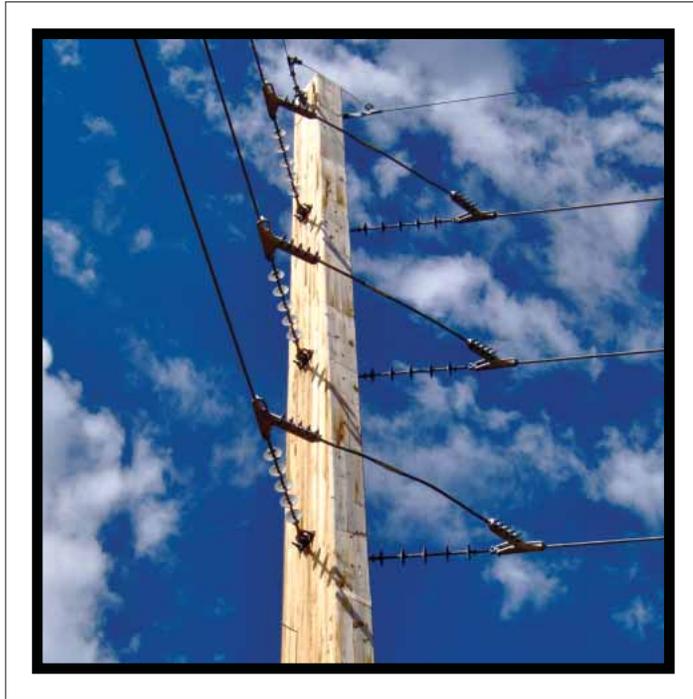


Glued Laminated Wood Utility Poles



APA

Glulam is a Bright Idea for the Utility Industry

Walk into a room, flip on a switch and the room brightens – most people don't give the process much thought. But North America's electrical needs are growing. As utilities address infrastructure upgrades to their transmission and distribution lines, glued laminated timber (glulam) stands ready to keep the lights on.

Round wood poles and steel structures have served the utilities market for years. These products have a place in some applications today, but lead-times are often long or uncertain, supply for long round poles is tightening, and experts project that steel prices will remain high. As a result, glulam utility poles and structures are being used more and more as an alternative to round wood poles and steel.

Glulam poles are well suited for transmission and distribution structures and joint use and telecom poles. They are dimensionally stable, cost effective and readily available. Glulam utility poles and structures are also durable proven performers. Records document that glulam poles in the ground since 1963 – two years before the first tubular steel poles – have exhibited minimal decay.

Glued laminated timber meets increasingly sophisticated technical and land-use requirements that call for full tension dead end poles, ungued angles and engineered structures in which guying is expensive or



Bell Lumber & Pole photo

Western Archrib manufactured two 107-foot poles, and installers bolted them together on site to achieve this unique 90-degree application in Calgary, Alberta. These joint-use poles carry transmission and distribution lines, as well as cable and phone lines.

not an option. Appropriate for the 345 kV and lower voltage market, these poles can be custom designed to meet specific loading requirements, wire size, span and other criteria. Glulam poles are engineered using carefully graded dimension lumber and wet-use adhesives that do not deteriorate when exposed to the elements. They

are code approved, manufactured per ANSI 05.2 and ANSI A190.1 and treated per the American Wood Protection Association Standard AWPA Use Category UC4A, UC4B or UC4C. Wood is environmentally friendly, abundant and produced from a renewable resource that is not subject to shortages or surcharges.

INDUSTRY CATCHING UP

The increasing popularity of glulam can be attributed to a changing market in which utilities are pushing for infrastructure upgrades to catch up with demand. “We’re finding that the infrastructure we had been comfortable with since the 1970s is no longer adequate to handle the needs of the deregulated transmission market,” said David L. Plante, P.E., transmission project manager for Public Service of New Hampshire, a subsidiary of Northeast Utilities. “Our transmission capital program is focused on upgrading line infrastructure so it can carry the additional load of interstate and intrastate transmission, as well as support our own native load. In 2000, we started upgrading our transmission system to the bigger conductors, and that’s when we started using glulam poles.”

Bob Reisdorff, P.E., is president of Laminated Wood Systems, Inc. (LWS), an industry leader in designing and supplying glued laminated timber structures to the North American utility industry. “In 1975, the U.S. spent about \$4.6 billion on transmission construction. That dropped over the next 22 years to \$1.2 billion in 1997,” explained Reisdorff. “During that 22-year period, the industry squeezed many round wood pole suppliers out of the market.”

