1. **Overview**

The Airfield Ground Lighting (AGL) is designed to permit aircraft landings under low visibility conditions whereby ICAO designated precision approach Category II on all runways and Category IIIA on RWY 25R apply. It also allows the controlled movement of aircraft on taxiways and within apron areas. The complete system is installed in accordance with the International Standards and Recommended Practices in ICAO Annex 14, Volume I. The lighting, which is available on a 24-hour-a-day basis, is controlled by the Air Traffic Control of Civil Aviation Department.

1.1 AGL has the following functions:

- Facilitate safe aircraft operations including landing, taxiing and take-off;
- Allow for day, night or reduced visibility operations; and
- Denote centreline and edge of pavement, and highlight turning edge of taxiway.

1.2 AGL consists of both elevated and inset lights. Generally, edge lights are elevated fixtures with frangible supporting structures and low enough in height to clear aircraft engine pods and propellers. All centreline lights are inset fixtures and capable of withstanding aircraft weight. All lighting has independent intensity variance control to suit different operational conditions.

1.3 The colour, intensity, orientation, dimensions, lateral and longitudinal spacing, and photometric characteristics of AGL conform with the criteria of ICAO Annex 14, Volume 1, Appendix 2 – Aeronautical Ground Light Characteristics. Furthermore, elevated ground light fittings within the movement area are conspicuously marked with yellow colour.

1.4 Plan 6 in Part L shows the colour and general layout of all AGL including runways, taxiways, taxilanes, approach and apron stand lights.
2. **Approach Lighting**

2.1 Runways 07R, 25L, 07L and 25R are provided with an ICAO Category II precision approach lighting system at each end of the runways. RWY 25R is also provided with an ICAO CAT IIIA precision approach lighting system at the end. Complete details of spacing, profile and layout are shown on Plans 7A, 7B, 7C and 7D in Part L.

2.2 The Approach Lighting System consists of:

2.2.1 **Centreline Barrettes**
- 4 unidirectional lights, 1.5m apart
- Located on the extended runway centerline
- Variable intensity white
- Located every 30m commencing 900m before the threshold

2.2.2 **Side Barrettes**
- 3 unidirectional lights, 1.5m apart
- Located 9m either side of the extended runway centreline
- Variable intensity red
- Located every 30m commencing 270m before the threshold

2.2.3 **Inner Crossbar**
- 4 unidirectional lights, 1.5m apart
- Located on the extended runway centreline between the centreline barrettes and the side barrettes
- Variable intensity white
- Located 150m before the threshold

2.2.4 **Outer Crossbar**
- 7 unidirectional lights, 1.5m apart
- Extends out 15m either side of centreline barrette
- Variable intensity white
- Located 300m before the threshold

2.2.5 **Sequenced Flashing Light**
- Single capacitor discharge flashing light
- Sequentially flashes from outermost to innermost
- Variable intensity white
- Located at each centreline barrette from 900m to 300m before the threshold
3. **Obstacle Lighting**

3.1 Localizer (LLZ) azimuth antennas are installed by CAD at both ends of the South Runway and North Runway. Each LLZ antenna array has 3 obstruction lights located at either end and at the middle of the array.

3.2 These obstruction light grid coordinates (HK1980) and heights are as follows:

<table>
<thead>
<tr>
<th>Runway</th>
<th>Location Co-ordinates</th>
<th>Height (mPD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>07R LLZ</td>
<td>811409.00 E, 818808.44 N</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>811399.90 E, 818834.91 N</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>811390.79 E, 818861.40 N</td>
<td>12.6</td>
</tr>
<tr>
<td>25L LLZ</td>
<td>807235.25 E, 817430.53 N</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>807244.35 E, 817404.03 N</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>807253.45 E, 817377.59 N</td>
<td>13.2</td>
</tr>
<tr>
<td>07L LLZ</td>
<td>811233.46 E, 820434.23 N</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td>811247.31 E, 820411.04 N</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>811250.63 E, 820384.32 N</td>
<td>11.2</td>
</tr>
<tr>
<td>25R LLZ</td>
<td>807093.17 E, 818952.8 N</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>807084.54 E, 818977.7 N</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>807075.99 E, 819002.7 N</td>
<td>11.0</td>
</tr>
</tbody>
</table>

4. **Precision Approach Path Indicators (PAPI)**

4.1 PAPI are installed at both sides of South Runway and one side of North Runway (right hand side of 25R and left hand side of 07L). It is a 4 multi lamp unit, with adjustable intensity (red and white colours), slope and elevation.

