

KHULNA INTERNATIONAL AIRPORT

BY

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Abstract

This report aims to show a clear perspective to its reader about the importance of a new international airport with the growing air traffic and freight business in the southern part of this country. Airports are known as global hub. It is the only fastest way of connecting cities. It plays the most important part of countrys socio-economic situation. For many years the southern part was remain undeveloped because of unaccessibility and lack of road networking system. With the construction of new Padma bridge the socio-economical growth will take pace. To help its growth and keep pace with 21st century air traffic government is planning to build an international airport in Khulna. Throughout the previous 15 years air movement has expanded significantly in Bangladesh, freight transportation has additionally raised. Outer exchange has developed from \$1 billion to \$37 billion, and Shahjalal International Airport no longer can handle the gigantic stream of such exchange and travelers. Within next 25 years Dhaka airport(DAC)will go on its final limit with this kind of growth. Also it is very difficult to bring all the cargo to DAC and then send to different parts of the worlds. If an international airport is being constructed in Khulna it can support the people of the whole southern part and also can make a great impact in the socio-economic situation. Therefore the government is planing to go for the construction of Khan Jahan Ali International Airport in Khulna.

Table of Content

Introduction of the project	pg.03
Chapter 1: Background of the Project	
1.1 Project Introduction	pg.04
1.2 Projcet Specification	pg.04
1.3 Aims and Objectives	pg.05
1.4 Economical impact of the airport.....	pg.05
Chapter 2: Literature Review	pg.07
2.1 Hlstory of Dhaka Airport	pg.07
2.2 Evoluation of airports.....	pg.09
2.3 Basics of Airterminal Arrangements	pg.14
2.4 Airport Arrangements	pg.14
2.4.1 Holding bays and bypasses	
2.4.2 Apron Design	
2.4.3 Runway	
2.4.4 Taxiway	
2.4.5 Aircraft Dimension	
2.4.6 Turning radious of the runway and taxiway	
2.4.7 Turning radious of the aircraft	
Chapter 3: Site Analysis	pg.37
3.1 The Slte	pg.37
3.2 Approval for the Bagherhat site	pg.37
3.3 Reasons for recomanding Khulna	pg.37
3.4 Other important information	pg.38
3.5 Site Location.....	pg.38
Chapter 4: Case Study	pg.43
4.1 KL International Airport.....	pg.43
4.2 Heathrow Airport Terminal 4.....	pg.47
Chapter 5: Program Development.....	pg.49
Chapter 6: Design Development.....	pg.56

Introduction

Airports are known to be the most exciting buildings on earth. No other building type on earth does so much or has developed so rapidly. The 20th century, like 18th and 19th centuries, was largely hit by massive development in transport technology. From the very first people were trying to innovate the fastest mode of transportation. From the very begging of canal age we moved towards railway and from there we reached to the age of motor car and planes. By the beginning of the 21st century the airport terminal had become strategically the most significant structure in the world. Airports has become more of a symbolize of progress, freedom, trade and aspiration of their host countries on the global stage. From the very first flight of the Wright Brother's we have passed a century of architecture in developing a perfect airport. In 1909 when for the first time in world Louis Bleriot crossed the channel from France to England in a monoplane, architects have been fascinated by the idea of accommodating the plane. The ever airport in the world was first made in a Edwardian airshow. It was no more than a building structure and a level ground for landing and takeoff. It was in 1920s the need of planning an airport came into account with the increasing number of people using the building. From then to now airports have gone through several phases of development to achieve a optimum flow of getting people through the terminal building and on to the plane. After that airports soon became a new architectural building task (Hugh Pearman, 2004).

Airports are mainly knows as the gateway for people, places of arrival and point of departure. It is verifiably the primary point of communication for travelers arriving in a new nation and hence, air terminals are vital in making the initial introduction of that nation or city. It is not just a building structure anymore. "Airports are a national symbol, therefore no expense is spared to make sure mine is better than yours," says architect Ron Steinert. The world's most beautiful airports aren't just for show—they also bring heightened functionality. In other words, these airports will not only dazzle one person—their design

may also help them get to their gate on time. The avionics business itself is regularly thought to be a significant business because of its immediate effect on the health of our national and global economies. Air terminals contribute billions of dollars every year to our countries economic sector and make a huge number of employments for the common people. The history of aviation industry in Bangladesh started in 1971, just after the liberation war. The airport at Tejgaon, Dhaka was the only international one. This airport began to fail to fulfill the requirements of a modern international airport. A new airport Hazrat Shajalal International Airport previously known as Zia International Airport (ZIA) was built. Operational activities were shifted from Tejgaon to Kurmitola in the year 1980. It has been the center of all operational activities of CAAB within the country, and hub airport of the region (Civil Aviation Authority Bangladesh, 2016). Now this airport is left with 25 years of its life span and also its passenger holding capacity has crossed the limit. To help DAC share its load the government of Bangladesh is planning to construct an international airport in Khulna. The new airport will be planned in a way that it can contribute as long as 50 years. A pre-feasibility study of the airport has been done by CAAB and the new airport to be constructed is expected to be start soon.

The thesis paper covers the development of airports, some case studies, brief review of the technical details of modern airports, the studies of planning and organization required for an airport, schematic diagrams and the issues to be taken in consideration which are necessary to step into the architectural design of modern international airport. Khan Jahan Ali International Airport is an attempt to meet the demand of country's growing need and to provide facilities of international standards to make the southern part of the country economically strong.

Chapter 1: Background of the project

1.1 Project Introduction

To support the southern part of this country government is planning to construct this airport in a total of 690 acres of land. Initially they have plans to construct a single runway which will be 3350 m long and 300m wide. It will be an international airport with the state of the art facilities. Also it will include fire services, accommodation for the staff, aircraft maintenance department etc. With the domestic and international flight facilities they will also include cargo facilities to support the business growth of this area. The project is expected to be completed by beginning of 2021 (Civil Aviation Authority Bangladesh, 2016).

1.2 Project Specification

The new airport will be replacing Hazrat Shahjalal International airport which will lead to several impacts on the new location and also all over the world. There are around 400 aircrafts that flies in every 24 hours over the geographical location of Bangladesh. The construction of this new airport with all the modern facilities like refueling, hangers, transit, hotels, shopping etc are expected to attract more aircraft to land and thus contribute to the economy.

Name of the project: Khan Jahan Ali International Airport

Client: Civil Aviation Authority of Bangladesh (CAAB)

Site location: Khulna

Site area: 690 acre of land (including the buffer zone, future expansion area and air funneling zone)

Founded by: Government of Bangladesh

Budget: Not yet finalized.

Date of completion: June 2021 for the 1st phase

1.3 Aims and objectives

The aim of this project is to design a fully completely airport with a sufficiently bright, open and comfortable airport building; nice orientation system to find destination more effectively and a friendly environment with proper light, colors and space to create an airport experience that passengers will never forget. Passenger flow and capacity can be enabled through the easily understandable signage concepts, different colors and lighting concepts. Incorporated airport buildings with sensible passenger distribution and aesthetically well worm surroundings are expected to bring about an environment in which passengers will be able to perform all the activities in a stress free manner. The project has immense effect in national level as well as in international level. This airport will be a symbol for presenting the southern part of the country in the International platform and open new opportunities to bring in more wealth into the country economic growth by inviting buyers from everywhere throughout the world.

1.4 Economical Impact of the new Airport

Airports are now currently known to have a considerable economic and social impact on their surrounding regions. They upgrade the development of individuals, products, and administrations all through the nation and around the globe, permitting the economy to work all the more successfully and effectively. Typically, airports involve three revenue streams. Landside parking passengers pay money to park their cars; retail passengers and spend money at the airport's retail space and passengers also through airlines pay airport landing fees. However, the presence of an international airport can be a critical factor in attracting new inward investment from outside the area and specially companies from overseas, promoting the export business of that region, adding to the quality of life of citizens by enabling better infrastructures and facilities. Another important factor is that an airport attracts business and leisure visitors and hence inbounds tourism to the area,

generating income and employment in the tourism industry. The expansion of facilities like hotels, shops, restaurants, tourist's facilities at and around the airport is in such that these are more profitable than the airlines that use them. Nowadays only about 20% of the income of the major airports results from takeoff and landing fees, the traditional source of income. The remaining 80% is earned by letting space to the airlines, the operators, the luggage handling systems and the similar services, the other companies in the terminal and the users of other buildings on the grounds of the airport. Heathrow, for instance in 2000 has earned \$295 million, which far exceeded the income of British Airways, the major carrier at the airport (Smith, 2012). Through sensible arranging and outline, these open doors can be grasped to the benefit of the airport authority and the community at large. Because of this innovative economic advantage of the location it is conceivable to approach open assets to finance the work of the airport. Today airports are merely private business enterprises.. The picture is thus so essential and huge amount of money is invested in an airport project by various private sectors. If this airport is build in this region this will creat a great impact on the overall condition of this area. This airport will creat jobs on a global sclae and also will contribute to Mongla port, which the second major sea port of our country and also the tourism sector which has grown up surrounding the great Sundarbans. Due to the construction of the Padma Bridge all the major industries is now shifting their factories to this part of the country. So an airport of this scale this really a necessity here. That is why the impact of this airport to its surroundings is not negligible at all.

Chapter 2: Literature Review

2.1 History of Dhaka Airports

Dhaka Airport is the largest airport that we have in our country. Operated and maintained by the Civil Aviation Authority, Bangladesh, also been used by the Bangladesh Air Force. In 1980 it started operation in Kurmitola, taking over as the country's sole international airport from Tejgaon Airport. The airport's IATA code – "DAC" is derived from "Dacca", the previously used spelling for "Dhaka". The airport is built over 1,981 acres. This

international airport has a capacity of handling 15 million passengers annually and is predicted by the CAAB to be enough until 2026 (HSIA, 2016). To handle the future passenger rush and cope with the demands the CAAB is looking for new airport to replace this one. But to make a new airport in this size could take few years. For this reason for now they are now planning to make regional airports to shift some load to those airports. (Civil Aviation Authority Bangladesh, 2016).

Airports are like urban communities which is never static. They are continually developing in structure and capacity. For the past few decades, airports have been known as places where planes operate, with the help of runways, control towers, terminals, aircraft hanger point and with some other facilities which directly or indirectly serve aircraft, passengers and cargo. This conventional comprehension is offering approach to much more extensive, additionally incorporating idea known as the Airport City which has turned into the 21st century path forward for some airports (Kasarda, 2008).

Airports are now changing themselves into 'Airport Cities' and in the process they are having a massive effect on surrounding neighborhood and regional economies. It creates an impact on a city scale. From very begginign airports are playing a vital part in mass transportation. In 1920s it was 1st understood that it is necessary to arrange carefully the position of various structures of airport buildings like hangers, offices, post offices, warehouses, custom offices, waiting halls and so forth on the complex and the connections between them. At the very first people only used planes for war and it was only developed for this only purpose but as time go by people realized that it can also be used as transportation and thus the concept of an airport arise. In August 1919, Hounslow Heath Aerodrome, in London, England was the primary airplane terminal to operate planned international commercial flights. It was shut and supplanted by Croydon Airport in March 1920. In the United States, Bisbee-Douglas International Airport in Arizona turned into the main international air terminal of the Americas in 1928. And through this the jurney of the Airport began. The idea of solace and appearance on that time depended on the well-to-do travelers. However, now things have changed as air terminals are not constrained just to the rich and well beings of the general public. It is now a days turning

out to be increasingly mainstream and sometimes just the one and only mode of transportation. The elements of the air terminals are nowadays changing as to support the aviation industry. Air terminals are progressively getting to be administration lopes with an exhaustive scope of administrations. More shops, inns, eateries, multi-story auto stops and even films are getting worked inside the airplane terminals. Presently the authority needs the travelers to stay in the air terminal longer in an airport that fortifies utilization. Another essential aspect that has been definitely changed in the arranging is the security framework as a consequence of 9/11 catastrophe. Other than all these the design of the air terminal is additionally motivating significance to make uniqueness and high acknowledgment element. Airports are by and large built an area with great movement access and a huge catchment zone guaranteeing financial advantages for the city. In any case, then again it causes noise, depletes exhaust and disturbs the environment of that range. Accordingly a delicate consideration of the nearby urban development plan and buffer zone with innovative landscape ideas comes along with the planning and design of an airport (Kasarda, 2008).

2.2 Evolution of Airports

The first airport that the world ever experienced was the London Croydon airport which first came on service in 1915 after planes started to be used as commercial means of transportation. This airport was created for protection against Zeppelin raids during the First World War. Then a wooden air traffic control and Customs building was made to support the airfield. Though the flight was only possible for the rich and wealthy families at that time and the arrangements were all made only for them. From this very airport the journey of a century of Architecture began.



Figure: Londo Croydon Airport, 1915
 (source: <http://www.controltowers.co.uk/c/croydon.htm>)

After that time companies started to build aircrafts to carry people globally and London was in a need of a new airport which can carry more planes at exactly the same time. Many designs were made but one man came up with an ingenious idea, Mark Jakeman. He designed the world's first ever airport terminal building at London Gatwick.

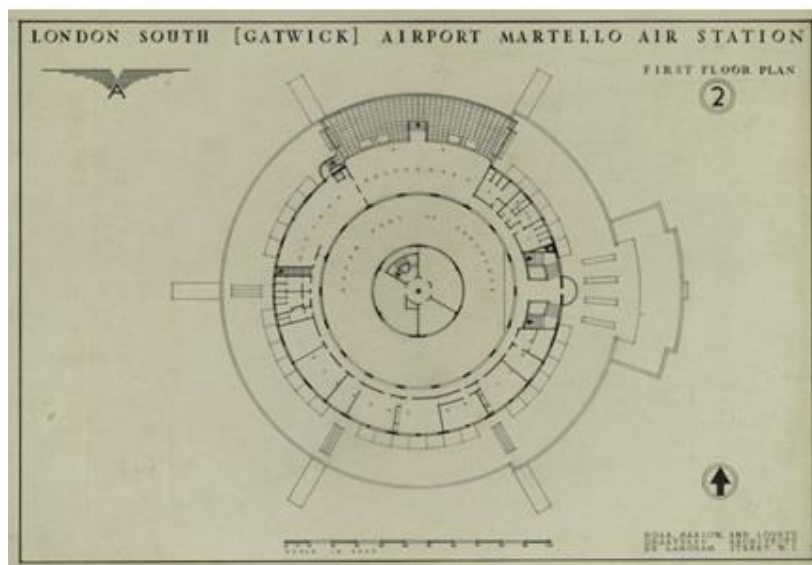


Figure: London Gatwick airport firts floor plan
 (source: http://www.british-caledonian.com/Gatwick_Airport_-_The_History_P2.html)

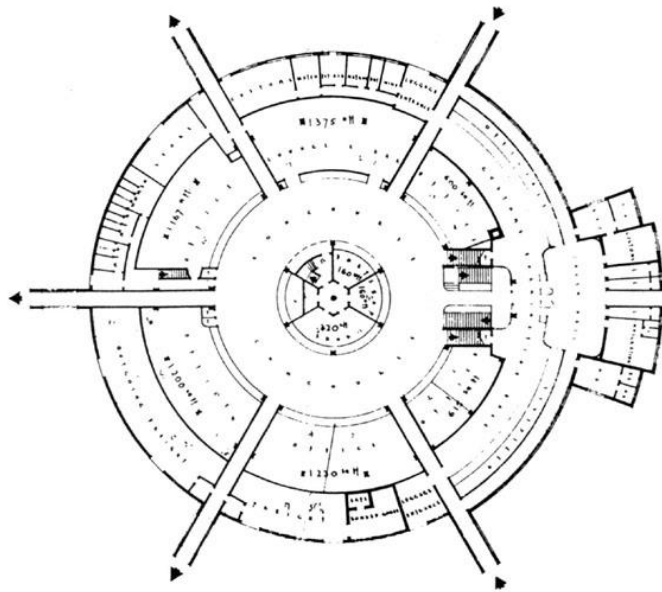


Figure: London Gatwick airport ground floor plan
(source: http://www.wikiwand.com/en/Beehive,_Gatwick_Airport)

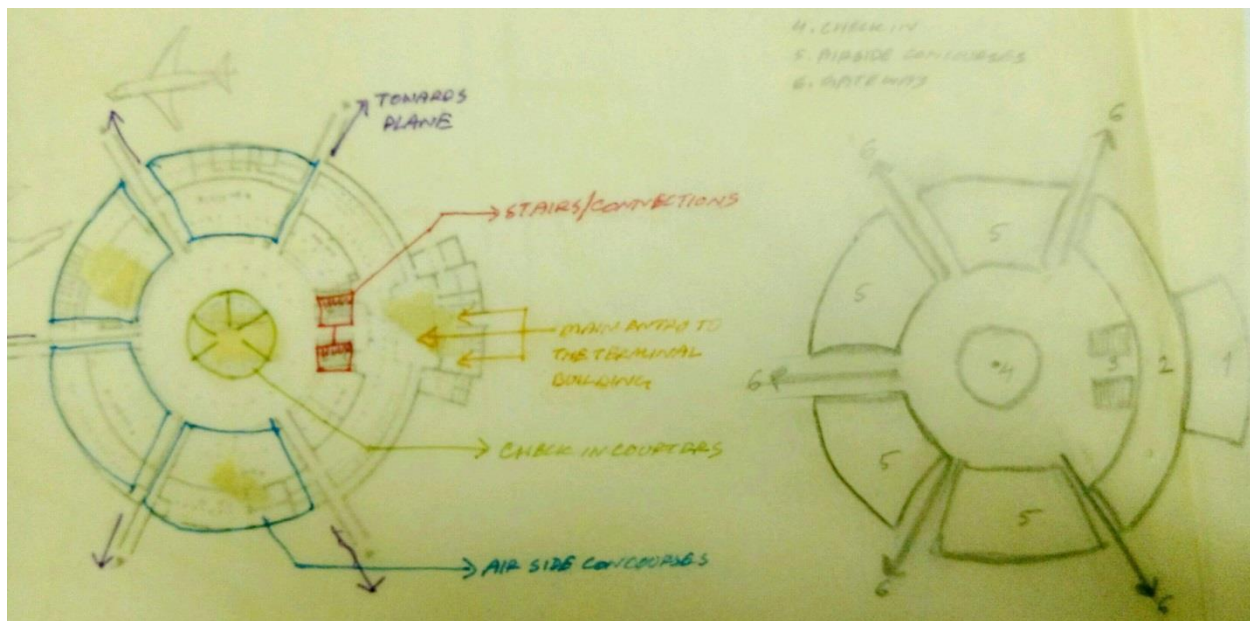


Figure: London Gatwick airport plan analysis
(source: Author)

After the age of propeller driven aircrafts came jets and London was in need of a new and bigger airport with new terminal concept and new technology. Lead architect Scott Brownrigg & Turner London Heathrow started its first journey. This terminal building used linear concept and arrange its functions accordingly.

