Airfield Lighting training

Safegate Group
Content

• Presentation of Safegate group

• Introduction to the Airfield lighting

• TAFL range overview
Presentation of Safegate group
THORN Airfield Lighting is a member of the Safegate group, world leader in:

- Docking Guidance Systems (DGCS),
- Advanced Surface Movement Guidance Control Systems (ASMGCS),
- AFL Control & Monitoring Systems (AFL CMS) and equipments.
Safegate group

- The **Safegate group** has a turnover over 50M€ and a staff of 100 high qualified people.

- The **Safegate group** has offices in:
  - Malmö, Sweden (Head office)
  - Östersund, Sweden
  - Stockholm, Sweden
  - Horsens, Denmark
  - Les Andelys, France
  - Paris, France
  - London, UK
  - Melbourne, Australia
  - Dubai, UAE
  - Doha, Qatar
  - Minneapolis, USA
THORN Airfield Lighting - member of Safegate group
THORN Airfield Lighting - member of Safegate group

- Factory, R&D and Central Warehouse (Les Andelys-France) ISO9001
- Marketing head office: Paris
- Worldwide representation:
  - Paris, France
  - London, UK
  - Melbourne, Australia
  - Dubai, UAE

50 Years of airfield lighting
Core skills

- R&D and manufacturing of airfield fittings
- Specialist in procurement of AGL systems
- Project management
- Installation
- “Turnkey” project
- Training on site / factory
- Supervision
- Maintenance
# Regulations & standards

<table>
<thead>
<tr>
<th>International standards</th>
<th>National certifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ICAO, Annex 14</td>
<td>• STAC (France)</td>
</tr>
<tr>
<td>• FAA, AC150/5345</td>
<td>• AENA (Spain)</td>
</tr>
<tr>
<td>• CAP 168</td>
<td>• MAK (RUSSIA)</td>
</tr>
<tr>
<td>• IEC / CENELEC</td>
<td></td>
</tr>
<tr>
<td>• NATO / STANAG</td>
<td></td>
</tr>
</tbody>
</table>
Key recent projects awarded

- Amsterdam Airport (2002) – 4,000 Inset Lights
- Madrid Airport (2003) – 5,000 Inset Lights
- Barcelona Airport (2003) – 5,000 Inset Lights
- Dubai Airport (2004) - 12,000 Inset Lights
- Sydney Airport (2004) - 3,000 Inset Lights
- Mumbai Airport (2004) - Complete AGL Equipment
- Antalya Airport (2005) - Complete AGL Equipment
- Teheran Airport (2005) - Complete AGL Equipment
- New Delhi Airport (2006) – 2,000 Inset Lights
- Jebel Ali Airport (2007) – 10,000 Inset Lights
Thorn AFL in the Top 20 airports

TOP 20 world airports in passengers (2005)

- Denver
- Las Vegas
- Los Angeles
- Phoenix
- Dallas
- Houston
- Minneapolis
- Chicago
- Detroit
- Paris-CDG
- London-Heathrow
- New York-JFK
- Atlanta
- Amsterdam
- Frankfurt
- Madrid
- Tokyo-Narita
- Beijing
- Hongkong
- Bangkok

Rank 2005

1. 85.9
2. 76.5
3. 75.8
4. 67.9
5. 61.4
6. 53.8
7. 44.2
8. 44.0
9. 40.6
10. 36.4
11. 39.0
12. 39.7
13. 40.0
14. 41.0
15. 41.9
16. 41.6
17. 41.0
18. 40.0
19. 40.0
20. 40.0

Million passengers in 2005
Source: ACI Traffic Data

THORN equipment supply
- Nothing
- < 50%
- > 50%

THORN Airfield Lighting
Overview of Airfield functions

1- Approach
2- Runway
3- Taxiway
4- Fixing
5- Power
6- General lighting
7- System
8- Helipad
9- Obstruction
Introduction to the Airfield Lighting
Key dates of the Aviation

- **1890** First flight (Clément ADER)
- **1909** First crossing of the English Channel (Louis BLERIOT)
- **1913** First crossing of the Mediterranean sea (Roland GARROS)
- **1914** Technical improvements of the Aviation during World War I
- **1927** First crossing of the Atlantic ocean (Charles LINBERG)
- **1930** First flight to South America (Jean MERMOZ)
- **1939** Technical improvements of the Aviation during World War II
- **1944** Convention on the Civil Aviation (ICAO)
First Beacon : 300 years before JC on the Pharos Island in the entrance of the Alexandria harbor, a fire was set at the top of a tower in order to guide the ships.

