

# MADCS

Issue 34

December 2007

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Teton Coop Reservoir Co.
- **Dan Doornbos**  
Ruby River WUA
- **Robert T. Goffena**  
Deadman's Basin WUA

**Message from the President**

Another successful workshop!! We increased our attendance and had more vender participation. Thank you for your support. If you know anyone interested in joining us please contact me so that I can invite them to join.

As you are aware we now have membership categories and charging a small fee to be a part of MADCS. For those joining, we will send you a list of the members. These fees go to offset costs for the Association and are used to have a bigger and better Workshop. Any suggestions would be greatly appreciated.

Thank you for your comments at the Workshop. These are very helpful for planning future events. Merry Christmas and a Happy New Year.

**2007 Workshop Wrap-Up**

Thanks to all who attended the 2007 Annual workshop last October in Helena, Montana. We had 87 attendees including representatives from:

Ackley Lake WUA	Fred Burr Water Users	MT Dept of Environmental Quality
Billmayer Engineering	Granite County	Nevada Creek WUA
Bitterroot Irrigation District	Greenfields Irrigation Dist.	Town of Philipsburg
Broadwater-Missouri WUA	City of Helena	Pioneer Technical Services
Carroll College	Helena Valley Irrigation Dist.	Pondera Canal and Reservoir Company
Correctional Enterprise Ranch	HKM Engineering	Sunset Irrigation District
Crazy Mountain Ranch	Hydrometrics	Teton Cooperative Reservoir Company
Deadman's Basin WUA	Malta Irrigation District	Upper Musselshell WUA
Department of Natural Resources & Conservation	Montana Tech	US Forest Service
DJ Engineering	Morrison Maierle Inc	Willow Creek WUA
Fort Shaw Irrigation District	Mountain Water Company	

**Ideas We Received From You For Next Years Workshop**

- Construction Dewatering Systems – the key to keeping your construction project on schedule and under budget
- Concrete repair
- Talking to the media with out putting yourself in the cross hairs
- Outlet inoperable? Guidelines for use of pumps and siphons for reservoir drawdown
- Considerations when choosing gates for your dam and canal
- Unique water delivery techniques used by Deadmans Basin Water Users
- HDPE, PVC, Ductile Iron, Concrete? Considerations when choosing pipe materials.
- Canal lining options with geomembranes
- Overview of canal lining and sealants

**Other ideas? Please contact MADCS president Larry Draper at (406) 961-1490**

# Thank You Exhibitors!

<b>A-M VALVE CO LLC</b> Don Koskovich 7425 W Sunnyview Ave Visalia CA 93291 (559) 651-2066	<b>AMCI</b> Bruce Bacon 17301 West Colfax Ave Ste 400 Golden, Colorado (303) 279-2002	<b>B. A. FISHER SALES CO.</b> Bernie Fisher 2178 Centurion Place Boise, Idaho (208) 375-1411
<b>BEN TAYLOR INC</b> Joel Stokes PO Box 482 Valier MT 59486 (406) 279-3365	<b>EDC CANAL LININGS LLC</b> Jack Haynes 7154 W State St #381 Boise ID 83714 (208) 841-0344	<b>FIRESTONE BUILDING PRODUCTS</b> Ron Harnden 18690 142nd Ave NE Woodinville WA 98072 (425) 841-1213
<b>JT WATER MANAGEMENT LLC</b> Thomas Lovegrove 1884 Elizabeth Dr. Parker, Colorado (303) 841-4562	<b>THOMAS DEAN &amp; HOSKINS INC</b> Melissa Widseth / Erling Juel 1200 25th St Great Falls MT 59405 (406) 761-3010	<b>WATERMAN</b> Bill Murphy 5605 Bitter Brush Place Caldwell ID 83607 (208) 890-3453
<b>WWC ENGINEERING</b> Shawn Higley / Scott Aspenlieder 1275 Maple St. Ste F Helena MT 59601 (406) 443-3962	<b>Your support helps us keep membership fees low.</b>	

## Limiting Irrigation Canal Seepage With Geomembranes

Of all the methods available to line canals, synthetic liners or geomembranes makes long term irrigation water distribution efficient at a price that is affordable. Geomembranes can outlast the water holding capability of many concrete lined canals. According to the World Bank, a one percent cracked concrete canal can seep seventy percent of the water of an unlined canal. When long term water holding is factored into the evaluation, geomembranes establish themselves as a singularly cost effective seepage control option. As discussed below, there are a number of different types of geomembranes including EPDM (ethylene-propylene diene monomer), HDPE (high density polyethylene), PVC (polyvinyl chloride), and polypropylene.

