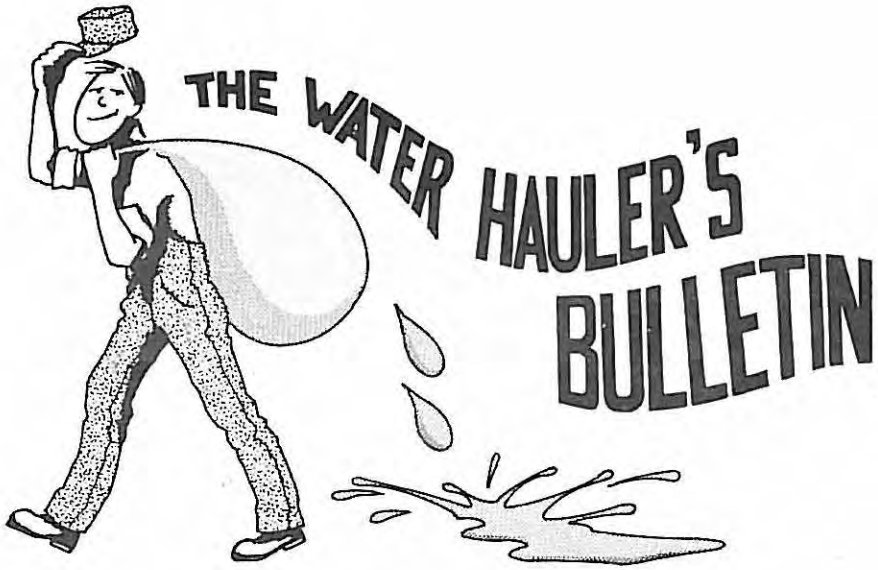

VOLUME 12, SUMMER 1983

IN THIS ISSUE

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CANAL LINER OF THE EIGHTIES

If the sixties was the decade of the buried polyethylene liner, and the seventies saw miles of unreinforced concrete slip-form lining installed; are we about to see the exposed plastic liner come of age in the eighties? The United Irrigation District has recently installed an exposed liner made by Schlegel Lining Technology Inc. What is Schlegel Lining, you may ask? Well, it's a high density polyethylene exposed liner that is manufactured by a patented process. It comes in rolls up to 10 metres wide by approximately 200 metres long. Schlegel sheet is produced in thicknesses ranging from 1.5 mm (60 mil) to 3.5 mm (140 mil). On-site joining is accomplished by an extusion-welding process that forms a homogeneous weld area that has all the properties of a parent sheet.

Lateral A1

Physical characteristics which may lend favorability to making Schlegel a plastic liner for the eighties are:

- Physical Stressing (tensile, flexural, compressive and shear strength seem to be good; can be driven on with rubber tired equipment)
- Aggressive Fluids (can withstand or resist many chemicals)
- Ultraviolet Degradation (should withstand 25 years or more of our climatic conditions)
- Temperature Changes (good through -40^{o}C to 80^{o}C)
- Biological Attack (has resistance to rodents, root penetration and microbiological attacks).

Although the U.I.D. is the first irrigation district to install a fairly lengthy section of Schlegel lining (1000 metres), the Eastern Irrigation District had about 100 lineal metres of the lining material installed in an experimental ditch section in 1981. Mr. Svat Jonas of the Project Planning Branch reports "the material is showing good results with no apparent problems".

The U.I.D. installed the Schlegel liner in an earthen pad constructed to about the same standards as one used for concrete lining. The ditch section was excavated by Dyck Bros.' trapezoidal ditcher.

Schlegel recognizes that the installation of their lining system is as important as the production of their sheet. In all construction Schlegel insists installation crews are employees trained and supervised by themselves. In the U.I.D. case, additional local labor assisted the two Schlegel technicians. Installation went relatively smoothly. As with most first-time major installations, we already have ideas for improvement and time saving construction practices.

Those interested in more information about this product may contact R. J. (Bob) Thomson of Schlegel Lining Technology Inc. at 269-1769 or Project Planning Branch staff at 329-5164.

