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THE WATER HAULER'S BULLETIN

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IN THIS ISSUE

When Is Ice Safe?	*p. 1-3*	*Lining Failure*	*p. 7*
Precon's New Turnout	*p. 4*	*Valve Actuators*	*p. 8*
Land Evaluation	*p. 5*	*Insert - Upcoming Events*	
300 mm Drainage Tubing	*p. 6*		

WHEN IS ICE SAFE?

With ice covering our reservoirs and rivers from four to six months, we all will sometime venture out on the ice for either work or recreation. What is "safe ice" then, you ask? Alberta Health Safety & Compensation have a neat little brochure out, entitled "Travelling, Standing & Working on Ice Requires Extreme Caution", that tells us how to calculate ice effective thickness and relate its equivalent load bearing strength. The following are excerpts:

The effective thickness of a base of clear, blue ice plus white ice or snow ice is a thickness of clear, blue ice of equivalent load bearing strength.

The hydraulic hoe on shore after being lifted back up through the hole in the ice. The Operator lost his life.

The formula to calculate total effective ice thickness is:

$$T_{CLEAR} + \frac{1}{2} T_{WHITE} = T_{EFFECTIVE}$$

Example: 400 mm of clear ice plus 200 mm of snow ice = 400 mm clear + $\frac{1}{2}$ of 200 mm snow ice = 500 mm effective. WHERE WATER LIES BETWEEN LAYERS, USE ONLY THE DEPTH OF THE TOP LAYER OF ICE.

Daily air temperatures must be constant over a given period so that ice thickness will withstand the permissible loads as outlined in the tables. When ice is:

- Less than 500 mm thick, temperature must be constant for three (3) days.
- Between 500 and 1000 mm thick, temperature must be constant for four (4) days.
- Over 1000 mm thick, temperature must be constant for five (5) days.

During a sudden drop in temperature and for three to five days following such a decline, the minimum ice thickness should be adjusted. If the temperature drop is excessive, severe thermal stressing or cracking of the ice will require caution and temporary load restrictions.

If drop is:

- 5° or less - multiply 1.4 x minimum ice thickness
- 5° to 10° - multiply 2.0 x minimum ice thickness
- 10° + - multiply 2.4 x minimum ice thickness

Under thawing temperatures where the average air temperature exceeds 0°C increase the required ice thickness given in the tables by 20 per cent or, reduce the allowable weight by one-third (1/3).

Construction of flooded areas for ice crossings, parking areas or bridge erection requires daily measurement for ice thickness, air temperature and ice cracks. Currents can create wear to the underside of the ice and reduce its thickness.

Vehicle speed should be reduced as ice thickness and water depth decreases. Water pressure waves under the ice require this. It is recommended that vehicle speeds should be less than 30 km/hr for safe passage on the appropriate thickness of effective clear ice (per table 1) over depth of water less than 15 metres. Vehicle speeds should be less than 15 km/hr when approaching shore or travelling parallel and close to shore.

Timber mats should be used to spread the surface area bearing on ice to support crawler tracks and outrigger pads when using mobile cranes to hoist heavy lifts.

Other precautions when travelling on our lakes are:

- Spacing of at least 800 metres between vehicles when travelling in convoy.
- Truck doors should be removed or securely fastened in the fully open position while travelling over ice.
- When travel is in isolated areas and over great distances, there should be an accompanying vehicle.
- Continuous travel will fatigue ice and cause failure. Change roads on ice landings frequently.

On Rivers remember the following:

- Ice bridges are to be located where channels are narrowest and deepest. Avoid shallow water and sand bars.
- Ice bridges installed for the full winter season should be given a 100 mm flood once a month.

TABLE 1

ICE STRENGTH FOR CONTINUOUS TRAVEL

This table is for clear, blue ice on lakes and on rivers. This table does not apply for parked loads, or where ice faults are evident.