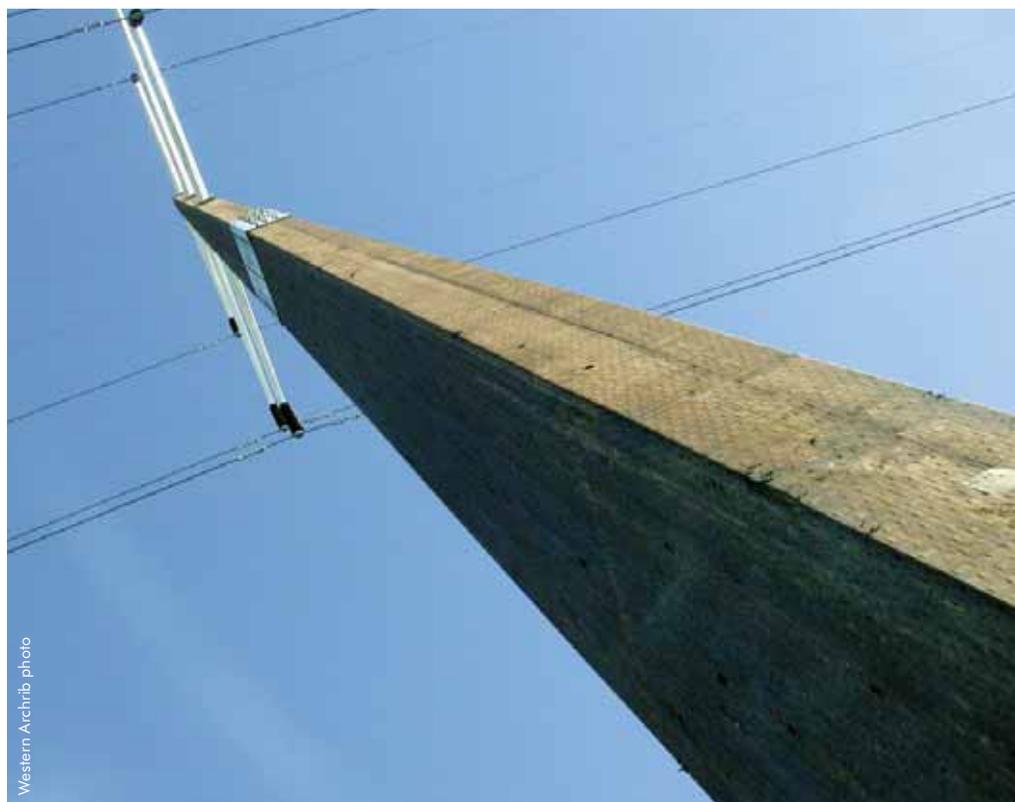
Canadian and U.S. APA member glulam suppliers have the capacity to meet market needs. Western Archrib, an APA member based in Edmonton, Alberta, has manufactured glued laminated structural wood systems for more than 50 years. “Here in Canada, the infrastructure for power

distribution and transmission is overdue for an overhaul,” said Andre Lema, manager of business development and marketing. “We’re prepared to meet the growing demand.”

SHEDDING LIGHT ON THE ADVANTAGES OF GLULAM

For more than 100 years, wood has provided durability, strength, dimensional stability and affordability to the utility industry. As times change, utility managers are considering more and more factors in choosing materials: life cycle costs, installation, right-of-ways, maintenance and even environmental impact. Wood compares favorably against steel, concrete and fiberglass poles in almost every category.

Glulam utility poles can be engineered to meet site-specific requirements, providing a cost-effective solution where right-of-way is limited or guying is not allowed.



Western Archrib photo

UTILITY APPLICATIONS FOR GLULAM

- Transmission structures
- Distribution structures
- Unguyed angles and dead ends
- Guyed and semi-guyed structures
- Tangent poles
- H-frames
- Switch structures
- Substation structures
- Joint-use structures
- Telecom structures

PRICE AND LEAD-TIME FAVOR GLULAM

When selecting transmission or distribution pole types, utilities consider a number of factors, including lead-time, price and line design. “It’s difficult to get a lot of 100-foot H-6 round wood poles, and we were finding that we needed to order them a year or two in advance,” said David L. Plante, P.E., transmission project manager for Public Service of New Hampshire, a subsidiary of Northeast Utilities. “I put a performance specification together with our structural and general configuration requirements and asked steel, concrete, round wood and glulam suppliers to bid. The glulam proposals were the best in terms of price and lead-time by more than 10 percent. The process really caused us to look at glulam differently. In every major project we’ve done since, we have used glulam poles.”

