

**Firestone**

# GEO PROFILES

**CANAL LINER SERIES**  
Project Profile #1

**Project  
Profiles  
Featuring  
PondGard  
EPDM  
Rubber  
Liners**



**Tulelake Irrigation District  
Northern California**



## WATERWAYS GET NEW LEASE ON LIFE

PondGard EPDM Liner  
Conserves Valuable Irrigation  
Water in Northern California



Water conservation is essential to drought-affected regions where high seepage rates of earth-lined canals often contribute to water loss. In northern California, the Tulelake Irrigation District (TID) addressed a severe water loss situation by installing a PondGard EPDM Rubber Liner from Firestone Building Products Company, Carmel, Indiana. Firestone PondGard delivers unmatched durability and installation ease to give irrigation districts cost-effective and efficient canal lining systems.

### Canal Project Poses Many Challenges

One of the oldest irrigation projects in the western U.S., TID supplies valuable water to approximately 800 dry, but otherwise fertile, farms using a vast network of 242 miles (390 km) of main canals, laterals and ditches. The unlined canals, some of which date back to the turn of the 20th century, historically account for seepage rates in excess of 30 percent. This, combined with severe drought conditions, prompted the federal government to seek a canal lining system to protect against future water loss.

"There were several challenges associated with this project due to TID's geographic location," recalled Ron Froebel, principal of R.K. Froebel & Associates Consulting Engineers, Evergreen, Colorado. "Any liner we selected needed to be durable enough for long-term exposure to ultraviolet rays, severe weather, high winds and rough soil conditions. The product also had to be capable of withstanding large animal traffic."

The U.S. Bureau of Reclamation required the lining system be low cost and low tech. Moreover, installation, maintenance and repair had to be straightforward enough to be completed by irrigation district personnel without the need for specialized equipment or hired contractors.

In June 2001, the U.S. Bureau of Reclamation, Mid-Pacific Region, solicited proposals for lining a 2.3-mile stretch of the Tulelake Irrigation District. The section selected was an earth-lined canal constructed in 1942 with several rocky reaches, steep slopes and seepage losses ranging from 30 to 50 percent. The request specified a geomembrane system with a maximum panel size of 30 ft. x 200 ft. and a minimum thickness of 45 mils. The government required that a system be selected based on the following criteria:

- Installation ease
- Damage resistance
- Ease of repair
- Life expectancy
- Seepage control
- Past history and performance
- Price

## EPDM Fits the Bill

Following a thorough review of numerous system types—including EPDM, HDPE, LLDPE, polypropylene, geosynthetic clay, prefabricated bituminous, scrim reinforced and spray-applied urethane liners—the U.S. Bureau of Reclamation selected a 45-mil PondGard EPDM Rubber Liner from Firestone Building Products Company.

Developed by the premier name in rubber polymer technology and innovation, PondGard comes with the experience and success associated with all Firestone products. The PondGard logo is the mark of a high quality, user-friendly liner that has withstood the test of time.

EPDM geomembranes have been in use worldwide for more than 40 years in numerous containment applications, including large and small irrigation canals. EPDM rubber liners are an excellent choice for use in the rehabilitation of existing concrete or gunnite canals and laterals, due to minimal channel preparation requirements and a proven track record in providing a watertight barrier. Qualities contributing to PondGard's long-term durability include:

- **Flexibility and conformance**—PondGard's superior elongation characteristics enable it to conform to objects in the subgrade, including installation in areas with rock outcroppings or other difficult soil conditions. This feature is also important when a canal has been in service over a period of time and when movement of earth places stress on the liner. PondGard EPDM contains no plasticizers that can embrittle with age, causing plasticized materials to lose flexibility and crack. Additionally, PondGard stays flexible in temperature extremes—from  $-40^{\circ}\text{F}$  to  $175^{\circ}\text{F}$ —enabling year-round installation utilizing the Firestone QuickSeam Tape Seam System.
- **Friendly to large wildlife**—Large animals such as elk and deer can gain sufficient footing to easily escape the PondGard-lined canal as compared to competitive stiff plastic liners, which are often too smooth or unforgiving to provide adequate footing. This eliminates the need for unlined canal sections or other expensive canal modifications designed to give animals necessary escape mechanisms.
- **Non-toxic to fish and plant life**—PondGard is a highly stable material. It is specially formulated for safe, long-term exposure to fish and plant life, and it helps maintain clean irrigation water.
- **Puncture resistance**—PondGard-lined canals have proven resistant to damage from animal traffic and difficult soil conditions, even in very cold climates. PondGard EPDM Rubber Liners are backed by a long-term membrane weathering warranty, even when fully exposed.

