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OWNER'S MANUAL

ENGINEERED PORTABLE TIMBER BRIDGES

Models: PTB-30 AND PTB-40

Table of Contents

Bridge Serial Number: _____

Date Purchased: _____

OVERVIEW OF ENGINEERED PORTABLE TIMBER BRIDGE AND OPTIONAL PORTABLE ABUTMENTS

The Engineered Portable Timber Bridge is composed of two six-foot wide modules, in both 30 and 40 foot lengths, which are joined in the field at the installation site. Each module is constructed of CCA-treated southern yellow pine structural lumber longitudinally stress-laminated using high-tensile threaded steel rods. This construction method allows the bridge, when properly installed, to safely support an HS 20-44 load, or a maximum 80,000 pound multi-axle load. Each module is encased in steel channel for durability (Figure 1). The handling, installation, and storage of both modules are identical. Typically, the bridges are installed directly on the stream bank without abutments. However, low banks and pre-existing fords necessitate a different end-support system. Optional Portable Abutments that can be temporarily installed directly in, or by, the stream can be used in these situations.

WARNING:

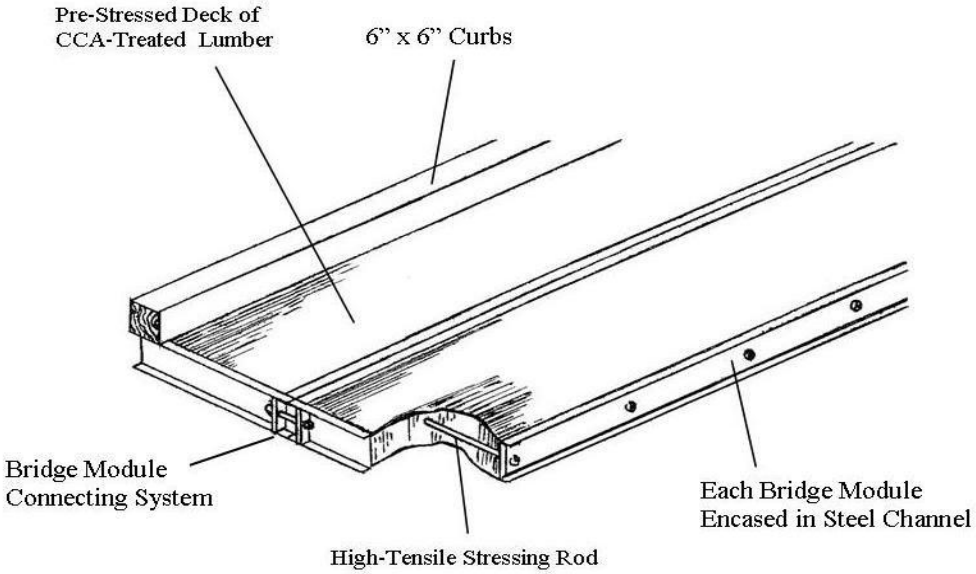
THE ENGINEERED PORTABLE TIMBER BRIDGE AND OPTIONAL PORTABLE ABUTMENTS ARE DESIGNED FOR TEMPORARY INSTALLATIONS. PERMANENT INSTALLATIONS OF THESE BRIDGES **DO NOT** FALL WITHIN DESIGN SPECIFICATIONS.

The Engineered Portable Timber Bridge is designed for temporary stream crossings in industrial applications. Typical applications include access for timbering, drilling and producing oil and gas wells, pipelining, utility rights of way, construction projects, housing developments, emergency relief, etc. To facilitate relocation and reuse, these systems are designed to be easily transportable with a tractor-trailer. The components can be installed with typical excavating or construction equipment. Cranes are NOT necessary.

FOR SAFETY AND FOR THE STRUCTURAL INTEGRITY OF THE ENGINEERED PORTABLE TIMBER BRIDGE, IT IS NECESSARY THAT THE FOLLOWING REQUIREMENTS BE STRICTLY OBSERVED FOR EACH INSTALLATION:

- A MINIMUM OF FIVE–FOOT BEARING LENGTH FOR EACH END OF THE BRIDGE (PAGES 3, 4, 8, 9, 10, 12, 13, & 14; WARNING ON PAGE 8; AND FIGURE 2)
- STRAIGHT APPROACHES TO EACH END OF THE BRIDGE (PAGES 3 & 4)
- BRIDGE AND SUPPORTING STREAM BANKS MUST BE LEVEL FROM SIDE-TO-SIDE AND HAVE NO MORE THAN TWO (2) PERCENT SLOPE FROM END-TO-END (PAGES 3 & 4)
- THE BRIDGE MODULES MUST BE PROPERLY CONNECTED TO ONE ANOTHER (PAGES 10 & 13; FIGURE 4; AND WARNINGS ON PAGES 11 & 13) AND TO THE OPTIONAL PORTABLE ABUTMENTS, WHEN USED (PAGE 15 AND WARNING ON PAGE 14)

