United States Department of the Interior, Bureau of Reclamation

IRRIGATION OPERATION AND MAINTENANCE

BULLETIN NO. 66

October, November, December 1968

In This Issue:

The Irrigation Operation and Maintenance bulletin is published quarterly, for the benefit of irrigation project people. Its principal purpose is to serve as a medium of exchanging operation and maintenance information. It is hoped that the reports herein concerning labor-saving devices and less costly equipment and procedures, developed by resourceful project people, will result in improved efficiency and reduced costs of the systems for those operators adapting these ideas to their needs.

To assure proper recognition of those individuals whose suggestions are published in the bulletins, the suggestion number as well as the person's name is given. All Bureau offices are reminded to notify their Suggestions Award Committee when a suggestion is adopted.

* * * * *

Division of Irrigation Operations
Office of Chief Engineer
Denver, Colorado 80225

COVER PHOTOGRAPH:
Composite picture showing various activities in the performance of day-to-day duties for good maintenance on irrigation projects.
Photo PX-D-62122.

IRRIGATION OPERATION AND MAINTENANCE
BULLETIN NO. 66

October, November, December 1968

INTRODUCTION

Four basic objectives are realized by good maintenance, as pointed out starting on page 1. The importance of good maintenance were included in remarks made by Mr. Hollis Sanford, at the first water users conference held in Region 2, at Sacramento, California, prior to his retirement from the Bureau in March 1968, as Chief, Division of Irrigation Operations, Office of Chief Engineer, Denver, Colorado.

A suggestion on page 6, for a fiberglas gate opening indicator, points out the advantages of fiberglas over metal when used for this purpose.

Several individual articles on safety can be found in this issue: One on page 7 lists the most recent issues of the National Safety Council data sheets. The article on page 9 describes an accident resulting from flying steel fragments and suggests means of prevention, and the article on page 16 is entitled "What You Should Know About Studded Tires." Some seat belt facts are given on page 19, and how to help someone in case of a heart attack is discussed on page 24.

Located on page 8 is a suggestion submitted by two enterprising employees of the Cabrillo and Channel Islands National Monument for an inexpensive mooring buoy.

Starting on page 10, is an article entitled "Painting to Beat the Heat." The article discusses what can be done with paint when heating of machinery occurs, and the cooling effect various paints have for changing the movement of heat to or from machinery.

Two separate suggestions submitted by Bureau personnel can be found on pages 14 and 15. The first one recommends hour meters be put on all sump pumps to determine the amount of leakage at a dam, and the second idea is for an improved method of anchoring toe rock for rock riprap.

The summary on page 20 of a report entitled "Buried Asphalt Membrane Canal Lining," presents the Bureau's findings and use of buried hot-applied asphaltic membrane lining for control of water seepage from canals and shallow reservoirs, and briefly describes the construction methods.

Beginning on page 22 is a simple solution for reducing fluctuations of automatic overflow siphons. The suggested device, now in use, is both inexpensive and very easy to install.

This issue of the Bulletin contains two suggestions from GRIST, a publication of the National Conference on State Parks, that could be useful to irrigation project operation and maintenance personnel. One concerns an attachment to a forklift as shown on page 25, and, on page 26, is a heavy duty tow bar and fair lead to be fastened on the stern of a boat.

IMPORTANCE OF GOOD MAINTENANCE
by Hollis Sanford1/

We in Denver have been reviewing the reports on your programs with interest and satisfaction because we find that the quality of maintenance of irrigation works in this area is unexcelled by that of any other irrigated area in the West. You can be justly proud because this means without doubt that it is unexcelled by any other area in the world. Eric Hoffer, the shirt-sleeved philosopher from the San Francisco waterfront, made this statement, "If the President had picked me to predict which country (in post-war Europe) would recover first, I would say 'Bring me the records of maintenance. The nation with the best maintenance will recover first. Maintenance is something very, very specially Western. If I were to go into a warehouse let's say, and see that the broom has a special nail, I would say 'This is the nail of immortality.' "

Not long ago, a group of irrigation managers in the Northwest attempted to define the phrase "good maintenance." They concluded that good maintenance achieves the following major objectives:

1. Timely and Reliable Service to all Water Users

   In discussing this point, they emphasized the importance of uniform service. One of them pointed out that every mile of lateral or pipeline, every structure, and every pumping plant is an additional hazard to the man at the end of the lateral. The aim of a good manager, they concluded, is to reduce these hazards and to assure that last man timely and reliable service.

