



Aeronautical Study “An Alternative Means of Compliance” – Perspective from KIAB

Introduction

Transposition

Standards
Recommended
Practices

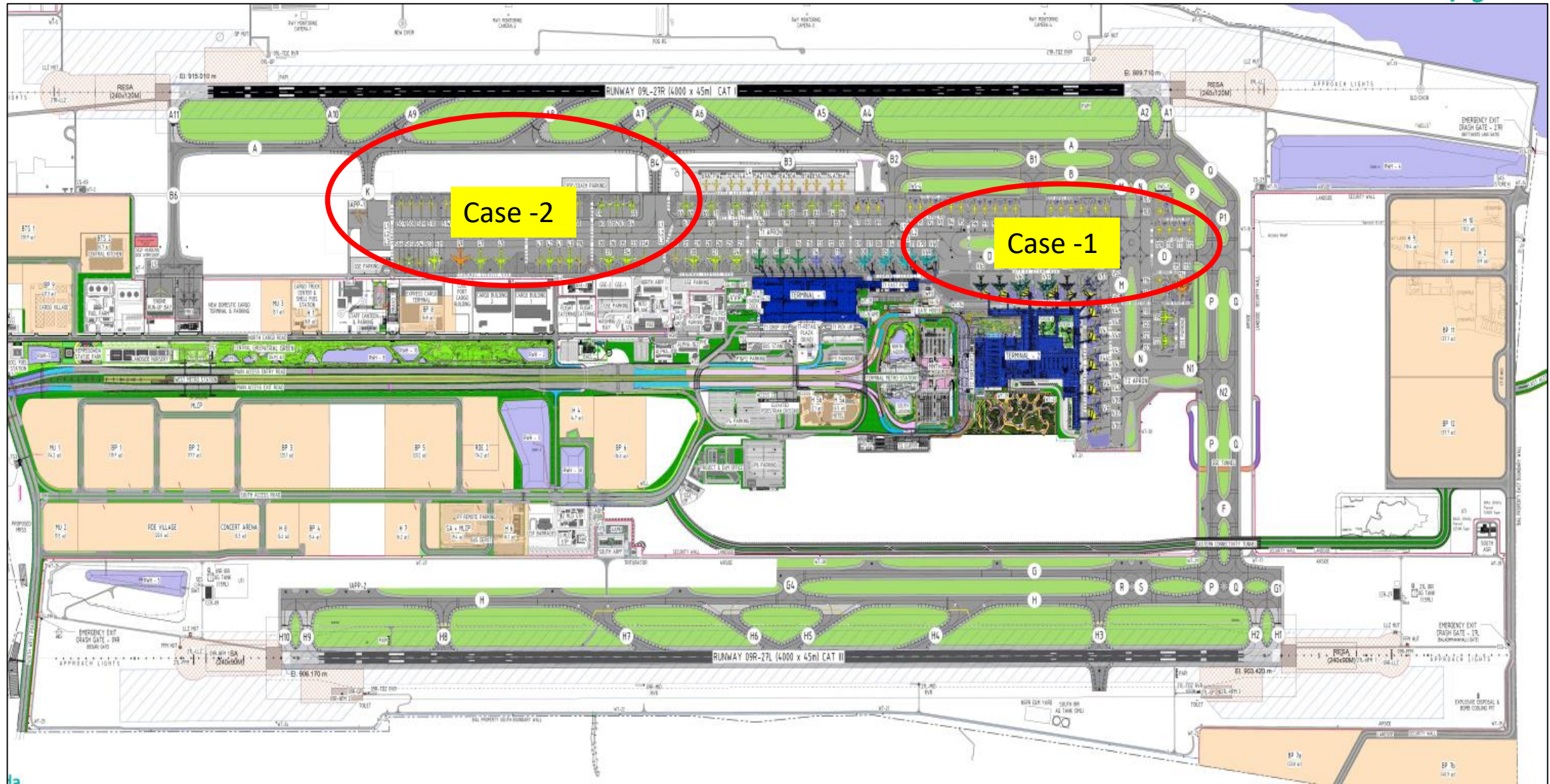
Exemptions

Permanent
Temporary

Aeronautical Study

- Safety and regularity
- Impact of deviation
- Alternative means
- Effectiveness
- Stakeholder collaboration

