



# SJÖFARTSVERKET

Planering och Normering

Handläggare, direkttelefon

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PM

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Input paper EEP2

EEP1 Action item 28

## Various types of Sector Lights

### Introduktion

In Sweden only Traditional Sector Lights and Slot Sector Light are in use. PEL and Laser sector lights haven't been used and my comments are therefore very briefly.

Also I haven't been able to find any reports on the Slot Sector Light due to our reorganizations, moving about and cleaning up in the archives. I'm convinced that this Slot Sector Light system is described in some early IALA report. However I've anyway made an attempt to make a description on that system.

### Definitions

#### *Sector Light*

<sup>1</sup>A Sector Light is a single light that shows different colours when viewed from different directions. The colour of the light provides directional information to the mariner.

<sup>2</sup>A light presenting different characters (usually different colours) over various parts of the horizon of interest to marine navigation.

#### <sup>3</sup>*Sector Screen /Cut Screen*

An opaque screen so placed as to provide a sharp cut-off to a beam in sector light, and to reduce the angel of uncertainty.

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<sup>1</sup> *Vega Industries brochure*

<sup>2</sup> *IALA Dictionary 2-5-215*

<sup>3</sup> *IALA Dictionary 2-4-125*

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*<sup>4</sup>Angel of uncertainty*

The horizontal angle of the region of indefinite character near the boundaries of a sector of a sector light.

**Traditional Sector Lights**

In general a coloured, adjustable, glass is used as a filter for the light from the lamp.

Lamps should be of incandescent type so the wanted colour would be in the spectrum. If large coloured sectors ( $>20^\circ$ ) is wanted, they would preferably be created by putting a <sup>3</sup>Sector Screen inside the lantern. The area of the Sector Screen glass in the actual Sector Screen rack will in this way be minimized. This will facilitate cleaning of the windows in Lantern House and in the case of only a screened Lantern, it will reduce the surface exposed to the wind.

Indoor Sector Screening, Light houses and Beacons with lantern house, have the Sector Screening placed longer from the lamp and will hence obtain sharper boundaries in comparison with so called external Sector Screening.

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<sup>4</sup> IALA Dictionary 2-5-230

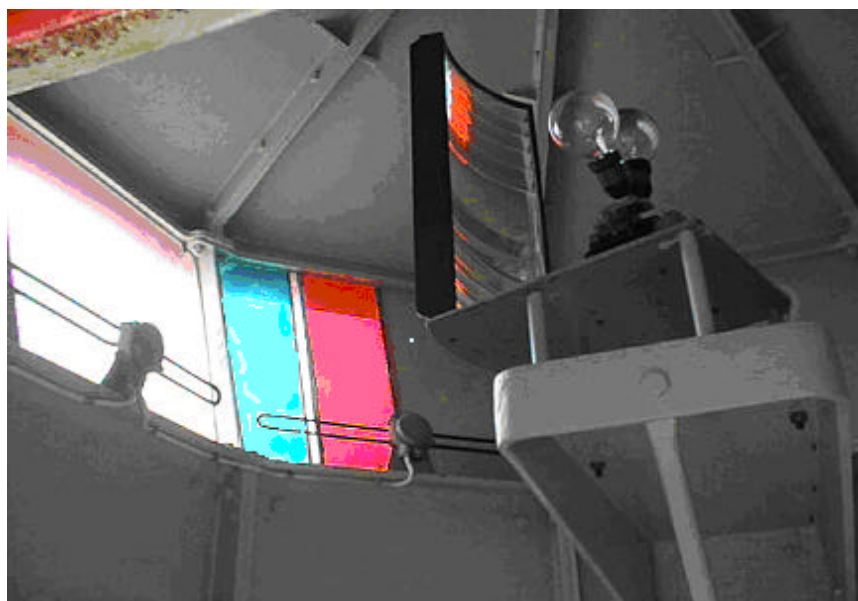
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*Type*

Indoor Sector Screening. Lighthouses and Beacons with a lantern house where the Sector Screening is placed inside the lantern house glass, alternative the lantern house glass is replaced with a Sector Screen.