2. Low Operation and Maintenance Costs on a Long-range Basis

   The group recognized that this is a broad objective and they broadened it even more by adding the phrase "on a long-range basis." In doing so they were saying that the deferment of needed maintenance usually increases the cost. Next year the work will probably cost more and, in the meantime, the threat of unreliable service has increased. There seems to be no basis for assuming that farmers will be more prosperous sometime in the future. Consequently, it was agreed that there is no justification for deferring needed maintenance.

1/Report from the First Regional Water Users Conference 1968, Region 2, Bureau of Reclamation, by Mr. Hollis Sanford (retired). Formerly Chief, Division of Irrigation Operations, Office of Chief Engineer, Denver, Colorado.

3. Safe Conditions for the Workers on the System and the Public

   All agreed that this is an important objective and that if it is not pursued aggressively it can result in increased costs and unsatisfactory service. A good safety program pays.

4. A Sense of Pride

   Initially this "pride factor" was not included in the definition, but as the discussions progressed, there was a growing feeling that it is a most important objective. Every individual in an organization must have pride in his work if he is to contribute to the primary objectives of adequate and efficient service to the water users. The group of managers concluded that pride is reflected in the neat, orderly, well-managed appearance of everything in the district program including the office, the equipment, and the distribution system itself. They felt that an irrigation district has a service to perform that is perhaps more important to the welfare of the community than any other service function. They felt that O&M without pride is like a mother without love for her children.

You have a right to be proud. The cost of labor, equipment and supplies has been going up every year. In fact, in the past 17 years the price paid for labor, equipment, and supplies has more than doubled. In the same period, your O&M charges to the water users have gone up only half that amount. This means that you have utilized your labor, your equipment, and your supplies more efficiently each year. Despite this good showing, irrigation operation and maintenance costs have increased an average of 3 percent each year for the past 17 years. We can assume that the labor, equipment, and supply costs will continue to increase at the rate of about 6 percent a year. The challenge you face is to keep the actual O&M cost to the farmer from increasing faster than 2 or 3 percent a year.

Recently an irrigation district in another region reported that it faced serious problems. In the past 17 years its wages had increased 37 percent. Apparently they were not aware that wages in general have increased much more than 37 percent in 17 years. They have been operating in the red for a number of years and have used up $100,000 they once had in reserve. They are now faced with a major increase in annual O&M charges and borrowing money to make major system improvements to reduce their O&M burdens. The reluctance on the part of the manager and the board of this district to raise charges in the past is understandable. We all appreciate the seriousness of the cost-price squeeze that farmers face today, but management does not make the farmers' circumstances any rosier by curtailing O&M or failing to raise charges when the cost of service actually goes up. A typical farm in the Central Valley Project in California has an overall annual operating cost of about $300 an acre. The district O&M costs for this typical farm

could be about $6 an acre or 2 percent of the total farm operating cost. When management defers an increase in O&M costs or defers necessary maintenance to avoid increasing the farm costs a fraction of a percent, they are doing a disservice to the farmer because eventually these costs must be paid and sometimes at a higher rate and at an even more unfavorable time.

Let us go back and discuss the things management can do to keep these ever-increasing costs as low as possible. You will, of course, keep in touch with industry and be alert to the possibilities of more efficient equipment, chemicals, and other materials. You will find, however, that almost two-thirds of your costs are in labor. In labor you will find the big possibilities for savings. Savings in labor must come from increased efficiency which reduces the number of personnel.