Airport Layout



Case -1

Aim of the Study – Developing Parallel Taxi Lane compatible for Code E & Code F

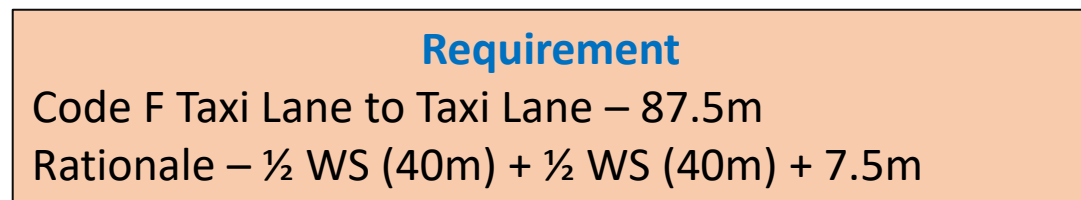
Background – ICAO Annex 14

Table 3-1. Taxiway minimum separation distances

Code letter	Distance between taxiway centre line and runway centre line (metres)								Taxiway centre line to taxiway centre line (metres)	Taxiway, other than aircraft stand taxilane, centre line to object (metres)	Aircraft stand taxilane centre line to aircraft stand taxilane centre line (metres)	Aircraft stand taxilane centre line to object (metres)
	Instrument runways				Non-instrument runways							
	Code number	Code number	Code number	Code number	Code number	Code number	Code number	Code number				
1	2	3	4	1	2	3	4					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A	77.5	77.5	—	—	37.5	47.5	—	—	23	15.5	19.5	12
B	82	82	152	—	42	52	87	—	32	20	28.5	16.5
C	88	88	158	158	48	58	93	93	44	26	40.5	22.5
D	—	—	166	166	—	—	101	101	63	37	59.5	33.5
E	—	—	172.5	172.5	—	—	107.5	107.5	76	43.5	72.5	40
F	—	—	180	180	—	—	115	115	91	51	87.5	47.5

Note 1.— The separation distances shown in columns (2) to (9) represent ordinary combinations of runways and taxiways. The basis for development of these distances is given in the Aerodrome Design Manual (Doc 9157), Part 2.

Note 2.— The distances in columns (2) to (9) do not guarantee sufficient clearance behind a holding aeroplane to permit the passing of another aeroplane on a parallel taxiway. See the Aerodrome Design Manual (Doc 9157), Part 2.



Code F Taxi Lane to Taxi Lane – 87.5m
Rationale – $\frac{1}{2}$ WS (40m) + $\frac{1}{2}$ WS (40m) + 7.5m

Code F Taxi Lane to Code E Taxi Lane – 80m
Rationale – $\frac{1}{2}$ WS (40m) + $\frac{1}{2}$ WS (32.5m) + 7.5m

Case -2 Upgradation of Code E Taxi Lane & Parking Stands - B747-8

Current Situation

- **Parallel Runways**
 - 09R/27L (4000M x 45M; Code F & CAT 3)
 - 09L/27R (4000M x 45M, Limited Code F (B747-8) & CAT I)
- **Taxiways** – 23M wide – Code F Compatible
- **Aircraft Taxi Lane**
 - L2 (Btn K & 49) & D – Code F Compatible
 - Remaining – Code E Compatible
- **Parking Stands**
 - Stands 02, V57, V60 (Contact Stands) and 49 & 114 (Non Contact Stands) – Code F Compatible
- **Operational Requirements**
 - A380 (Daily Pax) & Enroute Alternate
 - B747-8 (01 Daily Pax & 03 Daily Cargo) & Enroute Alternate