Figure 1

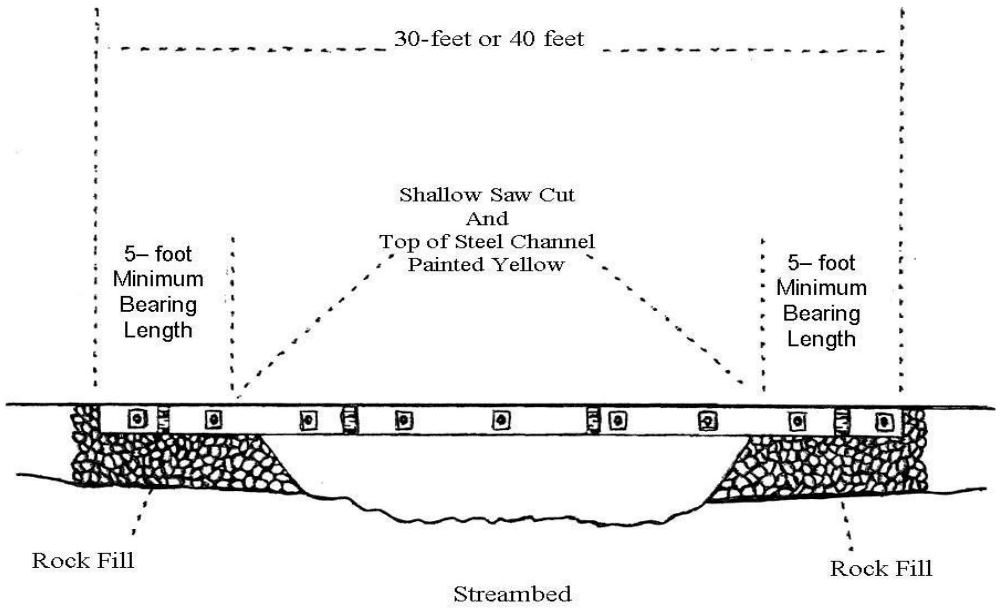


SITE SELECTION

The proper installation of an Engineered Portable Timber Bridge begins with selecting the proper site. Because many streams have few optimal sites for installation, it is often easier to select the stream crossing before the road lay-out. A quick survey of the entire tract is extremely valuable in organizing the location of roads, landings, and stream crossings.

Six critical attributes of a stream crossing must be assessed before installing an Engineered Portable Timber Bridge: bank height, bridge span, bearing length, approach alignment, approach grade,

Figure 2



and bridge grade. Specification limits on these crossing attributes are listed in Table 1. A brief description of these six attributes follows.

- Bank height is the vertical distance from the underside of the bridge deck to the stream bed. A minimum distance of two (2) feet is required. Check on federal, state, and local regulations for possible additional requirements or permits involved with stream crossings.

- Bridge span (or clear span) is the distance between stream banks or abutments over which the bridge will be unsupported. For a 30-foot bridge, design specifications require that the clear span not exceed twenty (20) feet, allowing a minimum of five (5) feet of bearing length on each stream bank. For a 40-foot bridge, design specifications require that the clear span not exceed thirty (30) feet, allowing a minimum of five (5) feet of bearing length on each stream bank (Figure 2). Each bridge module includes a shallow saw cut across its width, located five (5) feet from each end of the module, identifying the five (5) foot minimum bearing length. In addition, the top of the steel channel on each bridge module is painted yellow five (5) feet from each end to designate the minimum required bearing length.

- Bearing length is that portion of the bridge length that is in direct contact with, or resting on, stable stream banks or on portable abutments. The minimum bearing length for both the 30-foot bridge and the 40-foot bridge is five (5) feet on each end of the bridge (Figure 2). This minimum five (5) feet of bearing length for each end of the bridge is marked on each bridge module by a shallow saw cut into the wood from side-to-side and by bright yellow paint on the top of the steel channel encasing each bridge module (Figure 2).

- Approach alignment is the angle at which the road approaches the bridge from either side of the stream crossing. Approaches must be straight onto the bridge for a minimum of 1-1/2 total truck lengths so as to allow trucks to be aligned perpendicular to the stream and parallel to the bridge before moving onto the single-lane bridge. Tractor-trailers obviously require more distance for alignment than do tandem axle trucks or tri-axle trucks.

- Approach grade is the steepness of the road as it approaches or leaves the bridge. Best Management Practices (BMPs) generally require that haul road grades not exceed specific slope percentages. The most common specification for maximum haul road grade is ten (10) percent. Likewise, for Engineered Portable Timber Bridge installations, the road grade on either side of the bridge must not exceed ten (10) percent. Adherence to the maximum approach grade will prevent excessive impact loading of the bridge.

- Bridge grade is the actual slope of the bridge when in service, measured from end-to end and from side-to-side. The bridge should be installed as near to level as possible. Under no circumstances should the slope of the bridge from end-to-end exceed two (2) percent. The bridge must be level across the width of the bridge. This is particularly important in order to minimize sideways movement of equipment as it moves across the bridge under wet, icy, or muddy conditions.

WARNING:

IMPROPER SITE SELECTION OR LACK OF ADHERENCE TO ENGINEERING SPECIFICATIONS DESCRIBED IN THIS MANUAL MAY RESULT IN BRIDGE FAILURE AND HARM TO MACHINE OPERATORS.

Table 1

CROSSING ATTRIBUTE	REQUIREMENT
Bank Height	Minimum of two (2) feet from bottom of bridge deck to stream bed
Bridge Span	Maximum of: Twenty (20) feet for 30-foot bridge Thirty (30) feet for 40-foot bridge
Bearing Length	Minimum of five (5) feet on each end of bridge
Approach Alignment	Parallel to bridge length for a minimum of 1-1/2 truck lengths
Approach Grade	Maximum of ten (10) percent grade
Bridge Grade	Maximum of two (2) percent end-to-end Bridge must be level side-to-side

SITE PREPARATION

The installation of the Engineered Portable Timber Bridge is greatly facilitated by proper site preparation. The ideal situation is for the road to be constructed to the stream crossing, allowing truck transportation of the bridge to the site. All vegetation should be cleared and the approach graded. Fill is sometimes required if the bank has large stones which cannot be easily moved or if the bank slopes in a direction that would prevent the bridge from being level from side-to-side. Rocky fill performs best in providing a firm platform, or base, for the bridge. If soil conditions warrant, the site may be stabilized with a geotextile fabric. The bearing length (the base upon which the bridge will set) should be finished with sufficient stone to prevent the bridge from settling over time. The bearing capacity of the soil should be 1100 psf or better, and it is recommended that this be verified by a licensed Professional Engineer.