In the discussions I mentioned earlier the group of managers concluded that the "pride factor" is the most important element in labor management. They mentioned the following four specific phases of project management that have an important bearing on pride: appearance, the assignment of responsibilities, long-range programing and training. Much of the discussion revolved around appearance. They felt that the headquarters should be neat, clean, and efficient looking and so should the employees in the office. They felt that the appearance of headquarters reflects the efficiency of the district program in every phase. An efficient looking headquarters can be pointed to with pride by both the employees and the community itself. They felt that the equipment used by the district should be painted in a uniform color scheme and kept clean. The employees should be well equipped with safety devices such as hardhats, safety shoes, first aid kits, and fire extinguishers. There was a strong feeling that the attitude of the employees will be improved by these actions on the part of management showing pride and attention to details.

Major importance was attached to the assignment of specific responsibilities to each employee. Each ditchrider should be made responsible for all features on his beat that have not been specifically assigned to other maintenance employees. They should also be made responsible for the appearance and condition of the equipment and supplies they use. It was the consensus of the group that maintenance records should be kept for all important structures and features in the system. These records should be kept by the employee who has been assigned responsibility for that structure or feature. For example, a steel pipeline that is protected on the inside by coal-tar enamel should be examined periodically. The date of each examination, the name of the examiner, and a few terse comments should be kept on a card file in the office. Such a record would be used not only as a reminder of when such examinations are due but would also be useful whenever there is a change in employees or responsibility assignments. A more complete card system of maintenance records should be kept for such features as pumping plants. Irrigation Operation and Maintenance Bulletin No. 60 presents

a complete system for keeping such maintenance records. Similar but less detailed records should be kept for closed drains, siphons, large gates, control works, major buildings, and other important structures. These responsibility assignments should be periodically checked by management. Employees' suggestions for improvements should be solicited, carefully evaluated, and promptly adopted where practicable to do so. Good work should be commended, and need for improvements should be noted. In fact, it was the conclusion of this discussion group that every irrigation district should initiate some form of an incentive awards system in which efficiency and good appearance are both recognized.

In addition to the routine regular operation and maintenance program, the group concluded that the manager and the board should develop a long-range program for the accomplishment of major system improvements and replacements. Some of these will involve considerable capital expenditure and must be planned a number of years ahead. Some of them may reduce O&M costs significantly, and it is important that they be studied carefully to weigh the costs against the benefits. Such a program should be developed for at least 5 years in advance. It should be adjusted and refined as the time for the work draws near, and adequate financing should be arranged. The discussion group emphasized the importance of training. The process of learning is continuous, and it should start at the top. The directors on an irrigation district board should go to meetings like this. They should call on their state educational institutions for classes, lectures and bulletins through which both new and old directors can get a better understanding of the functions of a board and the way it should manage the business of the district. Similar training programs should be developed for the manager and his principal assistants, and they should be allowed to visit other irrigation districts to get new ideas and to discuss mutual problems with other managers. Some form of training should be available to all employees of the district. If this cannot be carried out through the help of an outside agency, there should be an in-house training program. The district's training program should have as its objectives, first, improved efficiency in the operation and maintenance program; and second, the development of employees who can fill higher level positions.

Attention to these four elements of management; namely appearance, assignment of responsibility, long-range programing, and training will all improve the "pride factor" in any district organization. In the discussions which were mentioned earlier, the group of managers generally agreed that while wages are an important element in developing good morale, they are by no means the only factor. They cited cases where their best employees were those who had been satisfied with gradual increases in a modest income. This satisfaction stems from a knowledge of the importance of their service to the community and from a strong feeling of loyalty and pride in the organization.

You managers of irrigation systems have been backward in telling the public and the water users in the district about the importance of your services. The functions you carry out are more important to the community than that of any other utility organization. You are more important than the power company. Your work is more important than the job done by the telephone company. The delivery of water to the farms is essential to the economy of that community and to the nation as a whole. Many of the directors on irrigation district boards and managers have performed services requiring many hours of personal time. Your employees have made similar sacrifices and have performed services beyond the call of duty. Such dedicated employees should be rewarded and the community should be informed of their loyalty. For example, in its advertisements the telephone company talks about the lineman working in a blizzard or the pretty operator with her feet in the floodwater. Similar efforts are made by the electrical utility companies to impress the public with the importance of their service by recognizing the individual effort of their field employees. An irrigation district has a better story to tell than any of these service organizations. It should be told to the public on every opportunity. It should be told to the water users themselves. It will help to develop a sense of pride, and it will help to make the community appreciate the organization that performs this essential community service.

