OPERATION AND MAINTENANCE
EQUIPMENT AND PROCEDURES
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INTRODUCTION

This bulletin, published quarterly, is circulated for the benefit of irrigation project operation and maintenance people. Its principal purpose is to serve as a medium of exchanging operation and maintenance information. Reference to a trade name does not constitute the endorsement of a particular product, and omission of any commercially available item does not imply discrimination against any manufacturer. It is hoped that the labor-saving devices or less costly equipment developed by the resourceful water users will be a step toward commercial development of equipment for use on irrigation projects in continued effort to reduce costs and increase operating efficiency.

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Division of Irrigation Operations
Commissioner's Office
Denver, Colorado.
NO MORE PLUGGED CONTROL PIPING

In the photograph below, Arthur C. Birdzell of the Tracy Operations Field Branch, Central Valley Project, California, is receiving an award for the development of the device he is pointing to for preventing the plugging of gages and mercoid control piping by silt.

The device consists of a diaphragm box to which is attached a "mud-leg." The diaphragm box keeps the silt out of the gage piping and still insures the proper pressure on the top gages and mercoid switches. The "mud-leg" (pipe attached to the diaphragm) is added to facilitate removal of silt trapped by the diaphragm and permits draining of the piezometer piping.

Construction:

The arrangement of the piezometer piping is shown on the schematic diagram on the following page. Tubing above the diaphragm box is filled with any suitable liquid to transmit the pressure to the gages. The water in the piezometers can not pass the diaphragm, hence cannot enter the gage piping and cause a stoppage.

The inexpensive equipment and material required can be installed on any similar controls. For further details on the construction of the device and to obtain information concerning the diaphragm box, write the Regional Director, U. S. Bureau of Reclamation, Sacramento, California.

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DIAPHRAGM BOX AND MUD LEG
MOSS RAKE

The removal of moss from the trashracks of the Klamath Falls Pumping Plants on the Klamath Project, Oregon, is quite a task, as it is on most projects where the moss problems are severe. Project Employee Kuno E. Schuetz devised the rake shown in the photograph below to simplify the task. In the photograph Mr. Schuetz is holding one of the tines of the new rake in his right hand and the old type rake used in the operation in his left hand.

Construction:

As shown in the drawing below, the new rake has tines spaced to match the spacing of the grate bars of the trashrack. The tines of the rake have been designed of such length to avoid their "hanging-up" on the cross members of the grates. The tines made of saw steel are durable and can be easily removed and replaced if they become broken and bent.
NOVEL PAINT RIG

Stewart Mountain Dam, 41 miles northeast of Phoenix, Arizona, on the Salt River, was constructed by the Salt River Valley Water Users Association in 1930, with some supplemental work performed by the Bureau of Reclamation in 1936-39. The dam is one of seven storage reservoirs on the Salt River Project which has been operated by the Salt River Valley Water Users Association since 1917. Periodically the Association repaints the downstream face of the dam, which impounds 69,765 acre feet of water in Saguaro Lake, to reflect heat and diminish temperatures within the mass of the variable radius concrete arch structure and gravity abutments.

Last painted in 1949, the downstream face was again painted during the summer of 1956. To reduce hazards and to increase the efficiency of the painting operation, the united efforts of the Project Civil Engineering, Construction and Maintenance Departments and the painters were combined in development of the scaffolding shown below.

The painting rig was designed by Clarence Whalin, Supervisor of Civil Engineering and assembled by Al Martin of Construction and Maintenance and his crew. The repainting job was accomplished in approximately
three weeks. The deck portion of the assembled rig at the top of the photograph on the preceding page was provided with castors so that it could be moved manually across the top of the dam. Made with a framework of steel and decking and other accoutrements of wood, the upper deck is 14 feet long and 10 feet wide and provides means of access to the movable scaffolding over the 15-foot overhanging roadway and parapet at the top of the dam.

The movable scaffold, as shown above, has an aluminum base 14 feet long and 3 feet wide. It is raised and lowered by cables and one three-quarter horsepower motor at each end of the scaffolding. Two painters were employed on the platform at a time and were able to maneuver the scaffold as necessary.