Genesis of the Airfield Lighting :
- Ground lights to guide the pilots during their flights.
- On airports, passive ground markings and signs.
- First airfield lights for night operations and ground guidance.
Possible uses:
- Private Aviation
- Commercial Aviation
- Freight Aviation (Cargo)
- Military Aviation

Infrastructures:
- At least, one terminal
- At least, one runway
- Taxiways
- Apron areas

Key aspects:
- Security/Safety
- Reliability, availability
- Environment care (noise, pollution)
Airport code (1 - 4):
- Available landing distance
- Type of aircrafts (Code A- F)
  - Max wing span
  - Width of the main wheels

Types of approaches:
- Visual approach
- Classical approach
- Precision approach
## Airport classification

<table>
<thead>
<tr>
<th>Code</th>
<th>Runway (Length/Width)</th>
<th>A (&lt;15m)</th>
<th>B (&lt;24m)</th>
<th>C (&lt;36m)</th>
<th>D (&lt;52m)</th>
<th>E (&lt;65m)</th>
<th>F (&gt;=65m)</th>
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</thead>
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<tr>
<td>1</td>
<td>&lt;800m</td>
<td>18m</td>
<td>18m</td>
<td>23m</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>2</td>
<td>&lt;1200m</td>
<td>23m</td>
<td>23m</td>
<td>30m</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>3</td>
<td>&lt;1800m</td>
<td>30m</td>
<td>30m</td>
<td>30m</td>
<td>45m</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>&gt;=1800m</td>
<td>No</td>
<td>No</td>
<td>45m</td>
<td>45m</td>
<td>45m</td>
<td>60m</td>
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</table>
## Operational classification

<table>
<thead>
<tr>
<th>VFR (Visual Flight Rules)</th>
<th>In the controlled space area</th>
<th>Out of the controlled space area</th>
</tr>
</thead>
<tbody>
<tr>
<td>In flight visibility</td>
<td>8Km</td>
<td>1500m</td>
</tr>
<tr>
<td>Distance to the clouds</td>
<td>1500m horizontal 300m(1000ft) vertical</td>
<td>Out of the clouds</td>
</tr>
</tbody>
</table>

### IFR (Instrument Flight Rules):

<table>
<thead>
<tr>
<th>Category</th>
<th>DH</th>
<th>RVR</th>
<th>VH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT I</td>
<td>&gt;= 60 m</td>
<td>&gt;= 550 m</td>
<td>&gt;= 800 m</td>
</tr>
<tr>
<td>CAT II</td>
<td>&gt;30m and &lt;60 m</td>
<td>&gt;= 350 m</td>
<td>500 m</td>
</tr>
<tr>
<td>CAT III a</td>
<td>&lt; 30 m</td>
<td>&gt;= 200 m</td>
<td>1000 ft</td>
</tr>
<tr>
<td>CAT III b</td>
<td>&lt;15 m</td>
<td>&gt; 50 m and &lt; 200m</td>
<td>500 m</td>
</tr>
<tr>
<td>CAT III c</td>
<td>No DH</td>
<td>No limit</td>
<td>No limit</td>
</tr>
</tbody>
</table>

DH = Decision Height  
RVR= Runway Visual Range  
VV = Vertical Visibility  
HV = Horizontal Visibility  
TORA = Rolling Distance usable for take-off  
TODA = TORA + Prolongation  
ASDA = TORA + prolongation for stopping  
LDA = Distance usable for landing
Standard/regulation organisms

I.C.A.O. = International Civil Aviation Organisation
Created after World War II following the development of the Civil Aviation. They establish the minimum requirements that must be followed by the member States in all areas related to Civil Air Transport (ex: Radio communications, security, Runway design…)

F.A.A. = Federal Aviation Administration
Department of the US Ministry of Transportation. They establish and check the application of the rules to be followed by the Civil Aviation in the US territory.

