

GLULAM IN GOLF RESORT CONSTRUCTION



ENGINEERED WOOD SYSTEMS
APA EWS

Glulam Plays Through at the World's Fine Golf Resorts

Golf is played virtually everywhere in the world. Courses vary, from traditional links to lush fairways with waterfalls. Clubhouses differ as well, as each resort tries to create a signature look to distinguish itself in a competitive industry.

But one feature is common across all top golf resorts. Clubhouses and facilities are designed to provide members and golfers with a place to relax, to enjoy the natural environment and the richness of the experience. That is why glulam is such a great design choice for golf resort construction around the world.

Glulam uniquely meets both the structural requirements and the design goals for long spans and large, open spaces where key structural elements are exposed, says architect Yuji Noga of Issiki Architects in Japan. “The reasons are that glulam is lightweight – lighter than concrete – and it offers beautiful expression. Glulam is natural and warm, while other materials such as steel or concrete are rather cold, chilly and mechanical.”

“People relate to wood, particularly in recreational structures,” added architect Roger Williams, FAIA, of Seattle. “Wood is an important part of our built environment and our natural environment. People appreciate its warmth, but I think it’s much deeper than that; it’s cultural intuition of strength and aesthetics.”

“People who golf are outdoors for a reason; they enjoy nature and want to spend time in a beautiful place,” agreed Tray Williams with American Laminators, a glulam manufacturer in Oregon. “Glulam allows a golf resort designer to carry the natural environment into the clubhouse or across a bridge. In addition, clubhouses need to reflect the value of club membership. Glulam’s rich look allows that to come through.”



Structurlam photo

Glulam reflects the natural beauty of the surrounding area at “Birdies and Buckets” Family Golf and Driving Range in British Columbia, Canada.

Even when treated with preservatives for use in exposed applications, glulam can often accept virtually any color of stain depending on the treatment. The fabricator stained this bridge at Sheshan Golf Course, near Shanghai, China, a dark mahogany color to meet regional design preferences.



APA photo

GLULAM ALLOWS CONSISTENT VOCABULARY

Club ambience doesn't stop inside, added Roger Williams. "It continues into the loggia, bridges, decks, walkways and other structures. Continuity is important, and glulam allows an architect to use the same design vocabulary throughout. People have an intuitive appreciation for consistency; it creates a relaxing environment."

"When people want to relax, they like being surrounded by a beautiful atmosphere," said Jim Walsh, president of Walsh Industries LLC, an exporter of glulam to Japan and the Middle East. "In Japan, golfers enjoy lunch after nine holes and then a hot bath at the end of their round – it's a day-long indulgence. It is important to create a facility that allows them to enjoy that luxury."

Structurlam Products, a glulam manufacturer and fabricator in British Columbia, has supplied beams and columns for several innovative golf club structures. "Glulam is a good choice for golf resorts because it is warm and inviting, particularly when compared to steel or concrete," said Mark Rufiange, with Structurlam. "Glulam presents a warm finish at the same time it provides structural support, a combination that steel and concrete do not offer."



STRUCTURAL VERSATILITY, PROVEN PERFORMANCE

North American laminators produce glulam to exacting specifications that meet specific strength requirements. Today, technical specifications and engineering data are readily available, making it easier than ever to design using glulam.

“Our industry has a long history of proven performance,” said Claire Vermedahl of Alamco Wood Products in Minnesota. Tray Williams from American Laminators agreed. “North American manufacturers adhere to stringent manufacturing guidelines, so quality is an everyday commitment for all of us.”

Quality doesn’t end at production, but is carried through fabrication to the job site. Structurlam uses computer numerical control (CNC) equipment, with computer aided design (CAD) and robotic cutting to fabricate their glulam. “We work closely with the contractor, the architect and the engineer. We then model the entire building in three-dimension CAD so we know it is right before we even start cutting,” said Structurlam’s Rufiange.



Structurlam photo

Set in the picturesque wine country of British Columbia, the Fairview Mountain Golf Club features a simple design that uses glulam in both interior and exposed applications.

VERSATILITY CREATES A CLUB SIGNATURE

While volumes of technical data exist to support the structural engineer, it’s up to the architect to utilize glulam’s full potential when designing a unique golf resort.

