WATER OPERATION AND MAINTENANCE

BULLETIN NO. 126

DECEMBER 1983

IN THIS ISSUE

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

The Water Operation and Maintenance Bulletin is published quarterly for the benefit of those operating water-supply systems. 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 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 persons name is given. All Bureau offices are reminded to notify their Suggestions Award Committee when a suggestion is adopted.

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Division of Water
and Land Technical Services
Engineering and Research Center
P O Box 25007
Denver CO 80225

Cover photograph:

Spillway gate hoist deck, Choke Canyon Dam, Nueces River Project, Texas.

The spillway is equipped with seven radial gates, each 49.2 ft wide by 23.7 ft high (15 000 mm wide by 7230 mm high). Maximum discharge capacity is 257 400 ft^3/s (7290 m^3/s) at elevation 232.2 ft (70.77 m) (maximum water surface).

SI METRIC

WATER OPERATION AND MAINTENANCE
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INTRODUCTION

The Navajo Indian Irrigation Project's experience with clearing obstructions from siphon blowoff drains is related on page 1.

The article beginning on page 4 describes how a potentially hazardous and destructive situation was averted at Whiskeytown Dam by the quick reaction of one of its employees.

How do you clean an earth-lined canal without destroying some of the lining? Do you have any ideas on or experiences with preserving compacted soil canal linings? We need your input. See page 9.

Pesticides can be safe and effective if used as instructed. The article on page 11 describes symptoms of pesticide poisoning and precautions to be taken.

An unfortunate accident resulting from improper handling of acrolein is presented on page 13.

The articles on pages 14 and 15 contain information on the care and handling of the old faithful hardhat.

Having trouble with light bulbs being shot out? Page 16 describes a bulletproof cover on light standards.

Flappers and hookers – interested? Read page 17.

A unique, automatic alarm system is used to report problems at a pumping plant. See page 19.

CLEARING OBSTRUCTIONS FROM SIPHON BLOWOFF DRAINS[1]

The Navajo Indian Irrigation Project in Farmington, New Mexico, was experiencing problems with plugged siphon blowoff drains. These drains frequently plug with silt and debris in spite of regularly scheduled operation of the valves to flush out the material. The method used to clear the plugged blowoffs was by "slugging" with a high flow of water. This method did not always work well and was not feasible if an emergency required unwatering a siphon during the nonirrigation season. The other alternative for removal of blockage is to pump the siphon down through the transition and manually remove the plug. This method was a slow process and expensive.

Mr. Leroy Frame has developed a new method for clearing obstructions from these siphon blowoff drains. He used 1-in (25-mm) diameter pipe nipple, ball valve, and air hose connection (fig. 2 on following page) and welded them to the blind flange at the top of the riser pipe immediately upstream from the discharge valve (fig. 1). The cost of this addition is approximately $15. A 150-ft^3/s (4250-L/s) air compressor is then used to pump air into the plugged riser pipe until the obstruction is forced back into the siphon, freeing the blowoff piping for use. The amount of air pressure applied to the riser pipe should not exceed the rated pressure of the blowoff piping and valve.

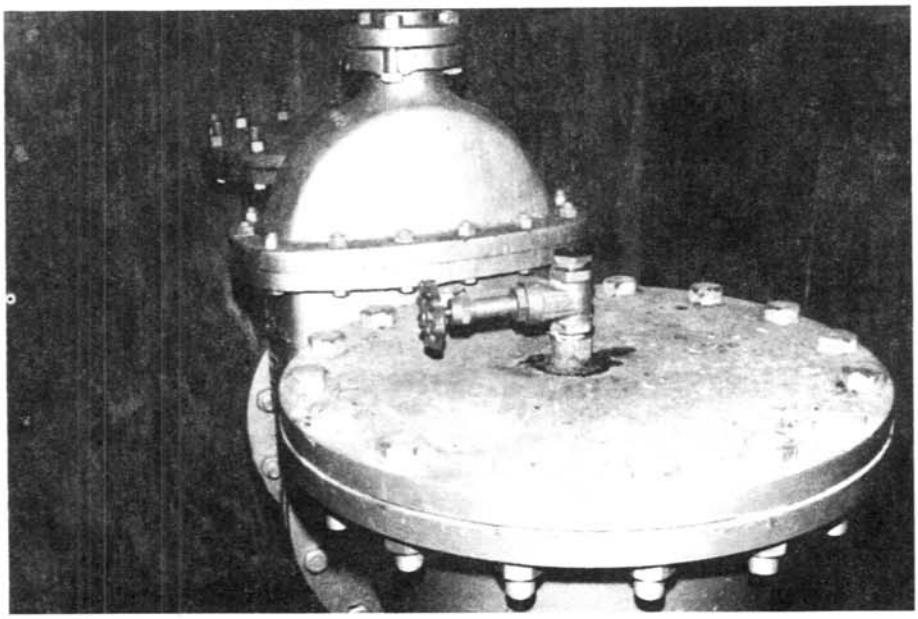

Figure 1.–View of coupling, valve, and pressure hose fitting installed on siphon blowoff to permit use of air pressure to clear obstructions from the discharge pipe.

[1] From Suggestion No. SW-NIIP-83S-003 by Leroy H. Frame, Supervisory Construction Engineer, Navajo Indian Irrigation Project, Farmington, New Mexico.