S.T.A.C. = Technical Services of the French Civil Aviation (former STNA)
Department of the French D.G.A.C (General direction of Civil Aviation) which reports to the Transport Ministry. They establish and check the application of the rules to be followed by the Civil Aviation in the French territory (reference document: CHEA)


I.E.C (CENELEC) = World organisation for electrical equipment standardisation

B.S = British Standards and its CAP168 rules for Airfield
Definition of the Airfield lighting

Provide visual aids to the pilots during day, night and with bad visibility

ICAO ANNEX 14 VOLUME I : Design & technical use of aerodromes Marking and Airfield lighting (chapter 5)

a) **Type** of light fitting (fix, flashing…)
b) **Location** on site (= position, distance, quantity…)
c) Minimal photometrical **Performances** (Appendix 2)
d) **Color** definitions (Appendix 1)

The ICAO gives information on the **frangibility** and the **wind resistance** of the equipments.

In the FAA Advisory Circulars, the **mechanical characteristics** of the equipments are defined in detail.

The IEC has established an international standard on the **electrical and mechanical security** of the Airfield lights.
AIRPORT BEACON

Locate the airfield

Visibility in Approach

2. Visible from very long distance
   => High luminous intensity

3. Guidance to the Axis of Runway
   Used to align the plane with the runway
   -- Steady burning light
   -- Flashing light (SFLS, ODALS or SAGA)

4. Guidance on the approach slope
   Keeping the aircraft in the cone to make a perfect landing in optimum conditions
   VASI system, APAPI, PAPI

5. Indication of the direction of the wind
   Information on the direction and force of the wind-Wind sock and / or "T" Landing
6 Runway Threshold
Indicate the beginning of the usable area of the runway for landing.
- Steady burning green light
- Flashing light (RTIL or SAGA)

7. Runway Edge
Delimitation of the edge of the runway
- Steady burning light Clear and Yellow (last 600m)

8 Runway end
Boundary line that is not allowed to overrun during landing or take off operation.
- Steady burning light Red

9 Runway centre line
Light of the centre of the runway (compulsory from CAT II).
- Steady burning light Clear and red (last 900M)

10 Touch down Zone
Delimitation of the area where the plane have to land (compulsory from CATII).
- Steady burning light CLEAR.
11 Light for taxiway edge or apron
Delimitations of the edge of the taxiway or apron
- Steady burning light Blue

12 Runway guard light
Delimitation of the entry on the runway.
- Flickering light Yellow

13 Light for stop bar and clearance bar
Lighting of the area where the plane have to stop or take care for crossing over (compulsory from CATII).
- Steady burning light red (stop bar) or Yellow (clearance bar)

14 Light for taxiway centre line
Light in the centre line of the taxiway, lead on, and taxiway exit (Compulsory from CATII).
- Steady burning light Green (or yellow)
15 Location Signs
Indicate the name (first letter) of the taxiway you are on.
- Yellow character on black background.

16 Information Signs
Give the information about the taxiway(s) that the is going to cross.
- Black character on yellow background.

17 Mandatory Signs.
Identifies the place beyond the plane is not allowed to go without ATC authorisation.
- White character on Red background.

18 Obstacle light.
Identifies the obstacle on the movement area.
- Steady burning light.
Mains characteristics of lighting circuits.

1) Provide the necessary energy so that the fittings give the visual aids with the required level of light.
2) Fix the homogeneousness of the light output of every fitting of the same function.
3) Permit to adjust, in regards of visibility, the light output level of the fitting.
4) Fix the continuity of the mains supply of the circuit in regards of the category of the airport.
5) Wide area of the airport = Long length of cable.