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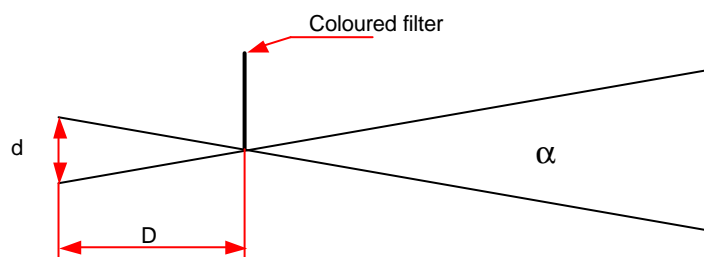
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External Sector Screening. For us on Beacons that consist of only a lantern.  
The Sector Screening is mounted in a rack in front of the lantern.



<sup>4</sup>Angel of uncertainty.

In account of the horizontal dimension of the light source the boundary between two coloured sectors will not be distinct; a horizontal boundary with indefinable light will be obtained, a so-called “Angel of uncertainty”.



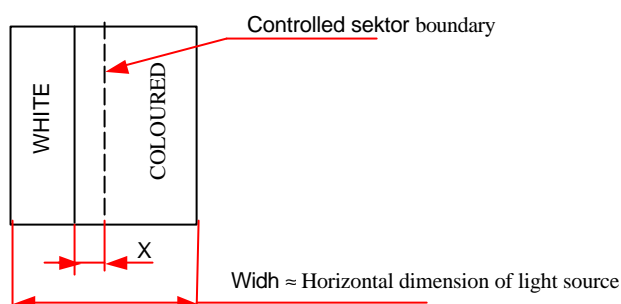
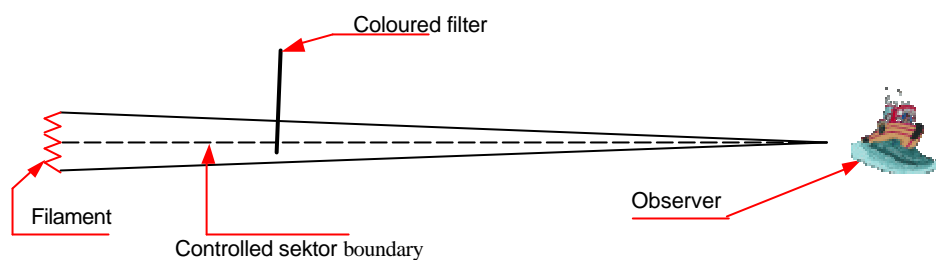
$d$  = Horizontal dimension of light source.

$D$  = Distance from filter to light source.

Angel of uncertainty  $\alpha = d/D * 57$  (degrees)

*Distribution between white and a coloured light seen in sector boundary.*

Depending on the factor of transmission on the coloured glass, the glass needs to be increased in to the white sector =  $X$ .



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Consequences that as follows could arise, if the share of a coloured light is cut down due to snow or the montage of aerial masts etc. the sector boundary can then unintentional move to the coloured sector. A wider white sector will be the result.

Due to its low transmission factor coloured filter made of ordinary glass should be avoided, only acrylic glass with high transmission factor should be used.

A sector should not be narrower then the horizontal dimension of light source.

A very thin white sector can be arranged if a red and a green glass is glued together with a minimal seam, the boundary that is of mixed light, experiences then as white.

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## Slot Sector Light

### General

Slot Sector Light system was invented by the lighthouse engineer Bengt Holm, Swedish Maritime Adm. In the end of 1940. Grundkallen was The first lighthouse with this system in 1958.

### Construction

Sealed beam lamps, PAR 56 200W 30V, mounted in simple stands are used as a light source. The light system is divided in two systems, main and standby system.