## THE INSTALLATION PROCESS



### Site Excavation

PondGard EPDM requires minimal channel preparations prior to installation. For the 2.3-mile stretch of the Tulelake Irrigation District, site excavation removed vegetation and large rocks. The canal soil was also graded and compacted.



### Installing the PondGard Liner

Custom-sized 30 ft.  $\times$  200 ft. rolls made the liner easy to install. Unrolling and unfolding each panel required approximately 30 minutes. The installation crew used hand clamps fastened to the panel sides to pull the PondGard EPDM up the canal slope. A geotextile underlayment was also installed to provide the canal with additional puncture protection.



### EPDM and QuickSeam Tape

The edges of the PondGard EPDM panels were overlapped a minimum of six inches. The overlapped area was cleaned and primed with Firestone QuickPrime Plus, and Firestone QuickSeam Cover Strip Tape was applied to form high-quality, watertight seams. After unrolling and seaming all of the panels, the installation crew compacted soil along the top of the canal to ensure the liner will remain securely in place.

- **Weather resistance**—EPDM demonstrates outstanding resistance to the harmful effects of ultraviolet radiation, ozone and other environmental conditions. PondGard's lay-flat characteristics provide excellent resistance to wind-uplift and liner displacement during installation. Weather resistance is an especially important consideration as the typical liner is often exposed in whole or in part.

In addition to long-term durability, PondGard is a unique, user-friendly material that can be installed quickly and easily. To better meet a variety of canal liner needs, PondGard is available in several widths and lengths of 100, 150 and 200 feet.

Irrigation district personnel can install liners with minimal training and without the need for expensive special equipment. Using a full range of accessories, PondGard is easily connected to turnouts, pipes, gate structures and other flow control devices.

"The installation went very smoothly," explained Froebel. "Firestone provided some brief instruction and technical assistance to the irrigation district personnel during the liner installation. In the long run, minimal supervision was necessary and the crew was very surprised at how quickly and easily the liner went in."

A team of eight people from TID installed the EPDM panels. Once the panels were unrolled and unfolded up the side slopes, they were placed into anchor benches on both sides of the channel section. The ends of the panels were then overlapped a minimum of six inches and the overlap area was cleaned and primed with Firestone QuickPrime® Plus. The installation crew then applied Firestone QuickSeam® Cover Strip Tape to provide reliable, watertight seams. Once the panels were in place and seamed, the crew placed soil cover in the anchor benches and compacted the soil at the top of the slope using TID's equipment.

Beyond the initial installation, PondGard liner requires little or no regular maintenance. In fact, PondGard can survive normal environmental exposure for well over 30 years. Should the need arise, the liner is easy to repair in place with readily available Firestone QuickSeam accessories thus minimizing maintenance cost and delays caused by the mobilization of skilled repair technicians.

### Successful Outcome

The Tulelake Irrigation District project was highly successful, according to Gerald Pyle, TID assistant manager. "Our primary goal with this project was to eliminate water loss, and PondGard has proven to be effective in providing us with a seepage-free channel. We had many requirements going into this project, and PondGard was able to meet all of them. The combination of desirable technical characteristics and user-friendly materials that can be installed by irrigation district personnel with minimal training and no specialized equipment provides an outstanding alternative to other systems."

## PROJECT DETAILS FOR THE TULELAKE IRRIGATION DISTRICT

Section Length:	2.3 miles
Side Slope (average):	1.5H:1V
Canal Base Width:	Ranges from 6 ft. to 8 ft.
Flow Rate:	72 cfs
Flow Velocity:	1.32 fps
Flow Depth:	4.0 ft.
Liner Material:	45-mil PondGard EPDM
Panel Size:	30 ft. wide by 200 ft. long



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