Checking of light emitted by an incandescent lamp.

The intensity of the light emitted by an incandescent lamp is proportional to current going through the filament.

NOTA: The new LED light don’t react proportionally. They need a sophisticated electronic interface.
REMINDER OF ELECTRICAL RULES

\[
U = R \times I \quad \text{et} \quad P = U \times I
\]

Where
- \( U = \) voltage express in Volt (V)
- \( I = \) Current express in Amps (A)
- \( R = \) Resistance express in Ohm
- \( P = \) Power express in Watt (W)

These two formula learn to us that:
* With a constant voltage \( U \), higher is the consumed power \( P \), higher is the current.
* A wire, with a resistance \( R \) and a current \( I \) going through gives at its extremity a drop voltage \( U \).
* With a similar resistance \( R \), higher is the current \( I \) is, higher is, the voltage drop.
* With a similar current \( I \), higher is the resistance \( R \) is higher is the voltage drop.
* In inverse; for a similar current \( I \), lower is the resistance, lower is the drop voltage \( U \).

Note: The resistance of a wire
1) In inverse ratio to its section (bigger is the wire lower is its resistance)
2) Proportional to its length (longer is the wire more it is resistant).
SUPPLY OF THE CIRCUIT

parallel circuit

Drop voltage:
\[ U > U_4 > U_3 > U_2 > U_1 \]
\[ \Rightarrow \]
Different current in the lamps:
\[ i_{L4} > i_{L3} > i_{L2} > i_{L1} \]

\[ \rightarrow \] Homogeneousness of the current?
\[ \rightarrow \] Monitoring of the brightness?

Long length of the = loss of power in the line + drop voltage + the necessity of the homogeneousness of the intensity of all fittings for a same function = SUPPLY IN CURRENT OF THE AGL FITTINGS
SERIE CIRCUIT

Série circuit
Current in every lamp $= I$
Voltage variable with the load.

→ Link = Insert isolation transformer
CURRENT LOOP

The supply in current ask for a special network called serie circuit or loop of current or AGL loop.

This type of circuit needs the following basics equipments :

1) A current supply = CONSTANT CURRENT REGULATOR
2) A primary circuit.
3) Isolating transformer.
4) Secondary circuits.
5) AGL fittings

AS option we can find the following equipments

A) Circuit selectors.
B) Monitoring modules
CONSTANT CURRENT REGULATOR (CCR)

Electrical cabinet where the input energy is transformed from voltage to an output current adjustable from 2.8Ac to 6.6A.

Usually named CCR.

Take care: the output voltage can reach high voltage level > 1000V

For Example:

LOAD IN THE CIRCUIT: P=10KVA

Regulated current: I=6.6A

Output voltage: U=P/I = 1515Volts
Câble HT mono-conducteur, courant nominal 6.6 A, tension nominal = 5KV (CCR 30KVA ★ U = 4 545V )

Chaque portion de câble peut être livré avec une longueur prédéfinie déjà équipée de connecteurs primaires surmoulés ou être (sur site) coupée à la bonne longueur et équipée avec des kits de connexion primaires.

Note 1 : Le câble peut être équipé ou non d’un écran

Note 2 : Le circuit primaire peut être suivi en parallèle par un circuit de terre = fil de cuivre nu et piquets de terre (un tous les 200 / 300 m).
The purpose of the isolating transformer is to separate the light from the primary circuit (the loop is close even if one lamp fails)
Input current: 6.6A
Output current: 6.6A
Output power: 45, 65, 100, 150, 200, 300 VA
Secondary Circuit

Cable low voltage two or single*core cable, nominal current 6.6 A, nominal voltage = 500 V

Each cable can be delivered with the exact length you need equipped with factory molded plug or cut on site and equipped with connector kit.

(*) We use single core cable mainly for the connection of side entry base.
Always use the correct equipment.

