Micro Engineering Company

ASSEMBLY INSTRUCTIONS
TALL STEEL VIADUCT
Height Extension Kit
75-546 HO & HOn3

Micro Engineering, Co.
29084 Sunset Dr
Macon, MO 63552
www.microengineering.com

I. GENERAL

• The Micro Engineering Tower Height Extension kit allows the addition of a 4th story or a 4th and 5th story to both towers of the HO or HOn3 Tall Steel Viaduct Standard Bridge kits. This kit will normally be assembled along with the three story Tall Steel Viaduct towers or it can be assembled as stand alone **tower bases** which are then attached to existing three story towers. (See "Assembly Options" at the start of section **V. Assembly**.)

• Most parts in this kit are made of injection molded styrene plastic and can be glued with MEK solvent or a styrene cement (such as Testors®). We strongly recommend using a glass tube cement applicator. If using Delrin® plastic track, glue it and the white metal parts with a cyanoacrylate (CA) or a rubber based cement (such as Pliobond®, available from Micro Engineering).

• Read each instruction step completely before proceeding with that step. Refer to the photos and box label for reference.

II. TALL STEEL VIADUCT ADD-ON KITS

• Tall Steel Viaduct bridges can be customized in a variety of ways or entirely new bridges can be designed and built. There are a number of basic and add-on HO-HOn3 Tall Steel Viaduct kits for increasing the length, height, or configuration of the basic bridges. See the Micro Engineering Tall Steel Viaduct brochure sheet for a list of these kits.

III. NOTES

• Figure 1 identifies the major assemblies and subassemblies of the Tower Height Extension kit and the Tall Steel Viaduct Tower. For the purposes of these instructions, the bridge stories are numbered from the bridge deck down. The Tower Height Extension kit adds one or two more stories, identified as the fourth and fifth story, to the base of the stock, three story towers.

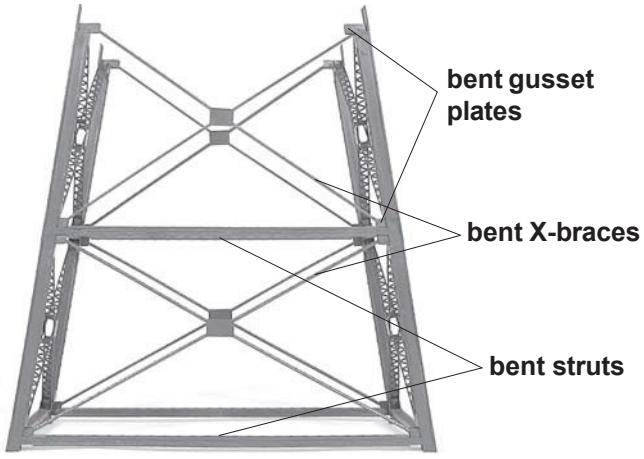
• The sequence of assembly for building a four or five story tower is; 1. Attach the 4th story (and 5th story, if used) bent half to a 3 story bent half; 2. Construct the **bent assemblies**; 3. Construct the **tower struts**; 4. Assemble the **tower** using the bent assemblies, tower struts, and tower X-braces. If building a **stand alone tower base**, it is then attached to an existing three story tower.

IV. PARTS

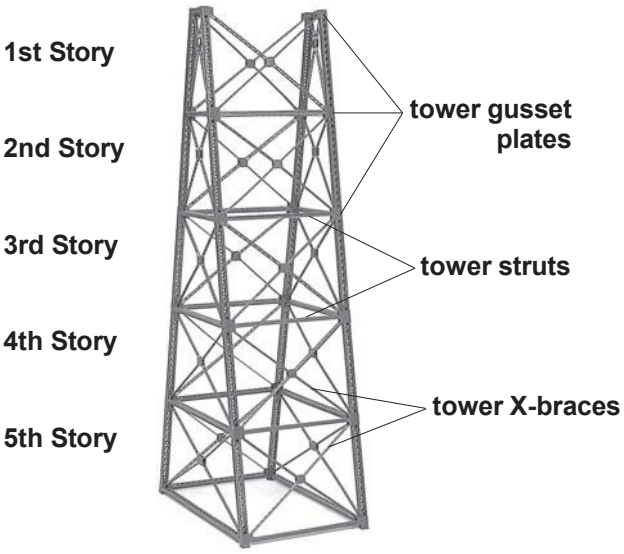
• The parts photo and parts list are shown in figure 2. The part numbers are keyed to the photo.

