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TIMBER BRIDGES:

New Products, New Resources, New Opportunities for Infrastructure Improvements

Throughout the USA, renewable forest lands stand ready to provide sustainable resources for a new, innovative, "green" industry that will revive the use of timber bridges for highway and roadway construction. This industry will apply recent advancements in material science, tested bridge engineering and construction practices, available manufacturing facilities and the demonstrated durability of timber construction to meet demands for infrastructure repairs. The need for replacement bridges on American highways, roads and streets is enormous, immediate and recurring. More than a million bridges have been identified as obsolete and decaying and additional structures will require attention within the next twenty years. The costs to do this with conventional steel and concrete technologies will be high in terms of capital outlays and time. Timber bridges could provide alternatives to conventional bridges, be installed more quickly and provide recurring local employment for modular construction facilities in forested areas of the US where the recession's effects are being most severely felt.

Among the most noteworthy improvements in timber bridge construction are applications of material science discoveries and of conventional modular construction practices that can produce heavy-weight bearing bridges in factories rather than onsite. New wooden bridges can be fabricated by teams able to apply modular construction and factory production efficiencies and economies of scale. They can be installed in a fraction of the time required for concrete and steel construction and can be put into use with causing months of disruptive and costly traffic detours.



Public policy is needed at local, state and federal levels to stimulate applications of wood/material science technology to US infrastructure repairs. Doing this could advance

orders for timber bridges to to replace large numbers of outdated and weakened bridges on state, federal and local transportation routes. It would also stimulate cultivation of forests and help preserve their trees for highest, best and limited uses such as wood bridge construction. Most of the woods that are suitable for bridge building can be cultivated by foresters and can reach maturity within scheduled timeframes that can fulfill bridge building factories' regional demands.

A modular bridge building industry could quickly put a diversely skilled and widely situated underemployed and unemployed labor force to at forest harvesting sites, lumberyards, wood drying and fabricating facilities, as well as at factories, engineering work centers and at the many bridge sites where transportation dangers have been identified. The work that is needed to build a timber bridge ranges from unskilled labor required to sweep forest roads for transport and hauling vehicles to lumber yard and transport personnel, designers, civil and mechanical engineers, surveyors, geologists, material scientists, and business managers. It could rapidly become an industry of scale throughout the US and one that could pay dividends to investors and taxes to communities. Cornerstone Consultants is working to advance attention to these opportunities and to the community development potential they represent for timber regions.

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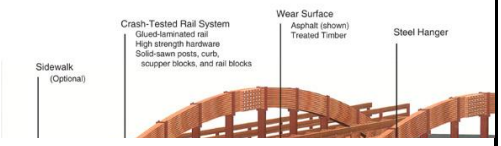

Why Wood?

Wood has been used to build bridges for thousands of years. Some spans in use today date their origins to the Roman Empire. Many were designed and erected in the 18th and 19th centuries and a large number of these remain in use for limited traffic or pedestrian walkways today. Some, built for railroads continue to support a tired infrastructure and will do so until scheduled replacements occur.

The use of wood as a bridge building material fell into decline in the US during the industrial age. Public fascination with the elasticity and strength of steel rope suspension bridges, and the rise of high speed transportation routes moved uses of wood for road construction and bridges out of favor. By the middle of the 20th century, timber bridges were almost universally replaced in the US by steel and concrete spans. As a result, several generations of engineers and public safety managers have had little experience with timber bridges and have, because of this, discounted the material's utility, durability and availability as a sustainable, "green," building resource.

Despite the disfavor being shown by the end of the 20th Century for timber bridges, there were still a large number in use that would require replacement throughout the US. In recognition of this and in response to a number of environmental management issues that were detrimentally impacting forest and wood building industries, the USDA Forest Service initiated a national

inquiry into ways to revive advance wood construction technology. Its inventory of timber bridges revealed that there were more than 38,000 wooden bridges in use on US roadways and an additional 39,000 steel bridges with timber decks that would require attention, repair or replacement. This led to a 1988 Congressional appropriation for a Timber Bridge Initiative to find new ways to deploy wood as a bridge building material and to foster its use in the repairing and replacement of existing, obsolete bridges. The Inititiative was also charged with the task if identifying economies and efficiencies of scale in its development of new timber bridge building practices. It financed 419 demonstration projects. The longest of these was a three-pin Fontana Park Bridge (shown here) in Iowa. This bridge is 8 meters wide, 42 meters long and can simultaneously hold two loaded semi trucks without restriction. The three-pin ,arch design has a pin at each end of its arches with one pin in the center of each arch. These bridge arches are constructed of southern yellow pine, while the basic design is comprised of Douglas fir. The Fontana Park Bridge replaced a 77 year old steel and concrete bridge that had deteriorated as a result of corrosion. In its twenty years of use, it has proven to be as if not more durable than its predecessor inasmuch as its requirements for maintenance and inspection do not require X-rays to detect hidden faults.

