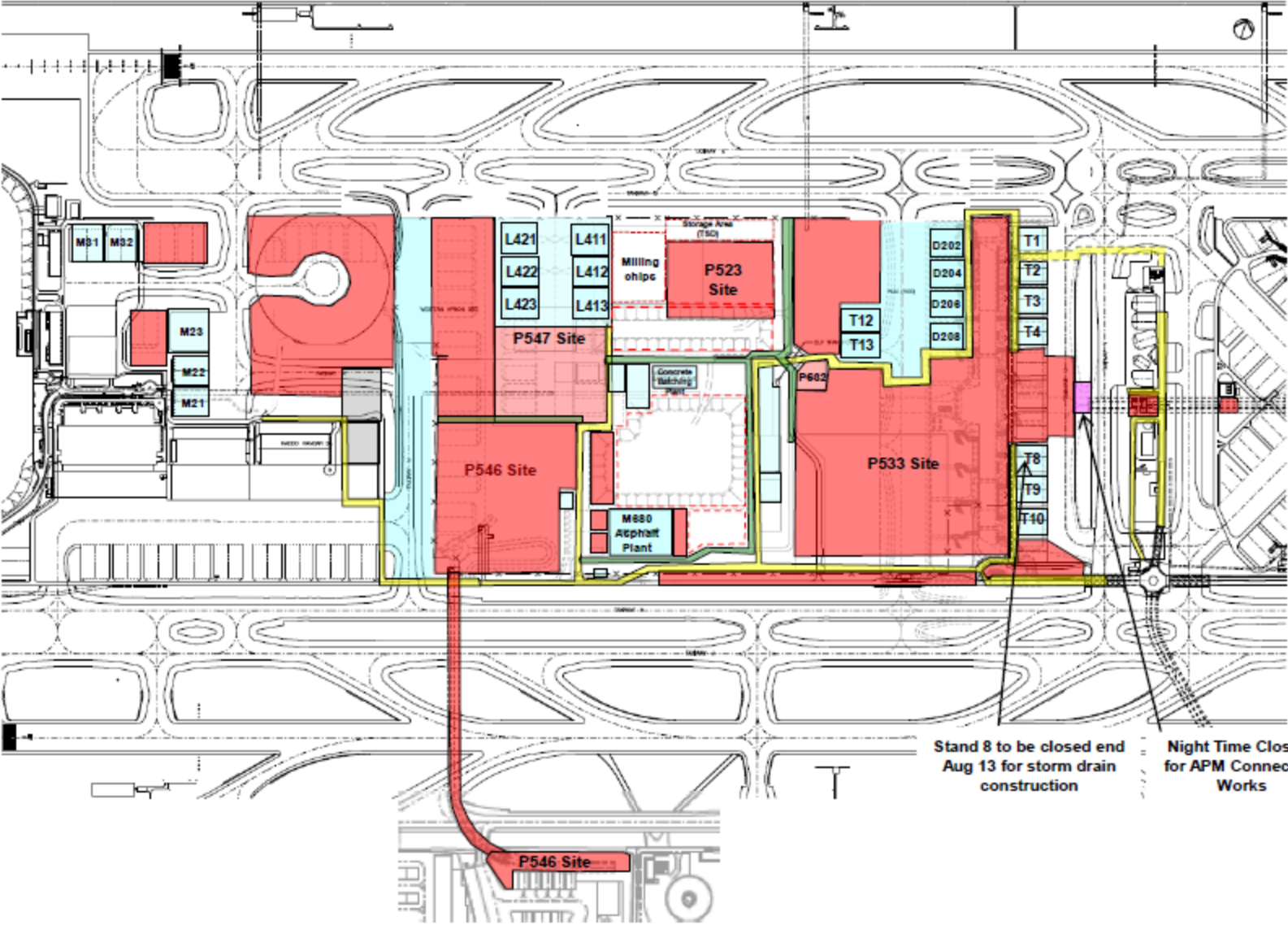
 香港國際機場   HONG KONG INTERNATIONAL AIRPORT	<b>AIRFIELD OPERATIONS CERTIFICATE</b>									
		<table border="1"><tr><td>Name:</td><td>CHAN TAI MAN</td></tr><tr><td>Company:</td><td>HAECO</td></tr><tr><td>Certificate No.:</td><td>HAE011179</td></tr><tr><td>Issuance Date:</td><td>20-Jul-2012</td></tr></table>	Name:	CHAN TAI MAN	Company:	HAECO	Certificate No.:	HAE011179	Issuance Date:	20-Jul-2012
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<b>Standards and Service Delivery Section Airfield Department</b>										
<table border="1"><tr><td>ATRC</td><td>Aircraft Towing &amp; Runway Crossing (Operator) (Valid until - 30/06/2014)</td></tr><tr><td>FGP</td><td>Fixed Ground Power System (Operator) (Valid until - 30/06/2014)</td></tr><tr><td>PCA</td><td>Pre-conditioned Air System (Operator) (Valid until - 30/06/2014)</td></tr><tr><td>VHF</td><td>VHF Radio (Operator) (Valid until - 30/06/2014)</td></tr></table>			ATRC	Aircraft Towing & Runway Crossing (Operator) (Valid until - 30/06/2014)	FGP	Fixed Ground Power System (Operator) (Valid until - 30/06/2014)	PCA	Pre-conditioned Air System (Operator) (Valid until - 30/06/2014)	VHF	VHF Radio (Operator) (Valid until - 30/06/2014)
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# Construction Hazards

