WESTERN RED CEDAR POLE ASSOCIATION
THE WORLD'S FINEST UTILITY POLES

Cedar Pole NEWS

Vol. 18
Issue 1

Electronic Cedar Pole News

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Manitoba Hydro Has Great Cedar Pole Performance Record

Western Red Cedar poles have always played an important roll in Manitoba Hydro's electrical system.

Most of their 36,000 transmission poles are Western Red Cedar poles used in H-frame transmission line structures supporting 115kV, 138kV and 230kV transmission line circuits. Single pole structures also carry 115kV lines.

Western Red Cedar has an excellent performance record in Manitoba's severe winters.

Manitoba Hydro has used most sizes of Western Red Cedar poles up to 90 feet for transmission structures.

Manitoba Hydro uses cedar transmission poles because of their proven investment record. Although initial costs are higher, records show that cedar poles last longer, thus lowering the life cycle costs.

The majority of poles used in the province are original cedar poles with the oldest being 80 years old.

Four transmission lines in southern Manitoba are representative of the province's transmission system. About 80 miles north of Winnipeg a 230kV transmission line runs from near Eriksdale east for 150 kilometers, has 230kV H-frame structures with 75-85 foot high cedar poles.

West of Winnipeg a 230kV H-frame line runs about 180 kilometers to the west and has 400 cedar structures with 75-foot high poles.

Some 20 kilometers north of Winnipeg six transmission lines leave the Parkdale substation. All lines have cedar structures and all but one line are H-frames. The oldest line is 115kV and has 1,200 structures with 55-foot high cedar poles.

Two single pole lines, about 50 kilometers east of Winnipeg, run east from the Beausejour substation and have a total of 280 structures with 85-foot high cedar poles.

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Manitoba Hydro Uses Cedar for Transmission Lines

Cedar's straight grain minimizes twisting, an important feature in single pole structures, such as this 115kV line constructed with 280 cedar poles.

400 Cedar pole H-frames in this 230kV line have required little change out during 30 years of service.

Manitoba Hydro is a provincial Crown Corporation providing electrical energy to approximately 700,000 customers throughout the province, and is one of the largest energy utilities in Canada.

About 98 percent of the utility's electrical generation is produced by 12 hydroelectric generating stations on four rivers -- the Nelson, Winnipeg, Saskatchewan and Laurie Rivers.

This power generation base is backed up with two thermal stations and four remote diesel stations providing the balance of electrical power.

The utility also exports electricity to over 50 electrical utilities and marketers in the Midwestern U.S., Ontario and Saskatchewan.

These tie lines are beneficial as backup supply during emergencies and periods of high demand.

A significant difference of the Manitoba Hydro electrical distribution system from most other provincial systems is the exceptionally long DC (direct current) transmission line between the Nelson River generating stations and southern Manitoba where most of the power is used.

This method of transmission is very efficient and economical for long distances.

Manitoba Hydro recently acquired Winnipeg Hydro from the City of Winnipeg, allowing the utility to operate more efficiently. Additionally, the Selkirk Generating Station was converted from coal to natural gas, and two new natural gas turbines were added to the Brandon Generating Station, resulting in significant increase in station capacity. Wind power generation is planned for the future.

The oldest line in a group of parallel transmission lines, it has provided service for 54 years. The 55-foot high cedar poles in this 115kV line have withstood severe freezing temperatures as well as wind and ice storms.

ANSI 05.1
Wood Pole Specification Update

Excerpts from a paper presented at the International Conference on Utility Line Structures by Nelson Bingel, Chair of the ANSI 05 Committee and Chair of the Fiber Stress Subcommittee, outlining the important changes that were made to the standard in 2002. A copy of the complete paper can be found at www.woodpoles.org/EngineeringDesignInfo.htm.