As a matter of interest, approximately 550 gallons of vinyl paint was used to cover the face of the dam. Prior to applying the paint, the workers washed the face of the dam with jets of air and water at a pressure of 90-pounds per square inch. The paint was applied pneumatically moving from top to bottom in 14-foot wide panels. The pressure on the paint spraying equipment was maintained at a pressure of 40 pounds per square inch at the top of the dam and gradually reduced to 20 pounds per square
inch near the base of the dam. For further information concerning the
design, construction and use of the rig, which could be adapted to other
similar maintenance work, write the Salt River Power District, P.O.
Box 1980, Phoenix, Arizona.

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HAND SPRAY SHIELD

The lightweight shield for use on a hand-boom when spraying
various weed control materials, shown in the photograph and sketch below,
was fabricated by Tom Hines, Tracy, California, for use on the Contra
Costa Canal, Central Valley Project.

The shield reduces the drift of weed control materials by excluding
the wind from part of the spray fan. It is particularly adapted for use in
spraying weed oils under over-hanging branches of shrubs and trees. The
shield effectively prevents the branches from being sprayed by the
drifting weed control material.

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TRANSMISSION JACK

Gordon Sewell and Roy Garner, of the Central Valley Project, Lindsay, California, built the movable platform on caster wheels shown below, which in combination with a regular 3-ton floor jack, made it into a transmission jack. After Roy lost six weeks work from an injury using a regular floor jack as a transmission jack, which they didn't have, he and Gordon Sewell put their heads together and developed the converted jack which will move forwards, backwards, sideways or at any angle and handle all types of car and truck transmissions.

For further details on the jack, contact the Regional Director, Bureau of Reclamation, Sacramento, California.

* * * * *

KILLING CRAYFISH IN LATERALS

Some of our projects, troubled with crayfish digging holes in the canal and lateral banks, follow the practice of killing the crayfish with aromatic solvents, normally used in the control of water weeds. The amount of water flowing in the canal or lateral is reduced to the point at which it barely covers the bottom. The aromatic solvent is then added. A concentration of solvent about equal to that ordinarily used in treating water weeds should accomplish the job.

The best time for treatment of crayfish seems to be the summer months, rather than in the fall, as the crayfish seem to burrow into the canal bottom as the weather and water cools. Consequently, late in the season, the crayfish are out of reach of the solvent.

* * * * *
PORTABLE PLATFORM

Designed in Region 5 of the Bureau of Reclamation for the particular job of servicing penstock valves the portable platform shown in the photographs on this page and in the drawing on the following page may be used to advantage in other similar locations. It is safe and substantial.

Hung between the two penstocks, as shown in the upper photograph, the portable platform provides easy access for the mechanic in repairing or operating a bypass valve.

In the middle photograph, the right end of the portable platform is shown hung on the penstock expansion joint.

A closer view of the right end of the platform and details of the hanger are shown in the lower photograph. Note that the middle bar in the triangular shaped hanger has two fingers that fit over the right ring of the expansion joint to prevent the platform from swaying.

Construction:

Details of the platform and hangers are given in the drawing on the next page. The platform is of timber construction, 16 inches wide and 7' 4" in length.

1. View of portable platform hung between No. 1 and No. 2 penstocks. Mechanic is in position to operate the bypass valve.

2. View of the right end of portable platform hung on No. 1 penstock expansion joint. View shows relation of man, platform and penstock.

3. A close-up view of the right end of the portable platform. Note the middle bar in the triangle has two fingers that fit over the right ring of the expansion joint to prevent the platform from swaying.

* * * * *
AQUATIC WEED CONTROL

In the January 1957 meeting of the Four States Irrigation Council, composed of irrigationists in the States of Nebraska, Kansas, Colorado, and Wyoming, Robert B. Balcom, Weed Control Specialist of the Bureau of Reclamation, reported upon aquatic weed control studies that have been and are being made under the joint efforts of the Department of Agriculture's Research Service and the Bureau of Reclamation. So that you may be informed of the progress made, parts of Mr. Balcom's report are being presented.

"Operators of irrigation projects know the necessity for controlling waterweeds in irrigation systems, and many methods of control have been devised. Some have grown out of sheer necessity to do something to get the water through to the water-users. Many of these, of course, are only temporary means and have to be repeated several times a year.