## ***Hazards that appear when part of the airport becomes non-operational***

- May create unanticipated “hot spots”
- Potential need for vehicles or equipment to cross runways
  - The more crossings, the higher the incursion risk
- Potential impact on runway maintenance, snow removal or RFF procedures

# Recent Major Construction Works at HKIA





# Construction Mitigations

- Conduct a Risk Identification and Assessment exercise whenever the airport configuration changes
- Impose conditions by a Works Permits System
- Clear worksite demarcation by hoardings, marker boards and beacon lights
- Establish standard vehicle routes to avoid crossing aircraft movement areas
- Provide training for all drivers of vehicles that operate on the aircraft movement area, *OR*
- Escort by trained and certified drivers only, e.g. 2-3 works vehicles escorted into/exit airside every time

# Visibility Hazards

***Reduced visibility increases potential for ground crew disorientation and as a result incursions***

- Not only due to fog, but also glare, rain, sand, or reflection from snow or water

## Mitigations

- Implement low visibility procedures for all ground vehicles
- Establish low visibility routes
- Develop driver training / driver licensing programs
- Suspend aircraft towing / Escort service by airport operator, if necessary



# Low Visibility Procedure

## PART F OPERATIONAL PROCEDURES DURING LOW VISIBILITY CONDITIONS

### Section 1 General

1. Overview
2. Weather Criteria
3. Facility and Equipment
4. Low Visibility Route for Aircraft Ground Movement

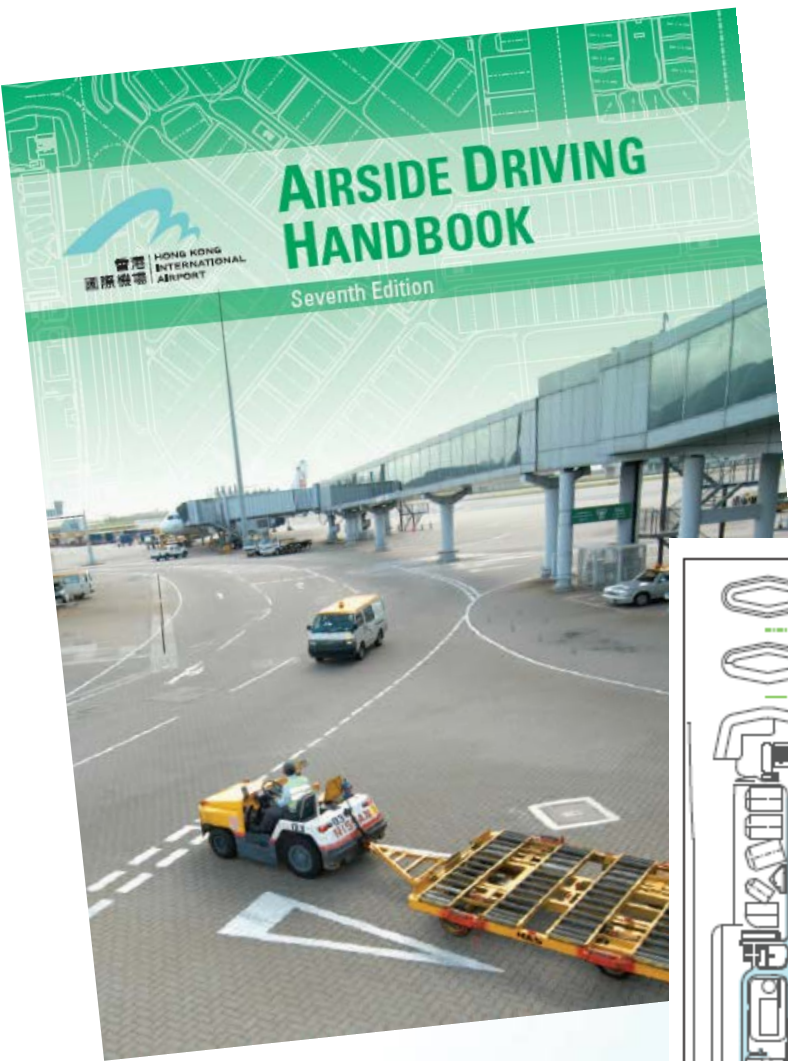
### Section 2 Responsibilities and Actions