Concrete lined canals crack and deteriorate when inadequate

reinforcing steel, thickness or compressive strength concrete is installed. Repair of worn and cracked concrete is costly. The stabilized concrete side slopes are costly to install. The installation of concrete canal linings is prohibitively expensive when vehicular access is not available along the entire length of the canal. An advantage of concrete is that no maximum velocity exists for the water contained in a properly designed concrete lined canal. A concrete canal can be designed to have side slopes that are even steeper than a soil's angle of repose (the steepest angle at which the soil remains stable.)

Piping irrigation water minimizes the evaporative loss of open canals. Piping limits swimming or other safety concerns and allows pressurization to maximize flow. Piping is generally an expensive water transmission option as

both the piping and requisite engineering are substantial unless the canal is small. Backfill over piping in existing canals can be prohibitively expensive in some cases. Today, piping of irrigation water is generally limited to the more urban agricultural areas of the U.S.

Earthen canals erode and generally require regular maintenance to eliminate aquatic weed growth. Water velocities in excess of three feet per second are erosive to earthen canals. Water seeps through the earthen canal prism or wicks through the base soil of these canals into the adjacent soil. The high frictional coefficient of earthen canals requires high energy requirements to transport the water. Soil amendments do not generally alleviate these drawbacks.

## Limiting Irrigation Canal Seepage With Geomembranes *(continued)*

Geomembranes have many advantages. Geomembranes can eliminate or minimize water loss due to seepage and preserve canal water quality in the presence of soil contaminants such as soil salinity. In addition, geomembranes are generally inert, elastic and some geomembranes such as EPDM and HDPE are highly resistant to the forces of weathering. Canal prisms generally experience differential settlement in spite of the best soil compaction efforts at the time of construction. Although geomembranes are seepage controls and do not add any structural strength to the canal prism or shape, many geomembranes such as PVC and EPDM exhibit superior performance in the presence of differential settlement. Concrete, HDPE geomembranes, bentonite, synthetic polymers and inflexible canal lining materials generally do not perform well when soil settles differentially.



Geomembranes require no regular maintenance however all canal linings should be periodically inspected. Animals, vandals and incompatible farming activities can damage

exposed geomembranes. If such damage is expected to be widespread, geomembranes must be covered with soil, shotcrete or some other protective cover. Soil covering geomembranes can wick moisture and may require vertical, anti-wicking geomembranes. EPDM is easily repaired and thus most damage does not affect this geomembrane's relatively low life cycle cost. Not all geomembranes are so easily repaired over time as is EPDM. Aged PVC, polyethylene and polypropylene geomembranes can be more difficult and expensive to repair over time.



When geomembranes are employed, canal water velocities should be less than four feet per second. If geomembranes are used in canals with velocities that exceed 4 fps or water falls directly on the geomembrane, it should be ballasted with an appropriate material to combat the tracktive or erosive force of the water. When lining a canal prism with a geomembrane, the prism slopes should not exceed the soil's angle of repose. Covered geomembrane linings are best constructed with high friction angle geomembranes such as EPDM. Other geomembranes possessing a lower friction angle require the slopes

to be more gradual requiring a larger excavated area. Low friction angle geomembranes also require more material be buried to ensure adequate anchorage. Exposed geomembranes permit an energy efficient transfer of water. Firestone PondGard EPDM geomembranes have been



selected for canal lining in the Deadman's Basin and the Greenfields Irrigation Districts in Montana because of its easy repair and installation characteristics.

Those who fail to plan their canal linings with great care and select the proper materials are often doomed to repeat the lining process or just waste time, resources and water. Geomembranes like EPDM can be cost effective seepage controls when installed by either professional installers or irrigation district staff with minimal training.

