Department of the Interior
Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 46

October, November and December 1963

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CONTENTS

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Cover page. Backfilling against a plastic curtain cutoff provided for the East Low Canal, Columbia Basin Project, Washington. P222-116-45117

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

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OCTOBER, NOVEMBER AND DECEMBER 1963

INTRODUCTION

The Operation and Maintenance Equipment and Procedures release, published quarterly, is circulated for the benefit of irrigation project operation and maintenance people. Its principal purpose is to serve as a medium for exchanging operation and maintenance information. 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 a continued effort to reduce costs and increase operating efficiency.

Included in this issue of the bulletin are several suggestions for improving equipment and procedures by project operating personnel and several ideas borrowed from GRIST reporting improvements made by the National Park Service's operating personnel.

The possible damage that can be caused by nutria on western irrigation projects is called to your attention in an article beginning on page 1. It has been suggested that the Government be informed of the presence of these animals and of the damage that has been reported from their activities.

Beginning on page 12 there is an article on vertical plastic membrane cutoffs constructed on the Columbia Basin Project to reduce seepage from the canals. The cutoffs were used in lieu of linings in areas where high ground-water tables exist.

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 Awards Committee when a suggestion is adopted.

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Division of Irrigation Operations
Office of Chief Engineer
Denver, Colorado

NUTRIA AS A POSSIBLE PEST ON DITCHBANKS

Our attention has been called by the Commissioner's Office, Washington, to the nutria (or coypu) as a possible pest on ditchbanks, by a copy of the Fish and Wildlife Service Leaflet 445, discussing "The Nutria in the United States." Our specific attention was called to the fact that nutria burrows have seriously damaged dikes, bayou banks, drainage canals and irrigation ditches. With reference to a map in the Leaflet nutrias have been reported in 14 of the 17 continental Western States.

The Commissioner has suggested that irrigation districts be advised of the potential danger of these animals and that the Bureau of Reclamation in turn be advised if nutria have been found. The Regional Director, Sacramento, California, has subsequently reported that information obtained from the California Department of Fish and Game indicates that nutria have been imported into the State by fur farmers and some have escaped. Muskrat trappers have taken them at widely scattered points throughout California in the past 10 years. However, at no location do they seem to thrive, at least thus far. The "clean" type of ditch maintenance practiced, plus the lack of vegetation which they prefer, seems to militate against their becoming established. The Department of Fish and Game is alert to their potential as pests and state law requires that they be kept in pens.

The text of the Leaflet is reproduced for general information on the following pages.

THE NUTRIA IN THE UNITED STATES

By Richard H. Manville
Branch of Wildlife Research
Bureau of Sport Fisheries and Wildlife
United States Department of the Interior

In the last few decades a native South American mammal, the nutria or coypu (Myocastor coypus), has became widely established in the United States. For a time it was regarded as a desirable furbearer, but it soon became evident that it might become as distinct a liability as the introduced starling and house rat. Interest in the nutria has increased in recent years. Encouraged by the claims of commercial promoters, many people have investigated possibilities of raising nutria as a profitable venture; most of them have been disillusioned.

Natural History

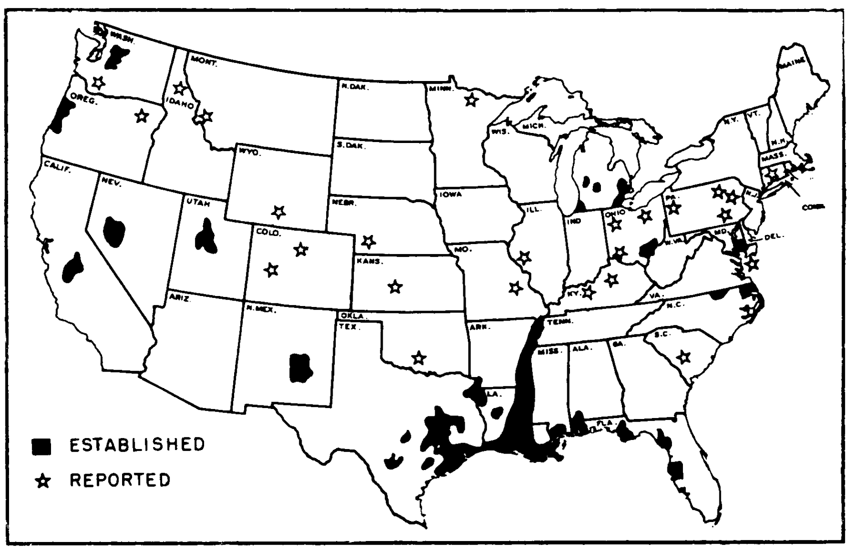
The nutria is a large aquatic rodent that rarely attains a weight of 25 pounds. Superficially it resembles a muskrat, with reddish-brown fur, a long rounded tail, and hind feet that are partially webbed. The family is raised, and may persist as a colony, in bank burrows or in platform nests anchored to marsh vegetation or built up from the bottom.

The nutria is prolific; a female may have five litters in 2 years, at any season. The young number from two to eight (average five) per litter. Females first breed successfully at about a year of age. The gestation period is about 130 days. The young are well developed at birth and get about on their own in a few hours. By their second week they begin to eat solid food, and they are weaned by the eighth week.

In its feeding habits the nutria is strictly herbivorous. Its natural foods include a variety of aquatic plants--succulent green stems, rushes, grasses, seeds, roots, and such coarse vegetation as cattails, reeds, duckpotato, chufa roots, and sedges. The food is usually consumed on the shore, particularly in the evening.

Establishment in the United States

In 1850, nutrias were abundant in the rivers, estuaries, and marshes of their native Argentina. Changing fashions and requirements of the fur trade, to the point where the demand for pelts was 100 times that of the supply available from hunters and trappers, nearly led to their extermination. Raising nutrias in captivity began in South America in 1922, farms sprang up throughout Argentina, and the industry spread to Europe and North America. Nutria farms were established in Quebec, Canada (1931), in the Green River area of the State of Washington (1932), on Avery Island, Iberia Parish, Louisiana (1938), and elsewhere. In most cases these proved to be costly investments, since more money was spent on equipment, feed, and labor than was realized from the sale of furs. Most nutria farms went out of business; many operators turned the animals loose or allowed them to escape. From these releases the nutria has spread and become widely established over the country. Feral nutrias, as shown on the map above, have been reported from at least 31 states and 3 Canadian provinces; established colonies apparently exist in the wild in at least 16 states.



Economic Importance

As is often true of newly established foreign species, the nutria population has built up rapidly in some areas. Breeding at the rate it does, an animal of this size and with its voracious appetite can pose a serious

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problem. Competition with native wildlife is one result - muskrats have declined in areas where nutrias were on the increase. Habitats have been altered and waterfowl marshes destroyed. In agricultural areas, nutria burrows have seriously damaged dikes, bayou banks, drainage canals, and irrigation ditches. Cultivated crops have been ruined on sites close to waterways. Alfalfa, sugarcane, rice, and young corn seem particularly subject to attack, and the nutria also has a taste for such produce as sweet potatoes, cabbage, clover, and most root crops except white potatoes. These damage problems are at present most intense in parts of Louisiana and Texas. Both State and Federal Governments are doing research and expending funds on control of the nutria where it is established in the wild and is proving detrimental to other interests.

Nutria as a Fur Crop

Nutrias are trapped in the same manner as are the smaller muskrats, except that the traps must be staked out more securely. The pelt is "cased" and dried, fur side in, over a frame 30 to 35 inches long. The condition, quality, and color of the underfur determine the price received. There is practically no commercial demand for pelts less than 22 inches from the eyehole to the bottom of the skin. Because of the extra work required to prepare nutria, many Louisiana trappers prefer to concentrate on muskrats. In recent years the best wild-caught Louisiana nutrias have brought $2.50 a pelt; the average has been about $1.00.

Over 80 percent of these raw furs have been exported to the European markets. The few low-grade skins consumed in the United States have been used principally for linings in cloth coats. Even the best nutria garment is far less serviceable than fur seal, beaver, or sheared raccoon. It is the high processing and manufacturing costs that make the finished nutria fur coat a luxury item.

