

# Standard Trail Footbridge Plan for 16-foot Bridge

## Design of Athens Trails

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These plans contain all design and specifications for a standard trail footbridge made of commercial treated lumber, four feet wide and sixteen feet long. Carriage bolts assemblies (hot-dipped galvanized) are used for mounting the handrail posts to the frame. Otherwise, 3" exterior-grade bugle-head screws are used for assembly. ½" (#4) re-bar pins are used to hold the bearing blocks in place. There are three particular options for handrails: 36" top rail assemblies only, 36" full handrail assemblies or 42" full handrail assemblies. This bridge can be scaled down to eight feet easily. See the table on page 5 for shorter-length bridge measurements. Bridges longer than 16 feet need separate instructions for stringer assembly. Width can easily be increased to six or eight feet, but if doing so, then the median stringer should be double, rather than single. For wider bridges, see info on page 6.

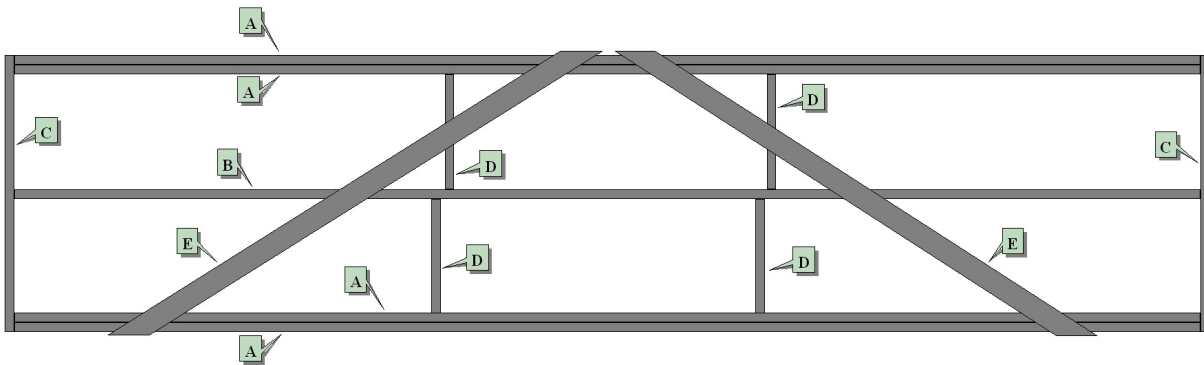
### **Bridge Materials for Sixteen-Foot Footbridge**

1. 5# 2x10-16': cut to 188½" for 5 stringers
2. 1# 2x10-8': cut in half for 2 endcaps
3. 17# 2x6-8': 16 cut in half for 32 pieces of decking;  
1 cut into 4 pieces 18¼" long for bridging
4. 1# 6x6-10': cut in half for 2 bearing blocks
5. 4# 4x4-8': cut in half for 8 handrail posts
6. 8# 5/4x6-16': mounted uncut, for 36"-height handrails  
optional: 4# only for top rail assembly only  
optional: 10# for 42"-height handrails
7. 3# 2x4-8': 2 mounted as diagonal braces and cut to fit in place;  
1 cut into 4 pieces 18¼" long for spacers
8. 1# #4 (½") rebar, 10': cut into quarters for 4 bearing-block pins
9. 16# 3/8x8" carriage bolts, hot-dipped galvanized
10. 16# 3/8" washers, hot-dipped galvanized
11. 16# 3/8" nuts, hot-dipped galvanized
12. 10 pounds 3" exterior-grade bugle-head screws, spline drive or square drive