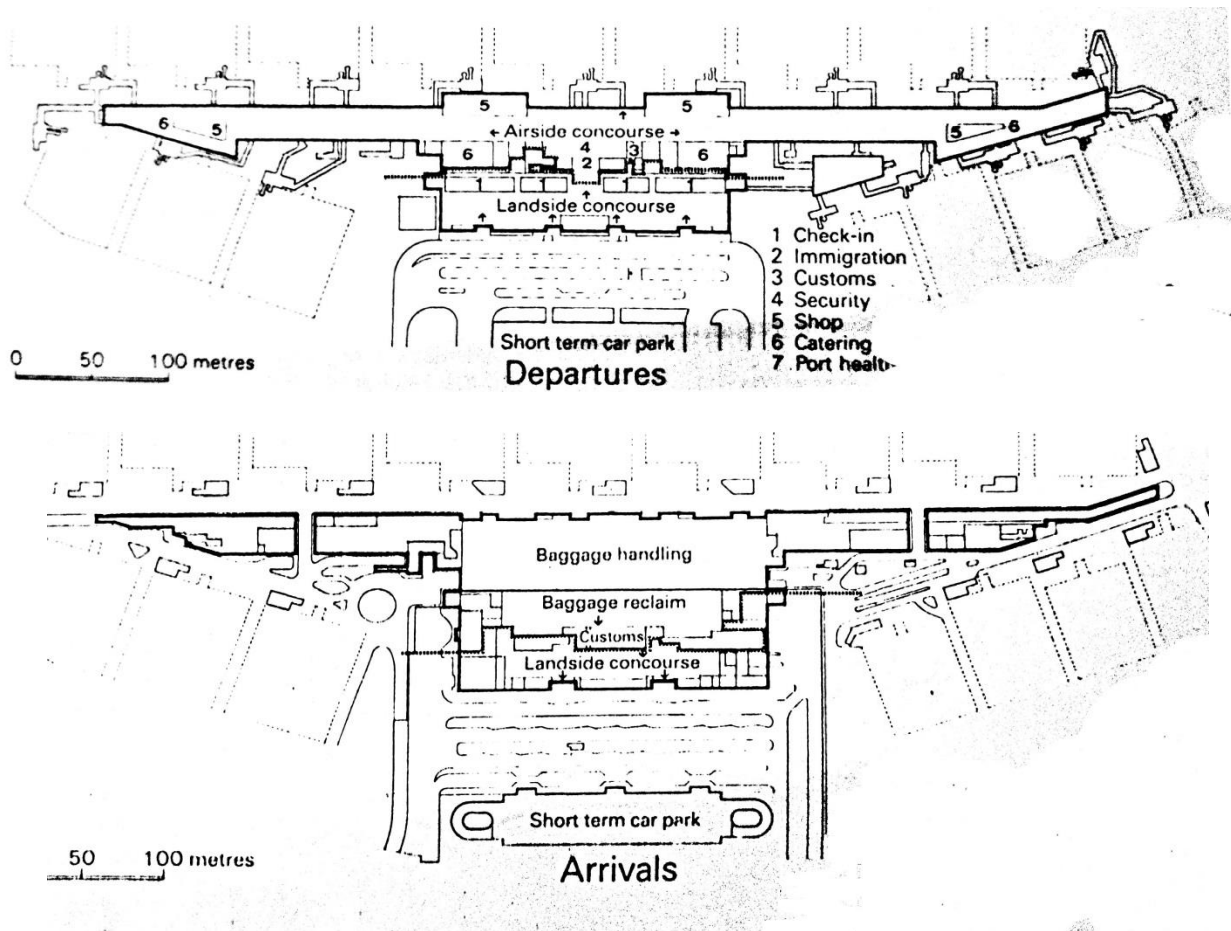


Figure: London Heathrow airport Terminal 4
source: Christopher J. Blow (1998), Airport Terminla, 2nd Edition



Figure: London Heathrow airport Terminal 4, Diagrammatic presentation, (source: Author)

In this way airports has continued to grow till this date and new concepts of pier design started to get shape. In Hongkong Sir Norman Foster and in Bangkong different concepets of pier design took place.

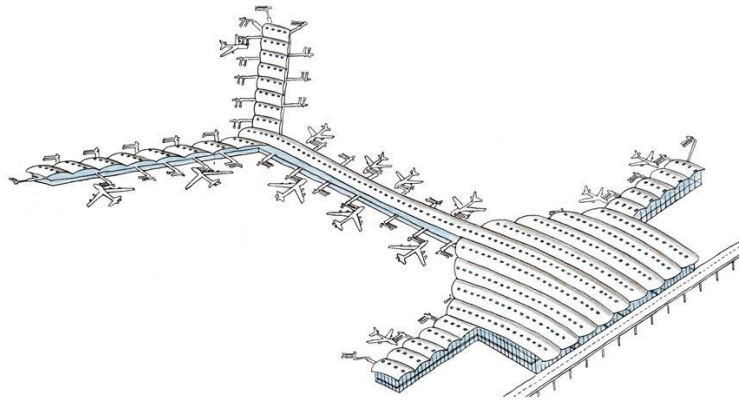


Figure: Hongkong International Airport
(Source: Foster & Partners)

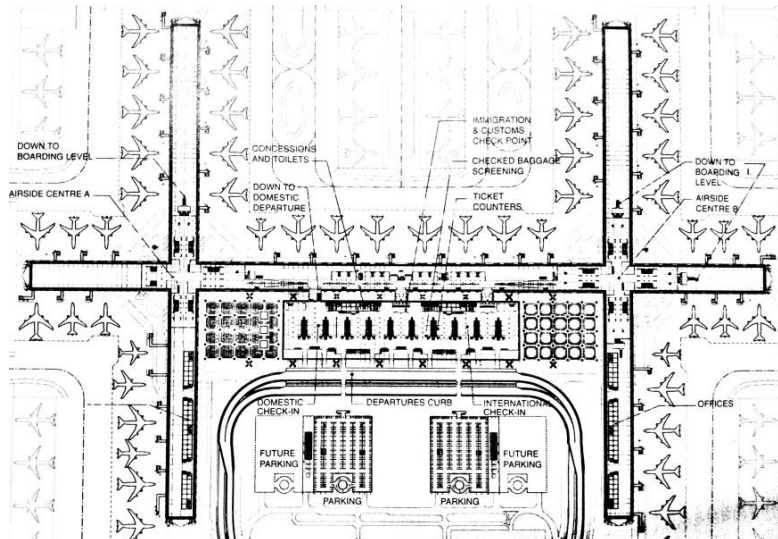


Figure: Bangkok International Airport
Source: Hugh Pearman (2003), Airports, Acentury of Architecture)

At the very last stage after all this years of design development this two airport come out on top of airport design. The Hong Kong International Airport designed by Sir Norman Foster is the truly an engeneering marvel. It was designed in all under in one single roof and the concept he used is pier concept. It s known as a true airport city for the Hong Kong city. Similarly another one is Bangkok airport and despite of its size it is also a well

solved functional airport and also designed under a one roof concept. Airport are now days are becoming more and more simpler but immensely complicated

2.3 Basics of Airterminal Arrangement

According to US Federal Aviation Administration there are 5 initial components that an airport consists of

- The runway
- The parking and service space for the aircraft
- The technical facilities for maintenance of the aircraft
- The flight gates
- Passenger terminals

The secondary components are

- Tower
- Fire station
- Access drives
- Car parks
- Other buildings

These components ought to be considered as the part of the airport complex and their position and connection between each other must be kept up with appropriate arranging and associations.

2.4 Airport Arrangement

As per zoning wise the entire air terminal can be divided as three sections

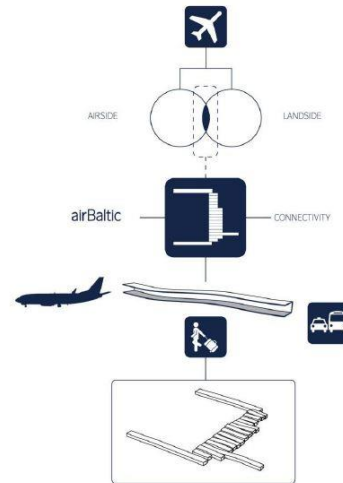
- Air side
- Terminal building
- Land side

Airside

- Apron
- Taxiway
- Runway

Land side

- Parking area



Terminal is in between land side and air side allowing passengers to pass through 5 levels of security services.

2.4.1 Holding bays and bypasses

It is a defined area of an airport where aircraft hold its position till the runway is cleared for takeoff. Holding bays and bypasses are provided where amount of air traffic is very high in numbers.

Types of bypasses

- Dual taxiways
- Holding bays
- Dual runway entrances
- The runway thresholds
- Blast pads

(Source: US Airfield Standards)

Dual Taxiways: It is a second taxiway or a taxiway detour to the typical parallel taxiway. Taxi passes can be built at moderately minimal cost, yet gives just a high measure of flexibility.

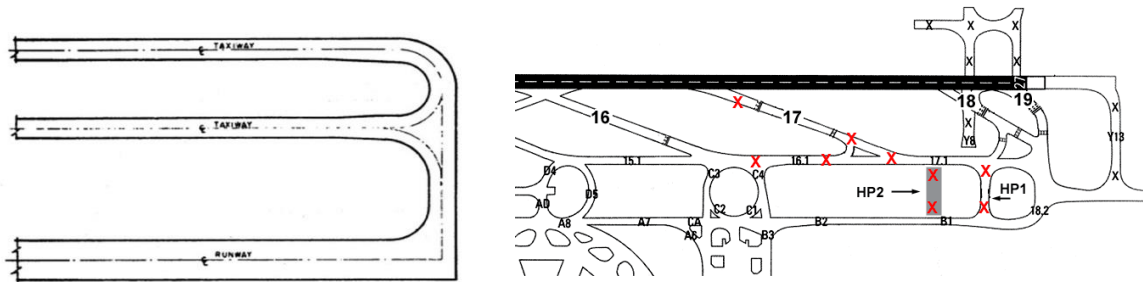


Figure 01: Dual parallel runway (Source: US Airfield Standards)

Holding bays: A defined area where aircraft can be held, or bypassed, to facilitate efficient surface movement of aircraft.[ICAO (2004) Official definition, Annex 14/I, Aerodromes — Aerodrome Design and Operations].

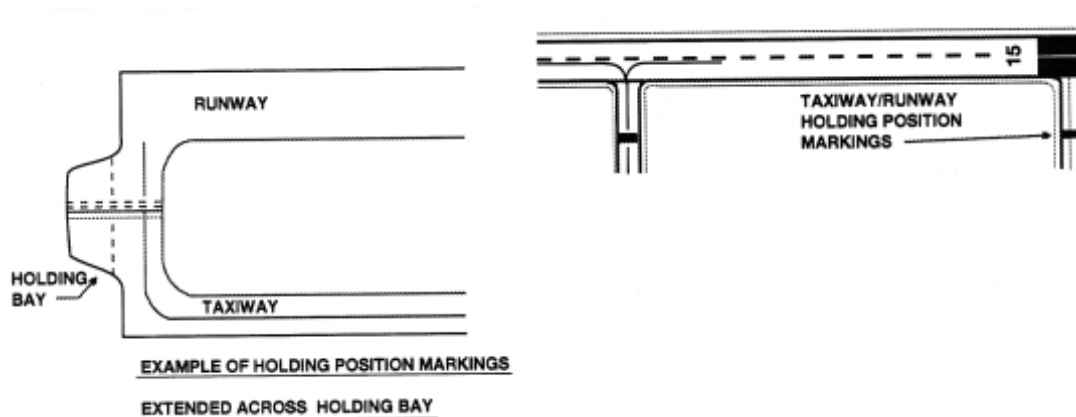


Figure 02: Holding bays (Source: US Airfield Standards)

Dual runway entrances: Double runway doorways are a duplication of taxiway passageways to the runway. The utilization of double doorways in blend with double taxiways will give a level of adaptability. The double runway passageway diminishes the take-off run accessible for flying planes utilizing the passage not situated at the furthest point of the runway.

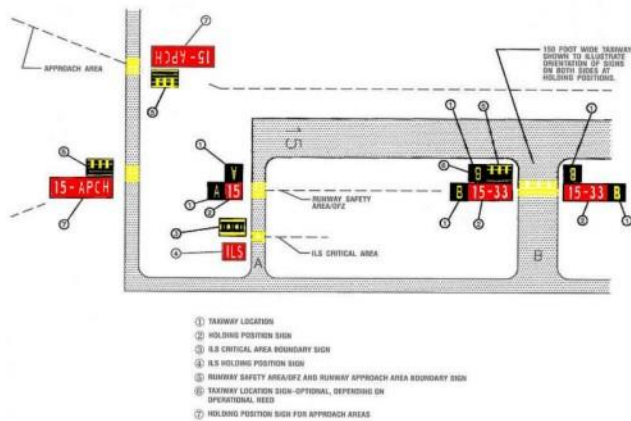


Figure 03: Dual runway entrance (Source: US Airfield Standards)

2.4.2 Apron

The airport apron is the territory of an airport where aircraft are used parked, unloaded or loaded, refueled, or boarded. In spite of the fact that the utilization of the apron is secured by directions, for example, lighting on vehicles, it is commonly more available to users than the runway or taxiway.

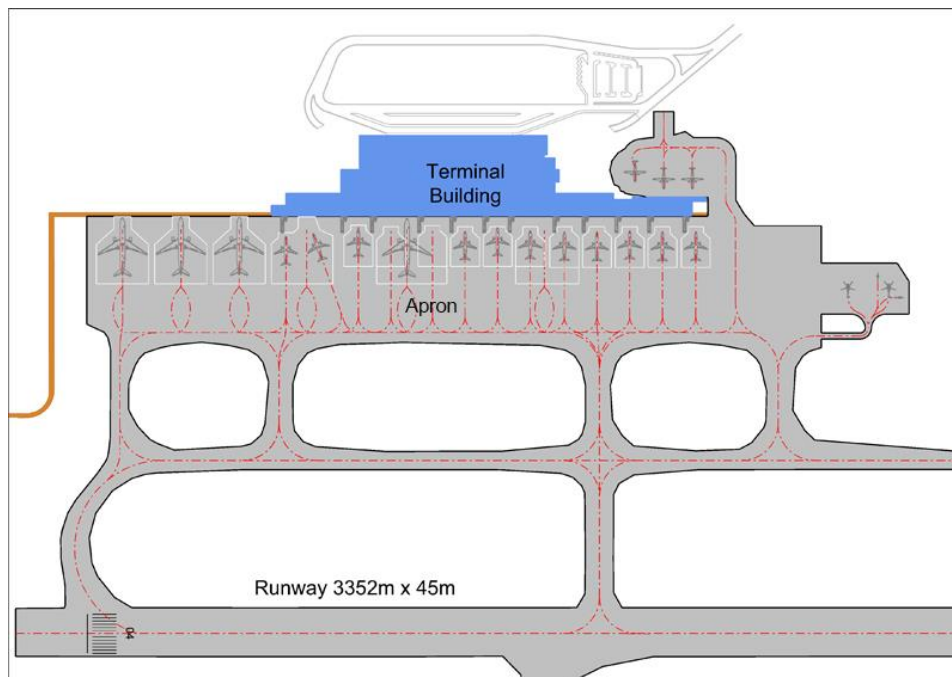


Figure 04: Apron (source:Apron Planning and Design Guidebook)

2.4.2.1 Apron Concepts

According to US Federal Aviation Airfield Standards an airport Aprons can be divided into several types which are

- Simple Apron
- Linear Apron
- Open Apron
- Pier Apron
- Satellite Apron
- Hybrid Apron

Simple Apron: Mainly the small size airports use this kind of concepts. This is basically a self-maneuvring type apron. Aircraft parking position mainly depends on the terminal frontage here.

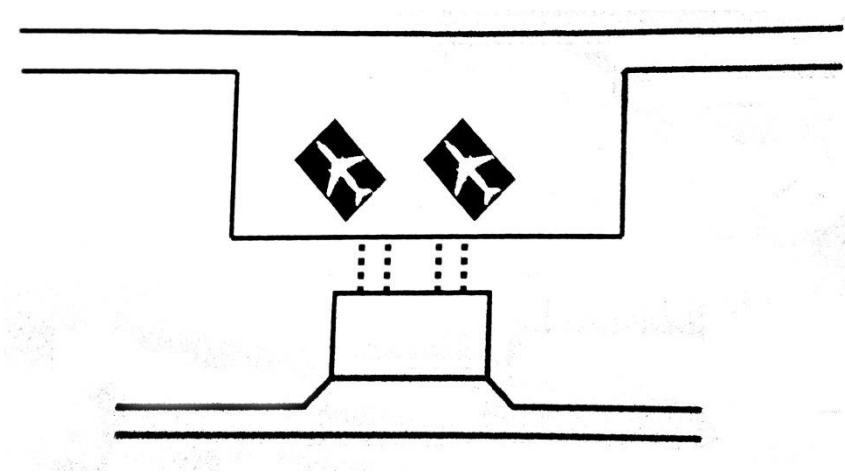


Figure 04: Simple concept Apron
(source: ICAO Doc 9157 part 2)

Linear Apron: At many airport simple concept eventually at later time turns into linear concept to articulate more aircrafts at the same time. Here a service road is provided between the apron and the terminal frontage.

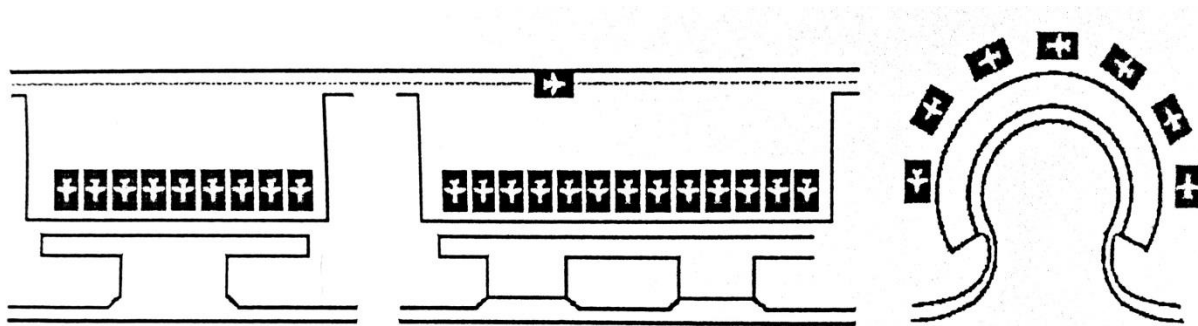


Figure 04: Linear concept Apron
(source: ICAO Doc 9157 part 2)

Open Concept: In this concept the stands are located on one or more than one rows in front of the building. One of the rows may be close in, but most will be a long way from the terminal. Through buses and mobile lounges all the passenger transports are provided. Milan Linate airport is an example of this type of apron concept.

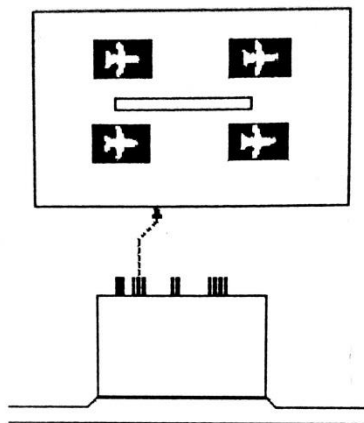


Figure 04: Open concept Apron
(source: ICAO Doc 9157 part 2)

Piear Concept: In many airports now a days this type of apron concept is used because of the expansion of the airport. By creating piers airports can now handle more aircrafts then any other time in the aviation history.