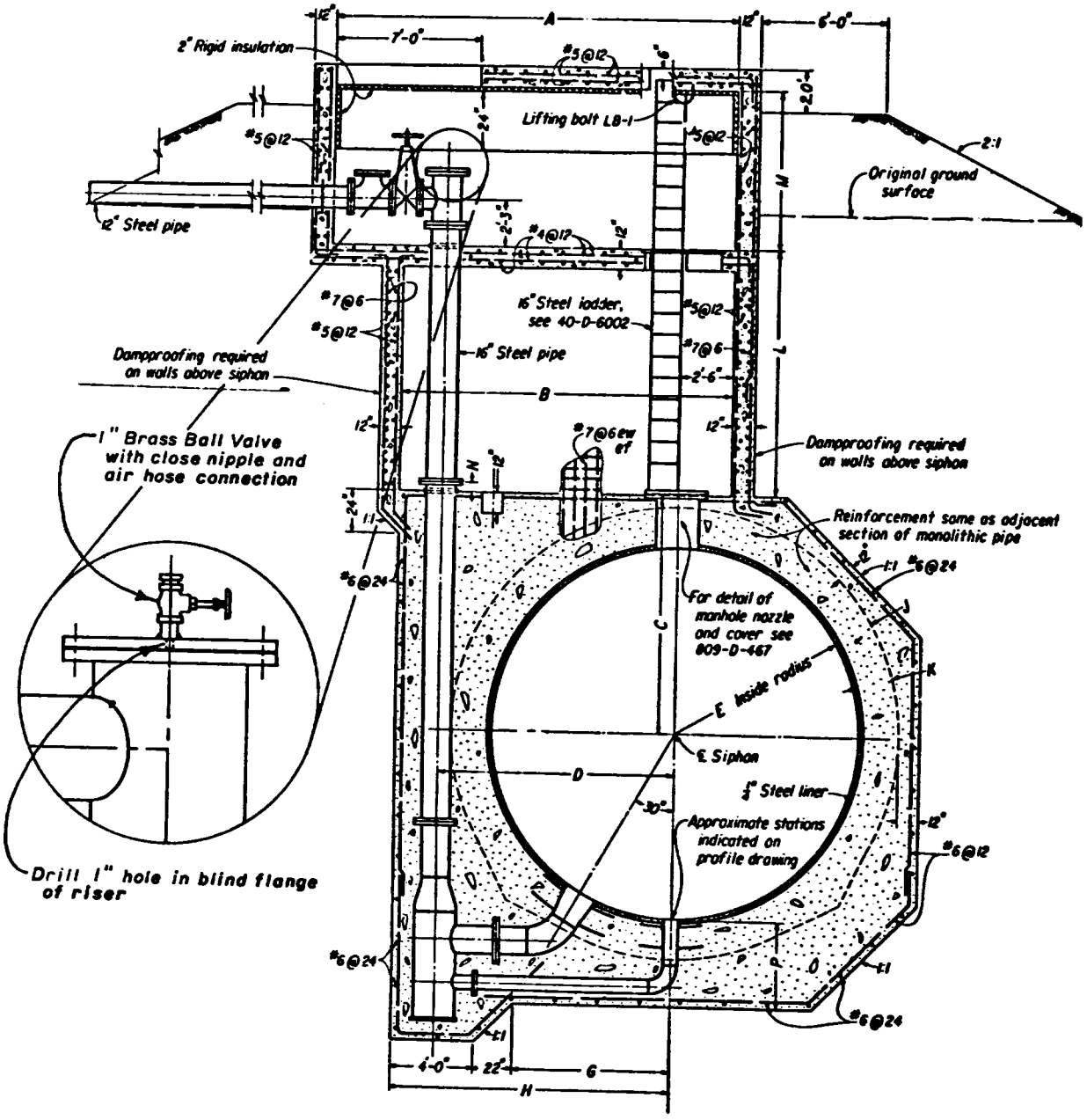

Figure 2.–Blowoff structure.

Mr. Frame's method allows one man to clear the system. It was successfully implemented in an emergency situation at the Navajo Indian Irrigation Project. Future designs for siphon blowoff systems will include a similar connection that will permit this procedure for cleaning.

* * * * *

INCIDENT AT WHISKEYTOWN OUTLET WORKS [2]

Whiskeytown Dam and Lake are located near Weaverville, California. The lake was in an overflow condition the day of the incident. Several times prior to the incident, Whiskeytown Lake elevations had exceeded spillway elevation due to numerous storms.

Conditions Prior to Incident

The outlet works at Whiskeytown Dam were being used to draw down the level of Whiskeytown Lake (elevation 1211.06 ft (369.13 m) on day of incident). Guard gates No. 1 and 3 were opened and guard gate No. 2 had been closed to change the intake elevation of penstock No. 2 to 1110 ft (338 m) from 972 ft (296 m) for purposes of water clarity. Regulating gates No. 1 and 2 were 14 in (355 mm) open and 100 percent open, respectively. Both butterfly valves serving Clear Creek Community Services District were open. The 10-in (250-mm) jet flow valve was closed; its 12-in (300-mm) guard gate valve open.

Incident

The operator had started to adjust the regulating gates so that there would be 100 percent flow through gate No. 1 and partial flow through gate No. 2. From the control cabinet, he initiated the hydraulic system to close gate No. 2, made a visual inspection of the gate itself to verify that it was closing, and then started back to the control cabinet. At that time, the 12-in (300-mm) gate valve upstream from the 10-in (250-mm) jet flow valve split vertically in half and blew a piece about 10 in^2 (6450 mm^2) out of the valve bonnet. The valve halves, having separated about 1/2 in (13 mm), created a water discharge which blew the operator against the far east wall of the regulating chamber and began filling the chamber within seconds. The operator escaped up the 10-ft (3-m) high chamber access ladder unharmed. Increasing static water pressure within the regulating chamber collapsed the steel door separating this chamber from the penstock tunnel and water began to fill the tunnel.

The operator immediately initiated an emergency closure of all guard gates by using the remote control panel at ground level above the tunnel. One of the two guard gate hydraulic pump circuit breakers kept tripping out on overload, thus requiring the remaining pump to close the gates alone. The operator then closed the butterfly valves to the Clear Creek Community Services District to prevent back-siphoning of their water supply.

He then notified the Chief of Shasta Operations by radio of the failure while continuing to close the gates. The Chief informed Central Control at Sacramento by radio while he was in transit to the site (about a 1/2-hour drive). Eighteen minutes after the failure, the operator reported both guard gates were closed and water flow had ceased.