• When cutting the plastic and white metal parts from their sprues, file or trim off any flash, ejector pads, or gate nibs. Use care when handling the parts as some are thin and easily broken. If a part breaks, lay it on a flat surface and cement it back together. The Micro Engineering Rail Nipper #48-102 is excellent for cutting these small parts.

Fig. 1 Assemblies / Terminology



4th & 5th Story 'Tower Base'



5 Story 'Tall Tower'

Part No.	Part Name	Sprue No.	Parts Needed
1.	bent half, 4th story	1	8
2.	bent half, 5th story	3	8
3.	outside bent lattice	2	8
4.	inside bent lattice	1	16
5.	bent strut lattice, 4th story	2	8
6.	bent strut lattice, 5th story	2	8
7.	bent X-brace, 4th story	2	8
8.	bent X-brace, 5th story	2	8
9.	tower rivet plate	1, 3	16
10.	tower strut side, inside	2	8
11.	tower strut side, outside	2	8
12.	tower strut lattice	1	16
13.	tower X-brace	1	16
14.	bearing plate	1	8
15.	bent rivet plate, 4th story	3	8
16.	bent rivet plate, 5th story	3	8

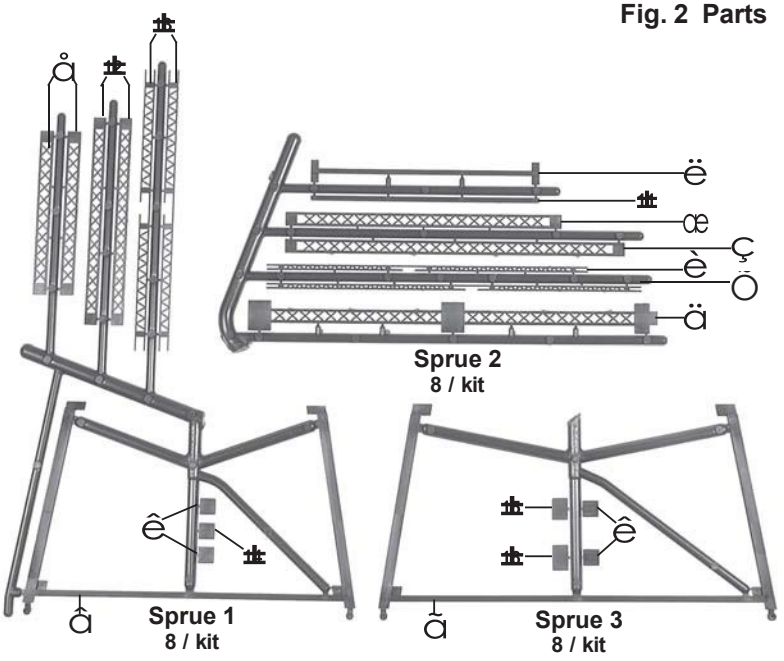


Fig. 2 Parts

V. ASSEMBLY

Assembly Options

The Tall Steel Viaduct Height Extension kit can be assembled two ways. 1. The kit can be assembled along with the three story Tall Steel Viaduct towers to form **tall towers**. This is the recommended method of assembly. 2. The kit can also be assembled as stand alone **tower bases** which are then attached to existing three story towers. This is a more difficult method of assembly as it requires removable of several cemented parts on the existing three story towers. See fig. 1. With either of these options the height extension kit can be assembled as a four story only tower extension or as a four and five story tower extension.

