

FRP Truss Bridge Field Installation Guide





Typical Installation Instructions for Areté Structures FRP Truss Bridge

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1.0 GENERAL NOTES

- OBSERVE COMMON SAFTEY PRECAUTIONS.
- AVOID EXCESSIVE PRESSURE WHEN SAWING, DRILLING, ROUTING, ETC. TOO MUCH FORCE WILL RAPIDLY DULL TOOLS AND CREATE EXCESSIVE HEAT THAT CAN SCORCH THE FIBERGLASS.
- DO NOT GENERATE EXCESSIVE HEAT WHILE DRILLING OR CUTTING. EXCESSIVE HEAT SOFTENS THE BONDING RESIN IN THE FIBERGLASS RESULTING IN A RAGGED RATHER THAN CLEAN CUT EDGE.
- SUPPORT THE FIBERGLASS MATERIAL RIGIDLY DURING CUTTING OPERATIONS. SHIFTING MAY CAUSE CHIPPING AT THE CUT EDGES. PROPER SUPPORT WILL ALSO PREVENT WARPING.
- THE CONTRACTOR SHALL EXERCISE PRECAUTIONS NECESSARY TO PROTECT THE FIBERGLASS PULTRUDED STRUCTURAL SHAPES FROM ABUSE TO PREVENT BREAKAGE, NICKS, GOUGES, ETC. DURING FABRICATION, HANDLING AND INSTALLATION.
- STRUCTURAL SHAPES SHALL BE FABRICATED AND ASSEMBLED AS INDICATED ON THE DESIGN DRAWINGS AND IN ACCORDANCE WITH STRONGWELL'S EXTREN FABRICATION & REPAIR MANUAL.
- ALL FRP MATERIAL TO BE STRONGWELL'S EXTREN 500 SERIES



2.0 TYPICAL TOOLS & EQUIPMENT

Note that the tools listed & shown in this document are a minimum for the assembly of the bridge under normal conditions. The contractor (or builder) may find a need for other tools & equipment beyond those listed here.

- 1) Scaffolding or Other Temporary Support (to support bridge during assembly, not shown)
- 2) Utility knife or Tin Snips (for cutting shipping banding)
- 3) Framing Square
- 4) Level
- 5) Straight Line String (for measuring chamber)
- 6) Tape Measure
- 7) Ratchet, Sockets, & Wrenches

o 1-1/8", 3/4", 9/16", 7/16"

- 8) Alignment Bar(s)
- 9) Hex Key
 - o 7/32"
- 10) Rubber Mallet
- 11) Cordless Drill
- 12) Drill Bits

o 9/16", 7/16", 3/16", 1/8"

- 13) Phillips Head Drive Bit(s)
- 14) Hard Hat (for when lifting overhead)
- 15) Gloves
- 16) Safety Glasses
- 17) Various Sized Shims/Blocking



FIGURE 1. TYPICAL TOOLS & EQUIPMENT



3.0 TEMPORARY SUPPORT STRUCTURE

A temporary support structure will be required during the bridge assembly process. Often scaffolding may be temporarily assembled under the proposed bridge location and then removed after installation is complete. This structure provides support to the floor beam and/or bottom chords while other truss members are assembled. This temporary structure should be level or just below the bridges end abutments. Because each bridge is built with a **positive chamber**, shims (spacers) are required at various locations throughout. See your specific bridges plans for required positive chamber dimensions.



FIGURE 2. SCAFFOLDING SET IN STREAM PRIOR TO BRIDGE INSTALL



FIGURE 3. SCAFFOLDING w/ BLOCKING TO ADD CHAMBER



4.0 PLANS & FIELD ASSM'Y PRINTS

Each Areté Structures bridge is supplied with a specific set of *Field Assembly Prints* for your bridge. This print will have a 940 series drawing number *(i.e. 940-XXXX-FLD)*. Prior to beginning the assembly process the contractor/builder should familiarize themselves with this print. A set of example install drawings has been provided at the end of this document.

Each Field Assembly Print has a minimum of 3 Sheets.

- Member Layout Sheet
- Cross-Section & General Procedure Sheet
- Hardware BOM, Abutment Detail, & Various Details Sheet

Member Layout Sheet

The *Member Layout Sheet* shows an *Elevation View & Plan View* of the bridge (*see figure 4*). Component numbers (*e.i. no. 30*) are as labeled on each piece of the kit as sent and corresponds with the specific set of *Field Assembly Prints* provided with the bridge kit. Note that the bridge has built- in positive chamber to eliminate dead load deflection; because of *some bridges* will have top rails that are slightly longer than the bottom rails & top chords are slightly longer than the bottom chords. See your set of specific *Field Assembly Prints* for applicability and minimum chamber height.



