

DEPARTMENT OF THE ARMY
MISSISSIPPI RIVER COMMISSION, CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI 39180

ADDRESS REPLY TO:

PRESIDENT, MISSISSIPPI RIVER COMMISSION
CORPS OF ENGINEERS
P. O. BOX 80
VICKSBURG, MISSISSIPPI 39180

S: 2 Nov 84

S: 1 Dec 84

MRCED-GS

29 OCT '84

SUBJECT: Proposed I-Wall Field Load Test

Commander, New Orleans District
ATTN: LMNED-F

1. Reference meeting in NOD between Mr. Rich Jackson, MRCED-GS, and your F&M Br staff on 18 and 19 Sep 84, concerning the subject proposed test.
2. The most appropriate method of analyses for determining the optimum depth of penetration for cantilevered sheet pile walls has been the subject of considerable discussion among design engineers for many years. The required depth of embedment of an I-type sheet pile floodwall is governed by the magnitude of the water load on the wall and on the lateral earth pressure acting on the embedded part of the wall. The current method of analysis used to determine sheet pile penetration within LMVD is somewhat conservative, i.e., "S" strengths used, in order to account for uncertainties in sheet pile and soil behavior. We are not aware of any existing field load test data that could be used to verify our methods of analysis on I-type floodwalls and little performance data are available on existing floodwalls since these walls have seldom been loaded to any degree by flood waters.
3. Over the next few years, there are many I-type floodwall projects, with an estimated cost of over \$100,000,000 to be constructed within NOD. These include floodwalls for Mississippi and Atchafalaya River flood protection projects and also hurricane protection projects. Considering the high cost of a sheet pile I-wall, we consider it appropriate and advisable at this time to reevaluate our design procedures for determining the depth of sheet pile penetration required for I-wall stability considering the duration of loading imposed on these walls. This reevaluation can best be accomplished by instrumenting a section of I-wall in the field, ponding water against the wall, analyzing the instrumentation data, and then revising our current analytical procedures as necessary.
4. After reviewing several possible test sites during the referenced meeting, it was agreed that EABPL Item E-99, levee enlargement Avoca Island, would be a promising location to construct a test section due to the following:
 - a. The I-wall foundation soils are relatively poor, consisting of soft, highly plastic clays, and would be representative of a NOD worst case condition.

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b. The test section can be incorporated into the Item E-99 levee enlargement contract scheduled for award in Feb 85 or constructed concurrently under separate contract.

c. The test section results could be used to reevaluate the sheet pile penetration required for adjacent Items E-96 and E-105. Using Item E-99 as an example, a savings of about \$4,000,000 could be realized if the test section results indicate the Q-case penetration is adequate (see para 5 below). After the test data from the Avoca Island test section are analyzed it can be determined if additional I-wall test sections are desirable. For example, a section of the Barracks to Montegut Mississippi River floodwall could be instrumented, tested as described above, and the data used to reevaluate the stability of the existing Dumaine Street floodwall which we understand would be considered inadequate if present design procedures are used.

5. Using current design procedures, the long term or "S" case often governs the design penetration. The instrumentation data from the proposed test may show that the "S" case is, in fact, not applicable and that the classical methods of analysis using the "Q" case will result in adequate penetration and performance. Alternate analytical methods, such as soil structure interaction, should also be investigated to determine whether they would yield results closer to that observed in the test sections. This could be done using the proposed load test data and existing soil/structure interaction programs. Also, it may be possible to develop design curves showing a relationship between required sheet pile penetration and hydrostatic head in feet for various soil strengths. WES has indicated that it could assist with the analyses of the test data and that Repair, Evaluation, Maintenance, and Rehabilitation Research Program funds could be made available for studies which could be applied to reevaluation of existing I-type floodwalls, such as the Dumaine Street floodwall.

6. If you concur in the desirability of performing the I-wall load tests as discussed above, we consider it advisable to begin design of a test section as outlined roughly below.

a. Construct the test section on the landside berm of the E-99 levee approximately as shown in plan and section on the attached sketch.

b. Determine penetration of test section sheet pile using an 8.0 ft head, Q-case conventional analysis, and best estimate of ground water level during test. It may be desirable to vary the levels of the ponded water and/or sheet pile penetration during test. Water should be ponded against wall about 90 days to simulate project flood conditions.

c. Ensure that overall levee and berm stability are adequate during test.

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d. Arrange for WES to install inclinometers and strain gages on sheet piles. Make one undisturbed boring at the test site and install piezometers on the loaded side of the wall and landward of the wall.

7. In summary, it is considered that the proposed I-wall test section, which we estimate can be constructed and analyzed for less than \$200,000, is well justified. The test section can be constructed as part of the Item E-99 contract and the test section sheet pile pulled and redriven as service sheet piling if desired. As an alternative, a separate contract could be awarded to construct the test section. Please inform us by 2 Nov 84 whether you agree with this proposed test approach. If the study is performed, we would expect you to prepare the preliminary test section design, submit it to this office by 1 Dec 84, and schedule a review meeting soon thereafter so that the test section design can be reviewed and approved at an early date.

FOR THE PRESIDENT OF THE COMMISSION:

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R. H. RESTA, P.E.
Chief, Engineering Division