The lamps are normally mounted in two horizontal rows. From a lamp stand, lamps can be oriented to different focal apertures. From each lamp the light beam are oriented to the correspondingly focal apertures in the lantern house. Normally it is 8 focal apertures, symmetrical distributed, around the lantern house. The focal apertures are about 250 mm wide and 1400 mm high, the lantern house is about 5 m in diameter, and with this construction a stabile foundation for a helicopter platform is obtained.

The luminous intensity in different sectors can alter depending on the number of lamps orientated to that sector. We have system with up to 2 x 96 lamps. The lamps are connected in several separate groups, which are switch on in different order, this will give a stable power load and a character like a rotating light. A rotating induction regulator controlled earlier system. It rotate in time with the character and switch in proper order the lamp groups, this was a excellent system to give a soft lightning of the lamps and they proved to last a very long time.

In later system thyristors are used, to give the lamp a soft lightning but, this system still consumes more lamps.

We also use small system with only a couple of boundaries and 3-6 lamps.

With a Slot Sector Light it is possible to create very distinct boundaries and also sectors if the lamp stands are put in varying distance to the focal apertures.

A burnt-out lamps will not lead to a total loss of light in boundaries or sectors, only a impairment (weakening) in that part of sector due to that the boundary are lighted by several overlapping lights.

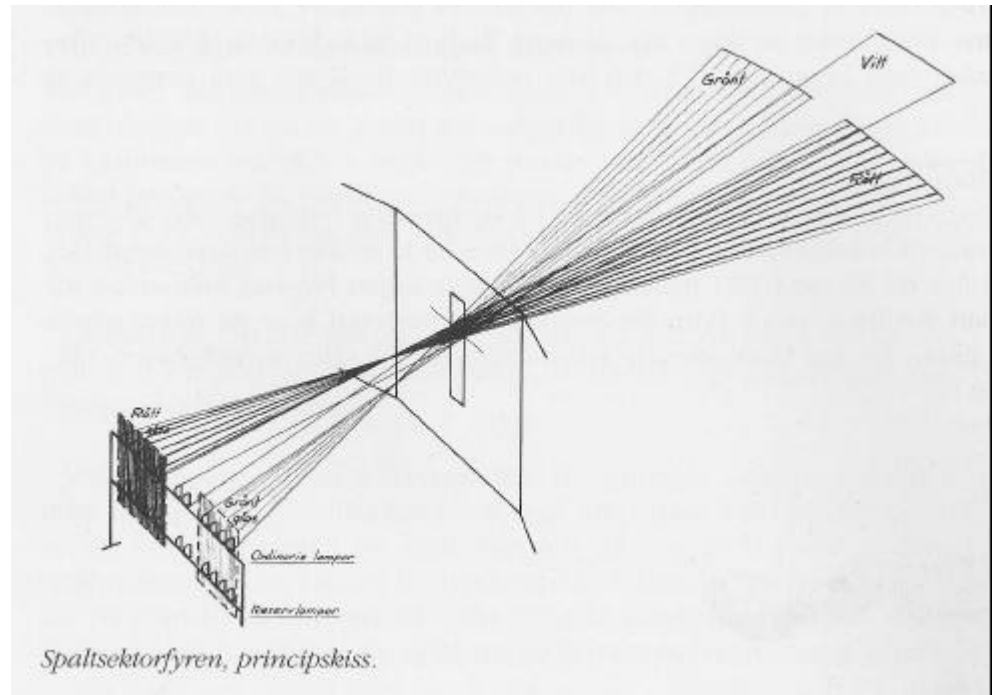
Coloured sectors are arranged with coloured glass direct mounted in channels in front of the lamp. The boundaries arranges with baffle plates that are some millimetres wider than the focal apertures in the lantern house,

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that gives a impairment of the light exactly in the boundary crossing. The baffle plates are mounted in the same way as the filter glass.

