



MAJOR ELECTRICAL INFRASTRUCTURE UPGRADE KEEPS THE WATER FLOWING

More than 200 custom heat shrink electrical terminations were added to modernize and safeguard five pumping stations and meet site-specific constraints in order to ensure uninterrupted water supply to 19 million residents.

The Challenge

To ensure reliable, uninterrupted water distribution across a vast portion of the Western USA, a large, regional municipal water authority recently undertook a \$30-million program. The project involved upgrading and refurbishing the aging electrical infrastructure that powers the motors, pumps and valves to ensure water flow throughout the region. The project also involved replacing thousands of feet of electrical cable and the addition or upgrade of numerous water-pumping stations along a span of 250+ miles (400+km).

Two particular constraints associated with the existing system added complications, which forced the water authority to seek a custom-kitted solution when selecting and specifying the needed medium voltage electrical terminations for this complex project.

Featured:

Country:

United States of America

Industry:

Water and Power Utility

Challenges:

Upgrade and safeguard an aging water distribution system with unique cable and space constraints, while ensuring uninterrupted service to millions of customers.

Solutions:

TE's HVT-3-1500 Series Heat Shrink Terminations, and certified field installation training

Key Figures:

- \$30 million program
- 250+ miles (400+km)
- 19 million residents
- 200 customized kits

- The existing electric cable infrastructure has a variety of bend-radius constraints
- The existing electrical infrastructure uses large-diameter, paper-insulated lead-covered (PILC) cables, which are subject to potential oil leakage during their anticipated 40-year service life; this limits the options for the needed terminations

PILC cable is a paper-insulated lead cable that has oil impregnated in the insulation material to safeguard the underlying cable. It is widely used and is generally considered to be a reliable product, providing decades of service in underground installations. However, these highly engineered PILC electrical cables require hermetically sealed electrical terminations, and the potential for oil leakage over the course of decades of service rules out the use of cold shrink terminations.

The Solution

After assessing several competing options, the water authority selected Raychem heat shrink HVT-3 15-kV PILC terminations from TE Connectivity (TE), the inventors of heat shrink technology with broad and deep experience (60+ years) in customized designs to enable highly specialized connections and terminations.

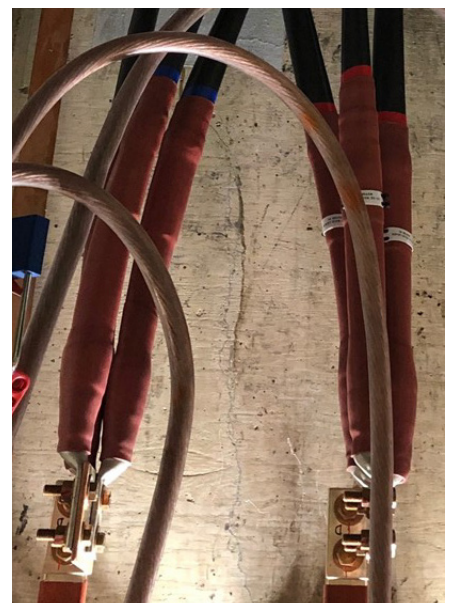
In order to meet the bend radius limitations that are present throughout the existing electrical cable infrastructure, TE's engineering team created design changes that could accommodate the constraints. These adaptations included adding extra tubing and other components to elongate the off-the-shelf product, and using extruded, oil-barrier tubes and other grounding components, allowing them to meet the site-specific constraints.

Similarly, to support the creation of a custom solution, dedicated samples were created and sent to the customer for hands-on review. To support ongoing operations and maintenance efforts, TE worked with the water authority to update its electrical drawings and in-house specification standards to include the TE heat shrink terminations. Lab testing was also conducted to ensure the product met up to 50 PSI (pounds per square inch) performance specifications to ensure no cable oil leakage.

Raychem **HVT-3 heat shrink terminations** use specially-formulated, thermoplastic materials. When heated with a "clean burning" gas torch in the field, the materials used to produce the multilayer tubes have shape memory, allowing them to shrink and conform to the irregular surface of the cable, creating a hermetic seal. More than 200 custom, heat shrink termination kits were installed during this project.

The Raychem terminations have decades of shelf life, are fully qualified to applicable sections of IEEE-48, and have been pressure-tested to perform at 110°C & 15 psi under load-cycling conditions. This allows the maintenance, repair and operations staff to maintain surplus inventory that essentially will not expire — ensuring access to spare inventory whenever it is needed. By comparison, cold shrink terminations lose their tension set if left on the shelf past their expiration date, so they must be installed within two to three years.

TE created a dedicated inventory of custom components kits, and provided training and certification to the customer's field electricians and contractors to streamline field installation. The field training included an overview of best practice, highlighting heat shrink installation methodologies and proper cable cut back preparation for PILC cables. Such coordination took advantage of the limited windows of opportunity for installation during scheduled downtime.



The Outcome

The motors, pumps and valves that help keep the water flowing are now protected from damage from ultraviolet light, exposure to pollution, acids, cable oils and other chemicals, salt fog, fire and thermal aging, surface electrical activity, tracking and erosion because of TE's Raychem specially-formulated heat shrink materials.

Altogether, the selection of TE's Raychem heat shrink HVT-3 15-kV PILC terminations with customized adaptations, along with installation training services, allowed the water authority to safeguard its electrical cable infrastructure which ultimately helps to keep uninterrupted water flow to nearly 19 million residents.

Learn more at [TE.com/heatshrink](https://www.te.com/heatshrink)

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