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RESEARCH NEWS UPDATE

Following is a brief description of two research studies currently underway by the staff of the Project Planning Branch, Resource Planning Division.

Buried Plastic Lining Study

The Research Section has commenced a study to evaluate the effectiveness and durability of previously installed buried plastic membrane canal liners. It is hoped that from the results obtained guidelines can be developed for selection of the most economical and effective plastic lining materials available for use as buried canal liners. The study is funded through Irrigation Council.

Preliminary work on this project is already underway and staff have been locating and identifying each type of canal lining already in place. The actual sampling and testing procedure is presently being established to determine which method will give the best results.

Samples of the various types of linings and age categories will be collected. Material samples will be used for laboratory tests such as: rupture pressure, tensile strength and puncture strength. Currently, Fabrene types P, TF, TP and No. 1044 Mai Weave are the most commonly used lining materials.

The Department of the Environment, in cooperation with Alberta Research Council, has tested plastic lining materials; however, most of these were of the PVC type and did not include most polyethylene materials currently used by our local irrigation districts.

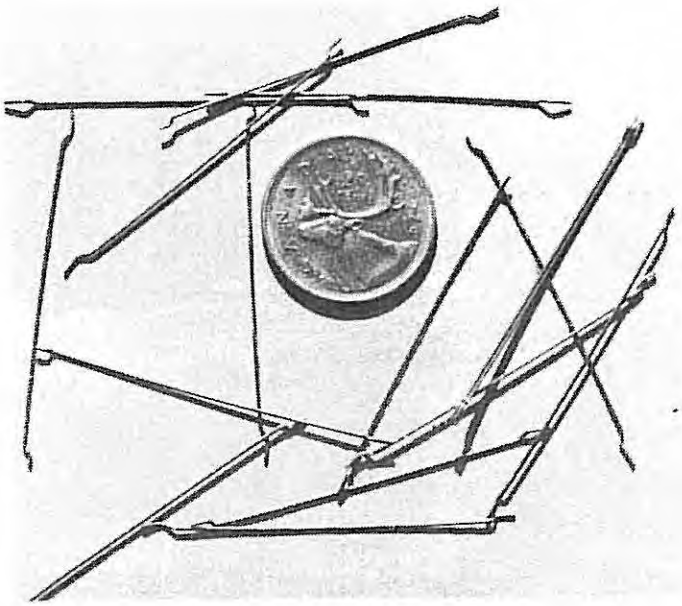
A progress report on this study will be published in the spring edition of THE WATER HAULER'S.

Reinforced Slip-form Lining

Under the Farming for the Future program, a project was initiated by the Research Section to develop a durable and rigid canal liner suitable for soil and climatic conditions in southern Alberta.

Joshi Consultants from Calgary were hired to prepare detailed designs and develop a laboratory test plan for evaluating four types of reinforced concrete slip-form liners.

With cooperation from the Taber and Lethbridge Northern Irrigation Districts, two test sites for construction of the reinforced concrete lining sections were chosen. Dyck Bros. Construction was awarded the contract for placement of the concrete. Steel fibre (50 mm long x 0.6 mm thick) was mixed with the concrete in mixtures of 12 kg/m^3, 24 kg/m^3, and 47 kg/m^3. It appears that 12 kg/m^3 or 24 kg/m^3 steel fibre is a better design for workability compared to 47 kg/m^3 steel fibre reinforced concrete. However, more concrete installations are needed to support this theory. The other reinforced concrete sections installed were 100 x 100, P13 x P13 wire mesh reinforcement, 50 x 50, P13 x P13 wire mesh reinforcement. A control section of non-reinforced concrete was also installed. Both sites will be carefully monitored throughout the ensuing



Closeup: Steel fibre in relationship to a quarter

years. The first results are expected next spring after spring thaw.

