North American Wood Pole Coalition

TECHNICAL BULLETIN

Case history of a pole purchase: Columbia Power Selects Wood Poles for New Double Circuit Transmission Line

Columbia Power is in the process of engineering and building 48 km (30 miles) of new transmission line. It is being designed, bid and built in stages over the next two years. In evaluating the first section, several products were evaluated. First designed for steel, it was ultimately redesigned for wood, providing significant cost savings and timely completion near budget. The wood pole industry was able to provide and treat the large poles (Class 1 and H4s to 130 feet) on schedule. Because of the success of the first segment, most of the remaining portion of the 48 km (30 mile) project is being designed in wood.

The segment of the new transmission line, engineered by BC Hydro for Columbia Power Corp., Castegar, B.C., was originally designed with steel poles, but the specification was changed to pressure treated wood poles after the bids were reviewed. Redesigned for treated wood utility poles, Columbia Power was able to save significantly and keep the first 12 km (7.5 mile) section of the transmission line close to budget.

The transmission line connects the new Columbia Power Corporation Arrow Lakes Generating Station (ALGS) near Castlegar, B.C., 400 meters (1,300 ft.) downstream from the existing Hugh Keenleyside Dam, with the BC Hydro power grid near the Selkirk Substation east of Trail, B.C. and just north of the U.S. border.

Steep terrain and abundant water resources provide ideal conditions for producing hydroelectricity for the province. It has been almost 120 years since BC Hydro's predecessor companies began powering British Columbia. In 1962 BC Electric and the British Columbia Hydro and Power Authority were amalgamated to form BC Hydro, the third largest electrical utility in Canada.

Following ratification of the Columbia River Treaty in 1964, three Columbia River dams were built on the Canadian portion of the river. With recent changes in the electrical industry, BC Hydro's emphasis has shifted from building hydroelectric dams to supplying electricity to its more than 1.5 million customers.

The Hugh Keenleyside Dam was built in the 1960's as one of the three Columbia River Treaty dams in Canada. Used for flood control and water storage for hydroelectric power plants on the lower Columbia River, generators were not originally installed when the dam was built.

In order to meet growing consumer energy demand the new generating station is being added to the system. Scheduled for completion in 2002, the generating station is under construction by a design/build team comprised of GE Canada, Harza Engineering and Peter Kiewit Sons Co. Ltd.

The powerhouse contains two vertical shaft turbines capable of generating a total of 170 megawatts at 0.9 power factor. A 1500 meter (4,800 ft.) intake channel to provide water to the power plant is under construction also. The generating station will operate near full capacity from July through January until the reservoir drops below the intake elevation of 424 meters (1,400 ft.), typically during the period between February and May.

The transmission line needed to connect the generating station with the power grid was engineered by BC Hydro for Columbia Power Corp. Numerous studies were conducted to ensure that the new

To accommodate a narrow rugged right-of-way, a BC Hydro 230 KV circuit is relocated from an existing wood H-frame structure to a new double circuit H-frame structure.

Keenleyside generating station, as well as the transmission line would be built and operated with minimal environment impact.

These studies were done as part of a four-year Environmental Assessment of the Powerplant Project at Keenleyside. The studies included wildlife, water resources, vegetation archaeology and First Nations' traditional use, which lead to an environmental management plan for construction of the transmission line.

Part of the new transmission line was constructed on BC Hydro right-of-way. Three lines were already in the corridor, including two 230 kV wood H-frame lines and one 500 kV steel line. An existing BC

Hydro 230 kV transmission line was relocated onto the double circuit structure for part of the distance and will be combined with a new Columbia Power circuit.

In this corridor, large double circuit H-frame structures were required and the first portion of the line was completed in the fall of 2000.

As the line was built, conductors from one existing BC Hydro H-frame circuit were transferred to the new double circuit H-frame structures which were large enough to accommodate two circuits. The old H-frames were then removed.

Poles in this corridor were placed on the same spacing at the same position as the other wood H-frame lines to obtain the best land use. To maintain the same minimum ground clearances, many tall poles were required.

The 86 new wood poles in the double circuit section are Class 1 and H4, and range in height from 75 ft. to 130 ft. The average height of the wood poles was 110 ft.

Poles in the double circuit structures were spaced 13.34 meters apart with crossarm overhang of 3.5 meters on the side where the BC Hydro circuit was relocated, and 3.0 meters on the side where the new Columbia Power conductors will be placed. The new circuit for Columbia Power Corporation will be installed in the spring of 2001.