### **Tools needed**

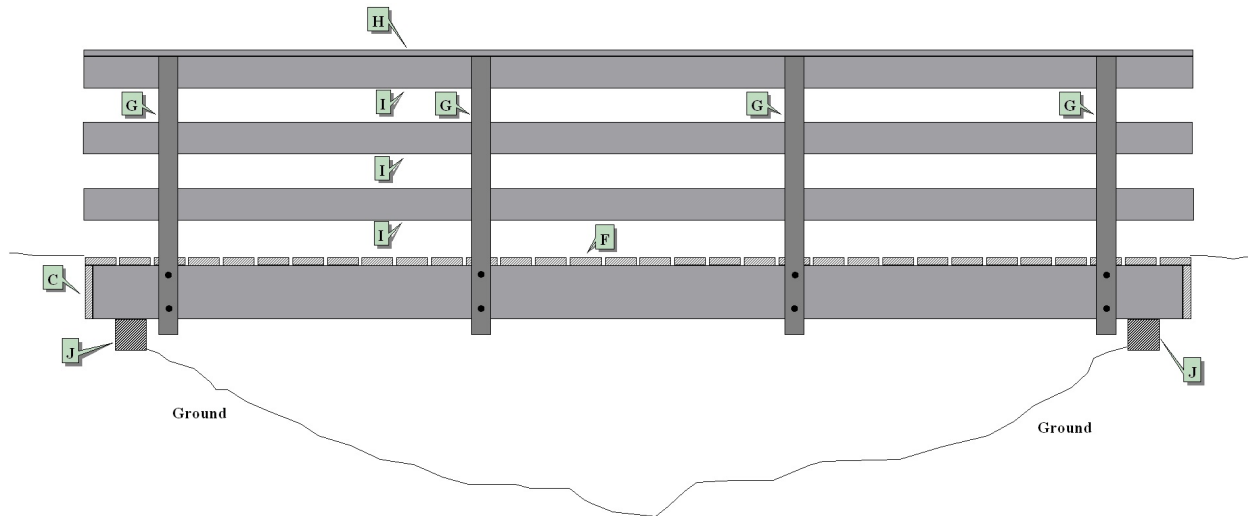
1. Framing square
2. Tri-square
3. Measuring tape
4. Marking pencil
5. Circular saw with wood blade
6. Metal cut-off blade for saw
7. Drill
8. 7/16" wood augur bit
9. 9/16" wood augur bit (or can be ½")
10. Level
11. Light hammer (for driving through carriage bolts)
12. Sledge hammer
13. 9/16" ratcheting wrench or ratchet with 9/16" deep socket

**Bridge Frame View (view from bottom)**



- A: Lateral stringer, 4 pieces 2x10-189"; drilled for anchor bolt holes for handrail posts
- B: Median stringer, 1 piece 2x10-189"
- C: End cap, 2 pieces 2x10-44" (may be longer with overlap for soil retention)
- D: Bridging, 4 pieces 2x6-18<sup>1</sup>/<sub>4</sub>"
- E: Diagonal brace, 2 pieces 2x4-8'; cut in place to fit

**Bridge Side Elevation View**



- F: Decking, 28 pieces 2x6- 4' (+/-); 4 pieces 44<sup>1</sup>/<sub>4</sub>"
- G: Handrail post, 8 pieces 4x4- 4' (+/-)
- H: Caprail, 2 pieces 5/4x6-16'
- I: Inside rail, 6 (or 2 for top rail only, or 8 for 42" rail) pieces 5/4x6-16'
- J: Bearing block, 2 pieces 6x6-5'

**Step-by-step assembly instructions**

Frame member preparation

1. Cut 6x6-10' in half. In each piece, drill two ½" or 9/16" holes through near the ends for the pins (the pins will be easier to drive in 9/16" holes).
2. Cut all five of the 2x10s to 188 ½". One of these will be the center (median) stringer and will be undrilled. Pair up the other four in two pairs. For each stringer, mark the top. Then, using a 7/16" augur bit, drill eight 7/16" holes in each stringer pair, being very careful to make the holes perpendicular. The holes are in four pair. In each pair, one hole will be 1¼" from the top, and the other will be 7¾" from the top. The hole sets, from one end, will be at 13¼", 67¼", 121¼", and 175¼". Then turn each pair on edge, and set all four together, with ends even. On the top edge, mark the decking placement marks: from one end, mark at 4", 4½", 10", 10½", 16", 16½", etc. (in other words, keep repeating measurements at six-inch intervals until the other end).
3. Cut the 2x10-8 (or this can be a 10' piece) in half. On one side (the inside crown side), mark six perpendicular lines. Starting from the center, mark at ¾", 19", and 22" (so there will be two lines in the middle 1½" apart). These are the mating lines for the stringers.
4. Cut the remaining 2x6-8 into four lengths 18¼" long for the four bridging pieces.
5. Cut one of the 2x4-8s into four lengths 18¼" long for the bearing-block spacers.

The frame is now ready for assembly. You can jump to frame assembly or continue with materials preparation now.

