

Structure Condition Indexing, Rubble-mound Coastal Structures Workshop

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Workshop Purpose

- Present a forum to discuss Structure Condition Indexing requirements, procedures, formats and tools.



Agenda

- Stan Boc/Cheryl Pollock CHL
- Rose Dopsovic SAM
- Rob McAdory CHL
- Mike Mohr LRB
- Monica Chasten NAP
- David Michalsen NWP
- Open discussion All



The Corps of Engineer' policy relative to periodic inspection

“Civil works structures, whose failure or partial failure could jeopardize the operational integrity of the project, endanger the lives and safety of the public, or cause substantial property damage shall be periodically inspected and evaluated to ensure their structural stability, safety, and operation adequacy.”



Why are we doing this?

- Provide maintenance managers at all levels with tools to promote easier and more effective maintenance and budget planning tools
- Existing evaluation systems vary from district to district
- HQ wants a tool for tracking and planning for future resourcing needs



Objective

- Create uniform procedures for accessing the condition and functionality of structures
- Assessment procedures should be:
 - Repeatable from yr to yr
 - Repeatable by different people
 - Comparable from structure to structure and from district to district
 - Comparable from yr to yr
 - Computer based data storage
 - Computer based yr to yr comparison tools
 - Measurable objective index, not subjective
 - Key words are repeatable, measurable and comparable
 - ?Tablet notebook with GIS/GPS/Camera integrated?



How are Districts inspecting and documenting structure conditions now?

- TR REMR-OM-24 “Condition and Performance Rating Procedures for Rubble Breakwaters and Jetties” and the attached computer program “Breakwaters”. 1998
- LA and SF may be the only districts using it.
- Some districts have developed alternate systems that work well for them.
- Inspections as needed or not at all.

TR REMR-OM-24

- Method for developing a numerical value (1-100) Condition Index (CI) associated with the physical condition (SI) and the functional performance (FI).
- SI is an indicator of the structure's general condition. SI trends can be use to judge likely future functional performance degradation.
- FI reflects the functional evaluation based on observation, dredging records, surveys, etc.



Steps in Condition and Performance Rating System (after Oliver et al. 1996)

Step Description

Steps 1-5 are Initial (One-Time Only)

- 1 Determine structure function
- 2 Divide structure into major reaches based on function
- 3 Subdivide major reaches into sub-reaches by structural and length criteria
- 4 Establish functional performance criteria
- 5 Establish structural requirements

Steps 6-8 are Repeated as Necessary

- 6
 - a) Inspect structure
 - b) Produce structural rating
- 7
 - a) Produce functional rating
 - b) Calculate condition index
- 8 Review structural requirements



$$\left. \begin{array}{l} CR \\ SE \\ CH \end{array} \right\} = R_5 + 0.3(R_1 - R_5) \left(\frac{R_2 + R_3 + R_4}{300} \right)$$

$$SI_R = I_L + 0.3(I_H - I_L) \frac{I_M}{100}$$

$$SI = I_L + 0.3(I_H - I_L) \left[\frac{\%1}{100} \left(\frac{S1}{100} \right) + \frac{\%2}{100} \left(\frac{S2}{100} \right) + \frac{\%3}{100} \left(\frac{S3}{100} \right) + \dots \right]$$

$$FI_R = R_L + 0.3(R_H - R_L) \left[\frac{(R_2/100 + R_3/100 + R_4/100 + \dots)}{N} \right]$$

$$FI = I_L + 0.3(I_H - I_L) \left[\frac{(I_2/100 + I_3/100 + I_4/100 + \dots)}{N} \right]$$

FUDGE FACTOR

- How do we get subjectivity out of the ranking?
- Documented measurements and records.
- Repeatable and comparable procedures.



Breakwaters Program

- Computer program developed for processing the data collected for each sub-reach of the structure and calculating a final condition index (CI) for the entire structure
- Program is no longer readily available
- Program runs on old DOS format.



Issue

- The *condition index* for a reach or structure is the same as the functional index.
- How do the districts fund these inspections
- Where do these numbers go, how are they used
- Too subjective
- Too much time required with no return benefit to the district.



1st steps

- District input
- Workshop
- PDT development and communication
- Sample structure inspections (let us know if you have inspections scheduled)
- Improve the system we have, develop new system?
- Beta version of inspection format FY07,Q2



Questions?

