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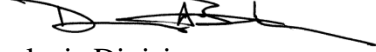
October 31, 2011

Procedure Memorandum No. 60

Amending the Guidelines and Standards for Flood Hazard Mapping Partners

Title: Revision to Figure D.2.8-3, Wave Runup Guidance for Vertical Wall, From Shore Protection Manual (USACE, 1984)

Effective Date: Immediately for future studies and Letters of Map Change, and retroactively for Fiscal Year 2010 coastal projects

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Background: FEMA's coastal flood study guidelines and methodology recognizes the vulnerability of coastal shorelines to wave runup during significant flood events. Wave runup is the vertical height above the stillwater level to which water from an incident wave will run up the face of a slope, and may result in wave overtopping if the wave runup exceeds the structure crest. The runup elevation is also used to determine the base flood elevation for mapping purposes.

Issues: The procedure for estimating wave runup on vertical structures relies on the use of Figure D.2.8-3, provided the wave steepness and the depth of the toe of the structure. However, a comparison of the *Guidelines'* Figure D.2.8-3 to the *Shore Protection Manual* (USACE, 1984) Figure 7-14, revealed an inconsistency in the coefficient for structure depth, listed for the uppermost curve.

Actions Taken: For all new detailed coastal study starts in Fiscal Year 2010 making use of this procedure for estimating wave runup on vertical structures, the coefficient listed for the uppermost curve is redefined to be 1.50, consistent with the *Shore Protection Manual*. Letters of map revision submitted for studies initiated or completed prior to issuance of this procedure

memorandum shall use the redefined coefficient of 1.50. A corrected Figure D.2.8-3 contains these changes.

Supersedes/Amends: Figure D.2.8-3 presented in Section D.2.8.1.4 of the *Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update, Final Draft*, February 2007 will be superseded.

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Revision to Figure D.2.8-3, Wave Runup Guidance for Vertical Wall, From Shore Protection Manual (USACE, 1984)

FINAL

October 31, 2011



FEMA

All policy and standards in this document have been superseded by the FEMA Policy for Flood Risk Analysis and Mapping. However, the document contains useful guidance to support implementation of the new standards.

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Table of Standards

The Table of Standards is an overview of all mandatory elements within this Appendix. For details regarding these standards, refer to the body of this document where standards are shown in **bold** text.

Section Number	Short description
3	For all new detailed coastal study starts in Fiscal Year 2010 making use of Figure D.2.8-3 for estimating wave runup on vertical structures, the coefficient listed for the uppermost curve is redefined to be 1.50.
3	Letters of map revision submitted for studies initiated or completed prior to issuance of this procedure memorandum shall use the redefined coefficient of 1.50.
3	A corrected Figure D.2.8-3, presented within this guidance document, contains this redefined coefficient.

1. Background

FEMA's coastal flood study guidelines and methodology recognizes the vulnerability of coastal shorelines to wave runup during significant flood events. Wave runup is the vertical height above the stillwater level to which water from an incident wave will run up the face of a slope, and may result in wave overtopping if the wave runup exceeds the structure crest. The runup elevation is also used to determine the base flood elevation for mapping purposes. Procedures used in the assessment of wave runup on vertical structures are presented in Appendix D of the *Guidelines and Specifications for Flood Hazard Mapping Partners* (see, for example, Section D.2.8.1.4 of the *Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update, Final Draft*, February 2007). These procedures for the estimation of wave runup on impermeable, vertical walls are empirical and were developed from laboratory tests in two studies in which waves of known characteristics were propagated against test structures in wave flumes at the Waterways Experiment Station of the Corps of Engineers at Vicksburg, Mississippi, and at the Beach Erosion Board's laboratory in Washington, D.C. (*Wave Run-Up on Shore Structures*, 1956, Saville). These procedures are also detailed in the *Shore Protection Manual* (USACE, 1984). The central concept in the evaluation of wave runup on vertical structures is that runup height is dependent on the wave steepness (H/T^2) and on the depth at the toe of the structure, unless this depth is large in comparison to the wave height. The curves presented in the study guidelines enable the estimation of wave runup on vertical structures given the wave steepness and structure depth.

2. Issue

The procedure for estimating wave runup on vertical structures relies on the use of Figure D.2.8-3, shown below, provided the wave steepness and structure depth. The figure cites both the *Shore Protection Manual* (SPM) and Saville's paper (1956). However, a comparison of the *Guidelines'* Figure D.2.8-3 to the SPM's Figure 7-14, also below, revealed an inconsistency in the coefficient for structure depth, d_s/H_0 , listed for the uppermost curve.