1) Get the right photometric result
2) Get the correct color
3) To be compatible with all standards equipment
4) Strong enough to resist at all conditions
5) As simple as possible to save time in the maintenance operation
6) To have adjustable devices

**Alignment axis**

+/- 6.4 mm

**Axe du faisceau**

Azimuthal tolerance

+ 0.5°

- 0.5°

**Surface**

+0 mm / - 1.6 mm

**Décalage de l’embase**

Tolérance en Site

+ 0.5°

- 0.5°
Power express in KVA

\[ \sum \left( \frac{P_1 + P_2}{\rho} \right) / \cos \Phi + P_3 \]

- \( P_1 \): Power of the lamp W
- \( P_2 \): Loss in the secondary cable W \( (P_2 = R_s \times d_s \times I_s^2) \)
- \( \rho \): Transformer efficiency
- \( \cos \Phi \): power factor of the transformer TI
- \( P_3 \): Loss in primary cable VA \( (P_3 = R_p \times d_p \times I_p^2) \)

Installed value \( \geq \) Calculated value +10% (reserve)

Power AGL \( \geq \sum \) Installed power
MAINTENANCE CRITERIA

>50% of the photometric performance

>75% à 95% of the function to be operational

Never 2 lamps out on a Stop bar (CATIII)

Availability of the energy

Mechanical condition (RFO : Risk of Foreign Object)

Loos of category = rerouting
PHOTOMETRIC

Photometric performance of a light

Define by:
1) A grid covered by the beam and graduate in degrees
   - Horizontal axis = coverage in azimuth
   - Vertical axis = coverage in site
2) A set of isocandela curves represent the minimum required intensity inside the curve (value in candela)
3) The minimum average value inside the first area = 200% of the minimum value
4) I Max / I min limited at max 3 in the main beam
5) Orientation of the beam (Toe in)
COLOR

Color characteristic of the light

The chromaticity measurement are express in X and Y value shown on the CIE diagram.

The appendix 2 of the volume 1 of Annex 14 from ICAO precise the different allowed area for each color.

Measurement is made with a colorimeter.
### OPTIC

**Mirror and reflector**

Réflexion =>

Angle of Incidence = Angle of Réflexion

---

**Prism**

Réfraction =>

Angle of Incidence = Angle of Réfraction x n (index)

---

**filter** (transmission factor)

absorption (coloured glass)

selective (dichroic filter)

---

1 degré d’angle (1°) = 60 minutes d’angle (60’)

---

THORN
Airfield Lighting
Inspection program

in view to maintain all equipments in good condition we recommend the following inspection

**Daily** : Visual inspection of the lights

**Weekly** : Visual inspection of each light and cleaning of the dirty prism

**Monthly** : Inspection of the prism.

**Annually** : detailed inspection of all the function
Maintenance program

1. First level maintenance:

Fitting inclus equipment with limited length life. Theses components has to be changed regularly to insure the good condition of the installation

- Lamps
- Prism and glasses
- Gasket
Fitting Concept

1) «optic»
   a) A lamp
   =
   b) A device to concentrate the light.
   c) A filter for the color
   d) A prism or a lens to put the light in form

2) «Electrical connector»

3) “Mechanical body”

training for the maintenance of the fitting to follow…
TAFL range overview
## Range overview per function

<table>
<thead>
<tr>
<th>Airport</th>
<th>Helipad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>Approach</td>
</tr>
<tr>
<td>Runway</td>
<td>TLOF</td>
</tr>
<tr>
<td>Taxiway</td>
<td>FATO &amp; taxiway</td>
</tr>
</tbody>
</table>
Light fittings for Airports

APPROACH

RUNWAY

TAXIWAY

THORN
Airfield Lighting
Light fittings for Airports - Approach

**Functions**
- EL-AT: Centerline
- INL-AP: Crossbar
- INL-RG: Side row barret
- EL-ATF: Threshold
- INL-RET: End
- PAPI: Flash