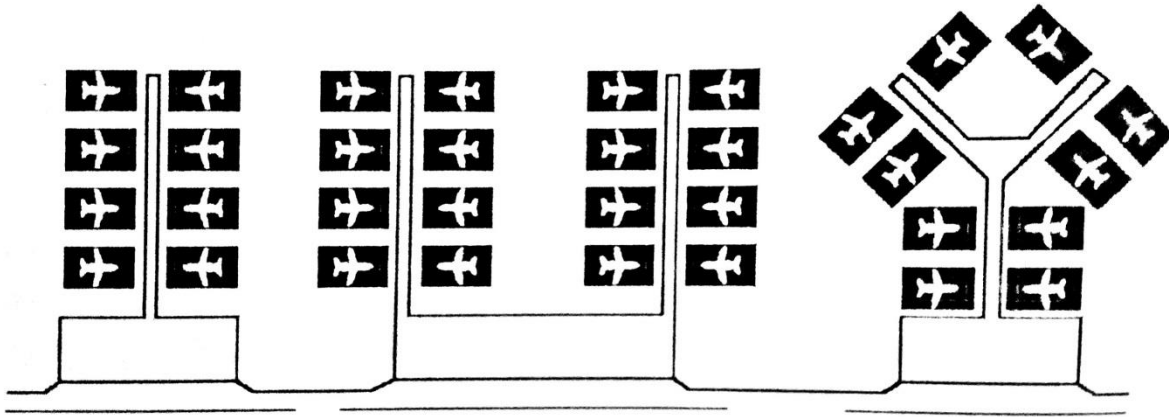


Figure 04: Pier concept Apron
(source: ICAO Doc 9157 part 2)

Satellite Concept: In this concept each of the remote passenger loading satellite is connected with the terminal building by underground tunnels or by overhead corridors.

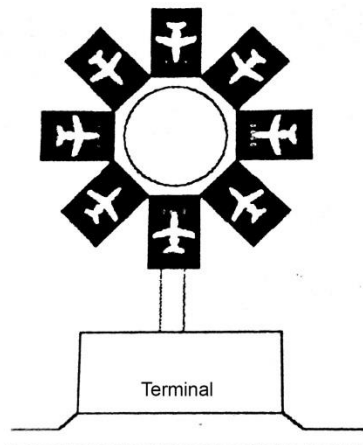
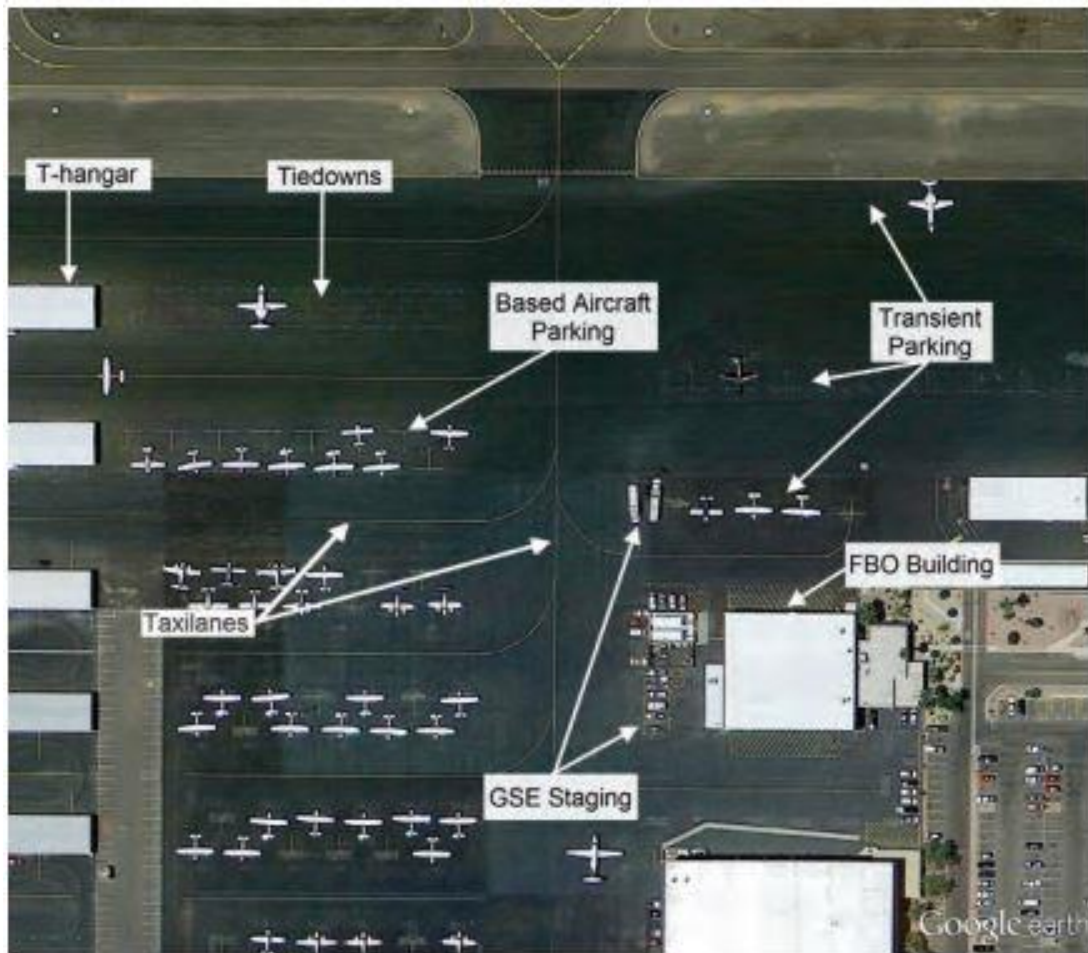


Figure 04: Satellite concept Apron
(source: ICAO Doc 9157 part 2)

Hybrid Concept: When an airport uses more than one above mentioned concepts together then it is called the hybrid concept. London Heathrow airport uses an hybrid concept.



Source: Google Earth Pro.

Figure 09: General aviation Apron

2.4.2.2 Passenger Loading Methods

There are several ways through which passengers could be loaded into their desired aircrafts:

- A Jet Bridge loading
- Movable steps
- Passenger transporters
- Aircraft contained steps

A Jet Bridge loading: A jet bridge is an enclosed is an encased, mobile connector which most usually stretches out from an air terminal entryway to a plane so that passengers can get into and out of an aircraft. a jet bridge may be fixed or movable depending on the design of the terminal building.

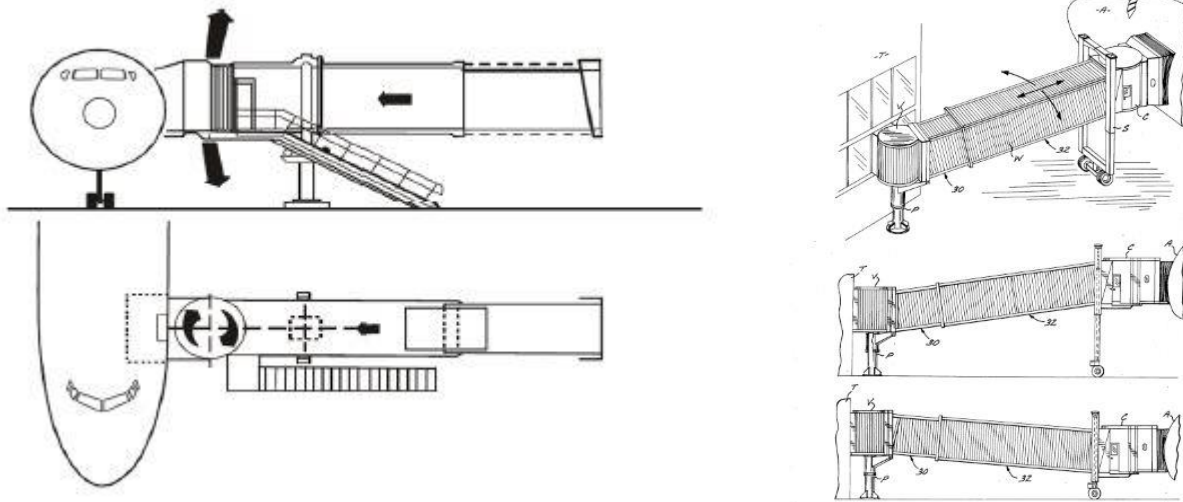


Figure 10: A jet Bridge (source: Apron Planning and Design Guidebook)

Movable steps: These are the type of stairs that can be move towards the aircraft and lock it on the aircraft door so that the passender can get down or in the aircraft.



Passenger transporter : In this type the passengers are brought to the aircraft by a bus or a train so that they can enter the aircraft.



Aircraft contained steps: Some aircraft have Self-contained steps. After stopping, the crew releases the self-contained steps and passengers walk on the apron.



2.4.3 Runway

The runway is probably the most important component of an airport. It has to be clearly identified from an plane for landing or take off. Runways and taxiways should be planned in relations to other major working elements, such as, terminal building, freight zones, aprons air traffic services and parking and so forth to give an airplane terminal design offering the greatest general productivity. Runways are typically distinguished by the essential components. Runways are named by a number somewhere around 01 and 36, which is generally the magnetic azimuth of the runway's heading in decadegrees. This

heading contrasts from genuine north by the neighborhood attractive declination. A runway numbered 14 focuses east (140°), runway 18 is south (180°), runway 20 focuses west (200°). When taking off from or arriving on runway 09, a plane would head 90° (east). [Daggubati and gurung, 2014]. The quantity of runway relies on upon the most number of flight come and goes every hour. A runway can deal with 50 to 65 flights for every hour. If there should be an occurrence of parallel runway the safety distance between them must be no less than 500 m. The introduction of the runway relies on upon the wind headings and the length is controlled by the arrival prerequisite of a plane. In Bangladesh we just have north-south wind bearings and no cross wind headings. The runways around there are along these lines required to have right around 90 degrees or precisely 92.5 degrees. All the direction depends on the position of runway. It varies from country to country. So far it has been seen that a runways with least 13,123 ft or 4000 m length are fit for landing a large portion of the aircraft that are been utilized. The majority of the global airplane terminals have runways 250 ft or 80 m wide. Although the number given here is variable. It can vary to airport to airport. Not every airport has the same runway length. It also varies on the aircraft size also. If it is a multi-national airport then is size of the runway will be very long and wide also at the same time as well. Taxing distance is a critical issue here as long navigating separations protract flying times, builds fuel utilization and lead to delays (Robert, 2007).

2.4.3.1 Types of runway

According to the Airport design and operation there are four kinds of runways which are

- Single Runway
- Parallel Runway
- Open-V runway
- Intersecting Runway



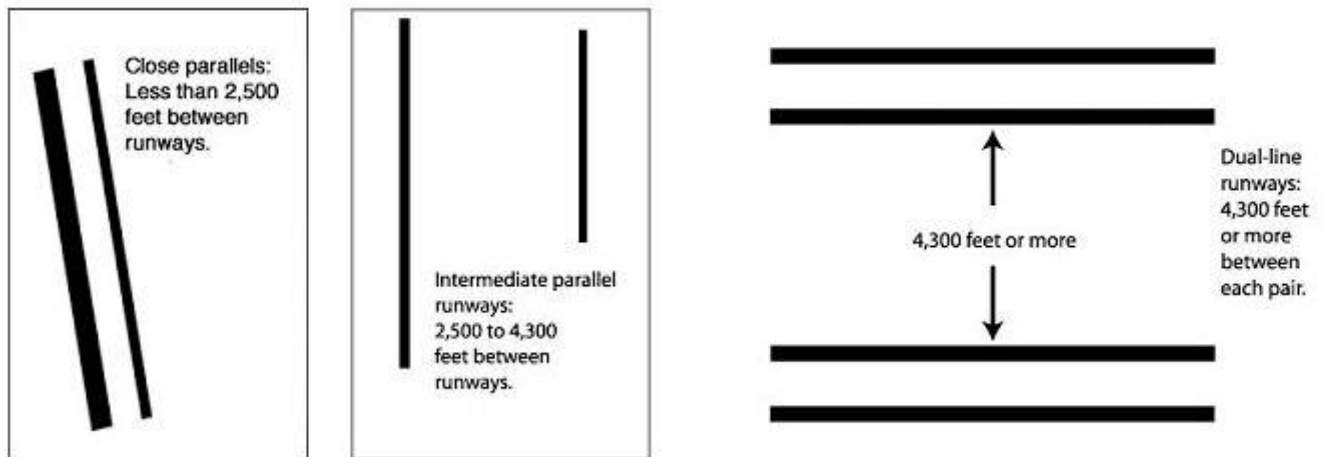


Figure11: Parallel runway(source:Airport Design and operations)

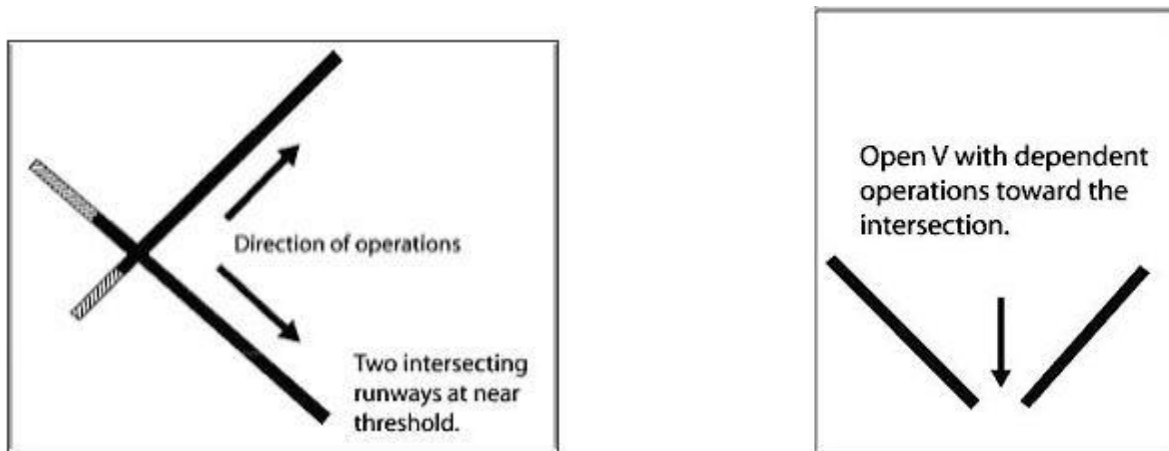


Figure12: Parallel and open V runway(source: Airport Design and operations)

2.4.3.2 Different parts of a runway

- Runway Safety Area
- Runway
- Blast Pads
- The runway Threshold

The runway thresholds: The runway thresholds are markings over the runway that signify the starting and end of the assigned space for landing and departure under non-crisis conditions.



Figure 13: The runway thresholds(source : Runway design and structural design of an airfield pavement)

Blast pads: Blast pads, otherwise called overrun regions or stopways, are regularly built just before the begin of a runway where jet impact delivered by expansive planes during the departure roll could otherwise erode the ground and eventually harm the runway. Invade regions are likewise built toward the end of runways as emergency space to gradually stop planes that overrun the runway on an arrival turned out badly wrong, or to gradually stop a plane on a rejected departure or a departure that gone wrong. Impact cushions are frequently not as solid as the principle cleared surface of the runway and are set apart with yellow chevrons. Planes are not permitted to taxi, take off or arrive on impact cushions, with the exception of in a crisis.



Figure 14: Blast pads(source : Runway design and structural design of an airfield pavement)

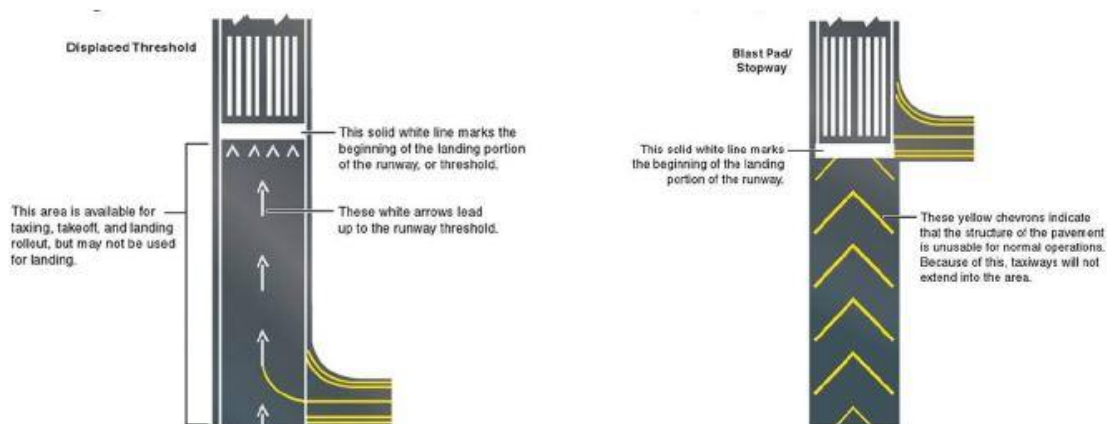


Figure 15: Runway safety area (ASI Runway Safety Flash Cards)

Runway Marking Elements

Runway Surface Marking Scheme	Threshold Approach Category		
	Visual Approach	Non-precision Approach (Approaches with vertical guidance not lower than 0.75 statute mile visibility)	Precision Approach (Approaches with vertical guidance lower than 0.75 statute mile visibility)
Runway diagram			
Landing Designator	X	X	X
Centerline	X	X	X
Threshold	Note 1	X	X
Aiming Point	Note 2	Note 3	X
Touchdown Zone	(not applicable)	(not applicable)	X
Side Stripes	Note 4	Note 4	X

Note 1: Required on runways serving approach categories C and D airplanes and for runways used, or intended to be used by international commercial air transport.

Note 2: Required on 4,200 foot or longer runways serving approach categories C and D airplanes.

Note 3: Required on 4,200 foot or longer instrumented runways.

Note 4: Used when the full runway pavement width may not be available for use as a runway.

Figure 16: Runway safety area (ASI Runway Safety Flash Cards)

2.4.3.3 Dimension of a runway

Runway measurements fluctuate from as little as 245 m (804 ft) long and 8 m (26 ft) wide in smaller general aviation airplane terminals, to 5,500 m (18,045 ft) long and 80 m (262 ft) wide at large international airports to facilitate the biggest planes.

