DESIGN OF SMALL CANAL STRUCTURES

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

A WATER RESOURCES TECHNICAL PUBLICATION

DESIGN OF SMALL CANAL STRUCTURES

1978

Engineering Technology Pertaining Primarily to the Design of Small Canal Structures of Less Than 100-Cubic-Feet-Per-Second Capacity

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

by

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"As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for the wise use and conservation of our land and water, energy and minerals, fish and wildlife, and park and recreation resources. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration."

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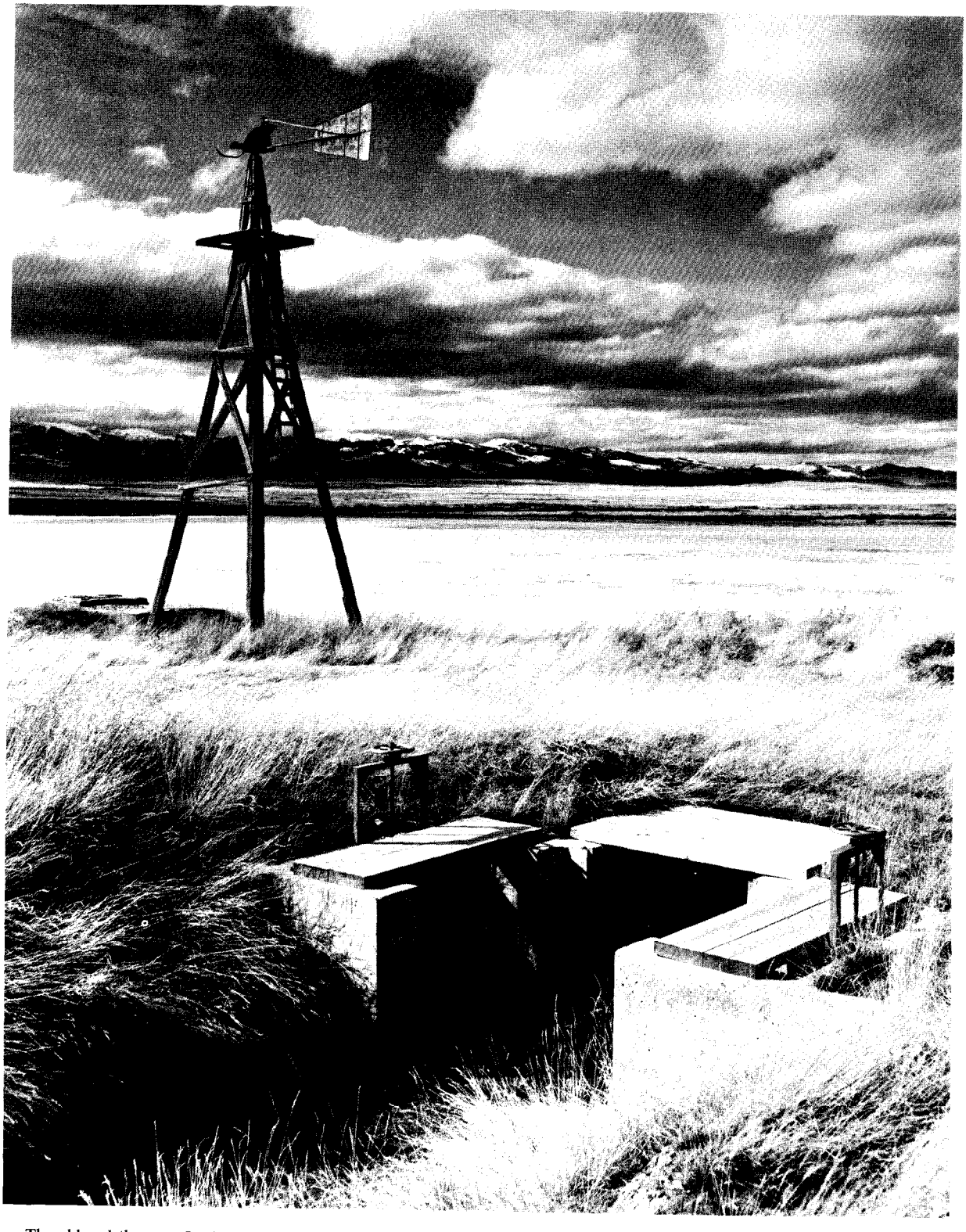

