

A light-weight splitting wedge – unique avalanche protection for a lattice tower on the Snettisham transmission line, Southeastern Alaska

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The 138KV Snettisham electrical transmission line is the main power source for Juneau, the capital city of Alaska. Avalanche potential affecting the line is severe and frequent. On April 7, 1976, less than three years after construction, an avalanche impacted and damaged tower 4/6, about 8 km from the hydroelectric plant. In 1981 plans were made for relocating tower 4/6 to a lower hazard location, and eliminating the adjacent tower 4/7. These improvements proved inadequate when a large avalanche on April 16, 2008 destroyed tower 4/6 and damaged an adjacent tower. Field evidence suggests initial impact was about 7m above ground level.

Tower 4/6 was carried about 50m down slope “feet first” while the conductors held the upper portion of the tower. Tower 4/6 could not be eliminated or moved to lower hazard location. Options such as structural reinforcement of the tower or active control with explosives were deemed impractical. A massive, reinforced concrete splitting wedge was also considered but eliminated due to difficulties and expenses in transporting heavy materials to this remote location by helicopter. The solution became a porous steel structure consisting of tubular steel and rectangular steel sections designed to function similarly to a concrete wedge. The structure is approximately 8m high with an apex angle of 37 degrees, and designed for a maximum horizontal thrust of up to 250 kPa normal to the flow. It is guyed uphill into competent igneous bedrock to develop the necessary bending strength and provide some deflection of debris. Construction was completed in October, 2009. This is the first such structure we know of that has been built to withstand large avalanche loads.