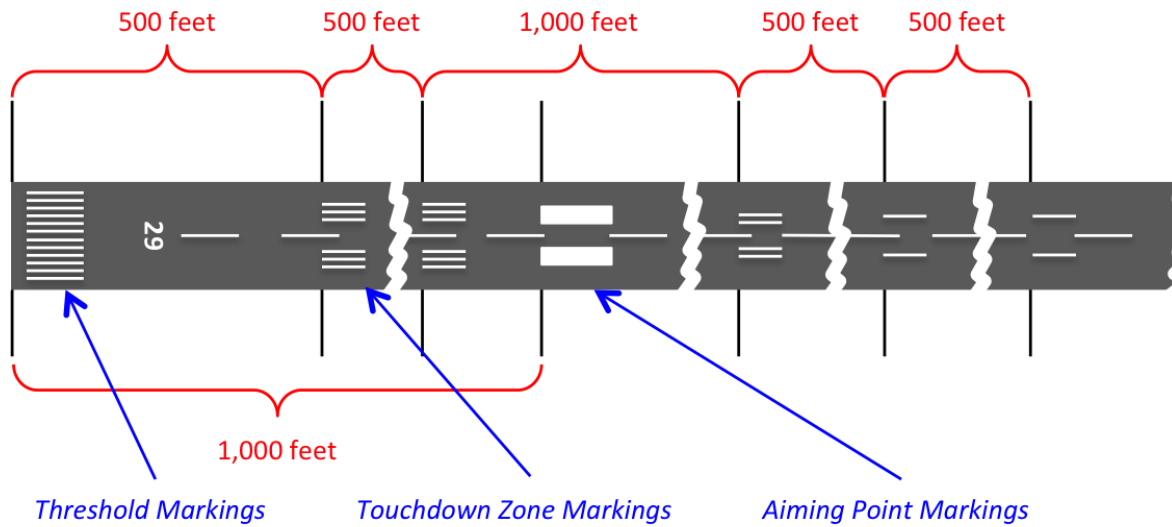


Figure 17: Runway Dimension (ASI Runway Safety Flash Cards)

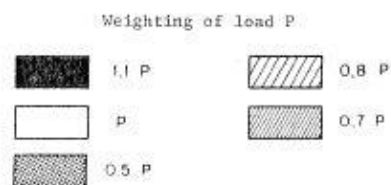
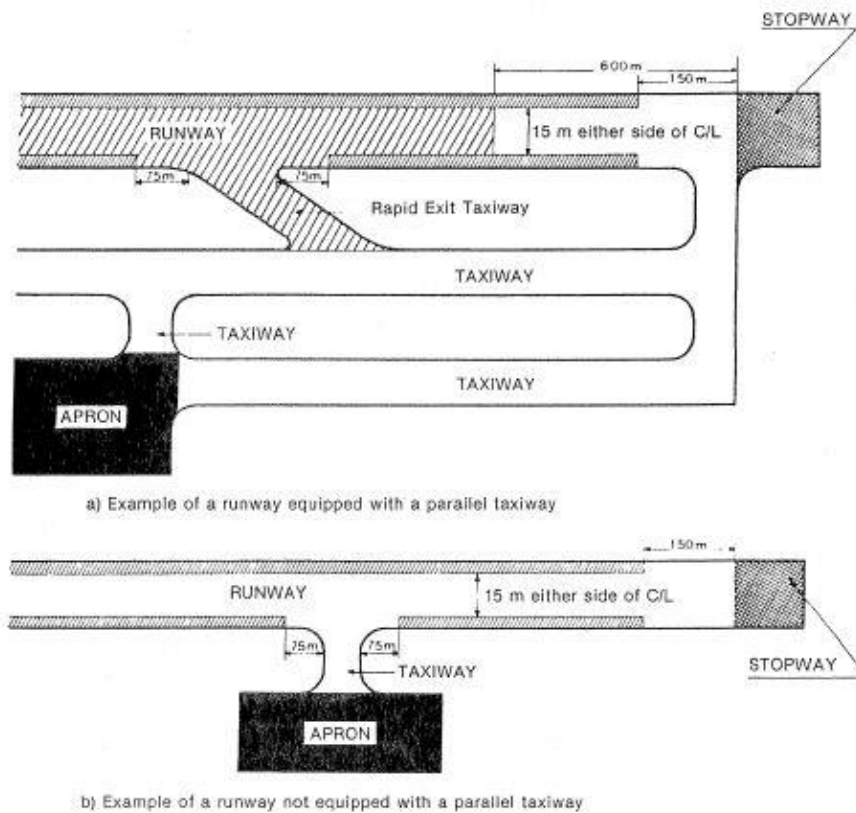


Figure 17: Runway Dimensions

(source: Aerodrome Design Manual, Part 3, Pavement, ICAO Doc 9157-AN/901)

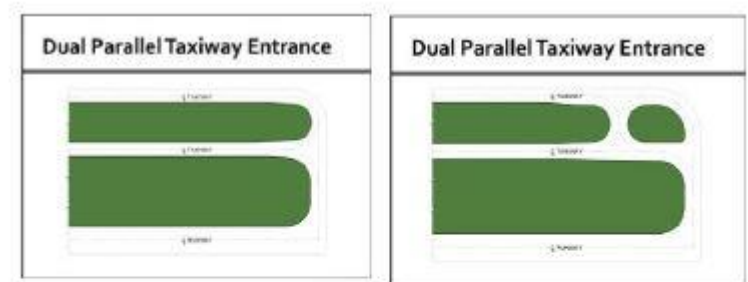
2.4.4 Taxiway

A taxiway is a way for planes at an airport associating runways with aprons, hangers, terminals and different facilities. They for the most part have a hard surface, for example, black-top or cement, but some small planes now and then may use a rock or grass surface (Robert, 2007).

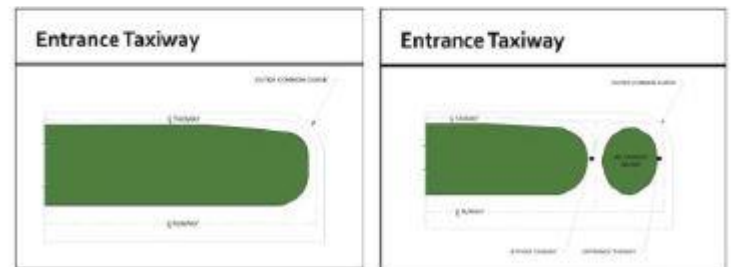
2.3.4.1 Different elements of a Taxiway

There are four types of taxiways:

- **Parallel taxiways:** aligned parallel next to runway



- **Entrance taxiways:** opposite to the runway and situated close to the takeoff end of runways.



source: Goolge.com

- **High-speed taxiways:** to permit plane rapidly free-up the runway. (Otherwise called Rapid Exit), situated at different focuses along the runway to permit landing airplane to effectively leave the runway after landing.
- **By-pass taxiways:** Situated near apron, to allow the plane by-pass other plane at aircraft parking site.

2.4.4.2 Taxiway Dimensions

The size of the taxiway varies depending on the size of the aircrafts that uses the taxiway.

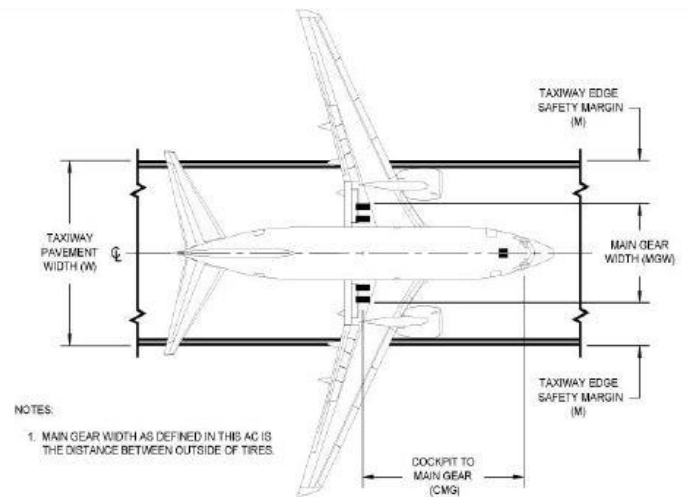
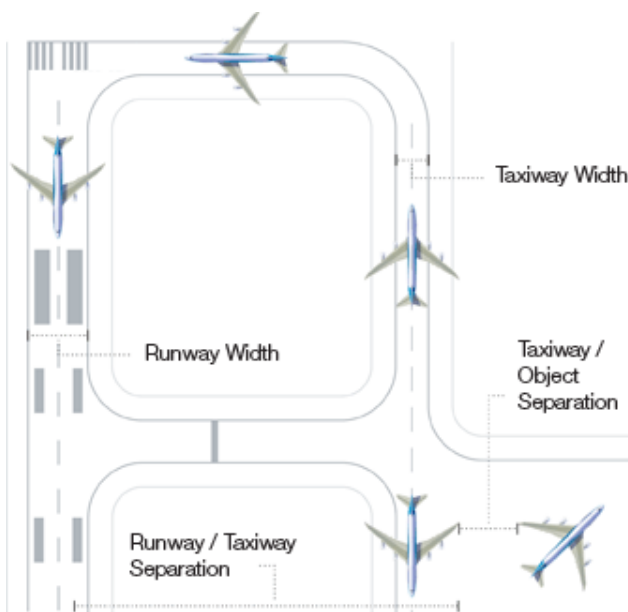
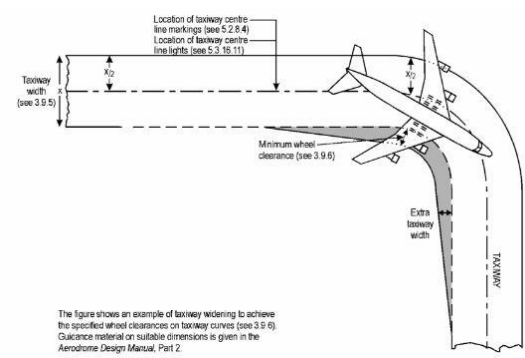
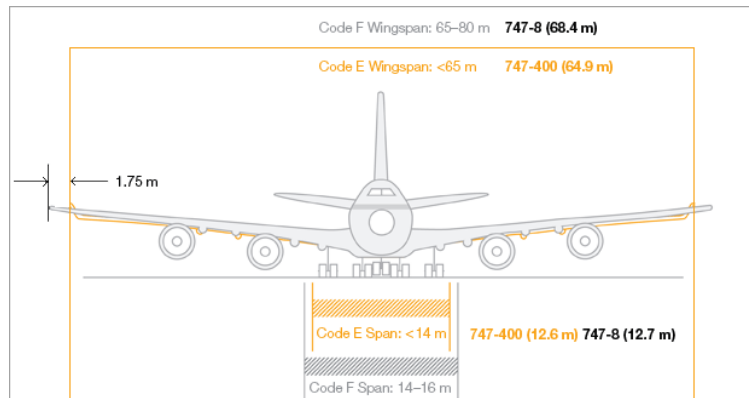
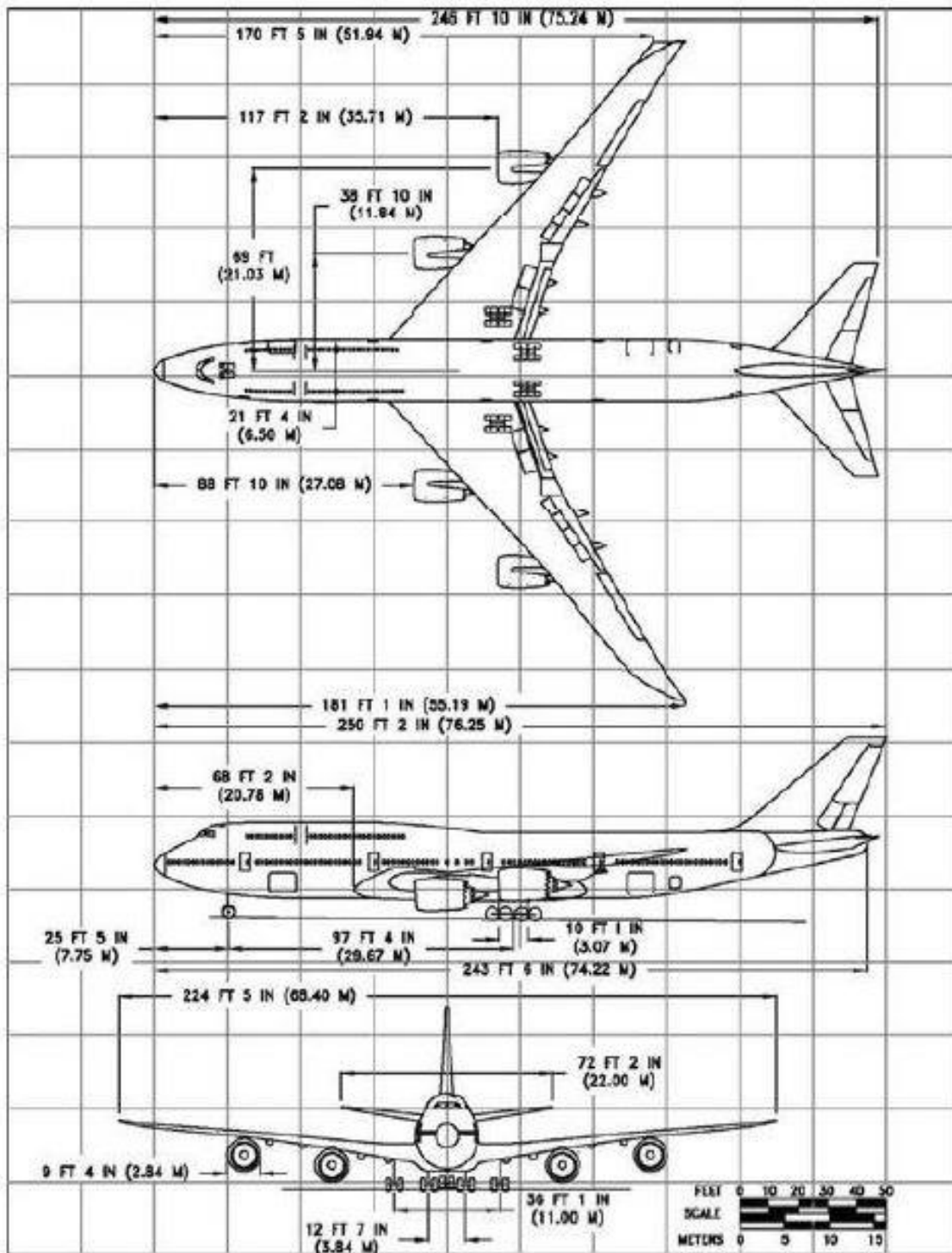


Figure18: Dimensions of a taxiway (source:Airport Design and Engineering Standards)

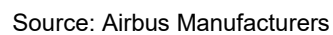
2.4.5 Aircraft Dimensions

Boeing 747-400



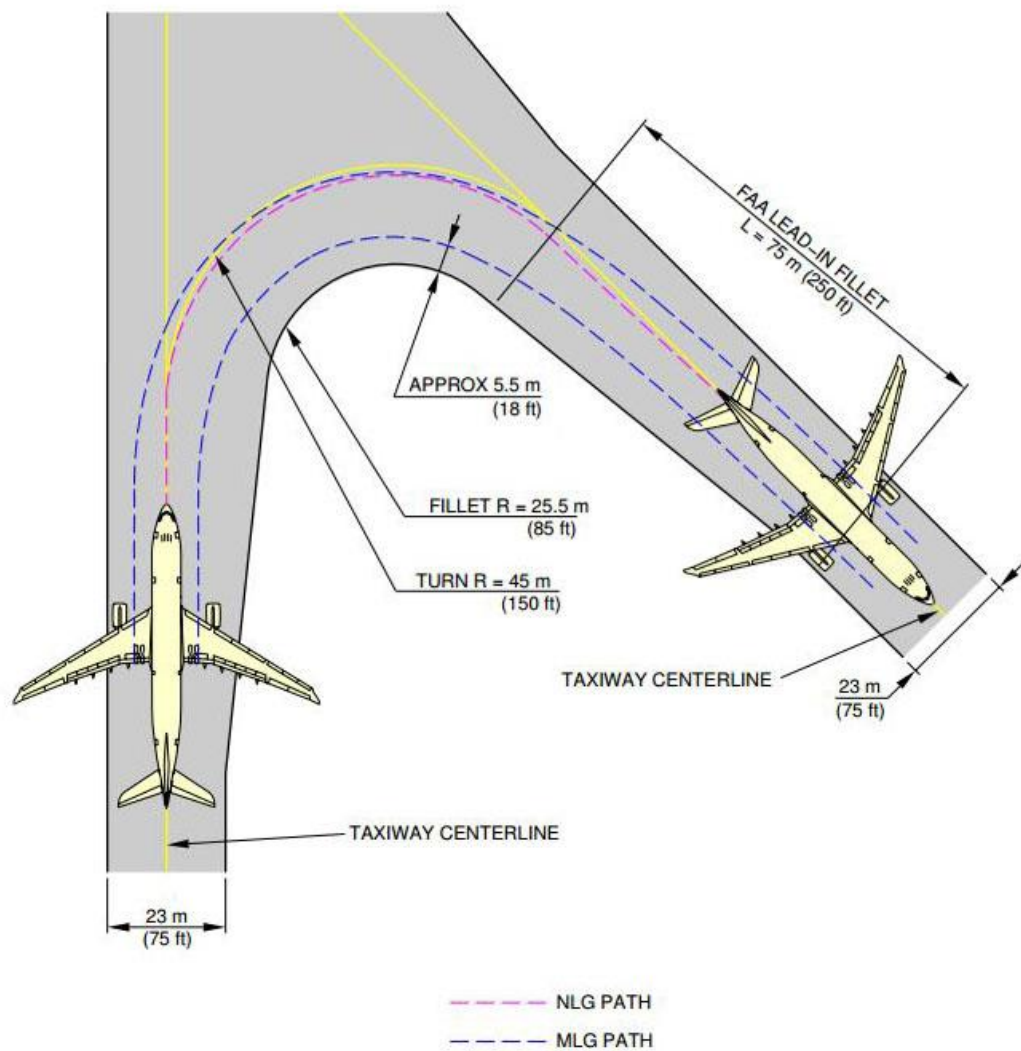
Source: Boeing Manufacturers

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2.4.6 Turning Radius of Taxiway and Runway

**ON A/C A330-200 A330-200F

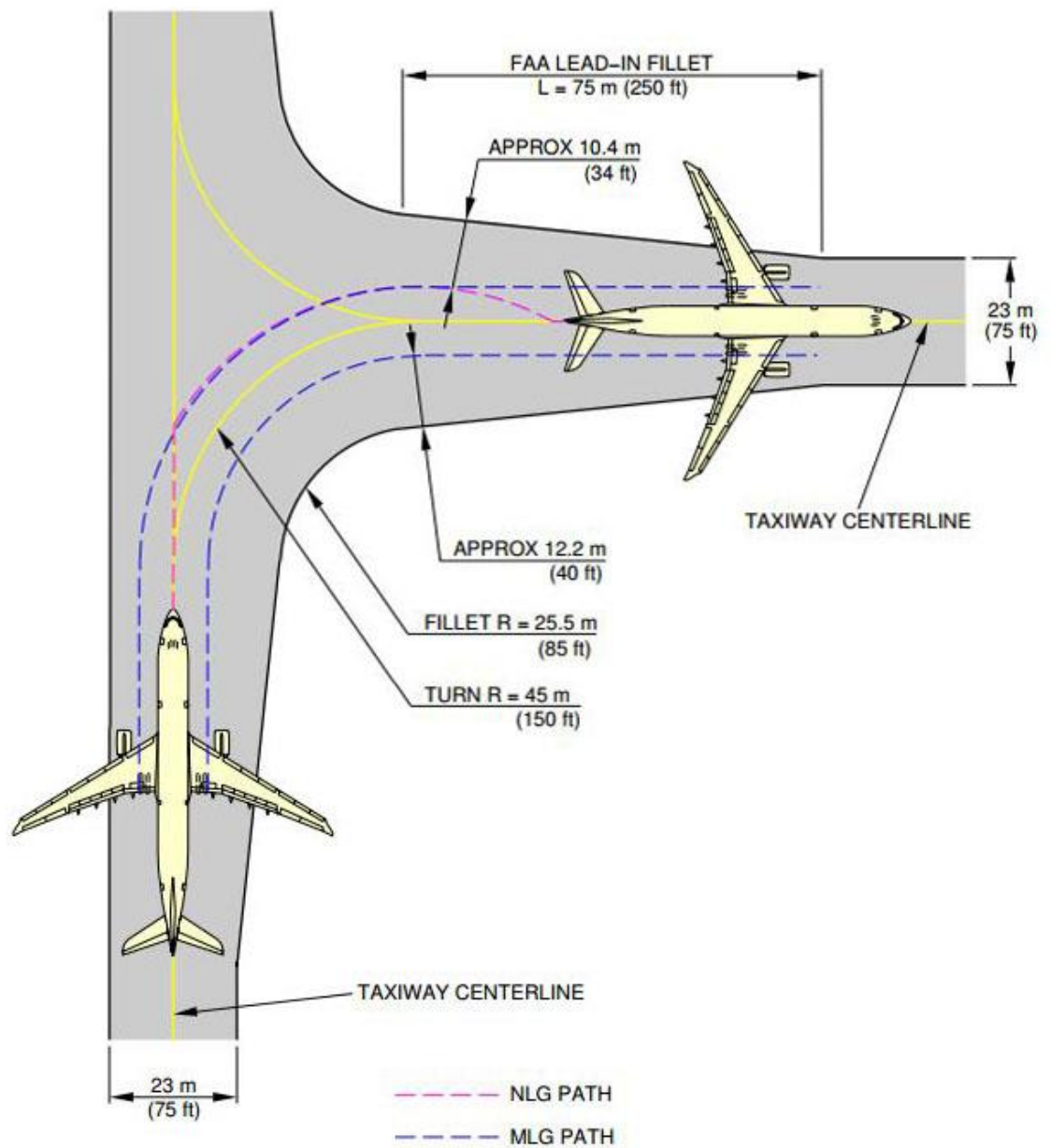


F_AC_040504_1_0080101_01_00

135° Turn - Taxiway to Taxiway
Cockpit Over Centerline Method
FIGURE-4-5-4-991-008-A01

