

Sewer Outfall Pipelines

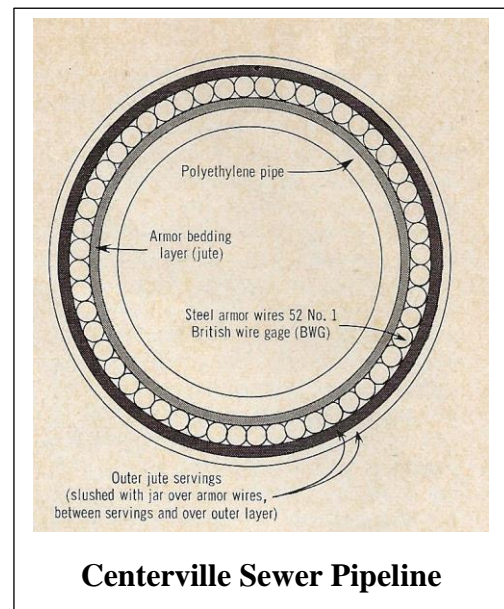
Typical sewer outfalls for the ocean were designed of concrete pipe connected together and laid on the seafloor to take the sewer effluent out to sea a sufficient distance for it to disperse. However, in areas where the onshore terrain was very steep and subject to slump conditions and where the surf conditions were very rough, using concrete pipe was out of the question. There needed to be a better solution. The FPO-1 project office had two sewer outfall projects that had difficult design conditions. One was at Centerville, CA which had very strict environmental conditions to meet and the other at LaMaddelena, Sardinia, Italy.

Under California Environmental Requirements, the sewer outfall for the Centerville Naval Facility was required to transfer the sewer effluent 3,000 feet offshore. Further, it had to negotiate a steep slope of about 260 feet of elevation to the beach before going offshore. Our engineering solution for this sewer outfall was to capitalize on the technology of deep-sea signal cables used in Navy operations.

Many of the Navy's undersea cables were manufactured at Simplex Cable and Wire Company in NH. They had the capability to armor cables for the nearshore environment. Our solution was to design a plastic pipe and wrap it with steel wires to provide ruggedness for the placing in the rough nearshore ocean environment. Further, with the steel wires, we could wrap the pipeline on large reels and deploy the pipeline just as do for undersea cables.

The design of the pipeline used a 4-inch Outer Diameter (OD) plastic pipe wrapped with steel wires and outer jute covering to form a 6-inch OD sewer outfall. Each reel contained 1,000 feet of pipeline which could be deployed from the reel using the same techniques used for laying undersea cables.

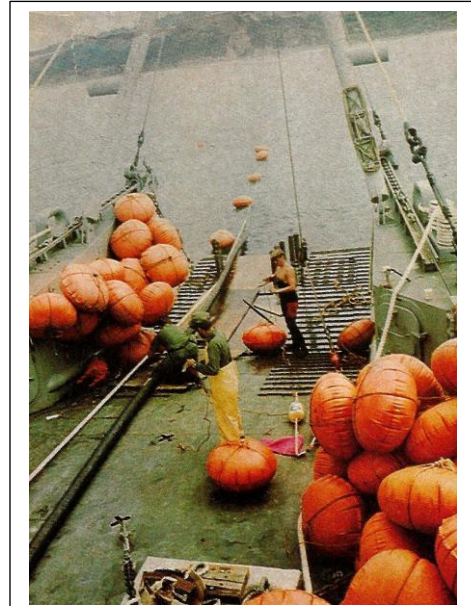
UCT-2 installed the Centerville Sewer Outfall. For the Centerville, CA installation, a Landing Craft Utility (LCU) boat was moored offshore 3,500 feet so the pipeline could be pulling onshore from a fixed location. As each 1,000 feet of pipeline came off the reel, the operation would be stopped temporarily so the next section could be connected and the operation continued until the pipeline was on shore and connected to the facility. After the final section of pipeline was pulled toward shore, then a special constructed diffuser was installed on the ocean floor and connected to the pipeline by divers. It only took six hours to install the pipeline but because of bad weather off of California, the construction crew had to wait 12 days for good weather to install the pipeline.



UCT-1 installed the LaMaddalina sewer pipeline. The LaMaddalina sewer outfall project had a much less severe design environment for placing the pipeline in the ocean. However, the beach area to work from was more restrictive in size so the pipeline design solution had to accommodate those conditions. The LaMaddalina pipeline was only 1,000-foot-long as compared to the 3,000 foot one for Centerville but because of the beach conditions could not be built perpendicular to the ocean. It had to be assembled parallel to the ocean and then pulled out into the ocean around a specially built sheave. Because of the site conditions, plastic pipe was selected as the best alternative.

The pipe selected was an eight inch inside diameter (ID) pipe in 40-foot sections. The construction technique used was to lay the pipeline sections on the beach and fuse each 40-foot section to the next one. As the pipeline grew in size, a tug using a winch pulled the pipeline offshore around the 25-foot diameter sheave to move the pipe offshore and suspended it with lift balloons. The pipeline was completely fused together for the entire 1,000-foot length in eight hours. Once the pipeline was suspended over its intended path, the pipe was flooded with water, the balloons removed and the pipe placed on the seafloor.

The site adaptability of using plastic pipe for sewer outfall designs showed that this solution could be adapted to most environmental and site conditions and allowed the facility to be installed in record times at significant costs savings.



Installation of Centerville Pipeline