The 2002 edition of ANSI 05.1, American National Standard for Wood Products-Specifications and Dimensions, was published after several years of test data evaluation and debate. The effort was catalyzed by the fact that the designated fiber stress values had been the same since the 1960's and yet a lot of subsequent, full-scale testing had occurred. Fiber stress values were reevaluated based on consideration of the additional test data.

A derivation of fiber stress values based on a combined data set of the ASTM (distribution) and EPRI (transmission) full-scale pole test resulted in some changes in the standard. For the most part, distribution designs remain the same while some transmission designs will require higher class poles. The paper provided an overview of the fiber stress derivation that was used to reevaluate the test data. The correlation is shown between ANSI 05.1 2002 predicted poles strength and the test data.

Fiber Stress Derivation for ANSI 05.1-2002

Combining Test Data

This derivation started with the raw test data from all of the ASTM and EPRI pole tests in the ANSI database. The following assumptions and adjustments were made:

1. No adjustment for load sharing.
2. No adjustment for variability.
3. No test data from small clears.

All data combined for this derivation was from full-scale tests of green, untreated poles.

For poles that broke at the groundline, the modulus of rupture at the break point (MORBP) was equal to the modulus of rupture at the groundline (MORGL). For poles that broke above groundline, the MORBP was calculated using the actual circumference at the break point.

The observed groundline stress is another value that comes into play when a pole breaks above the groundline during a test. This value is the fiber stress that occurred at the groundline when the pole broke at a location above ground.

For poles that break above the groundline, it is important to note the difference between the theoretical projected fiber stress at the groundline and the observed groundline fiber stress.

Since the Table 1 values in the ANSI standard are supposed to be true groundline MORs, and since the earlier data on distribution poles closely represented a true groundline MOR, the transmission data had to be reported on a similar basis in order for the data to be combined as measurements of the same material property, the actual groundline MOR.

Resulting projected fiber stress values at the groundline varied compared to the observed groundline stress due to actual pole geometry. In some cases, projected values were higher than the observed and in other cases lower.

Class Oversize Adjustment

The class oversize is applied to the actual measured MOR calculated from the actual dimensions. This is the true material property. The average pole is going to be one-half of a class size larger so the actual average strength will be midway between classes. Since all designs are based on the minimum dimensions, the design fiber stress value is multiplied by the oversize factor to account for the actual average oversize. The factor varies for species and between different classes. Adjustments ranged from 1.07 to 1.158.

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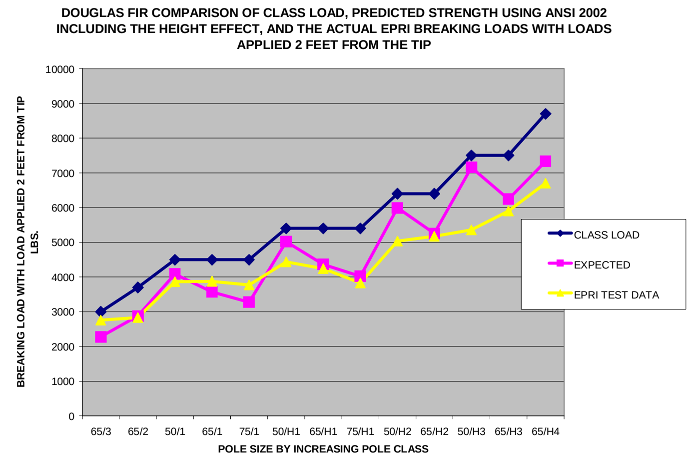