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[2] Excerpted from report by Messrs. Greg O'Haver and Lou Baum, Bureau of Reclamation.

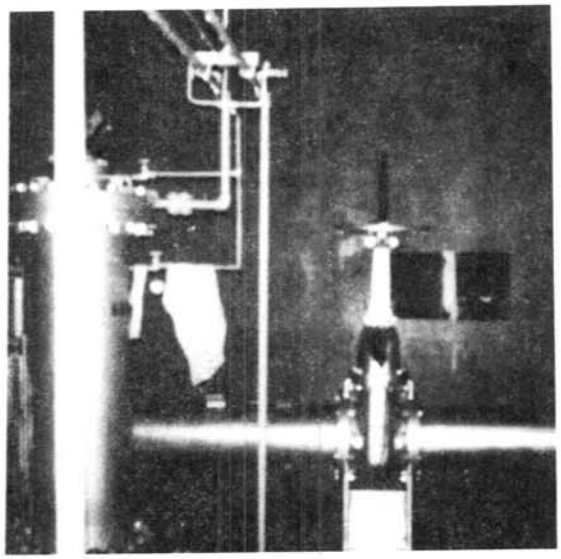

Figure 3.–12-in (300-mm) gate valve installation.

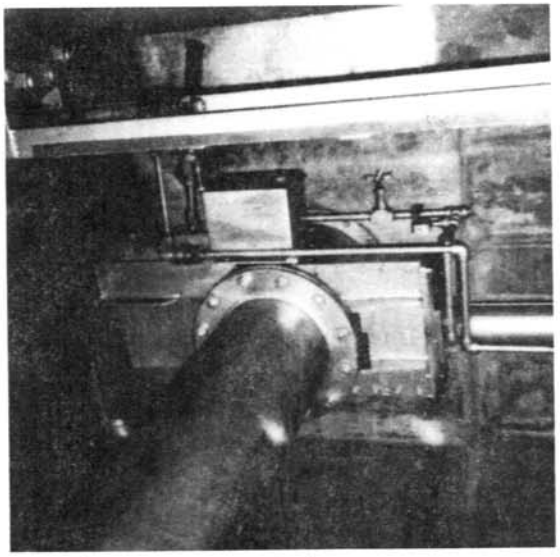

Figure 4.–10-in (250-mm) jet flow valve.

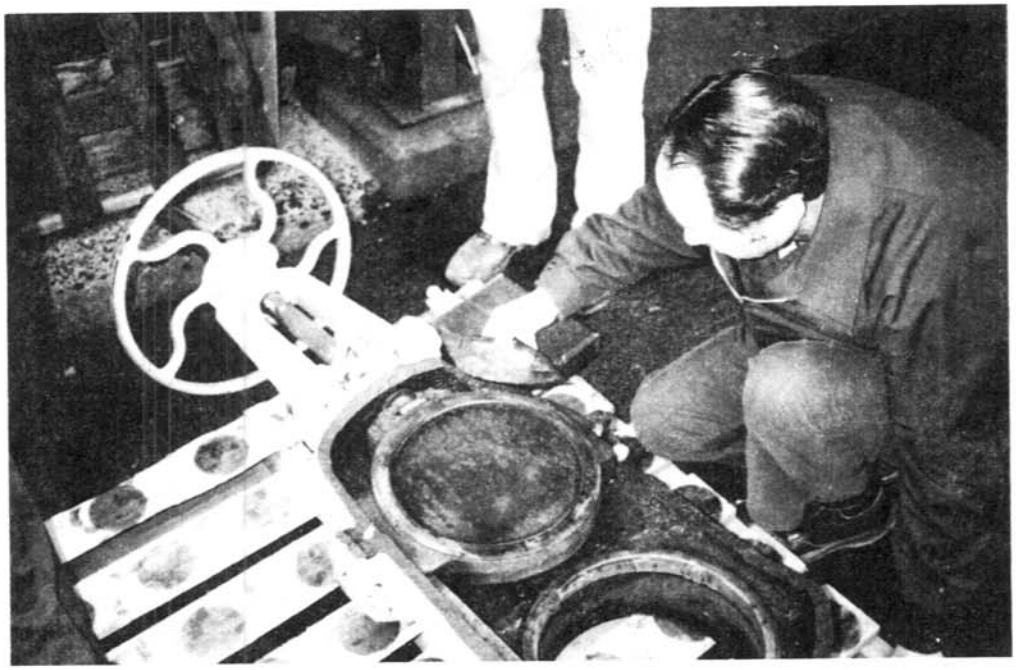

Figure 5.–12-in (300-mm) gate valve.

Findings

The 12-in (300-mm) gate valve that failed was a Crane 200 water, oil, and gas, flanged, cast iron valve rated for 200 lb/in^2 gage (1380 kPa) working pressure, nonshock, and shell tested to 350 lb/in^2 gage (2413 kPa). The maximum pressure this valve experienced during its life was 105 lb/in^2 gage (725 kPa) static. The raw edge along the fracture line appears to have failed as a brittle fracture, typical of cast iron.

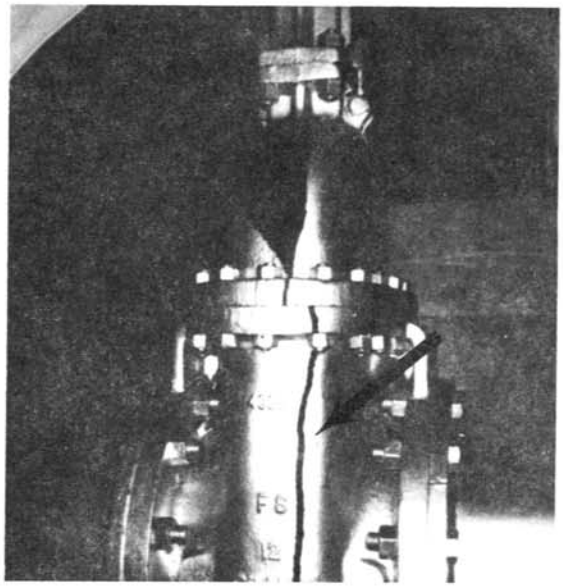

Figure 6.–Fracture.