Permissible load (clear, blue ice)	Effective Ice Thickness in Millimetres	
	Lake	River
One person on foot	50	60
Group, in single file	80	90
Passenger car 2000 kg	180	210
Light truck 2500 kg	200	230
Medium truck 3500 kg	260	300
Heavy truck 7000 to 8000 kg	350	410
10,000 kg	380	440
25,000 kg	630	730
45,000 kg	800	920
70,000 kg	1000	1150
110,000 kg	1250	1440

TABLE 2

ICE STRENGTH FOR STATIONARY LOADS AND WORKING ON ICE

This table is for clear, blue ice on lakes and on rivers. This table applies to loads to be stationary on ice for more than two (2) hours.

Permissible Load (clear, blue ice)	Effective Ice Thickness in Millimetres	
	Lake	River
1,000 kg	200	230
2,000 kg	300	350
4,000 kg	450	520
8,000 kg	600	690
25,000 kg	1100	1270
45,000 kg	1500	1730
70,000 kg	1800	2070
110,000 kg	2300	2650

THESE TABLES ARE INTENDED TO PROVIDE GENERAL GUIDANCE ONLY.

Any urgent concerns regarding calculations of ice thickness should be directed to 427-8848, Edmonton. Treat any ice, whether in a highball glass or on a reservoir, with the greatest respect.

* * *

LOCAL FIRM DESIGNS NEW TURNOUT

For years now, those supposedly in the know, have been predicting the day when almost all irrigation structures under seven cubic metres per second will be built with precast concrete panels. Precon Manufacturing of Lethbridge has taken the industry one step closer with their two-piece precast turnout structure.

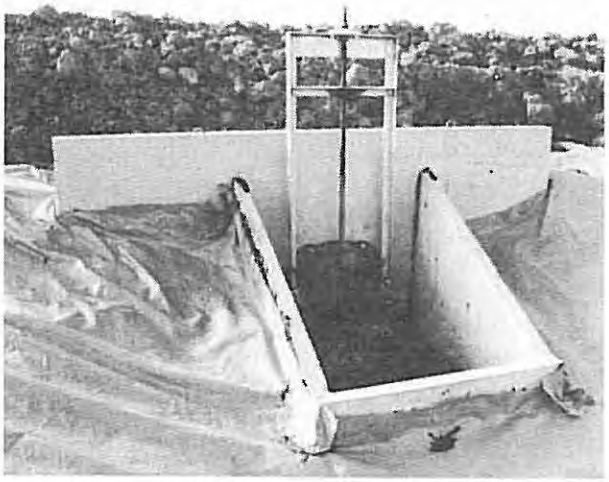
The structure, consisting of a single precast headwall and a basin, has become very popular with contractors because of the short assembly time. As many as three turnouts have been installed in a typical work day. Assembly is very simple - the monolothic inlet basin has protruding 20 mm diameter plated bolts which fit through holes in the headwall. The gate and flanged stub are designed to assemble to the structure with minimal amounts of sealants and labour time.

Precon's Robin Timmerman states "the structures are available in three sizes and can accommodate slide gates from 300 mm to 760 mm in diameter. However, headwalls can be custom built to better suit specific design demands". To use boxing terms, their large heavy weight tips the scales at just 2620 kg for the headwall and 3120 kg for the basin. Their "small turnout" weighs in at 1500 kg and the basin at 1000 kg.

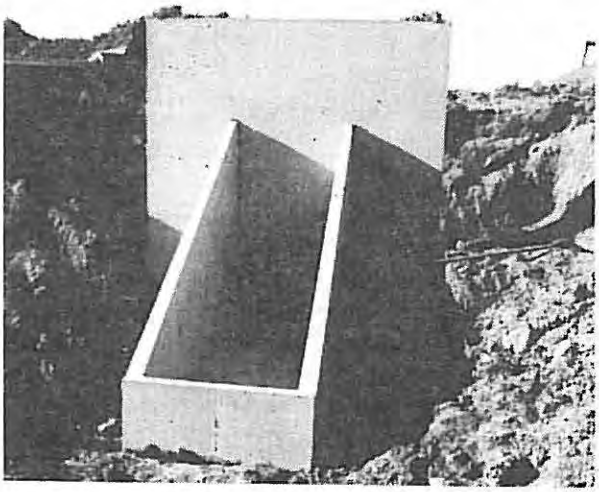
Dual bay turnouts have been installed successfully using one headwall in the Bow River Irrigation District.