Pole strength and lateral stability were also significant factors in Northeast Utility’s decision to choose glulam. “We had a good experience with glulam poles on a 345 kV line that had been in service for more than 30 years,” Plante said. “We never had to change a pole. There was no ground line decay or insect damage. We were interested in keeping that track record going.”

Western Archrib photo



Glulam poles offer many features that save utilities money, including long service life, easy field modification and dimensional stability under extreme weather conditions, preserving line quality.

Proven Durability

Clyde Robbe, a senior project engineer for NorthWestern Energy (NWE) in Butte, Montana, says NWE buys thousands of laminated and round wood poles each year and is confident in wood’s durability. “We began using treated glulam structures in the mid-1960s. In the early 1990s, we re-routed one of those lines and the glulam poles we removed looked excellent at ground line. There was no deterioration at all.”

Plante uses glulam poles in New Hampshire’s wetland and other areas where frequent inspections are difficult. “Our experience with glulam poles has proven they are good for long-term installations – even in wet areas – so I’m confident they’ll perform well over time.”

“More than a thousand glulam poles were installed in Idaho in 1963, and they are still in excellent shape,” said Sid Kamprath of LWS. “They have

no decay, and they’ve held up well against woodpeckers. These poles are proven performers, which should eliminate any hesitation people have about wood’s longevity.”

Strong and Dimensionally Stable

“Dimensional stability is one of the inherent properties of glulam,” said Jack Minneci, a retired APA professional engineer. “Glued laminated timber uses engineered kiln-dried dimensional lumber. The laminating process eliminates twisting and allows for stable connection details. When utilities install sensitive switches on poles, any rotation can trip the switches and create problems. The dimensional stability in glulam prevents pole rotation. In addition, glulam doesn’t warp and is not subject to deep-checks such as solid timbers, and its structural performance has been verified by full-scale testing.”

According to Kamprath, LWS collaborates with the three major switch manufacturers to ensure switches work on glulam poles. “Since glued laminated wood poles arrive pre-drilled, all field crews have to do is add the switch, tighten the bolts, erect the pole and adjust it. Then they never have to touch it again. For this reason, glulam poles have become the standard pole of choice for phase-over-phase switch applications up to 161 kV.”

Field crews don’t have to return to retighten cross arms because glulam is not subject to excessive shrinkage. Additionally, manufacturers engineer glulam for predictable deflection to improve line quality. “Utilities can specify glulam poles as cambered or raked to accommodate most unguyed angle applications,” said Reisdorff. “We can easily engineer glulam for specific applications.”

Readily Available and Competitively Priced

A key advantage of glulam is product availability. “We’ve networked glulam manufacturers together so that we have a huge production capacity,” said Reisdorff. “When utilities must choose between having a line energized in a year using steel versus just weeks with glulam, they start looking very seriously at their material specs and at glulam. We maintain a 10-week lead-time for delivering glued laminated wood utility structures.”

Product affordability is also important, and a current industry trend is to carefully consider life cycle costs. Two factors weigh heavily in favor of glulam: material cost and total installed cost. Market prices for steel have been high in recent years, and will likely remain high due to international market pressures and import surcharges. Meanwhile, the

material cost of wood – a renewable resource in abundant supply – has remained stable.

The total installed cost of wood is also more competitive than steel. “Unlike the steel and concrete pole companies, we design the foundation for

Most treated glulam utility poles can be directly embedded in the ground and backfilled with select aggregate, making installation considerably less expensive than steel, which requires a concrete foundation.

Glulam Manufacturers Work Together to Aid Disaster Recovery

Gulf State hurricanes, Midwestern ice storms and Pacific Northwest windstorms are just some of the natural disasters that have hit the power industry hard. When disaster strikes, glulam utility pole manufacturers work together to aid recovery.

“After a massive ice storm in Nebraska destroyed 600 miles of line during the winter of 2006, we worked together with two other glulam manufacturers,” said Jim Weber, general manager of Cascade Structural Laminators, an APA member glulam manufacturer. “Each of us quickly produced 300 to 500 glulam poles to help get power restored to cold Nebraska families. The glulam industry is known for working together when people need us. It’s been that way for the 25 years I’ve been in this business, and I expect that utilities can count on us to work together to supply engineered wood poles for many years to come.”