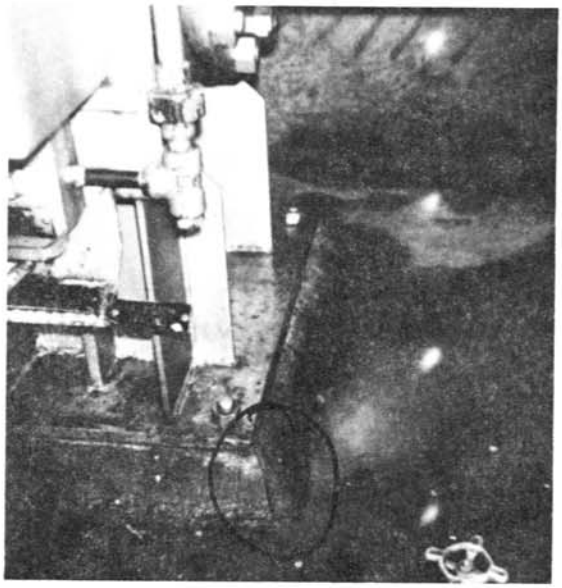

Figure 7.–Cracked grout.

The penstock tunnel at the control building end had filled with water approximately 5 ft (1.5 m) deep, completely submerging the sump pump and motor. A portable pump was obtained to pump out the tunnel (a 2-day process). The 12-in (300-mm) valve was removed, the pipe inlet capped with a blind flange, and the outlet works placed back in service the same day.

The failure of one hydraulic pump is attributed to a faulty thermal overload protection system. An investigation is pending.

Damage to the outlet works structure was minimal. The steel door opening to the tunnel was destroyed including its jamb. The tunnel sump pump and motor ran under water for some time, but only required cleaning and general maintenance. The 10-in (250-mm) jet flow valve and discharge nozzle was moved downstream about 1/4 in (6 mm), cracking the grout under the valve support. It is assumed that both the gate valve and the jet flow valve were alined and grouted during installation, thus preventing the presence of residual stresses within either valve. The nature of the gate valve failure prevents verification of this assumption.

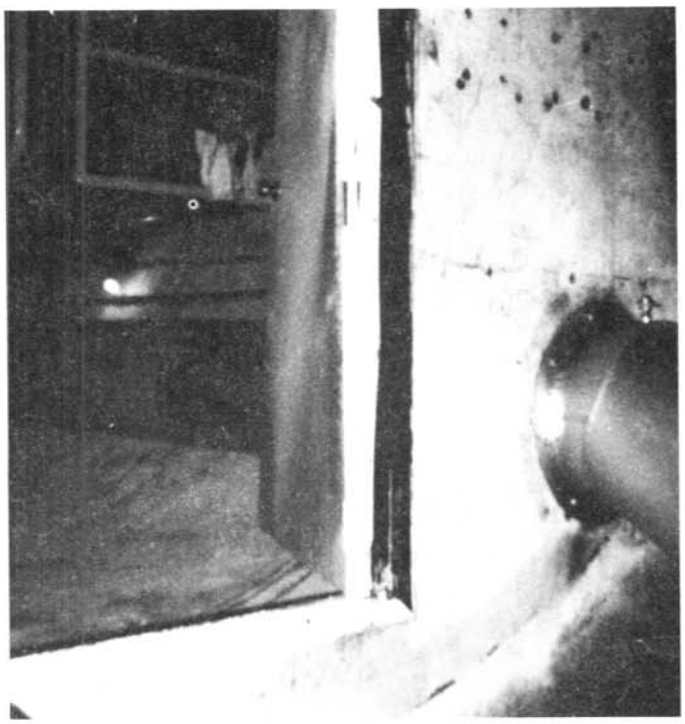

Figure 8.–Collapsed door to penstock tunnel.

The operator acted quickly and responsibly to shut down a potentially hazardous and destructive situation, without causing bodily injury to anyone, or causing inconvenience to the water district, or destruction to equipment and structures.

Conclusions and Recommendations

The failure of the 12-in (300-mm) gate valve appears to have been a brittle failure, possibly caused by a material defect. More probably, however, the failure was the result of a combination of fatigue and embrittlement due to crystallization of the metal. The valve had experienced dynamic oscillating loads since about 1962 as a result of the nozzle discharge forces situated 10 ft (3 m) away.

It is recommended that the valve be inspected and tested by an experienced metallurgical and nondestructive testing laboratory to determine, if possible, the cause of failure. The replacement valve should be a cast steel valve 125 lb/in^{2}gage (860 kPa) steam rated and not cast iron. A coupling placed between the valve and the discharge nozzle is recommended to soften dynamic loads and to relieve thermal and static shocks. A report on the causes of the valve failure should be issued and an investigation into other potentially hazardous sites Bureau-wide should be initiated.

Because Whiskeytown Dam is an unmanned project receiving only weekly inspections, and because another failure in the penstock system could go virtually unnoticed for perhaps days, it is recommended that a high-water alarm be placed within the penstock tunnel, alerting Keswick Control. A high tailwater alarm could also prove beneficial.

Because all of the emergency guard gate closure hydraulic equipment is contained within the area that could be inundated by a penstock failure, it is recommended that a portable hydraulic pump be placed

at the ground level control panel, with a separate hydraulic line connected from it to the guard gate activating cylinders. This would provide positive mechanical control of the guard gates in emergency situations if electrical power is interrupted.

