Abstract: Tsunamis and hurricane induced wind and waves have devastating effects on the beachfront houses in coastal areas. The property damage and widespread impact caused by these extreme events, especially in the last decade, demonstrate the significant importance to develop more resilient houses to survive such kind of natural disasters in the houses’ service life. While the wind effects on the coastal residential houses have been extensively studied and are well addressed in the ASCE code and other related codes, the wave effects resulted from tsunamis and hurricanes are rarely evaluated. This paper aims to provide a general understanding for the portion of the wave loadings in the combined total forces (wind and wave loadings). A wave model based on the 2nd order solitary wave theory is developed to investigate the wave loadings on a typical beachfront house. Different still water depths with various structure elevations are considered for the parametric study. Both the horizontal and vertical forces under the prescribed conditions are analyzed in details. Comparisons are made between the results of 2D and 3D models through the commercial software ANSYS Fluent in order to present an insight view of this topic. The acquired wave forces are compared with those from empirical equations provided by FEMA.

Key words: Wave forces; Beachfront house; Solitary wave; Computational Fluid Dynamics.