Both bearing surfaces (the bases upon which the bridge will set on each side of the stream) must allow the bridge to lie flat without twisting. This often necessitates the moving of equipment to the opposite side of the stream prior to bridge installation for the purpose of preparing the bearing surface area. Sometimes, equipment can cross streams in old fords or areas with low banks. One method of using the Engineered Portable Timber Bridge to assist in initial stream crossings prior to bridge installation will be discussed later in the BRIDGE INSTALLATION section. Since equipment movement degrades both the bank structure and stream bottom, crossings prior to bridge installation should be minimized. Damaged stream banks can accelerate erosion, increasing the required bridge span and limiting available module bearing length.

WARNING:
AN UNSTABLE STREAM BANK, SUBJECT TO EROSION AND REDUCED BEARING LENGTH, CAN CAUSE BRIDGE FAILURE AND HARM TO MACHINERY AND OPERATORS USING THE BRIDGE.

BRIDGE UNLOADING

The Engineered Portable Timber Bridge modules should be transported to the site on a tractor-trailer, stacked one on top of the other and resting on 4" x 4" wood blocks that are, in length, approximately the width of each bridge module and that are evenly placed at a minimum of four locations along each module's length. When in transit, the bridge modules should always be securely fastened to the trailer with straps or chains.

At a mill or log yard, the bridge modules can often be lifted for loading or unloading with a large forklift. However, this equipment is rarely available at a bridge installation site. Two methods are recommended for unloading the Engineered Portable Timber Bridge at an installation site, both utilizing the lift eyes which are provided at four locations along each side of each module (Figure 3). These lift eyes are clearly identified with painted letters on the steel channel of each module. Lift eyes can facilitate lifting or dragging the modules by fastening a chain or wire cable in the form of a loop between pairs of lift eyes directly opposite each other along the sides of the bridge (Figure 3). A winch line can then be easily fastened to the chain or wire cable loop for lifting or skidding.

WARNING:
EACH MODULE OF A 30-FOOT BRIDGE WEIGHS APPROXIMATELY 4 TONS, FOR A TOTAL BRIDGE WEIGHT OF 8 TONS. EACH MODULE OF A 40-FOOT BRIDGE WEIGHS APPROXIMATELY 6 TONS, FOR A TOTAL BRIDGE WEIGHT OF 12 TONS. BRIDGE WEIGHTS WILL FLUCTUATE DUE TO NATURAL VARIATIONS IN THE WOOD AND TO CHANGES IN THE MOISTURE CONTENT OF THE WOOD. WHEN LOADING OR UNLOADING A BRIDGE MODULE, THE EQUIPMENT MUST BE CAPABLE OF HANDLING THE WEIGHT SO AS TO AVOID TIPPING OR ROLLOVER OF EQUIPMENT.

EXCAVATOR METHOD OF BRIDGE UNLOADING

Using the Excavator Method, a bridge can be unloaded directly at the stream crossing. However, if the access is not complete or not wide enough, an alternative unloading area can be used. The bridge decks can then be skidded to the stream crossing.

Equipment needed for the Excavator Method:

- Backhoe or Excavator

- Skidder or bulldozer equipped with a winch
- Heavy-duty chains or heavy-duty wire cables
- Appropriate personal protective equipment, such as safety boots, hard hats, gloves

The size of the backhoe or excavator necessary depends on the bridge length being installed. For this method, the backhoe or excavator is only required to lift one end of a module. Each module of a 30-foot bridge weighs approximately four (4) tons. Each module of a 40-foot bridge weighs approximately six (6) tons. Most commercial backhoes, excavators, and bulldozers used on these types of operations or construction sites are sufficient.

Once properly equipped, the unloading should proceed as follows:

- Back the truck carrying the bridge modules to the stream crossing or landing.
- Position the winch at the rear of the trailer.
- Position the backhoe or excavator adjacent to the trailer in order to facilitate a straight, vertical lift.
- Attach chains or wire cables to form loops at both ends of the top bridge module, using the paint-labeled lift eyes.
- Attach the winch line to the chain or wire cable loop at the rear of the bridge module (located toward the back of the trailer).
- Attach the front chain or wire cable loop (located on the front end of the trailer nearest the truck cab) to the backhoe or excavator bucket and lift to take some of the weight off of the 4" X 4" blocks supporting the module.
- Begin slowly winching the top bridge module from the trailer.
- As the module's balance point nears the end of the trailer, support the over-hanging end of the bridge module using a downward force of the bucket on the front end (located nearest the truck cab) of the module.
- When the module's balance point is beyond the end of the trailer, slowly reduce the downward pressure of the bucket and allow the bridge module to tilt until the leading end is resting on the ground.
- Again grasp the chain or wire cable loop (located on the front end of the module) and lift the module from against the rear of the trailer.
- Drive the truck from under the module.
- Lower the top bridge module to the ground with the bucket.
- Repeat this sequence to unload the second bridge module.

WARNING:
CHAINS OR WIRE ROPE ATTACHED TO LIFT EYES COULD SLIP OR BREAK DURING UNLOADING, INSTALLATION, OR LOADING. PERSONNEL SHOULD STAND CLEAR OF EQUIPMENT DURING ANY OF THESE ACTIVITIES TO AVOID INJURY. APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT SHOULD ALSO BE WORN.