**For more information on geomembrane lining, please contact:**  
**William Johnson, Firestone Specialty Products at**  
**[johnsonbill@firestonesp.com](mailto:johnsonbill@firestonesp.com)**

# Cured-In-Place Pipe Lining for Outlet Pipe Rehabilitation

by

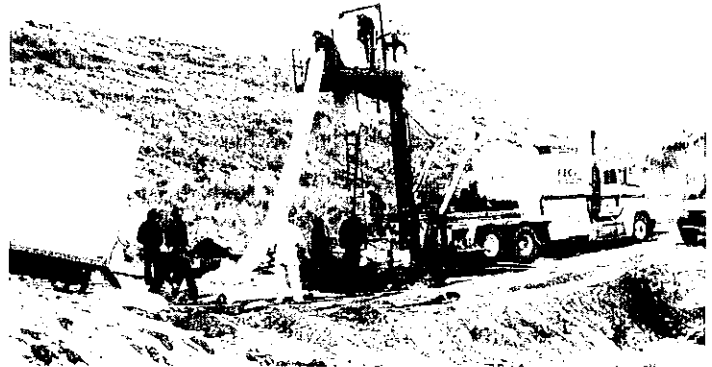
Gary Fischer, P.E., Hydrometrics, Inc. and Carroll College

and

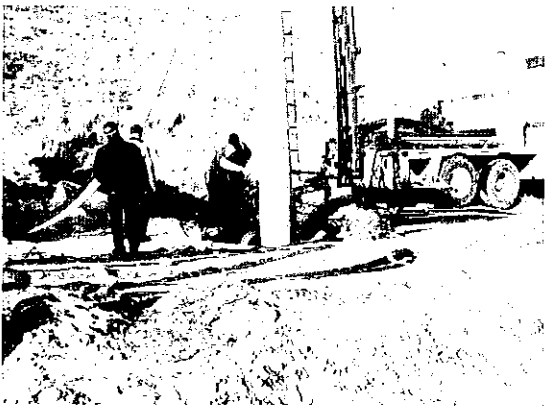
Mike Hatten, P.E., Tetra Tech, Inc.

One of the biggest concerns of dam and utility owners is to replace pipe that has aged and become too corroded or damaged to be safe and effective. Replacement costs are very high and replacement construction is disruptive and can take a long time. A common alternative to replacement is to slip-line an existing pipe with either polyvinylchloride (PVC) or high-density polyethylene (HDPE) pipe. Slip lining is usually less expensive than replacement but there are risks to slip lining, such as ensuring a tight seal of the annular space between the two pipes by grouting and maneuvering around deformities in the existing pipe that would prevent pulling the slip pipe through. Another alternative is available that offers a relatively inexpensive method of lining a pipe without removal and has

been shown to be effective in renewing the existing pipe and significantly reducing its deterioration: a technology called cured-in-place pipe. Cured-in-place pipe, or CIPP, has been in existence for over 30 years and has been widely used to renew utility water and wastewater piping. It is just recently that the technology has been applied to dams and other water delivery systems.



CIPP being prepared for installation at Upper Taylor Dam outlet

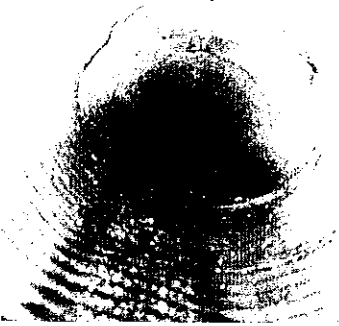


CIPP being inserted and turned inside out at lower end of Upper Taylor Dam outlet

CIPP can be applied by several different methods, but one of the most common involves a resin-impregnated felt liner covered with a polyester material that is pulled in or actually turned inside out in the receiving pipe during installation. The liner is filled with hot water or steam until the resin has set. The liner is pressed tightly against the inner surface of the existing pipe until it is fully cured in place (thus the name).<sup>1</sup> CIPP can be applied to pipe diameters that range from about 3/4 inch to 40 inches, but there may be special sizes that can be accommodated.

CIPP was recently used to rehabilitate the outlet pipe at Upper Taylor Dam on the Montana State Prison Ranch near Deer Lodge. The design was developed by Tetra Tech, Inc. of Helena and the cured-in-place pipe was installed by PEC, Inc. of Helena. Upper Taylor Dam is approximately 40 years old and is a 44 foot high homogenous earth embankment dam. The outlet is approximately 230 feet long, and is comprised of a 24-inch corrugated metal pipe (CMP) for the lower two-thirds of its length and a 14-inch CMP along the upper one-third. Both pipes were corroded and damaged in isolated locations.