"Before chemicals began to play an important part in controlling weeds it was natural to look to mechanical methods for solving this problem. Dragging heavy chains, discing the bottom and sides, and as a last resort, draglines have been, and often are still, used to clear the channels. No doubt you are all familiar with these methods.

"A few years ago the Bureau of Reclamation recognized the need for more effective and economical means of controlling weeds, including waterweeds, and study of the problem was initiated. Also a cooperative plan of research was formulated with the Department of Agriculture which has aided in the development of more effective means of controlling waterweeds. These investigations included the use of chemicals.

"One of the earliest and still used methods for controlling algae, a low form of plant which propagates from spores, is the use of copper sulphate. This is usually applied by hanging in the canal, sacks filled with crystals of this chemical, sometimes called blue vitriol. The dosage depends on the quality and temperature of the water and the kinds of algae present but usually 0.5 to 1.0 ppm is used in still water and 10 to 12 ppm is applied for 30 minutes in canals.

"More recently other chemicals such as the rosin amines have been used with good success on certain species of algae.

"The first chemical formulation found to be effective on higher type submersed waterweeds, like the pondweed, was a chlorinated hydrocarbon manufactured and sold by an eastern firm. This was considered to be too expensive for the larger scale treatments. A Department of Agriculture plant physiologist and Bureau of Reclamation chemists working together here in the Denver laboratory discovered the effectiveness of the material now most widely used for controlling submersed waterweeds. This is known as aromatic solvent and from a very small beginning its use, in the 17 states where Federal reclamation projects are located, increased to over 300,000 gallons in 1956. It is estimated that 365,000 gallons will be used in 1957 and by 1960 over 460,000 gallons of aromatic solvents will be used."
"The material is applied under the water through nozzles at a rate, depending on conditions, from 5 to 10 gallons per cubic foot per second of water flow. More detailed information on this is found in USDA Circular No. 971, entitled 'The Use of Aromatic Solvents for Control of Submersed Aquatic Weeds in Irrigation Channels.'"

"For many years the cattail problem was one of the most difficult to solve, but thanks to the new herbicide 2,4-D and the persistence of Mr. F. L. Timmons of the Agricultural Research Service a method was developed which has proved quite effective. Each acre of plants is sprayed with a solution prepared by mixing 4 to 6 pounds of 2,4-D as a low volatile ester with 200 gallons of water and 10 gallons of diesel oil plus 1 quart of emulsifier. The first application is made in the spring when the cattail heads are just starting to form. The regrowth should be sprayed again just before frost. One or two spot treatments may have to be made the following year to clean up the infestation. Every precaution should be taken to prevent the spray drifting to sensitive crops.

"Tests underway to determine the effects of some of the newer herbicides on cattails look promising and as time and funds permit other formulations will be tested and additional, much needed, research work will be initiated.

"A herbicide known as Dalapon appears to be as effective as 2,4-D when used at the rate of 15 to 20 pounds per acre in 100 to 200 gallons of water containing 5 gallons of diesel oil and 1 pint of emulsifier.

"Amino triazole at 8 to 10 pounds per acre of cattail plants in 100 to 200 gallons of water and 5 gallons of diesel oil is almost as effective.

"Both of these herbicides are considerably more expensive than 2,4-D but may be useful on canals near crops sensitive to 2,4-D, especially cotton, grapes, and tomatoes. Also beans and sugar beets are more sensitive than some other crops.

"The amount of research for the control of land weeds and the number of workers in this field have increased many fold in the past few years. The combined efforts of Federal Agencies, State Colleges, and commercial firms have resulted in excellent progress toward solving land weed problems. It is only natural that these problems have received more attention because they are common to every state and locality.

"Less attention has been given to waterweed problems because they are limited to specific locations or areas. However, we have some encouraging news to report in this regard. The cooperative research program which was discontinued for a while due to lack of funds has been renewed recently between the Agricultural Research Service of the Department of Agriculture and the Bureau of Reclamation. The new accelerated program promises to result in the development of more effective and economical methods of aquatic weed control. The research team consists of two Department of Agriculture Plant Physiologists and two Bureau of Reclamation Chemists."
"In addition to the laboratory work here in Denver the Agricultural Research Service has four field stations which do some field testing in aquatic weed control. The Agricultural Research Service is adding five new research specialists on aquatic weed control at field stations. Of these, two will be working on irrigation weed problems.