1. Overview
2. Air Traffic Management Division, Civil Aviation Department
3. Airfield Department, Airport Authority
4. Technical Services Department, Airport Authority
5. Airport Fire Contingent
6. Airside Operators and Drivers

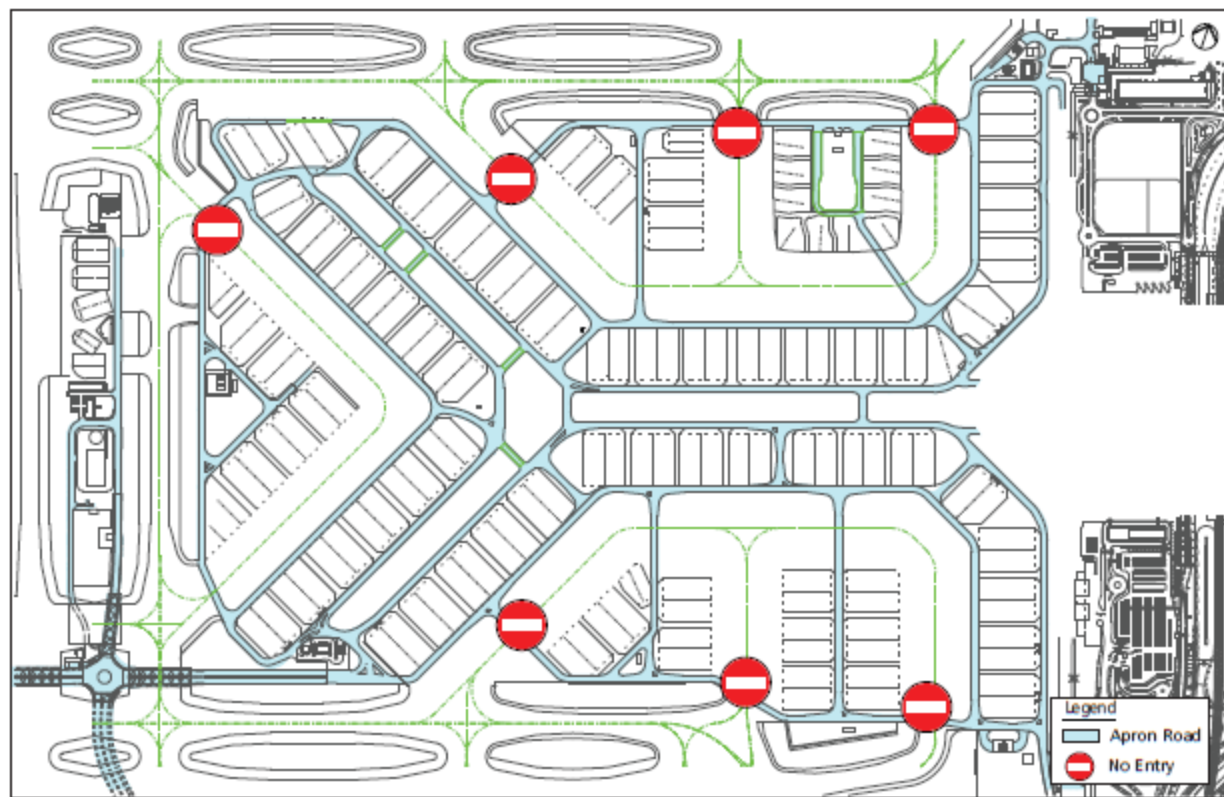
### Section 3 Low Visibility Airfield Inspection

1. Overview
2. Procedures

### Appendix 1 Low Visibility Operations



# Road Closure during low visibility



PLAN 4 – PASSENGER APRON ROAD RESTRICTIONS DURING LOW VISIBILITY OPERATION

# Signage Hazards

***Signage may be complex, inadequate or not clearly visible***

- Complex signage
- Inappropriate positioning
- Inadequate signage for:
  - closed runway
  - taxiway
  - hot spots
  - Non-movement areas