From a hydraulic standpoint, the 100 mm raised sill above the channel bed, considerably reduces bedload silting.

As the ever increasing demand for larger and better performing precast hydraulic structures at less cost grows, Precon Manufacturing has done their part with the development of this two-piece turnout.



Two piece turnouts installed in EID polyethylene lined canal. Armor will be placed directly on the liner.



RID ordered this custom turnout with an extra large headwall.

* * *

TOWARDS A SINGLE LAND EVALUATION SYSTEM

In Alberta, as elsewhere in Canada, there are several systems for rating agricultural and forested land. Existing agencies and organizations have developed their own land evaluation systems to meet their specific needs. Municipal Affairs have a system known as the Farm Land Assessment Schedule used primarily for taxation purposes. The Public Lands Division has a land evaluation system for evaluating and administering public lands. Canada Land Inventory (CLI), a federal system, rates land capability for agriculture across Canada and the Alberta Soil Survey has been surveying and rating lands since the 1920's. There is also a system for evaluating range lands and the Land Irrigability Classification System for rating irrigated and potentially irrigable lands.

All of the above, except the Land Irrigability Classification System, are used for evaluating dryland for farming or grazing. Most systems recognize the fundamental influence of climate, but there are major differences in the application of this parameter. All systems suffer from a lack of specificity. Some have several ranges for values while the CLI combines all the factors together.

The multitude of different land evaluation systems is obviously a handicap for systematic and uniform land resource management. In 1982 the Soil Inventory Sub-Committee, one of four sub-committees of the Alberta Soils Advisory Committee, formed a Ratings Systems Working Group for the purpose of developing a single, uniform agricultural land evaluation system. This Group has been actively comparing the three most popular systems - Municipal Affairs, Public Lands and the CLI for the purpose of developing a homogeneous system. The need for an improved method of evaluating climatic parameters has become evident. Agrometeorologists are in the process of identifying essential differences in climate across the province to fill this information gap. Currently there is little co-ordination by the numerous agencies involved in collecting land and soils information. Soil samples have occasionally been collected at different times and in various ways by more than one organization on the same parcel of land. The duplication and inefficiency resulting should be remedied.

With imminent development of a central, computerized land information system in Alberta, the need for a single land evaluation system is now more pressing than ever before. Co-ordination of data collection, however, will not replace the need for various land evaluation systems in Alberta. Specific needs such as land classification for irrigation or specific evaluation of land will still be required. Information will simply be stored in a provincial land base data bank. Data can then be utilized for different purposes by several agencies according to their specific needs. Closer co-operation and standardization in land and soil data collection procedures in Alberta can thus be expected.

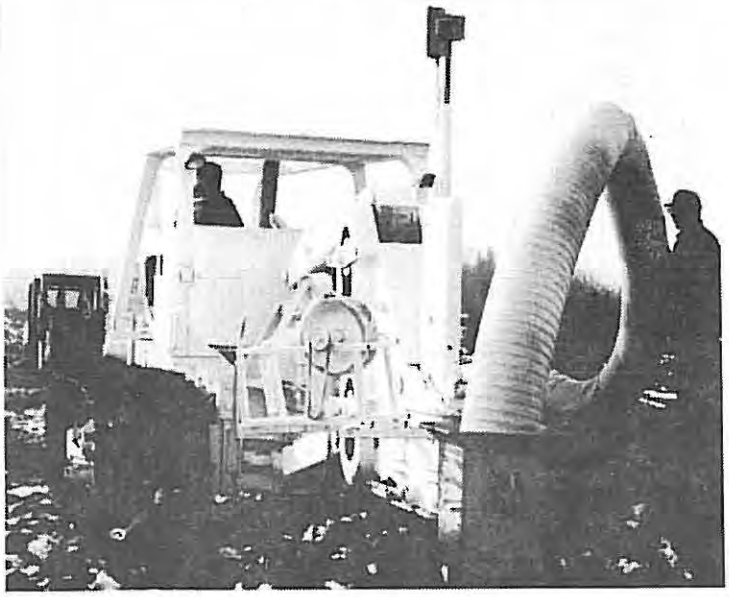
For further information, contact K. Pohjakas of the Land Classification Branch at 381-5121.