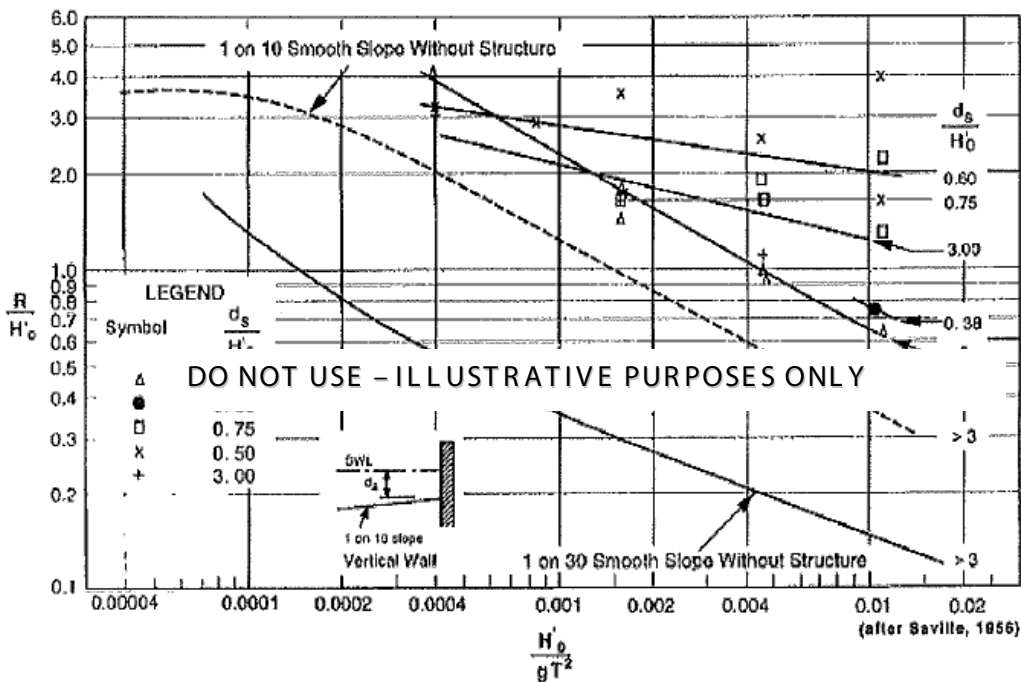
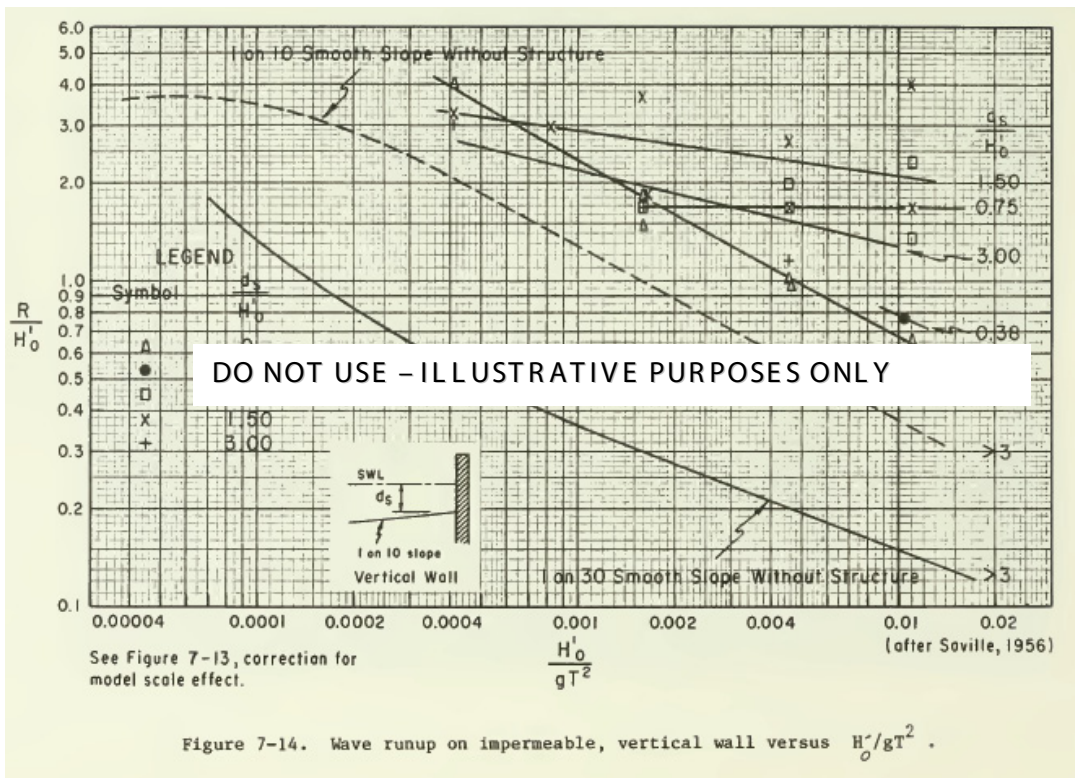


