US Army Corps of Engineers®
Engineer Research and Development Center

Improved Structure Condition Indexing

Description

Under development are techniques and tools to assist District personnel evaluate and report existing conditions of USACE rubble mound structures. These tools will aid in monitoring and documenting yearly changes in the structures and in forecasting structural changes and rehabilitation requirements. Four interactive tools are currently under development: standardized data collection forms; a hand-held computer for GPS stamped data collection and reporting in the field; an Integrated Survey System (ISS) to perform safe, accurate, remote, and simultaneous surveying of both above- and below-water portions of a structure; and the Coastal Structures Condition Assessment and Standardized Reporting Application (CoSCA), an interactive GIS tool for data management, project assessment and standardized reporting for structures. A national database populated with information acquired through these tools and processed in the CoSCA system could provide an overall picture of the condition of Corps' rubble mound structures and a foundation for asset management and risk assessment planning.

Issue

The Corps of Engineers has over 650 coastal navigation and hundreds of hardened shore protection structures in place with more planned. Approximately 100 structures protect the major port deep draft navigation channels and are critical to the Corps' Navigation mission. Corps regulations require yearly inspections of these projects. These inspections and the subsequent condition index evaluations are critical when decisions on which structures to repair/rehabilitate are made, and to estimating cost. Limited funds make it critical that the condition index accurately reflects the structure's condition, that this information be used as a basis for computing structures' functionality and ultimately become part of the optimum plan for asset management with in the region. The present condition index methods are subjective, cannot utilize digital technology (e.g., DGPS combined with digital photography), and lack an easy method to quantify changes and trends. Also, many inspections are completed by engineers and inspectors walking these structures and noting changes that they observe, making the safety of the engineers and inspectors a major concern.

Users

USACE Districts, Divisions and Headquarters.

Products

The overall product will be a coordinated package of 4 tools for assessing and documenting the condition of rubble mound structures. The tool is a standardized format for field inspections and condition reporting. The second tool will utilize the technology of hand-held tablet computers to automate the collection, processing and storing of structure inspection data, making inspecting and reporting into an automated in-field operation. The computer will be outfitted with camera, a distance measuring device, an altimeter, and GPS, as well as the standardized form, to aid in simplifying data entry needs and to produce the inspection results in a digitized format that will allow comparison to future surveys and inspections. Additionally, the hand-held device will allow the user to calculate the GPS location of a remote point and to delineate an area of damage without entering that area. The third component of the package, under development, is a tool to simultaneously gather the above- and below-water structure geometry in a geo-referenced format. This Integrated Survey System (ISS) can complete a survey of a harbor area in a

fraction of the time presently required and will produce a point cloud that is dense enough that individual armor units can be viewed. This system should have multiple applications, including surveying most types of structures, beach mapping, and real-time construction monitoring. Cross sections derived from this data set could be used in the development of the repair construction documents as required. The fourth tool, Coastal Structures Condition Assessment and Standardized Reporting application (CoSCA), brings it all together. CoSCA is an interactive GIS tool for data management, project assessment and standardized reporting methods for structures. With the inclusion of a GIS component to assist in the condition index reporting, data can begin to be gathered, integrated, and managed for comparisons and change assessments in a more standardized approach.

Benefits

The tools developed in this work unit will allow the Districts, Divisions, and Headquarters (HQ) to more accurately assess structures' condition and to budget for future rehabilitations. Asset Management and Risk Assessment will be aided by the ability to easily review consistent, measurable, accurate, and comparable results of condition assessments of USACE coastal structures when they are collected and reported in a standardize process.

Sponsors

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Partners

USACE Engineering Research and Development Center Coastal and Hydraulics Laboratory; Great Lakes and Ohio River Division; and the Mobile, Honolulu, Buffalo, and Chicago Districts.