BRUSH PILE METHOD OF BRIDGE UNLOADING

The Brush Pile Method may be used when a properly-sized backhoe or excavator is not available on the site. This method utilizes a brush pile as a ramp. Brush for quick construction of an adequate brush pile is often present around construction sites or roads after clearing.

Equipment needed for Brush Pile Method:

- brush pile
- skidder or bulldozer equipped with a winch
- heavy-duty chains or heavy-duty wire cables
- appropriate personal protective equipment, such as safety boots, hard hat, gloves

Most commercial skidders or bulldozers used on a logging operation or construction site are sufficient, providing they are equipped with a winch. A skidder is often easier to use because of the lifting advantage provided by the high arch.

Once properly equipped, the unloading should proceed as follows:

- Construct, by piling and lightly packing, a pile of brush at the point where the bridge modules are to be unloaded; the top of the brush pile should be slightly higher than the height of the trailer bed on which the bridge modules are resting.
- Back the truck carrying the bridge modules to the brush pile.
- Position the skidder or the bulldozer with the winch on the opposite side of the brush pile and facing away from the trailer and the brush pile.
- Attach a chain or a wire cable to form a loop at the rear end (back end of the trailer) of the top module, using the paint-labeled lift eyes.
- Attach the winch line from the skidder or the bulldozer to the rear chain or wire cable loop connected to the top bridge module.
- Winch the module from the trailer and partially onto the brush pile.
- When the balance point of the bridge module is off the trailer, pull the trailer away from the module while restraining the module from moving with the trailer by using the skidder or the bulldozer.
- The brush pile will serve to cushion the fall of the bridge module; the bridge module should never be allowed to fall directly onto the ground from the truck bed.
- Attach the skidder or bulldozer winch line to the chain or wire cable loop.
- Winch the module off the brush pile from whichever end of the module is most convenient, being sure to attach chains or wire cables only to the paint-labeled lift eyes.
- Skid the module to the stream crossing.
- Repeat this sequence to unload the second bridge module.

WARNING:
NEVER ALLOW THE BRIDGE MODULE TO FALL DIRECTLY ONTO THE GROUND FROM THE TRUCK BED. DOING SO MAY DAMAGE THE BRIDGE MODULE.

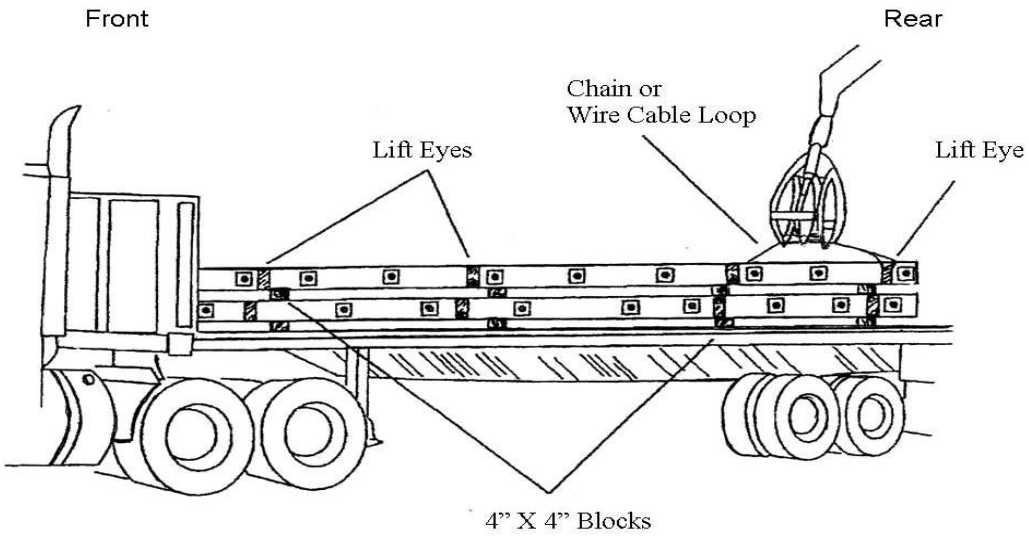
BRIDGE INSTALLATION

The Engineered Portable Timber Bridge is easily installed directly on the banks of most streams, providing a proper site is available. In these cases, the installation should take under an hour if the site is prepared in advance. The actual installation process depends on the equipment available and the site.

Three methods are available for bridge installation, two of which require a piece of equipment with a winch line positioned on the far bank of the stream crossing. A skidder works best in this position because the skidder's high arch facilitates lifting the end of the bridge deck, reducing damage to the stream bank. The installation should be planned in advance to minimize the number of stream crossings required prior to, and during, the installation. The third method of bridge installation makes use of one of the bridge modules for facilitating the initial stream crossing by a skidder or a bulldozer.