Ranch-raised nutria pelts produced in the United States have not been significantly superior to the best grade of South American or Louisiana wild nutria. Prices for these pelts have been disappointing, owing to the inferior size and quality of the skins. By 1940, most American ranchers had gone out of business. Those that continued, operated mainly as centers of distribution, holding wild-caught animals for exportation as breeding stock.

Wild Nutria Catch in U.S. in Recent Years

	1960	1961
Arkansas	--	10
Florida	--	1
Idaho	31	5
Louisiana	694,110	716,435
Maryland	34	--
Mississippi	--	384
North Carolina	536	36
Oregon	154	547
Texas	270	13,402
Virginia	74	92
Total	695,209	730,912

A Word of Warning

In recent years, promoters of nutria breeding stock have made fantastic claims and have painted rosy pictures of quick and easy riches from the stock they provide. Breeding pairs, claimed as being superior animals of pedigreed stock, have been foisted upon a gullible public at $1,200 a pair. As a result of one such operation, three promoters of a nutria breeders association were indicted for mail fraud in the U.S. District Court, Los Angeles, in 1961. They pleaded nolo-contendere and were duly fined. Postal officials estimated that this breeding-stock scheme had grossed over $3 million. The association represented has since filed a petition in bankruptcy.

Persons interested in raising nutria as a business venture should consult the National Better Business Bureau, Inc., 230 Park Avenue, New York 17, N.Y., for current information.

Some states have adopted regulations with respect to importing, rearing and releasing nutrias. Contact your State Conservation or Wildlife Agency before embarking on a nutria project.

* * * * *

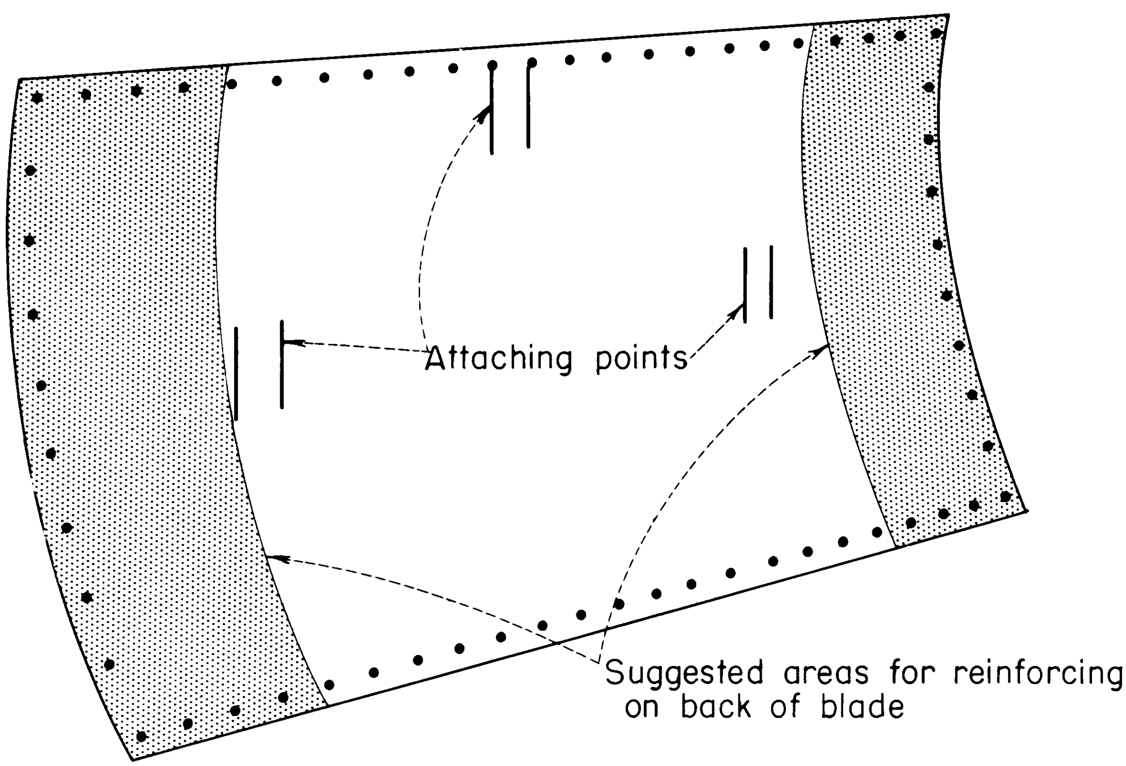
SNOW PLOW BLADE FROM SALVAGE

(Reprinted by permission of GRIST, November/December 1961 issue, a publication by the National Conference on State Parks, Washington, D.C.)

Needing a pusher snow plow blade but not having the more than $100 required to purchase one, personnel at Warren Dunes State Park, Michigan, cut a piece out of a discarded 550-gallon water tank and mounted that on a front-end loading tractor. The tank had just the right curve so that the blade lets snow roll off easily.

The welder who handled the job cut a piece 20 inches high and 4-1/2 feet long, in such a way as to have the riveted double edges from the tank reinforce the blade edges. He then fitted brackets to the back of the blade.

Lyle McDonald, Park Manager, says the blade probably would last longer if reinforced with an extra thickness of metal plate for a foot or so at each end. Such reinforcing pieces could also be cut from the salvaged tank.