(sourcr: Airport and Maintanance Planning)

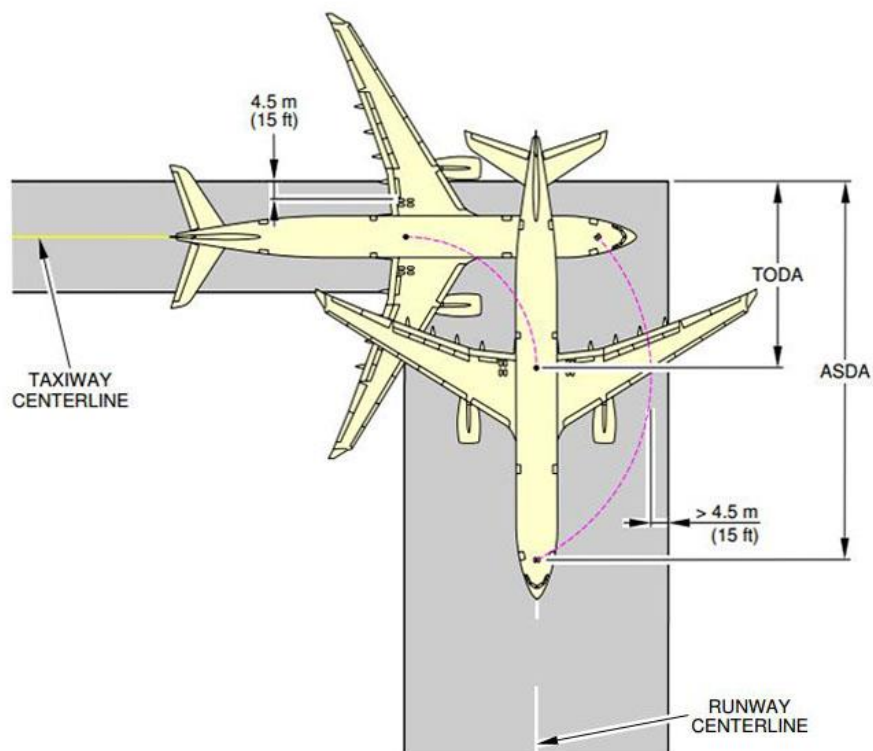
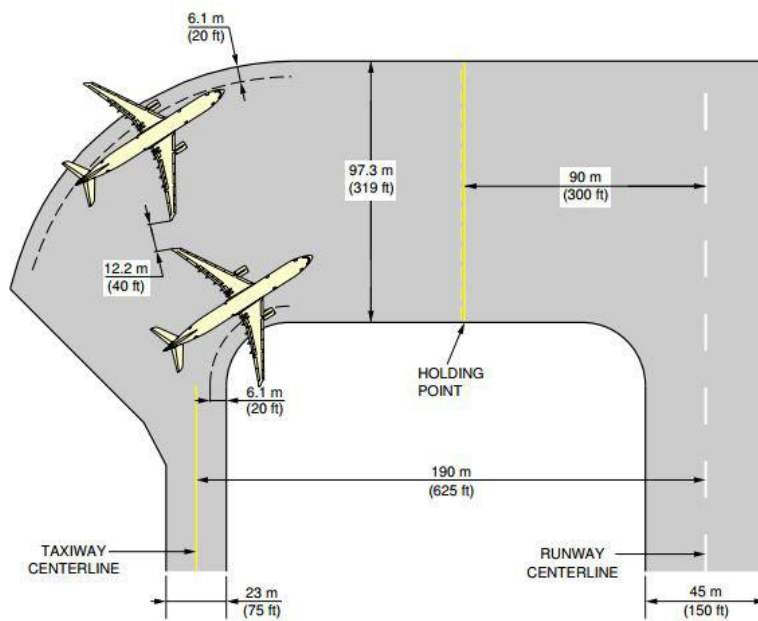
****ON A/C A330-300**



F_AC_040505_1_0030101_01_01

90° Turn - Taxiway to Taxiway
Judgemental Oversteer Method
FIGURE-4-5-5-991-003-A01

(source: Airport and Maintenance Planning)

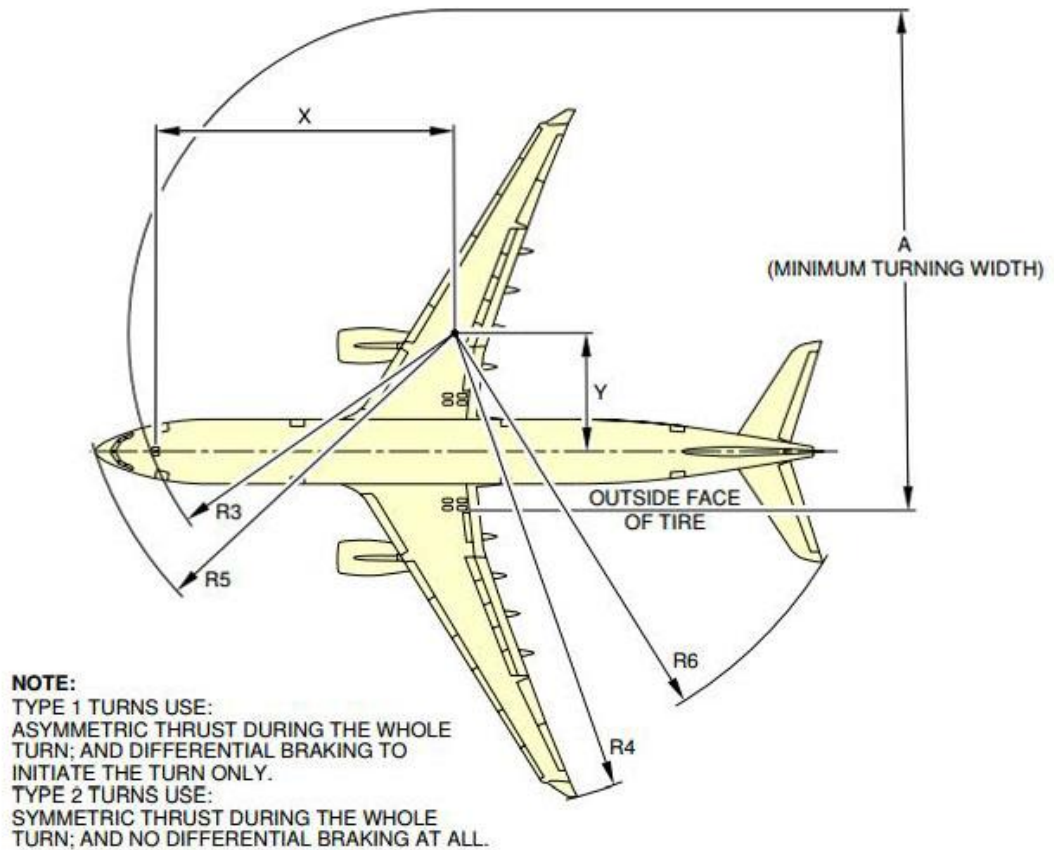


90° TURN ON RUNWAY ENTRY					
AIRCRAFT TYPE	MAX STEERING ANGLE	45 m (150 ft)/60 m (200 ft) WIDE RUNWAY			
		MINIMUM LINE-UP DISTANCE CORRECTION			
		ON TODA		ON ASDA	
A330-200/-200F	65°	22.5 m	74 ft	44.7 m	147 ft
A330-200/-200F	72°	19.7 m	65 ft	41.9 m	137 ft
A330-300	65°	24.2 m	80 ft	49.6 m	163 ft
A330-300	72°	21.2 m	69 ft	46.5 m	153 ft

(sourcr: Airport and Maintantenance Planning)

2.4.7 Turning Radius of an aircraft

****ON A/C A330-300**



A330-300 MINIMUM TURNING RADII										
TYPE OF TURN	STEERING ANGLE (deg)	EFFECTIVE STEERING ANGLE (deg)		X	Y	A	R3 NLG	R4 WING	R5 NOSE	R6 TAIL
1	72 (MAX)	67.8	m	25.4	10.4	44.6	27.6	41.6	33.7	33.1
			ft	83	34	146	91	136	111	109
2	72 (MAX)	63.8	m	25.4	12.5	47.6	28.5	43.7	34.4	34.4
			ft	83	41	156	94	143	113	113
1	65 (MAX)	62.1	m	25.4	13.4	49.0	29.0	44.6	34.7	35.1
			ft	83	44	161	95	146	114	115
2	65 (MAX)	60.1	m	25.4	14.6	50.7	29.6	45.8	35.2	35.8
			ft	83	48	166	97	150	115	117

NOTE:
 IT IS POSSIBLE TO GET LOWER VALUES THAN THOSE FROM TYPE 1
 BY APPLYING DIFFERENTIAL BRAKING DURING THE WHOLE TURN.

F_AC_040300_1_0010101_01_05

Minimum Turning Radii

(sourcr: Airport and Maintanence Planning)

Chapter 3: Site Analysis

3.1 The Site

Due to lack of any site for selection of the airport in the khulna city, it was decided to look for a place in the Bagherhat district as suitable for the airport. A Team with high officials of Ministry, CAAB and other Govt. organizations visited the site in 1996 and then decided to build an airport here but didn't started the work. Now after the declaration of the Prime minister of Bangladesh CAAB again visited the site for inspection and finally fixed this site for Khan Jahan Ali International Airport. The accentual size that is available here is 514 acres but CAAB is still considering on acquiring more land to make it an international airport.

3.2 Approval for Bagherhat Site

Accordingly MOCAT, CAAB and the Cell visited on 3rd and 15th November, 2015. A report submitted on MOCAT on 2nd December, 2016. Later on a power point presentation placed before Honourable PM on 11th may, 2016 and PM approved the site.

3.3 Reasons for recommending Bagherhat, Khulna

Criteria	Sreenagar, Munshiganj
Availability of land	Around 1000 acre
Density of population	Almost nil
Future expansion	Possible
Communication with capital city	Not Difficult

Standing Crops	Crops 1 time
Distance from capital city	187 KM
Land acquisition and rehabilitation	Easier due to less settlement
Distance from HSIA	205 km
Road communication	Good
Land acquisition/ Status of land	Acquired
Social Problem and Condition	Nil
International Air Routes	Closest to the site
Final Recommendation of location or BSMIA	Suitable

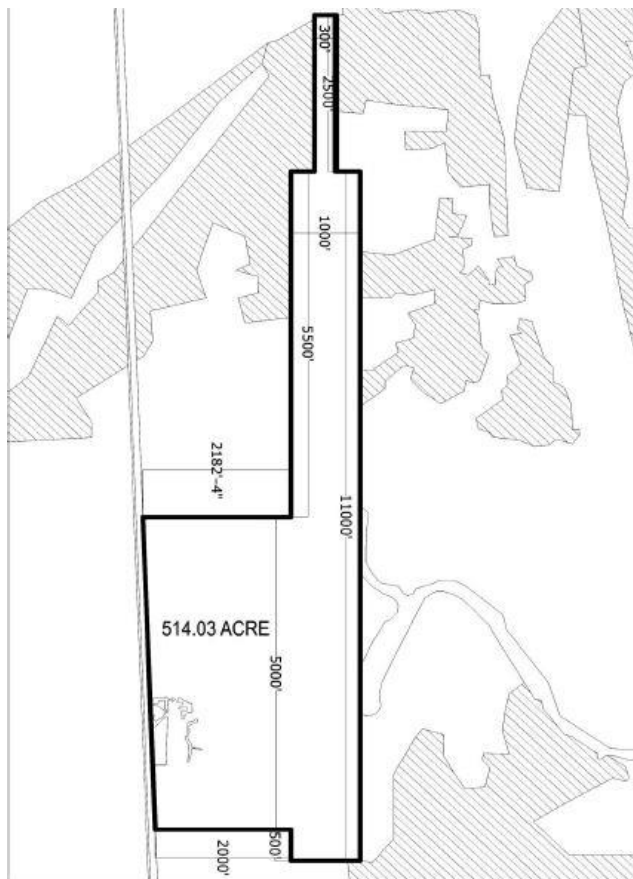
3.4 Other important information

- Dhaka- Mawa highway via Sreenagar connects the proposed site
- River Padma and Meghna connect the site for transportation of aviation fuel
- Alternate Trans- Asian highway and railway will be connected to the site via Padma and Paturia-Daulatdia bridges.
- Padma bridge is going to be completed by 2018
- Bangabandhu Bridge access road

3.5 Site Location



Proposed Site



 SITE PLAN



(Source: Author)

SWOT Analysis

Strength- River line is accessible for flight fuel transportation, if there should be an occurrence of climate redirection; flights won't require to cross the international corridor and in this way ATC issue and air activity administration can be avoided.

Weakness- At present does not have any railroad close to the site. Earth filling is important as the area is at present being utilized for agribusiness. Lakes and restricted water trenches for irrigation system are available on the site, which should be filled up. Cutting of trees are required.

Opportunity- South situated development promotion advancement will be energized, new satellite city can be produced.

Threat- All are open fields surrounding this site.

The approach road is from Khulna-Mongla highway and mostly surrounded by green fields. Few canals are there and a floor free land.

Wind Force and Direction

Wind-force per Day (January 2004 - December 2014)

Jan	Feb	Mar	Apr	May	Jun	
2.4	3.2	4.1	5.3	4.7	4.5	[kph]
77	82	83	86	87	74	Data availability[%]

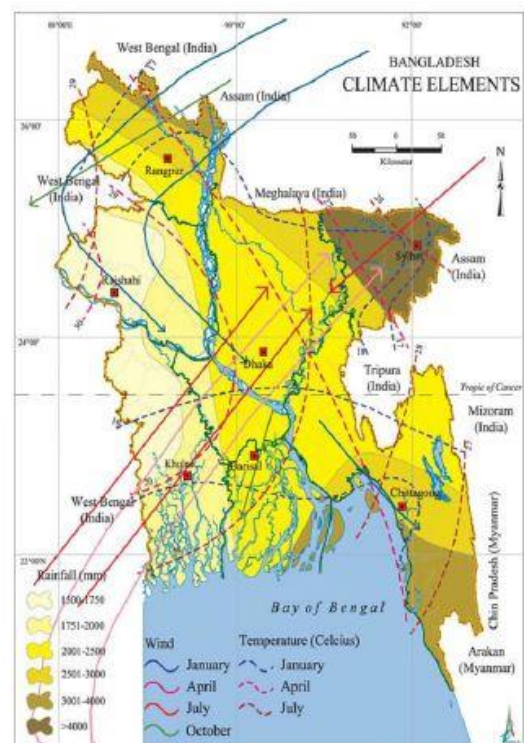
Jul	Aug	Sep	Oct	Nov	Dec	
4.7	3.3	3.1	2.0	1.5	1.6	[kph]
87	87	87	82	90	79	Data availability[%]

Averaged Value (January 2004 - December 2014) : 3.4 kph

Wind-direction (January 2004 - December 2014)



Source: Weatheronline.com





Site Image(Source: Author)

Chapter 4: Case Study

4.1 KL INTERNATIONAL AIRPORT

Airport type :Public

Owner :Government of Malaysia

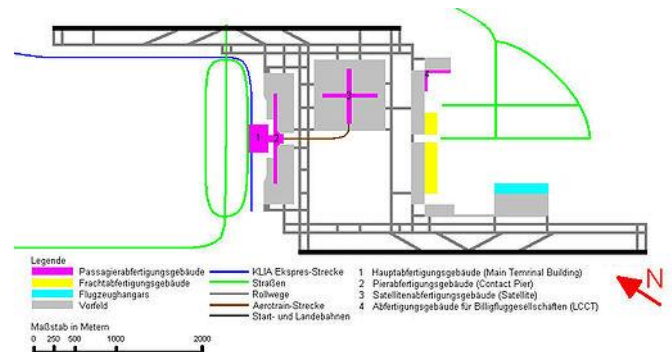
Operator :Malaysian Airports Company

Serves:Malaysia

Elevation :AMSL 21 m / 70 ft

Coordinates: 02°44'36"N 101°41'53"E

KL Airport is spread over an area of 100 square kilometers of land. In 2012 DXB handled a record 25 million in passenger traffic, a 14.3% increase over 2011.



Master Plan Layout

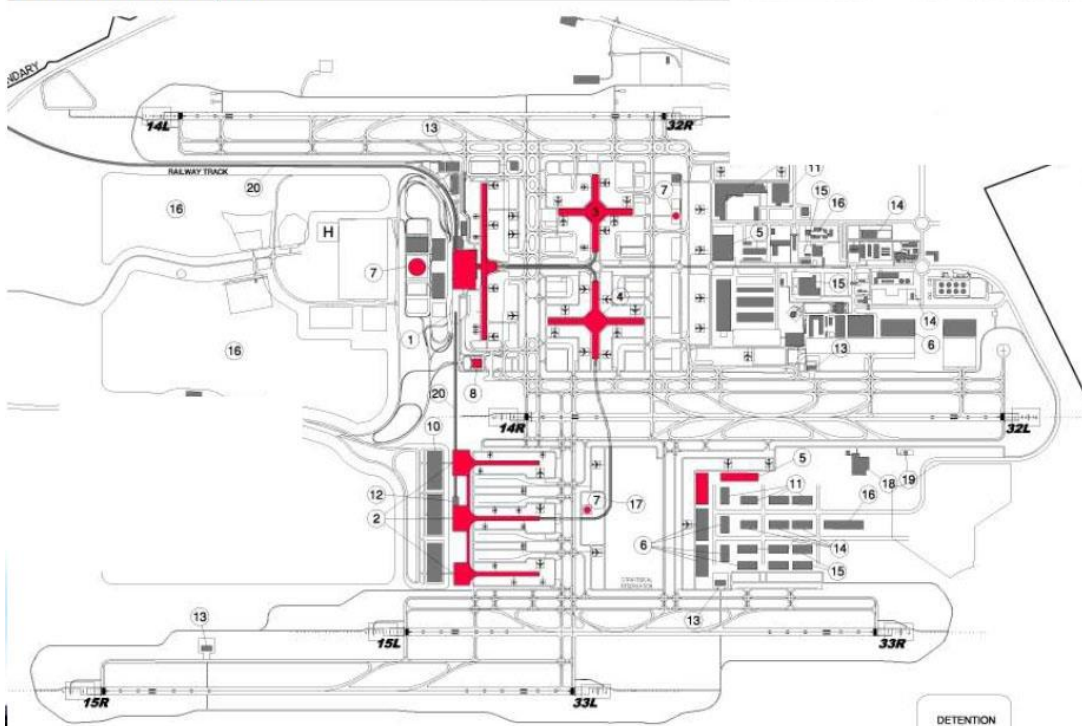


Figure: KL International Airport Master Plan

(Source: <http://aboutairportplanning.blogspot.com/2012/07/kuala-lumpur-international-airport-klia.html>)