Steel crossarms and bracing were specified for both wood and steel pole options because of the large H-frame structure size where crossarm length was 66 ft. The lower steel crossarm had a splice at mid-point to permit relocation of existing conductors between the lower crossarm pieces for final position below the top crossarm.

Outage constraints were placed also on the construction of the new line. The existing line could be taken out of service only during periods of reduced capacity. These periods included six weeks in the fall and six weeks in the spring, when one generator is out of service for maintenance.

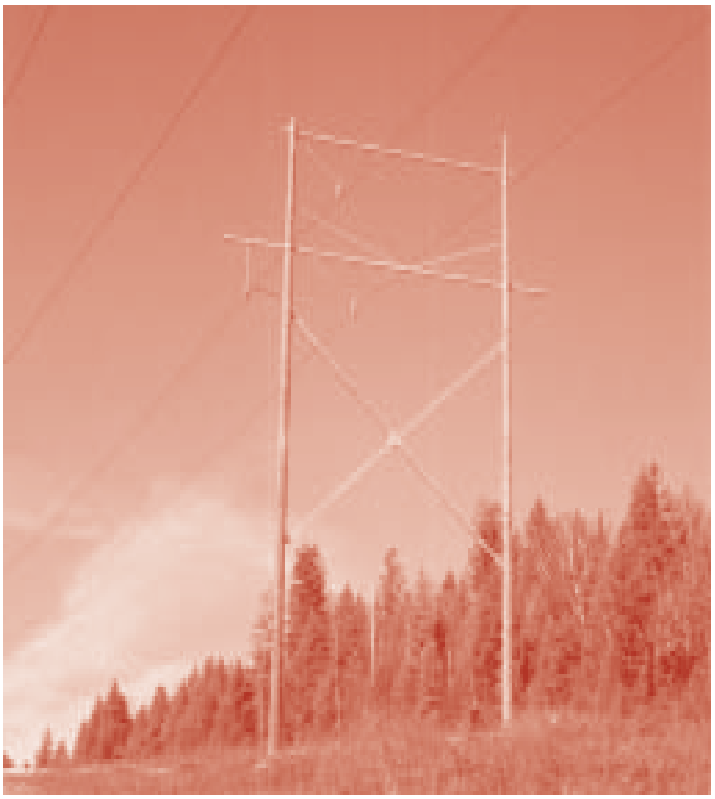
Both Douglas fir and western red cedar poles were included in the transmission line. Cedar poles were pressure treated with CCA and the fir poles were pressure treated with ACZA.

Pole treatment was provided by Stella Jones, Inc., of New Westminster, B.C., Canada's largest treating company. Pacific Lumber and Shipping of Rochester, Wash., supplied the long pole lengths.

Davey Cartage, Vancouver, B.C., provided pole transportation, both from Rochester to New Westminster, for treatment and to the transmission line site in Castlegar using special rigs with steering dollies on the rear trailer wheels.

The controlling forces for the double circuit portion of this line were the transverse load of ½-inch radial ice combined with six lbs. per square foot of wind load, or ¾" radial ice with no wind. Allowances for longitudinal loading from unequal ice were made also. A factor of safety of 1.5 was applied to all loads. In addition, a 0.9 kN / m^2 wind load was applied on the structure itself.

Since the crossarms and bracing were open at a mid-span splice during construction, to relocate existing conductors to the new structures, additional loadings were calculated.



125 ft. poles are shown here in the new double circuit wood H-frame structure. The relocated circuit is on the left and the new Columbia Power Circuit will be installed on the right side of the sturcture in Spring 2001.

Where longitudinal loading was determined to be a factor, longitudinal guy wires were installed.

To speed installation during the six-week window of construction a stub 36-inch diameter corrugated pipe was sunk for each pole, then bacfilled and compacted. Poles on steep terrain were transported up slopes with a D8 Caterpillar tractor. The poles were later inserted into this stub pipe and backfilled and compacted with gravel. Martech Industries of Castlegar erected the poles for Columbia Power.

The choice of pressure treated wood poles over steel resulted in dramatic savings on the double circuit segment of this new transmission line and kept this project close to budget.

As a result of the substantial savings with wood, all other segments of the new 48 km transmission line were designed in wood except where exceptionally long spans were required, at deadends, and at an additional narrow section near Brilliant Dam.

An existing 230kV circuit is relocated from one of the wood H-frame lines to the new double circuit H-frame.

North American Wood Pole Coalition

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