"Since less work has been done on developing better waterweed control methods and, therefore, there is less to report to you in this regard, we thought you would be interested in this brief resume of the problems involved and the research which has been conducted. Real progress in solving a problem is made only when the people like yourselves, who are vitally interested and affected by that problem, realize its full magnitude and the need for further study and research.

"Organizations like yours can do much toward a more complete mastery of the waterweed problem by your understanding of its importance, your backing of the research program, your encouragement of the research workers and through advising the Denver office on the problems which still need to be solved."

* * * * *

DITCHER HITCH

The Roza Division of the Yakima Project has developed the wire rope hitch shown in the photograph below. The hitch was developed to prevent the front wheels of the ditcher from flipping up on end when the going gets rough.

The Briscoe ditcher is pulled with a tractor on each bank. One of the hooks shown in the foreground is attached to each tractor. The rope from each hook passes through guides on the fore axle and is fastened to the front end of the plow. In addition to controlling the position of the front wheels, the hitch takes the pull strain off the machineframe and applies it directly to the plow.

* * * * *
GATE HOIST WIRE ROPE PERFORMANCE

Recently the Bureau of Reclamation made a study of the performance of various types of wire rope used on gate hoists in an effort to determine the types giving best service under different conditions. From data supplied and comments received the matter of serviceability of wire rope is a very real problem on most operating projects. Frequent inspection of the cable by dam tenders, ditchriders, or other operating officials should be emphasized.

A study of the information provided leads to the conclusion that with the vastly differing conditions of exposure to which gate hoist ropes are subjected, the exposure conditions should be considered carefully when we choose wire rope to serve in a specific location. On some projects where the water is not corrosive, plain steel ropes have given very good service, although most agree that the service life is improved if protective coatings are maintained on the ropes. In certain areas, also, galvanized wire ropes are favored and have given up to 28 years of service on the Yakima Project, Washington, and 26 years of service on the Sun River Project, Montana, with the rope still in good condition. The water on these projects is not corrosive.

In other places where the water is corrosive, stainless steel seems to be the only satisfactory type of rope to use. The information provided shows that under severe conditions the additional cost of the stainless steel rope is fully justified. The Imperial Irrigation District in California, served by the All-American Canal with water from the Colorado River, reports that stainless steel ropes show no signs of deterioration after 10 years. The Gila Project, which also receives its water supply from the Colorado River, reports that some of the plain steel ropes originally installed on the project did not last six months. Of the several projects reporting use of stainless steel ropes, only one stated that trouble had been experienced due to galling or seizing of the wires making up the rope.

By way of preventing corrosion of ropes by the water, some projects as shown on the cover of this issue of the Bulletin use link chains or suspender rods for the submerged portions of the hoist lines. The chains or rods are connected to the ropes above the water's surface.

A majority of the projects reported that some type of protective coating was used to retard corrosion of wire ropes, and that the use of these coatings is worthwhile, although opinion in this regard was not unanimous. Two projects made favorable mention of plastic coated ropes which have recently become available. Only the submerged portion of the rope was coated and, since the coating is relatively soft, it would probably be damaged if it was wound up on the average hoist drum. The protective coatings used are: NO-OX-ID, CA-50, Texaco Crater LePro, Tnemec and Ensign 383 compounds, water pump grease and coal tar and red lead paints. Cleaning of the rope and soaking it in diesel oil was also recommended by one project.
Most of the operating projects agreed in comparing flexible versus stiff rope that the stiffer rope last longer. The opinions in this regard were not unanimous, however, and some qualifications should be stated. Where corrosion is the principal factor limiting the life of a rope, the stiff rope (6x19) with larger individual wires, will loose metal through corrosion at a slower rate than the more flexible (6x37) ropes. However, where corrosion is not the predominant factor and the rope will be subject to frequent bending and flexing, the 6x37 rope may give better results. The size of the rope compared to the drum and sheave sizes should also be considered along with the corrosion condition and frequency of operations when choosing between the stiffer (6x19) and more flexible (6x37) ropes.