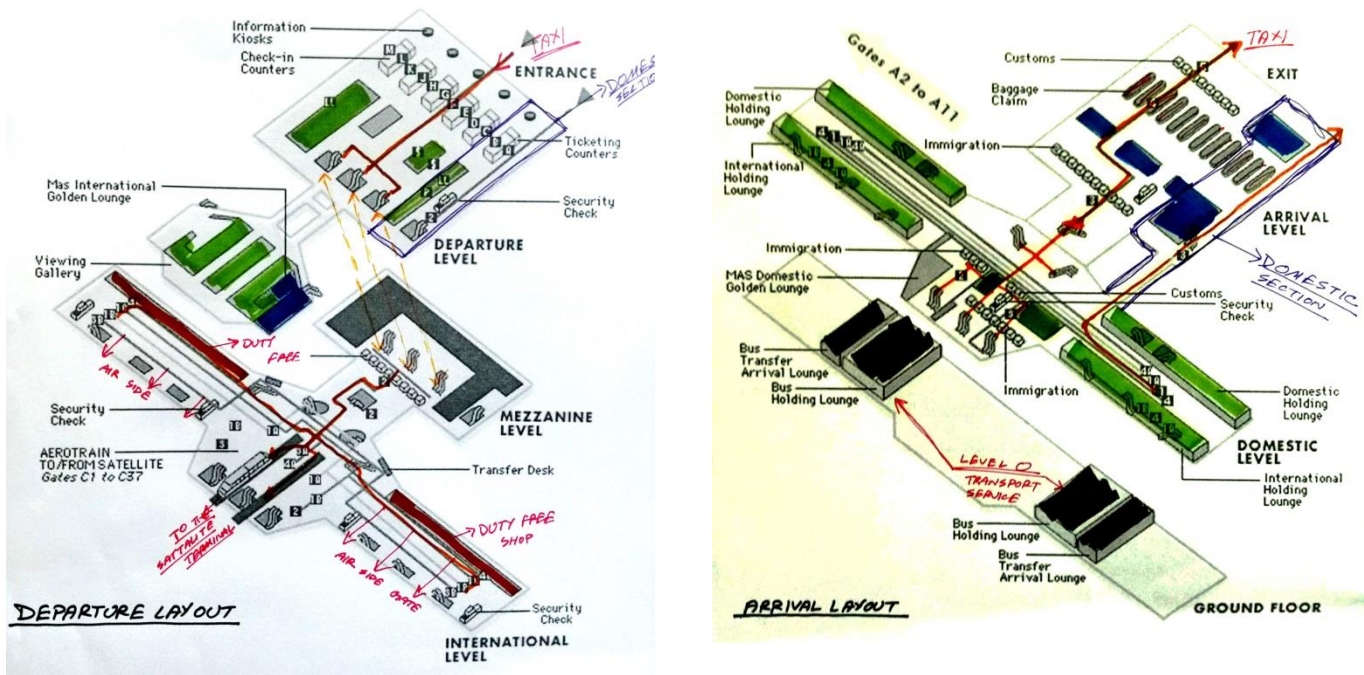


Figure: KL International Airport floor plan analysis
(Source: Author)

KL International airport is one of the best airport in modern days. It is mainly design with a simple concept and farther added sattelite concept terminal. It has in total 4 layers of functions which is marged with each other very nicely. The departure level is on the top most floor and the arrival floor is in the botton level and in between them there is a mezzenine level. The sattelite terminal is conncted with the main terminal via metro line system.

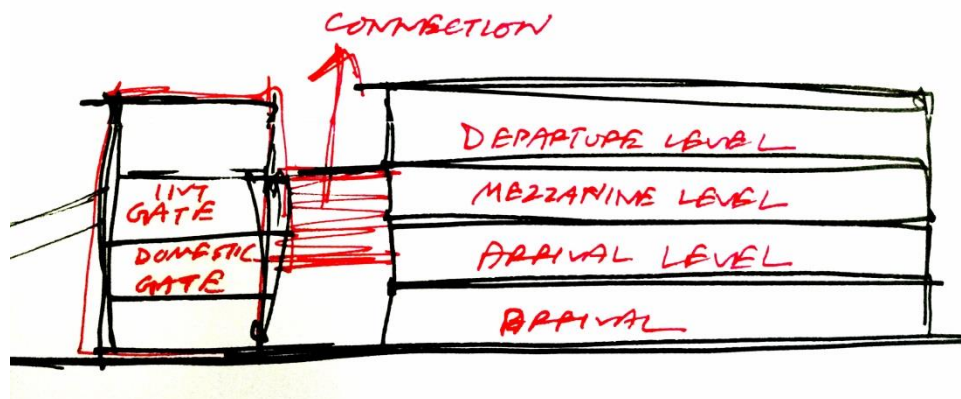


Figure: KL International Airport floor schematic section
(Source: Author)

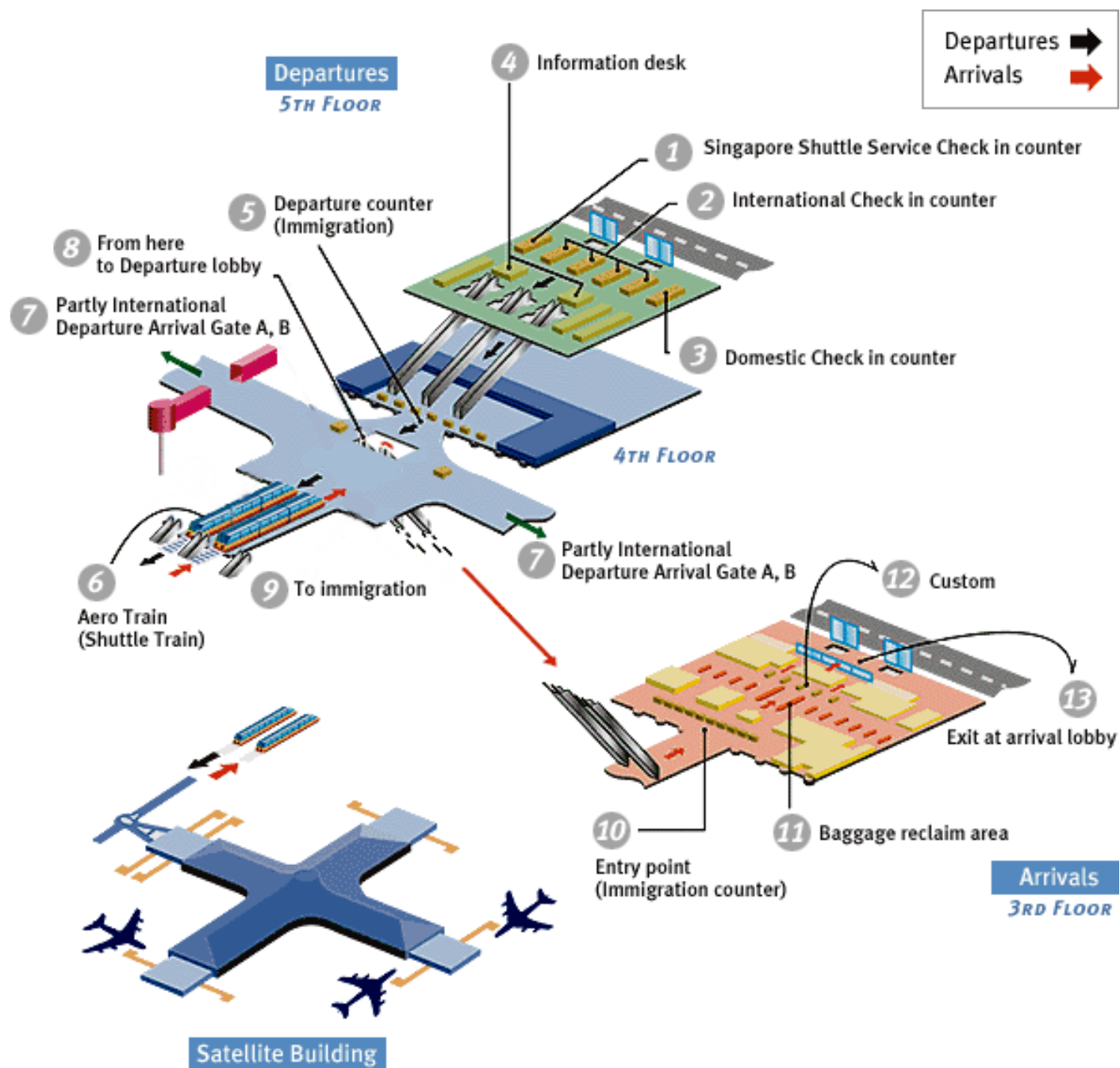


Figure: KL International Airport floor plan
 (Source: <http://www.ana.co.jp/www/my/e/local/departure/airport/>)

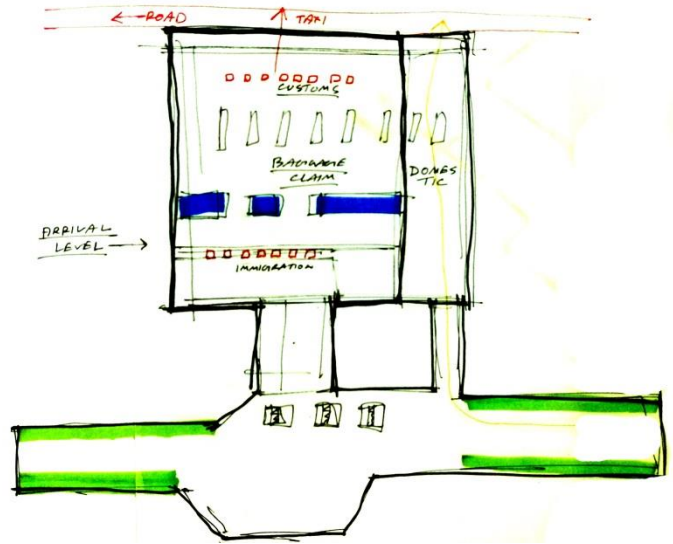
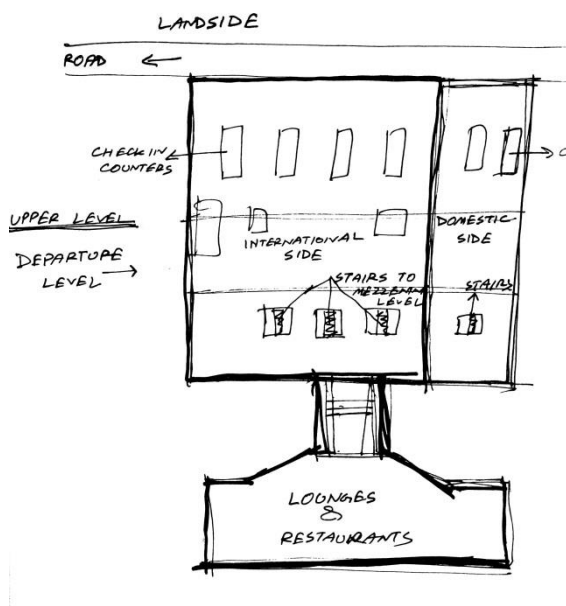


Figure: KL International Airport floor plan
(Source: <http://www.ana.co.jp/www/my/e/local/departure/airport/>)



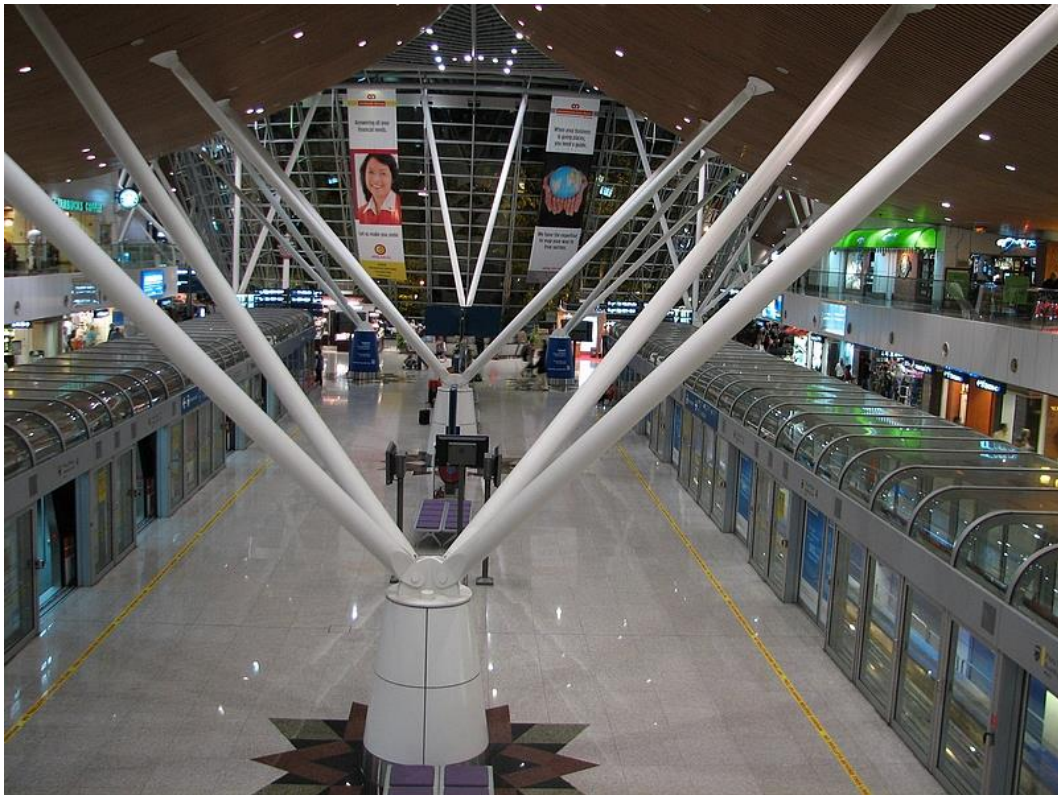


Figure: KL International Airport Images
(Source: Pbase Galleries)

4.2 Heathrow Terminal 4

Airport type :Public

Owner :Government of UK

Operator :UK Airports Company

Serves:Great Briten

Elevation :AMSL 25 m / 83 ft

Coordinates: 51°28'39"N 000°27'41"W

This Airport is spread over an area of 1,135,390 sq ft of land.



(source: Aviation Voice)

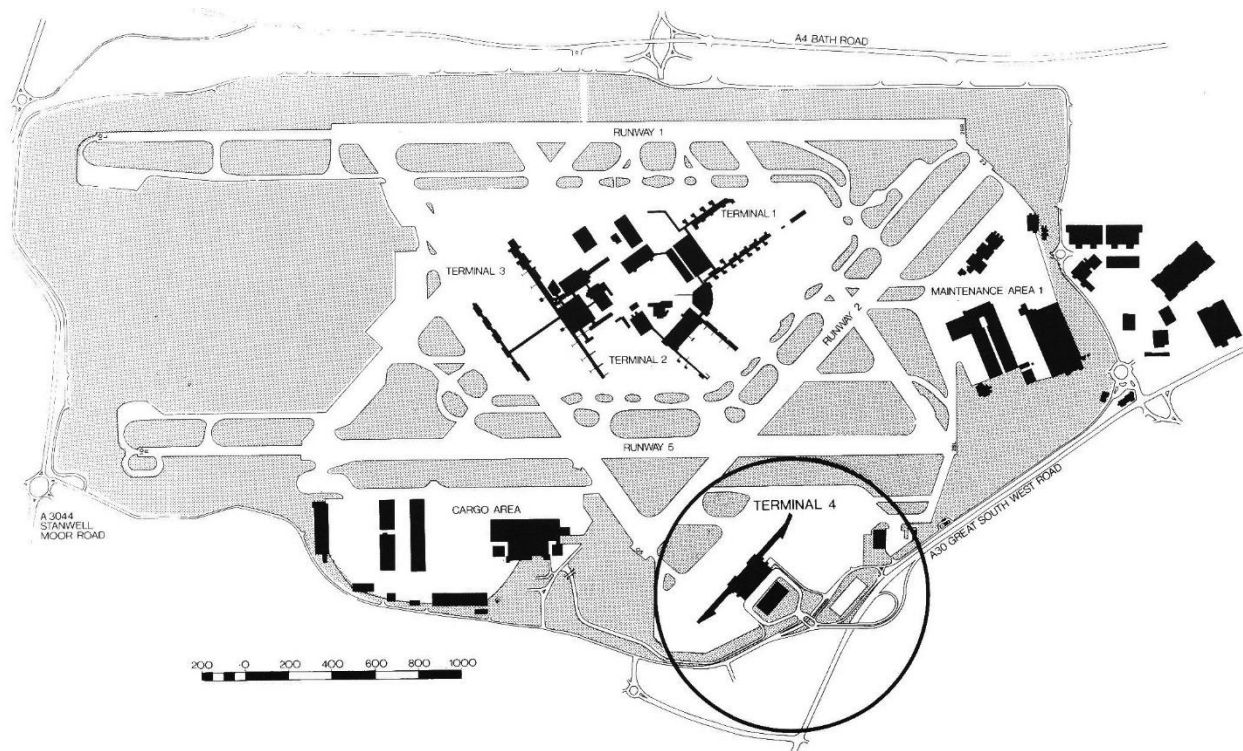


Figure: Heathrow International Airport Terminal 4

(Source: <https://tonyhwijaya.wordpress.com/2011/10/11/existing-international-airport-layouts/>)

