

SUBMARINE CABLES AT THE SAN JUAN ISLANDS

Washington 9 San Juan

At approximately 7:00 P. M., on April 13, 1955, the submarine cable between the San Juan Island and Lopez Island failed. It took until 4:00 P. M. of May 9, 1955 to repair and place it back into service. The cost of making such repairs was \$32,294.27. In addition the excess costs of generating, above the wholesale power costs, amounted to approximately \$3,951.00. Thus the total "recorded" cost of the cable failure is \$36,245.27.

The 25-kv cable between San Juan and Lopez islands was fabricated by the Okonite company. It was installed on February 5, 1952. Two other cables, one between Lopez and Shaw islands and one between Shaw and Orcas islands were laid about a year previously. The two earlier cables were both around 5,000 ft. in length whereas the Okonite cable was 12,060 ft. long.

The two shorter cables were installed by K. L. Smith (Northwest Engineers and Associates) by contract. They were fabricated by General Cable. The Orcas Power and Light Company later decided to install the longer cable by force account but under the supervision of Mr. K. L. Smith. Mr. Smith offered the reel and accessories to the cooperative for \$4758.41. Considerable correspondence and discussion ensued. The cooperative and Mr. Smith argued that the reel would be necessary in the event of failure of the cable. In the end REA allowed the money for the purchase. The reel was used for the installation of the longer cable; -by force account.

When the cable failed in 1955 the reel was not in shape for use to pick up the cable. It was estimated that it would take from two to four weeks to get the reel ready for use. At the time the purchase of the reel was under discussion W. J. Hauck, REA Field Engineer, argued that if the cable failed the logical way to repair it would be to underrun it. A long distance telephone conversation, after the cable failed, with representatives of the Okonite company resulted in that company recommending that the cable be underrun. It was as a result of this telephone conversation, plus Mr. Hauck's opinion that it could be done, that the cooperative decided that repair would be by underrunning rather than by picking up.

Some of the cooperative personnel felt that it would be wise to employ a diver to look at the bottom before picking up the cable. The Leiter Hockett crew agreed to do the work at a given rate per hour. The equipment of Mr. McRay, another diver and deep-sea salvage operator, was also reviewed. Mr. McRay recommended that the cable be observed with a television camera. Unfortunately, however, he did not have such a camera and could not be assured of getting one in less than about a month. Since time was of the essence and Hockett's equipment looked more rugged it was decided to enter a contract with Hockett. The cooperative had never had experience with this type of work; -neither had any of the engineers that were consulted.

When the job was completed it was quite obvious that the costs had skyrocketed because there was no time limit on the job nor a limit to the amount the contractor could incur. This was borne out by the fact that:

1. While the cooperative thought the agreement included getting all equipment prepared before arriving on the job, the contractor arrived with the sheaves and stops laying on deck and mounted them on the cooperative's time at the cooperative's expense.
2. It took Hockett over two days to get into position to let the diver down; -while it is now hard to prove, it was the opinion of the engineers at the time that he(Hockett) was not making satisfactory effort to get the barge anchored and into place.
3. When the first portion was underrun (from San Juan island to the break) W. J. Hauck recommended that the damaged portion of the cable be secured to a barge and the underrunning be continued to Lopez island. Hockett argued against this and got his way. Later on (after $2\frac{1}{2}$ days) that very procedure was followed. Better than two days might have been gained here.

The above items, if careful efforts had been made, could have been reduced enough to save over a week of the 15 days that the contractor (Hockett) was on the job.

At the time the agreement with Hockett was consummated it was felt that the increased costs of generating power for San Juan island would be much greater in proportion to the cost of making the repairs. Thus it was felt that the work should be undertaken regardless of tide conditions. Hockett went along with this and, of course, it helped run up his fee. It would have been much wiser to arrange for doing the work when tide conditions were more favorable.

Another error was in asking the supplier of the cable to supply splicers. While the man supplied was very conscientious and worked hard to get the job done, his fee included travel expenses from New Jersey along with standby time. It is now felt that capable splicers can also be obtained on the west coast.

In view of the slow progress and high costs the alternative approach, of reeling up the cable and then making the repairs in some protected bay and relaying it, has gained appeal. That method might eliminate the hazard of making a splice on a barge during bad tidal conditions. It would, however, have its own inherent problems. Laying would definitely need to be done under satisfactory tidal conditions. Weather conditions would be just as important as for underrunning. The chances for damaging the cable by allowing it to coil up on the bottom would be greater. The seagrowth would need to be removed as the cable is reeled in. This might turn out to be a more difficult task than anticipated. There is a limit to the tension that could be applied with the compound wound motors. With the underrunning method the cable remains in a tangent position and thus is more likely to remain free of entanglement with rocks. The reeling up method could allow swinging for the barge which could result in entanglement. The reeling up method would be especially difficult on the longer cable because the reel is not large enough to hold the entire cable. The two cables have been

The cooperative is proceeding with getting the reel and auxiliary equipment mounted together on a frame so that it can be ready to slide onto a barge immediately, in the event of another cable failure. The estimated cost of getting the reel ready is \$4500.

In the event of failure of one of the shorter cables, it would probably be logical to proceed with reeling up the cable. In the event there is another failure of the longer cable both alternatives should be studied closely before making a decision. The revelation as to the location of the failure should be given full consideration before the method of picking up is decided upon. The cooperative now owns also the two 6 ft. sheaves which can be secured to a barge for underrunning. The barge can be moved with tugs; and equipment such as Hockett's would not be required.

If underrunning is again decided upon, the procedure should be fully agreed upon before work is undertaken. Under similar conditions it appears that the cable should be underrun completely at one time. Damaged places should be secured to a barge that is brought along for that purpose. Anchors should also be in readiness so that they can be placed immediately when it is decided to secure a barge. After the underrunning is completed repair operations can be continued on the barge. Diving should be considered "with a grain of salt" in the future.

At this time the repaired cable is still giving satisfactory operation. It is not anticipated that there will be any further damage in the near future. The failure was found to be due to the cable being suspended over some rocks so that it vibrated in the tremendous tidal currents. There was a rocky area no more than 200 ft. in diameter over which the cable was laid. It is quite logical to believe that when the bottom was originally charted, for laying the cable, the charting boat just missed the rocky area. When laying look place there was a slight variation from the charted area. After all, a 100 ft. to 200 ft. variation out in the middle of a 12,000 ft. span is not very noticeable. A 400 ft. section was added into the cable at this point and the cable was moved considerably to one side of the rocky area. Condition of the remainder of the cable was excellent and it is found that there are no more such rocky areas.

For further information see Daily Field Activities Reports for:

5-2-55
4-26-55
4-18-55
2-4-55

William J. Hauck