* * *

PLOWING IN 300 MM PLASTIC TUBING WITH A STANDARD DRAINAGE PLOW

Installation of 100 mm and 150 mm diameter drain tubing with the standard drainage plow has been successfully carried out on hundreds of projects throughout Alberta. Larger pipe, greater than 150 mm in diameter, has not been required because of the relatively small size of drainage projects (normally under 40 acres). However, as drainage projects have become larger, or where the movement of larger volumes of water are required (slough drainage, irrigation water), installation of larger diameter pipe is necessary. With this in mind, Jensen Engineering Ltd. of Olds, Alberta initiated plans to design, build and test a large pipe chute which would attach onto a standard drainage plow and be capable of installing 300 mm corrugated polyethylene pipe. Construction of the chute, which is approximately 400 mm wide, was completed and installed on a Badger plow which in turn was attached to a HD 21 crawler tractor during November, 1985.

Field testing of the unit was carried out during early December on a drainage project located at the Hobbema Indian Reserve near Wetaskiwin. The Montana Band was interested in draining a 400 acre slough and wetland area immediately south of the Battle River. Preliminary investigations indicated that large volumes of water would have to be drained in order to lower the water table enough to sustain crop growth. It was determined that approximately 1000 m of 300 mm corrugated plastic drain tubing, complete with filter sock, was needed to provide the outlet for approximately 15,000 metres of 100 and 150 mm lateral drain tubing which was to be installed throughout the 400 acre wet-land.



Grade was maintained by means of a Laserplane automatic grade control system.

Installation of the 300 mm tubing commenced the first week of December and was completed in 2 days. Installation depths varied from 1.1 m to 1.7 m below ground surface. At depths less than 1.3 m the drainage plow was able to pull in the 300 mm tubing unassisted. For depths greater than 1.3 m, a winch cat (D6) was used as an anchor. A large winch mounted on the front of the drainage plow provided the extra power.

The 300 mm drain tubing was supplied by United Extrusions Ltd. of Ontario at a cost of approximately $11.50/metre (FOB Calgary) which included filter. Cost of installation was $6.00/metre, giving a total cost of $17.50/metre for supply and installation.

For more information please contact Jensen Engineering Ltd., Professional Building, Olds, Alberta. T0M 1P0 (403) 556-8755.

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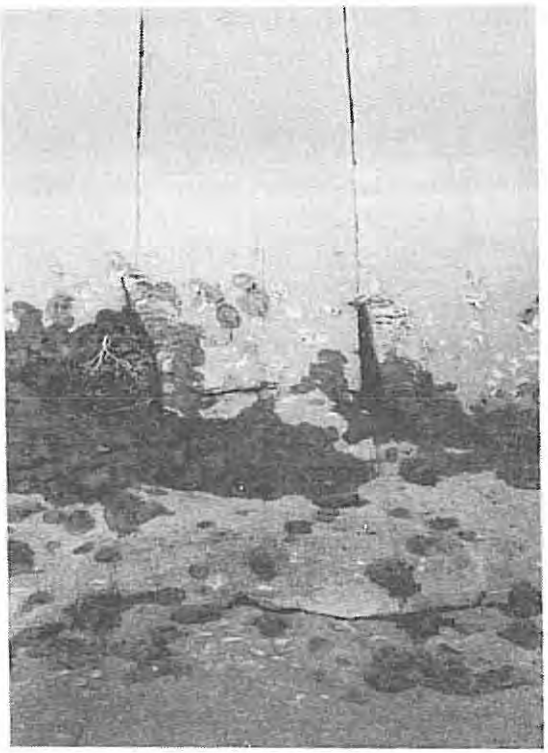
WESTERN IRRIGATION DISTRICT EXPERIENCES LINING FAILURE