FIGURE 4. TYP. MEMBER LAYOUT PLAN & ELEVATION

Cross-Section & General Procedure Sheet

The *Cross-Section & General Procedure Sheet* shows the typical cross-section for the bridge (*see figure 5*). Bolt sizes & locations are located here. In addition, this sheet also has a general procedure for the erection of the bridge.





FIGURE 5. TYP. CROSS-SECTION

Hardware BOM, Abutment Detail, & Various Details Sheet

The Hardware BOM, Abutment Detail, & Various Details Sheet shows exactly as the name suggests. The list of hardware & quantities required to assembly the bridge. This hardware will be packaged in boxes separately from the FRP members. Abutment Details, Splice details, etc. (*see figure 6*) are also shown on this sheet; along with details to install the decking as ordered.



FIGURE 6. TYP. VARIOUS DETAILS



5.0 EXAMPLE OF "IN SHOP" BRIDGE ASSEMBLY

Throughout this assembly process several bolt tightening terms will be used:



"Finger Tighten": This means to tighten no more than what can be done using only one's hand/fingers. The nut should only be making connect to the Lock Washer (not compressing it).

FIGURE 7. FINGER TIGHT BOLTS



"Hand Tighten": Tighten nut with the use of wrench till Lock Washer is fully compressed (typically 50ft-lbs)

FIGURE 8. HAND TIGHT BOLTS



Step 1 & 2—Assemble U-frames / Lay Out Bottom Chords & Attached to Vertical Truss Members

• U-frames are assembled using the Floors Beams, Vertical Truss Members, & Stringer Center Posts (Figure 9). It should be noted that some Vertical Truss Members will be plugged; refer to the Field Assm'y Print Member Layout Sheet for member locations.



FIGURE 9. NOTE THAT LAYING OUT U-FRAMES PRIOR TO LAYING OUT BOTTOM CHORDS WORKS ONLY IF EACH FLOOR BEAM CAN BE SUPPORTED CONTINUOUSLY.

- Bottom Chords & Stringers are laid out according to Field Assm'y Print Member Layout Sheet.
- Add splice connections as shown in specific plans (*Figure 11 & 12*). Splice Connections should be *Hand Tighten* during this process. Bridges under 40ft typically do not have a Bottom Chord Splice.
- The *Bottom Chords* are then attached to *Vertical Truss Members* with **Finger Tighten** bolts (*Figure 10*). If *Floor Beams* cannot be supported continuously, the Bottom Chords will need to be laid out and supported before Floor Beams are added.



FIGURE 10. BOTTOM CHORDS ATTACHED TO VERTICAL TRUSS MEMBERS

That this time the Bottom Chord should be flat (*no chamber added*). This is to allow for easier connection of the Chord & Stringer Splice Plates (*Figure 11 & 12*).





FIGURE 11. TYPICAL STRINGER SPLICE

FIGURE 12. TYPICAL BOTTOM CHORD SPLICE

Step 3—Attach Top Chord Side Brace Tubes

• Attach *Diagonal Top Chord Braces* & *Diagonal Top Chord Brace Plates* at all *Floor Beam* Extensions & at top of *Vertical Truss Members* (*Figure 13 & 14*). **Finger Tighten** Side Brace connections.



FIGURE 13. DIAGONAL TOP CHORD BRACES



FIGURE 14. DIAGONAL TOP CHORD BRACE CONNECTIONS



Step 4—Attach Diagonal Truss Members

• Attach *Diagonal Truss Members (or X-Bracing)* to *Bottom Chords (Figure 15)*. Finger Tighten all Connections. Note that some *Diagonal Truss Members* will be plugged or vary in length; refer to the *Field Assm'y Print Member Layout Sheet* for member locations.



