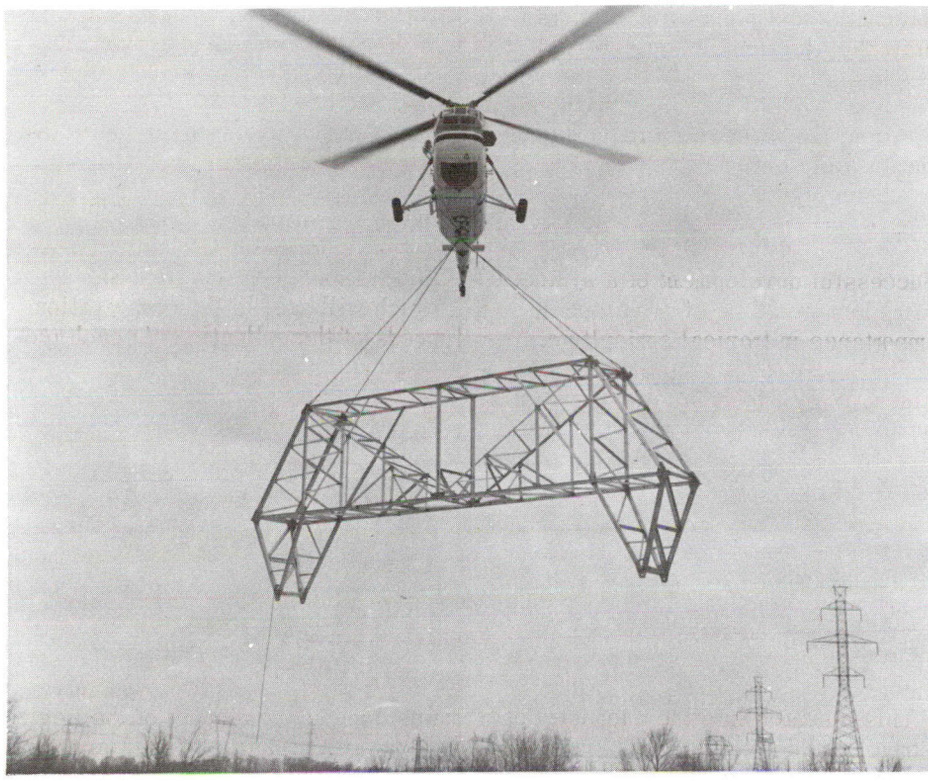
Volume 1, No. 32 August 15, 1973

Pre-assembled hydro towers for emergency replacement



It's difficult to think of something as tall, sturdy, and burdensome as a hydro tower being an off-the-shelf item, always in stock, ready for pick-up by helicopter. But that's the way Ontario Hydro wanted it after a tornado claimed yet another of the towers along the 550-kV transmission line that extends from near James Bay to the outskirts of Toronto. It is one of the most important power lines in Ontario, feeding the industrial heartland of Canada.

"The last tower was the thirteenth that's been lost or severely damaged in less than seven years," says Bob Wilson senior development engineer with Hydro's line-maintenance group.

"It took at least five days to restore the circuit – and we lost earnings of about $30,000 a day while it was out of commission," he says.

"We decided that what we needed was emergency replacement towers, pre-assembled into modules, and stored at strategic areas along the route of the 500-kV line."

Gord Wallace, vice-president and general manager of Powerlite Devices Limited of Toronto was consulted:

"Hydro's engineers told us that when a storm or high winds claims one of their EHV towers, revenue losses can quickly soar as high as $120,000 in a few days. They emphasized they wanted to be able to replace the towers quickly – to get the line back into operation within 48 hours," he said.

Powerlite's design team, headed by Terry Lewis, supervisor of product engineering, went to work.

Specifications called for towers that could be partially pre-assembled in modules of a size suitable for highway transportation and aerial assembly. A base plate was specified to serve as a temporary footing in the event the existing footing was damaged beyond use.

"And there was another specification," Gord Wallace recalls. "The 'replacement' towers would become 'permanent' towers once they were installed."

Pre-assembled packages

Hydro placed an original order for 15 replacement towers and meanwhile determined strategic storage areas along its EHV route. Then, following a successful field test – during which a Sikorsky *Skycrane* helicopter airlifted the pieces of a test rig into position – the 15 towers, pre-assembled into modules, were stored in 'packages' of five at sites near Timmins, Sudbury and Barrie.

"The towers are built of extruded aluminum shapes. Extruded bulb angles for the outside parts and round sections for struts enabled us to gain an advantage in wind-loading," says Gord Wallace.

"Each tower weighs about 10,000 pounds. Hydro cannot lift more than 4,000 pounds with its regular S58 helicopters, so the tower has to be erected in sections.

"When a tower is destroyed, Hydro generally finds the guys are in good shape and can be reused. The guys weigh a lot and don't, of course, figure in the 10,000-pound calculation.

"The replacement tower then goes up in five sections. One leg is put up and held in guy; next, the other leg. Then there is a centre beam to hold the two together. Finally, the two wing arms are added, one on each side."

Versatile design

"Our design had to cover any one of many possibilities," says Gord Wallace.

"One problem we faced was the various mounting heights Hydro required. The largest of these is 162 feet. But there are other cases where all Hydro requires is a 100-foot tower – on a hillside, for instance. We got around this problem by making the towers in modular sections, and supplying additional odd-size modules in lengths that would enable Hydro to attain certain specific heights."

Jack Simpson, head of Hydro's line maintenance department, says: "Rather than store different types of tower, the design of the replacement tower is such that it meets all situations. That makes it unique – and a first in the industry.

"We're now working on a similar program for close to 120,000 miles of 230-kV line across the province. Again, there are many different tower designs, but we're hopeful we'll come up with a design that will be compatible with the existing line and meets all design criteria. Then, as with the EHV line, we can expect at least a 50 percent saving in revenue when we have to replace a tower."