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| IALA Guideline |

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The Use of Modern AtoN Equipment in Heritage Lighthouses

Edition 1.0

Document date

Revisions to this IALA Document are to be noted in the table prior to the issue of a revised document.

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| Date | Page / Section Revised | Requirement for Revision |
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# INTRODUCTION

As AtoN technology changes there will be increasing requirements to replace obsolete equipment and/or to install new equipment in existing heritage infrastructure. The challenges of integrating new technology into, in many cases, centuries old structures are many and varied. This guideline aims to provide guidance on the issues that must be overcome

# Technology

## Modern lighting

Modern light sources offer many advantages in terms of reliability, longevity, maintenance efficiency, power consumption, availability of parts, and consistency of systems. Many different types of modern lighting exist, including fully self-contained systems, lights for use in fixed and rotating lenses which take advantage of the existing optics, sector lighting, etc...

### Issues and Challenges

* Power requirements
* RF interference
* Beam focusing
* Colour requirements
* Sector angles
* Heat/Ventilation

### Solutions

## Communications Systems

Communications systems are often installed in lighthouses to provide shore to ship communications for VTS operators, local rescue organisations, and other third parties. Typical systems may comprise VHF, UHF, MF/HF, Microwave, and/or Satellite transceivers and antennas.

### Issues and Challenges

* Radhaz
* Cabling
* Mounting
* Interference with other systems
* Physical space
* Aesthetic issues

### Solutions

## AIS

AIS systems provide vessel and AtoN information over a VHF or Satellite data link. An AIS system typically comprises of a VHF antenna to receive data transmitted by vessels within range, and a data processing unit to process and relay the information to relevant parties.

### Issues and Challenges

* Radhaz
* Cabling
* Mounting
* Interference with other systems
* Physical space
* Aesthetic issues

### Solutions

## RADAR systems

RADAR systems along with AIS form the backbone of VTS system data. RADAR units are typically installed at strategic elevated locations, which often correlate with existing lighthouse infrastructure. A RADAR unit will consist of a number of components including complex electronic systems and a rotating antenna mounted as high as possible. RADARs can also be used for weather monitoring, providing valuable information to mariners.

### Issues and Challenges

* Power supply
* Structural capacity
* Radhaz
* Installation and maintenance access
* Data transfer to users
* Aesthetics
* Lightning protection

### Solutions

## RACON

RACON systems are devices that provide an active response to a ping from a marine radar unit. A RACON provides a burst of data back to the transmitter unit providing various information.

### Issues and Challenges

* Radhaz
* Cabling
* Mounting
* Interference with other systems
* Physical space
* Aesthetic issues

### Solutions

## Rotator Systems (Mercury bath replacement)

With Mercury now recognised as a hazardous substance, many existing rotator systems are being/will be changed to alternative technologies.

### Issues and Challenges

* Disposal of existing Mercury/cleaning of existing site and equipment
* Power consumption
* No ‘one design’
* Hard to develop solutions – suck it and see.
* Increased maintenance
* Durability and reliability

### Solutions

## Remote Monitoring

The availability of modern communications systems provides opportunities for constant or periodic remote monitoring of systems within a remote AtoN. Monitored systems include power system status, AtoN operating status, current draw of systems, rotation of lenses, security systems, with many other opportunities existing where sensors can be installed.

### Issues and Challenges

* Installation of sensors for monitoring
* Power consumption
* Cabling
* Mounting
* Interference with other systems
* Physical space
* Aesthetic issues

### Solutions

## CCTV

CCTV systems are often installed as part of a VTS system to provide visual awareness to VTS operators.

### Issues and Challenges

* Power supply
* Structural capacity
* Installation and maintenance access
* Data transfer to users
* Aesthetics
* Lightning protection

### Solutions

## Power generation and storage systems

Modern power generation systems include solar, wind, tidal and water current systems, and fuel cell generators. Power storage solutions include battery banks, UPS systems. Some sites rely entirely on local power generation and storage solutions, whilst some are grid connected and use local generation and storage as a backup system.

### Issues and Challenges

* Aesthetics/noise
* Space constraints
* Bird fouling
* Optimal angle of inclination
* Structural capacity
* Hydrogen build up from batteries
* Voltage drop
* Replacement cycle

### Solutions

# Other General Issues

It is important to take notice of any national statutory requirements with regards to heritage sites and how this affects the installation of AtoN equipment into heritage lighthouses.

Maybe lightning protection should be here??

Tourism

* Health and safety
  + Guarding
  + Electrical safety
  + Lighting
  + Radiation
* Accidental damage and vandalism
* Aesthetic appeal
* Increased wear and tear
* Compliance
* Power costs
* Location of equipment mounting

Indigenous relations

Legacy AtoN requires an Upgrade?

