Guidance for Flood Risk Analysis and Mapping

Calculation of Incident Wave Height and Slope for use with TAW Wave Runup Method

May 2015

FEMA

Requirements for the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) Program are specified separately by statute, regulation, or FEMA policy (primarily the Standards for Flood Risk Analysis and Mapping). This document provides guidance to support the requirements and recommends approaches for effective and efficient implementation. The guidance, context, and other information in this document is not required unless it is codified separately in the aforementioned statute, regulation, or policy. Alternate approaches that comply with all requirements are acceptable.

For more information, please visit the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage (www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping), which presents the policy, related guidance, technical references, and other information about the guidelines and standards development process.

Document History

Affected Section or Subsection	Date	Description
First Publication	May 2015	Initial version of new guidance. The content clarifies existing guidance in the *Guidelines and Standards for Flood Risk Analysis and Mapping*.

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1.0 Overview

This document describes the recommended procedure for calculating the incident wave height, H_{m0}, and slope, m, when applying the Technical Advisory Committee for Water Retaining Structures (TAW) wave runup method for use in Flood Risk Projects.

2.0 Wave Height

The wave height parameter required for use in the TAW equations is the spectral significant wave height, H_{mo}, at the toe of the structure. In many cases, waves are depth-limited at the toe of the structure, and H_b can be substituted for H_{mo}, with H_b calculated using a breaker index of 0.78, unless the Mapping Partner justifies a different value. The reference water level for determining the depth limited wave height at the toe should be the 2 percent Dynamic Water Level, DWL2%. The DWL2% is the sum of the stillwater elevation (SWEL) and the static and dynamic wave setup components, if present.

Dynamic wave setup is not calculated on the Atlantic Ocean and Gulf of Mexico coasts where wave and bathymetric characteristics are quite different from those on the Pacific coast. With longer wave periods and a narrower continental shelf, the Pacific wave climate has narrower wave spectra, and consequently, a substantial oscillating dynamic setup component. The dynamic setup is negligible on the Atlantic and Gulf coasts where there are broader wave spectra and shorter wave periods; therefore, the reference water level on the Atlantic and Gulf coasts for calculating the depth limited wave height at the toe is the SWEL plus the static wave setup component.

3.0 Slope

The slope, m, to be used in the Iribarren number calculation for the TAW runup method should be calculated between two points: a lower point, defined by seaward point, and an upland point, defined by the runup limit. Since the runup limit is initially unknown, the slope is determined using an iterative method. The first estimate of the runup limit should be set at SWEL (without any wave setup components) plus $1.5*H_{mo}$. The seaward point should be set at SWEL minus $1.5*H_{mo}$ unless this point falls below the barrier toe. In these cases, the seaward point should be set to the barrier toe. The TAW slope should not include any portions of the foreshore as shown in Figure 1. If SWEL plus $1.5*H_{mo}$ or the runup limit exceed the barrier crest level or face point, the face point should be selected as the upland point for the slope calculation.

In cases where the slope is uniform between the toe and face points, it may be reasonable to simplify the TAW slope computation with a non-iterative calculation using the toe and face points. However, the profile should be inspected to verify that the slope is uniform and that this slope is comparable to the slope that would be calculated iteratively.

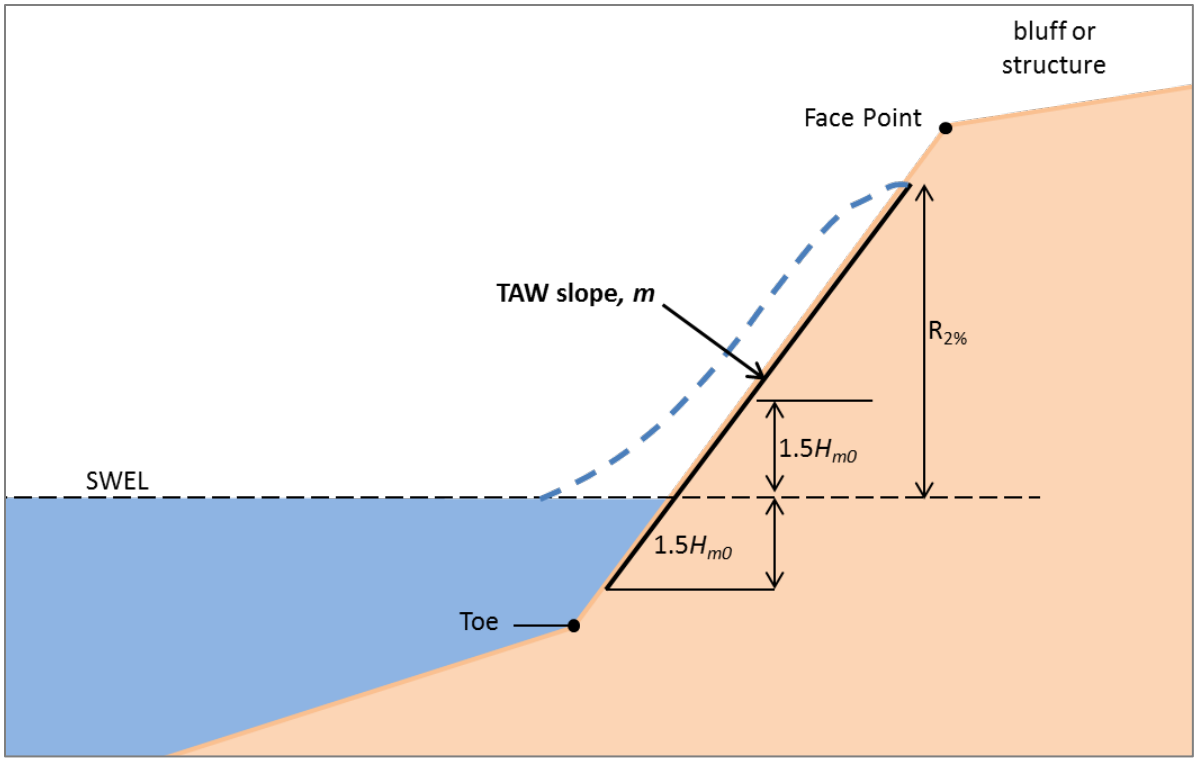

Figure 1. Determination of the TAW slope for computing wave runup