The Electrification of the McKENZIE RED LAKE GOLD MINES

Ingenious Line Construction Reduces Costs

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THE electrification of the McKenzie Red Lake Gold Mine presented some problems of engineering interest. The Hydro-Electric Power Commission of Ontario supplies the Howey Gold Mines with power from a hydro-electric plant located on the English River at the outlet of Lac Seul and the power is transmitted over the Howey line at 44,000 volts, 60 cycles.

McKenzie Red Lake mine is located almost six miles north of the Howey on McKenzie Island in Red Lake. The McKenzie line taps the Howey line three structures ahead of the substation through a gang operated disconnecting switch supplied by the Eastern Power Devices Ltd. The 44 kv. line from this point on passes over particularly rough country and in addition has three long water spans of 1,950 feet; 2,250 feet and 1,975 feet each.

The mine is located about 90 miles by air north of Hudson Station and freight is taken in by water, a distance of about 200 miles.

For the most part the right-of-way was thickly covered with spruce and pine timber many trees being of a size suitable for poles and it was therefore decided to use local pine and spruce poles even though their probable life was not more than eight or ten years. It was felt that at the end of this period or when each individual pole showed sufficient butt rot to indicate weakness, that the poles could be stubbed with cedar butts thereby materially prolonging their life.

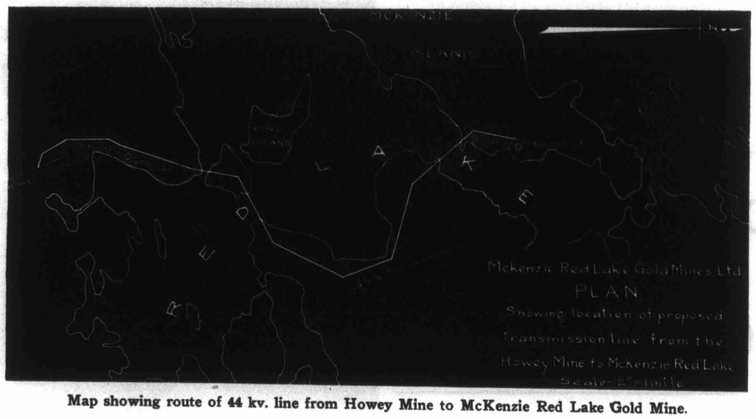
The choice of route was strictly limited, since there was only one possible route which could be taken without materially lengthening the line. A survey was made and a plan and profile plotted—notations being made of the class of excavation.

The location of each structure was determined on the profile by means of sag templets and the height of pole, class of structure, span, etc., was thereby determined.

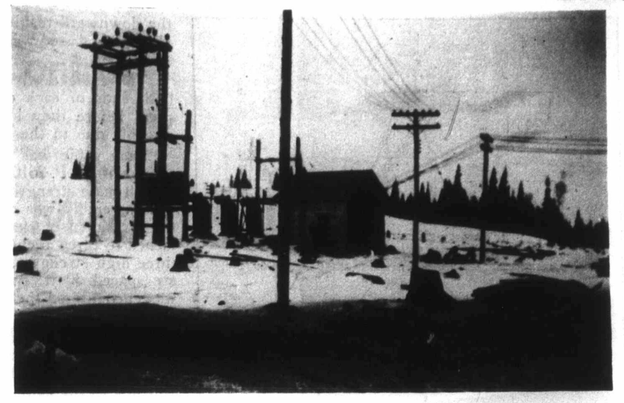
Where the contour was not too rough single pole construction was used and H-frame construction was used where long spans were indicated. On the extra long water spans special construction was necessary. With the exception of these long spans the conductors were 1/0 a.c.s.r.

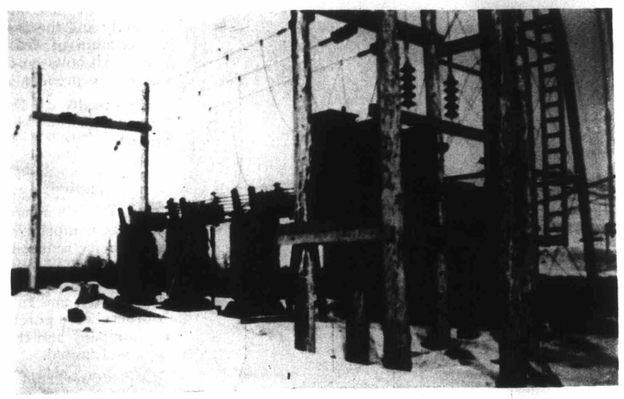
A single ground wire was strung on the single pole construction, two on the H-frame construction and the ground wire was carried through under the water on the long water spans so as to make it continuous. Particular attention was paid to grounding since lightning conditions are severe. Where good grounds could be obtained in earth, swamp or in the shore of the lake they were used and in rock sections a counterpoise was used.

Flat configuration was used on the single pole construction, the cross arm used being Douglas fir



Map showing route of 44 kv. line from Howey Mine to McKenzie Red Lake Gold Mine.





Two views of the substation at the McKenzie Red Lake Gold Mines showing three 250 kv.a., 44,000 volt Ferranti transformers protected by three 75 ampere, 46,000 volt surge absorbers. This equipment was shipped last Fall in time to be freighted in by water and is now in operation providing power for the mill.

4 in. by 5 in. by 10 ft. 6 in. long with pin spacing 36 in. by 44 in. by 36 in. C.P. 4575 pin type insulators were used on this type of construction with steel pins and 1⅜ in. lead thimbles. The centre wire occupies alternate pole pins on adjacent poles making the spacing at the centre of the span 58 in. This type of construction was used on spans up to 250 ft. For longer spans H-frame construction was used.

The cross-arm used on H-frame construction was 4 in. by 6 in. by 16 ft. long with conductor spacing of 7 ft. 8 in. and pole spacing of 8 ft. C.P. 4700 ball and socket insulators were used, two in suspension positions and four in strain positions.

The long spans were particularly difficult due to the fact that the lake is a part of the navigable waterways of the district and it was necessary to maintain a minimum clearance of 30 ft. at maximum sag. The maximum height of pole available locally was 60 ft. Furthermore the shore of the lake at the crossing points is low and hence the sag which could be used was small compared with the length of span.

After a more or less thorough investigation of the various types and sizes of wire available it was decided to use a conductor of 203,200 a.c.s.r. aluminum having 16 strands of .1127 in. aluminum and 19 strands of .0977 in. steel. This conductor has an ultimate strength of 14 tons and the maximum working stress under a loading of ½ in. ice and 8 lb. wind is 7 tons.

Special Type of Construction

As these stresses are rather high for wood poles it was decided to use a special type of construction. Instead of dead ending the conductor on the wood pole structure it was carried past these structures a distance of four to five hundred feet and anchored in the rock or soil. By this means the heavy longitudinal stresses were safely taken care of and the structures were used merely to provide the required sag and take care of the wind stresses across the line.

Each structure consists of two poles spaced 9 ft. centres and laced together with 2 in. by 8 in. plank. The cross-arms consist of two 8 in. by 8 in. timbers bolted together to form an arm 8 in. wide by 16 in. deep. To each structure a single conductor is attached by means of a string of 5 C.P. 2610 clevis type suspension insulators of 20,000 lb. ultimate strength supporting the weight of conductor plus ice loading plus