The Western Irrigation District has lined approximately 6.5 kilometres of their canals with reinforced bitumenous geomembranes over the past three years and have experienced reasonably good success. However, during August 1985, one of the canals utilizing this exposed liner suffered a failure. The failure occurred over approximately 500 metres of canal (total length of liner installed in this canal is 1800 m). The liner lifted away from the bottom of the canal and was floating near the surface of the flowing water. There are 6 areas where the damage to the liner is severe and a few other areas where lesser damage is evident. Sections between the failed areas appear to be intact. The failed areas are characterized by a distortion of the trapezoidal canal shape where earth materials beneath the liner have eroded to leave a semi-circular cross-section. In some places the liner is suspended above the canal invert.

The failure mechanism is unknown at this time, although it is currently being investigated. It is postulated that the failure was initiated by one or more joint failures, thus allowing water to flow beneath the liner and subsequently causing floatation. It is speculated that the joint failures were caused by disbonding. Disbonding of the liner has been noted in several places along the failed section of liner, but has not been noted at all in the non-failed sections. The disbonding varies in size from pencil size to complete separation across the width of the channel.

The disbondings are of the adhesive failure type. Adhesive failures occur because of a lack of adhesion between the two layers, and not because the materials were torn. It is not possible from a visual inspection to determine the cause of the disbonding and since none was present at the time of failure, it remains a mystery.



Failure due to vandalism is not suspected, although not ruled out - investigations continue.

The District plans to continue its investigation to solve the reason and mechanism for the failure. In the meantime, the failure will be repaired and the canal put back into operation in time for water delivery in May 1986.

The other exposed reinforced bitumenous geomembrane installations are performing satisfactorily with no indication of deterioration, or signs of possible failure. A thorough inspection of all installations will be made prior to water entering these canals this year.

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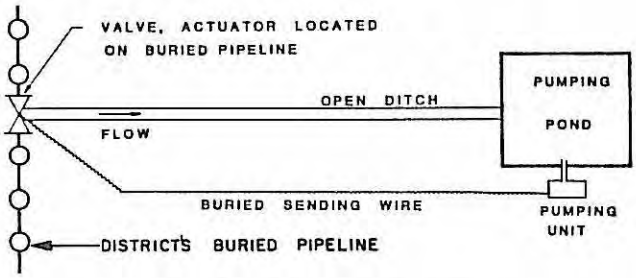
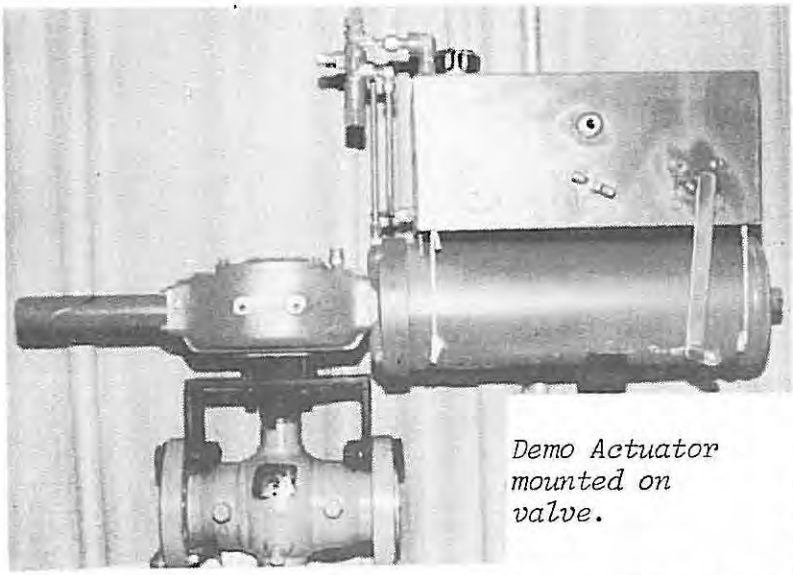
VALVE ACTUATORS

For the irrigation farmer and ditchriders alike, it is a utopian vision: a valve at a pipeline delivery point being opened and closed by the new G.H. Bettis unmanned actuator that receives its direction from the farmer's pumping station 1000 metres away. When the actuator loses its electrical signal from the pump, it will, depending upon its time-lag setting, begin closing the valve on the pipeline.