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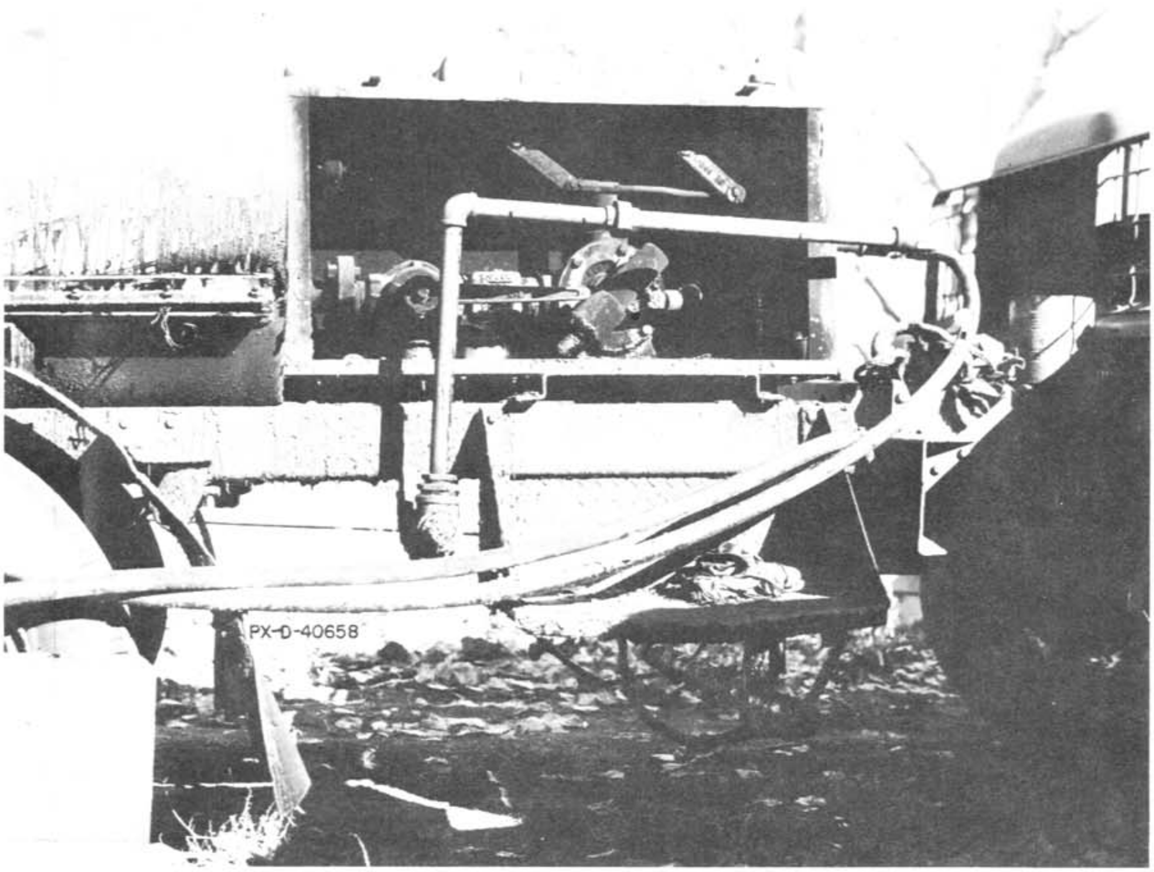
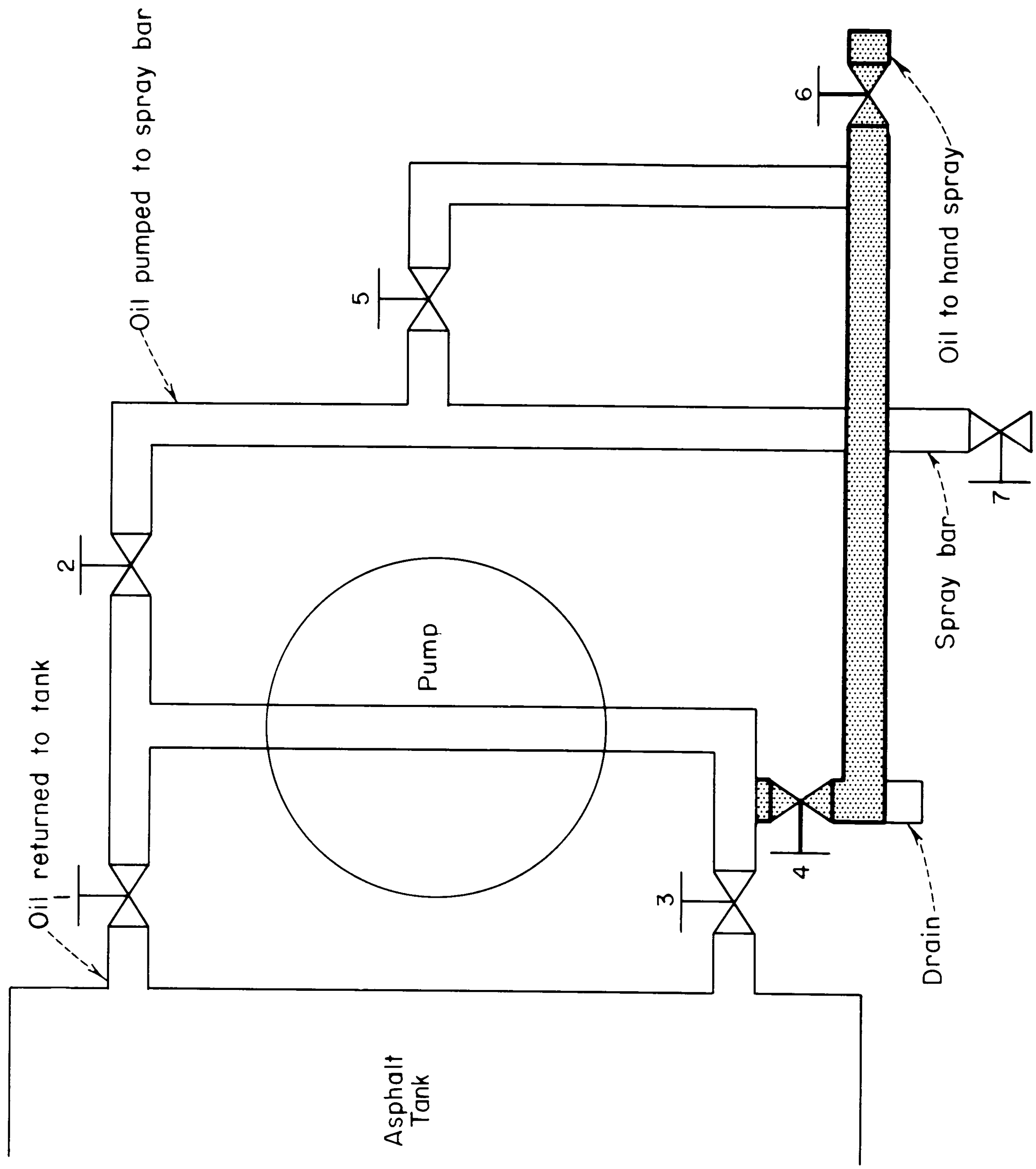
ASPHALT DISTRIBUTOR IMPROVED

(Reprinted by permission of GRIST, November/December, 1961 issue, a publication by the National Conference on State Parks, Washington, D.C.)

One simple pipe added to an asphalt or road oil distributor, photograph below, can improve operations considerably, saving from 15 to 30 minutes per "shot," says Earl Mansor, a truck driver at Zion National Park, who thought up the suggestion. This "suck back" line is run from the hand spray line to the drain line. It prevents the hand spray line from stopping up with asphalt and reduces puddling from spray bars.

The system is shown diagrammatically on the following page, with the darkened pipe, 3/4-inch or 1-inch, the one to be added. To operate, close valves 2, 3, and 7, open valves 1, 4, 5 and 6, thus allowing oil to return to the tank. If two-way valves are installed on your distributor, the operation becomes even simpler.

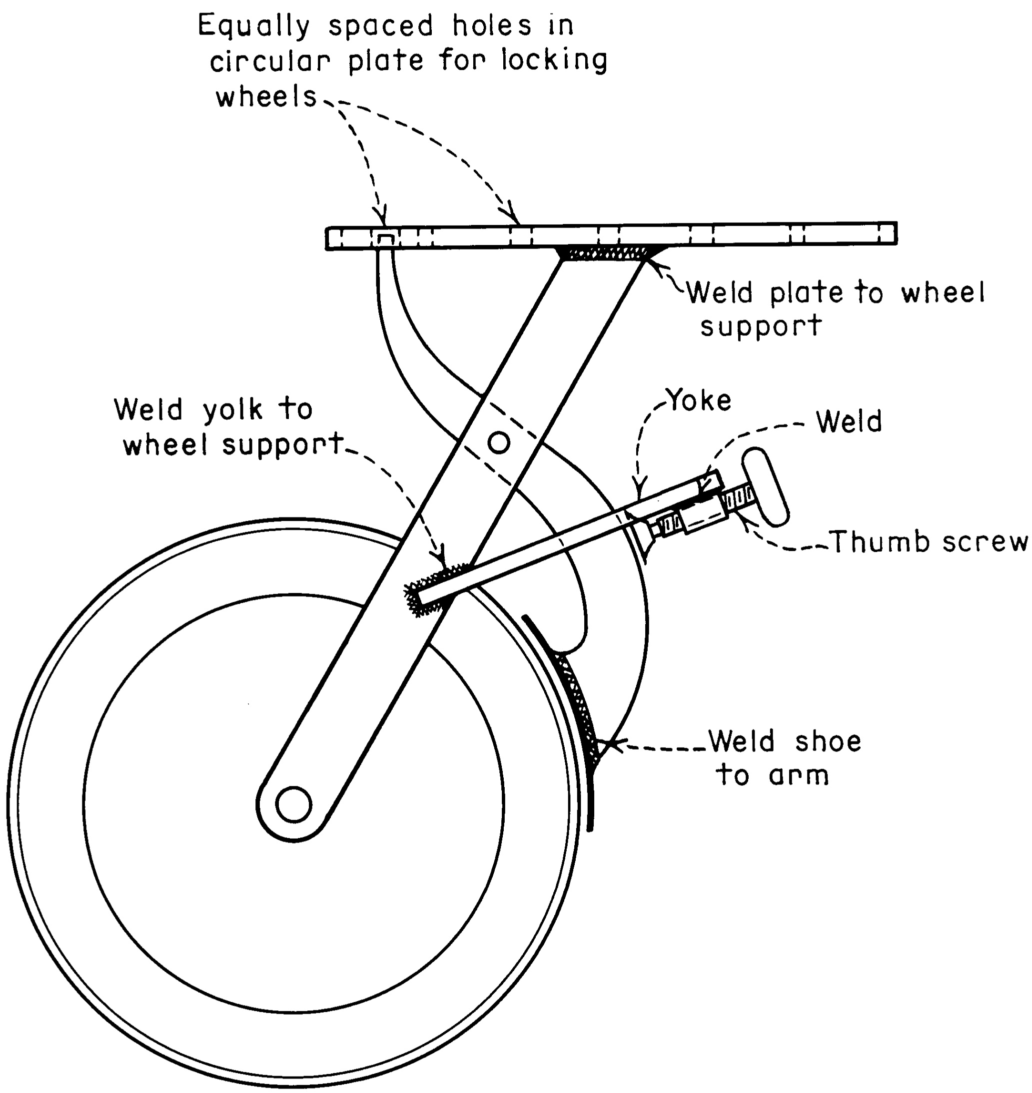



Oil pumped to spray bar
Oil returned to tank
Pump
Asphalt Tank
Spray bar
Oil to hand spray
Drain
1
2
3
4
5
6
7

SAFETY BRAKE FOR SCAFFOLD
(Suggestion R2-63-48)

No provision had been made on scaffolds for use in the Folsom Field Division of the Central Valley Project, to lock the wheels or casters in place. The need for some means of accomplishing this and assuring a safer working platform was recognized by Eugene H. Lee of the Plant Maintenance Branch. Mr. Lee suggested the locking device shown in the sketch below.