# Mitigations

- Establish a system to identify signage issues
- Regular review on adequacy of signage
- Install and maintain signs in accordance with regulatory requirements

## 2. MOVEMENT AREA GUIDANCE SIGNS

### a. Mandatory Instruction Signs

- White inscription on red background
- Identify a location beyond which an aircraft taxiing or vehicle shall not proceed unless authorized by ATC



No Entry

### b. Direction Signs

- Black inscription on yellow background
- Identify the designation and direction of taxiways at an intersection



Direction

### c. Location Signs

- Yellow inscription on black background (with yellow border where it is a stand-alone sign)
- Identify the designation of the location taxiway, runway or other pavement the aircraft or vehicle is on or is entering



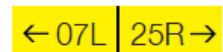
Location

### d. Destination Signs

- Black inscription on yellow background
- Indicate the direction to a specific destination on the aerodrome



Destination



Destination

# Mitigations

- Establish a maintenance program



# Operational Hazards

***Hazards that result from operational factors including:***

- Emergency vehicle operations
- RFF operations
- Maintenance vehicles and equipment
- Snow removal and deicing equipment
- Unidentified hotspots

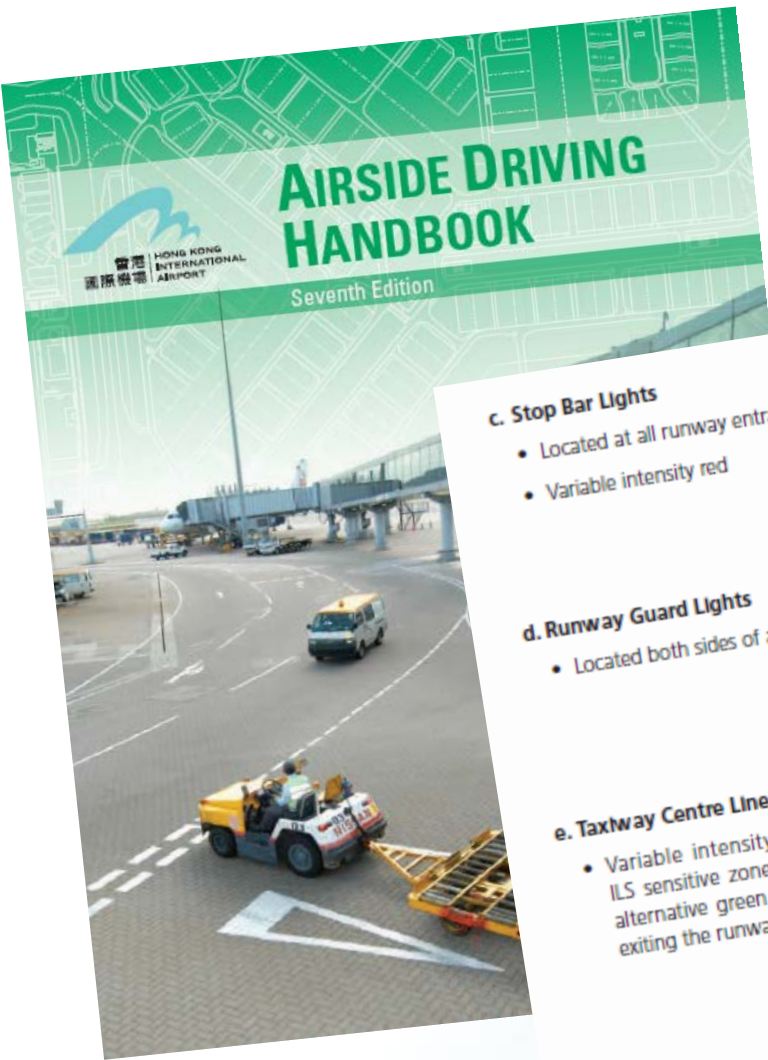
# Operational Mitigations

- Identify hazards associated with each of the operations
- Mitigate the hazards using appropriate training and technology and regulations
- Establish supporting guidance material



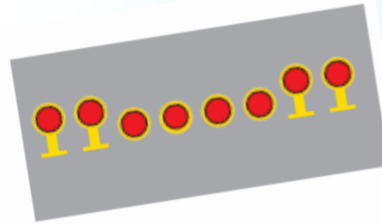
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Implementation

# Driver Training



## c. Stop Bar Lights

- Located at all runway entrances
- Variable intensity red



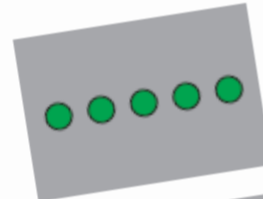
## d. Runway Guard Lights

- Located both sides of a stop bar



## e. Taxiway Centre Line Lights

- Variable intensity green except in ILS sensitive zone where they show alternative green / yellow to aircraft exiting the runway