Western Archrib photo

glulam poles,” said Reisdorff. “Most wood poles are directly embedded in the ground, which eliminates the need for a concrete foundation, making wood a very competitive option. The cost is typically 15 to 25 percent less than steel.”

“Our capital budgets are getting tighter and tighter, so we have to pay close attention to installed costs,” said Robbe. “We’re doing a better job of looking at the installed costs of glued laminated poles and finding that the product saves us time and money.”

SEEING IS BELIEVING

In addition to its many practical advantages, glulam is aesthetically pleasing. “The public tells us they

Glulam a Good Call for Cell Towers

Glued laminated wood telecommunication and joint-use towers offer system designers many options in terms of creativity and cost reduction. Glulam is aesthetically pleasing and versatile, allowing utilities to design concealment-type structures, water towers, church crosses, multi-leg church crosses and other stealth-type applications. Glulam installation is simple, fast and inexpensive.

think glulam looks better than steel or round wood,” said Plante. “Most prefer glulam poles because they are so neat looking.”

When proposing a glulam pole solution, LWS illustrates the aesthetic appeal of glulam by providing electronic images of the proposed line, showing how laminated wood will look compared to other pole types.

WOOD LEAVES OTHER MATERIALS GREEN WITH ENVY

Wood poles have a significant environmental advantage over other materials because wood is a renewable resource in abundant supply. Additionally, glued laminated wood and other engineered wood products are efficiently manufactured, utilizing raw materials better than competing products.

Life Cycle Assessment – a method of evaluating a product’s environmental impact from extraction of the raw material to demolition of the structure at the end of its long lifespan – reaffirms wood as a green building product. “Studies have shown that wood outperforms steel and concrete over its lifetime,” said Minneci. “From the time a tree is cut and sawn into dimension lumber, glued and then fabricated into a glulam utility structure, it uses less energy to manufacture and install than other materials.”

Glulam poles can be custom engineered to meet a utility’s specific load criteria. “We make exactly what the customer needs, which is a more efficient way to utilize the material,” said Lema. “We find



Western Archib photo

Most people prefer the appearance of a glulam utility pole, giving glued laminated wood an advantage over steel or concrete poles.



Laminated Wood Systems, Inc. photo

When proposing a glulam pole solution, LWS creates electronic images showing how laminated wood will look compared to other pole types.

utilities are sometimes surprised at what we can do with glulam while eliminating the need for over-engineering.”

Utility field crews also appreciate glulam poles. “They are easy to climb and easy to modify in the field with standard tools,” said Kamprath. “And wood is less conductive than steel, an important consideration for installations taking place near energized lines that can’t be taken out of service. Utilities appreciate these extra features.”

EPA-APPROVED PRESERVATIVES ENSURE DECADES OF SERVICE

Utilities have used treated wood poles and crossarms for well over 100 years. Wood poles may be treated with any number of different preservatives depending on the actual product application, but all preservatives are EPA-approved and applied prior to installation according to American Wood Protection Association Standards.

“Utilities have a number of preservative treatment options, depending on the location, environmental regulations, lineman’s needs, price and other factors,” said Todd Brown of Bell Lumber and Pole, a wood pole producer and supplier to the utilities industry. “We typically use pentachlorophenol, a naturally biodegradable oil-based preservative, and chromated copper arsenate (CCA), a water-based preservative. We can also treat with creosote, one of the only preservatives approved for a marine environment. We also recently began using copper naphthanate, which is relatively new on the market.”

Glulam utility structures perform well for decades when properly preserved.

To improve treatment penetration, some wood species require incising the poles to a depth of 3/4-inch deep full length, and then deep boring 3 inches in a zone all the way around the perimeter 2 feet above and 3 feet below the ground line, the area most susceptible to decay. Pole ends may be encased in a protective boot for extra protection.

To improve penetration, this pole was incised to a depth of 3/4 inches along its full length before treatment with EPA-approved preservatives.