Remaining member preparation

6. Cut fourteen of the 2x6-8s in half for the decking, resulting in thirty-two pieces.
7. Cut two of the 2x6-8s into four 44¼" pieces.
8. Cut the four 4x4-8s in half for the handrail posts. Line up the four posts evenly.  
For 36" full handrails: From one end, which will be the top, make marks at 5½", 11½", 17", 23", 28½", 35", 36½", 37¼", and 43¾". Draw perpendicular lines at these marks. These lines will mark the inside of the posts. For the two last lines, draw the lines around to the other side of the posts (the outside of the posts) using your tri-square. Then, on these lines (37¼", and 43¾"), mark the center point on each. Using a 7/16" augur bit, drill halfway through from one side, then flip them over and drill the rest of the way through to ensure that the holes are perpendicular.  
For 36" top rails only: From one end, which will be the top, make marks at 5½", 35", 36½", 37¼", and 43¾". Draw perpendicular lines at these marks. These lines will mark the inside of the posts. For the two last lines, draw the lines around to the other side of the posts (the outside of the posts) using your tri-square. Then, on these lines (37¼", and 43¾"), mark the center point on each. Using a 7/16" augur bit, drill halfway through from one side, then flip them over and drill the rest of the way through to ensure that the holes are perpendicular.  
For 42" full handrails: From one end, which will be the top, make marks at 5½", 11½", 17", 23", 28½", 34½", 40", 42½", 44", 45¼", and 51¾". Draw perpendicular lines at these marks. These lines will mark the inside of the posts. For the two last lines, draw the lines around to the other side of the posts (the outside of the posts) using your tri-square. Then, on these lines (45¼", and 51¾"), mark the center point on each. Using a 7/16" augur bit, drill halfway through from one

side, then flip them over and drill the rest of the way through to ensure that the holes are perpendicular.

**Site preparation**

9. Dig two flat shelves, at a level 16¼" below the finished trail surface. These should be about a foot wide and about six feet long, level with each other, and parallel.

10. Set the bearing blocks in place. Check the bearing blocks for level both ways. Then use one of the 5/4 stock, on edge, or one of the stringers on edge to check level. If not perfectly level, then it is necessary to re-dig/re-grade until they are level. Then check distance to ensure that the bearing blocks are parallel to each other. The blocks can be anywhere from 140" to 181½" apart, measured outside of block to outside of block. However, make sure that they are on solid native soil, not fill that you have created, and preferably back away from a steep dropoff. Then lay the 5/4 stock or the stringer flat, with the edge even with the end of the bearing block, and use a framing square to check that it is perpendicular to the bearing block. The edge should also be even with the end of the far bearing block. If not, re-adjust. Keep re-adjusting as needed until both blocks are level both ways, parallel, level with each other, and square.

11. Drive the pins into the bearing blocks to secure them in place. Use shovels driven in against the sides while driving the pins to ensure they do not move.

**Frame assembly**

12. Place the stringers on top of the bearing blocks, with the top edges down. Then lay each outermost stringer down flat so that only three are still on edge. Place each endcap against the ends of the stringers, aligning by the marks already made, use the framing square to ensure that the endcap is square against the stringers, and use three screws through the endcap into the end of each stringer.

13. Place each piece of stringer into the frame. Place these at approximately six feet from each end, to ensure that they do not interfere with mounting the handrail posts. Offset them slightly so that you can screw directly into each one (see frame diagram). Use two screws through each stringer into the end of each piece of bridging. Locate the bridging about halfway up/down on each stringer, so there is a little space above and below. You will use a total of 16 screws.

14. Flip up the two remaining stringers. Put three screws through each one into the inner stringer, one about six inches from each end and one in the middle. Then screw through the endcap to secure these, three screws per location.

15. Take the two uncut 2x4s. Lay these flat across the frame in a "V" pattern (see diagram). They should touch at the very middle just out from one side. Ensure that they stick out beyond the stringers. Make sure that the ends that are near the ends of the frame are at least eighteen inches from the frame ends to ensure that they do not interfere with mounting the handrail posts. Use two screws to fasten these to every stringer (thus, ten screws per 2x4). Then cut the ends of the 2x4s parallel with the stringers, about an inch out.

16. Flip the frame over so that it is now right-side up. Position as desired (centered both ways) on the bearing blocks. Slip the short 2x4s (18¼") into the gaps between the stringers on top of the bearing block. Screw these into the bearing blocks, using two screws per piece. Then fasten the frame to these spacers. If these are right at the ends, you can screw through the endcaps.

Otherwise, you will have to toenail them.

Remaining bridge assembly

17. Slip two carriage bolts through the holes in each handrail post. Mount each handrail post through the frame, driving bolts through with the hammer, and tighten down with one washer and one nut on each bolt on the inside. Tighten only until the carriage bolt heads start biting into the wood on the outside of the post. Be sure that the seven (three) top lines are on the inside of the bridge.