Several views of the brakes and the brake parts are shown on the following page. The brake locks the wheel and the turntable of the caster at the same time.



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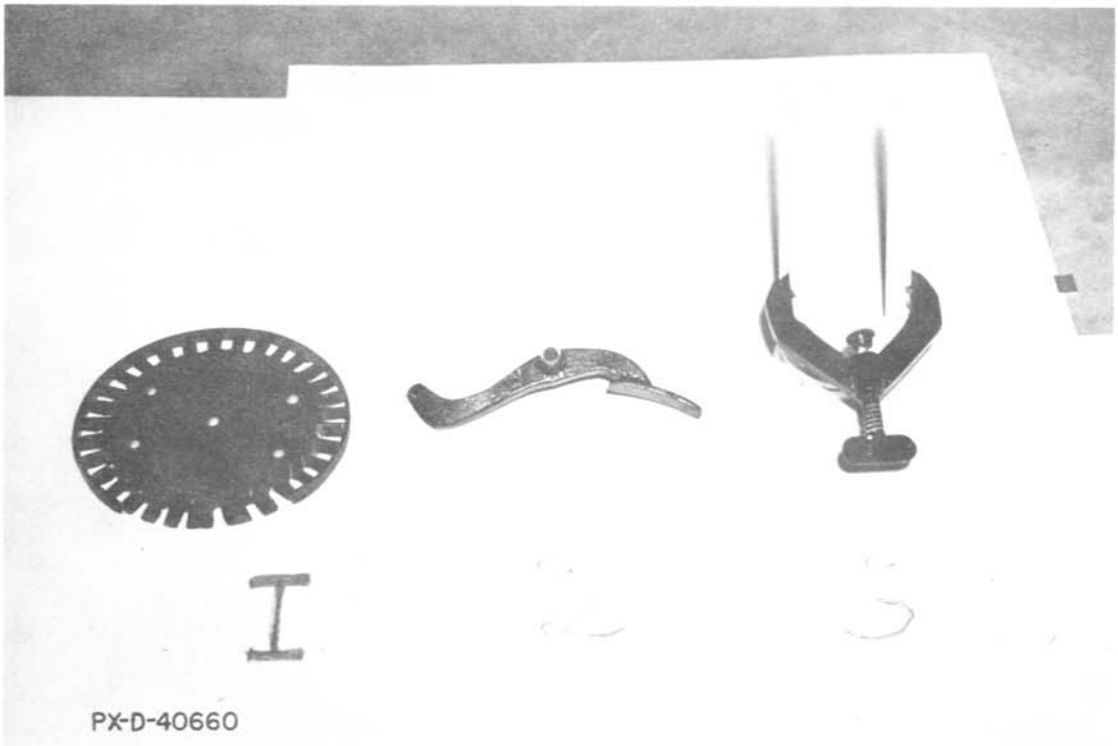
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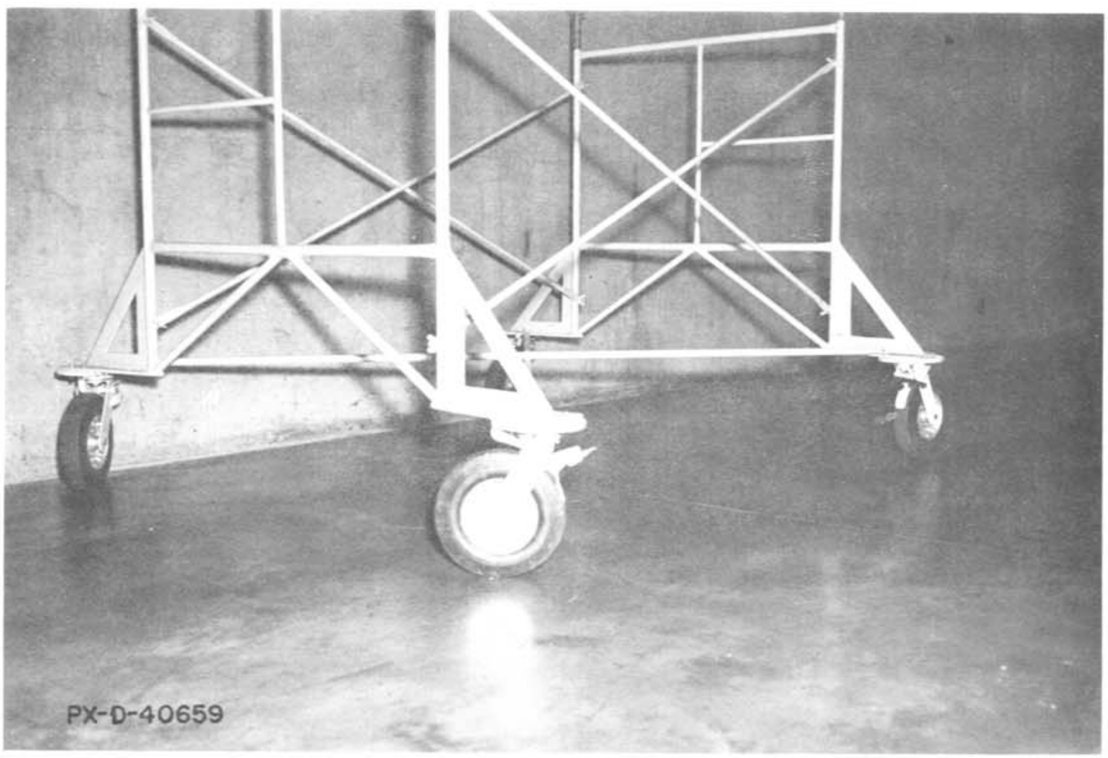
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NO-SLIP GRIPS FOR SCREWS

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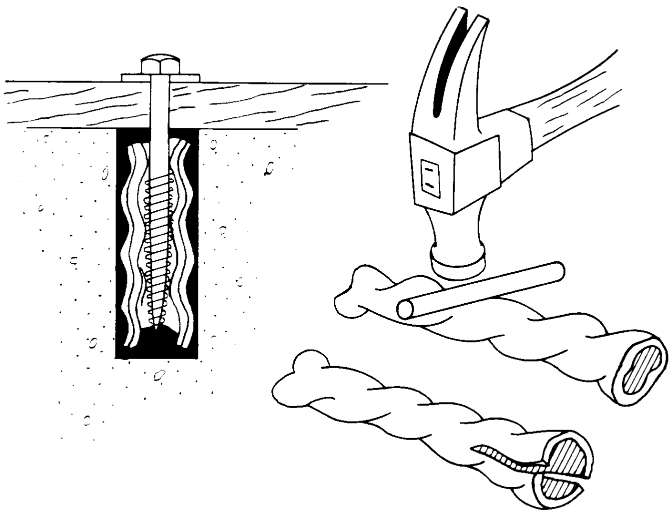
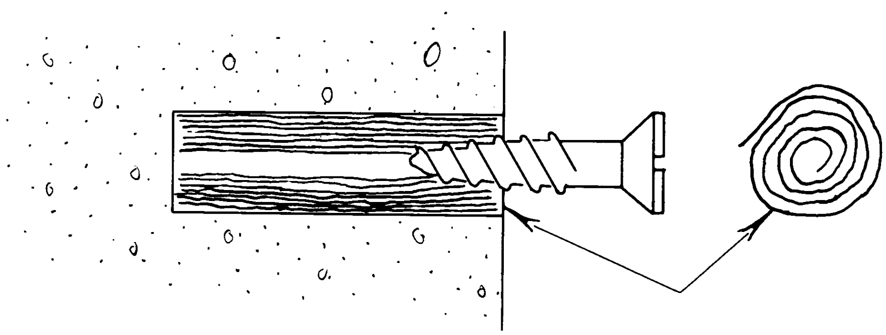