FIGURE 15. DIAGONAL TRUSS MEMBERS

Step 5—Attach Bottom Laterals

- Attach *Bottom Lateral Members (or X-Bracing)* to bottom of *Bottom Chords*. Hand Tighten all Connections. Note that some *Bottom Lateral Members* may be plugged or vary in length; refer to the *Field Assm'y Print Member Layout Sheet* for member locations. The *Bottom Lateral Members* have at minimum 5 holes that will be attached to the Bottom Chords & Stringer (*Figure 16*).
- Holes have been predrilled to the outside Bottom Chord Members for initial alignment & attachment (*Figure 17*).
- Ensure the Bridge is "square", before drilling. (Figure 18)
- Match drill bottom flange of bottom chords at pre-drilled lateral brace hole locations. (Ø 9/16 drill bit) (*Figure 19*)
- Attach remaining hardware to Bottom Lateral Members.



FIGURE 16. TYP. BOTTOM LATERAL





FIGURE 17. ATTACH BOTTOM LATERALS AT OUTSIDE CHORDS



FIGURE 18. ENSURE BRIDGE IS SQUARE



FIGURE 19. MATCH DRILL BOTTOM OF CHANNELS



Step 6—Attach Top Chords

- At this point, it will be *necessary to add a positive chamber*; *Top Chord* will not line up with the *Diagonal Truss Members* if chamber is not added. (*Figure 20*)
- Attach Top Chords & Splices at proper locations shown in the *Field Assm'y Print Member Layout Sheet. (Figure 21) Top Chord Splice* connections are similar to the Bottom Chord Splices; however, note that for 6in Chords the Lock Washer should be placed on the Bolt Head Side. This is to allow clearance of the Top Cap. (*Figure 22*) Splice Connections should be **Hand Tight**.
- An Alignment Pin is a helpful tool for aligning Diagonal & Vertical Truss Members to the Top Chord. (*Figure 23*)
- Note that a bridge will a have visible positive chamber of the top chord after chords are installed. (*Figure 24*)
- After all Top Chords have been installed, All Truss Bolts at the Top & Bottom Chords should be Tightened to Hand Tight.



• DO NOT REMOVE temporary support structure.

FIGURE 20. POSITIVE CHAMBER ADDED



FIGURE 21. TOP CHORD ATTACHED





FIGURE 22. 6IN TOP CHORD BOLT ASSM'Y (NOT NESSACARY FOR 8IN CHORDS)



FIGURE 23. ALIGNMENT PIN USE



FIGURE 24. VISABLE CHAMBER OF TOP CHORD



Step 7—Attach Top Cap

- Lay out Top Caps at proper locations shown in the *Field Assm'y Print Member Layout Sheet*.
- Match drill the top flange of the top cap at predrilled holes in the Top Cap. (Figure 25)
- Install hardware according to Field Assm'y Print.
- After Hardware for the top cap has been installed; the temporary support structure and shims may be removed.



FIGURE 25. DRILL & ATTACH TOP CAP



Step 8—Attach Decking (Timber Decking)

Decking will need to be cut & pre-drilled, according to your set of specific Field Assembly Prints. *(see Figure 26)*. Center decking & use self-drilling 1/4" screws to attach decking to top flange of the bottom chords & stringers at desired spacing *(see Figure 27)*. Top Flange of FRP may be drilled with 3/16" bit *(optional)*.



DECKING DETAIL 2X12 PT #2 SYP DECKING

FIGURE 26. TYP. DECKING CUT/DRILL DETAIL (SHOWN FOR 6-FT WIDE BRIDGE)



FIGURE 27. SELF-DRILLING DECK SCREWS



Step 9—Attach Railing

Due to the unique mechanical chamber built into Areté FRP truss bridges; railing lengths increase gradually as the pieces are placed vertically to the vertical posts. For example, a nominal 20' toe kick/railing piece placed low on the deck may measure 240"; the same piece may measure up to 240-1/2" when place at the top of the post.

For this reason, all railing members are shipped longer than necessary & no holes are drilled in the railing, so that pieces may be field trimmed & exact screw locations can be achieved.

- Note approximate railing length locations shown in the *Field Assm'y Print Member Layout Sheet*. (see Figure 4)
- Start attaching railing at one end of the bridge, starting with the bottom toe kick. Space bottom toe kick 1/2" to 1" (as desired) above deck, using spacers. (*Figure 28 & 29*)
- Use self-drilling screws to attach railing. Railing must be firmly held or clamped in place to ensure a flush connection when drilled. (*Figure 30*)
- Trim railing (using an angle grinder w/ cut off wheel) at center of tube where railing is to be spliced. (*Figure 31*)
- Continue attaching bottom toe kick for full length of bridge.
- Similarly, attach next railing row after bottom toe kick has been completely attached.



FIGURE 31. TRIM RAILNG