## d. Runway-holding Position

- Stop side has two continuous lines



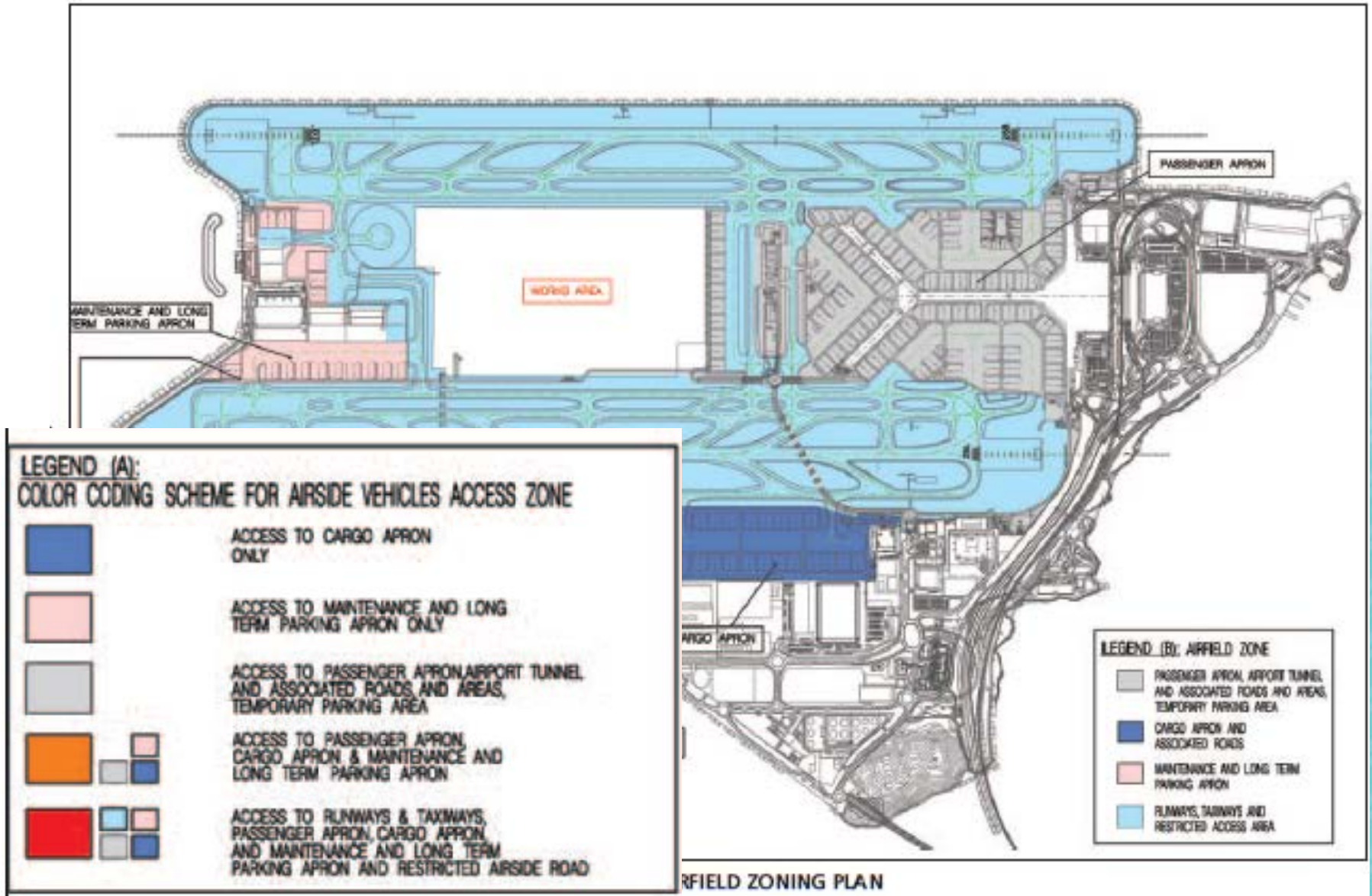
## f. Taxiway Edge Lights

- Variable intensity blue





# Vehicles Restrictions & Licensing



# Airport Design Hazards

- Runway and taxiway intersections
  - Intersections at various angles
  - Multiple runways and taxiways intersecting
- Runways in close proximity to terminals

## Mitigations

- Identify high risk locations
- Enhance signage and ground markings
- Develop a briefing package
- Implement SOPs for operations

Thanks