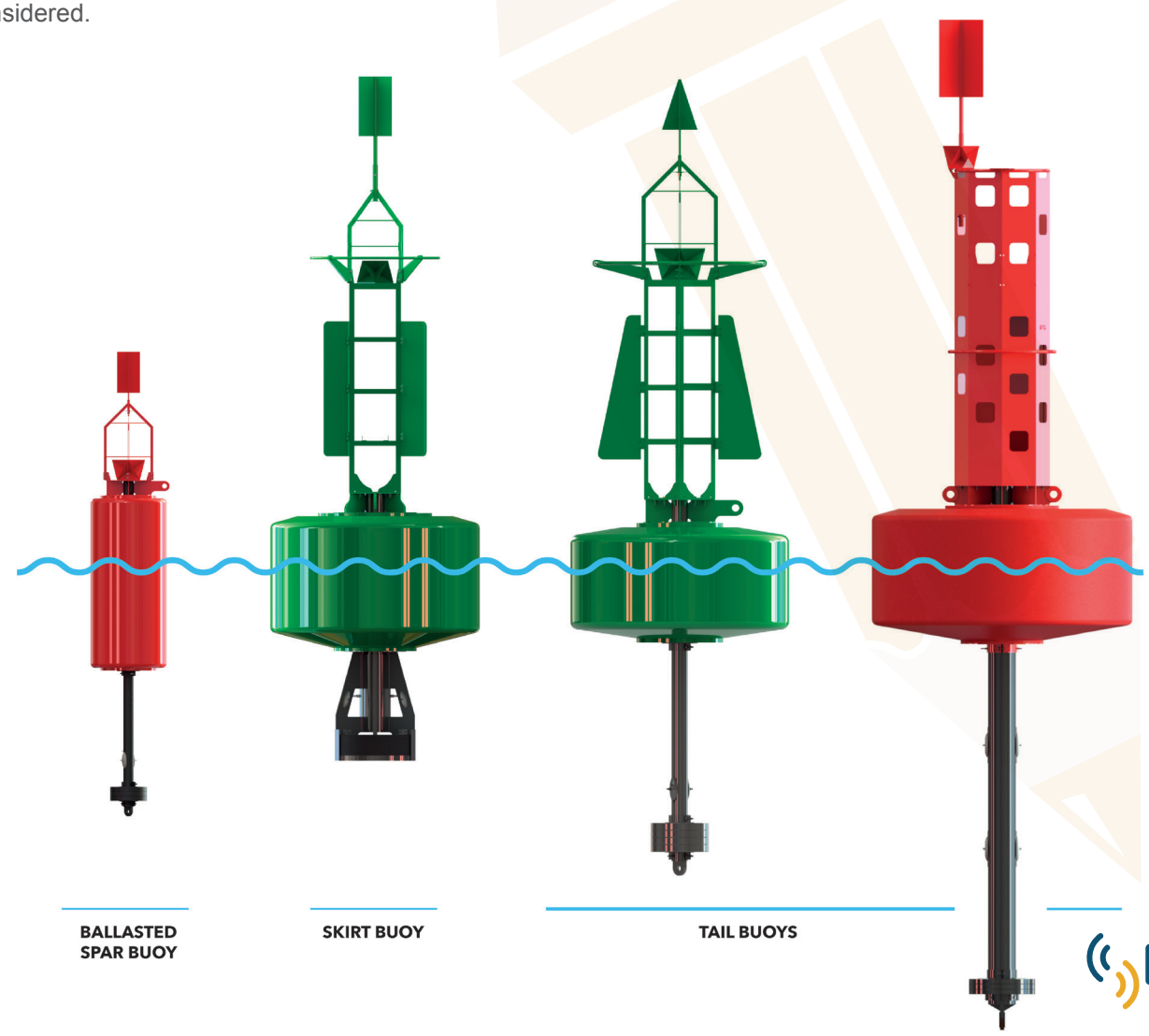
IALA GUIDELINE G1099

The Guideline G1099 provides information on the design and calculation of new buoy designs. Additionally, this article helps to acknowledge the impact of installing new equipment on existing buoys and defines important parameters to evaluate buoy performance.

The aspects of buoy design introduced on this article are parameters and definitions that affect **the buoyancy and stability of buoys,** this information should be used in conjunction with the **Guideline G1066 "Design of floating Aid to Navigation Moorings",** in order to consider also loads due to climatic effects. Nonetheless, the parameters introduced in this article are also useful as a tool for evaluating and considering the advantages and performance of determined buoys designs in any given environment.

This information can also be applied when an existing buoy is being redesigned or modified, and the effects of additional weight or structural modifications need to be evaluated.

This article is mainly focused on the performance of conventional buoys (skirt, tailtube or ballasted spar) moored with conventional moorings **(as shown in Guideline G01066).** Buoys without ballast weights, or articulated beacons are not considered.



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BUOYANCY

Buoyancy is the upward force produced by the float of the buoy displacing a volume of water.
The buoyancy must be enough to:

- The Aton to be effective in all weather conditions.
- Support the weight of the buoy and all mooring equipment.
- Support maintenance personnel and provide stability and safety if the possibility of a board operation is anticipated.
- In case of buoys with multiple watertight sections, buoyancy must be enough even in the case of one or more of the compartments to be flooded (defined by AtoN local authority).
- Resist wind and/or tidal flow forces.
- Supports weight due to ice on deck if this possibility is considered.
- Resist forces originated on wave drift.

Buoy under the influence of tidal flow, stable thanks to a high buoyancy and correct hydrostatic design

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Also, breaking waves and forces due to freezing on the water surrounding the buoy affect largely to the buoyancy needed, but this particular cases are complex and hard to calculate, and are not considered on this article *(if this is your case, feel free to contact our technical department and we will help you to choose the best solution).*

STABILITY

Stability measures the ability of the buoy to remain as vertical as possible under different forces and climatic conditions. In this article we talk about static stability, this is very important to note, because for dynamic reasons, different performance characteristics can be needed.

There are to main concepts that should be considered when evaluating stability:

- **Form stability:** is the stability provided by the shape of the immersed part of the buoy. High diameter buoys are more stable, because when the buoy is inclined, the wider the float is, the higher is the force that rights the buoy.
- **Weight stability:** The centre of gravity of the buoy being in a position such that it tends to right the buoy provides weight stability. This is most noticeable in long tail buoys, because higher ballast weights, positioned on a lower part of the buoy, produce higher righting force and higher stability.

These two parameters should be carefully considered when evaluating the static stability of a buoy. In the following articles, related definitions and calculations will be introduced.