Although it is not directly related to this incident, it has been brought to the attention of those concerned that the maximum release permitted by the Standing Operating Procedures through the outlet valve of the penstock supplying the Water District is at 14-in (355-mm) gate opening. Greater gate openings permit back-siphoning of the Water District's water supply. This practice decreases the maximum allowable flood release considerably. A correction to this undesirable situation should be pursued.

* * * * *

HOW DO YOU FIND THE TOP OF THE COMPACTED SOIL LINING [3]

It is often hard to tell where the top surface of the compacted soil is located, as many of our bulletin readers have discovered, in the maintenance of soil-lined canals. Often the sediment blends with the lining and the equipment operator may dig too deep and excavate some of the lining. During repeated canal cleanings, a significant amount of the lining and its ability to control seepage may be lost. To preserve the original lining thickness, a practical method of placing permanent reference points to help in locating the lining is needed.

Another reason for the reference points is to determine any erosion from the action of water. Recently, we started a research study of the erosion of compacted soil linings placed in the 1950's and 1960's. Lately, because of economy and other reasons, there has been a renewed interest in this type of lining and a few are being constructed or are planned. The purpose of the erosion study is to determine to what extent the linings, which have been in operation for many years, may have eroded. The results of the study which will be directed to linings with soils of low plasticity, will be used to see if our present guidelines for selecting soils for lining need to be changed. For future soil linings, reference points would be useful in keeping track of possible erosion.

We have started to collect ideas on reference points from people at the E&R (Engineering and Research) Center. One possible method of establishing reference points is illustrated on figure 9. This would consist of an auger hole filled with sand with a distinctly different color than that of the soil lining and containing markers at known depths. Enough clay (bentonite) would be added to make the sand impervious. These could be installed at each 100-ft (30.5-m) station. Possibly a colorful plastic tape of the type used by utility companies for locating underground facilities could be used to help locate the auger holes.

The tops of the sand-filled holes could be exposed to show the equipment operator where the lining surface was at the canal centerline. From this, the approximate location of the toe of the side slope could be determined. From the markers at known elevations in the lining, the original cross section of the lining could be reproduced for comparison with later surface cross sections to show any erosion.

Another suggestion is to install reinforced concrete squares, about 4 ft (1.2 m) on a side and 3 in (75 mm) thick at each 100-ft (30.5-m) station. Each square would be set into the compacted lining with the top of the concrete flush with the top of the compacted soil. They would weigh about 600 lb (270 kg) each and would probably stay in place when the bucket of the excavator hits it.

The main purpose of this article is to find out what ideas you have on this subject. We would like your comments on the two possible solutions above and to learn from your experience or thought on this subject. Perhaps any new ideas could be tried out in a lining to be constructed. You can write or call C. W. Jones, Bureau of Reclamation, E&R Center, attn: D-1541, P O Box 25007, Denver, CO 80225; telephone (303) 234-7044; who is collecting ideas on this subject. He is one of the investigators on the erosion research program. Also, for those of you who will be attending the O&M Workshop to

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[3] Article provided by C. W. Jones, Soil Engineering Specialist, Division of Research, Bureau of Reclamation, Denver, Colorado

be held in Denver during the week of February 27, 1984, this subject will be discussed during the session on earth construction practices.

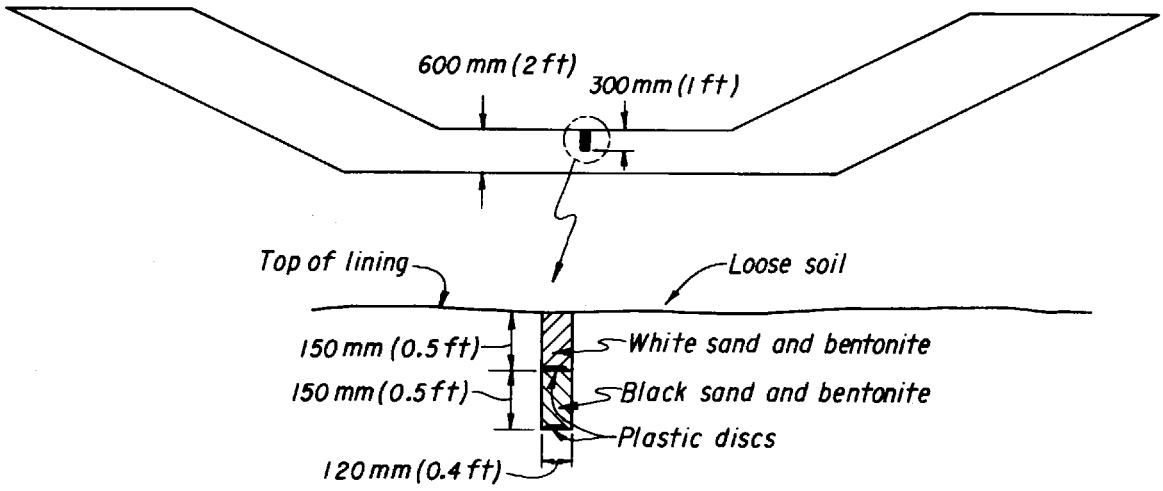

Figure 9.–One method of establishing reference points.

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PESTICIDE POISONING CAN BRING ON FLU-LIKE SYMPTOMS [4]

Farmers may mistake the symptoms of pesticide poisoning for symptoms of less serious illnesses.

Some of the general symptoms of pesticide poisoning – muscle aches, respiratory difficulty and visual problems – are often subtle or misleading. "You may just feel a little off, as though you're coming down with the flu," says Pesticide Education Specialist Jack Kenney, University of Wisconsin Extension Service. "But if you've been handling pesticides, and you're experiencing these symptoms, you should contact your physician."

Used as recommended, pesticides can be safe and effective. However, farmers and other pesticide applicators run a high risk of accidental exposure. Pesticides enter the body through the nose, mouth, eyes, lungs, and most often through the skin, says Kenney. Mixing and loading of pesticide concentrates, spills, spray drift, equipment failure, and premature entry into sprayed areas are the most frequent means of accidental exposure.