“Design flexibility is one of the ways in which glulam shines,” said Paul Gilham, an engineer with Western Wood Structures in Oregon. “You can

do almost anything with glulam; this in turn allows a golf resort designer to create a signature club.”

Xu Fang is technical director with American Softwoods in Shanghai. “Image and aesthetics, design flexibility and versatility are all features of glulam that promote its use in China. People appreciate those benefits. Primarily, resort developers here want to know about durability of exposed elements.”



Structurlam photo

The clubhouse at Green Meadows Golf Club in Japan used Douglas-fir glulam trusses and fir columns to complement the club’s natural setting.



Western Wood Structures photo

Radial glulam arches in the 21st Century Golf Club in Takasaki-Cho Gunma, Japan, provide a good example of the design versatility of glulam.



Structurlam photo

Mt. Fuji Golf Club in Chiba, Japan, uses glulam trusses with very intricate detailing, designed to look like furniture.



APA photo

Treated glulam is used in bridges, where the wood is constantly exposed to weather and wet environments.

DURABLE OVER THE COURSE (OF TIME)

Because of its versatility and durability, glulam can be used virtually anywhere. But when left exposed to the weather, as with bridges, glulam must be pressure-preservative treated to prevent insect attack and decay. Gone are the days when preservatives discolored the wood a dark green. The variety of preservative treatment options gives golf resort designers a great deal of flexibility in color and application.

David Bond is with Permapost of Oregon, a company that pressure treats west coast and southern pine species used in glulam. “We treat with three different mineral spirit-based wood preservatives as well as two heavy oil-based wood preservatives for in-ground applications such as retaining walls and bulkheads. We also offer clear preservatives, which allow the wood to keep its natural color. Possible applications of treated glulam are almost limitless.”

THE NATURAL CHOICE

All agree that glulam is a natural design choice for golf course settings. “As a player, I enjoy relaxing at a clubhouse with exposed wood,” said Doug Calvert of Calvert Company, a glulam manufacturer in Washington. “As a glulam supplier, I feel good that we can provide an environmentally-friendly building product at the same time.”

Wood is the only structural building material that is completely renewable. “The energy life cycle costs of producing glulam are far below those of steel and concrete, in terms of fossil fuels, water and electricity used,” said architect Roger Williams. “Glulam also fills two roles – as a structural member and as a design element. The strength and warmth of the wood can be expressed throughout a golf resort. You just can’t do that with other materials.”



APA photo

The Ocotillo Golf Resort is a good example of how exposed glulam members can be used to blend with natural settings.

Golf Faces Global Growth

According to the National Golf Foundation, more than 16,000 golf facilities existed in the U.S. at the end of 2004. An additional 1,000 courses were nearing or under construction. About 60 percent of these new facilities will become part of a residential community, which means the clubhouse will serve more than just golfers.

Golfing growth is global, particularly in Asia. Japan has more than 2,000 golf courses in operation, with hundreds more in various stages of planning.

Many expect China to eventually become one of the world’s largest golfing markets. In 2005, there were about 250 golf courses operating in China, and experts estimate that another 500 to 1,000 courses are in planning or under construction. A recent survey conducted by the China Golf Association concluded that China needed to develop an additional 2,000 courses in the next eight years to service demand.

Iono Golf Clubhouse

Nasu City, Tochigi Prefecture, Japan

Dramatic setting, striking structure

Its huge scale and the way in which glulam is combined with steel, concrete and masonry makes this project unique. But the breathtaking beauty of the glulam makes this clubhouse unforgettable.

The Iono Golf Clubhouse was the first major structure to use southern yellow pine (SYP) glulam in Japan. Resort owners favored pine because they liked its clean look and the fact that it had fewer edge knots. It also provided higher tension values, needed for the long spans in the structure, than Japanese cedar could offer. With a total floor area of 107,600 square feet (10,000 square meters), Iono was the largest wood roofed facility of its type in Japan when it was completed in 1996.

SYP glulam beams sloping in one direction are supported by columns with four braces. The cross-section of the largest beam is 10-2/3 inches x 40-1/3 inches (269 mm x 1,025 mm); it spans 154 feet (47 meters). In order to transport the glulam in shipping

containers, the beams were joined at the site by BVD steel connectors, a proprietary design from German engineer Peter Bertsche.

