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ENGINEERING AND CONSTRUCTION BULLETIN

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SUBJECT: Design and Evaluation of I-Walls Including Sheet Pile Walls.

CATEGORY: Guidance.

1. References:

- a. EC 1110-2-6066 'Engineering and Design: Design of I-Walls'
https://pubs.usace.army.mil/HQ_Public/EngCirculars/EC_1110-2-6066.pdf
- b. ETL 1110-2-575 'Engineering and Design: Evaluation of I-Walls'
https://pubs.usace.army.mil/HQ_Public/EngTech_Ltrs/ETL_1110-2-575.pdf
- c. EM 1110-2-2504 'Engineering and Design: Design of Sheet Pile Walls'
http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2504.pdf
- d. Ebeling, R. M., Fong, M. T., and White, B. C. 2016. Analysis of a Flood Plain I-Wall Embedded in Horizontally Stratified Soil Layers During Flood Events Using Corps I-Wall Software Version 1.0, U.S. Army Engineer Research and Development Center, ERDC Technical Report ITL-16-3, Vicksburg, MS.
- e. Pace, M. E., Abraham, K. and Ebeling, R. M. 2012. Complete Soil-Structure Interaction (SSI) Analyses of I-Walls Embedded in Level Ground During Flood Loading, U.S. Army Engineer Research and Development Center, ERDC Technical Report ITL-12-4, Vicksburg, MS.

2. Purpose. This bulletin transmits specific guidance to be used for the design and evaluation of I-Walls and Sheet Pile Walls with links to the supporting documentation located on the USACE Official Publications site and/or the Technical Excellence Network (TEN) site.

3. Distribution. Unlimited.

4. Background. EC 1110-2-6066 'Engineering and Design: Design of I-Walls' and ETL 1110-2-575 'Engineering and Design: Evaluation of I-walls' have expired and replacement documents have not yet been completed. This document provides guidance for the interim.

5. Design Guidance. For the design of I-walls use EC 1110-2-6066. For the evaluation of I-walls use ETL 1110-2-575. For the design of cantilever and single anchored earth retaining sheet pile walls use EM 1110-2-2504. Links to the documents are provided above.

6. I-Wall Design Height Limits. Paragraph 6-8.d of EC 1110-2-6066 states that until the Phase III investigations and guidance provides more information about gap formation, loading and deformations, the maximum unsupported stem height shall be limited to six feet for I-Walls located on levees or in soft soils. Phase III studies were completed in support of ETL 1110-2-575. Basic height limits for design can be determined using ETL 1110-2-575, Table B-2. For load cases and foundation conditions not listed on the table, designers must use soil structure interaction (SSI) analysis methods to estimate deflections (Pace, et. al, 2012). I-walls subject to usual and unusual loads must behave resiliently (no significant permanent deflection). Limit equilibrium methods, like those used in CWALSHT and Corps I-wall, cannot provide accurate calculation of deflections.

7. Computer Programs. Corps I-Wall Version 1.0 (Ebeling, et.al, 2016) is available for the design of I-walls on flat ground. It has the ability to account for wave loading in the analysis of coastal I-Walls, apply a hydraulic fracturing criterion to analyze gap initiation and propagation in saturated soils, and to construct System Response Curves for use in probabilistic analyses. Additionally, Corps I-Wall addresses shortcomings in CWALSHT for situations with undrained soil behavior. CWALSHT can be used for anchored sheet pile walls. For situations of I-Walls on levees, where limit equilibrium methods used in CWALSHT can overestimate passive lateral resistance on the dry side of the levee (ETL 1110-2-575, Appendix D), SSI methods must be used to ensure all failure modes are recognized and deflections are controlled. Computer programs can be downloaded at <https://knowledge.usace.army.mil/Hub.aspx>.

8. Points of Contact. The HQUSACE point of contact for this ECB is Richard Ludwitzke, CECW-CE, 202-761-1580. Alternate points of contact are Kent Hokens, CEMVP-EC-D, 651-290-5584, and Brad Arcement CEMVK-EC-PC, 601-631-5899.

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