The Fontana Park Bridge is one of 419 demonstration timber bridges built since 1988. It has a record-long span for a bridge built with wood.

Despite the documented outcomes of the 1988 Timber Bridge Initiative, a decision was made to end the project in the 1990s In part, this was because the US Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) had established a timber bridge research fund to provide for ongoing investigations into the reliability and utility of timber bridges. These monies have supported a good deal of additional research in the US into ways to improve wood as a bridge building material and ways to improve construction practices to make uses of wood economical and efficient. Despite this, a concerted, national “Manhattan Project” type of effort has not yet been taken to consolidate the results of this research and apply it to a nationwide development initiative that would produce a competitive and uniquely American modular bridge building industry.

A number of impediments have prevented the development of regional wood bridge building industries. Among these is the public’s ignorance about the sustainable benefits that attach to uses of wood for bridge building. Prejudices against wood for bridge building, particularly in respect to fears that it could burn if hit by lightening, have been hard to overcome in the US. The EU has had no such problems. It has in fact applied US supported research findings to a continent wide effort to use wood for bridge and road building. Many new European bridges owe much to modular imports brought to sites from small, itinerant US manufacturers and to technologies such as wood acetylation that were developed at US universities with support from Koppers Corporation in the 1960s and 70s.

Some of the forested nations in Europe have recognized the potential earnings from timber bridges and instituted policies to promote their development. Norway has committed its infrastructure budget to allocate ten percent of its bridge building funds to timber bridges which must meet national standards for 100 year long use. Similar mandates in the US could dramatically fuel investments into and development of timber bridge building.

For the US, the export sales potential for custom designed, modular wooden bridges should prove to be a significant driver for development. Other nations are not as likely to resist using "green" timber bridges as has been the case in the US. Markets in Asia, Africa parts of South America as well as Europe and the Middle East recognize benefits that could result from wood bridge construction: quick installation, easily rebuilt and installed replacement sections, simple maintenance and inspection requirements, and fewer carbon credit costs thank those created by metal production and concrete curing.

The development of a timber bridge building industry in the US faces a number of operational issues. Among these are limited human resources to design, construct and install weight bearing wood bridges, limited financing for in situ applications of material science discoveries that improve wood's durability and resistance to moisture; limited sharing of knowledge about environmentally friendly technologies such as variable microwave heating, and limited civil engineering and inspection experience with wood bridges in heavily trafficked urban and suburban areas. For the most part, wooden bridges have been used for small spans in these settings and longer spans in rural settings.

There are an impressive array of resources in place to support the development of this industry: an array of demonstrated technologies ready for widespread applications (a number of which are already in use overseas!), a reservoir of harvest ready timber and forest lands able to produce recurring supplies of timber, empty factories in areas where a labor force equipped to handle heavy manufacturing exists, and a large, defined market which has resources to purchase of an enormous number of bridges and a compulsion to do so with dispatch.

What is needed?:

Cornerstone Ventures seeks commitments from national proponents of "green" industry development and public agencies responsible for infrastructure development to collaboratively stimulate the purchase of wooden bridges for highways receiving federal highway funds and for tax credits for investors willing to provide the capital to wood bridge building enterprises would greatly advance the development of modular wood bridge builders in areas near US forests. States that are among those most hard hit by the 2008 Recession are among those most likely to benefit from a wood bridge building initiative. Maine, Oregon, Michigan, Minnesota, New Mexico, Washington, Virginia, Tennessee, Kentucky, California have the needs in respect to infrastructure and the redevelopment motivations to move quickly to develop timber bridge building capabilities. Resources in respect to infrastructure funding, human resource and facilities development and tax credits to motivate patient "impact" investments in social enterprises formed for timber bridge ventures are needed.