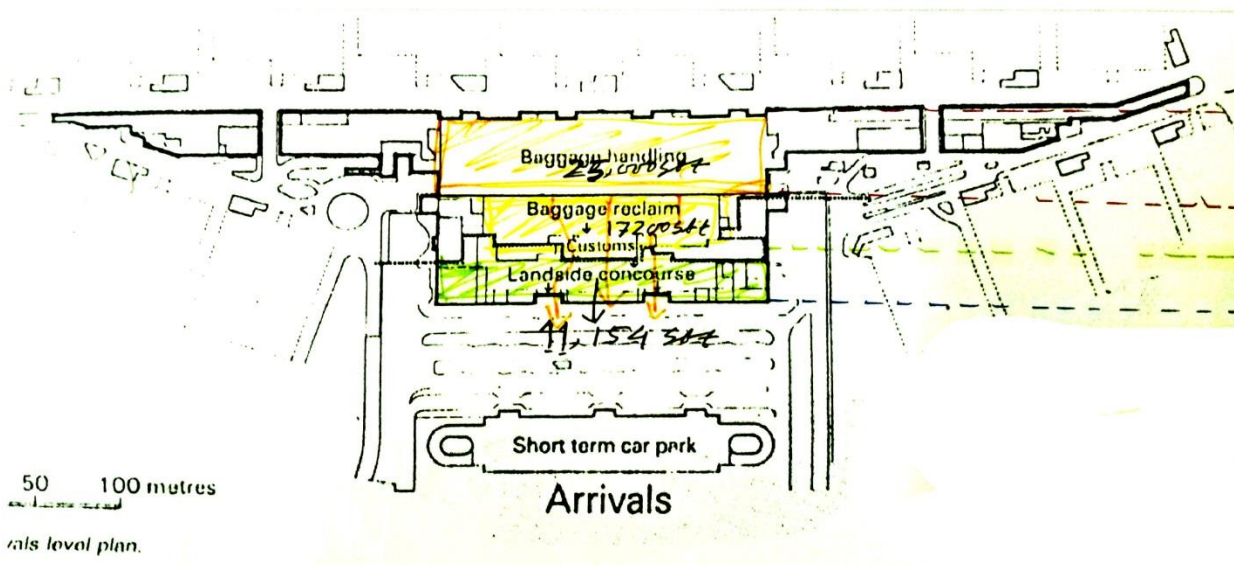
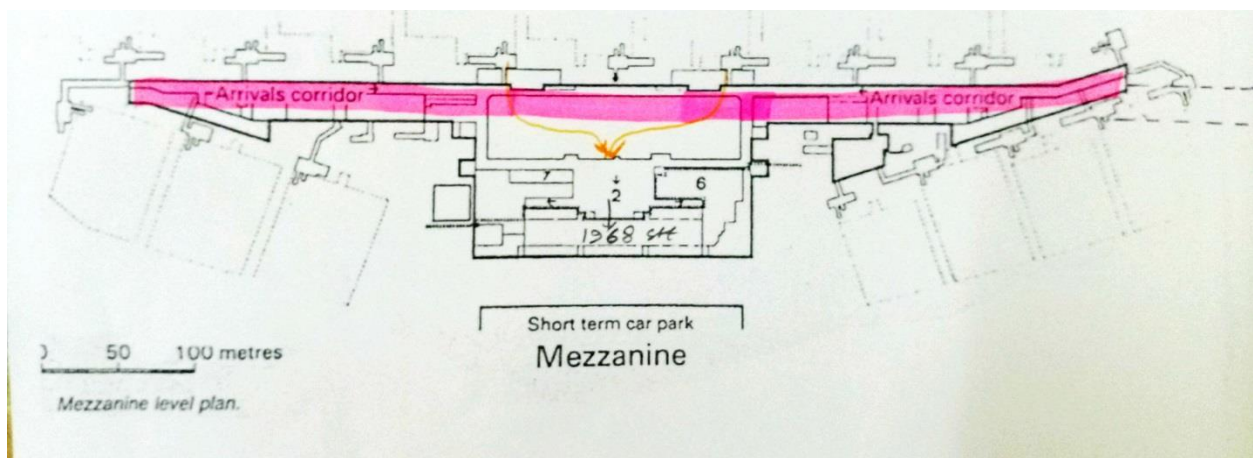
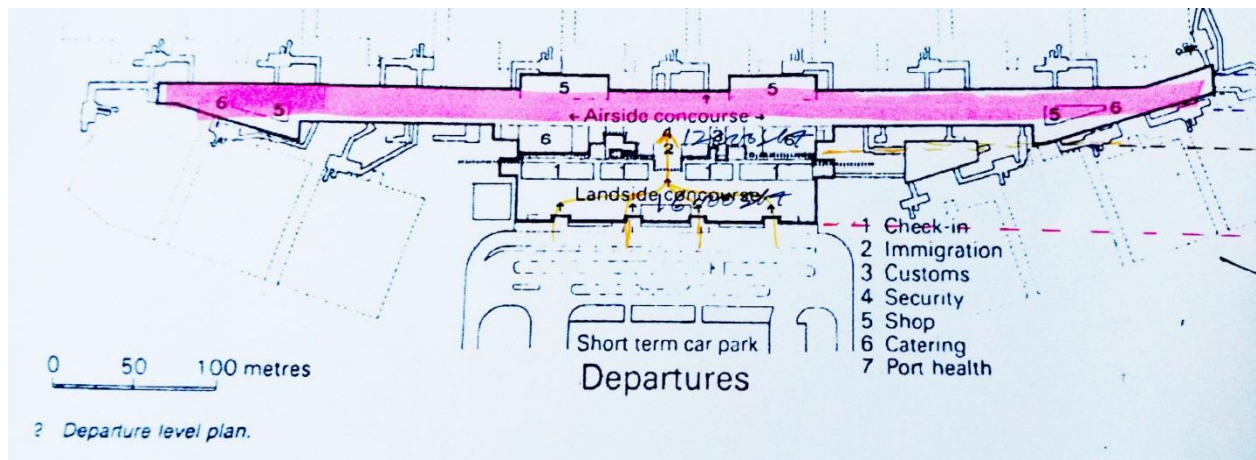


Figure: Heathrow International Airport Terminal 4 Plan Analysis
(Source: Author)

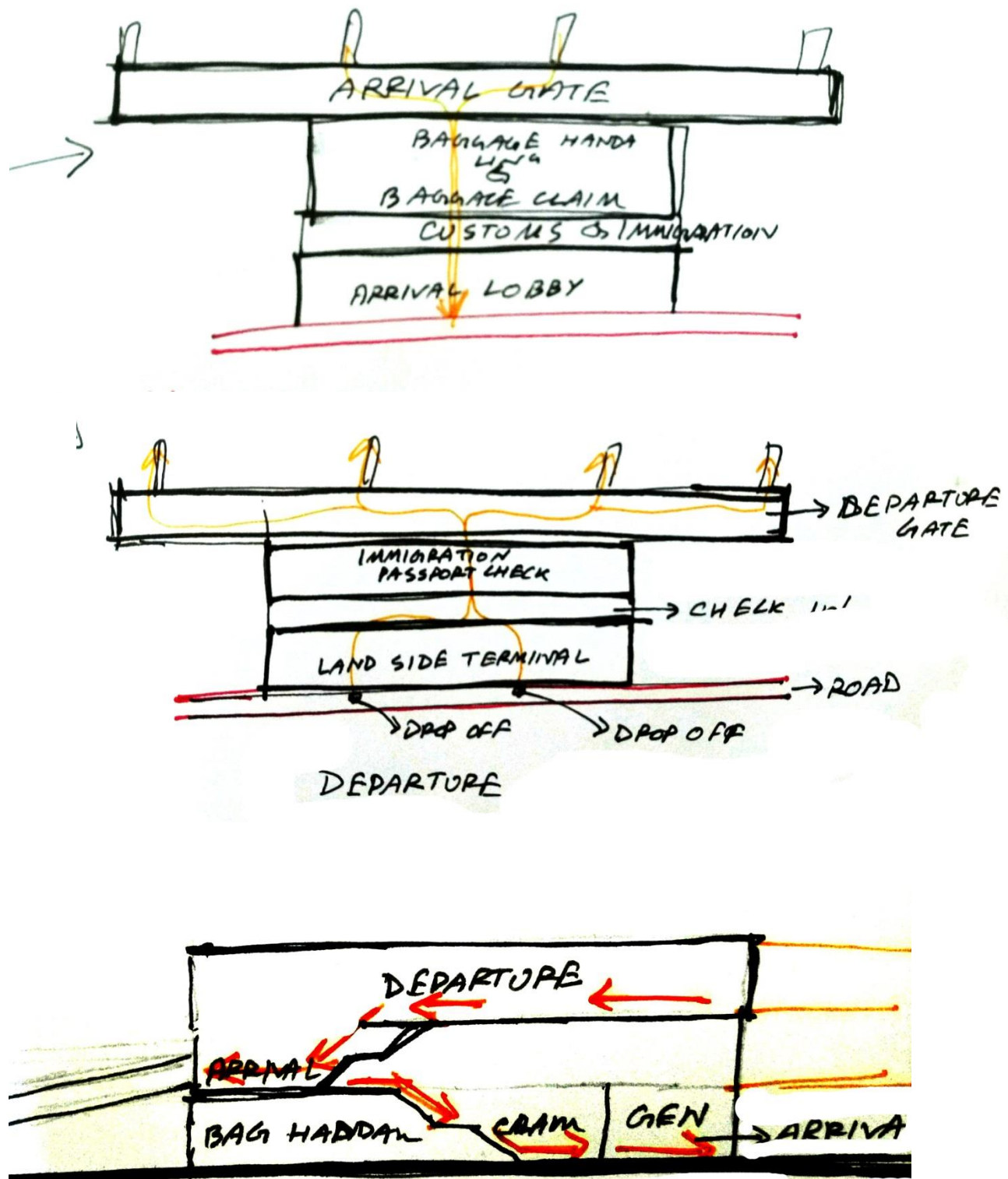


Figure: Heathrow International Airport Terminal 4 Plan Analysis
(Source: Author)

Chapter 5: Program Development

International Section

International Departure Lounge

•Concourse	16,791
•Queuing	10,000
•Check in counters	12,876
•Working Area	5,000
•Travel Taxes	2,000
•Money Exchange	500
•Post Office	800
•Small Café	1000
•Medicine Corner	200
•Flower Shop	135
•Gift Shop	500
•Haberdashery	135
•Insurance Vending	135
•Telephone Booth	100
•News Paper Stand	135
•Toilet [m=f]	675
Total	86,397sft

International Waiting Lounge

•Passengers Waiting Lobby	3,767
•Duty Free Shops	1,000
•Bars	675
•Restuarants	1,500
•Kitchen	600

•Prayer Room	1200
•Toilet__With Chage Room	810
Total	9,552sft

International Arrival Lounge

•Arrival Lobby	8,563
•General Concorces	12,489
•Immigration	1,291
•Customs Counter[9 counters]	5,063
•Baggage handaling	9,569
•Conveyor belt[3 belt]	20,150
•Working area	4,000
•Unclaimed baggage store	2,000
•Visitors waiting lobby	10,000
•Car rental agencies	500
•Hotel booking	600
•Money exchange	300
•Telephone	85
•Duty free shops	1,000
•Gift shop	400
•Supplimentary eating facility	500
•News paper stand	270
•Health & immigration	5,000
•Toilet__With Chage Room	675
Total	82,242 sft

Domestic Departure Lounge

•Concourse	10125
•Queuing	338
•Check In Counters	6942

•Working area	6750
•Passengers Waiting Lobby	3645
•Commisions	405
•Toilet__With Chage Room	473
Total	27905sft

Domestic Arrival Lounge

•Arrival Lobby	5700
•Conveyor Belts	5920
•Working area	3038
•Unclaimed Baggage Store	607
•Commisions	675
•Toilet__With Chage Room	473
Total	17,206sft

Control Tower

•Pre Light Info. Unit	338
•Control Tower	473
•Community Operation	270
•Community Engineering Unit	270
•Radar & Radar Tech. Unit	270
•Biman Operation Unit	540
•Weather Dept.	270
•Telephone Exchange Room	270
•Area Control Room	203
•Toilet	450
•Stair	102
•Prayer Room	405
Total	35,466sft

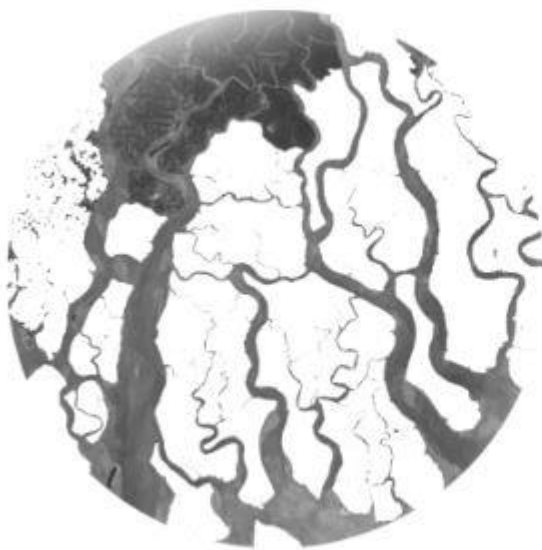
Others

•Administration	2025
•Airline Operation	6750
•Customs	1350
•Airport Security	1350
•Employee Snacks & Cafe	675
•Kitchen	237
•Toilet	675
•Car Parking 400 Cars	32400
•Mechanical Room	1350
Total	32,433
GRAND TOTAL.	2.94.234SFT

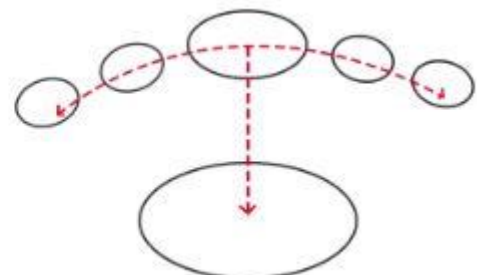
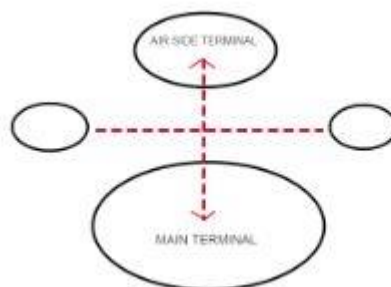
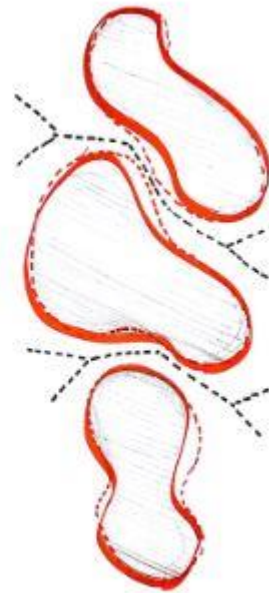
Chapter 6: Concept generation and design Development

6.1 Initial Planning Concept

The main idea was to build an airport which will complement local context. Khulna is a developing city and to cope up with this development we need to build a structure which is flexible in terms of design and space. If we look at land of this area we can find that the land over there is mostly delta and there is a fluidity in the land pattern. That's why I decided to use that fluidity which will help me generate spacious spaces.

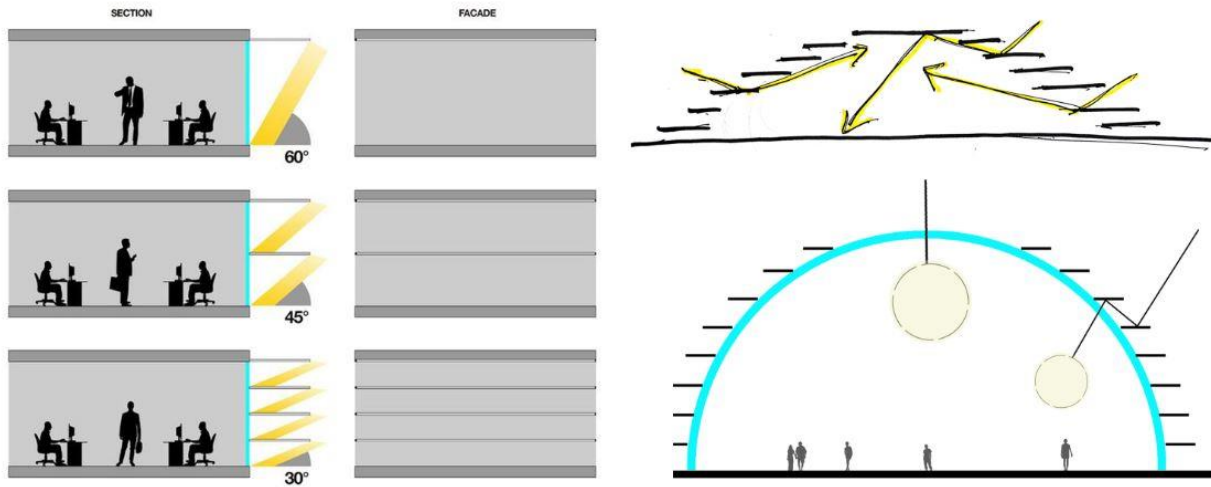


FORM DERIVATION



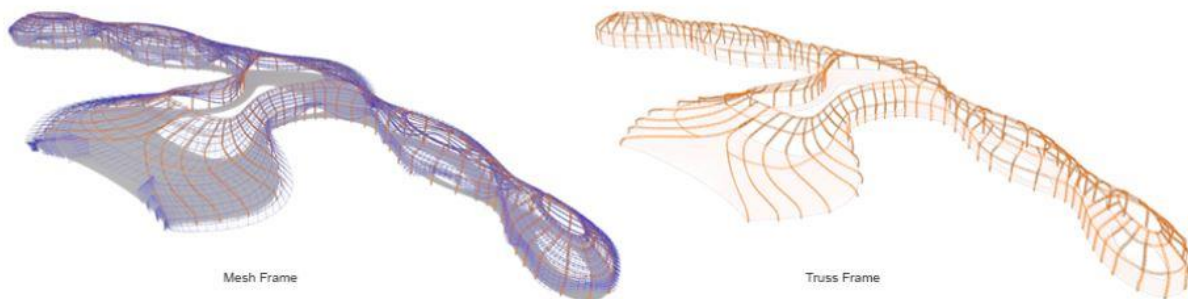
6.2 SKIN

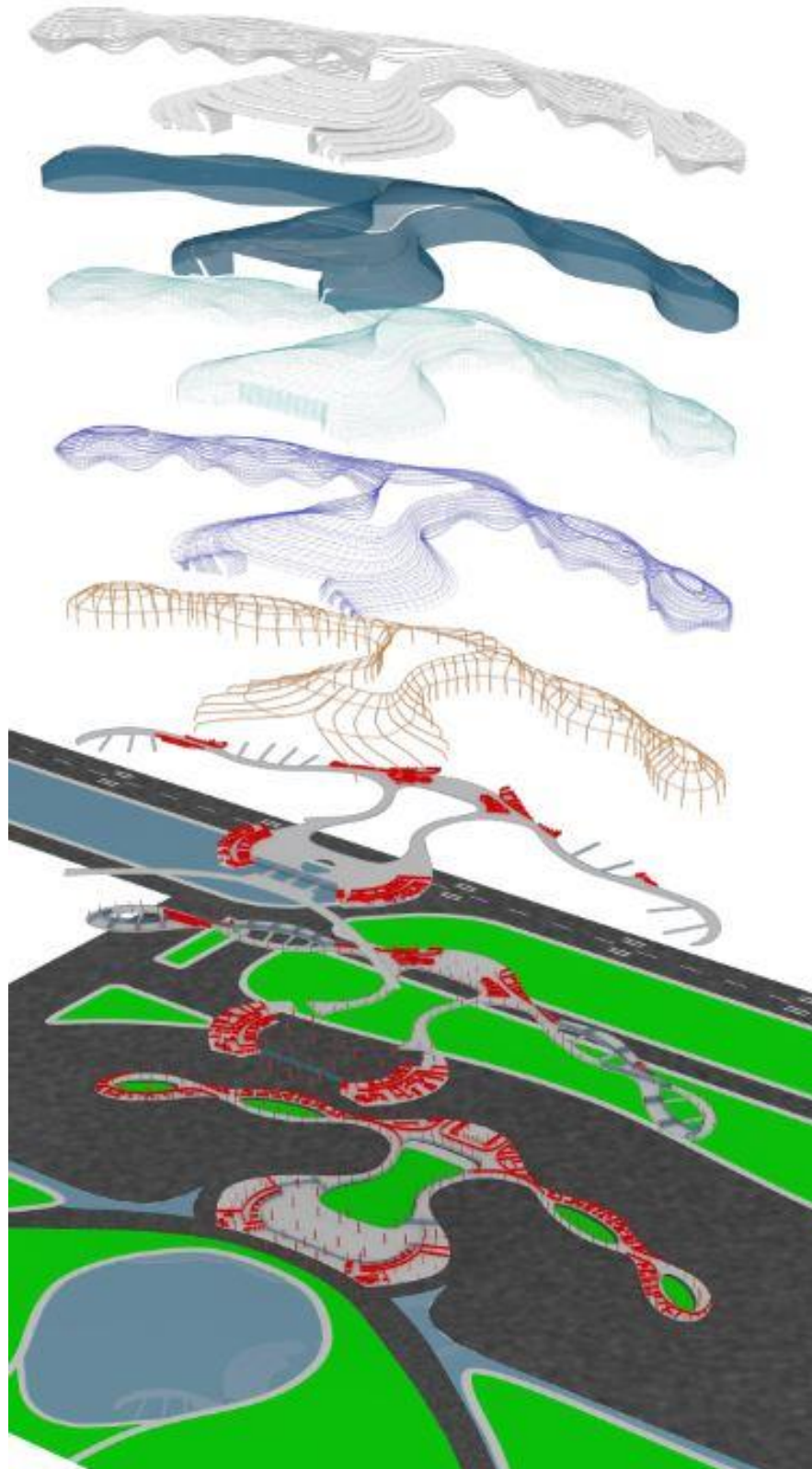
In airports defused day light is mostly preferred. So to do that the whole skin designed as a big huge louver which rapes the whole airport.