Produce costed options for upgrade

Design (Reference?)

2.3 Liaise with local Heritage Body (if one exists) and Planning Body on permitted extent of changes to legacy structure

2.2 Is there a Heritage Value?

No

Yes

2.4 Design Considerations

2.1 Needs Analysis

## Needs Analysys

In general, there will be many reasons why a particular AtoN is perceived to be in need of an upgrade - This applies equally to AtoN’s with Heritage value as well as those which do not. Such reasons will be:

* Unacceptable availability (reference?)
* Cost of maintenance
* Unacceptable degradation to users
* Changes to Navigation requirements

Any one of these reasons provides justification for investing in an upgrade to the AtoN.

## Heritage Assessment

At an early stage, an assessment will have to made to define whether or not any part of the structure has heritage value to the Lighthouse Authority. That may be a sub unit - for example a rotating lens, or the structure itself - for example a masonry tower. For sub units with heritage value, a new home such as a museum or local heritage association can be talked to with a view to being the new keeper of the heritage object. Liaison with the third party will have to involve:

* Ownership of the heritage object
* Care of the heritage object
* Access by the public to the heritage object
* Making safe – eg removal toxic hazardous material
* The safe archiving of related documents and drawings

## Heritage Body / Local Planning / local stakeholder Liaison

Any external body with an interest in Heritage or Planning will have to be engaged in decisions with changes to the structure or disposal of sub units. These bodies – or stakeholders – will at first need to be identified. It would be wise to engage early with these stakeholders so that their concerns are understood from the beginning of the process and the extent of changes are defined and understood by all parties. Particular areas to discuss and explain are

* The need for changes
  + This should have been an output from the Needs Analysis
* Proposed changes and disposals
  + What visual affect will be created?
    - Is this acceptable to the stakeholders?
    - What concessions can be made to the design in the light of feedback from stakeholders?
  + Are there heritage items that can be removed and put on display locally?
    - eg Legacy AtoN apparatus such as rotating lenses
    - Contact any local museums
    - Contact national museums
* Potential physical changes
  + Penetrative works to masonry
    - Endeavour to avoid where practical major penetrative works into legacy masonry or structures which will permanently disfigure the structure. Instead consider the feasibility of
      * Targeted bolting of subframes or platforms to the heritage structure
      * Incorpration of parts of heritage apparatus into the new AtoN design
  + Cutting of metalworks
    - Avoid where practical. Consider
      * Raising of new apparatus over hand-rails
      * Attaching new apparatus outside legacy structure
  + Degree of sympathy required for additions. Consider
    - Matching colours
    - Un-intrusive shape
* Environmental considerations
  + Find out if there are local or national Environmental Body which applies rules to situating structures or working on, or around, the physical area being developed.
  + Affect on flora
    - eg surrounding wild flower habitats
  + Affect on fauna
    - eg bat colony, nesting birds

### 

# TYPES OF MODERN AtoN

Brief content on types of Modern Aids to Navigation (AtoN) that can be installed on heritage lighthouse, with some practical considerations – e.g. Installation method, location on structure, OH&S risks, power supplies,

Modern light source in traditional optic. Refer to other IALA Guidelines as necessary.

AIS / VHF

* Will require consideration of power source, installation of transceiver and antennas
  + Fixing of power and rf cables to structures
  + Use of cable tray or P-Clips as necessary
  + Use of clamping arrangements for antennas rather that penetrative bolts or welding.
* Ensure that there aren’t any health & safety issues surrounding rf emissions
  + Refer to national regulatory limits to safe rf emissions and locate accordingly

CCTV

* Will require consideration of power source, installation of camera
  + Consider use of rf link rather than cabling
  + Refer to national regulations on privacy requirements

Radar

* Will require consideration of power source, installation of transceiver and radar body
  + Fixing of power and rf cables to structures
  + Use of cable tray or P-Clips as necessary
  + Use of clamping arrangements for radar body rather that penetrative bolts or welding.
* Ensure that there aren’t any health & safety issues surrounding rf emissions
  + Refer to national regulatory limits to safe rf emissions and locate accordingly
* Ensure that noise from rotating radar doesn’t cause a noise nuisance to any neighbours or engage with neighbours as necessary.