These instructions are written showing a general construction of the fourth and fifth stories. Some of the photos in these instructions are from the Tall Steel Viaduct instructions showing a three story tower but the assembly and general layout are the same for the Height Extension kit. If assembling the kit along with the three story Tall Steel Viaduct to form a four or five story **tall tower**, use the instructions that came with the three story Tall Steel Viaduct kit or the Tall Steel Viaduct Tower kit and refer to the following steps of these instructions; steps 1, 3, 6, 8, 10, 21, 22, 23, & the "Tower Struts" section after step 9.

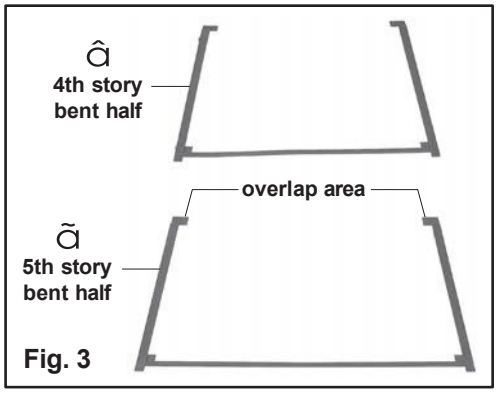


Fig. 3

Bent Assemblies

1. Cement a 4th story **bent half** part **(1)** to a 5th story **bent half** part **(2)**. See fig. 3. (If building a four story instead of a five story tower, skip this step.)

Place a 5th story bent half on the work surface with the rivet side up and apply cement to one of the overlap areas. Place a 4th story bent half on the 5th story overlap, applying pressure so the parts are flat, butted against each other, and the edges are flush and in line. Repeat at the second overlap area. Turn the assembly over and apply cement along the glue line at both overlap areas. Make sure the assembly is flat and aligned properly. Repeat this step with a second 4th and 5th story bent half.

Tip: Check the bent halves for fit before cementing as it may be necessary to file the bottom edge of the 4th story bent half for a good joint.

Tip: On many bridges, some of the tower or bent legs are short-

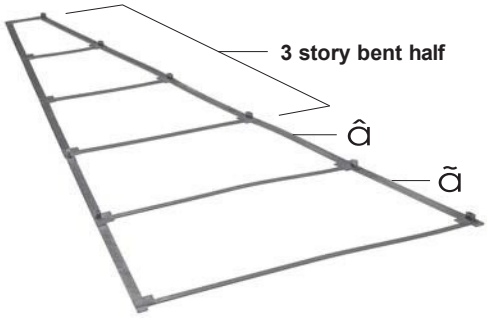


Fig. 4 Five story bent half

ened to fit the terrain. If using a shortened leg(s) cut the bent halves and other parts to the correct length before assembling.

Note: If building the **tall tower** in conjunction with a three story Tall Steel Viaduct Tower, cement the just completed bent half assembly from step 1 to a three story Tall Steel Viaduct Tower bent half. See fig. 4.

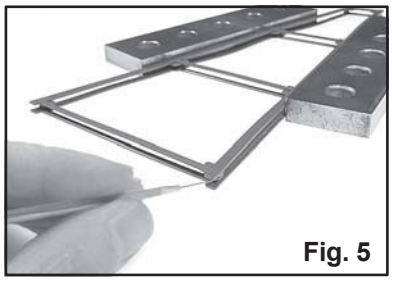
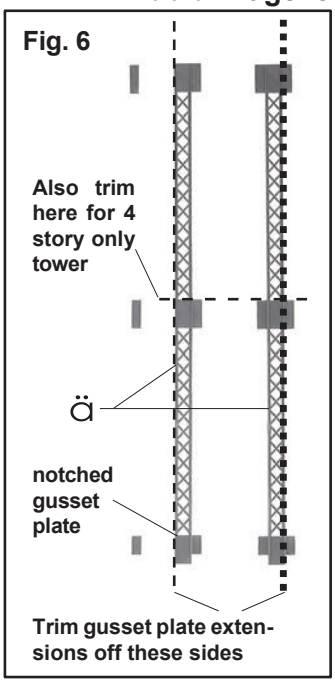


Fig. 5

2. Cement the two **bent half assemblies** from step 1 together.

Lay a bent half assembly flat on the work surface with its spacers up. Place another bent half assembly on top of the first with its spacers down. Place a thick, heavy straight edge on each side of the bent assembly to align the edges flush. See fig 5. Be sure all edges of both bent halves are flush with one another. Apply cement between a spacer and the bent half and apply pressure until dry. Repeat at each spacer.