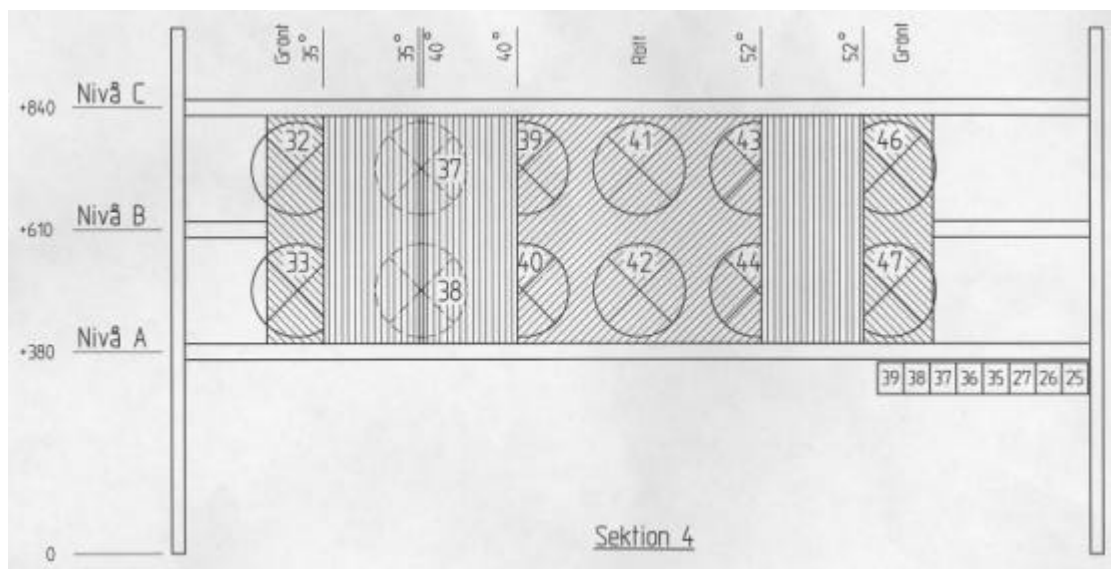
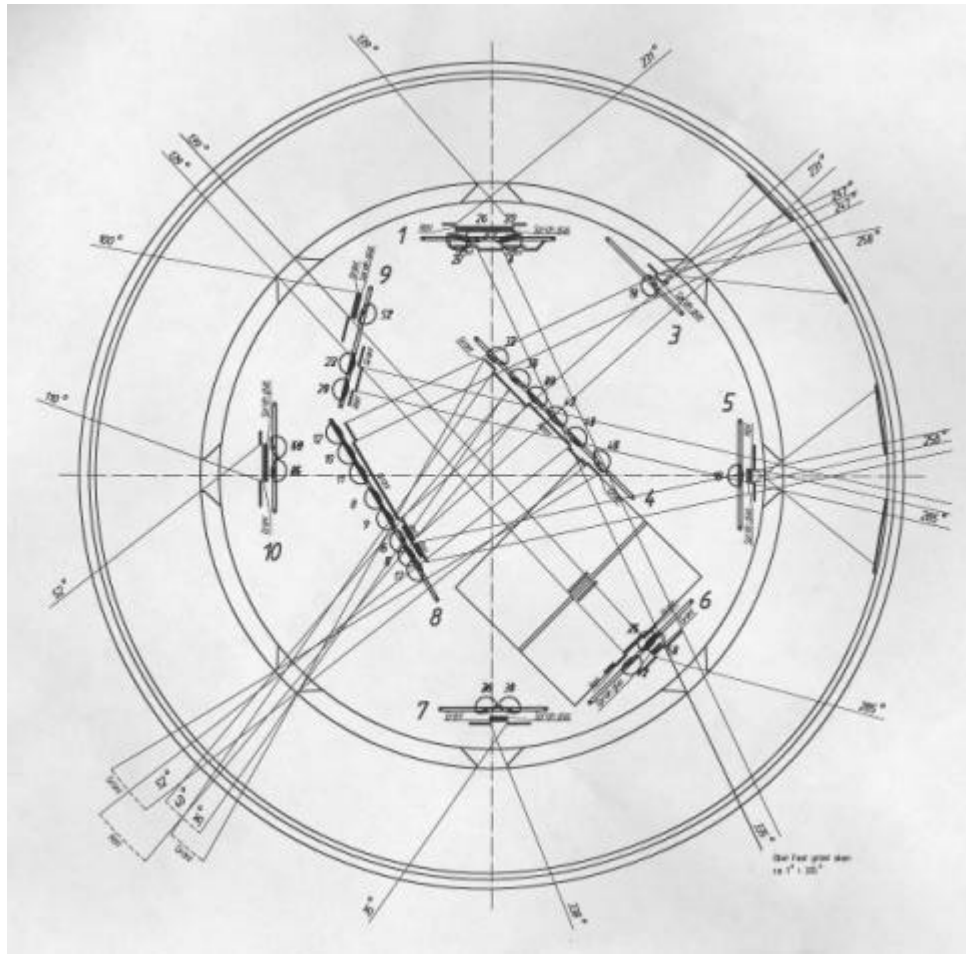




