

Safety of vessels against tsunamis

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On 11 March 2011, a magnitude 9 earthquake in the seas east of Honshu, Japan generated a devastating tsunami which caused great casualties and damages to the north-eastern coast of Honshu. A lot of ships and vessels were washed onto the shore, crashed against the quay wall or bridges, capsized and sunk in violent current and waves. The event has raised the concern of the marine community worldwide on the precautionary measures that the vessels can do in tsunami situations.

As a country seriously affected by tsunamis, a number of studies on this issue have been conducted in Japan. According to the study conducted by the Research Committee for the safety of vessels (Takahashi 2004), the severity of damage to vessels depends on the height, the period, the current speed and the attack direction of the tsunami, the shape of the port or the bay, the water depth of the anchorage, etc. The influences of tsunami on vessels as discussed in the study are summarized below:

1. There is no influence on ships navigating in deep waters where the tsunami wave is not significant. In bay or port where the water is not deep enough, the controlling of large ships would be affected and small vessels like fishing boat would capsize and sink due to tsunami wave and current.
2. The influence on the vessels moored at the quay is mainly the cutting off of the mooring rope due to the movement of the vessel caused by water level change and current of the tsunami waves. Large vessels would be strongly affected by the current, while small boats would be strongly affected by the elevated water level.
3. The influence on the vessels moored by anchor or mooring buoy is the dragged anchor due to the current. If the speed of the current is 1 m/s, it is estimated that the anchor chain would receive a maximum tension equivalent to that caused by a wind speed of about 20 m/s; and if the speed of the current is 2 m/s, the maximum tension of the anchor chain would be about four to five times higher.

In view of the above, countermeasures against tsunami to be taken by vessels would depend on the type, size, navigation condition and mooring condition of each vessel as well as the topographic characteristics and facilities of the port.

Reference: Masaru Takahashi, 2004. Japan Association of Marine Safety magazine.