When Wind Farms and Ethanol Plants Need Quick Supply, Glulam Delivers

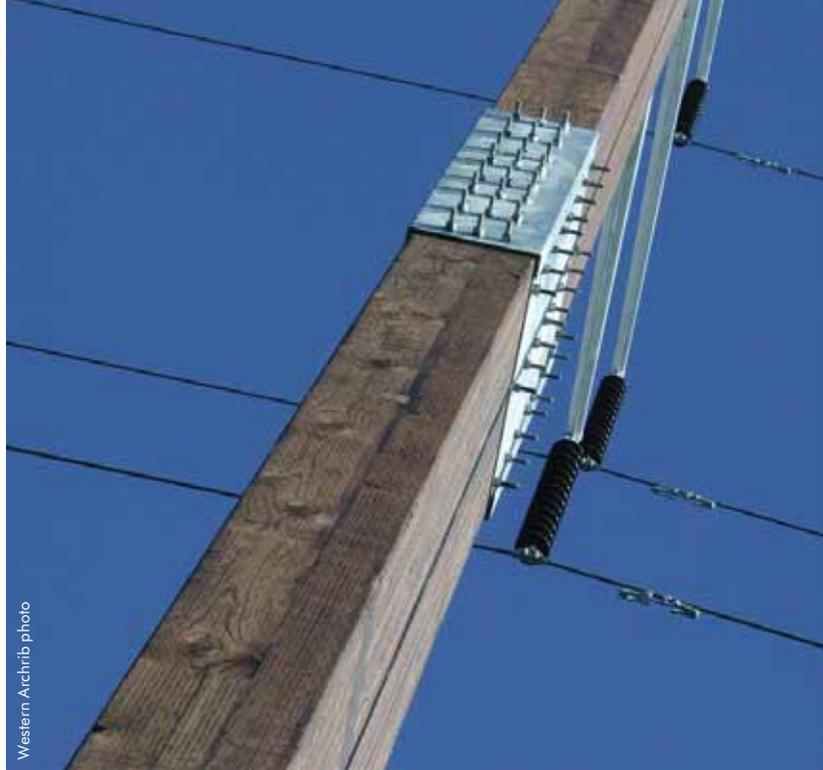
Currently, some of the most rapid utility infrastructure growth is occurring at wind farms, often competitive turnkey ventures between contractors and consultants, and at ethanol plants, which require power lines in and out of the facility. Companies like Alliant Energy, MidAmerican Energy, FPL Energy and others are increasingly turning to glulam for their utility structure needs because of competitive pricing and lead-times.



GLULAM – A POWERFUL POLE OPTION FOR THE UTILITY INDUSTRY

Why do utilities choose glulam poles? “Glulam offers engineered strength, longevity and superior resource utilization,” answered Jim Weber, general manager of Cascade Structural Laminators, an APA member. “We’re using second- and third-growth plantation wood to make these poles. Wood is a sustainable resource that has less waste and uses less energy to manufacture.”

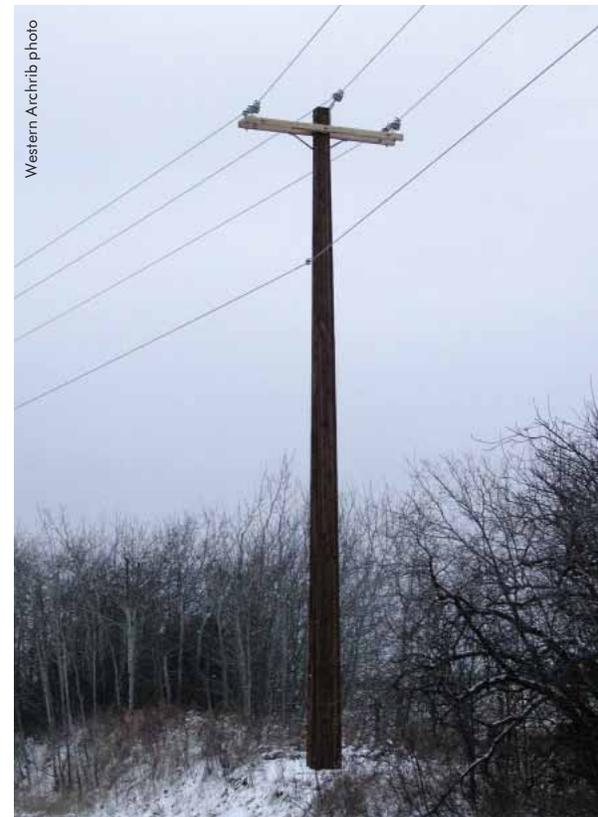
He added that delivery lead-times and competitive pricing strongly favor glulam for the utility pole market. “Our industry can react quickly for faster delivery. And because poles are highly engineered, glulam can meet virtually any technical requirement. These advantages make glulam poles an attractive alternative for utilities seeking value in terms of installed price, performance and durability.”



