

EGU2020-4349

<https://doi.org/10.5194/egusphere-egu2020-4349>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



Efficacy of Vertical Evacuation Refuge from Tsunamis (VERT)

Ian Robertson

University of Hawaii at Manoa, Civil and Environmental Engineering, United States of America (ianrob@hawaii.edu)

ABSTRACT:

Virtually every tsunami that has affected coastal communities in the past few decades has resulted in loss of life, often in the tens of thousands or more. Increased population density along tsunami-prone coastlines will only increase the potential for loss of life during future tsunamis. Conventional evacuation planning focuses on early warning systems and horizontal evacuation to the nearest available high ground. While this approach should be encouraged and improved, there is also a need for vertical evacuation options for areas where horizontal evacuation is not possible, or where residents, for whatever reason, are still in the inundation zone when the tsunami waves arrive.

Vertical evacuation into sturdy buildings that are tall enough to provide refuge areas above the inundation elevation has saved innumerable lives during past tsunamis. Most of these buildings were never designed for tsunami loads, but nevertheless remained intact and protected those who sought refuge in the upper floors. Seismic design requirements are common in tsunami-prone areas, which increases a building's potential to survive the tsunami loads. However, consciously designing for tsunamis would increase the reliability of vertical evacuation significantly.

The 2016 edition of "ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures" includes a new Chapter 6 on Tsunami Loads and Effects. This chapter provides a comprehensive approach to probabilistic tsunami design of buildings and other structures for various performance levels. One section of this chapter provides specific requirements for design of vertical evacuation refuge structures for tsunamis, which results in less than 1% probability of failure during a design level tsunami. It is also strongly recommended that all buildings in the tsunami inundation zone that are tall enough to provide safe refuge should include tsunami design, even if at a less stringent level of performance.

This presentation will discuss the implications of adding tsunami design, evaluate the cost premium involved, and present some recent VERT design and construction projects.