Airport Layout

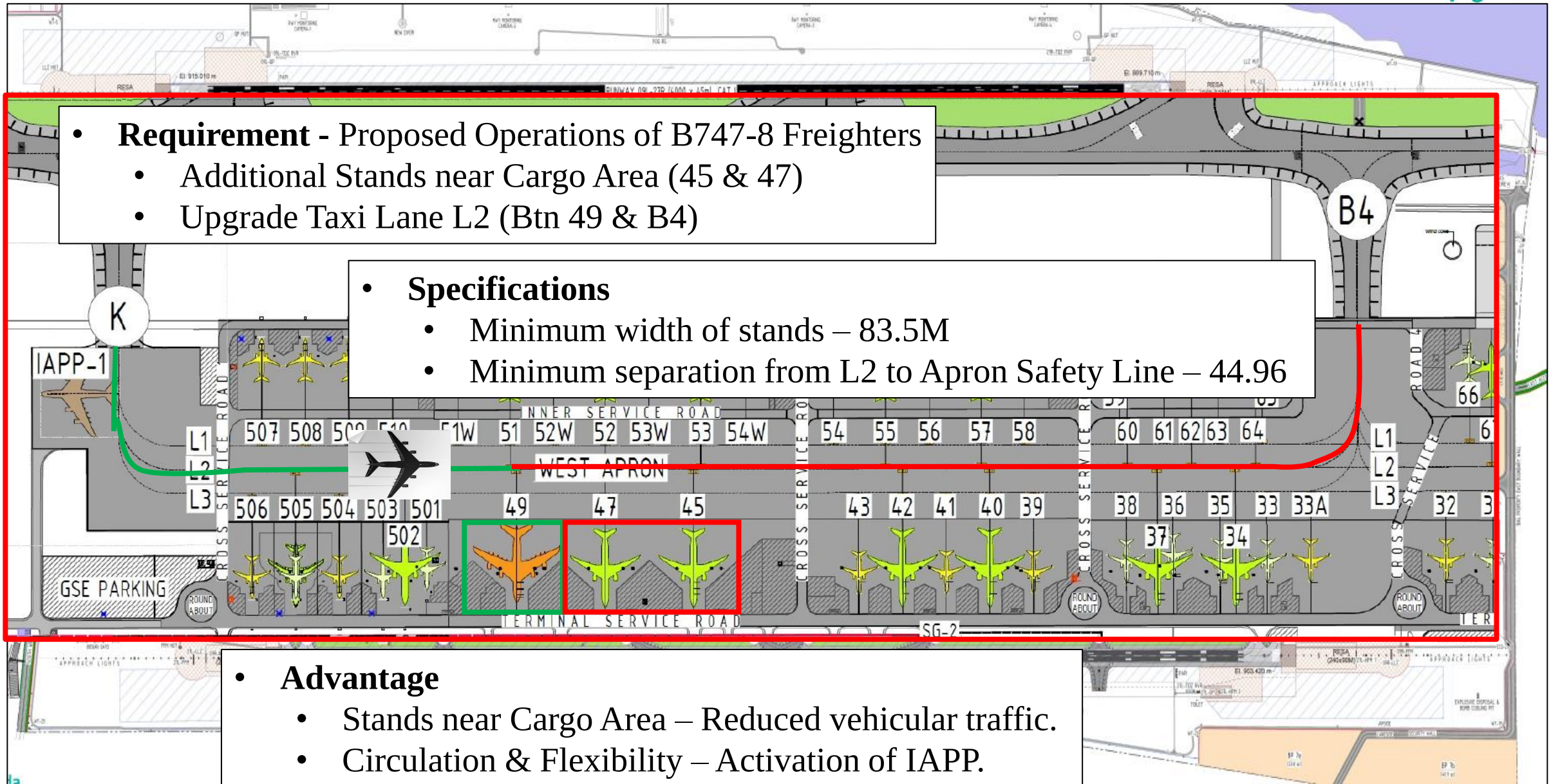
- **Requirement** - Proposed Operations of B747-8 Freighters
 - Additional Stands near Cargo Area (45 & 47)
 - Upgrade Taxi Lane L2 (Btn 49 & B4)

- **Specifications**

- Minimum width of stands – 83.5M
- Minimum separation from L2 to Apron Safety Line – 44.96

- **Advantage**

- Stands near Cargo Area – Reduced vehicular traffic.
- Circulation & Flexibility – Activation of IAPP.