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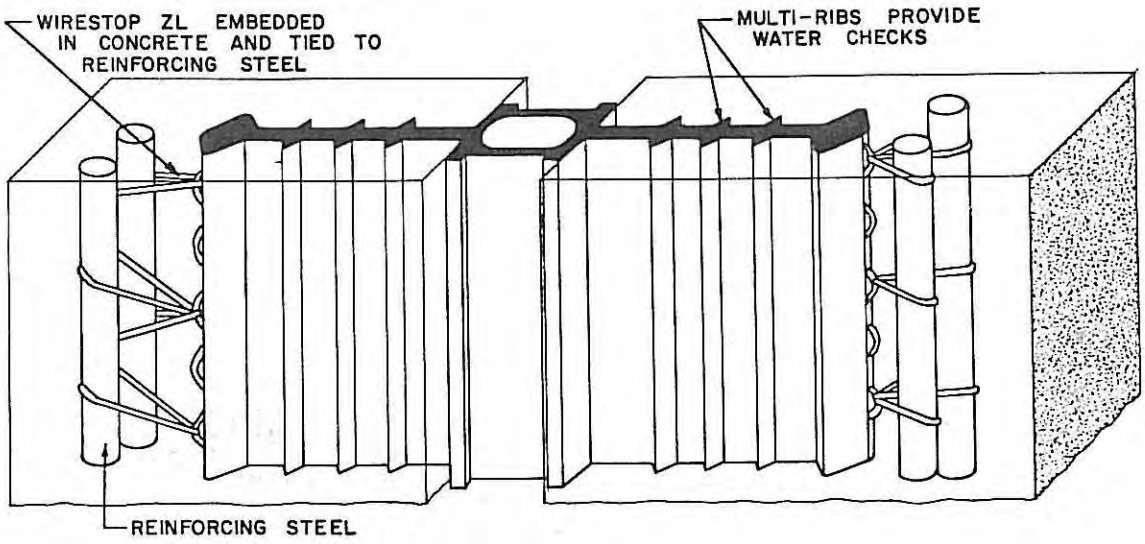
WIRESTOP ZL

Schlegel Canada have just recently introduced their "Zero Leakage" waterstop called "Wirestop ZL". The new waterstop is manufactured from high quality polyvinyl chloride resins and plasticisers with a continuous looped galvanized wire permanently banded to the end bulbs. The concrete contracts around this wire to form a permanent bond.

Waterstops have been traditionally hard to install and maintain in a precise position. Schlegel patented continuous wire looping should make fastening to rebar more positive and less time consuming.

Wirestop ZL was tested at the Wimpey Laboratories at Hayes, Middlesex, England, and was found to have zero leakage whereas conventional PVC waterstops against which the product was tested were found to leak up to 4.32 litres per metre per day. Schlegel, upon request, will make available free, the Laboratories independent report. Wirestop ZL is available from Schlegel Canada Inc. Contact Person: David Murray (416) 845-6657.



Cross-Section of "ZL" fastened to rebar and cast in concrete

WILL LIME ELIMINATE YOUR MUD PROBLEMS?

Workers slit open bags and dump hydrated lime in piles at Texas Highway Department warehouse site, Bryan. Note how lime blots up moisture from saturated clay soil.

10:00 A.M.

Lime is mixed into soil with twin disc harrow pulled by crawler tractor. Mixing starts right after lunch. 2:00 P.M.

By 5:00 p.m. the wet clay has dried out sufficiently for compaction to proceed. The compacted lime-treated subgrade will provide excellent support for the concrete floor slab.

How many times have we had our construction sites bogged down by mud? Have you ever thought of using lime to dry up the mired-down areas?

Quicklime and hydrated lime have a high affinity for moisture, producing a blotting action on wet clay and silt soils. The National Lime Association suggests that "for most dry up applications 2 to 4% of lime (based on dry weight of soil) is required, depending on degree of wetness. This is about 1-2 lbs./sq.ft. for 6 inches of compacted depth. At 3-5¢/lb., the lime material cost is generally 5-6¢/sq.ft. depending on whether bulk or bagged material is used, amount required, rate of application, etc.".