WARNING:
EACH BRIDGE MODULE INCLUDES A SHALLOW SAW CUT ACROSS ITS ENTIRE WIDTH, LOCATED FIVE (5) FEET FROM EACH END OF THE MODULE. IN ADDITION, THE TOP OF THE STEEL CHANNEL ENCASING EACH BRIDGE MODULE IS PAINTED BRIGHT YELLOW FOR A DISTANCE OF FIVE (5) FEET FROM EACH END. THE SAW CUT AND THE YELLOW PAINT INDICATE THE MINIMUM REQUIRED BEARING LENGTH FOR THE BRIDGE. AN INSTALLATION WITH LESS THAN REQUIRED FIVE (5) FEET OF BEARING LENGTH ON EACH END OF THE BRIDGE DOES NOT FALL WITHIN DESIGN SPECIFICATIONS. INSUFFICIENT BEARING LENGTH CAN CAUSE BRIDGE FAILURE. IF BEARING LENGTH IS INSUFFICIENT FOR DESIGN SPECIFICATIONS, ANOTHER CROSSING SITE SHOULD BE SELECTED THAT WILL MEET BEARING LENGTH REQUIREMENTS, OR PORTABLE ABUTMENTS SHOULD BE USED TO ATTAIN MINIMUM BEARING LENGTH REQUIREMENTS (SEE PORTABLE ABUTMENTS INSTALLATION FOR MORE INFORMATION).

Figure 3



STANDARD METHOD OF INSTALLATION

In the Standard Method of bridge installation, the bridge is unloaded and skidded to the stream crossing. The installation proceeds most efficiently with two machines (skidders or bulldozers or a combination of both), at least one of which has a winch. The installation should proceed as follows:

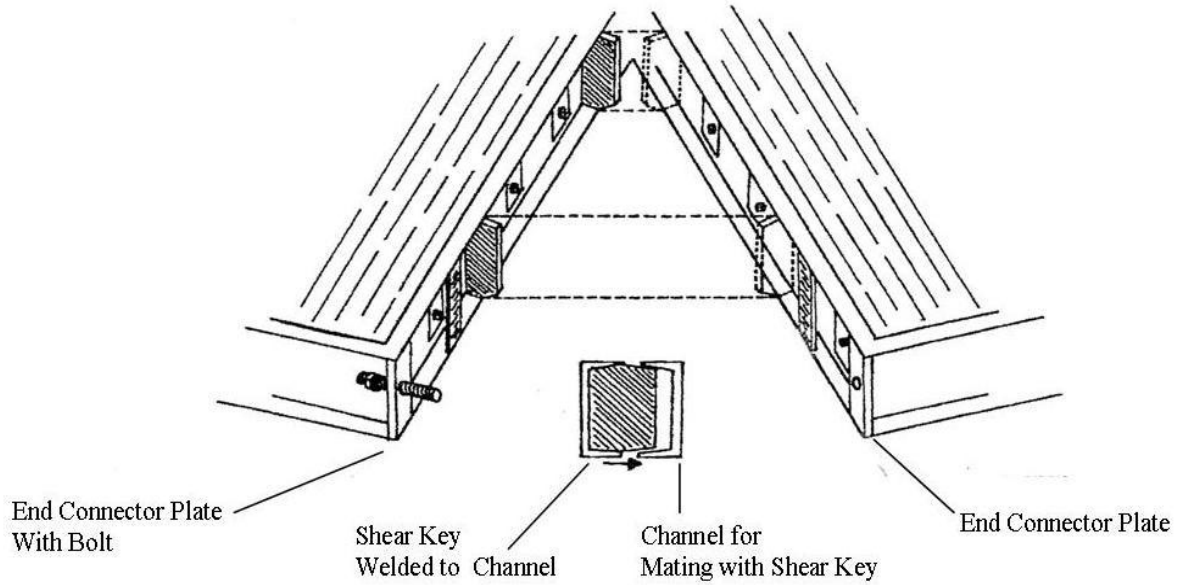
- Skid the first bridge module to the stream crossing with a chain or wire cable using the paint-labeled lift eyes.
- Position the bridge module on the correct side (left or right) of the roadway. The module must be located so that the shear keys can mate with an empty channel at the center of the bridge (Figure 4).
- Position a skidder or bulldozer, equipped with a winch line, on the opposite side of the stream.
- Attach the winch line from the machine on the opposite side of the stream to the chain or wire cable loop used to skid the bridge module to the installation site.
- Winch the bridge module across the stream.
- Check and ensure adequate ground bearing length and that maximum clear span for the bridge module has not been exceeded (see Figure 2 and the WARNING at the beginning of the BRIDGE INSTALLATION section).
- Detach the winch line and the chain or wire cable loop attached to the module.
- Skid the second bridge module to the stream crossing, using the paint-labeled lift eyes. Position it directly in front of the first bridge module, so that , once spanning

the stream, the shear keys on one module can mate with the empty channel on the other module (Figure 4).

- Winch the second bridge module across the stream using the first module as a bridge.
- Detach the winch line and chain or wire cable loop attached to the second module.
- Lift each end of the deck with the blade from the machine on each bank.
- Position the second bridge module adjacent to the first module, assuring alignment, using the blade of the skidder or the bulldozer on one end of the bridge at a time.
- Check and ensure adequate ground bearing length and that maximum clear span for the bridge module has not been exceeded (see Figure 2 and the WARNING at the beginning of the BRIDGE INSTALLATION section.).
- Attach the two modules by using the end connectors at each end and the supplied bolts, ensuring that the patented shear key and channel system mates properly (Figure 4).
- Attach the 6" X 6" curbs using the lag bolts supplied with the bridge.
- Place stone on both approaches to provide a smooth transition between the road and the assembled bridge.

Figure 4

Patented Shear Key and Channel System



WARNING:

DURING INSTALLATION, CARE MUST BE TAKEN TO AVOID PINCH POINTS BETWEEN INSTALLATION EQUIPMENT, BRIDGE MODULES, AND THE GROUND, SO AS TO AVOID INJURY TO HANDS, FEET, AND OTHER BODY PARTS.

