

much more economical than delaying the construction of the building until the full details of the machinery are known, which would result in a large amount of capital spent on machinery lying idle for a considerable time.

The decision to provide for a horizontal acceleration of $1/6$ g. in the design of the power-station building as a precaution against possible earthquakes necessitated checking a large amount of the design-work already done, and, where found advisable, providing additional bracing or supports, or making other structural alterations. These alterations involved amendments to the majority of the drawings, amounting in some cases to redrawing.

In connection with the supply of power to the Dunedin City Corporation in the near future preliminary drawings were prepared for a substation at Half-way Bush. The rupturing duties for oil circuit-breakers were calculated and the ratio and tappings for main transformers determined.

(e) GENERAL.

All interruptions of supply to consumers on the various systems were checked and investigated to ascertain as far as possible the cause in each case. This involved the checking and investigation of the operation of protective relays.

The plotting of operating data for the various systems, including lake-level and river-flow data, maximum loads, and weekly outputs for generating-stations, maximum demands and consumption of energy for local supply authorities and other major consumers was continued throughout the year. A design was prepared for an automatic releasing-clamp for connections to transformers to prevent undue strain on transformer bushings or controlling switch-gear during earthquake disturbances.

A road magnet for picking up nails and other scrap-iron from highways was designed for the Main Highways Board.

(f) TRANSMISSION-LINES.

Arapuni-Stratford 110 kv. Line.—Drawings and specifications prepared for the steel towers required on the portion of this line between Taumarunui and Stratford. Tendered designs of towers analysed and checked. Also route plans prepared showing location of the steel structures. Data sheets and sag curves supplied for the wood-pole line between Arapuni and Taumarunui, also drawings of the various types of pole-supports.

Arapuni-Edgecumbe Line.—Deviation of route to avoid the sulphur springs in the Tikitere district. Location of supports for a portion of the line on which steel-cored aluminium conductors are to be used, and drawing prepared for the special crossing over Lake Roto-iti.

Wanganui-Stratford Line.—Investigation made of conductor stringing in Hawera district.

Waikaremoana-Gisborne Line.—Interference between telephone-wires and power-conductors investigated.

Khandallah-Melling Line.—Sundry plans and drawings supplied in connection with a proposed deviation at Normandale.

Waimakariri River Crossing.—Investigation of yielding of foundations of special strain structure, and of possibility of stringing telephone-wires under power-conductors.

Addington Transmission-lines.—Design of steel gantry structures to support existing power circuits and provide for future extensions.

Waitaki-Glenavy 110 kv. Line.—Sags and tensions calculated for the conductors and earth-wire, and tables compiled for use when stringing same. Vibration breaks in cadmium-copper telephone-wire investigated.

Timaru-Oamaru Line Duplication.—Conductor-stringing data and tower-erection drawings supplied. Investigation of conductor vibration at Waitaki River Crossing.

HYDRAULIC DESIGN OFFICE.

Arapuni-Horahora.—Along with the lining of the headrace and the protection of the falls at Arapuni the installation of an emergency gate in the diversion-tunnel has claimed a good deal of attention in the preparation of the shaft and collaboration with the designers who are also the makers of the gate. The gate is now at the site and ready to be installed.

Considerable erosion had taken place in the tufa rock below the control weir at Horahora, which, if allowed to continue, would in time have endangered the whole structure. Protective work was designed, and is now being carried out.

Mangahao.—The surge-chamber gates and hydraulic controls, which through corrosion have ceased to give satisfactory service, are being remodelled to a form which should prove less susceptible to trouble from further corrosion. Tests have been made and further tests are being prepared to determine hydraulic losses in this scheme, with a view to getting the utmost possible from the station.

Waikaremoana.—Superficial investigation for the upper development were continued during the year. These comprised contouring, tracing underground flow with salt and dyes, searching the lake-bottom with a diver to locate leaks; also temperature and other tests. A great deal of useful information has been obtained, but no further activity is warranted unless sufficient funds are available for exploratory excavations to verify and supplement the conclusions drawn. Work has therefore ceased for the time being.

Waitaki.—Detail plans have been prepared for the permanent sluices and for the Canterbury abutment. The shape of the dam itself has been adapted to the changing foundation levels and conditions.