Iono is located in a mountainous area north of Tokyo. Architect Yuji Noga of Issiki Architects used wood and glulam to create a dramatic setting in the spacious, three-story lobby. "To harmonize a golf clubhouse with its natural environment, the structure should

be timber frame; the same applies to materials used in the interior," said Noga. "The expression of the wood structure is expected to relax the golfers who mainly live in the busy city."

"It's a unique design that fits in with its surroundings very well," added Claire Vermedahl from Alamco Wood Products, the glulam supplier. "Walking in the lobby just takes your breath away."



Yuji Noga, architect for the Iono Golf Clubhouse (above and below) near Tokyo, used glulam to create a unique reception area that combines stunning views outside with relaxing spaces inside.



Riverwalk Golf Club Bridges

San Diego, California, United States

Environmentally smart bridges

When the Riverwalk Golf Club's fairways were reconfigured to accommodate a new community light rail line, club owners found they needed to add two bridges that would allow golfers and maintenance workers to cross the San Diego River.

"It was an environmentally sensitive area," remembers William Steen, P.E., principal of William A. Steen and Associates of San Diego. "Permitting agencies would not allow piers in the river, so we studied structural options that included concrete, steel and other wood systems. We quickly determined that glulam was our best design choice."

Steen provided engineering for the site improvements and riverbank flood protection, and worked closely with Western Wood Structures, which provided the structural design and treated glulam for two pinned arch bridges. Both bridges were 11 feet wide (3.4 meters); one was 117 feet long (35.7 meters) and the other was 170 feet (51.8 meters) long. The glulam bridges were designed to carry golf carts as well as the Club's 10,000 lb. (4,536 kg) maintenance vehicles.



Western Wood Structures photo

Glulam bridges spanning 117 feet and 170 feet provide graceful crossings at the Riverwalk Golf Club.

It was Steen's first experience working with glulam in a bridge application, and he found the process quite easy. "Our decision to use glulam was partially driven by a desire for something aesthetically pleasing," he remembered. "The resulting bridges were

graceful, artistic structures; they also provided an environmentally-acceptable solution. We've received many positive comments on our choice."

'Birdies & Buckets' Family Golf and Driving Range

Surrey, British Columbia, Canada

Smart engineering saves \$100K in cold, hard steel

Birdies & Buckets is a golf practice and driving range located outside Vancouver, British Columbia. Owners spent CAN\$3 million to create the 30,140-square-foot (2,800-square-meter) facility. More than 72,000 mbf of Douglas-fir glulam beams were used to support the patio and tee line, visually connecting the different areas of the facility and providing what they call "flow and continuity."

But it's what you can't see that tells the story for this unique golf facility. According to Mark Rufiange from Structurlam Products, the original engineer had overdesigned the facility. By working with the contractor and a new structural engineering firm, Structurlam saved the owner CAN\$100,000 in steel costs and eliminated many of the clunky steel connectors originally specified.

Robert Malczyk, P.E., is principal of Equilibrium Consulting, the new engineering firm. His company specializes in design of heavy timber and glulam connections.

"When you have two pieces of glulam meeting together, the easiest way to connect them is to cut a notch, which optimizes the bearing parallel to grain, and this is what we did," said Malczyk. "Instead of using steel plates on the outside, we transferred the force in bearing, which is a more direct and natural way to connect members in compression."

When members were needed to transfer tension, steel rods were inserted into the glulam. "Tension rods were hidden, which fits with our philosophy to hide steel inside the wood. Doing so also protects the steel from yielding under fire, since wood chars and insulates before it burns. Because we introduced these simple concepts, we were able to achieve extraordinary savings."

Malczyk said their approach works because they use the same software used by manufacturers who use computerized fabricating machines. "Close collaboration with the fabricator made these cost savings possible, because we both worked with the latest technologies."



Structurlam photo

Structurlam Products finished the beams for this driving range with a protective, natural wood finish. The two-coat system protects the glulam against ultraviolet light, so that the wood "looks as good today as the day it was built."