IT IS NECESSARY THAT THE ENGINEERED PORTABLE TIMBER MODULES BE COMPLETELY MATED, ENSURING THAT THE SHEAR KEYS ON ONE MODULE ARE MATED TO THE INSIDE OF THE OPEN CHANNEL ON THE OTHER MODULE, BY BOLTING THE TWO MODULES TOGETHER AT EACH END USING THE BOLTS SUPPLIED WITH THE END CONNECTOR PLATES. IF THE BRIDGE IS NOT PROPERLY MATED, THE SYSTEM WILL NOT PERFORM AS DESIGNED, CREATING A POTENTIALLY HAZARDOUS SITUATION (FIGURE 4).

COMBINED UNLOADING / INSTALLATION METHOD

If a properly-sized backhoe or excavator can be positioned at the stream crossing, each bridge module can be installed directly across the stream while unloading. This method proceeds as with the EXCAVATOR METHOD OF BRIDGE UNLOADING. However, the skidder or bulldozer with a winch line is positioned on the opposite bank of the stream, and each bridge module is winched across the stream as it is unloaded. A skidder works much better than a bulldozer in this situation because the high arch of the skidder facilitates lifting of the bridge modules.

The unloading and installation should proceed as follows:

- Back the truck carrying the bridge modules to the stream crossing.
- Position the skidder or bulldozer, equipped with a winch, on the opposite stream bank facing away from the truck.
- Position the backhoe or excavator adjacent to the trailer in order to facilitate a straight, vertical lift.
- Attach chains or wire cables to form loops at both ends of the top bridge module using the paint-labeled lift eyes.
- Attach the winch line from the skidder or bulldozer to the chain or wire cable loop at the rear of the bridge module (located toward the back of the trailer), using the paint-labeled lift eyes.
- Hook the front chain or wire cable loop (located on the front end of the trailer nearest the truck cab) to the backhoe or excavator bucket and lift to take some of the weight off of the 4" X 4" blocks supporting the module.
- Begin slowly winching the top bridge module from the trailer.
- As the module's balance point nears the end of the trailer, support the over-hanging end of the bridge module using a downward force of the bucket on the front end (located nearest the truck cab) of the module.
- When the module's balance point is beyond the end of the trailer, slowly reduce the downward pressure of the bucket and allow the bridge module to tilt until the leading end is resting on the ground.

- Again hook the chain or wire cable loop (located on the front end of the module) and lift the module from against the rear of the trailer.
- Drive the truck from under the bridge module.
- Lower the bridge module to the ground with the bucket.
- Position the bridge module on the correct side (left or right) of the roadway. The module must be located so that the shear keys can mate with an empty channel at the center of the bridge (Figure 4).
- Winch the second bridge module across the stream with the skidder or bulldozer.
- Check and ensure adequate ground bearing length and that maximum clear span for the bridge module has not been exceeded (see Figure 2 and the WARNING at the beginning of the BRIDGE INSTALLATION section.).
- Detach the winch line and chains or wire cable loops.
- Back the truck carrying the second bridge module to the stream crossing, positioning it directly in front of the first bridge module, so that, once spanning the stream, the shear keys on one module can mate with the empty channel on the other module. (Figure 4).
- Position the skidder or bulldozer, equipped with a winch, on the opposite stream bank facing away from the truck.
- Position the backhoe or excavator adjacent to the trailer in order to facilitate a straight, vertical lift.
- Attach chains or wire cables to form loops at both ends of the bottom bridge module using the paint labeled lift eyes.
- Attach the winch line from the skidder or bulldozer to the chain or wire cable loop at the rear of the bridge module (located toward the back of the trailer).
- Hook the front chain or wire cable loop (located on the front end of the trailer nearest the truck cab) to the bucket and lift to take some of the weight off of the 4”X 4” blocks supporting the module.
- Begin slowly winching the top bridge module from the trailer.
- As the module’s balance point nears the end of the trailer, support the over-hanging end of the bridge module using a downward force of the bucket on the front end (located nearest the truck cab) of the module.
- When the module’s balance point is beyond the end of the trailer, slowly reduce the downward pressure of the bucket and allow the bridge module to tilt until the leading end is resting on the ground.
- Again hook to the chain or wire cable loop (located on the front end of the module) and lift the module from against the rear of the trailer.
- Drive the truck from under the bridge module.

- Lower the bridge module to the ground with the bucket.
- Winch the second bridge module across the stream with the skidder or bulldozer using the previously installed bridge module as a bridge.
- Detach the winch line and chain or wire cable loop on the side of the crossing with the skidder or bulldozer.
- Lift the second bridge module off the first module using the skidder or bulldozer blade on one end and the bucket with the attached chain or wire cable loop on the other end.
- Detach the chain or wire cable loop from the second bridge module on the backhoe or excavator side of the crossing.
- Position the second bridge module adjacent to the first bridge module, assuring alignment, using the blade of the skidder or bulldozer on one end of the bridge at a time.
- Check and ensure adequate ground bearing length and that maximum clear span for the bridge module has not been exceeded (see Figure 2 and the WARNING at the beginning of the BRIDGE INSTALLATION section).
- Attach the two modules by using the end connectors at each end and the supplied bolts, ensuring that the patented shear key and channel system mates properly (Figure 4).
- Attach the 6" X 6" curbs using the lag bolts supplied with the bridge.
- Place stone on both bridge approaches to provide a smooth transition between the road and the bridge.

WARNING:

DURING INSTALLATION, CARE MUST BE TAKEN TO AVOID PINCH POINTS BETWEEN INSTALLATION EQUIPMENT, BRIDGE MODULES, AND THE GROUND, SO AS TO AVOID INJURY TO HANDS, FEET, AND OTHER BODY PARTS.

