

SITE ACCESS SOLUTIONS PERMANENT BRIDGE INSTALLATION



PERMANENT BRIDGES

CUSTOMIZED TO MEET YOUR SPECIFICATIONS

Mustang's permanent bridges are custom built to accommodate crossings over waterways with lengths of 15' to 100'. They are ideal for private crossings and low traffic volume public roads such as township and county roads. Options include paint color, railing style, finishes and decking. A Mustang Bridge Specialist can help you determine the options that will best meet the requirements of your project.

Bridges up to 70' in length can typically be transported as full-length units. Longer bridges are typically fabricated as partial-length units and welded or bolt-spliced on site. See the Mustang Extreme Long Span Bridge Installation Guide for instructions.



SAFETY PROTOCOL

- Always use proper PPE: Steel-toe boots, hard hat, gloves and safety vest.
- Be aware and make note of unstable ground conditions and slip hazards.
- Always be aware of personnel and equipment location and movement.
- Locate overhead power lines, trees, and other potential obstacles or obstructions.
- Establish communication protocols with the crew.
- Be aware of other contractors' equipment and personnel at the site.

ABUTMENT AND BEARING REQUIREMENTS

Abutment design and bearing requirements are dependent on a number of site and project specific factors, including the stability of the stream banks and local soil conditions. It is the customer's responsibility to determine the appropriate level of analysis for their specific use.

Minimum bearing width for a concrete foundation is typically 2 feet. The maximum clear-span distance would be the total bridge length, minus 4 feet (2 feet on each end of the bridge for support).

Concrete foundation options include cast-in-place strip footings and cantilever abutments (Inverse T-footers) as well as a variety of pre-cast options. Piles or caissons with steel or concrete header beams can also be used.

Anchoring to the concrete abutments:

The two most common options for anchoring bridges to the concrete abutments are Z-retainer clips and steel base plates. Please discuss the preferred method with a Mustang bridge specialist prior to construction. Your bridge specialist will provide detailed drawings based on the method selected, but general guidelines are as follows:

- **Z Retainer Clips or Keeper Angles**

Most economical and easier to install, Z clips are typically centered on the foundation but can be shifted as necessary. Install one clip per beam at each end with approximately 2/3 of the clips facing upstream and 1/3 facing downstream.

- **Steel Base Plate**

More common for DOT projects, steel base plates have a fixed side, and an expansion/sliding side. Base plates can be pre-welded to the stringers or shipped loose and field welded.

- **Anchors**

The z-clips and base plates can be used with a variety of different anchor types:

1. Thread rod type anchors pre-installed (embedded) into the foundation
2. Post-installed thread rod type anchors - drilled and epoxied
3. Expansion anchors (Hilti Kwik Bolt, etc.)
4. Concrete lags (Simpson Titen screw anchors, etc.)

Discuss the preferred method with your bridge specialist when placing your order.

BRIDGE TRANSPORT

Bridges typically ship on flatbed or step-deck trailers with one or more modular steel bridge sections stacked on top of each other, as well as the timber decking.



ASSEMBLY INSTRUCTIONS

1. Set first section in place (sections can be set in any order).
 - a. If utilizing a crane or picking/setting with an excavator, rig by choking directly around the bearing stringers in four points on the exterior beams of each section on both sides of centerline [approximately 3' – 5' either side of centerline]. Nylon straps work well. Use two, two-way spreader chains between the nylon straps. A hook or shackle may be helpful as it allows choking up on the guardrail side of exterior sections to achieve a more balanced pick
 - b. If utilizing excavating equipment to pick/pull at the end(s) of the bridge, all of the following are acceptable:
 - i. Hook the end plate through the "mouseholes" utilizing a two-way spreader chain.
 - ii. Loop a two-way spreader chain through the mouseholes and hook the top flanges of the exterior stringers.
 - iii. Utilize short nylon straps to choke around the end set of diaphragms.

Never rig to the guardrail!

2. Set subsequent sections in place adjacent to previously placed section(s) utilizing same process.
 - a. Structures consisting of three or more sections will have markings welded on the end plates to ensure the correct orientation of sections without guardrail. End plates at one end of the bridge will all be marked with an "E" while end plates at the opposite end will be marked with a "W".
 - b. Structures consisting of four or more sections will have match marks in the corners of the end plates to ensure the correct orientation and order of the sections i.e. mate up the two end plates both marked "2E" in the corner.
3. Align sections and bolt together utilizing $\frac{3}{4}$ " x 2" A325 bolts/nuts provided.
 - a. Bolt-up can start at either end of the bridge. Work from one end to the other – do not skip around. It may be necessary to hook to one section only and lift slightly to achieve vertical alignment while working across.
 - b. Bolts should be installed "snug-tight". Work through the bolt pattern at least twice – previously tightened bolts may loosen as adjacent bolts are brought tight.
4. **If Applicable** – Anchor bridge to bearing surface with "keeper" angles per attached sketch.
 - a. Approximately $\frac{2}{3}$ of the clips should face upstream, and $\frac{1}{3}$ of the clips should face downstream.
 - b. Steel bearing surface:
 - i. Weld the clips to the steel bearing surface at one end of the bridge. Fillet weld around the three exposed sides of the clip. Weld thickness should match the angle thickness – three passes will likely be required.
 - ii. On the opposite end of the bridge weld the bottom flanges of the stringers directly to the steel surface. Place a minimum $\frac{1}{4}$ " fillet weld for the entire contact area between the bearing surface and the stringer.
 - c. Concrete or timber bearing surface:
 - i. Clips will be punched with a $\frac{7}{8}$ " hole for use with a $\frac{3}{4}$ " diameter anchor. On a concrete surface clips can be used with drilled and epoxied/grouted rods, or an expansion type anchor. On a timber surface clips can be used with lag bolts.
 - d. Clips are typically centered on the bearing surface, but that can be varied as long as sufficient edge distance is maintained.