18. Place all decking pieces on the bridge, with the 44¼" pieces going between the handrail posts. Each one will overhand each side stringer by about two inches (except for the four short pieces). Align them to the marks. Make sure that the crowning is concave downward, unless the bark side is exceptionally bad. Fasten each with two screws in the center stringer, and two in each inside side stringer, six screws per decking piece. Do not screw into the outermost stringers. For the two end pieces only, which will overlap the endcaps, use three screws in the stringers, and four into the endcap.

19. Using the framing square, make sure that each handrail post is perpendicular to the decking. Use the long leg of the square on the decking, and the short leg on the post. Simply hit the post sideways to adjust.

20. Take one 5/4 stock piece for each side, and lay on the inside of the handrail posts, with the edge even with the top. Center and fasten with two screws into each post.

21. Take one 5/4 stock piece for each side, and lay flat on top of the handrail posts and on top of the piece just mounted. Do not make flush on the inside, but very slightly overlap so that the bevel is beyond the piece just mounted. Fasten into the tops of the handrail posts with two screws per post, plus screw into the underlying handrail piece with five screws: one between each handrail post, and one about six inches from each end.

22. IF you are using full railing, then align the other four handrail pieces to the marks already made, center and fasten as with the others. There should be a six-inch gap between each one.

23. Fill against each end of the bridge, compact, and level fill.

**Table for Other-Length Bridges**

	Stringer length	Decking pieces	Handrail posts	Holes to be drilled in stringers for handrail posts – drill at 1¼" and 6 ¾" from top edge of stringers			
8'	92½"	16 (12+4)	2	13¼"	79¼"	---	---
10'	116½"	20 (16+4)	3	13¼"	61"	103¼"	---
12'	140½"	24 (20+4)	3	13¼"	73"	127¼"	---
14'	164½"	28 (24+4)	4	13¼"	61¼"	103¼"	151¼"
16'	188½"	32 (28+4)	5	13¼"	67¼"	121¼"	175¼"

**Six-foot-wide bridge**

With doubled median stringer. Mark endcaps at 1½", 31", and 34" each way from center (step 3).

**Bridge Materials**

1. 6# 2x10-16': cut to 188½" for 6 stringers
2. 1# 2x10-12': cut in half for 2 endcaps
3. 17# 2x6-12': 16 cut in half for 32 pieces of decking;  
    1 cut into 4 pieces 29½" long for bridging
4. 1# 6x6-14': cut in half for 2 bearing blocks (use 16' if 14' not available)
5. 4# 4x4-8': cut in half for 8 handrail posts
6. 8# 5/4x6-16': mounted uncut, for 36"-height handrails  
    optional: 4# only for top rail assembly only  
    optional: 10# for 42"-height handrails
- 7a. 3# 2x4-10: 2 mounted as diagonal braces and cut to fit in place;  
    1 cut into 4 pieces 29½" long for spacers
8. 1# #4 (½") rebar, 10': cut into quarters for 4 bearing-block pins
9. 16# 3/8x8" carriage bolts, hot-dipped galvanized
10. 16# 3/8" washers, hot-dipped galvanized
11. 16# 3/8" nuts, hot-dipped galvanized
12. 10 pounds 3" exterior-grade bugle-head screws, spline drive or square drive

**Eight-foot-wide bridge**

With doubled median stringer. Mark endcaps at 1½", 31", and 34" each way from center (step 3).

**Bridge Materials**

1. 6# 2x10-16': cut to 188½" for 6 stringers
2. 1# 2x10-16': cut in half for 2 endcaps
3. 17# 2x6-16': 16 cut in half for 32 pieces of decking;  
    1 cut into 4 pieces 41½" long for bridging (this can be a 14' if available)
4. 1# 6x6-18': cut in half for 2 bearing blocks (use 16' if 14' not available)
5. 4# 4x4-8': cut in half for 8 handrail posts
6. 8# 5/4x6-16': mounted uncut, for 36"-height handrails  
    optional: 4# only for top rail assembly only  
    optional: 10# for 42"-height handrails
- 7a. 3# 2x4-14: 2 mounted as diagonal braces and cut to fit in place;  
    1 cut into 4 pieces 41½" long for spacers
8. 1# #4 (½") rebar, 10': cut into quarters for 4 bearing-block pins
9. 16# 3/8x8" carriage bolts, hot-dipped galvanized
10. 16# 3/8" washers, hot-dipped galvanized
11. 16# 3/8" nuts, hot-dipped galvanized
12. 10 pounds 3" exterior-grade bugle-head screws, spline drive or square drive