While the information obtained did not indicate that there is one outstanding kind of rope that should be used under all conditions, it does show that there are varying degrees of exposure to be considered in selecting the type of rope to be used. Under non-corrosive water, it would be hard to economically justify the use of stainless steel rope; while in strongly corrosive water, stainless steel is the most economical. The widespread use of galvanized ropes, and their successful performance under the right conditions was quite interesting to note.

For information purposes, an abstract of questionnaires received from the projects in the 17 Western States is given in the tables on the following pages, as a guide to wire rope users. Also a study on the Central Valley Project, California, of various types of ropes and rope protective materials is appended to the abstract.

One project reported an experience in socketting ropes with lead instead of zinc, which is the preferred material. It was reported that the lead set up a galvanic action which caused rapid deterioration of the rope since the lead was less active chemically than the steel. With the zinc, this action is reversed and the steel is protected. There have been reports of several instances of ropes failing or pulling from their sockets when lead was used for socketing. This electrolytic action was called to the attention of readers in a recent issue of the Bulletin, but it cannot be emphasized too strongly, therefore, that only clean zinc should be used for this purpose and the various steps in the socketting process should be carried out in accordance with the instructions given in any reliable wire rope handbook. These handbooks can be obtained from any of the leading wire rope manufacturers. In addition to instructions for proper socketing, the handbooks contain a great deal of information of value to individuals working with wire rope. One such suggestion from one manufacturer concerns the best method of storing wire rope outdoors. It is reprinted here for your information.

In Wire Rope Talks, Robert M Killian, Chief Engineer of Leschen Wire Rope Division, H. K. Porter Company, Inc., presents practical hints on the use and care of wire rope. In discussing the subject of storing wire rope outdoors, it is pointed out that when equipment is to be left outdoors in an unused condition, especially during the winter months, the wire rope being unused should be carefully protected. Several months of inclement weather can corrode wire rope so badly that it suffers a very large reduction

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in breaking strength, and thus is of little use when it is put back into service again. Rust also tends to bind the wires together so they are not free to move back and forth and adjust themselves to operation around sheaves under a load.

Wire rope that has been removed from service and is to be stored for future use should first be cleaned thoroughly by means of a wire brush, compressed air, or superheated steam. It should then be well lubricated, first with a penetrating lubricant that will coat all the wires of all the strands, internally as well as externally, and then with an external protector that seals in the other lubricant and repels the penetration of moisture and fumes. The rope should then be wound on a reel and not coiled loosely on the floor or on the ground.

If the rope to be stored is new and on its original shipping reel it is a good idea to cover the outer layer of rope on the reel with heavy protective lubricant. A generous application will tend to protect the entire length.

Following this treatment it is advisable to cover the rope on the reel with waterproof or tar paper, sealed at the flange with protective lubricant. If a number of reels are to be stored at one concentrated spot it is an excellent idea to cover the entire group with a tarpaulin.

The storage area selected should be as clean and dry and as well protected from the weather as possible. It should be free from acid fumes and other corrosive agents because such fumes can cause embrittlement of the surface of the wires. Reels should not rest directly on the ground; they should be placed on wood or metal supports.

When the wire rope is put back into service any excess lubricant can be wiped off with some waste as the equipment is run very slowly. It is much better to wipe the rope than to clean it with a solvent, because the solvent would have a tendency to work into the rope and leach out the internal lubrication. It is true that the lubricant will pick up some dirt, but this will cause far less damage than would the solvent.