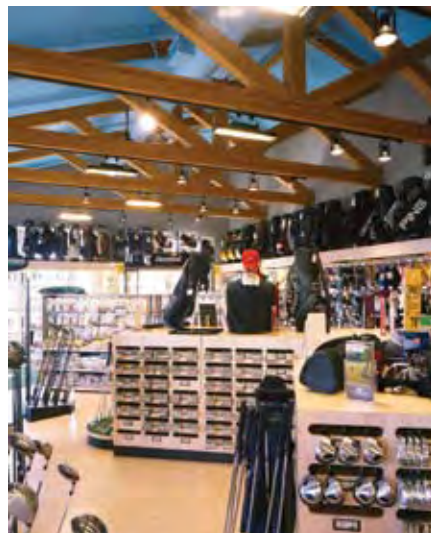


Structurlam photos

By having their driving range structure re-engineered, owners saved money by better utilizing wood's natural compression strength and eliminating many of the steel connectors.



Structurlam Products uses a CAD software program to model their projects in three-dimensions, drawing beams, steel connectors and holes to ensure accurate fabrication.



Architects used glulam throughout this family golf facility, which included 76 tee-off stalls as well as a retail store, café and special events room.



Equilibrium Consulting re-engineered the driving range project, using notches and hidden connectors to save money. The strategy also resulted in a clean, uncluttered design.

Ocotillo Golf Resort

Chandler, Arizona, United States

Distinguished design

In a crowded resort community like Chandler, Arizona, a golf club needs distinguishing features, something to help set it apart from its competitors. On its fairways, Ocotillo features water and lush landscaping, which makes it unique among the surrounding desert-style golf resorts. In turn, architects used glulam and other natural materials to distinguish the resort's structures.

George Melara is with Nelsen Architects in Scottsdale, Arizona. He said Ocotillo's owner had an engineering background, and so was receptive toward using glulam to create a signature statement. The project featured straight and curved Douglas-fir glulam for the skeleton of the main clubhouse. Curved glulam was also used in the resort's covered walkways.

Melara said, "We wanted something that felt natural and warm, a component that would play to the upscale look we wanted for the clubhouse. That's exactly what we got with glulam."

Whenever Melara's firm designs hospitality-type structures, the warmth provided by glulam makes it an obvious choice over steel. "Many buildings lack integrity between the outside and the inside; we wanted a building with integrity, with real structure," he said. "Glulam served a dual function, giving us the natural look we wanted on the interior as well as the support we needed for the structure."



Straight and curved glulam members lend strength and architectural distinction to the Ocotillo Golf Resort.

APA photo



APA photo

Eagle Point Golf Club

Wilmington, North Carolina, United States

Unpretentious comfort

Architects often look to their surroundings for inspiration, and that's what led to the unpretentious comfort of the glulam trusses used in the clubhouse for Eagle Point Golf Club.

Henry Johnston, AIA, of Johnston Architecture LLP, said they toured some of the finest clubs and resorts on the east coast before bringing their design home. "We wanted to bring an eastern North Carolina influence into the design of this private club," he said. "We finally narrowed that down to commonly found structures here – lifesaving stations on the Outer Banks, railroad stations and Carolina tobacco barns. Many of Eagle Point's members are not from North Carolina, so we wanted this beautiful and inviting clubhouse to have a comfortable, identifiable context – indigenous to the area, but not a cookie-cutter look."

Johnston and his partner Ian Johnston used glulam to give the clubhouse broad eaves which protect golfers from the hot Southern sun. "Early on, we knew we had big spans and so couldn't use solid-sawn timbers. We immediately turned to glulam, because it is so easy to work with. I have been designing with glulam since the 1960s, and am very comfortable using it as a structural building element."

Although Eagle Point Golf Club was voted by *Golf Digest* as one of the top 10 new private courses in 2001, Johnston wanted to design a clubhouse that was comfortable, unimposing and unpretentious. "People come to this club to relax, so we wanted to design a facility that had an ease about it. Glulam allowed us to do that."



Structurlam photos

Glulam trusses complemented the comfortable environment of the Eagle Point Clubhouse.



Structurlam photos

Westwood Plateau Golf and Country Club

Coquitlam, British Columbia, Canada

Glulam frame provides structural expression

The breathtaking beauty of the glulam in Westwood Plateau Golf and Country Club can easily overshadow its other function – that of providing structural support for the 36,000-square-foot (3,345-square-meter) clubhouse.

The structure is unique in that all seismic loads, including lateral loads applied to the building, are carried in the glulam frame. There are no concrete shear walls or other structural components carrying lateral loads.