5. Install timber deck system.
 - a. Decking can commence from either side.
 - b. Deck panels can be set utilizing equipment with forks, or can be picked with a pair of nylon slings.
 - c. Set first deck panel on top of the assembled steel structure approximately 18" away from the end plate. Center the section sideways between the guardrails and ensure the deck panel is parallel to the end plate.
 - d. Install a row of deck clips on the side of the timber panel closest to the end plate. One clip should be installed on each beam, with half the clips facing one direction and the remainder of the clips facing the opposite direction. If the bridge has waterproofing membrane on the top flanges it is helpful to leave a slight gap between the clips and membrane to avoid tearing the membrane when the panel is slid tight to the end plate in step 'e'.
 - e. Slide the panel tight to the end plate. Install another row of clips on the opposite side of the panel. These clips should be held tight to the beam flange.
 - f. Set a second panel tight to the first panel. Install deck clips on the leading edge only of the second panel.
 - g. Toe-nail the joint between the first two panels with nails on approximate 12" centers.
 - h. Repeat steps "f" and "g" until only one panel remains.



Installing clips facing end plate on first deck panel.



Installing clips on leading edge of first panel, after panel is slid tight to the end plate.



Second panel set tight to first panel with clips installed on the leading edge.

- i. Set the final panel in place with a gap between it and the end plate. Install deck clips on the side closest the end plate as in steps "c" and "d", and slide it tight to the end plate. No deck clips will be installed on the opposite side of the final panel.
- j. Complete deck installation by installing the individual boards provided. Ensure a tight fit by wedging open the gap for the final board, and driving the board in with a sledgehammer. Take care not to damage the board. Toe-nail all loose boards installed to secure them.

6. **If Applicable** - Install w-rail.

- a. Bolt guardrail to posts utilizing $\frac{5}{8}$ " x 2" domed head bolts provided. Use one bolt per post. Posts are typically drilled with two holes to provide a spare in the event one hole is damaged in a collision. It can be helpful to use a spud to hold guardrail in one hole while inserting a bolt in the other.
- b. Standard procedure is to start installing the guardrail on the left side of the bridge and work down to the opposite end. From there work back on the right side of the bridge.
- c. Splice guardrail sections together utilizing $\frac{5}{8}$ " x 1- $\frac{1}{4}$ " domed head bolts provided.
- d. The domed heads face traffic – the nut goes on the backside of the post/rail.
- e. It is common that w-rail sections will need to be shifted end-ways one way or another to get the splices to line up. Don't tighten up the post bolts until the splice bolts have been inserted.
- f. Bolt the end terminals on the four corners utilizing the same guardrail splice bolts.

7. **If Applicable** - Install timber running plank.

- a. Utilize 2" planks provided to install longitudinal timber overlay as shown on the plans that will accompany your bridge.
- b. Mark the longitudinal centerline of the bridge with a chalk line. Place a row of planks on either/both sides of the centerline and continue working outward.
- c. Stagger joints – install first plank full-length, then cut adjacent plank to half-length.
- d. It is often helpful to tack the planks in place by nailing the four corners, then going back and screwing them down.
- e. Miter planks at the ends of bridge prior to installation for a smooth transition.
- f. Secure with deck screws provided. Utilize two screws at the end(s) of each plank, and one screw every 1' – 2' in between (alternate sides). **Screws typically utilize a #3 square drive.**

8. Touch-up any paint damaged during shipping/installation (see information in maintenance section below).

COMPONENTS PROVIDED

All required fasteners and hardware for superstructure and deck installation will be provided, such as:

- $\frac{3}{4}$ " x 2" splice bolts
- $\frac{5}{8}$ " x 2" domed head bolts
- Keeper angles
- Deck clips and nails

Recommended Rigging/Tools (for steel assembly and decking installation):

- Nylon straps (4)
- Two-way spreader chains with chokers (2)
- Spuds (4)
- 3# hammer
- 1- $\frac{1}{4}$ " open end wrench, ratchet/socket [electric impact is helpful, but not required]
- Wrecking bar ("crowbar")
- 4' pry bar
- Sledgehammer
- Claw hammers (3-4)
- Metal wedges (3)
- Skil saw
- Brushes/rollers for paint touch-up

MAINTENANCE RECOMMENDATIONS

Cleanliness is key to maintaining both the timber deck and the steel structure.

- Keep the deck clear of debris, particularly any stones that might damage a deck board if driven over.
- Removing any dirt/debris from the steel structure on a periodic basis will help prevent corrosion.
- Touch-up paint as required.
 - Remove any built-up rust and loose paint back to tightly adhered paint. Lightly abrade the surrounding area to ensure a good transition from the newly re-painted areas to existing paint.
 - For minor touch-up utilize an oil-based enamel suitable for metal substrates. Paint chips can be provided for color-match.
 - For more extensive repairs use a primer prior to the enamel.
- No salt/brine should be placed on the bridge. If salt and/or brine are used on the adjacent roadway we recommend the structure be lightly pressure washed each spring (even if the bridge is not directly salted as some will likely be tracked onto the bridge on vehicle tires).



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