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<td>Douglas Dam</td>
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<td>None</td>
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<td>None</td>
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</tr>
<tr>
<td>American River</td>
<td>15</td>
<td>6x19</td>
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<tr>
<td>El Cajon Dam</td>
<td>75</td>
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<td>None</td>
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<tr>
<td>Dora</td>
<td>75</td>
<td>6x19</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>None</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>
| Dobbs Project | 67 | 6x19 | None | None | None | None | No | No | None | No | None | None | No | Most of the rubber coated types built on this project have been replaced with 6x19 wire rope with the cables fastened into the sockets with lead. These two metals set up a galvanic action that weakens the wire rope of the 1977 cables with stainless steel 19 wire rope and are not used. The cable ends with zinc which reverses the galvanic action and prolongs the life of the cable. All of the steel cables that have been replaced in this manner are still in use. Some of the 1967 galvanized steel has been installed in the Velton-Nemaha Division of the Osa Project did last 6 months.
<table>
<thead>
<tr>
<th>Project</th>
<th>No. of</th>
<th>Kind of rope</th>
<th>End of rope</th>
<th>Water which have been used</th>
<th>Water</th>
<th>Kind that</th>
<th>Such rope</th>
<th>In your project or other kind</th>
<th>Protective</th>
<th>Life increased</th>
<th>Fishtail</th>
<th>Tied with or without</th>
<th>Service</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-American</td>
<td>35</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
<tr>
<td>Coconella</td>
<td>5</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
<tr>
<td>District</td>
<td>6</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
<tr>
<td>Salt River</td>
<td>5</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
<tr>
<td>L. C. Austin</td>
<td>3</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
<tr>
<td>L. C. Austin</td>
<td>3</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
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<tr>
<td>Fort Sumner</td>
<td>2</td>
<td>Round</td>
<td>Steel</td>
<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
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<td>Round</td>
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<td>Stainless</td>
<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
<tr>
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<td>60</td>
<td>Round</td>
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<td>Yes</td>
<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
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<td>Round</td>
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<td>Stainless</td>
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<td>Pool steel</td>
<td>6 years</td>
<td>Used in use</td>
<td>Protective</td>
<td>Life increased</td>
<td>Fishtail</td>
<td>Gained on</td>
<td>Service</td>
<td>Stainless steel rope used</td>
</tr>
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<td>Location</td>
<td>Type</td>
<td>Results</td>
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<td>Description</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missouri River</td>
<td>On Steel</td>
<td>N/A</td>
<td>3 1/4 ft. diam.</td>
<td>These chains have been placed on the lower end of the hoist lines to keep the ropes out of the water but the chains scrape the point off of the gate faces. Early in 1953 an experimental installation was made of stainless-steel rope furnished by Pacific Wire Rope Company. After 3 years of service it still looks just as new. However, the stainless chain is not used on the ropes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dayton Project</td>
<td>Single</td>
<td>N/A</td>
<td>5 1/2 ft. diam.</td>
<td>Further tests at this location show why stainless-steel chain has been in service only 5 years and to date we have had very little experience with wire rope. Corrosion.</td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
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</table>

**Summarized**

- **Chain Usage**: Chain usage has been limited due to the high cost of maintenance.
- **Steel Chain**: Steel chains are recommended for use where frequent replacement is necessary.
- **Wire Rope**: Wire ropes are recommended for use where long life and minimal maintenance are desired.
- **Corrosion**: Corrosion is a significant issue with both chains and ropes, requiring regular maintenance and replacement.

**Recommends**

- For environments with minimal corrosive conditions, steel chains are recommended.
- For environments with high corrosive conditions, wire ropes are recommended.

**Notes**

- Regular inspections and maintenance are crucial for both chain and rope systems.
- Stainless-steel chains and ropes are ideal for environments with high corrosive conditions.
- Regular training and education for personnel handling these systems is recommended.
<table>
<thead>
<tr>
<th>Project</th>
<th>Make, Kind of wire, Kind of wire being used, Length, Corrosion, Wires, Protective coatings, Use, Water, Corrosion, Caused</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provo River</td>
<td>Galvanized 1/2&quot; x 25&quot; galvanized</td>
<td>Yes</td>
</tr>
<tr>
<td>Deep Creek Dam</td>
<td>Galvanized 1/2&quot; x 25&quot; galvanized</td>
<td>Yes</td>
</tr>
<tr>
<td>Moon Lake</td>
<td>Galvanized</td>
<td>None</td>
</tr>
<tr>
<td>Eden</td>
<td>Galvanized</td>
<td>None</td>
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<tr>
<td>Truckee Storage</td>
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</tr>
<tr>
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<td>Galvanized</td>
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<tr>
<td>Baa Hill</td>
<td>Galvanized</td>
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<td>Newton</td>
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<td>Byram</td>
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