Farmers usually request treatment for a single, acute exposure to pesticides, rather than the additive gradual buildup of toxins, says Kenney. But organophosphates – potentially the most dangerous class of pesticides – can gradually accumulate in the body. Organophosphates include such pesticides as phorate (Thimet), parathion, and terbufos (Counter), fonofos (Dyfonate), and disulfoton (Di-Syston).

The most common symptoms of organophosphate poisoning include headache, visual disturbances, abnormalities of the pupil, and greatly increased sweating, tearing, and respiratory secretions. More severe poisoning may involve nausea and vomiting, changes in heart rate, fluid in the lungs, muscle weakness, respiratory paralysis, confusion, convulsions, or coma and death.

Symptoms of poisoning by carbamates, another major class of pesticides, are similar to those of organophosphates. The carbamates include carbofuran (Furadan), carbaryl (Sevin), and aldicarb (Temik).

The organophosphates and carbamates act in the body as inhibitors of the enzyme cholinesterase. Cholinesterase, which is found in the blood and various body tissues, affects transmission of nerve impulses. Depending upon the specific pesticide, both organophosphates and carbamates may be direct or delayed enzyme inhibitors. Therefore, acute exposure symptoms may be immediate or delayed for several hours. Onset and progression of the symptoms depend on the size of the dose and the toxicity of the pesticide.

Unlike the organophosphates, the action of the carbamates is reversed by the body's ability to overcome the pesticide's effects. Carbamates can cause severe acute poisoning, but because their effect on cholinesterase is reversible, they don't usually produce long-term, cumulative poisoning.

Some physicians may not be familiar with the symptoms of pesticide poisoning. Organophosphate poisoning can be diagnosed with blood tests; carbamates are more difficult to detect.

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[4] Reprinted by special permission of the Editor, Colorado Rancher and Farmer, July 1983 issue.

As a preventive measure, pesticide applicators should have routine baseline blood tests for cholinesterase before handling organophosphates, advises Kenney. Cholinesterase levels should then be monitored with additional blood tests every 10 days to 2 weeks during the pesticide's use.

Using common sense is most important in avoiding pesticide exposure. "Used in accordance with the label directions and common sense, toxic pesticides can be used safely," says Kenney. "But if used improperly, even the least toxic can be dangerous. Read, understand, and follow the label directions before using the product, and know the precautions and first aid procedures," he urges.

Because pesticides enter your body by ingestion and inhalation, never eat, drink, or smoke during or after using pesticides unless you wash first. Carry a supply of water with you in the field so you can wash any spill off your body immediately.

Be sure to wear protective clothing when mixing and applying pesticides. Product labels may list specific requirements. Where they do not, use common sense. When you handle or apply pesticides, wear at least a long-sleeved shirt and long trousers or coveralls; also wear a rubber or plastic liquid-proof hat and unlined, liquid-proof neoprene gloves (unless the label indicates another type should be used). When pouring or mixing pesticides, you also should wear a liquid-proof raincoat or apron, goggles, and boots.

In addition, be sure to use only the recommended amount of pesticide, and store chemicals under lock and key and only in the original container.

If you suspect any degree of pesticide poisoning, be sure to seek medical help. "First aid is not a substitute for a trip to the hospital," says Kenney. Take the product label with you to your doctor's office or hospital emergency room.

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SAFETY PRECAUTIONS FOR USE OF ACROLEIN [5]

During the 1982 irrigation season, a district employee in Colorado sustained a serious injury, reportedly from exposure to acrolein, an aquatic plant herbicide. The victim was engaged in securing the application equipment following its use on an irrigation canal. He accidentally hooked an unlocked valve on the top of the acrolein cylinder with his shirt sleeve, activating it sufficiently for a small amount of liquid chemical to squirt against his arm and ricochet into his left eye. The victim maintains it was only a drop. He said he immediately jumped into the canal upstream from the application site and rinsed out his eye with canal water several times. He climbed out and continued to experience eye irritation, so he jumped back into the canal and rinsed the eye again. He was alone at the time the accident occurred. After he had climbed out of the canal the second time, he summoned help from a person some distance away in a field who took him to the hospital for medical attention. The injured employee did not have any acrolein label or literature with treatment information to provide the doctor. It is reported that the doctor administered the proper eye treatment for such an injury during this first visit and continued treatments for sometime thereafter. In spite of the treatments, the victim lost the sight of the eye. The doctor attributed the sight loss to acrolein exposure.

The case is a very puzzling one. Acrolein is well known and understood to be a strong sensitizer and the label contains precautionary language prescribed under EPA registration requirements for the use and handling of strong sensitizers. There have been a few minor accidents with acrolein over the years, including eye contact. At least one Reclamation employee has experienced eye contact with a small amount of acrolein. In every instance of eye exposure reported, the victims quickly rinsed the exposed eye with water and experienced only mild eye irritation. To the best of our knowledge, no one has been blinded as a result of these eye exposures.

Why this unfortunate victim was blinded by such a small quantity of acrolein is a matter of conjecture. We can only speculate that he might have gotten more acrolein in the eye than thought or perhaps he is unusually sensitive to acrolein.

Important factors in the case that should be considered are that the acrolein product labeling prescribes (1) users and/or handlers wear suitable eye covering, either goggles or an adequate face shield whenever handling or applying acrolein; (2) there should always be at least two people working together around acrolein application equipment so that assistance can be rendered or help secured in case of a problem or malfunction; and (3) a container of water should be kept close by for rinsing eyes or skin in case of accidental exposure.

None of these precautions were being observed by the accident victim. The accident could have been avoided if proper eye covering, as directed in the labeling, had been worn. Due to risk of drowning, jumping into the canal to rinse the eyes can be a dangerous practice also. It is much safer to have a container of water handy to preclude the taking of such a risk.

It is emphasized that these three precautions and all others directed in the acrolein labeling be carefully followed whenever acrolein is being handled or applied in the field.