The major components of the G.H. Bettis System are a spring return valve actuator, rotary hydraulic hand pump, reservoir, three-way manual latch valve and three-way solenoid valve.



The operation of the system is very simple, the pipeline valve is manually opened by first lifting the latch on the three-way latch valve, rotating the hydraulic hand pump until the pipeline valve is in a full open position. Now, the water flows from the pipeline into the farmer's delivery ditch and into his pumping pond. The solenoid valve is tied in electrically with the pump switch so it will be energized when the pump is started. The pipeline valve will remain open until the solenoid valve is de-energized at which time the valve begins closing. The solenoid valve may be de-energized by a manual switch or it can be hooked in parallel to the pump control to close the pipeline valve whenever the pump is shutdown.



Demo Actuator mounted on valve.

The Bow River Irrigation District is planning to install the G.H. Bettis actuator system, distributed by Movac Inc. of Calgary, on H3 Lateral farm turnout.

Gone are the days when a power outage shuts down the pumping unit only to have the water continue running all night long, overflowing the pumping pond and making "one heck of a mess".

* * *

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 381-5164, Lethbridge.

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UPCOMING EVENTS

February 10 thru 14, 1986 LEVEL I DITCHRIDER'S COURSE

The Lethbridge Community College (LCC), Irrigation Projects Association and the Resource Planning Division are jointly sponsoring a five day, Level I Ditchrider's Training Course from February 10 thru 14, 1986. This course is a prerequisite to the Level II Course, which will be held in December of 1986. You can register now, by phoning the LCC at 320-3377. Participation is limited to the first twenty registrants.

February 18, 1986 SAFETY SEMINAR

The Project Planning Branch of the Resource Planning Division and the Occupational Health & Safety Division are co-sponsoring a one day Safety Seminar at Ericksen's Family Restaurant in Lethbridge. Topics to be covered are: Safe Rigging Practices, Trenching, Confined Space Entry and Safety Legislation. Registrations are again limited to 35, call 381-5164 and ask for Judy, Don or Paul.

February 24 thru 27, 1986 TROUT FARMING WORKSHOP

The Olds College, through their Department of Continuing Education, is sponsoring a four day Trout Farming Workshop. This may be of interest to Water Supervisors who have trout farming operations within their District. Topics to be covered are: Pond Management, Water Quality and Supply, Flow Through Systems, Recirculation Systems, Laboratory Work, Harvesting Weed Control. For more information call the Olds College at 556-8281.

February 25 - 26, 1986 — 22ND ANNUAL ALBERTA SOIL SCIENCE WORKSHOP

This workshop will be held at the Sheraton Cavalier Hotel in Calgary. The plenary session has the theme "Soil Quality - How Does It Affect Us?" Six speakers will present papers around this topic. For more information, please contact:

J.F. Dormaar 327-4561
A.W. Fedkenheuer 233-3607
S. Landsburg 381-5322

Tentatively March 7,14,21, 1986 — IRRIGATION BOARD OF DIRECTORS ONE DAY WORKSHOPS - LETHBRIDGE

The LCC, AIPA and Resource Planning Division have designed specifically for the elected officials of an Irrigation District three one-day workshops which will address the following topics in three days:

1. Running an Effective Meeting
2. Legislation and the District (Irrigation Act)
3. Board Members Responsibilities
4. Board - Management - Council Relationships

Participants will have opportunities to discuss with peers, the concepts and their potential application in their own Irrigation District. For more information please call the Lethbridge Community College at 320-3377.