

Horahora Power Station was out of commission and the Auckland Power Board took over the Horahora load on their steam plant. Thanks to the co-operation of the Hamilton Borough Council and the Auckland Power Board, the filling of the lake was carried out without a hitch, and the water topped the spillway on 6th April, thirteen days from the time when the tunnel-gates were first closed down.

As soon as the water was available in the headrace, drying-out of the generators was commenced, and on the 10th April, 1932, the station commenced to take part of the commercial load of the system, after having been idle since 11th June, 1930.

While the restoration work was being done the installation of No. 4 unit and the auxiliary units was also completed, No. 4 unit first going on to commercial load on 16th May, and one of the auxiliaries at the end of June.

The position, then, at the close of the year is that the station is again in service, while work is proceeding on the installation of the emergency tunnel-gate, which could not be done while the river-flow was passing through the tunnel. The only other work still to be done is the finishing of a few small jobs about the power-house building, the concreting of a drainage drive from under the falls structure, and the clearing-up of material and housing of plant about the works.

Details of the work done on the restoration measures are as follows :—

*Dam.*—A considerable amount of grouting was done at each abutment of the dam, to obviate the possibility of water percolating in these areas. The junction line between the natural rock of the gorge and the concrete of the dam was plugged with bitumen to provide a seal as the dam deflects under full pressure. To reduce the possibility of leakage into the country generally, the walls of the gorge above the dam were for some distance coated with gunite. The area so covered being 14,660 square yards.

*Diversion Tunnel.*—The shaft to accommodate the new emergency gate was excavated and concreted prior to the filling of the lake. The country round the shaft had been thoroughly tightened by pressure grouting before excavation commenced. After the lake was filled a start was made with the breaking-out of the concrete of the tunnel-lining to make room for the valve-chamber and anchorages, and this work is now in hand. The gate, believed to be the largest heavily loaded gate either built or contemplated, which with the frame and lifting-gear weighs about 300 tons, was manufactured in England and was delivered in Auckland and transported to Arapuni in June. A start has been made on the painting of the sections.

The damage to the existing tunnel-gates, caused by the forced passage of masses of rock when the lake was being emptied at the time of the close-down of the station in 1930, was repaired, and the gates were operated successfully at the full head when the lake was being filled.

After the lake was filled and the full flow of the river directed over the "falls," the tunnel was carefully examined for any signs of wear or any weaknesses in the concrete. In spite of the fact that the river had been by-passed for about two years, the tunnel-lining was in excellent condition. It was considered advisable, however, to concrete in some holes eroded in the country at the outlet end of the tunnel. This is completed, and required about 110 cubic yards of concrete. It is also considered advisable to gunite the construction joints in the concrete lining, and this will be commenced shortly.

*Drainage and Inspection Tunnels.*—The system of drainage tunnels was completed in January. Excluding the drainage system under the falls structure, which is included under the Falls Section, the system consists of six small tunnels driven at right angles to the river below the headrace and forebay, all being interconnected. Beneath the top end of the lined section of the headrace there is a series of three galleries at different levels, connected at the ends by shafts to one of the drainage tunnels. All the shafts and parts of the gallery system have been lined with concrete, and other sections of the drainage system have been provided with a concrete invert. The trench which runs up the floor of the headrace beneath the lining, and in which is an open-jointed 2 ft. concrete pipe surrounded by spalls and broken rock, is also connected to the drainage system by a shaft. The function of this trench is to provide an outlet to the porous layers beneath the headrace lining. The drives were all excavated 6 ft. by 3 ft., and the shafts 6 ft. by 4 ft. This section of the work includes 9,581 ft. of drives and 564 ft. of shaft.

*Repairs to Penstocks and Grouting of Crack in Headrace.*—This work consisted of drilling a series of grout-holes where any cracks or fractures had occurred and pumping liquid cement in under pressure. Where the grout-holes intersected the line of a crack, reinforcing steel was placed in them, before grouting, to tie the fractured parts together. After the main crack, which opened on the 7th June, 1930, had been grouted, as a further precaution it was sealed with a plug of bitumen. The section of the headrace between the dam and the upstream end of the lining was cleaned and any joint planes found in the country rock treated with concrete and bitumen.

*Headrace and Forebay Lining.*—At the start of the year preparatory work for the laying of the "Hornell" lining had been completed and the construction of the side banks was well in hand. Work on the side banks was continued, and, in spite of a wet winter, was completed in October. These banks involved the moving of 116,546 cubic yards of material. As a section was finished and trimmed, it was covered with a porous layer of shingle 4 in. thick on the water face.

The porous layers on the bottom of the race, consisting of two layers of broken stone and one of shingle, totalling 10 in. in thickness, were completed in August.

In the meanwhile, two contracts had been let—one for the manufacture of the hexagonal concrete slabs for the lining of the side banks, and the other for the supply of bitumen, the laying of the lining of bituminous mastic and bituminous-protected sheet iron, and the laying and grouting with bitumen of the top course of slabs on the sides.