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[5] Article Provided by Gary W. Hansen, Pest Control Specialist, Bureau of Reclamation, Denver, Colorado.

HARDHAT INSPECTION [6]

"I have had this hardhat for 10 years and there is no way I am going to wear a new one." How many times have we heard that statement? Hardhats are like a tool and need constant maintenance and even replacement depending on there usage. They are designed to protect one of the most important parts of our body, as long as they are worn and properly maintained.

Advanced materials, space age technology, and right adherence to specifications by manufacturers provide the best possible head protection for today's construction worker, however:

Proper maintenance is now the primary problem!

Caps are designed to meet the requirements for impact resistance, penetration, and dielectric protection as long as the cap is not damaged or altered in any way.

- The suspension system is constructed as an integral part of the total protection and along with the shell will do the job. The crown straps must not be cut or tampered with. From a hygiene point of view, this suspension must be changed or washed on a regular basis.

- Replace the entire unit after a severe blow has occurred. The cap has done its job and it is now time for another one. Never drill holes in a cap because if altered in any way it voids all approvals.

- There should always be a minimum clearance of 1-1/4 in. (32 mm) between the suspension and the crown of the cap. If not, adjust the suspension accordingly.

- Over a period of time, ultraviolet rays will affect the cap shell causing minor cracks from the sun's degradation and, when this occurs, the cap should be replaced.

- A good rule of thumb is to replace the cap when in doubt.

It is recommended that regular sessions on head protection should be held at safety meetings. During these sessions, check all caps and suspensions to make sure that they are really doing their jobs.

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[6] From a National Safety Council Construction Section's Safety and Health Information Sheet and U.S. Bureau of Reclamation "Safety News" publication, Second Quarter, FY83.

TAKING THE HARDHAT FOR A RIDE [7]

Where do you put your hardhat when riding in a car or truck?

A device that can be hung on the back of a seat, as shown in figures 10 and 11, can be bought at most hardware stores. It will cut down on the beating a hat gets from dust and rolling around loose.

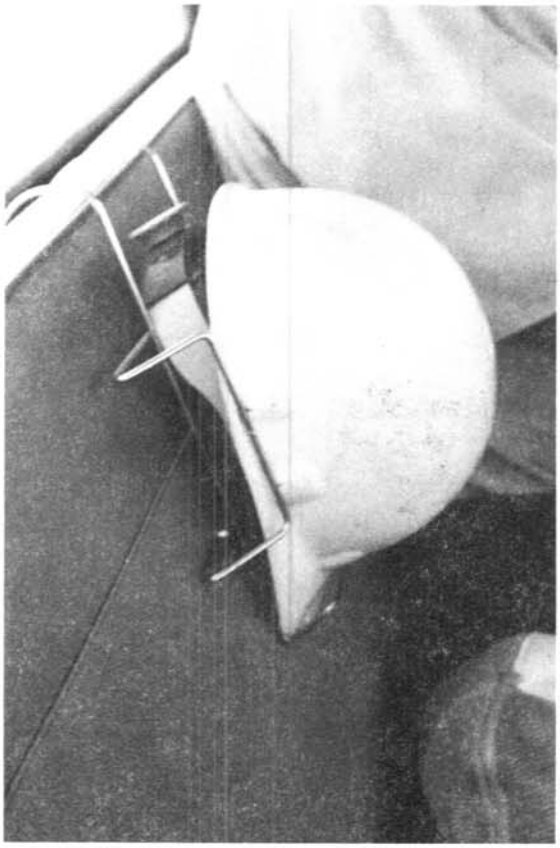

Figure 10.–Hardhat holder.

Figure 11.–Hardhat slides easily into holder.

[7] Article provided by Gordon Johnston, O&M Specialist, retired, Sacramento, California.

BULLETPROOF MATERIAL [8]

Vandalism has been a recurring problem at a pumping plant operated and maintained by the Exeter Irrigation District in California. Light bulbs have been shot out repeatedly. However, the District has reported that use of the bulletproofing material "Lexan" has been successful in protecting key components at the plant (see figure 12).

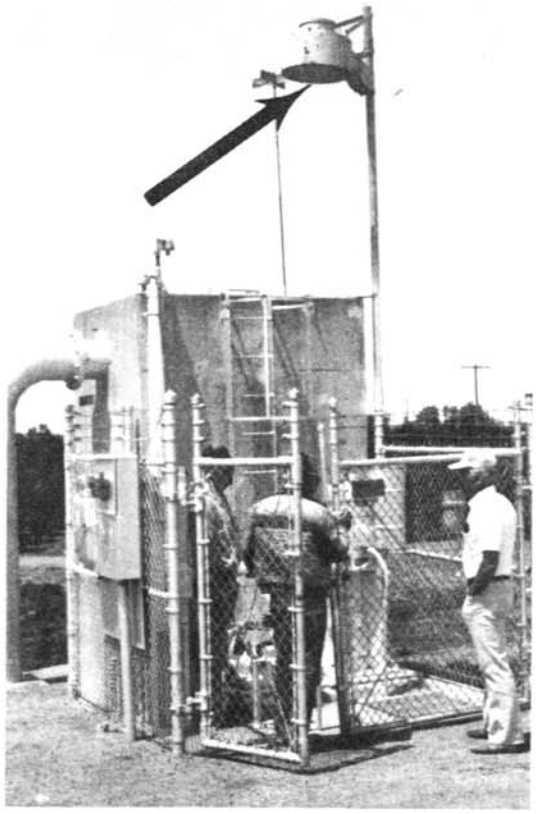

Figure 12.–"Lexan" cover on plant illuminator (arrow) has been successful against vandals.

[8] Excerpted from Review of Operation and Maintenance Examination Report by Robert J. Stuart, Bureau of Reclamation, Sacramento, California.

FLAPPERS AND HOOKERS [9]

They're not what you think!