Tip: If the bent assembly develops a warp as assembly proceeds, lay the bent on a flat work surface and place weights on it after each work session.



3. Trim the gusset plate extensions off one side of the eight **outside bent lattice** parts **(3)** so there are four left-hand and four right-hand parts.

Place two outside bent lattice parts **(3)** on the work surface with the rivet side down, positioned as shown in fig. 6. With a razor knife, trim off the three gusset plate extensions along the left side of one part and the right side of the other part, cutting along the outside edge of the raised rib. Repeat with the other three pairs of part **(3)**. See fig. 6 & 7.

Tip: Save the cut off pieces for possible use in step 21.

Note: If building a four story only tower base, trim off and discard the top portion on all eight parts 3 before trimming the gusset plates. See fig. 6.

Note: The notched gusset plates are always located at the bottom of towers, whether a four or five story tower.

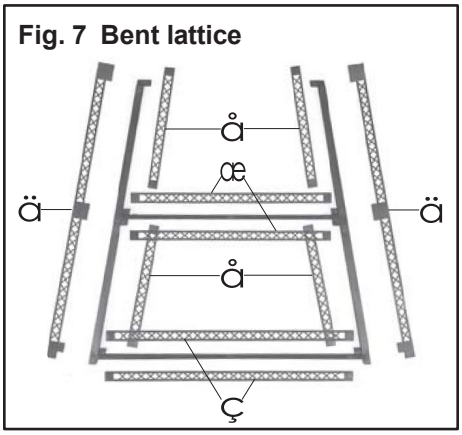


Fig. 7 Bent lattice

4. Cement the **outside bent lattice**, parts **(3)** to the bent assembly. Figure 7 shows their general position. (For clarity, the parts are shown flat in figure 7, they would actually be on edge if cemented to the bent halves.) Note that the gusset plate extensions of parts **(3)** have been trimmed for left-hand and right-hand parts.

Note that all bent lattice parts have a raised rib along each edge on one face. To assemble the outside bent lattice, lay part **(3)** flat on the work surface with the rib side up. Place the bent assembly on edge on top of part **(3)** so the ribs are on the outside of each bent half. See fig. 8. Cement in place, one edge at a time, while holding the bent half against the rib. Be sure the end of part **(3)** is flush with the end of the bent and the notched gusset plate is at the base of the tower. Repeat on the other side of the bent assembly. The six (or four) gusset plate extensions on parts **(3)** should all extend in the same direction, or up with the bent assembly flat on the work surface. See fig. 8 & 11.

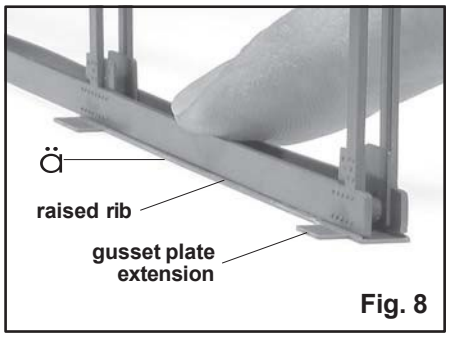


Fig. 8

5. Cement the **inside bent lattice** parts **(4)** to the bent assembly. Figure 7 shows their general position.

To assemble, pick up the bent assembly and hold part **(4)** against the bent edges, with its ribs outside each bent half. See Fig. 9. Apply cement along one edge at a time.

Tip: Check these parts for fit before cementing as it may be necessary to file the ends shorter so they fit between the bent gusset plates without bowing.

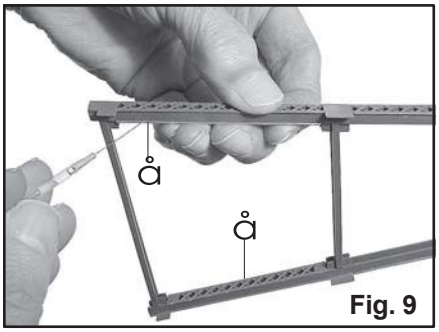


Fig. 9

6. Cement the upper and lower **bent strut lattice**, parts **(5)** and **(6)** to the bent

struts of the bent assembly. Figure 7 shows their general position.