If you think the various metal and plastic commercial screw anchors are the only answer except cementing for holding screws in masonry, take a look at these sketches and words from Straits State Park, Michigan:

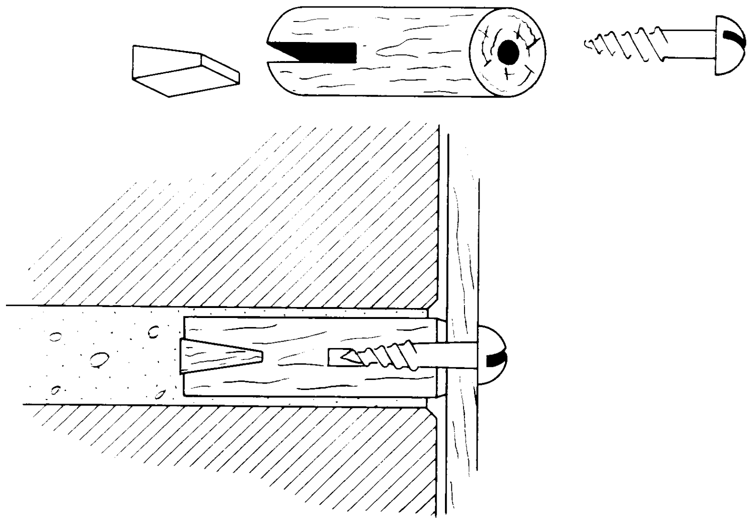
Copper Grip Sleeve

(1) Using copper tubing of a diameter which will assure its fitting snugly when forced into the hole, cut a length to correspond to the depth of the hole. (2) Make a saw slot in the outer end to allow for expansion of the sleeve. (3) With a nail or similar object placed horizontally on the sleeve, hammer dents into it which would correspond roughly to threads of the screw. (4) Insert sleeve into hold and drive the screw, which will then anchor firmly.



Foil Sleeve

Around a nail or other object of a diameter smaller than the screw, wrap ordinary household-use foil to a thickness to fit the hole prepared for the screw. Remove the nail and place the foil in the masonry hole. The screw, with its tip placed in the hole in the foil, will than fit and thread into the metal much as it would in a common lead expansion anchor.



Improved Wooden Plugs

Loosening of wooden plugs used for securing screws can be prevented by driving a wedge into the inner end of the plug. Slot one end of the plug about twice the length of the wedge. This will prevent splitting. Place the tip of the wedge in the slot and shove the plug gently into place, then seat it firmly with a hammer. Make a pilot hole in the plug to receive the screw.

* * * * *

SAFETY MEASURE FOR TRUCKS
(Suggestion R5RG-61-20)

While observing field crews working close to vehicles, especially dump trucks and trucks with booms or other heavy equipment, Mr. Daniel Farias, Hydraulic Engineer on the Rio Grande Project, Texas, became aware of the imminent danger to those working or simply standing behind these vehicles. It is often necessary for a driver in the midst of operations to back up or maneuver his vehicle into position without prior warning to others. The elimination of this danger could be of incalculable value in preventing accidents.

The present method of signalling, if any, is such that under normal circumstances a worker who is absorbed in his labor may or may not see or hear a warning. Mr. Farias suggested that a warning device be installed that would immediately draw the attention of workmen located around and behind a vehicle and alert them as to the intention of the driver. This might be a horn located in the rear; making the sound distinctly audible.

* * * * *

VERTICAL PLASTIC CUTOFF

By
K. S. EHRMAN
Chief, Waterways Design Branch
Columbia Basin Project

Earth canals and laterals in sidehill locations often need linings for bank safety and seepage control. If irrigation is planned above the canal, a rising water table may create back pressures that could rupture conventional canal linings. However, where a relatively impervious layer of silt, clay, or rock exists within a reasonable distance below bottom grade, a vertical cutoff wall in the lower bank may provide the required safety and seepage control. Such a condition existed on the Columbia Basin Project constructed and presently operated by the U.S. Bureau of Reclamation.

Approximately 5,934 linear feet of vertical plastic membrane cutoffs were constructed along two canals on the Columbia Basin Project in March and April of 1963. Work on one canal consisted of installing 2,334 linear feet of 10-mil black polyvinyl chloride sheeting 24 feet wide in a nearly vertical trench to strengthen the canal's lower bank. On the second canal 3,600 linear feet of two-ply reinforced polyethylene sheeting 12 feet wide was installed in a vertical trench along the lower inside toe of the canal and this was topped by compacted blended earth lining along the inside lower canal bank to reduce seepage. The work on both canals was performed by contract under specifications prepared by the Bureau. The installations were the culmination of experimental work with plastic membrane cutoffs performed on the Boise Project in Idaho in 1959 and on the Columbia Project in 1962.

Vertical plastic curtain walls of the type installed on the Boise Project in the spring of 1959 appeared to offer a low-cost answer to the project needs. Accordingly, in the spring of 1962, a 300-foot experimental test reach was selected on the Columbia Basin Project's East Low Canal for installation of a 20-foot-wide plastic membrane. In this reach, leaching and piping over a period of years through intermingled layers and pockets of sand and caliche in and below the canal bank had caused occasional breaks. A plastic membrane cutoff could sever these layers and prevent future canal breaks.

Experimental Installation

The experimental work in 1962 was advertised, but the only bid received was rejected as being excessive. Accordingly, the work was accomplished by Government forces to the specifications illustrated on Drawing No. 222-116-32355, page 26. When completed the actual installation covered only approximately 200 feet because of construction problems encountered.

A 300-foot-long by 28-foot-wide strip of 8-mil-thick black polyethylene membrane accordian folded was ordered for the work. Upon its arrival, it was discovered that the supplier had substituted 6-mil-thick plastic. Because of time limitations, however, this thinner plastic was used and a price adjustment secured from the supplier. Essentially the procedure was to blade a berm at an elevation 18 inches above water surface with a dozer; then to excavate a vertical-sided trench about 25.5 feet deep and 4.5 feet wide with a 1-cubic-yard dragline. The plastic was unfolded, suspended with ropes in the trench and the trench backfilled with the dozer. The excavation was into damp sand which had some tendency to slough, particularly after it dried out.

Due to a breakdown of the dragline, it was impossible to finish all 300 feet of trench fast enough to avoid some sloughing. To minimize this danger a 100-foot strip of the plastic was suspended from the bank of the first excavated portion of the trench and backfilling began by pushing the material from the canal side into the trench by dozer. Unfortunately a large slough occurred while backfilling was in progress. The sloughing material fell against the plastic and tore it loose from most of its anchors, with most of the plastic sheeting falling into the bottom of the trench. Since safety requirements prohibited entering the trench, the entire reach was backfilled and a new trench re-excavated through it. In spite of some additional sloughing, the remaining 200 feet of plastic was successfully installed. Loose backfill was placed through the intermediate reach, water was added to the backfill at the ends of the trench to make a slurry to seal the ends in place. Gravel protection was then placed along the inside slope of the canal.

Figures 1, 2, 3, 4, 5, and 6 illustrate various stages of this installation.

Figure 1

Figure 1 on the preceding page is a view of the cutoff trench. In general, the trench was standing in a nearly vertical position, although excavation was complete.

Figure 2 shows the method of tying the anchor ropes to a loop formed by a piece of filament tape to anchor the top edge of the plastic. This tape works very well on clean plastic.

Figure 2

Figure 3 below is a view looking downstream showing the plastic sheet lying on the operating road preparatory to placing it in the trench. This sheet extends approximately 118 feet and the decision was made to install this piece of plastic before additional caving could occur.