## CIPP Lining for Outlet Pipe Rehabilitation (continued)



Outlet prior to CIPP installations



CIPP one year after installation

Through an engineering feasibility study, CIPP rehabilitation was determined to be the best and most economical option for repair. Advantages of using CIPP for this application included: its ability to seamlessly line the outlet including the abrupt transition at the junction of two different diameter pipes; its strength to withstand the overburden force of the embankment and the hydrostatic force of the water; and the finished smooth inner surface that improves hydraulic performance, even with a reduced inner diameter. Construction took place in November 2006. Prior to construction, the reservoir was drained and access roads were built to allow equipment mobilization to both the upstream and downstream ends of the outlet pipe. PEC, Inc. crews were on site for approximately three days. Even with temperatures dipping to near zero degrees Fahrenheit, installation was successful. In October 2007, a one-year inspection of the pipe showed the liner to be in good condition and functioning as intended.

Cost of the cured-in-place pipe installation at Upper Taylor Dam was approximately \$43,000, which does not include new inlet gate installation. This is nearly six times less expensive than total pipe replacement and less than half the cost of slip lining for the same project.

CIPP is a viable and economic option for rehabilitating outlet pipes on dams. If you have questions about the process or the Upper Taylor installation, please contact Gary Fischer (406.447.4571, [gfischer@hydrometrics.com](mailto:gfischer@hydrometrics.com)), Mike Hatten (406.443.5210, [Michael.Hatten@tetrattech.com](mailto:Michael.Hatten@tetrattech.com)), or Chris Peccia of PEC, Inc. (406.447.5050, [cpeccia@mt.net](mailto:cpeccia@mt.net)).

1. Purdue Emerging Technologies web site (<http://rebar.ecn.purdue.edu/ECT/Civil/cippipe.aspx>)

## Focus Group Results: What Do You Want From MADCS?

Prior to the last workshop, a group of water users associations led by MADCS board member and Deadman's Basin Water Users President Bob Goffena met to brainstorm on answers to 2 questions:

1. What do you want from MADCS?
2. What Issues would you like MADCS to address in the future?

The following issues, action items and suggestions came out of the discussion:

### Information Exchange

#### Start MADCS Web Page

- . Measuring devices installation instructions
- . Other technical information
- . Links to other web sites
- . Industry information & links
- . Warning devices & security system information

*Continued on back page*

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MONTANA ASSOCIATION OF DAM  
AND CANAL SYSTEMS

## Focus Group Results: What Do You Want From MADCS? ...continued

### Information Exchange (continued)

Send mailing list out to members for information sharing

Delivery of storage water in drought conditions

- . Share information with other associations

Quantify Associations – who / what they represent

### Interaction with Government

DNRC

- . Share information with other state owned dam associations on how to deal with DNRC (dam owner)

Fish Wildlife and Parks (FWP)

- . Need to have a better working relationship
- . Communication is lacking
- . Recreational users need to help pay rehab costs
- . Weeds caused by recreationalists – need to be cost shared
- . FWP priorities need to be reevaluated on a project basis –they don't spend time and money on highest priority item

Forest Service

- . Same problems as FWP

### Politics / Legislature

Outreach to legislature

- . Ask reps to be speakers at workshop
- . Add some to newsletter mailing list

### Politics / Legislature (continued)

Contact other organizations that follow legislative activities

Develop political committee

- . Screen bills, suggest to board which ones to support
- . Consensus on things MADCS wants from legislature

Email alert list developed for high priority bills and issues

Communication network to members & board before and during session

- . Web site – weekly updates
- . Email alerts

### MADCS Operation

Regional Meetings - need to find way to include associations located far away

Regional Field Trips – Field trips are key – unique different ideas to showcase -hold even without meeting

Move to email – get email addresses for everyone (cost savings)

The board has plans to discuss and prioritize these issues and will report back to membership on a plan of action in a future newsletter. Interested in assisting in any of the above activities? If so, please contact Larry Draper, President MADCS .