Where lime is utilized for drying and expediting construction, construction procedures are as follows: (1) lime spreading, (2) mixing lime and soil, and (3) compaction. For large jobs these functions are achieved by using heavy equipment. Wet spots which may be too small to justify the use of heavy equipment, can be easily dried up with hand-labour using rakes and hoes, and hand tampers.

Quicklime can cause burns and hydrated lime can be caustic, thus precautions are advisable to protect the skin and eyes of the workman. Handlers should wear proper tight fitting goggles, gauntlet gloves, long sleeves and pants tucked into their boots. Wash off all lime dust from skin as soon as practical but in case of eyes flush out with clean water immediately and see a doctor. Protective cream is suggested for those with sensitive skin. Breathing lime dust is harmless. The National Lime Association suggests that following these few points, lime is perfectly safe to use.

For more information please contact Mr. John Hubbard or Art Kuzina of Steel Brothers Canada Ltd. Calgary telephone 276-9335.

NEW INDUSTRY IN ALBERTA? - GAME FISH FARMING

Although rearing and feeding of trout in ponds on the prairies is relatively new, more and more farmers are becoming interested in such an operation, especially when there is a source of water available such as an irrigation canal. The severe climatic conditions and the shorter growing seasons limit Alberta to "cold water" fish farming, in particular, the rearing of trout.

Methods of rearing trout are generally of two types, extensive and intensive. Extensive farming involves simply stocking trout in a pond or lake in the spring and harvesting them in the fall. If conditions are suitable, little maintenance is required, thus costs are lower, but the returns of harvested trout are also low. The fish farmer in this case has no control over unfavorable weather changes and little control over fish losses due to predators or poor water quality.

In intensive farming, fish are held in high densities where they are fed regularly, closely monitored and controlled. This type of farming involves more complex rearing systems that may require a continuous flow of fresh water through the ponds and aeration systems to maintain oxygen supplies. This system is most successful in larger commercial operations.

There were 285 permits issued in the 1982-83 season by the Fish and Wildlife Branch in the southern Alberta region. Permits are required for any ponds that are going to be stocked with fish, either for commercial use or private use.

The most common type of pond on the irrigated farm is an excavated pond or dugout of roughly 100 m x 25 m size with a gently sloping bottom varying in depth of 2 m at one end to 4 m at the other. If fish survival over winter is desired, the pond should be deeper. Location of the pond must be considered, as it should not be located in an area where runoff water from barnyards, feedlots, fertilized land, exposed soils or areas treated with pesticides are able to enter the pond. Because some irrigation districts use herbicides such as Magnacide H to control weed growth, they must use these chemicals with great care to avoid contaminating fish ponds that are taking water out of irrigation canals. Most weed control chemicals are toxic to fish; therefore, treated water must be kept out of the pond at all cost. It is necessary that the Irrigation District Water Supervisor

Nets are the "combine" for harvesting this crop

notify the various fish farmers that may be affected when herbicides or pesticides are used for weed control in canals.

It is important to make sure that water entering the pond is filtered through a gravel screen especially if water is drawn from an irrigation canal. If the water is not screened, young predator fish will enter the pond and eventually the stock will be lost. Trout are especially vulnerable to predation the first two days after stocking. It is therefore advisable to keep a close watch on the pond during the first few days while the fish become accustomed to their new environment.

Fish from a pond may be harvested by gill nets, angling, or draining the pond. Harvesting should be done in late fall if the pond winterkills. The quality of the harvested trout is very important if it is to be sold commercially, as good quality ensures the best returns, which could be a supplementary income to the farmer. Trout farmers must be aware of health regulations if fish are to be sold to the public, also commercial fish farm licenses are a must. For further information, contact Frank Bishop at 329-5266 of the Fish and Wildlife Division in Lethbridge.