Figure D.2.8-3 Wave Runup Guidance from Vertical Wall, From Shore Protection Manual (USACE, 1984)



The *Guidelines* shows a depth of 0.60 for the topmost curve while the SPM lists the same curve as having a depth of 1.50. The legend of Figure D.2.8-3 of the *Guidelines* also identifies this same curve as having a depth of 0.50. The legend in Figure 7-14 of the SPM again shows a value of 1.50. A review of Saville's work, Fig. 3, below, confirmed the original coefficient published was 1.5.

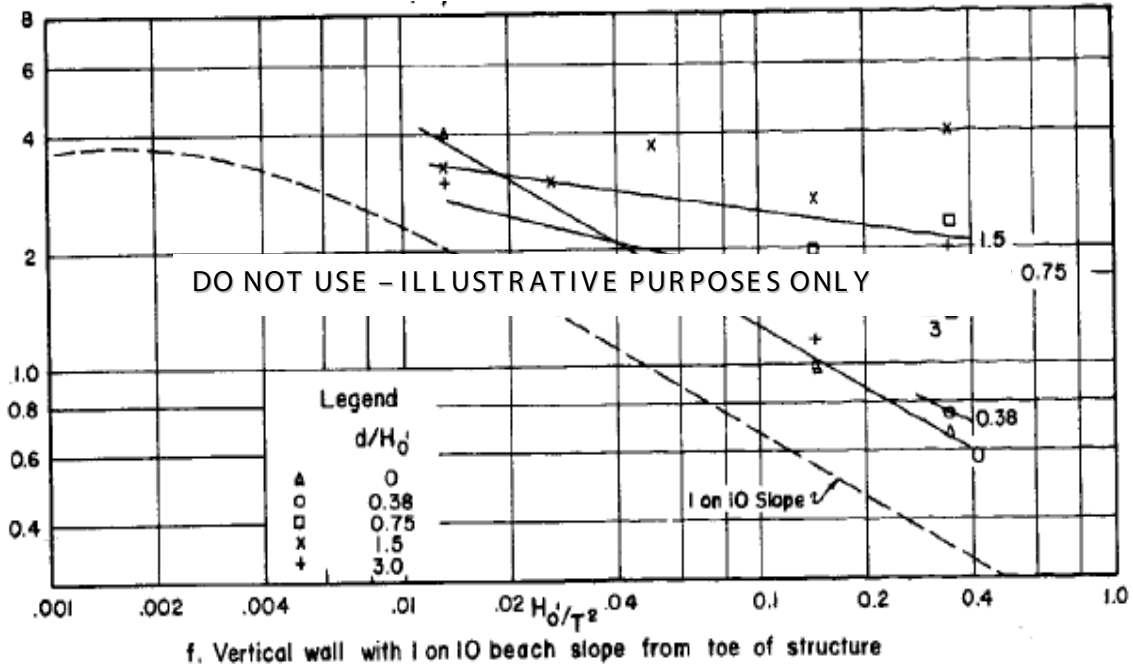


FIG. 3 · RUN-UP AS A FUNCTION OF STRUCTURE DEPTH AND WAVE STEEPNESS

3. Action Taken

For all new detailed coastal study starts in Fiscal Year 2010 making use of this procedure for estimating wave runup on vertical structures, the coefficient listed for the uppermost curve is redefined to be 1.50. Letters of map revision submitted for studies initiated or completed prior to issuance of this procedure memorandum shall use the redefined coefficient of 1.50. A corrected Figure D.2.8-3, presented below, contains these changes.

Corrected Figure D.2.8-3:

