

**No.
150**(May
2017)

Vapour pockets not in communication with cargo tank vapour / liquid domes on liquefied gas carriers

The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) as amended by Res. MSC.370(93), 8.2.17 states:

PRVs shall be connected to the highest part of the cargo tank above deck level. PRVs shall be positioned on the cargo tank so that they will remain in the vapour phase at the filling limit (FL) as defined in chapter 15, under conditions of 15° list and 0.015L trim, where L is defined in 1.2.31.

Under normal operating conditions, the vapour space is continuous and in communication with the vapour/liquid domes where the vapour line and cargo tank pressure relief valves (PRVs) are located. However, due to the geometry of the tank there may be times when a vapour pocket can be formed in a cargo tank on a liquefied gas carrier which is not in communication with the vapour/liquid domes. The vast majority of these conditions occur in a dynamic condition and are dissipated by the motion of the ship. However, there can be situations where the pocket exists in a static condition, for instance, due to damage to the ship caused by an accident such as grounding or collision. Even though the IGC Code states that the PRVs should be in the vapour phase under conditions of 15° list and 0.015L trim and presumes that no isolated vapour pockets are formed within this range in principle, this scenario can occur at other trim and list values based upon the filling level of the tank since the ship is designed to survive a damage condition up to 30° of list.

In this condition, there is the potential for liquid build-up in the vapour/liquid domes caused by a pressure differential between the isolated vapour pocket and the vapour/liquid domes resulting in a possible overflow of cargo liquid into the vapour line or into the tank PRVs.

Even though the likelihood of this situation occurring may be minimal, the consequences could be quite severe and lead up to the loss of the ship. Owners/operators of liquefied gas carriers, in consultation with the cargo containment system/cargo handling system designers, are recommended to develop emergency procedures to mitigate the risks to the vessel caused by isolated vapour pockets. These procedures should identify the condition when isolated vapour pockets can be present and contain measures to reduce or eliminate them and/or mitigate their consequences such as cargo jettisoning, transfer of cargo between tanks, and cargo vapourization/utilization based upon different scenarios following the accident, including, but not limited to, loss of power, limited ability to reduce angle of heel or trim.

These emergency procedures are not a substitute for requirement 15.4.1.1 when determining the increased filling limits.

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