Consolidated Irrigation District No. 19, that operates the Spokane Valley Project in Washington, has been experiencing problems with the flappers in the check valves at pump sites. They solved the problem by replacing the hinged bracket that holds the flapper plate with an aluminum bracket with brass and teflon bushings. This new bracket is less expensive to produce and easier to maintain (fig. 13). The district is planning to replace all the old brackets with the aluminum model over a 3-year period.

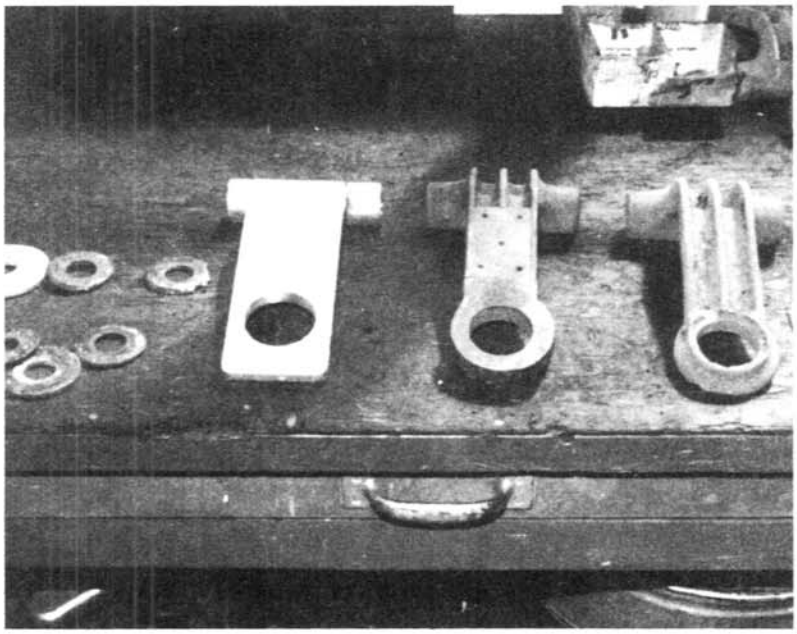

Figure 13.–The bracket on the right is the original and the middle bracket has been rebuilt from the original. The bracket on the left is the aluminum model with brass and teflon bushings.

The district is also phasing out their use of concrete lids on their delivery boxes. The concrete lids are deteriorating from freeze-thaw action and are being replaced with the metal lids shown in figure 14. The lids have angle iron welded to the bottom to keep them in place and a hole drilled for lifting (hooking) convenience.

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[9] Excerpted from 1983 Review of Operation and Maintenance Examination Report by Messrs. Virgil D. Temple and Richard W. Allen, Bureau of Reclamation, Boise, Idaho.

Figure 14.–Metal lids with angle iron welded to bottom to keep them in place.

MESSAGE ALARM SYSTEM [10]

In a recent examination of the river pumping plant at the Michaud Flats Project, the examination team noticed an automatic alarm system in operation. This system is unique because it will dial several telephones and report problems at the pumping plant, by way of a recorded message.

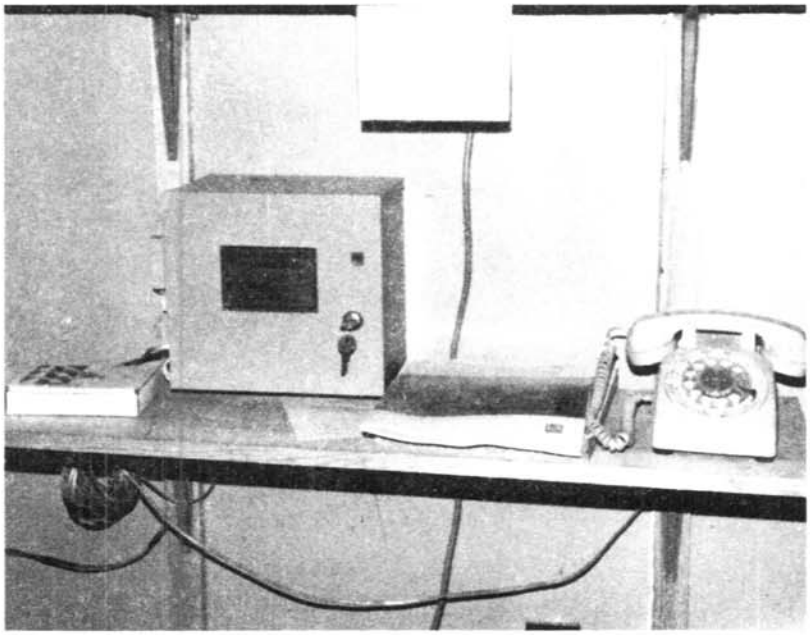

Figure 15.–Automatic alarm system.

[10] Excerpted from Review of Operation and Maintenance Examination report, July 14, 1983, by Virgil D. Temple and Earl M. Corliss, Bureau of Reclamation.

GPO 842 - 167

Mission of the Bureau of Reclamation

The Bureau of Reclamation of the U.S. Department of the Interior is responsible for the development and conservation of the Nation's water resources in the Western United States.

The Bureau's original purpose "to provide for the reclamation of arid and semiarid lands in the West" today covers a wide range of interrelated functions. These include providing municipal and industrial water supplies; hydroelectric power generation; irrigation water for agriculture; water quality improvement; flood control; river navigation; river regulation and control; fish and wildlife enhancement; outdoor recreation; and research on water-related design, construction, materials, atmospheric management, and wind and solar power.

Bureau programs most frequently are the result of close cooperation with the U.S. Congress, other Federal agencies, States, local governments, academic institutions, water-user organizations, and other concerned groups.

A free pamphlet is available from the Bureau entitled "Publications for Sale." It describes some of the technical publications currently available, their cost, and how to order them. The pamphlet can be obtained upon request from the Bureau of Reclamation, Attn D-922, P O Box 25007, Denver Federal Center, Denver CO 80225-0007.