Pic: Author

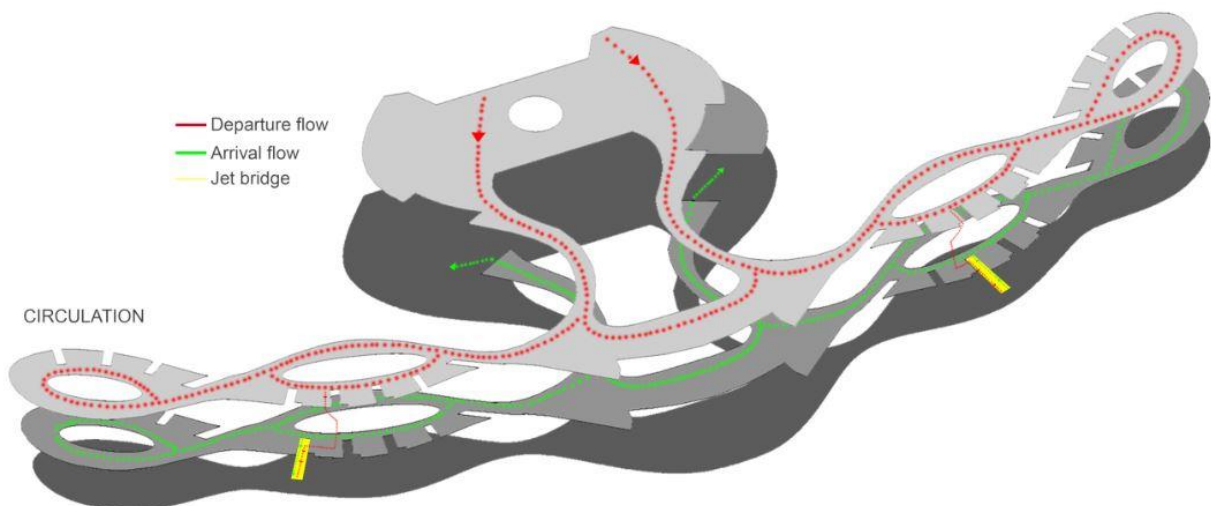
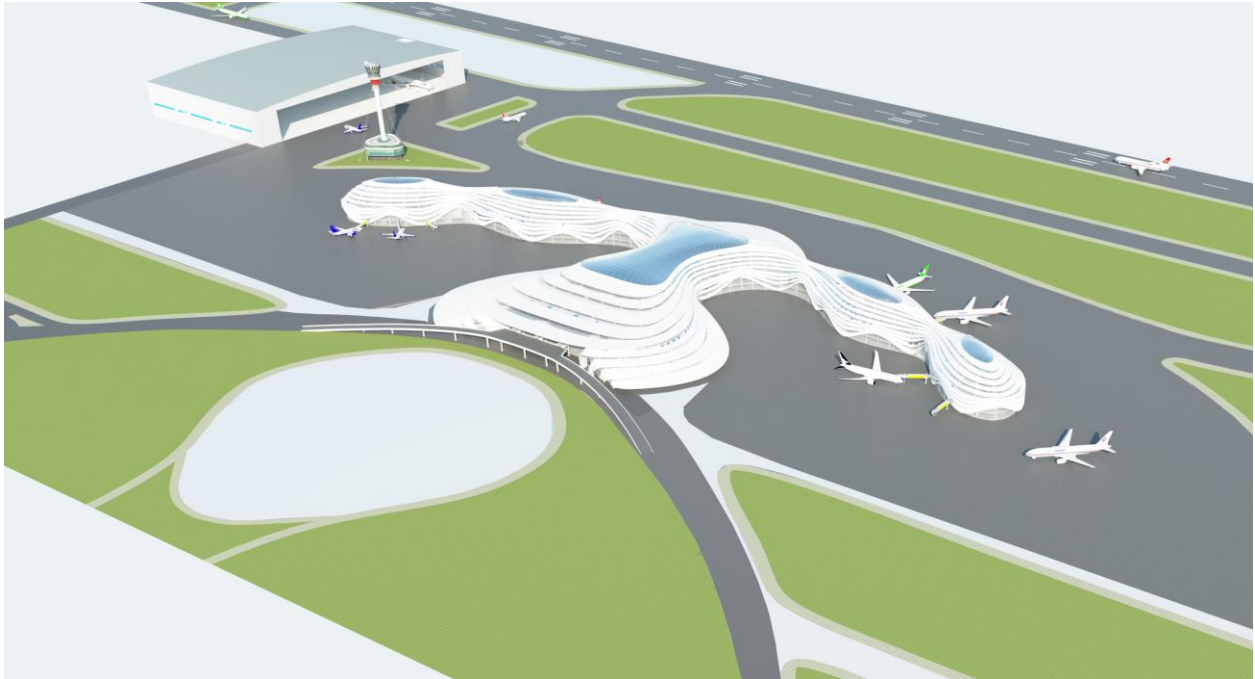
6.3 STRUCTURE



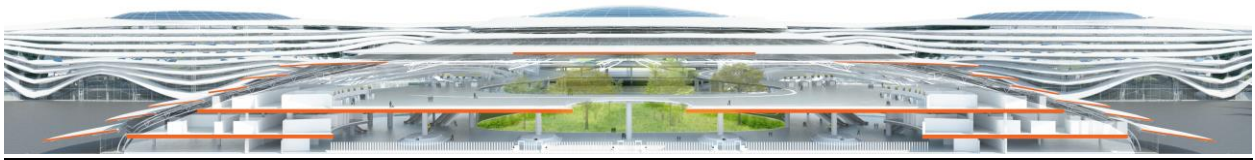
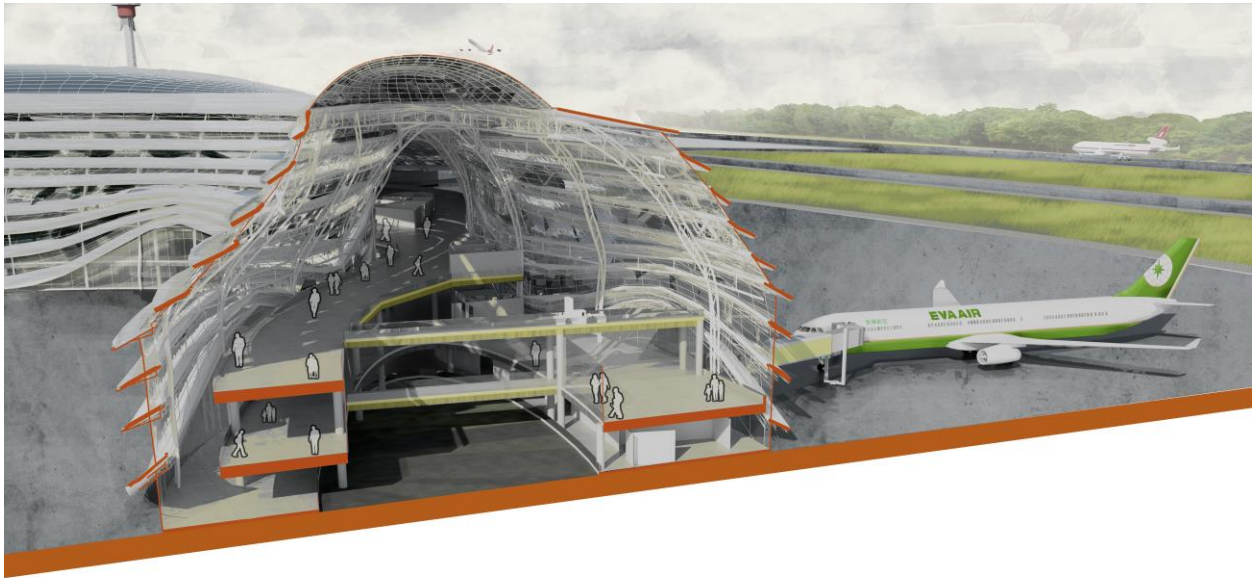


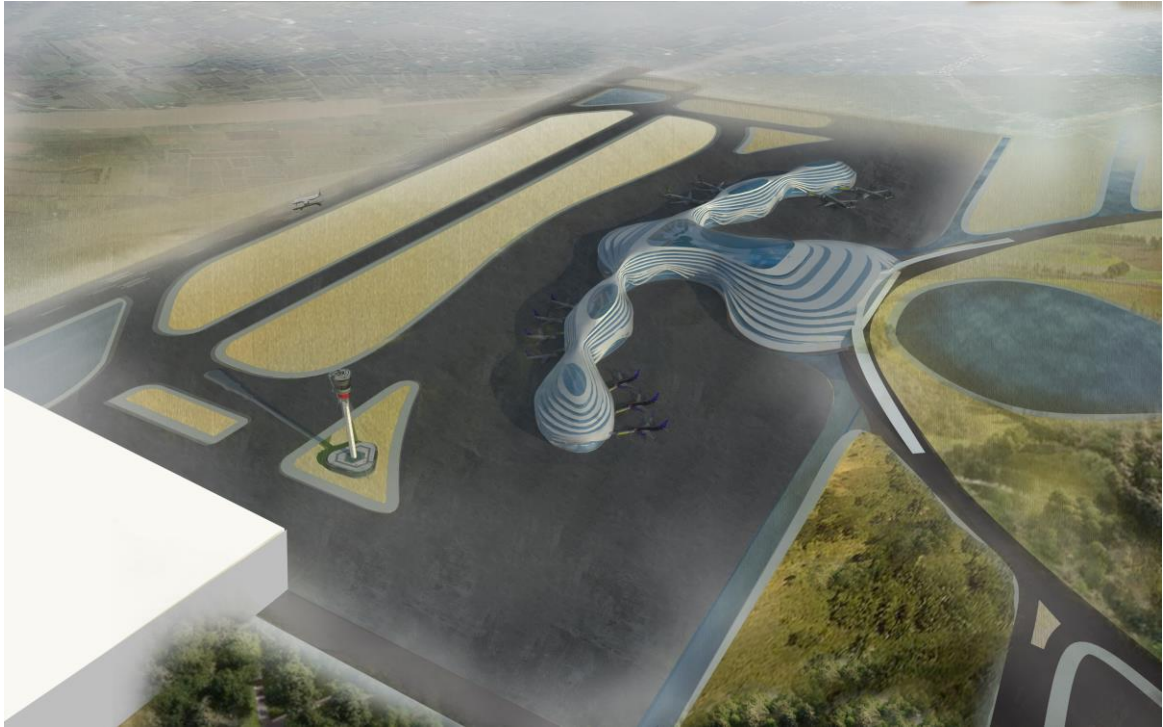
View: Exploded structure

6.4 Form

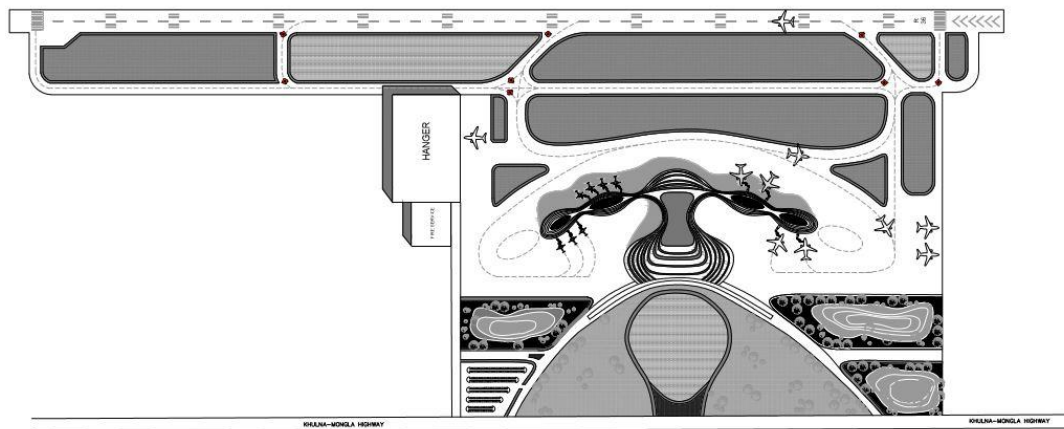


6.5 Sectional perspective

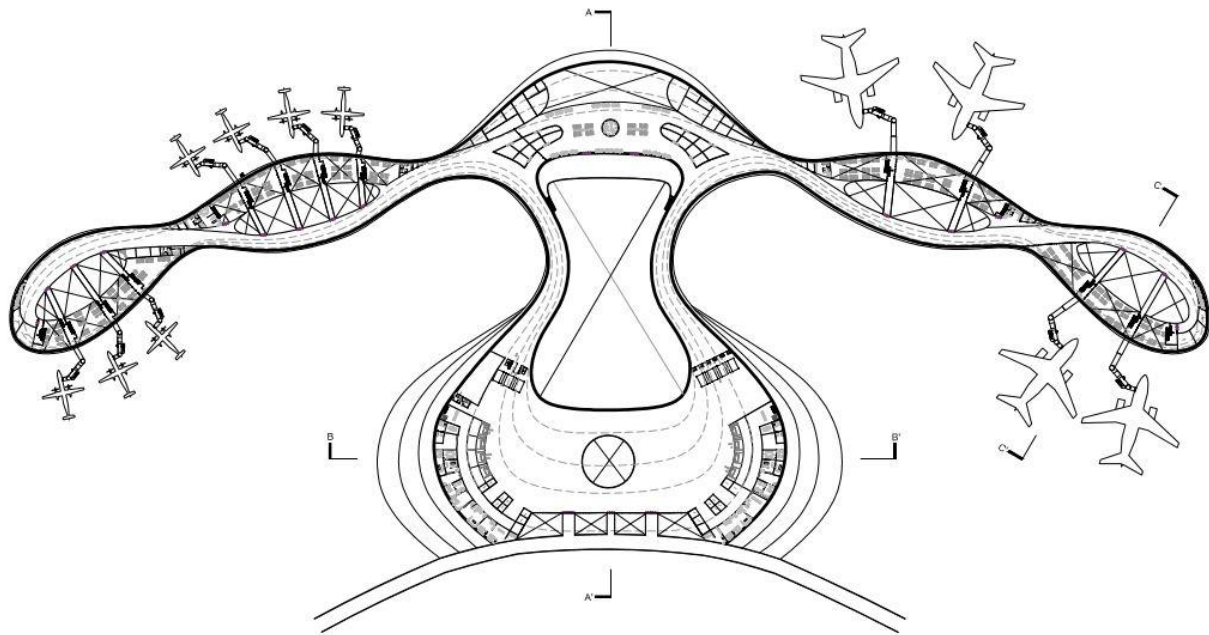




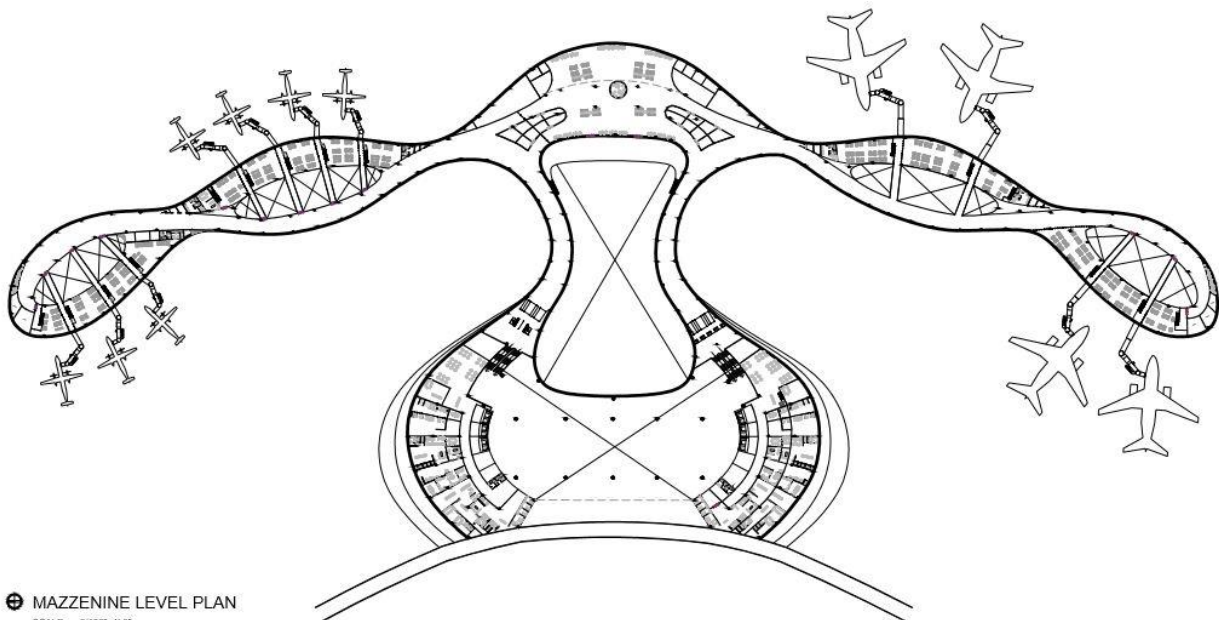
View: Top view Render



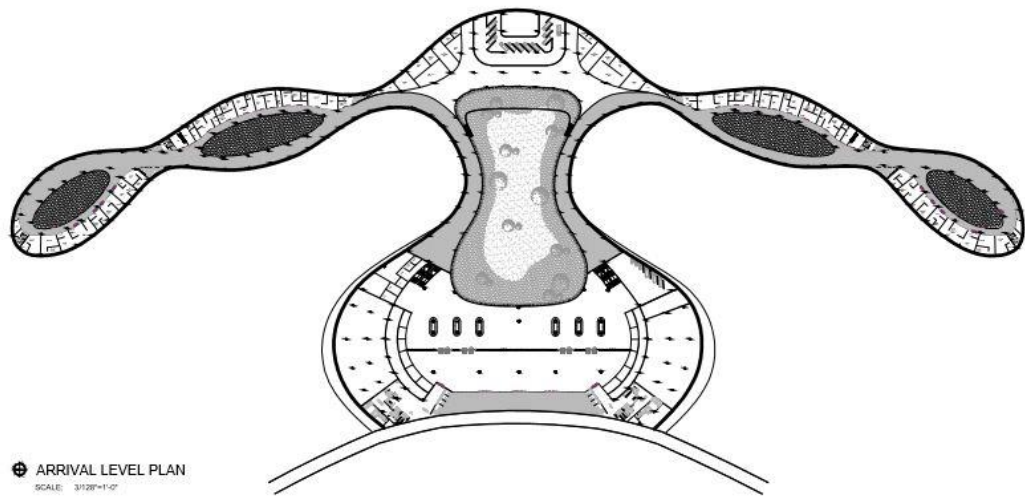
⊕ SITE PLAN
SCALE: 1/128"=1'-0"



⊕ DEPARTURE LEVEL PLAN
SCALE: 3/128"=1'-0"



⊕ MAZZENINE LEVEL PLAN
SCALE: 3/128"=1'-0"



Chapter 7: Conclusion

Designing an airport, is a very complex job. The core challenge was to manage the design the circulation accordingly. The necessity was to give something back to the city, fusing people in general with the venture. The principle accomplishment of this project has been the plan of the capacities, as indicated by their necessities satisfying every one of the prerequisites, which brought about a practically and fundamentally stable and furthermore aesthetically pleasant structure.

This project permitted me to explore different avenues regarding a scope of capacities, climatic thought, and structure; in addition the area of the site is in an exceptionally available and focused zone, Khulna range, which will in the long run be changed over to a business region with elevated structure structures, lodging business spaces, on both sides of the street. This made a chance to make the outline responsive by tending to the essential needs of the city. However, with all the practical requirements, if this airport is made it will increase the amount of air traffic in this country and the whole country will be benefitted by this airport.

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