

PADRE DAM MUNICIPAL WATER DISTRICT MEETS CHALLENGE OF REPLACING FIVE AGING RESERVOIR ROOFS

Padre Dam Municipal Water District was formed in 1976 when voters approved a merger of Santee County Water District, formed in 1956, with Rio San Diego Municipal Water District, formed in 1955. The District is named for the Old Mission Dam, built circa 1807; a historic water landmark located nearby. The dam provided water to the Mission San Diego de Alcala, founded in 1769, the first of California's 21 Spanish missions.

Today the Padre Dam Municipal Water District provides drinking water, wastewater, recycled water and recreation services to 100,000 residents in nine suburbs of San Diego County. Directed by a five member board of directors, the District imports 100% of its potable water supply and treats two million gallons of wastewater per day at its Ray Stoyer Water Recycling Facility. Altogether, it operates under an annual budget of \$57 million and oversees an infrastructure valued at \$243 million.



Image courtesy of Shea Hodges

As part of the water district's original infrastructure in the 1960's, five in-ground reservoirs had built-up wood framing and corrugated metal covers, supported by reinforced concrete columns. As the existing covers gradually came into disrepair, continual maintenance was required to keep these reservoirs in good operating condition and in compliance with California Department of Environmental Health regulations. The District's 2001 Integrated Facilities Plan recommended that all five be replaced at an estimated cost of over \$40 million.

In March 2007, following a significant rainfall event, a reservoir roof experienced a localized failure and subsequently collapsed due to ponding water. This required an emergency repair, but more importantly, heightened awareness as to the need for improvements. A structural engineer performed an investigation and determined the reservoirs' concrete shells were in good condition and would allow retrofitting, potentially saving the District \$25 million in lieu of complete replacement.

"The original reservoir covers built in the 1960s were no longer draining properly and the excess weight caused by ponding water had us concerned. The localized failure of the cover got everyone's attention and allowed us to place a priority on this project," said Michael Hindle, P.E., Padre Dam Municipal Water District.

All of this resulted in a new Five Year Business Plan in 2008 which identified five reservoirs that required immediate attention and secured the funds necessary for the improvements. Referred to as the "Five Reservoirs Retrofit Program," the plan included the replacement of old roofs with new aluminum covers, extending the life of the reservoirs and bringing them into compliance with current building and seismic codes.

"Our goal was to provide the public with the best value retrofit possible. The District focuses on providing essential services in the most cost-effective manner, including both maintaining and replacing aging

infrastructure. With these capital projects, we intended to extend the useful life of the facilities at the lowest possible cost,” said Hindle.

In the past, aluminum geodesic cover manufacturers Temcor and Conservatek had provided domes for some of the District’s water reservoirs. So the District was familiar with aluminum geodesic cover technology. The challenge was to verify whether aluminum dome technology could be applied to non-circular shapes. The result was to design was a low-profile, triangulated aluminum roof supported by stainless steel columns. The new roofs also incorporated new concrete shear walls which were designed to current seismic standards.

“Aluminum is inherently corrosion resistant requiring little to no maintenance, and the covers provided by CST had performed well for us in the past, providing good drainage. We were also pleased with the very quick construction process of the CST covers,” said Hindle.

The District also was attracted by the aesthetics of the new low-profile CST reservoir covers. In the 1960s the reservoirs and their large roofs were built in open areas. However, today residential neighborhoods have grown and homes are located adjacent to reservoirs, so aesthetics became very important.

“We knew that something like cast in place reinforced concrete roofs would have a greater impact on our neighbors due to the increased materials, construction equipment, and time required to install this type of cover,” said Hindle.

During the retrofit and upgrade process, the Water District also thought ahead and designed the aluminum covers to support additional loads such as solar panels at some point in the future.

To date CST Covers has replaced the aging roofs on three in-ground reservoirs with new low-profile aluminum covers. It was also determined that the fourth in-ground reservoir required complete replacement, so a pre-stressed circular concrete tank and cover were utilized. The fifth reservoir will involve the largest retrofit to date, including an aluminum cover by CST, and will be designed to accommodate storage of eight million gallons.

Well into the water district’s second Five Year Business Plan, Padre Dam continues to focus on providing essential services in a cost-effective manner. Unlike previous multi-year budgets, the five year plans have utilized a long range focus, adding operational and fiscal flexibility to serve the public. The Water District’s planning will come in handy as it approaches its largest reservoir retrofit, and continues to operate with the goal of achieving optimal operational performance, capital replacements and preventative maintenance – all at the best value for its customers.

Benefits of CST’s Aluminum Reservoir Covers:

- **Corrosion Resistance:** Aluminum is inherently corrosion resistant compared to other materials. It will last the lifetime of the structure and will not need to be painted or repainted for protection from the elements.
- **Low Lifetime Maintenance Cost:** With no need to maintain a protective finish to prevent corrosion over time, there are little-to-no maintenance costs associated with an aluminum dome.



- **Clear-Span Capability:** Aluminum's lightweight characteristics allow for larger clear-span cover capability than structures utilizing steel, concrete and other materials.
 - **Fast & Low-Cost Construction:** Creative design and lightweight components provide for installation in 1/3 the time it takes to install other cover systems. Less time, labor and equipment needs combine for a low total cost of installation.
 - **Design Flexibility:** Aluminum's excellent strength-to-weight ratios and creative component designs yield covers and structures that cannot be achieved with other materials.
 - **Aluminum is a "Green Material":** Not only are aluminum cover systems recyclable after their service life, but more than 50% of the aluminum used in the cover systems is made from recycled aluminum.
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