Western Archrib photo

APA is a nonprofit trade association of and for structural wood panel, glulam timber, wood I-joist, structural composite lumber and other engineered wood product manufacturers. To learn more about the use of glulam in utility poles and structures, or for more information about engineered wood products, contact APA's Product Support Help Desk at 253-620-7400. Or visit www.apawood.org.

Because glulam utility poles are engineered for specific applications, they make efficient use of the raw material.



Western Archrib photo

Glulam utility poles provide improved line quality because the poles are engineered for reliable deflection, even under adverse conditions.

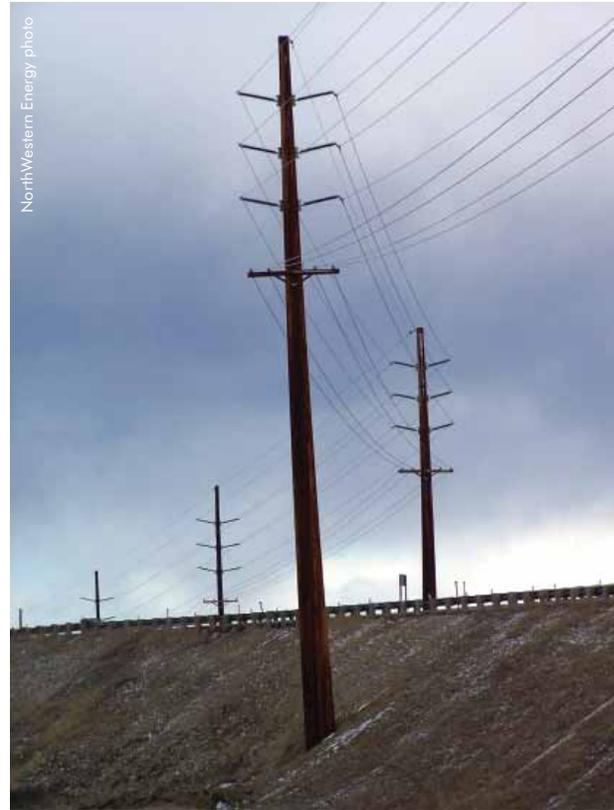
WHY CHOOSE GLULAM?

- Economical
- Quick delivery
- Dimensionally stable
- Manufactured from a renewable resource
- Not subject to shortages or surcharges
- Resistant to decay and woodpeckers when treated
- Aesthetically pleasing
- Can be directly embedded, no need for separate foundation
- Workers can climb with familiar gear
- Easily modified in the field

Three Rivers to Jackrabbit Line

Near Belgrade, Montana

When NorthWestern Energy needed to route a new 30-mile 161 kV line near Bozeman in 2006, they turned to glulam. “We chose glulam in many locations because of installed cost and availability, and because it was uniform and easy to frame,” Clyde Robbe of NorthWestern Energy explained. “The engineered wood helped us better maintain structural shape for the life of the line and provided better performance with operational switches and interface lines. We can engineer a glulam pole so that it doesn’t deflect in the transverse direction, which would have caused problems with our air-break switches. In addition, guying just wasn’t possible for us along much of the route, so glulam really shined for that purpose.”



NorthWestern Energy photo

Mt. Royal Neighborhood

Calgary, Alberta

Aesthetics were imperative to residents of this upscale Calgary neighborhood featuring \$2 million homes. Existing utility poles could no longer support the community’s growing electrical needs, but residents were not interested in unattractive steel poles or guyed structures. Further complicating matters was the expensive right-of-way cost in the exclusive neighborhood.

The solution was a dozen 52-foot long glulam poles, designed to handle the full load unguyed. Elaborate landscaping limited property access during installation, so ENMAX, Calgary’s electrical utility, used a crane to lift the 4,000-pound poles into place. The glulam poles were installed directly into the ground, without concrete foundations, minimizing right-of-way expenses.



