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Technical Domain / Task Number 2 …………………………………

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Establishment of Optical Performance Standards for Bridge Lantern to Improve Visibility

# Summary

This Input Paper introduces research cases in Korea for improving visibility of bridge lantern installed on maritime bridges. And, Proposes revisions to IALA recommendation and guideline in relation to optical performance standards.

## Purpose of the document

Requests registration of new work plan in the next session(2023-2027) with the subject of Establishment of Optical Performance Standards for Bridge Lantern to Improve Visibility.

## Related documents

R0113(The Marking of Fixed Bridges and Other Structures over Navigable Waters), G1061(Illumination of Structures)

# Background

In October 2020, an accident occurred at Wonsan-Anmyeon Bridge in Tae-an, South Korea where a fishing boat operating at dawn struck a pier. The accident has occurred at night time because operator didn't recognize bridge lantern. In Korea, maritime bridge collisions have continued to occur due to visibility problems, and 26 maritime bridge collisions have been reported over the past 10 years.

In order to prevent the same accidents, revision of the guideline for the function and specifications of AtoN is being pursued and the focus is on bridge safety management. In January 2021, the guideline for the functions and specifications of AtoN were revised and announced. In addition to the previously defined bridge marks, pier foundation lights and pier boundary lights have been added.

In addition, in the first half of 2021, safety inspections were carried out for bridge lantern of the Korean maritime bridge marks improvement plan. According to the survey, a total of 192 bridges in Korea were investigated. There are 60 bridges installed in large-scale fishing ports and 132 bridges installed in small-scale fishing ports. As a result of the safety inspection, a total of 83 points were noted, of which 68 were directly or indirectly related to the visibility of bridge lantern.

The visibility of bridge lantern is the most important factor in preventing accidents, and visibility may deteriorate due to the influence of backlights such as landscape lights and coastal lights. Therefore, in order to increase the visibility of bridge lantern, optimizing the luminous intensity according to distance and divergence angle, etc. would be considerated. For this reason, it is necessary to clarify the installation guideline for bridge lantern, such as restrictions on backlight, installation location, luminous intensity, etc.

The IALA R0113(IALA The Marking of fixed bridges and other structures) briefly presents the installation location of bridge lantern, color, synchronous blinking, and materials, there is no content related to optical performance. In addition, IALA G1061(Illumination of Structures) mentions matters related to lighting of fixed structures, but nothing related to bridges, etc.

# Korea RESEARCH CASES

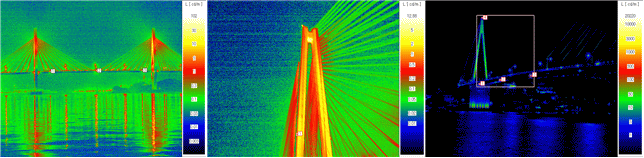
In Korea, Since the installation guideline for bridge lantern are not clear, we have selected a few maritime bridges with a lot of traffic and study on the installation guideline for bridge lantern considering optical performance through field surveys and data analysis in progress.

In order to prepare the optimal vertical divergence angle guideline, 4 domestic companies evaluated the visibility efficiency before and after changing the divergence angle of bridge lantern. As a result of the measurement, when the divergence angle of the existing bridge lantern was lowered by 9°, the visibility was improved by an average of 38 times. The effect of improving visibility by lowering the vertical divergence angle of bridge lantern and the like is shown to be large at the distance that ships mainly recognize maritime bridges and navigation (within about 1 NM from the maritime bridge).

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| --- | --- | --- | --- |
| *Figure 1 Fresnel lens type* | *Figure 2 Reflector type* | *Figure 3 Individual lens type* | *Figure 4 Lens module type* |

In addition, In order to select an appropriate luminous intensity guideline for bridge lantern, backlight measurement was conducted in the real sea area. The backlight measurement compared the background luminance (landscape lighting) with the bridge lantern currently installed on the bridge, and through comparative measurement, we tried to find a reference value that satisfies the prerequisite that the minimum luminous intensity bridge lantern should be higher than that of the backlight. Measurements were carried out at Wonsan-Anmyeon bridge, Hwayang-Jobal bridge, dolsan bridge. As a result of the measurement, it was confirmed that the minimum required luminance standard can be selected.



*Figure 5 Measurement of effective luminous intensity of Wonsan Anm-yeon Bridge, Hwayang-Jobal Bridge and Dolsan Bridge*

Finally, we identified the operating status and problems of bridge lantern in maritime bridge and collected opinions from ship users passing near the maritime bridge. As a result of the field survey, it was found that there was no difficulty in navigation as the bridge marks installed in large-scale fishing ports were well installed and operated with bridge lantern, bridge daymarks, pier foundation lights and pier boundary lights. On the other hand, in the case of bridge marks installed in small-scale fishing ports, bridge lantern and bridge daymarks are well installed and operated, but there is a high risk of collision with bridges at night because there are many places where pier foundation lights and pier boundary lights are not installed.

In the future, we plan to expand the field of investigation on the current status of maritime bridges in Korea to reinforce the evidence of vertical divergence guideline and effective luminance guideline for bridge lantern.

The above is an example of a research to improve the visibility of bridge lantern in Korea, and it is necessary to clarify the optical performance standards for bridge lantern through various research.

# Action requested of the Committee

IALA Recommendation R0113 contains information on the installation and operation of bridge lights, but no information on optical performance. In addition, since there is no content related to bridge lantern in IALA guideline G1061, it seems that the contents of related recommendation and guideline need to be reinforced.

Therefore, it is suggested to register as a new task in the next session (Work Plan 2023-2027) and to revise the recommendation and guideline.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Leave open if uncertain [↑](#footnote-ref-2)