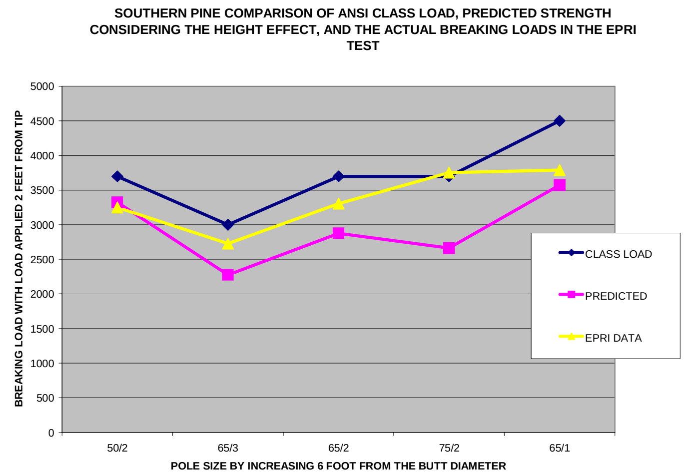

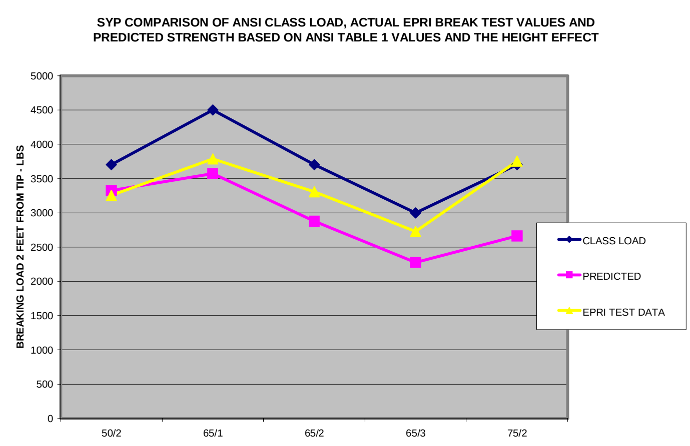

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ANSI 05.1 Specication Updates

Conditioning Adjustment

Test poles were not conditioned for treatment. Different conditioning methods affect pole strength to different degrees. Therefore, the test data was adjusted to account for the effects of conditioning so that expected strength correlates with the test data.

The following factors adjusted the test data to account for the effects of conditioning during the treatment process.

Species	*Conditioning*	*Factor*
Southern Pine	*Steam Conditioning*	*.85*
Douglas fir	*Boultonizing*	*.90*
Western Red Cedar	*Air seasoning*	*1.0*

Drying Factor for Taller Poles

For taller poles, the point of maximum stress is generally above the groundline. The MOR will increase above groundline due to drying to equilibrium conditions as compared to test results of green poles. Test data for poles taller than 50 feet was increased by 10% to count for this drying effect.

Results and Application

This derivation resulted in a design methodology that has good correlation with the test data, see Figures 1-3. Consensus was reached for the standard because the resulting designs are conservative in the vast majority of pole sizes. Therefore, a designer can calculate pole capacity safely and without actual pole dimensions.

Using the guidelines in ASNI 05.1-2002, one simply needs to assume minimum dimensions, apply the load and determine the point of maximum stress. If the maximum stress point is at the groundline, the pole capacity is based on Table 1 fiber stress and minimum pole dimensions. If the maximum stress point is above ground, adjust the fiber stress per the height adjustment equation and use the minimum dimension at that height.

This work confirmed that pole capacity on taller poles changes depending on the height of the applied loads. An applied load two feet from the tip of a taller pole will cause the maximum stress point to occur above groundline. As the load point is applied at lower heights, the maximum stress point moves lower on the pole. The fiber stress is greater and the circumference is larger at the lower points on the pole so the ultimate pole capacity increases.

A Working Group has been formed within the Fiber Stress Subcommittee to determine if there is strong evidence for changes that might result in less conservative or more precise designs.

Did You Know?

▲ *In Canada about 700 million seedlings are planted a year -- that's 25 trees for each Canadian.*

▲ *1.7 billion trees are planted a year in the U.S. -- that's more than 4 million new trees every day and more than 5 new trees a year for every person.*

▲ *In 2000 America's managed forests offset 17% of U.S. greenhouse gas emissions. This is expected to increase to 22% by 2010.*

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