



**US Army Corps
of Engineers.**
Engineer Research and
Development Center

Fact Sheet

Construction Engineering Research
Laboratory (CERL)
P.O. Box 9005
Champaign, IL 61826-9005

Public Affairs Office
Phone: (217)-352-6511
Fax: (217) 373-7222
<http://www.cecer.army.mil>

January 2000

(CF-58)

REMR MANAGEMENT SYSTEM FOR CONCRETE IN GRAVITY DAMS, RETAINING WALLS, AND SPILLWAYS

The Problem

The US Army Corps of Engineers operates some 270 navigation dams, usually with accompanying attachments and appurtenances, constructed of plain or reinforced concrete. The Corps of Engineers also operates more than 350 reservoir dams, most of which are either concrete gravity structures or embankment structures with accompanying attachments and appurtenances constructed of plain or reinforced concrete. Many of these structures require or will require significant repairs to ensure safe and efficient operations. A quantitative rating system for the condition of concrete in gravity dams and attachments and appurtenances has been developed. This rating system provides objective information to aid in making the decision of which dam, which structural unit within a dam, and which deficiency within a structural unit most merit repair. Successive ratings with time would provide a measure of the rate of deterioration. A computer application, CONCDAM, employs this condition rating system to provide a decision support tool to managers who plan REMR activities for concrete gravity dams.

The Technology

To assist managers with M&R planning and budgeting, the U.S. Army Construction Engineering Research Laboratory (CERL) has developed a Repair, Evaluation, Maintenance, and Rehabilitation (REMR) system. This computerized management system is based on standardized inspection and condition rating procedures. It also includes software for handling and storing data, performing required calculations, and producing a variety of reports for work planning and budgeting purposes.

The management system features a 100-point Condition Index (CI) that rates the structure on physical condition and the extent to which it is performing its intended function (see CERL Fact Sheet CF-22, The Condition Index). This is primarily a planning tool with the index values serving as an indicator of the general condition level of the structure. The index is meant to focus management attention on those structures most likely to warrant immediate repair or further evaluation. In addition, the CI values can be used to monitor changes in general condition over time and can serve as an approximate comparison of the conditions of different structures.

Application of this management system begins with an inspection of the concrete according to the standard procedure established for the system. Inspection information is entered into the system to compute the CI directly from the inspection records. Distresses reduce the CI according to two general considerations: (1) serviceability, or how the structure performs its function on a day-to-day basis, and (2)

subjective safety, or how, in the judgment of expert engineers, the safety of the structure has been degraded by various distresses. A combined CI for each monolith is calculated by weighting each of its five largest distresses.

Benefits/Savings

This computerized REMR Management System provides procedures for performing condition surveys, consistent and quantitative condition assessment, and data base management. Combined with economic analyses, these procedures allow efficient M&R budget planning through the evaluation of current condition and comparison of various M&R alternatives based on life cycle costs. The ultimate goal is to achieve the best possible condition for concrete gravity dam structures at any funding level. The collection of consistent, uniform condition assessment data will allow the generation of typical curves reflecting rates of deterioration. The combination of historical condition data and expert opinion should allow prediction of changes in the CI based on maintenance history, operating conditions, and applied M&R policies.

Status

The REMR Management System for concrete gravity dams has been tested and is being implemented throughout the U.S. Army Corps of Engineers. Training sessions for Corps personnel have been completed and the program will undergo updates and revisions as necessary. A Technical Report, REMR-OM-16 ("*REMR Management Systems - Navigation and Reservoir Structures, Condition Rating Procedures for Concrete in Gravity Dams, Retaining Walls, and Spillways*," Bullock, R., Foltz, S., U.S. Army Corps of Engineers, September 1995), has been published to document the procedures used. The most current REMR software is available on the internet at <http://www.cecer.army.mil/fl/remr/remr.html>

Point of Contact

CERL POC is Stuart Foltz, COMM 217-373-3487; toll-free 800-USA-CERL; FAX 217-373-6740; email s-foltz@cecer.army.mil; or CERL, ATTN: CECER-CFF, P.O. Box 9005, Champaign, IL 61826-9005.

Visit the CERL homepage at <http://www.cecer.army.mil>