Figure 3

Figure 4 shows workmen placing the plastic sheet in the reach shown previously. Although the filament tape anchored to the upper edge of the plastic was spaced 10 to 12 feet apart, it appeared to be quite secure. Additional anchors were placed to strengthen the hold on the plastic after it was determined the plastic was being subjected to considerable stress during subsequent backfilling operations.

Figure 4

Figure 5

Figure 5 is a view looking upstream showing backfilling operations. The backfill corresponds closely to the top of the plastic sheet. Figure 6 at the top of the next page is a view of the canal looking downstream along the right bank showing conditions after completion of

Figure 6

the test installation. Gravel has been placed on the inside sideslope to provide erosion protection. The drill at the right embankment toe is installing an additional ground-water observation well to be used to evaluate the effectiveness of the cutoff.

When water was put into the canal at the beginning of the irrigation season, there was some settlement of the loose backfill. However, this consolidation had been expected and the bank was reshaped by operation and maintenance forces when equilibrium was reached. Observation well readings during the 1962 irrigation season indicated that the membrane was not only affording protection to the canal banks but was also reducing water loss through the bank. The rise in wells directly opposite the lined reach was as much as 10 feet less than the rise in wells at either end of the reach. Total direct construction cost including the plastic and riprap for the successfully installed 200 feet of lining was slightly more than $11.00 per foot. In spite of the difficulties encountered in making this installation, it was obvious that a successful low-cost side lining could be secured by installing a plastic membrane in a vertical trench.

Second Trial Installation

The success of the first installation in the East Low Canal and the availability of a ladder-type excavator with a shield used for installing draintile in wet and unstable ground suggested a possible solution of a different problem. A portion of irrigable land adjacent to a wasteway could only be drained by pumping into the wasteway but unfortunately the wasteway was constructed in gravelly materials that would have rapidly recharged the area being pumped. It was decided that if a cutoff wall

Figure 7

could be installed to a relatively impervious layer of material which was 6 to 8 feet below ground surface this recirculation of pumped water would be eliminated. Project Engineer W. T. Lowe of the Drainage Branch devised a shield to fit the ladder-type excavators so that a vertical roll of plastic up to 12 feet long could be suspended inside the shield and fed out between the rollers at the rear. After a trial run in firm ground, about 1,300 feet of 8-mil polyethylene plastic was installed by the project forces along the wasteway, and although the plastic initially tended to bind in the rollers at the rear of the shield, this difficulty was generally corrected by remodeling the rollers to use washing machine wringer rolls with sealed bearings. The depth of the installed plastic varied from 6 to 10 feet.

The trial run is shown in Photographs 7 and 8. Photograph 7 is a closeup of the plastic cutoff curtain being installed during early trials. A trencher was used to excavate to a depth of approximately 10 feet in preparation for the commencement of the trial. One man is inside the project-developed membrane laying shield preparing to start feeding plastic through the pairs of hard rubber rollers visible on the trailing edge. Further experience indicated that a more sophisticated roller system might be required if the cutoff curtain was to be laid in wet trenches or in caving ground.

Figure 8

Photograph 8 shows more detail of the actual operation along the wasteway. An auxiliary shield attached to the trencher for protection against sloughing ahead of the shield is visible. The trencher is a special model built for drain-tile installation.

West Canal Installation

The success of both the experimental East Low and wasteway installations prompted two more extensive installations during the 1962-63 nonirrigation season. On the West Canal, leakage from one reach about 5,050 feet long was a major contributor to a high water table threatening about 300 acres of land. Full lining of the canal was impracticable because of the size of the canal and because irrigation from higher ground could also contribute to the high water table, so that back pressure could be expected against a full-lined perimeter.

The canal in this reach was excavated in sands, silts, and caliche with a relatively impervious indurated material at varying depths below grade. The saturated sands were quite unstable. In this situation, it appeared that a vertical plastic cutoff wall along the inside toe of the lower bank plus a side lining of the inside lower bank would form a barrier against the migration of water from the canal and from the lands above the canal into the lower areas. Accordingly, plans were prepared for the installation of 4,000 square yards of plastic membrane to be placed in the trench to a maximum depth of 12 feet below grade, using the shield and equipment developed for the wasteway installation. The plastic was to be topped by a compacted blended earth side lining. The work was advertised and awarded to a low bidder in the fall of 1962.

The contractor began by excavating for the side lining with a dragline. The canal was dewatered to a point below the canal invert grade by digging a drain trench along the right bottom of the canal and pumping water over a dike at the downstream end. As permitted by the specifications, the contractor decided to use the project-owned shield. The contractor also leased the same ladder trencher used in the experimental installations, and after completing the side lining excavation, began the installation of the Government-furnished 10-mil polyvinyl chloride sheet.

Again difficulties were encountered because of the tendency of the plastic to bind and tear as it emerged from the shield. After some 25 to 30 feet of plastic had been installed and before the full depth of cutoff was reached an equipment breakdown stopped work. During this enforced shutdown period the contractor further modified the shield to improve its operations. These modifications consisted of lengthening the shield, so that a second roll of membrane material could be placed within it; providing a sealed bearing for the plastic roll to be suspended from; and installing a pipe for an air jet to keep silt and mud from settling in the bottom of the shield.

Using the newly modified shield the contractor resumed work and placed 75 feet of plastic. Again some ripping and tearing occurred. In order to use a material with greater resistance to binding and tearing, a substitution of two-ply nylon reinforced polyethylene sheeting was authorized for use.

A further complication was encountered where one reach of the canal was on a curve and where caliche was at or near the canal invert grade. The contractor found that the caliche in this reach could be ripped sufficiently to be excavated, but that the trencher could not be turned on a short enough radius to negotiate the curve. Therefore the trench in this caliche reach was ripped with a tractor, excavated to a width of 3 feet with a backhoe and refilled with the same blended earth mixture designed for the side lining above the cutoff. The blended earth lining was placed in four short reaches where depth to caliche was a maximum of only 2 feet.

The machine was used, however, to install 2,740 lineal feet of plastic in soft and unstable ground. The depth of the machine-excavated trench varied from about 2 feet to a maximum of 9 feet, which was the greatest depth before caliche was reached. Even in a firm trench the maximum installed depth of plastic is about 10-1/2 feet because of the tendency of the material to slump when backfill was placed against it. In unstable ground about 7.5 to 8 feet was the maximum depth that can be installed using the ladder excavator and shield.

During the winter the sandy upstream reach of the canal that had previously tended to slough dried out sufficiently so that a trench could be excavated to a depth of about 8-1/2 feet with a backhoe. A roll of plastic material was suspended on end in the trench, then unrolled to form a vertical cutoff. After the cutoff was completed, the contractor placed a 1-foot-thick layer of preblended lining material over the membrane-lined trenches before constructing the remainder of the compacted blended earth side lining by conventional methods.

Details of the work are shown in Photographs 9, 10, 11, 12, and 13.

Photograph 9 is a view of the trenching equipment and attached Government-owned shield containing a 400-foot roll of 10-mil polyvinyl chloride plastic to be installed to a depth to 12 feet below the toe of the left bank of the West Canal.

Photo 9

Figure 10

Figure 10 is another view of the trenching equipment and attached shield containing a 400-foot roll of the plastic. Figure 11 below is a view from the left slope of the canal showing backfilling operations in badly caving sand areas. Workman in the center is holding the plastic curtain as dozers are filling around it. An air hose directly under the workman on top of the plastic dispenser shield leads to an air pump located in the bottom of the shield which in turn is used to pump out water and silt and make sure the plastic rolls are turning freely.