4.2 PAPI is designed with an approach slope of angle 3° and a minimum eye height over threshold (MEHT) of 20m. The PAPI distances from threshold are listed below:

<table>
<thead>
<tr>
<th>Runway</th>
<th>PAPI Distance from Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>07R</td>
<td>457.144m</td>
</tr>
<tr>
<td>25L</td>
<td>497.340m</td>
</tr>
<tr>
<td>07L</td>
<td>435.262m</td>
</tr>
<tr>
<td>25R</td>
<td>435.889m</td>
</tr>
</tbody>
</table>
5. **Runway Lighting**

5.1 The colour, intensity, dimensions, lateral and longitudinal spacing, and photometric characteristics of runway lighting are conformed with the criteria of ICAO Annex 14, Volume 1, Appendix 2 and the CAD Aerodrome Licensing Requirements Document. The specifications of lighting of South Runway and North Runway are identical, except where specified below.

5.2 Location details and characteristic compliance are depicted on Plan 6 in Part L.

5.3 The Runway Lighting consists of:

5.3.1 **Threshold Lights**

- Unidirectional inset lights
- Located 1.0m before the 07R, 07L and 25R runway thresholds and 1.5m before the 25L threshold
- Lights are spaced at 2.893m intervals between the runway edge lights and 2.5m intervals outside of the runway edge lights extending 10m beyond the runway edge light
- Variable intensity green

5.3.2 **Centreline Lights**

- Bi-directional inset lights
- Located at 0.6m offset (south) of runway centreline
- 29.674m spacing for South Runway touchdown zone and 14.76m spacing for North Runway touch-down zone. Outside the touch-down zones, spacing is 30m and 15m for South Runway and North Runway respectively
- Variable intensity white to 900m from runway end
- Alternative red/white from 900m to 300m from runway end
- Variable intensity red from 300m to runway end

5.3.3 **Touchdown Zone Lights**

- Unidirectional inset lights
- Located in the first 900m of runway at 30m spacing both sides of the runway
- Consist of 3 lights at 1.5m spacing either side
- Inner light is offset 9m from the runway centreline
- Variable intensity white
5.3.4 **Edge Lights**

- Omni-directional elevated lights and bi-directional inset lights at taxiway intersection
- Two parallel rows 30.375m either side of runway centreline
- 59.348m spacing for South Runway and 59.041m spacing for North Runway except in the touchdown zone where spacing is 60m
- Variable intensity white to 600m from runway end
- Variable intensity yellow for the final 600m
- For runways 25R, 07L and 07R the lights beyond the far end displaced threshold are variable intensity red

5.3.5 **End Lights**

- Uni-directional inset lights
- 12 lights spaced at 5.523m across the runway end
- located 0.5m beyond the runway end
- Variable intensity red

5.3.6 **Rapid Exit Taxiway Indicator Lights**

- Uni-directional inset lights
- Consist of a group of yellow lights in a 3-2-1 sequence
- Spaced 100m apart prior to a rapid exit taxiway

6. **Taxiway and Apron Stand Lead-in Lighting**

6.1 Details of taxiways and taxilanes for low visibility operations are listed in Para.3.1 of Part B, Section 5.

6.2 The Lead-in Lighting consists of:

6.2.1 **Centreline Lights**

- Bi-directional inset lights
- Offset 0.3m from the taxiway/taxilane centreline
- Spacing 30m maximum
- Spacing on curves of radii less than 400m is 7.5m
- Where the lighting forms part of CAT IIIA movement routing, the 7.5m nominal spacing is extended 60m beyond the curves
- Variable intensity green except in ILS sensitive zone where they show alternative green/yellow to aircraft exiting the runway