* * * * *

HIGHLY SENSITIVE TESTING DEVICE

An elephant's foot may be mighty sensitive, but not as sensitive as a 10,000-pound research tool designed and built by the Bureau of Reclamation's Engineering and Research Center at Denver, Colorado.

This ponderous unit will enable engineers to detect movements as slight as one ten-thousandth of an inch deep inside a rock wall when pressure is applied.

The new device is a radial jacking test unit which may be employed at the sites of proposed dams to determine if the surrounding rock structure can support the extreme pressure generated by the dam and the water it impounds.

Department of the Interior
News Release, dated February 23, 1967

* * * * *

FIBERGLAS GATE OPENING INDICATOR
(Suggestion R7-68S-40)

A very successful gate opening indicator for a radial gate on a water control structure was suggested by Mr. Edward Hlavinka, of the Kansas River Projects Office, McCook, Nebraska. This most economical and long lasting indicator is made from white fiberglas, 1/16 inch thick and 3 inches wide. A standard staff gage is seldom suitably graduated for use as an indicator on a radial gate, and custom gages are costly and are not readily obtainable to fit gates of different size and radius. Therefore, they must be fabricated by project personnel.

Metal indicators were first used and they lasted only three years. Experiments then with plexiglass indicated that this material would not be usable where direct sunlight is a factor, because of its expansion and contraction. Accordingly, fiberglas was tested. The fiberglas indicator shown in the photo below has been in use for three seasons and is still in good condition.

P60-D-62112

The fiberglas is inexpensive when purchased in sheets and can be cut in 3 inch strips with a regular bench saw. It is then sanded on one side to roughen it so the paint will adhere to its surface. After the computed radial gate scale in feet and tenths of feet are drawn on the sanded side, the numbers and marks are painted on with a black epoxy paint. This is a special paint for fiberglas. Then the indicator is fastened to the support frame on top of the gate and to the face of the gate with 3/16-inch stainless steel or brass bolts.

Where the bottom portion of the gate opening indicator is submersed in water, the fiberglas will not rust or corrode. Crustations that form on the portion of the indicator that is submerged in water can easily be cleaned off at the end of each season.

There are several gate opening indicators of this design in use on the Kansas River Project. The deterioration of the metal gages has been a problem throughout the years. Fiberglas staffs are being installed as replacements for the metal staffs as needed.

The initial cost of a gate opening indicator staff is very nearly the same for light weight flexible metal or fiberglas. Cost of replacement per staff gage installed on a gate including re-zeroing of gage is $28.00 for metal and $25.00 for fiberglas, including material and labor. The saving of the fiberglas over a metal staff is mainly through the elimination of frequent replacement by the longer life of the fiberglas.

* * * * *

NATIONAL SAFETY COUNCIL DATA SHEETS

The National Safety Council has recently published new or revised technical data sheets on the subjects listed below. Copies of these data sheets (by the numbers shown in parentheses) may be obtained from the National Safety Council, 425 No. Michigan Avenue, Chicago, Illinois 60611.

Hydrogen Sulfide (284 Revised)

Gear-Hobbing Machines (362 Revised)

Metal-Working Milling Machines (364 Revised)

Chlorates (371 Revised)

Air-Powered Hand Tools (392 Revised)

Off-the-Job Safety (601)

Inspection and Maintenance of Mechanical Power Presses (603)

Safety Nets for Construction Projects (608)

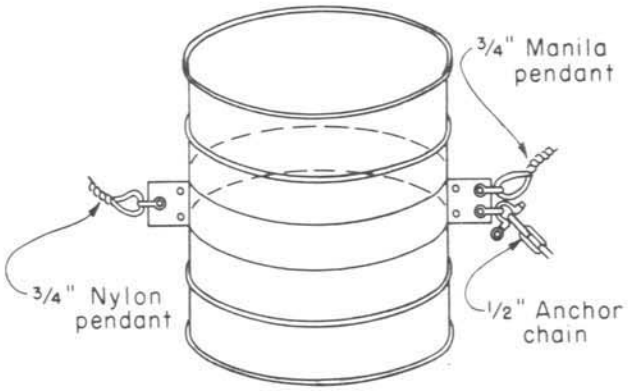
Cloth Shearing Machines (609)