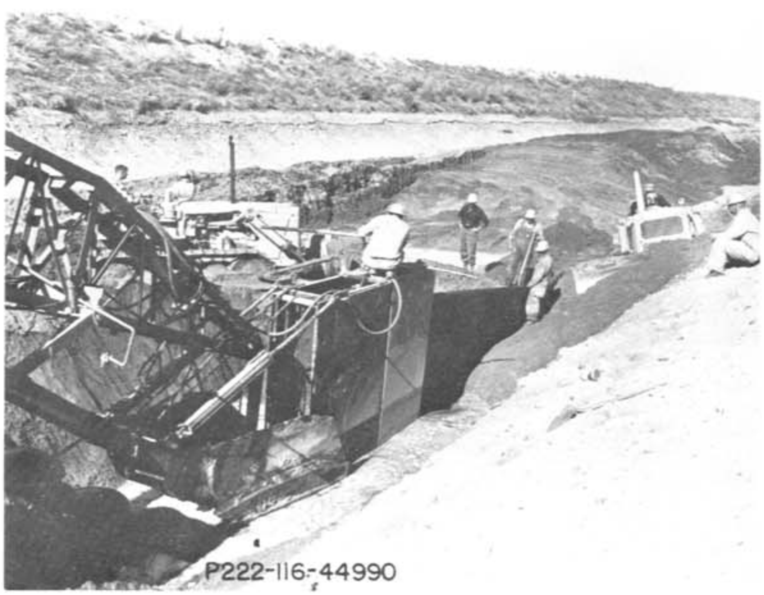


Figure 11

Figure 12

Figure 12 shows backfilling operations of the plastic cutoff curtain. Note the caving area in front of the two workmen in center of the figure. Water is visible on the left side of the plastic curtain and directly in front of the dozer in the foreground. Figure 13 is another view of the backfill operations for the plastic curtain. Workman in the center holds the plastic as dozers are filling on each side of it.

Figure 13

Total contract cost including the two-ply plastic was about $19.00 per linear foot of lining. Early readings of observation wells below the canal indicated much slower buildup of ground water than in previous years. This apparently indicates that plastic curtain is performing its job satisfactorily.

East Low Canal Installation

In the fall of 1962, three separate reaches of the East Low Canal were selected for the installation of vertical plastic membrane side lining. These were reaches where bank stability was questionable. In one of the reaches a canal break had occurred at an apparent low spot in the core bank. Free water was emerging in places along the toe of the bank and there was sufficient moisture within the bank that efflorescence from the evaporation of pore water was occurring on the operating road on top of the bank. Probes with auger holes and cross trenches in the banks indicated typically silty sand or sandy silt interspersed with streaks of sand and caliche. The original ground below the bank was a low density loess and lime impregnated sandy silt (caliche) with occasional lenses of open gravel. The material was considered free draining enough that it could be expected to stand vertically for short periods of time.

Under these conditions a plastic cutoff wall similar to that previously described on the East Low Canal appeared to offer an inexpensive and satisfactory method of repair. Plans were prepared as shown on Drawing No. 222-116-32835, page 27, and the work was advertised and awarded to the low bidder. The contractor began work in the upstream reach of the canal excavating the berm with a dozer and the trench with a dragline.

The 10-mil polyvinyl chloride sheeting was furnished to the contractor, accordian folded in 250-foot-long sheets. Renting hangar space at the Ephrata, Washington Airport, the contractor unfolded the plastic and rolled it around a pipe spindle. The plastic was placed in the trench by suspending the roll vertically from a second dragline and it was then unrolled like a new carpet as excavation proceeded.

The method of installation proved fast and efficient and kept the plastic close behind the excavation so the danger of trench sloughing before the plastic was put in its place was kept to a minimum. Backfilling followed as closely behind the plastic installation as possible. After completing the trench and berm backfill, a gravel beach belt was placed on the inside slope of the lower canal bank.

Construction details are shown on Figures 14 through 18. Figure 14 on the following page is a view of the plastic lining in the excavated trench showing the spindle around which the plastic was rolled.

Figure 15 also on the next page is a view of the plastic curtain in place.

Figure 14

Figure 15

Figure 16

Figure 16 is a view of the trench being excavated and the plastic cutoff material in place. Figure 17 shows the completed work and the beach belt protection provided to control erosion.

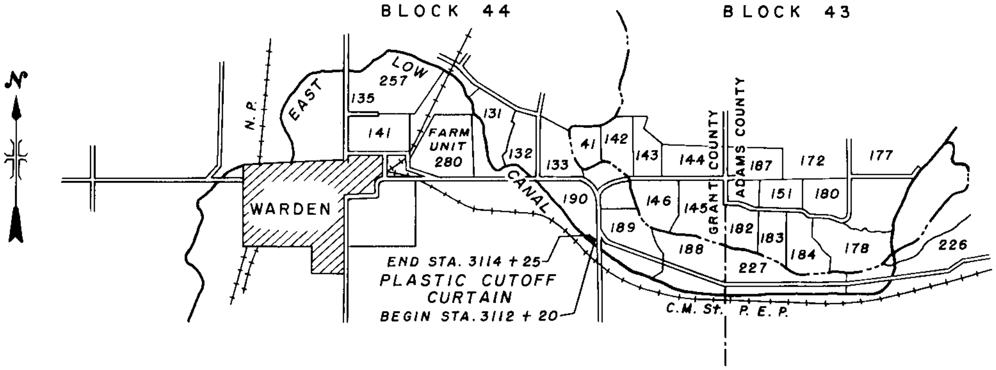
Figure 17

Figure 18

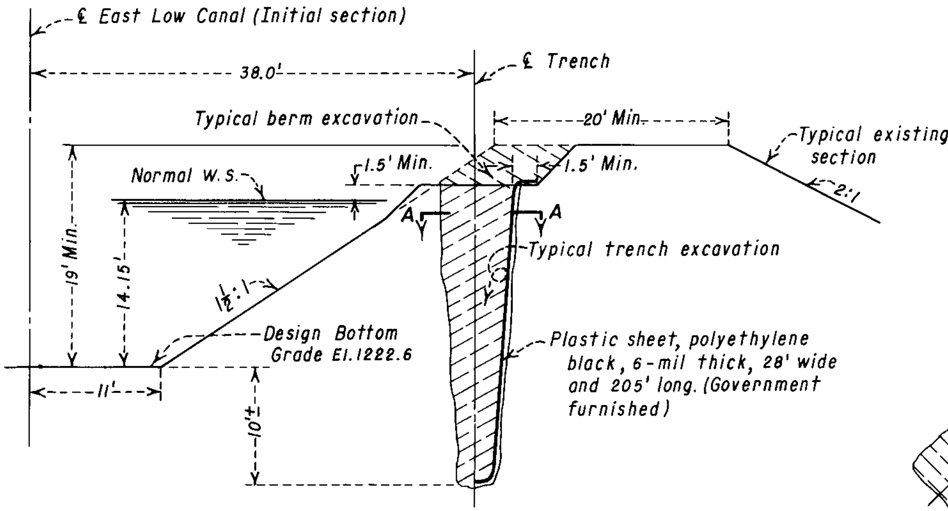
Except for some minor sloughing when too much trench was opened up on too steep a slope, work was completed on this reach of cutoff without incident. The contractor reported some holes or voids were encountered in or below the bank during excavation. When the canal was primed at the beginning of the 1963 irrigation season there was some settlement over the work area but this had been expected.

Typical of this settlement is that shown in Figure 18 above. The bank will be dressed up by project forces when settlement is complete.

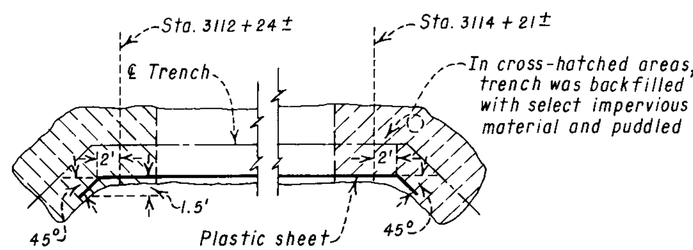
Total construction cost including Government-furnished plastic membrane for this plastic curtain job was about $9.65 per linear foot.