IT IS NECESSARY THAT THE ENGINEERED PORTABLE TIMBER BRIDGE MODULES BE COMPLETELY MATED, ENSURING THAT THE SHEAR KEYS ON ONE MODULE ARE MATED TO THE INSIDE OF THE OPEN CHANNEL ON THE OTHER MODULE, BY BOLTING THE TWO MODULES TOGETHER AT EACH END USING THE BOLTS SUPPLIED WITH THE END CONNECTOR PLATES. IF THE BRIDGE IS NOT PROPERLY MATED, THE SYSTEM WILL NOT PERFORM AS DESIGNED, CREATING A POTENTIALLY HAZARDOUS SITUATION (SEE FIGURE 4).

DECK FACILITATED STREAM CROSSING METHOD OF INSTALLATION

Environmental regulations or stream conditions may mandate that a stream cannot be crossed by a machine without a bridge installed. In this case, a single bridge module may be used to allow a skidder or a bulldozer to initially cross the stream without stream bed disturbance in order to facilitate the bridge installation.

This procedure is accomplished by unloading the bridge modules using either the EXCAVATOR METHOD or the BRUSH PILE METHOD and skidding a bridge module to the stream crossing as described in the STANDARD METHOD OF BRIDGE INSTALLATION. The module is then pushed lengthwise into the opposite stream bank with the skidder or bulldozer blade. The tilted deck can then be carefully crossed by the machine. Once on the opposite side of the stream, the skidder or the bulldozer can be used to lift and winch the bridge deck onto the stream bank. Ensure that adequate ground bearing length is available and that the maximum clear span is not exceeded (see Figure2 and the WARNING at the beginning of the BRIDGE INSTALLATION section). The installation of the second module should follow the procedure outlined for the second bridge module in the STANDARD METHOD OF BRIDGE INSTALLATION.

PORTABLE ABUTMENTS INSTALLATION

WARNING:
THE ABUTMENTS MUST BE SECURED TO BOTH BRIDGE MODULES ON EACH END. FAILURE TO SECURE THE BRIDGE MODULES TO THE ABUTMENTS COULD LEAD TO BRIDGE MOVEMENT, POSSIBLY CAUSING DAMAGE TO THE BRIDGE AND/OR EQUIPMENT, OR CAUSING PERSONAL INJURY.

Portable abutments can be used in situations where adequate end support of the bridge cannot be provided by placing the bridge modules directly on stream banks. Common applications of portable abutments include low and unstable banks, stream fords, or long stream crossings that do not provide adequate bearing length. Once in place, portable abutments are designed to directly support the Engineered Portable Timber Bridge without bearing on the stream banks.

The site for installation of portable abutments should be prepared by leveling the stream bottom with crushed stone, providing a firm and level base to support the abutments. The installation should proceed as follows:

- Pass a chain or wire cable through the first abutment opening and attach the end to itself to form a loop.
- Lift the abutment off the truck with a backhoe or excavator using the attached chain or wire cable loop.
- After the abutment is on the ground, inspect your connections to the backhoe, or fasten the abutment with a chain or wire cable to the blade of a skidder or bulldozer.
- Once the abutment is securely fastened, move it to the far side of the stream crossing and place it on the prepared base near the far stream bank.
- Repeat this procedure placing the second abutment on its prepared base at the near stream bank.
- Position each abutment so that the triangular shear supports are facing inward toward the stream (Figure 5).
- Measure the distance between the abutments and check against the clear span requirements of the Engineered Portable Timber Bridge, ensuring that the abutments are

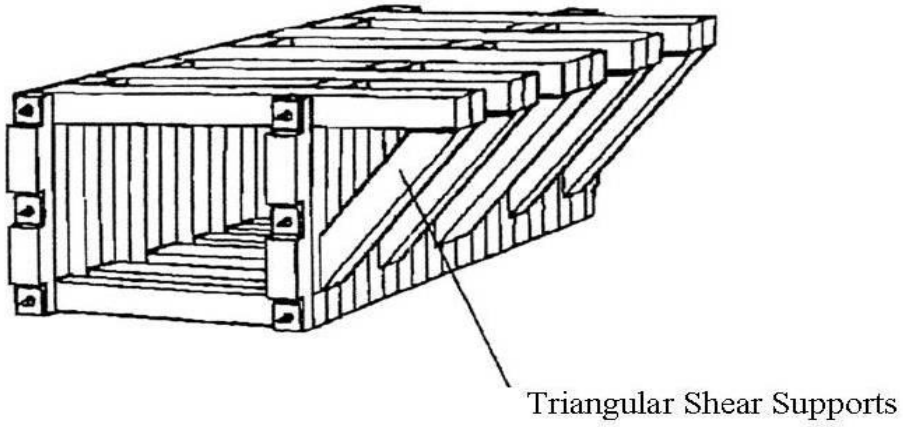
providing the required bearing length (see Figure 2 and the WARNING at the beginning of the BRIDGE INSTALLATION section).

- Ensure that each abutment is level in two directions (both parallel and perpendicular to the stream crossing). Shim with fill, if necessary.

- The bridge modules should be placed on the portable abutments using the same procedures outlined in the BRIDGE INSTALLATION section for installing the bridge directly onto the stream bank.

- Once the modules are correctly placed on the abutments and secured to one another using the patented shear key and channel system (Figure 4), use lag screws to secure the deck to the abutments.

Figure 5



BRIDGE REMOVAL

The Engineered Portable Timber Bridge is ready to remove upon completion of a job. In general, removal proceeds as a reversal of installation. Several steps are necessary:

- Position a skidder or bulldozer at each end of the bridge.