Roger Bayley, P.E., with Paul Merrick Architects Ltd., said his firm wanted to do a project with a high level of structural expression, and glulam gave them the flexibility to do just that. “We developed a design that allowed the building to frame itself in both directions by using glulam cross-bracing elements,” he said. “Other materials would not have worked, or would not have provided the visual impact of the exposed wood.”

Bayley said his team considered solid timbers, but quickly realized they would get better dimensional control and higher stress capacities with glulam. So, they used a deep textured finish on the Douglas-fir glulam,

which gave the beams a natural, textural feel and made the glue joints difficult to see.

Bayley’s firm used a sophisticated computer program to generate sizing requirements for the 158 mbf of glulam, and used innovative connection designs. “This project was more complicated than typical,” admitted Bayley. “We used a four-part column, so beam lines are always passing through the column in both directions. It is unusual to have a moment frame in two directions, so this was a complex assembly that required sophisticated fabrication and installation expertise. But the end result is breathtaking.”

The glulam members and fabrication were provided by Structurlam Products.



Architects oriented the Westwood Plateau Golf and Country Club’s lobby to align with stunning views of nearby Mount Baker, providing members with a dramatic interior space.



Structurlam, the glulam fabricator, used a wire brush to give these beams an interesting, rustic finish. The process made them look like solid timber, yet the beams still provided the structural performance of glulam.



Westwood Plateau’s architects wanted to design a project with high level of structural expression, so they developed a glulam system that allowed the building to frame itself in both directions with cross-bracing elements.

Structurlam photos

Sheshan Golf Course Bridge

Sheshan, near Shanghai, China

Bridging the future

Sheshan Golf Course needed a bridge that would allow golfers to easily move around the course while preserving the area's natural habitat and enhancing its aesthetic appeal. According to Xu Fang with American Softwoods in Shanghai, a fast-track schedule (the new course was preparing for a golf tournament) solidified the decision to use glulam. "This bridge was completed within four months of the original contact date," he said. "Once material arrived in Shanghai, it took just 18 days to install the bridge."

Western Wood Structures of Oregon worked with Shanghai Plus Wood Ltd. to provide materials for the 98-foot (30-meter) bridge, which accommodates vehicle traffic ranging from golf carts to 5-ton maintenance vehicles.

Calvert Company supplied glulam for the bridges. Permapost treated beams with an oil-borne, nearly clear preservative. Western Wood Structures provided engineering, shipping and on-site installation supervision.

Xu Fang said the owner chose glulam primarily out of architectural consideration. "This bridge connects the golf course with the residential community, a luxury Tuscan-style single-family housing complex designed by an architectural firm from California. The beauty of the glulam made it an ideal choice for the bridge."

Club owners report that the uniqueness of the bridge's design has already attracted paying members to their golf course because it is symbolic of their forward-thinking vision. In a country poised for rapid growth, the glulam bridge acts as a symbolic icon for the future.



Western Wood Structures photo

This glulam bridge connects the Sheshan Golf Course with a nearby, luxury residential community, providing both style and functionality. The project prompted new interest in using glulam for golf course bridges in China.

Fairview Mountain Golf Club

Oliver, British Columbia, Canada

Big impact, small budget

Smart architects turn to glulam when they need big visual impact on a tight budget. Such was the case with the Fairview Mountain Golf Club, located in British Columbia's wine country.

Cal Meiklejohn is a principal of Meiklejohn Architects of Penticton, British Columbia. He said Fairview Mountain did not have the budget for an opulent facility, so the design team recommended spending money on an exposed glulam structure instead. The 11,000-square-foot (1,022-square-meter) clubhouse was built at a cost of CAN\$1.25 million and features high, open-beamed ceilings and wood roof decking.

"We used glulam to help the building owner stretch the value of their construction dollar," said Meiklejohn. "By using a material like glulam, we got the integrity and performance we needed and gave the clubhouse owner a unique look and style. The exposed glulam beams provided warmth and beauty; if we had used standard construction methods and buried the structure, we would have just had a big shell."

Meiklejohn's firm chose a simple glulam design requiring little fabrication. Glulam was provided by Structurlam Products, which fabricated and applied the stain in the company's shop, to save money. "We were able to meet Fairview Mountain's goals and their budget by using glulam," Meiklejohn said.



Structurlam photos

Architects chose to leave the structure exposed in the Fairview Mountain Golf clubhouse. Doing so gave them the integrity and performance they needed along with a unique style for the facility – all while meeting a tight budget.