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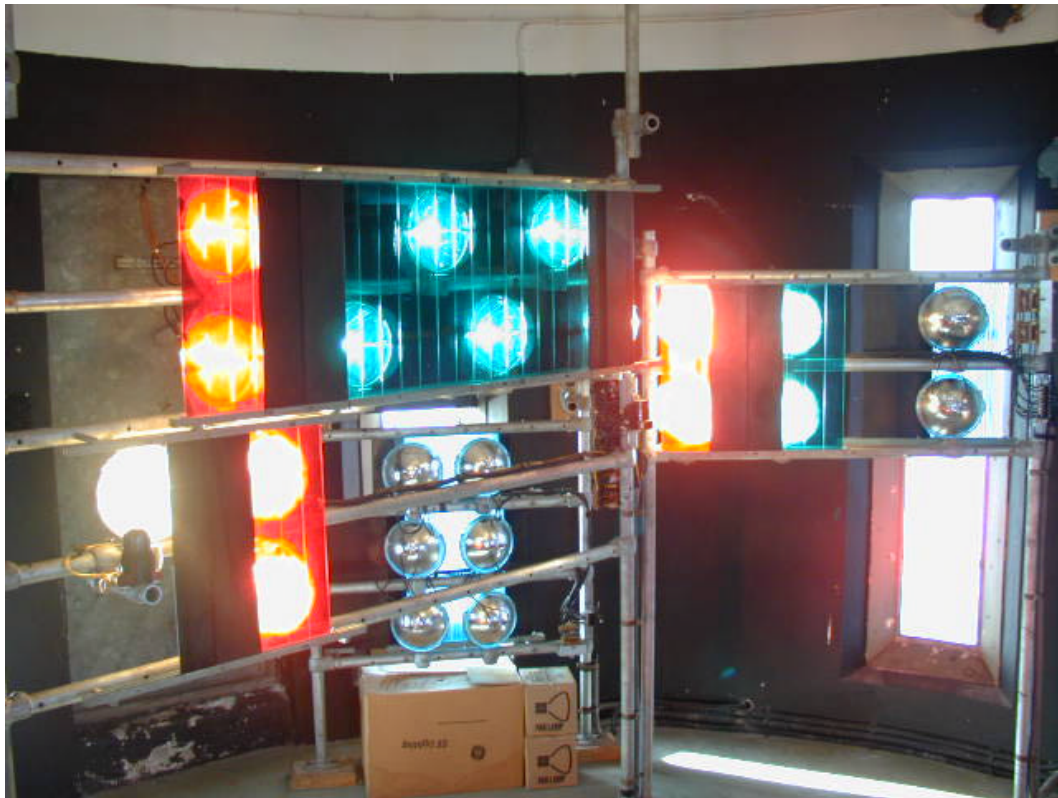
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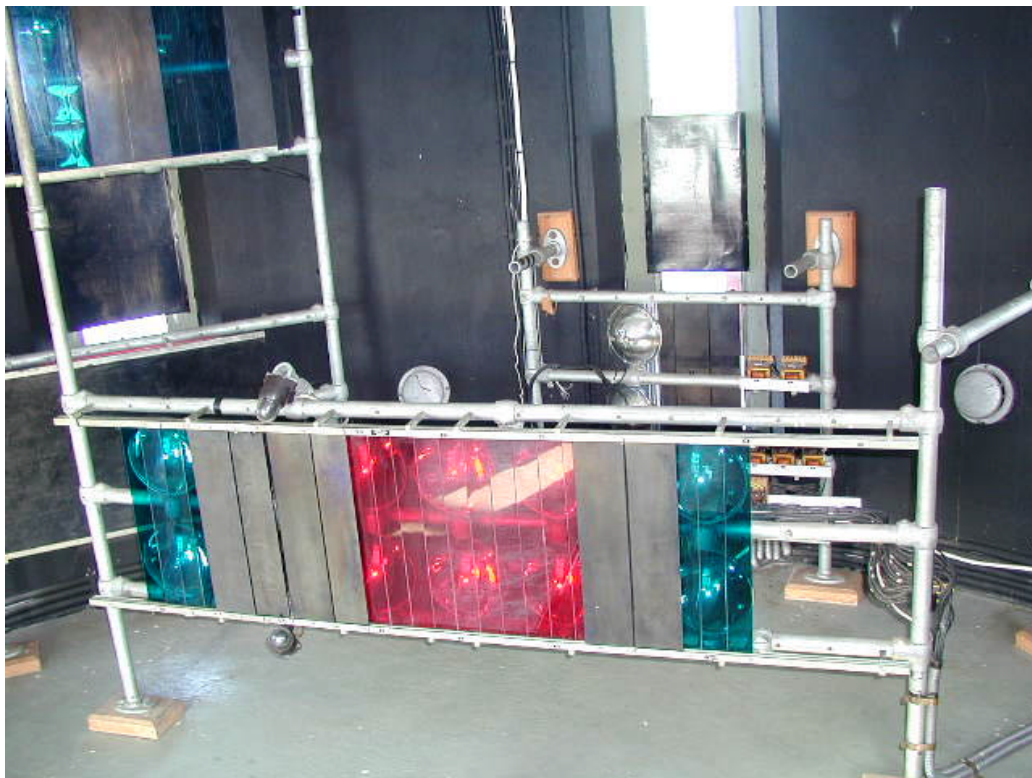
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Nordvalens Lighthouse. Sector glass and baffle plates.



Nordvalens Lighthouse. Sector green-white-red-green

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Grundkallens Lighthouse © Photo Magnus Riets



Farstugrund Lighthouse.

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### **<sup>1</sup>Port Entry Sector Lights (PEL)**

A Sector Light is a projection light which shows a different colour when viewed from different angles at sea. PEL Sector Lights are so precise that a complete colour change at a sector boundary occurs over an angle of less than 1 minute (0.02°) in most models. This corresponds to a lateral distance of just 1 metre at a viewing distance of 3.5 km. In addition the intensity is maintained right to the edge of the beam, and does not reduce the further the observer is away from the axis. The Sector Light is bright enough to use by day. (From Vega Industries brochure.)

### **Laser Sector Light**

As far as I know it doesn't exist any plain laser sector light system. What can probably closely be called a sector light is a system that has been tested as a laser range light by Russia and Canada. The system consist, briefly described, of two stationary laser beams which produces flashing coloured light on each side of the of the channel and is bright enough to be in use at day time.

Roger Beauchesne has earlier in the ENG committee meeting presented laser light system tested in Canada. Laser light has also been reported from the IALA LITES workshop in Koblenz 2001 and in IALA XVth Conference by JCG, CCG and Russia.

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