THORN Airfield Lighting
**Light fittings for Airports - Runway**

<table>
<thead>
<tr>
<th>Functions</th>
<th>EL-EAH</th>
<th>INL-RE</th>
<th>INL-REO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge</td>
<td><img src="image" alt="Edge" /></td>
<td><img src="image" alt="INL-RE" /></td>
<td><img src="image" alt="INL-REO" /></td>
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<tr>
<td>Threshold</td>
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<td><img src="image" alt="INL-RT" /></td>
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<tr>
<td>Touch Down Zone</td>
<td><img src="image" alt="Touch Down Zone" /></td>
<td><img src="image" alt="INL-RC" /></td>
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</tr>
<tr>
<td>Centerline</td>
<td><img src="image" alt="Centerline" /></td>
<td></td>
<td><img src="image" alt="INL-HSE" /></td>
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<tr>
<td>High speed exit</td>
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<td></td>
</tr>
</tbody>
</table>

*THORN Airfield Lighting*
# Light fittings for Airports - Taxiway

## Functions

<table>
<thead>
<tr>
<th>LED</th>
<th>Fluorescent Tube</th>
</tr>
</thead>
</table>

### Edge

- EL-EAM
- ELD
- F18
- IN-OMA
- ILD-OMA
- IN-EMA
- ILD-OMA

### Centerline

- 1/2” depth
- 1/4” depth
- 1/4” depth
- IN-TT/TO/SB
- ILP-T
- ILD-T

### Stopbar

- ERG
- INL-RG

### Guard light

- INL-RG
- INL-RG

### Signs

- MGS-PR
- MGS-PR-H

---

**THORN**

Airfield Lighting
Light fittings for Helipads

APPROACH

FATO & taxiway

TLOF
Light fittings for Helipads - Approach

Functions

- **Beacon**: F30
- **Flash**: EL-ODF
- **Final approach (T)**: F2.1 (white)
- **Azimuth guidance**: HBA
- **HAPI**: AB-LX

THORN
Airfield Lighting
Light fittings for Helipads – TLOF

- **Functions**
  - TLOF lighting
  - TLOF edge
  - Aiming point
  - IN-OMH (green)
  - F2.1 (green)
  - IN-OMH (white)

THORN
Airfield Lighting
Light fittings for Helipads – FATO & taxiway
Elevated fittings
Elevated fittings

Installation of elevated fittings

1 ½ ” NPS
2” NPS or BSP
Elevated fittings

EL-EAM

- Functions:
  - taxiway edge and end
  - runway edge (MI/LI)
  - runway end (MI/LI)
- Halogen lamp 45W PK30D
- Prismatic tainted glass dome
  - 360°
  - 180°/180° (Clear, Yellow, Red, Green, Blue, blank)
- Variable height
- Support:
  - 2” NPS
  - 1”1/2 UNF
EL-EAH

- Functions:
  - runway edge
  - runway end/threshold
- Halogen lamp 150W PK30D
- Prismatic clear glass dome
- 180° filters (Yellow, Red, Green, Blue, blank)
- Variable height
- Support:
  - 2” NPS
  - 1”1/2 UNF
Elevated fittings

**EL-AT**
- **Functions**:
  - approach centerline (Clear 100W)
  - runway end (Red 100W)
  - stopbar (Red 45W)
  - cat.II reinforcement (Red 200W)
  - threshold reinforcement (Green 200W)
  - threshold (Green 150W)
- Halogen lamp PK30D

**EL-ATF**
- **Function**: Flashing approach guidance
- 60J Xenon lamp (2KV)
  - Lifetime: 1000h at 60J and 2 flash/sec.
- Ignition coil and protection capacitor
- 3 brilliances (100% ; 10% ; 3%)
Elevated fittings

ELD-TED

- Functions: taxiway edge
- 1 LED with integrated optics
- Consumption: 6W at max brillancy
- Lifetime: 50,000 hours
- 6.6A and 230V versions
- Electronics integrated in fitting
- Support:
  - 2” NPS
  - 1”1/2 UNF
Elevated fittings