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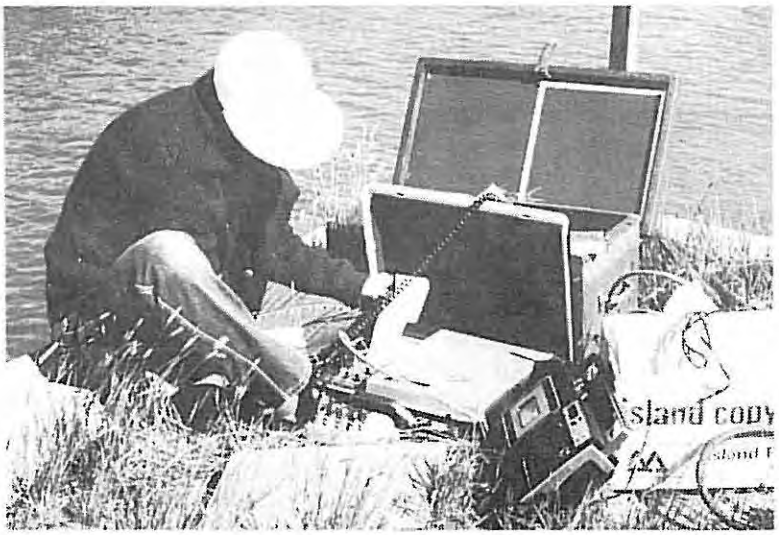
BRID - MONITORING IRRIGATION WATER

Control of irrigation water is becoming more and more important as we all become aware of the finite nature of the resource. Efficient control of irrigation water requires a well maintained canal system and an understanding of how to best operate that system to provide timely deliveries to the water user. A key element to efficient control is knowledge on how the check structures and canals react when gate settings are changed. This was the goal of the Bow River Irrigation District when the consulting firm of Underwood McLellan Ltd. was asked to conduct a study of the operation of the Lomond Lateral.

Some operating problems had been experienced on the Lomond Lateral including uneven flows through turnouts because of fluctuating water levels, and delivery times to farmers at the bottom end of the system that were measured in days instead of in hours. The study was undertaken in hopes of giving the District operating and engineering staff a better understanding of how the canal system responds so that new operating ideas and methods could be tried.

Twelve sets of electronic recording equipment were set out along the Lomond Lateral system to record the water levels at key points in the system. The ditchriders were asked to fill in forms indicating when they made gate and turnout changes and by how much. With the aid of a computer, the water level and gate change records were all plotted together for analysis.

Two plots were drawn: an hourly based plot, and a daily based plot. The plots were shown to the District staff. From the hourly plots each gate change and level fluctuation was evident. The staff were able to identify specific events over the course of the season and could recall the circumstances and actions that led to those events. From the daily plots the seasonal trends in canal levels could be seen. For example, the accompanying figure #4 shows quite well the effects of the rainstorm on July 1 (1982) weekend and also the effects of an over commitment of water at the downstream turnouts on the July 10-11 weekend and the subsequent recovery early the following week.



Technologist transferring water level data onto cassette tape.

In addition, lag times and total flow volumes were calculated. Lag time can be calculated from the plots of water level by comparing the plots of two sites, one upstream and one downstream. The time between a flow change arriving at the upstream site and the time it gets to the downstream site is the lag time. The total volume of flow past a point in the canal can be calculated, if a rating table is available, by determining the area under the water level plot.

The District is now in the process of reviewing a series of improvements that could be made to help improve its canal operation. These include: remote monitoring of canal levels for up-to-the-minute information; conversion of check gates to overshot style for easier control of levels; remote control of gate settings to cut down on ditchrider travel; and consideration of semi-automatic gate control to be implemented at some time in the future.

For more information please contact Mr. Gordon Ayers of U.M.A. at 329-4822.

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THE WATER HAULER'S BULLETIN

Designed to provide the operation and management personnel of Irrigation Districts with items of interest in their line of work. Comments are welcome. Please contact Duncan Lloyd at 329-5164, Lethbridge.

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