6.2.2 **Taxiway Edge Lights**

- Elevated fittings
- 30m maximum spacing
- Variable intensity blue
6.2.3 **Intermediate Holding Position Lights**

- Unidirectional inset lights
- 3 lights spaced 1.5m apart symmetric about the centerline
- Variable intensity yellow to approaching aircraft
- 2 sets at TWY V1 and TWY V4 with additional elevated lights

6.2.4 **Taxiway Hold Bars**

- Unidirectional inset lights with additional pair of elevated lights
- 18 sets are located at Taxiways A/B/H/N/V/W intersection
- Selectively switchable
- Control is available to the green lead-on lights to permit route selection
- Lights spaced at 3m intervals
- Variable intensity red

6.2.5 **Apron Stand Lead-in Lights**

- Omni-directional inset
- Two lights spaced at 15m to identify the start of the stand centreline
- Locally switched at the stand
- Variable intensity yellow

7. **Stop Bars and Runway Guard Lights**

7.1 **Stop Bars**

- Unidirectional inset fitting with additional pair of elevated edge light
- Located at all runway entrances
- Lights spaced at 3m intervals across the taxiway
- Selectively switchable
- Linked to intrusion sensor for RWY 07L/25R
- Interlocked to 90m of taxiway centreline lights beyond the stop bar
- Variable intensity red

7.2 **Runway Guard Lights**

- A pair of flashing elevated lights
- Located both sides of a stop bar
- 45 flashes per minute
8. **Apron Floodlighting**
   - 20 lux illumination provided
   - 10 lux under emergency power
   - 30m high floodlights provided at passenger apron, long term parking and maintenance apron
   - Stand E4 has 20m floodlight masts due to obstacle safeguarding restrictions
   - 20m or 30m high floodlights provided at the Cargo Apron

9. **Lightings for Vehicles**
   9.1 **Road Holding Position Lights**
      - Unidirectional elevated lights
      - Provided where vehicle traffic may interfere with ILS sensitive areas
      - Coincides with traffic sign displaying ‘Contact ATC’
      - Flashing red at 45 flashes per minute

   9.2 **Vehicle Warning Lights**
      - Unidirectional inset lights
      - A pair of flashing lights with 1.2m apart at Cargo area and 1.5m apart at other areas
      - Provided where vehicle traffic may interfere with taxiways
      - Coincides with ‘Give Way to Aircraft’ line marking
      - Flashing yellow at 45 flashes per minute

10. **Electrical Power Supply System**
   10.1 Power supply for the runway and taxiway lights originates from four AGL Vaults, one at each end of each of the runways (South and North). Constant current regulators located at each AGL Vault providing variable 6.6A constant current power supply to these lights.

   10.2 Primary power supply for AGL Vaults is from a power supply company via different electrical distribution routes. Secondary power supply is by local standby generators located in the generator buildings. When the primary power supply is failure, the secondary power supply will be automatically switch-over within 15 seconds to provide the power supply.
10.3 Under precision approach CAT II or CAT IIIA operation, the secondary power supply serves as the main power source for the runway and taxiway lighting and the primary power supply serves as the backup power supply. In such configuration, the switch-over time during main power source failure can be reduced to 1 second.

11. **AGL Control and Monitoring System**

11.1 Two separate independent AGL Control and Monitoring System (AGLCMS) are installed for the operations of South and North Runway. The AGLCMS can be accessed through the user workstations located in the Air Traffic Control Complex (ATCX), the Backup Air Traffic Control Complex (BATCX), the Fault Response Team Office (FRTMO), the AGL Vaults, Airfield Ground Maintenance Building (AGMB) and Integrated Airport Centre (IAC).

11.2 The AGLCMS provides the following functions:

- Provide runway operation mode selection, AGL facilities control and individual circuit control at ATCX and BATCX.
- Real time indication of the operational status of AGL lights.
- Generate and identify three levels of alarms according to the impact of the faults to operation:
  - Level 1 alarm needs immediate response and action
  - Level 2 alarm is a warning signal
  - Level 3 alarm is an event log
- Identify the affected category serviceability according to the type and level of alarms