DGNSS

* Will require consideration of power source, installation of DGNSS Rack, GPS antennas and DGNSS antennas.
  + Fixing of power and rf cables to structures
  + Use of cable tray or P-Clips as necessary
  + Use of clamping arrangements for antennas rather that penetrative bolts or welding.
* Ensure that there aren’t any health & safety issues surrounding rf emissions
  + Refer to national regulatory limits to safe rf emissions and locate accordingly
* Requirement for GPS antennas to be mounted with un-obstructed view of sky
  + Consider how access can be safely delivered to the top of structures.
    - Access systems

Meteorological

* Will require consideration of power source, installation of transceiver and meteorological instrumentation
  + Fixing of power and instrument cables to structures
  + Use of cable tray or P-Clips as necessary
  + Use of clamping arrangements for I struments rather that penetrative bolts or welding.

Radio comms

* Will require consideration of power source, installation of transceivers and antennas
  + Fixing of power and rf cables to structures
  + Use of cable tray or P-Clips as necessary
  + Use of clamping arrangements for antennas rather that penetrative bolts or welding.
* Ensure that there aren’t any health & safety issues surrounding rf emissions
  + Refer to national regulatory limits to safe rf emissions and locate accordingly

Power supplies

* Consideration of cable routing and mole-ing of cables under structures
* Prefered use of floor-standing racks rather than wall maounting

# MAINTENANCE AND OPERATIONAL CONSIDERATIONS

The installation of modern equipment on legacy structure requires pre-thinking on how this equipment is accessed for maintenance purposes. Equipment mounted outside a structure and particularly at height or on top of a structure may require considerable safety infrastructure installed to ensure safety of personnel. Very often, national legislation will dictate minimum levels of safety based on risk assessments.

Careful consideration should be given to the intrusiveness of such safety infrastructure – such as fall arrest systems – as these may have a greater impact on the heritage structure than the new AtoN equipment

Remote monitoring.

Refer to suitable IALA Guideline

# Acronyms

AIS

AtoN

CCTV

DGNSS

IALA

OH&S

VHF

# REFERENCES

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1. Abcd
2. Efgh
4. EXAMPLE OF AN ANNEX - LANDSCAPE

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1. example of ANNEX heading level 1

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* 1. example of annex heading level 2

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* + - 1. Example of Annex heading level 4

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1. Example table

| No | Title/Topic | IMO References | Requirements | Possible Audit Questions | Remarks |
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1. EXAMPLE OF AN APPENDIX TITLE
2. APPENDIX HEADING 1

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1. (EXAMPLE ANNEX TITLE)
2. Introduction (Example Annex Heading 1)

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# front lighthouse of suurupi leading line

Location of Suurupi leading line: <http://xgis.maaamet.ee/xGIS/XGis?app_id=PRIM01&user_id=at&bbox=515427.959621181,6589352.54096559,532841.995562113,6600393.63471263&LANG=1>

Years of construction and major reconstructions: 1859; 1885; 1998

Some historical background: http://www.suurupi.ee/EN/4739



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| Figure 1. Suurupi front lighthouse (<http://www.etts.ee/EE/galerii/pohja-eesti-tuletornid>). Lanterns are on the upper window. | Figure 2. Interior with the old lantern and the window forming the narrow light sector |



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| Figure 3. Position of reserve lantern (left) and new LED-lantern (right) as seen from inside | Figure 4. New LED-lantern (left) and reserve lantern (right) as seen from outside |

# front lighthouse of Tallinn leading line

New solution for sectors of Tallinn front lighthouse designed by Cybernetica Ltd in 2009

Location

<http://xgis.maaamet.ee/xGIS/XGis?app_id=PRIM01&user_id=at&bbox=540890.372569245,6587350.68583374,548105.6957274,6591925.44723165&LANG=1>





Figure 5. View of the lighthouse, lantern room and main and reserve lanterns before modernising



Figure 6. Working sectors of Tallinn front lighthouse (φ white, β green)



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| Figure 5. New lanterns and their beams limited by window frames | Figure 6. Rear view of the positions of the lanterns |



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| Figure 8. Additional white lantern for covering wider area at the near end of the useful segment of the leading line (φ2 in figuure 1) | Figure 9. |

Photos of the new LED –lanterns in positions to come…

# ??

1. PERMITTED COLOUR PALETTE



The IALA colour palette is divided in 3 palettes of different level of hierarchy that has to be respected.

Corporate colours

IALA’s corporate colour palette is directly inspired from the colours in our logotype:

- dark blue

- white

- yellow

- gradient blue

**Primary and secondary colours**

The primary colours are to be applied in complement

with the corporate colours.

This second level of colours gives rhythm and helps

to segment our publications.

The secondary colours are used to highlight

information, titles in a minor proportion only.

**Note: Corporate colours are not shown**

Recommendations

Model Courses

Guidelines