Document Revisions

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**IALA Guideline No. ####**

**On**

**The Use of Audible Signals**

**as Aids to Navigation**

**Edition 1**

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

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Guideline on the Use of Audible Signals as Aids to Navigation

# Introduction

Although audible signals, also referred to as sound signals, are still used as Aids to Navigation, it has been IALA policy since 1985 that these devices should only be used as a hazard warning. The Competent Authority shall determine whether a hazard requires a sound signal and the level of reduced visibility per year that justifies its installation (e.g. 10 days of visibility under 1nm/year). Certain man-made structures such as offshore structures, renewable energy infrastructure, bridges, breakwaters and isolated AtoN may be considered a hazard requiring one or more sound signals.

# Sound Signals and their use

Where provided, the sound signals should have a range of at least 2 nautical miles. In addition, Competent Authorities may require a backup sound signal of a reduced range (these do not necessarily need to be a separate unit); 0.5 nautical miles is considered adequate for these backup sound signals.

There are a number of considerations to be taken into account with regards to sound signals and their use:

1. Sound propagates in the atmosphere in a variable manner, making the perception of direction and distance to the emitter difficult. It may be very difficult to estimate the location of a danger.
2. A linear increase in the perception of a sound corresponds to an exponential power increase in the sound source.
3. Background noise level on board vessels may prevent recognition of a sound signal.
4. Occasionally, sound propagation is such that a signal may be almost inaudible close to the source, but of the expected level further away from the source.
5. The identification of the sound signal characteristics may not be reliable as a result of fluctuations in propagation causing interruption of reception.
6. A sound signal may be considered a nuisance by the local community.
7. In some situations, there is the need to combine two or more sound sources or to install a baffle device to avoid the propagation of sound in a certain direction. In both cases, care must be taken to avoid the sound of one source being cancelled by the sound of the other or by the reflected sound.
8. Sound signals are normally operated automatically using a fog detector. However, remote activated sound signals, where the sound signal is remotely activated either by a Competent Authority or mariner via a predetermined VHF radio frequency, are also used.

## Fog Detectors

Automatic fog detectors that emit an infrared beam, measure the reflection from the water particles in the air, and activate the sound signal at certain visibility thresholds. Reliable remote visibility meters, developed for use at remote meteorological stations, are used as fog detectors. These may be activated by heavy rain or snow, as well as fog.

## Remote Activated Sound Signals

Remote activated sound signals, especially mariner operated, facilitate the efficacy of AtoN sound signals, while eliminating the necessity of fog detectors.

## Sound Signals in the World

Some countries no longer use sound signals as aids to navigation, while others continue to use them, usually 2 mile range electric signals, on offshore lighthouses, light vessels, and some inshore hazards.

## Range of a Sound Signal

### Nominal Range

The distance at which, in fog, a lookout positioned in the wing of the bridge has a probability of 90% of hearing the signal when subjected to a noise as defined by IALA as being equal to or in excess of that found in 84% of large merchant vessels, the propagation between the sound signal emitter and the listener occurring during relatively calm weather and with no intervening obstacles (refer Table 1).

1. Nominal Range

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sound Pressure Level** | | | | |
| **Pn(NM)**  **F(Hz)** | **0.5** | **1** | **1.5** | **2.0** |
| 25 | 162 | 172 | 176 | 178 |
| 50 | 149 | 161 | 165 | 168 |
| 100 | 138 | 150 | 154 | 157 |
| 200 | 130 | 142 | 147 | 150 |
| 400 | 122 | 135 | 140 | 144 |
| 800 | 115 | 130 | 137 | 142 |
| 1000 | 113 | 129 | 137 | 144 |
| 1250 | 112 | 129 | 138 | 146 |
| 1600 | 110 | 130 | 140 | 150 |
| 2000 | 109 | 132 | 145 | 156 |
| 2500 | 108 | 136 | 151 | 166 |
| 3150 | 107 | 141 | 160 | 179 |
| 4000 | 109 | 150 | 177 | 199 |
| Pn – Nominal Range in sea miles  f – Frequency of the sound in Hz  Nr – Sound Pressure Level, in decibels, of the sound emitted by the SOUND SIGNAL at the reference distance of 1 metre in the direction concerned. | | | | |

### Usual Range

The distance at which, in foggy weather, a lookout positioned in the wing of the bridge has a probability of 50% of hearing the signal when subjected to a noise as defined by IALA as being equal to or in excess of that found in 50% of large merchant vessels, the propagation between the sound signal emitter and the listener occurring during relatively calm weather and with no intervening obstacles (refer Table 2).

1. Usual Range

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sound Pressure Level** | | | | |
| **Pu(NM)**  **F(Hz)** | **0.5** | **1** | **1.5** | **2.0** |
| 25 | 155 | 162 | 165 | 168 |
| 50 | 144 | 150 | 154 | 157 |
| 100 | 132 | 139 | 143 | 146 |
| 200 | 125 | 132 | 136 | 140 |
| 400 | 117 | 125 | 130 | 135 |
| 800 | 112 | 121 | 128 | 134 |
| 1000 | 110 | 121 | 128 | 135 |
| 1250 | 109 | 121 | 129 | 137 |
| 1600 | 109 | 122 | 132 | 141 |
| 2000 | 108 | 123 | 136 | 148 |
| 2500 | 109 | 127 | 142 | 157 |
| 3150 | 110 | 132 | 152 | 170 |
| 4000 | 112 | 142 | 168 | 193 |
| Pu – Usual Range in sea miles  f – Frequency of the sound in Hz  Nr – Sound Pressure Level, in decibels, of the sound emitted by the SOUND SIGNAL at the reference distance of 1 metre in the direction concerned. | | | | |

Further guidance regarding sound signal range calculation is provided in IALA Recommendation E-109 for the calculation of the range of a sound signal.

# Sound signals used to augment aids to navigation

Buoys, both lighted and unlighted, are sometimes outfitted with sound signals to enhance the buoy’s effectiveness to the mariner in reduced visibility. Buoy sound signals are most often powered by the motion of the sea and include bells, gongs, and whistles. Buoys may also be outfitted with electronic horns. Sound signals on buoys should be used to warn mariners of a particular hazard, such as proximity to shoals, rocks, or other hazards; or to alert the mariner to a change in navigational requirements, such as the entrance to a restricted channel. The Competent Authority, recognising the need for hazard warning, will determine whether a hazard requires a sound signal to augment an AtoN and the level of reduced visibility per year that justifies its installation.