Bell Lumber & Pole photo



Bell Lumber & Pole photo

King Avenue Overpass

Billings, Montana

A 2006 Montana Department of Transportation project to construct a railroad overpass near Interstate 90 in Billings, Montana, required NorthWestern Energy to install four light-angle structures, each up to 100 feet tall. According to NorthWestern's Clyde Robbe, an engineered product was required so that the laminated wood poles would not have to be guyed. "Right-of-ways were tight, and with the unique height and angle requirements, engineered wood was a perfect solution. Plus, the poles required some auxiliary attachments, and wood is very accommodating for that."

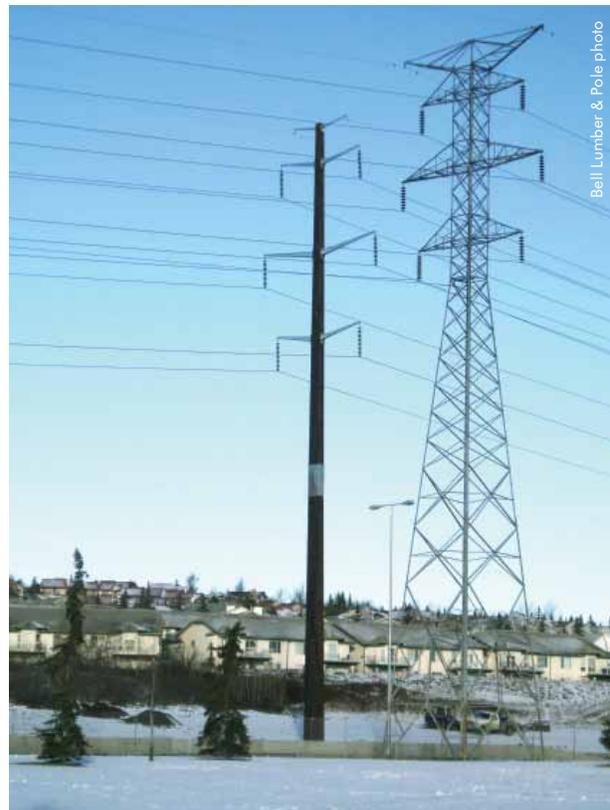


NorthWestern Energy photo

Highway in Calgary

Calgary, Alberta

SNC-Lavalin ATP of Calgary worked with AltaLink, Alberta's largest electric transmission services provider, to replace steel lattice towers alongside a Calgary highway with glulam poles in 2006. Community members agreed that wood provided a more aesthetically pleasing pole, while the utility met the structural requirements for the 161-foot-tall installations without needing huge footings. The switch was made from metal to wood on the 230 kV line with no outage. Best of all, utility representatives said that using wood instead of steel lattice towers resulted in a savings of more than a million dollars plus the additional savings realized from avoiding a service outage.



Bell Lumber & Pole photo

Pelican Narrows

Saskatchewan

In late 2005, SaskPower constructed an 11-mile 138 kV transmission line in Pelican Narrows, Saskatchewan near the Manitoba border (north of the 55th parallel). The project required 825 poles, ranging from 60 to 85 feet and Class 4 to H1. Lead-time was crucial due to the limited construction window of the remote location, and the round wood supply was short. In just six weeks, 181 Southern Yellow Pine Class 3/75, Class 2, 3 and 4/80, as well as Class 1, 2 and 3/85 glulam poles were ordered, manufactured in North Carolina, treated in Minneapolis, and trucked to Pelican Narrows.



Iowa Wind Farm

Near Crystal Lake, Iowa

In 2008, Laminated Wood Systems, Inc. (LWS) supplied nearly 760 glulam transmission structures to a wind farm project in northern Iowa. The 161 kV project included 36 miles of transmission line requiring 675 tangent poles, ranging in size from 35-foot Class 2 to 128-foot Class H4 complete with framing kits. The line also included 85 self-supporting unguyed angle structures that utilized a direct embedded foundation design. A considerable number of the structures also supported distribution underbuild and communication attachments.

Close communication between LWS, the owner of the project and the line designers, Ulteig Engineers of Fargo, North Dakota, allowed the line contractor to accept delivery of the structure kits to coincide with the construction schedule. The contractor constructed the line in eight "dead-end to dead-end" segments, and LWS staged fabrication to match the segments. This allowed the contractor to string the conductor as the project progressed.



Glued Laminated Wood Utility Poles

We have field representatives in many major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying engineered wood products, contact us:

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REPRESENTING THE ENGINEERED WOOD INDUSTRY