Hang the bent assembly over the corner of the work table with part **(5)** or **(6)** between the work surface and the bent assembly. See Fig. 10. When cementing, use tweezers to hold the bent struts against the raised ribs of part **(5)** and **(6)** to prevent the bent struts from bowing.

Tip: Cement part **(5)** or **(6)** to the top of the bent strut first. This will make it easier to center the bottom part on the bent strut.

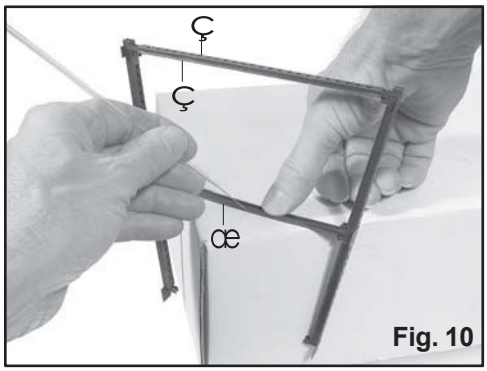


Fig. 10

7. Cement the **bent X-braces, 4th & 5th story** parts **(7) & (8)** to the bent assembly. See fig. 1 & 11. (Truss rods can be substituted for the X-braces as described in step 8 of the Tall Steel Viaduct Standard Bridge instructions.)

Position, but do not cement, a bent X-brace, part **(8)**, between the bent gusset plates at the upper right corner and lower left corner of the 5th story. See fig. 11. Position the bent X-brace with the notch facing up and its lattice straps toward the top of the bent. Align the X-brace at each end with the rows of rivets on the bent gusset plates. Position the second bent X-brace in the opposite two corners in the same way but with the notch down. Adjust the position of the two X-braces so their slots are centered on one another. Turn the bent assembly over and adjust the position of each X-brace on the opposite side gusset plates. Once both bent X-braces are positioned correctly, without bow, cement the four ends to the gusset plates on both sides of the bent assembly. Repeat for the 4th story X-braces.

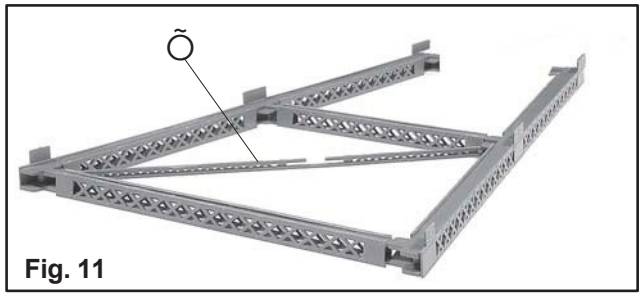


Fig. 11

Important: If building the stand alone tower base, cement only the lower ends of the 4th story X-braces, do **not** cement their upper ends. The top ends of the bent need to remain flexible until the tower base is fitted to the existing three story tower.

Tip: If the X-brace bows when positioned in place, it may not be pushed far enough under the gusset plate or it may be a little long. If long, remove the part, trim a little off each end, and check for fit again.

Tip: If the bent assembly is warped, adjust the X-braces as above, place the bent on a flat surface, place weights on it, then readjust and cement the x-braces.

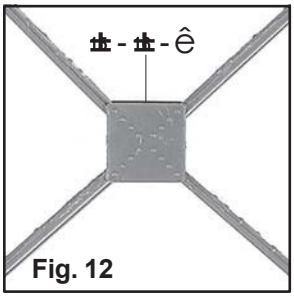


Fig. 12

8. Cement the **bent rivet plates, 4th & 5th story** parts **(15)** & **(16)** at the intersection of the bent X-braces in both stories and on both sides of the bent.