Requirements & Applicability

An 14 – Table 3-1

Code Letter	Aircraft stand taxiway centre line to aircraft stand taxilane centre line (metre)	Aircraft stand taxilane centre line to object (metres)
F	87.5 m	47.5 m

An 14 – Para 3.13.6

Minimum clearances between an aircraft entering or exiting the stand and any adjacent building, aircraft on another stand and other objects – **7.5M**

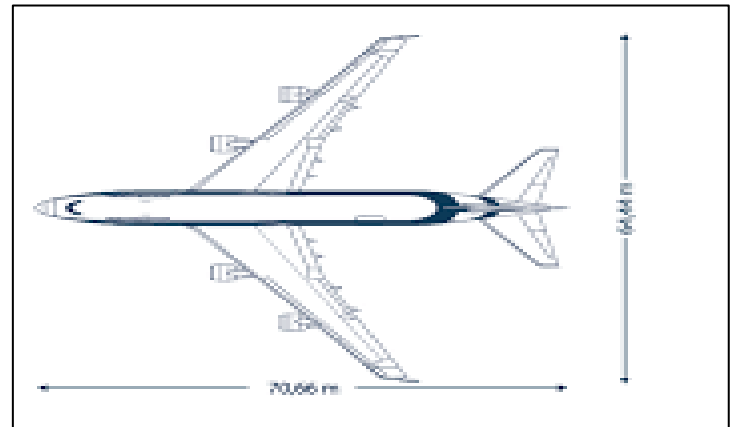
Applicability

Code Letter / Type of Acft	Aircraft stand taxiway centre line to aircraft stand taxilane centre line (metre)	Aircraft stand taxilane centre line to object (metres)
F /A380	$\frac{1}{2}$ WS (40m) + $\frac{1}{2}$ WS (40m) + 7.5m 87.5 m	$\frac{1}{2}$ WS (40m) + 7.5m 47.5 m
F/B748	$\frac{1}{2}$ WS (34.2m) + $\frac{1}{2}$ WS (34.2m) + 7.5m 75.9 m	$\frac{1}{2}$ WS (34.2m) + 7.5m 41.7 m

ADM 9157 Part-II:

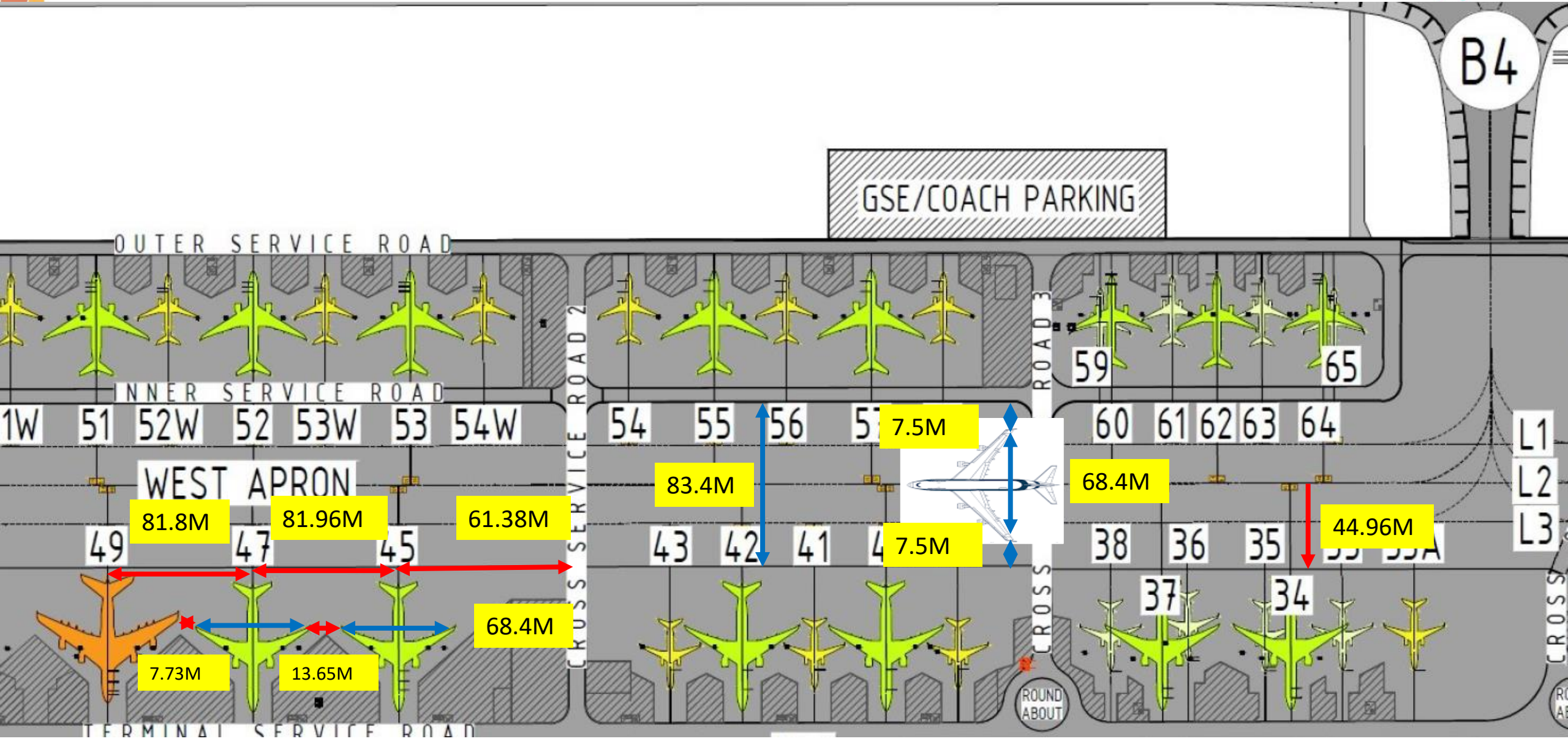
Taxiways Separation distance between centre line of aircraft stand taxilane and object:

$$\begin{aligned}
 &= \frac{1}{2} \text{ wingspan} + \text{gear deviation} + \text{increment} \\
 &= \frac{1}{2} \times 40 \text{ m} + 2.5 \text{ m} + 5.0 \text{ m} \\
 &= 40 \text{ m} + 2.5 \text{ m} + 5.0 \text{ m} \\
 &= \mathbf{47.5 \text{ m}}
 \end{aligned}$$



Aircraft Type	B 747-8
Aircraft Length	76.4m
Wingspan	68.4m

Availability at KIAB



Risk Assessment

- Identification of hazards, Consequence & Risk Management based on KIAB SMS
- Probability & Severity – Qualitative / Quantitative
- Recording in Haz Log – Hazards, Risks & Mitigation Measures. Haz ID – Operations - 43
- Review of Haz Log – Quarterly
- Risk Management – Identify, analyze, create mitigation measures (Impact to an acceptable level)
- Methods of Mitigation – Reduction of probability by compliance & procedures

Risk Assessment Matrix

Risk probability	RISK SEVERITY				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

Risk Tolerability

RISK INDEX	TOLERABILITY	SUGGESTED CRITERIA
3A, 4A, 4B, 5A, 5B, 5C	Intolerable	Unacceptable under the existing circumstances.
1A, 2A, 2B, 2C, 3B, 3C, 3D, 4C, 4D, 4E, 5D, 5E	Tolerable	Acceptable based on risk mitigation. It may require management decision.
1B, 1C, 1D, 1E, 2D, 2E, 3E	Acceptable	Acceptable as is. No risk mitigation required.

Risk Assessment

Hazard	Risk	Mitigations	Outcome
Reduced clearance on parking stands (Code F Requirements: 87.5m between stands and 47.5m from objects)	- Collision between Aircraft / Aircraft or GSE - Injury	- Separation based on Type - Markings & Signs - Marshallers - Charts	2C Acceptable based on Risk Mitigation
Reduced Taxiway separation distance for Code F (Code F Requirements: 47.5m from objects) (B748 wingspan: 68.4m)	- Collision between Aircraft / Aircraft or GSE - Injury	- Separation based on Type - Markings & Signs - Centre Line Lights - Selective Switchable - Follow Me Escort - Charts	2C Acceptable based on Risk Mitigation
Jet Blast – Break away thrust from aircraft holding on B4 facing TWY A	- Damage to Equipment - Injury	- If stopped, inspect stands behind. - Clear all the loose items.	2D Acceptable

Outcome

Stands 45 & 47 and Taxi Lane L2 between Taxiway B4 and Stand 49 can be upgraded for Limited Code F (B 747-8) Operations considering the actual specifications of the aircraft, available separations, implementation of mitigation measures and review process.



Thank You

Operated by

Bangalore International Airport Limited (BIAL)