The old and the new. In the shadow of an abandoned windmill, turnouts from a division structure on an East Bench Canal lateral await water for irrigating benchlands east of Dillon, Mont. P699-600-2253NA, March 28, 1968

Preface

"Let man have dominion over the earth and let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after its kind." So is it written in the Book of Genesis.

The availability of water has determined the course of empires in many civilizations. When made available, its use for irrigating crops has been practiced for thousands of years by many peoples of the world. But only since the late 1800's has man applied scientific knowledge to watering drylands to increase crop production. The wise use of soil and water resources has changed millions of acres of once barren wasteland and desert into productive farms supporting prosperous communities.

Development of water resources by the Government to provide irrigation water for the arid lands of the western United States was initiated when the Reclamation Act of 1902 was passed during President Theodore Roosevelt's administration. Because of his strong leadership ability and contempt for abusive exploitation of our natural resources, he became regarded as the steward of the public's welfare.

Reclamation engineers and scientists through the years have developed canal structures for irrigation systems which can effectively perform their intended functions. This publication has been prepared to illustrate the application of canal structures having design discharge capacities up to 100 cubic feet per second. Several types of canal structures have been standardized for this capacity range and are presented herein. Structure sizes required to discharge these flows are relatively small; however, engineering principles used in their design are also applicable to canal structures of greater capacity.

The need for this publication became apparent by the number of requests received, both foreign and domestic, during the past years. It is intended that this book provide the design engineer with a source of condensed information for use as a guide in efficiently designing small canal structures. The design engineer must realize, however, that sound engineering principles and judgment must be exercised in the selection and utilization of the structures, and that the use of design methods, procedures, and other information herein remains his responsibility.

There are occasional references to proprietary materials or products in this publication. These must not be construed in any way as an endorsement by the Bureau of Reclamation since such endorsement cannot be made for proprietary products or processes of manufacturers or the services of commercial firms for advertising, publicity, sales, or other purposes.

The text of this publication was prepared by a design team comprised of Bureau of Reclamation engineers from the Engineering and Research Center at Denver, Colorado, under the overall direction of H. G. Arthur, Director of Design and Construction.

The text was coordinated and edited by A. J. Aisenbrey, Jr., Civil Engineer, Hydraulic Structures Branch. Team members who authored the presentations for the canal structures were R. B. Hayes, D. L. Winsett, and R. B. Young, Civil Engineers, Hydraulic Structures Branch and H. J. Warren, General Engineer, Engineering Reference Branch. Editorial guidance, final review, and preparation of the manuscript for publication

was performed by W. E. Foote, General Engineer, of the Technical Services Branch. The revised reprint was edited by R. D. Mohrbacher, General Engineer, Technical Services and Publications Branch.

Many photographs used in the book were obtained through the cooperation of various Bureau of Reclamation offices and assembled for selection by R. S. Dinsmore, Civil Engineering Technician, Hydraulic Structures Branch under the guidance of D. L. Winsett.

Illustrations were prepared in the Drafting Branch, Division of Engineering Support by L. L. McGhghy and W. D. Anderson under the guidance of W. W. Groom and direction of B. F. Wilson.

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Food and fiber, essential to the well-being of mankind begins with the smallest viable seed, which when its fruit is harvested may provide substance to placate the hunger of man.

To believe that even the smallest seed will grow
is
To believe in the force of will.

To transform the desert into a living oasis is
To transform despair into hope,

That all mankind may be enriched
And share in the power of Charity.

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