



**US Army Corps
of Engineers.**
Construction Engineering
Research Laboratory

Fact Sheet

U.S. Army 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>

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MATERIALS SELECTION GUIDE FOR MECHANICAL COMPONENTS USED IN CIVIL WORKS PROJECTS

The Problem

Maintenance to prevent corrosion damage is a high-cost item in the Civil Works maintenance and repair budget for water resource projects. Corroded parts are often replaced with parts of the same corrosion-susceptible material, leading to future maintenance costs. Through a better understanding of the corrosion process and selection of more appropriate corrosion-resistant materials for given environments, these costs can be reduced.

The Technology

Responding to field demands for help in selecting corrosion-resistant materials, the U.S. Army Construction Engineering Research Laboratory (CERL) has compiled the Materials Selection Guide for Mechanical Components of Water Projects. This report presents typical mechanical property data, briefly discusses corrosion behavior, and provides general guidelines on the use of stainless steels for locks, dams, and hydroelectric plant applications.

New corrosion-resistant materials have been evaluated in the laboratory and in the field. Laboratory tests have examined pitting, corrosion, cavitation, and heat sensitivity. Parts such as high-strength bolts and dam gate-raising chains were field-tested, and a selection guide for lock and dam gate components was developed for design engineers. The guide compiles when, how, why, and where conventional materials and improved stainless steels should be selected as mechanical components for lock and dam and hydroelectric plant applications.

Benefits/Savings

The Materials Selection Guide allows Civil Works managers to choose the materials most appropriate for high-strength, corrosion-resistant, cost-effective mechanical components. Some of the information presented in the selection guide, such as galling properties of steels and bronzes, is not available anywhere else. Benefits accrue from reduced expenditures due to less frequent replacement of corrosion-prone components. For example, in 1979, the Ohio River Division saved \$6.3 million by using proper materials and designs for lock and dam gate-raising bolts, shafts, and maintenance bulkheads. More recently the guide has been used by the Rock Island District (Tainter Gate Hoisting Bars for L&D 13, and projected for L&D 12, 14, 17), the Nashville District (Nickel Aluminum Bronze Chains Links for Robert Byrd L&D) and the Vicksburg District (Mississippi Revetments). With this material selection guide the Corps districts are saving \$10 million per year by selecting optimum corrosion resistant materials.

Status

The Materials Selection Guide was published as a Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Technical Report entitled *Mechanical Properties and Corrosion Behavior of*

Stainless Steels for Locks, Dams and Hydroelectric Plant Application (REMR-EM-6). The selection guide is currently being revised to incorporate new development in materials . New materials to be incorporated include self-lubricating greaseless bushings. The use of industrial specification will be used where appropriate in place of Federal specifications. The revised guide will be computerized to allow posting on an electronic bulletin board or the Internet. A downloading version of the computerized guide is available and searchable at <http://owww.cecer.army.mil/corrosion/corr.htm> .

Points of Contact

CERL POC is Dr. Ashok Kumar, COMM 217-373-7235; toll-free 800-USA-CERL; FAX 217-373-6732; e-mail a-kumar@cecer.army.mil ; or CERL, ATTN: CECER-FL-M, P.O. Box 9005, Champaign, IL 61826-9005.

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