- Disconnect the modules by removing the bolts from the connector plates at the bridge ends.

- Slightly lift one module at each end with the skidder or bulldozer and move the module sideways, separating the modules by at least six (6) inches.

- Carefully move the machine on the far stream bank to the near stream bank over the separated modules.

- Remove the 6" X 6" curbs.

With the bridge modules separated, the bridge can be moved to the truck and loaded. This task can be accomplished by reversing the instructions of any installation and unloading method.

BRIDGE LOADING AND TRANSPORTATION

Bridge loading follows the reverse procedure of unloading. The modules may be stacked on the truck bed. Several precautions must be taken when loading the bridge modules:

- Support each module at four, equally spaced points along its length with 4" X 4" wood blocks that are in length approximately the width of each bridge module.
- When stacking modules, do not rotate or flip the modules. If the modules are rotated or flipped, the patented shear key and channel system will not properly mate when unloaded at the next site unless the module is again rotated or flipped.
- If abutments are to be shipped on the same load, place them on the top bridge module.
- Place the 6" X 6" curbs on the top bridge module.
- Secure the load with chains or straps.

BRIDGE STORAGE

The Engineered Portable Timber Bridge may require storage prior to the next installation. Always store the bridge in a supported and stacked condition, similar to that used for transporting the modules. Outside storage is appropriate; however, the site should be level and reasonably dry. Always provide for airflow if the bridge is covered with a tarp.

BRIDGE INSPECTION

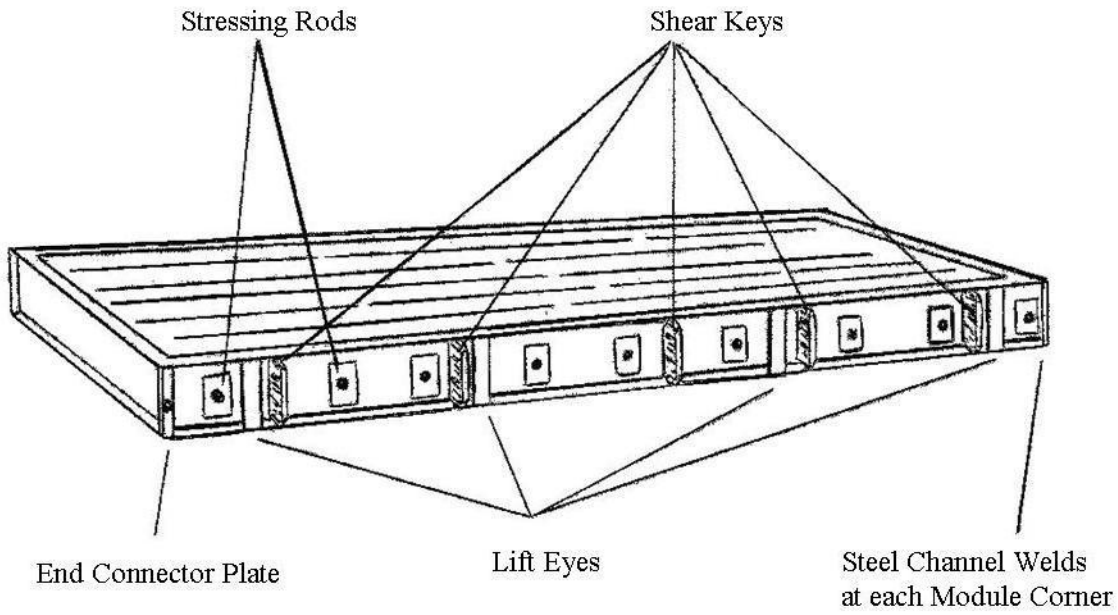
Before each installation, and daily during use, the bridge modules should be visually inspected (Figure 6). Items to inspect include:

- Stressing Rods. A 30-foot bridge contains nine (9) stressing rods spaced over the length of each module, while a 40-foot bridge contains fourteen (14) stressing rods. If rods are loose or broken or if the bridge is showing a permanent deformation (bending), DO NOT install or use the bridge under any circumstances. Permanent deformation may be an indication that the bridge has been over-loaded, been improperly installed, or that the required level of stress on the rods is not present.
- Welds on the steel channel surrounding each bridge module must be intact at each corner.
- Individual board deformation within a bridge module indicated by boards protruding significantly above or below the plane of the bridge module, should be minimal.
- Welds at each paint-labeled lift eye must be intact.
- All shear keys must be in place and all welds must be intact.

- End connector plates must be in place and welds must be intact.

If inspection indicates problems, DO NOT install or use the bridge under any circumstances. For assistance please contact E & H Manufacturing, Inc.

Figure 6



RESTRESSING THE BRIDGE

The strength of the bridge results from the friction created between the boards from the compression achieved by the stressing rods. Over time this compression may relax and needs to be regained. To recover the compression back to or near its original state, the rods will need to be restressed periodically.

Yearly, a torque wrench should be applied to the nuts on each stressing rod to a minimum torque value of 600 ft*lbs. Caution should be used to prevent the socket from slipping, and a restraint should be used to avoid accidentally falling off the bridge during tightening.

Every 5-10 years, prestressing equipment should be used to ensure the rods are properly and accurately restressed to full design levels, or at least 600 ft*lbs.

ADDITIONAL INFORMATION AND ASSISTANCE

Questions regarding any aspect of transporting, unloading, installing, or removing the Engineered Portable Timber Bridge should be directed to E & H Manufacturing, Inc. at 304-344-9875.

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