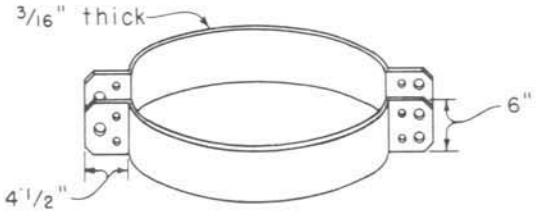
* * * * *

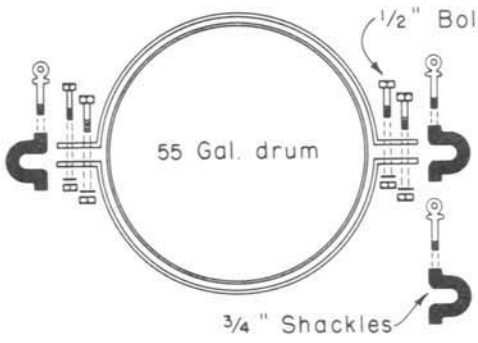
INEXPENSIVE MOORING BUOY

(Reprinted by permission of GRIST, May/June 1968 issue, a publication published by the National Conference on State Parks, Washington, D.C.)

Upon learning that a commercial buoy of sufficient size to which they could moor their patrol boat would cost more than $200.00, Chief Ranger Robert White and Park Ranger James Martin of Cabrillo & Channel Islands National Monuments searched for a less expensive solution. When they came up with it, the cost was just $16.00.







Bob and Jim designed a collar to fit around a 55 gallon drum as shown in the sketch at left and had it made and galvanized in a local welding shop. Made of 3/16" black iron, the collar is strong, light, and simple. It can be assembled by one man, and is easily transported in a small boat. The drum buoy can easily be changed if it becomes corroded or otherwise damaged. It is desirable to make the buoy unsinkable even if punctured, it can be filled with self-expanding polyurethane for about $25.00.

Note the two pendants leading from the collar. Since the patrol boat is moored in an exposed ocean cove, the security of a second, longer pendant, is felt to be well worth the small additional cost. In one instance the second pendant saved the boat when a stainless steel pendant parted.

For their 25 ft. launch, Jim and Bob use a 720 lb. railroad car wheel, 3/4" and 1/2" chain attached to the buoy, and 3/4" nylon pendants.

* * * * *

FLYING PARTICLES

Activity

Government mechanic and helper repairing track on crawler-type tractor.

Accident Situation and Occurrence

Two employees were replacing a track on a crawler-type tractor. In the process of replacing the master track pin, a piece of flying steel became lodged in the mechanic's left leg below the knee. The injury resulted in 4 days' lost time.

Cause Determination and Prevention

The mechanic was driving the pin in place with a 12-pound hard steel hammer. This accident possibly could have been avoided by proper planning that included:

1. Cleaning the pin and track links with emory cloth.

2. Providing means by which the links could be expanded by heat.

3. Using a softer hammer to drift the pin. In addition to heating the links with a torch, most mechanics cool the pin with dry ice, or other means, allowing it to shrink and move freely through the enlarged links.

Reclamation Safety News - 1967

* * * * *

NEW LABORATORY RESEARCH AIDS DRAINAGE STUDIES

Hydraulic research engineers of the Bureau of Reclamation's Engineering and Research Center at Denver, Colorado, have constructed a 60-foot-long tilting flume in their laboratory to study drainage from sloping irrigated land. They are using the flume to determine the most effective and economical spacing for installing agricultural drains on a variety of slopes--a major consideration in the development of irrigated agriculture. The flume is filled with fine sand and has a recharge system. The recharge system sprinkles water on the sand surface and simulates the application of irrigation water applied to the land.

* * * * *