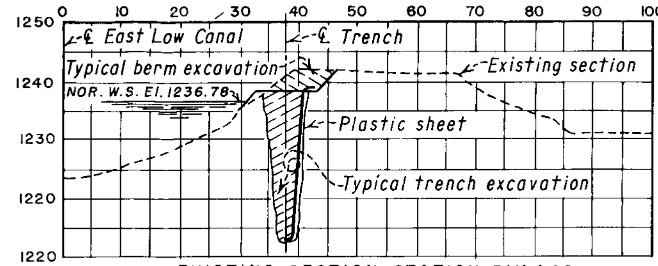
LOCATION MAP
SCALE 1" = 5000'



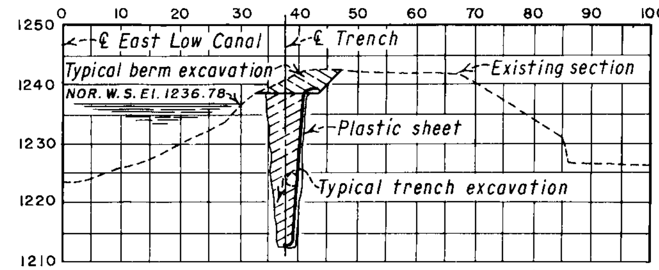
TYPICAL SECTION PLASTIC CUTOFF CURTAIN
EAST LOW CANAL - STATION 3112 + 20 TO STATION 3114 + 25



SECTION A-A



EXISTING SECTION-STATION 3111 + 00



EXISTING SECTION-STATION 3113 + 00

NOTES

There is an existing O & M road along the right side of the canal.

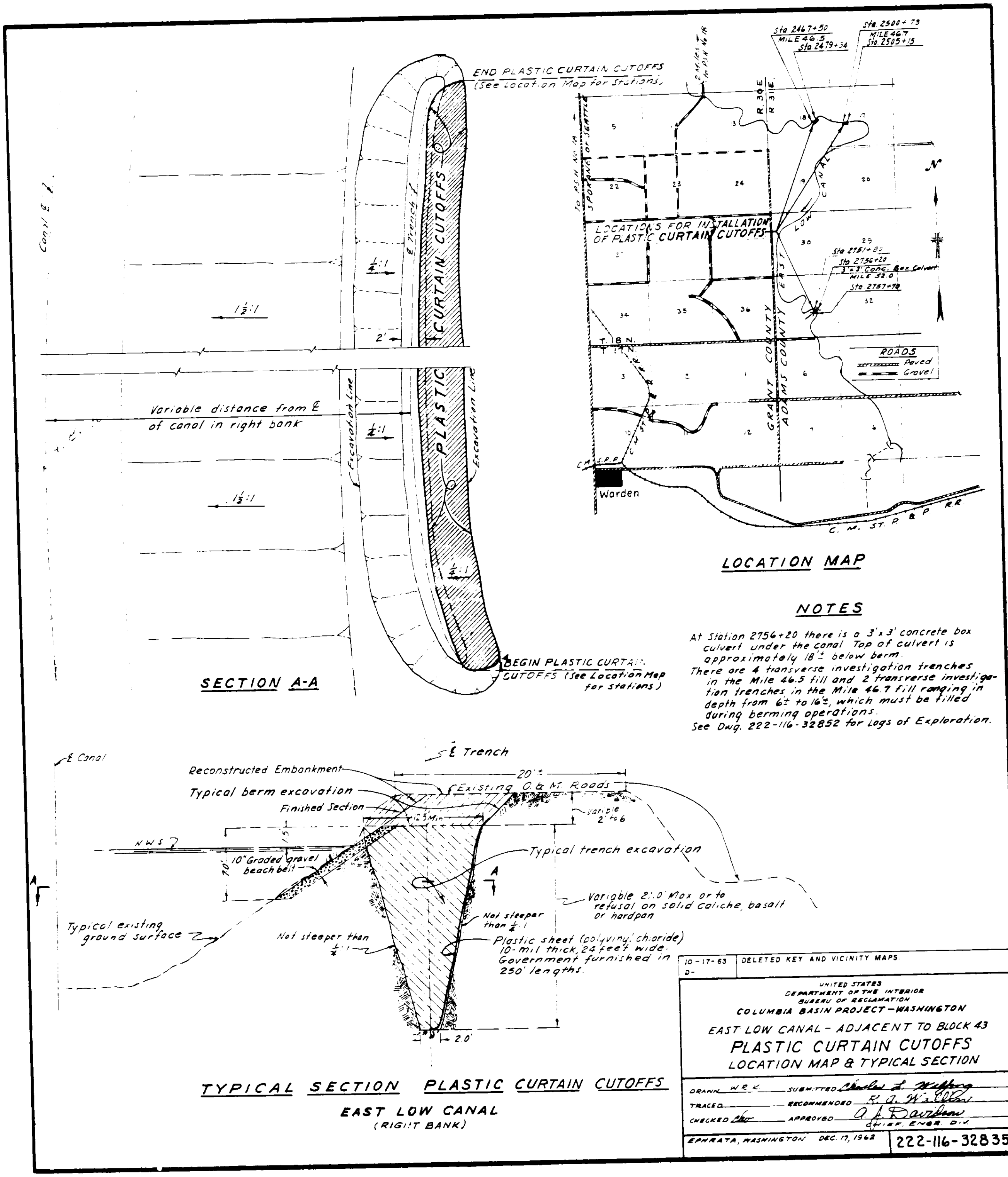
Existing sections shown were taken in January 1962.

The subgrade on which the plastic is to be placed shall be firm, free of jagged edges and smooth enough to prevent puncturing or tearing of the plastic during backfilling operations.

8-31-63 116 R.H.C.	AS BUILT.
10-17-63 D-	RETRACED. DELETED KEY AND VICINITY MAPS.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT-WASHINGTON
EAST LOW CANAL ADJACENT TO BLOCK 44
STATION 3112 + 20 TO STATION 3114 + 25
PLASTIC CUTOFF CURTAIN
LOCATION MAP-TYPICAL & EXISTING SECT'S.

DRAWN L.R.F. SUBMITTED L. R. Fox
TRACED J.S.M. RECOMMENDED K. S. Ehrman
CHECKED I.C.D. APPROVED A. J. Davidson
CHIEF ENG'R. DIVISION
DENVER, COLORADO, JAN. 22, 1962 222-116-32355


END PLASTIC CURTAIN CUTOFFS
(See Location Map for Stations)
PLASTIC CURTAIN CUTOFFS
Excavation Line
Variable distance from ℄ of canal in right bank
BEGIN PLASTIC CURTAIN CUTOFFS (See Location Map for stations)
SECTION A-A
LOCATIONS FOR INSTALLATION OF PLASTIC CURTAIN CUTOFFS
EAST LOW CANAL
GRANT COUNTY
ADAMS COUNTY
R. 30 E.
R. 31 E.
T. 18 N.
T. 17 N.
Sta 2467+50
MILE 46.5
Sta 2479+34
Sta 2500+73
MILE 46.7
Sta 2505+15
Sta 2751+83
Sta 2756+20
3'x3' Conc. Box Culvert
MILE 52.0
Sta 2757+78
ROADS
Paved
Gravel
Warden
C. M. ST. P. & P. RR
LOCATION MAP
NOTES
At Station 2756+20 there is a 3'x3' concrete box culvert under the canal. Top of culvert is approximately 18'± below berm.
There are 4 transverse investigation trenches in the Mile 46.5 fill and 2 transverse investigation trenches in the Mile 46.7 fill ranging in depth from 6'± to 16'±, which must be filled during berming operations.
See Dwg. 222-116-32852 for Logs of Exploration.
℄ Canal
℄ Trench
Reconstructed Embankment
Typical berm excavation
Finished Section
Existing O. & M. Roads
20'±
Variable 2' to 6'
N.W.S.
10" Graded gravel beach belt
Typical trench excavation
Variable 20.0' Max. or to refusal on solid caliche, basalt or hardpan
Typical existing ground surface
Not steeper than ¼:1
Plastic sheet (polyvinyl chloride) 10-mil thick, 24 feet wide. Government furnished in 250' lengths.
2.0'
TYPICAL SECTION PLASTIC CURTAIN CUTOFFS
EAST LOW CANAL
(RIGHT BANK)
10-17-63 DELETED KEY AND VICINITY MAPS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT—WASHINGTON
EAST LOW CANAL - ADJACENT TO BLOCK 43
PLASTIC CURTAIN CUTOFFS
LOCATION MAP & TYPICAL SECTION
DRAWN W.R.K.
SUBMITTED
TRACED
RECOMMENDED
CHECKED
APPROVED
CHIEF, ENGR. DIV.
EPHRATA, WASHINGTON DEC. 17, 1962
222-116-32835

GPO 837-628