**F18/2 : Integrated Transformer/Light**

- Functions: taxiway edge and end
- P28S or PK30D lamp: 30 or 45W
- 5kV isolating transformer rated at 30 / 45 Watts
- Prismatic tainted glass dome
  - 360°
  - 180°/180° (Clear, Yellow, Red, Green, Blue)
Elevated fittings

F2.1

• Functions:
  - taxiway edge
  - apron edge
• P28S or PK30D lamp: 45W
• Prismatic tainted glass dome
  - 360°
  - 180°/180° (Clear, Yellow, Red, Green, Blue)
Elevated fittings

EL-ODF
- Function: Flashing approach guidance
- 60J Xenon lamp (2KV) omni-directional
  (1000h at 60J and 2 flash/sec)
- Ignition coil and protection capacitor
- 3 brilliances (100% ; 10% ; 3%)
- Fresnel optic prismatic glass
Elevated fittings

ERG

- Functions: runway guard
- Low Intensity for night (300cd) and High Intensity (3000cd) for day operation
- 2 PK30D 150W
- Flasher 6.6A or 120/230V
Elevated fittings

PU3L

- Function: Precision Approach Path Indicator
- 2 or 3 PK30D 200W lamps
- 15 000cd in Red
- Red dichroïc filter
- 3 legs

- Option: heating resistance (anti-condensing)
Elevated fittings

HBA

- Function: Approach Slope Indicator
- 2x 24V 250W lamps
- 15 000cd in Red
- Green and Red dichroic filters
- Radio remote control compatibility
- 4 legs
Elevated fittings

SAGA

- Function: Approach azimuthal guidance
- 1x 12V 100W lamp
- 3 brilliancies
- Flash frequency: 1Hz
- Remote control compatibility
- Heating resistance

- Option: red filter
Elevated fittings

MGS-PR / MGS-PR-H
• Function: Illuminated guidance sign

• Fluorescent tube version (MGS-PR):
  - Exist in 6.6A and 230V
  - 1, 2 or 4 standard tubes (18, 30, 32, 58W)
  - Lifetime: 10,000 hours

• Halogen lamp version (MGS-PR-H):
  - 2 or 3 PK30D halogen lamps (105W)

• Option: protection against birds
## Inset fittings

<table>
<thead>
<tr>
<th>IN-ATF</th>
<th>INL-AP</th>
<th>INL-RET</th>
<th>INL-RN</th>
<th>INL-RE</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="IN-ATF" /></td>
<td><img src="image2" alt="INL-AP" /></td>
<td><img src="image3" alt="INL-RET" /></td>
<td><img src="image4" alt="INL-RN" /></td>
<td><img src="image5" alt="INL-RE" /></td>
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</table>

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<thead>
<tr>
<th>INL-REO</th>
<th>INL-RT</th>
<th>INL-RC</th>
<th>INL-HSE</th>
<th>INL-RTI</th>
<th>INL-RG</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image6" alt="INL-REO" /></td>
<td><img src="image7" alt="INL-RT" /></td>
<td><img src="image8" alt="INL-RC" /></td>
<td><img src="image9" alt="INL-HSE" /></td>
<td><img src="image10" alt="INL-RTI" /></td>
<td><img src="image11" alt="INL-RG" /></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>IN-TT/TO/SB</th>
<th>ILP-T</th>
<th>ILD-T</th>
<th>IN-OMA</th>
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</tr>
</thead>
<tbody>
<tr>
<td><img src="image12" alt="IN-TT/TO/SB" /></td>
<td><img src="image13" alt="ILP-T" /></td>
<td><img src="image14" alt="ILD-T" /></td>
<td><img src="image15" alt="IN-OMA" /></td>
<td><img src="image16" alt="ILD-OMA" /></td>
</tr>
</tbody>
</table>
Inset fittings

Installation of inset fittings

FAA deep base

Side entry

100mm shallow base

133mm shallow base

Bottom entry
Inset fittings

IN-ATF

• Function: Flashing approach guidance
• Diameter 16” (401mm)
• 60J Xenon lamp (2KV)
  Lifetime: 1500h at 60J and 2 flash/sec.
• Ignition coil and protection capacitor
• 3 brillancies (100%; 10%; 3%)
Inset fittings