Persimmon Country Club

Gresham, Oregon, United States

Not lost in translation

When the Japanese owners of a new golf club in Oregon chose a design theme for their clubhouse, they turned to a familiar form – wood.

“We wanted to blend traditional Japanese architecture with a classic Northwest style, and the obvious place to start was to use glulam,” said Hal Ayotte, principal of Fletcher Farr Ayotte architects. “Our client wanted the same attention to detail used in traditional Japanese architecture. So, we used glulam to create a design with delicate proportions, intricate details and exposed connections. You see the structure of the building as part of the ambience of the space, and that’s what the owners wanted.”

Inside, glulam allowed Ayotte to “design to context. Wood is part of our culture here in the Northwest. Glulam is a manufactured product that still has the feel of a natural wood beam. Other engineered products have their place, but they wouldn’t have provided the elegance we needed for this project. We’ve found that golf resort owners prefer a more sophisticated look, and we were able to deliver simple form and exceptional detailing using glulam.”

Western Wood Structures provided the glulam beams, columns, rafters and assembled trusses for the project. American Laminators manufactured the glulam members.



Laurie Black photo

Club owners wanted an elegant, sophisticated look for the Persimmon Country Club. Architects wanted the quality and performance of an engineered building product. Glulam delivered both.

CERTIFIED U.S. ENGINEERED WOOD PRODUCTS AND STRUCTURAL WOOD PANELS

The engineered wood products described in this brochure generally reference material manufactured in accordance with either Voluntary Product Standard PS 1-95 Construction and Industrial Plywood, Voluntary Product Standard PS 2-04 Performance Standard for Wood-Based Structural-Use Panels or ANSI Standard A190.1 for Structural Glued Laminated Timber.

The three standards outline the minimum requirements for product conformity assessment by a third party agency. Each third party agency is identified in the body of the trademark, which is located on the product. Trademarking is the responsibility of the individual agency performing the quality services at the mill.

Several independent agencies in the United States provide conformity assessment services. Contact information on these U.S. agencies is listed below.

Several U.S. manufacturers also provide wood-based structural panels and engineered wood products manufactured in conformance with proprietary U.S. or additional international standards. Please check with individual engineered wood product and panel suppliers for product availability to these alternative standards.

APA – The Engineered Wood Association and Engineered Wood Systems

7011 So. 19th St., Tacoma, WA 98466-5333

Telephone international: 1-253-565-6600 • Fax international: 1-253-565-7265 • <http://www.apawood.org>

American Institute of Timber Construction

7012 South Revere Parkway 3140, Englewood, CO 80112

Telephone international: 1-303-792-9559 • Fax international: 1-303-792-0669 • <http://www.aipc-glulam.org>

TECO

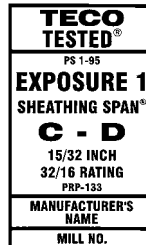
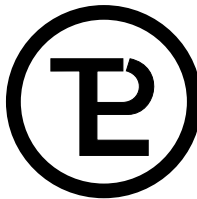
2402 Daniels Street, Madison, WI 53718 • Telephone international: 1-608-221-3361

Fax international: 1-608-221-0180 • <http://www.tecotested.com>

Professional Service Industries, Inc.

4820 West 15th Street, Lawrence, KS 66049

Telephone international: 1-800-548-7901 • Fax international: 1-800-979-3727 • <http://www.psiusa.com>



The product use recommendations in this publication are based on the continuing programs of laboratory testing, product research, and comprehensive field experience of Engineered Wood Systems. However, because EWS has no control over quality of workmanship or the conditions under which engineered wood products are used, it cannot accept responsibility for product performance or designs as actually constructed. Because engineered wood product performance requirements vary geographically, consult your local architect, engineer or design professional to assure compliance with code, construction, and performance requirements.

© 2006 ENGINEERED WOOD SYSTEMS • ALL RIGHTS RESERVED • ANY COPYING, MODIFICATION, DISTRIBUTION OR OTHER USE OF THIS PUBLICATION OTHER THAN AS EXPRESSLY AUTHORIZED BY APA IS PROHIBITED BY THE U.S. COPYRIGHT LAWS.

Form No. EXP G225
Issued June 2006/0200

ENGINEERED WOOD SYSTEMS
APA EWS