INL-AP

- Functions:
  - approach axis (clear)
  - reinforcement CAT.II (red)
  - runway threshold (green)
- Diameter 12”
- Depth ½” – FAA style 2
- 3x 105W lamps
Inset fittings

**INL-RET**

- Functions: combined runway end and threshold
- Diameter 12”
- Depth ½” – FAA style 2
- 3x 105W lamps
- Filters: 2 green and 1 red
Inset fittings

INL-RN

- Functions:
  - runway threshold
  - runway end
- Diameter 12”
- Depth ½” – FAA style 2
- 2x 105W lamps
- Filters: red or green
Inset fittings

INL-RE

- Function: runway edge
- Diameter 12"
- Depth ½” – FAA style 2
- 2x 105W lamp
- Filters: red or yellow
Inset fittings

**INL-REO** designed for the A380 and also used by military bases

- Function: runway edge
- Diameter: 12"
- Projection: 22mm (<1"")
- Halogen lamps 150W (bi) 5000cd and 45W (omni) 50cd

A380

Fighters

INL-REO

INL-RE

EL-EAH
Inset fittings

INL-RT

- Functions:
  - Touch Down Zone
  - Runway centerline uni-directional
- Diameter 8"
- Depth ½” – FAA style 2
- 1x 45W lamp
- Red filter
Inset fittings

INL-RC

- Function: runway centerline
- Diameter 8”
- Depth ½” – FAA style 2
- 2x 45W lamp
- Red filter
Inset fittings

INL-HSE - INL-RTI

- Function: high speed exit reinforcement
- Diameter 8"
- Depth ½” – FAA style 2
- 1 or 2x 45W lamp
- 800cd (new ICAO standard)
- Filters: green or yellow

Runway Exit Taxiway Indication Lights (RETILS)

THORN
Airfield Lighting
Inset fittings

**INL-RG**

- **Functions:**
  - runway guard (yellow)
  - runway end (red)
  - stopbar (red)
- Diameter 8”
- Depth ½” – FAA style 2
- 1 105W lamp
- Filters: yellow or red
Inset fittings

IN-TT/TO/SB

- Functions:
  - taxiway centerline (green/yellow)
  - stopbar (red)
- Diameter 8”
- Depth ½” – FAA style 2
- Prisms: Large, Narrow and Curved
- 1 or 2x 40W lamp
- Versions:
  - Single beam (SB)
  - 2 beams 1 lamp (TO)
  - 2 beams 2 lamps (TT)
- Filters: green, yellow, red
Inset fittings

ILP-T: ¼” taxiway

- Functions:
  - taxiway centerline (green/yellow)
  - stopbar (red)
- Diameter 8”
- Depth 1/4” – FAA style 3
- Prisms: Large, Narrow and Curved
- 1 or 2x 40W lamp
- Filters: green, yellow, red
ILD-T : ¼” LED taxiway

- Functions:
  - taxiway centerline (green/yellow)
  - stopbar (red)
- Diameter 8”
- Depth 1/4” – FAA style 3 
  **without counter-slope**
- 2 to 8 LED
- Integrated electronic module
- 50 000 hour lifetime
- 10W only per beam
- Prisms : Large, Narrow and Curved
- Short cover (100mm shallow base)
Inset fittings

IN-OMA / IN-OMH

• Functions :
  - taxiway edge (blue)
  - heliport TLOF edge (green)
  - heliport aiming point (white)
• Diameter 8”
• Depth ½” – FAA style 2
• 1x 40 or 45W lamp
• Filters : blue, green
Inset fittings

ILD-OMA : LED taxiway

• Function : taxiway edge
• Diameter 8”
• Depth ½” – FAA style 2
• 1 LED
• Integrated electronic module
• 50 000 hour lifetime
• 10W only
• 6.6A and 230V versions