Apply cement on the edges of the X-braces at their intersection. Using tweezers, place a rivet plate on the cemented area and align the rows of rivets on the rivet plate with the X-braces. See fig. 12. The edges of the rivet plate should also be vertical and horizontal. Once in correct position, apply pressure to the rivet plate so it makes contact and is cemented to all three X-brace edges. Turn the bent assembly over and cement a second rivet plate to the opposite side of the two X-braces. Be sure the two rivet plates are aligned with each other when viewed from either side of the bent assembly.

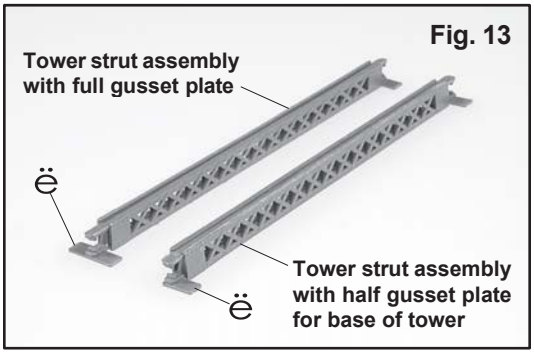


Fig. 13

Tip: Some rivet plates are easier to align and cement by laying the assembly flat on the work surface and working from the back side.

9. The first bent assembly is complete. Assemble three more bent assemblies.

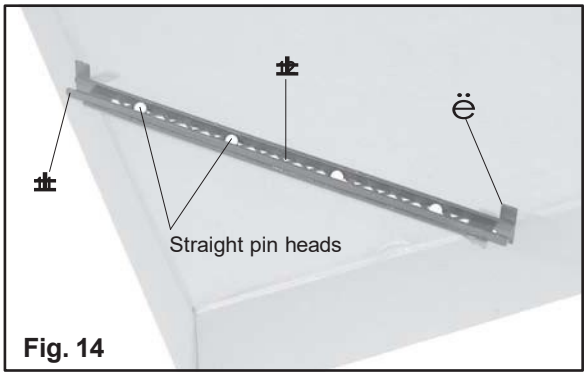


Fig. 14

Tower Struts

Note: Tower struts at the base of towers (whether its a 3, 4, or 5 story tower) require a half gusset plate at each end while all other tower struts have a full gusset plate at each end. See fig.

13. If assembling this kit along with a three story Tall Steel Viaduct tower, skip step 10, do not trim any part **(10)**s. Use part **(10)** of this kit for the 3rd story of the Tall Steel Viaduct kit and then use part **(16)** from the Tall Steel Viaduct kit at the bottom story of the extended 4 or 5 story tower.

Tip: When assembling tower struts, it is best to assemble an entire tower strut in one session while the cemented joints still have some flexibility since cementing the fourth side in place helps square up the assembly.

10. Trim off half the gusset plates of a **tower strut side, inside** part **(10)**. This step may need to be skipped. See the note above before starting this step.

Lay a part **(10)** flat on the work surface with the gusset plates down. With a razor knife, trim off half the gusset plate at each end, along the same side of part **(10)**. Repeat with a second part **(10)**. See fig. 13.

11. Cement a **tower strut side, inside** part **(10)** to a **tower strut lattice** part **(12)**.

On a block of soft wood or a piece of cardboard, place part **(12)** with the rib side up, across a corner of the block so both ends overhang the block slightly. See fig. 14. Pin the part to the block with several straight pins so it cannot move. Place part **(10)** on edge, centered on part **(12)**, against the inside of the raised rib, with the gusset plates to the outside. Apply cement along the rib, making sure part **(10)** is vertical and perpendicular to part **(12)**. Use the plates at each end for reference.

12. Cement a **tower strut side, outside** part **(11)** to the tower strut assembly.

Place part **(11)** on edge, centered on part **(12)**, against the inside of the other raised rib. Align both ends with the ends of part **(10)** and apply cement along the rib. Be sure part **(11)** is vertical and perpendicular to part **(12)**.

13. Cement a second **tower strut lattice** part **(12)** to the top of the tower strut assembly.

To assemble, remove the straight pins, pick up the tower strut assembly, and hold part **(12)** against the assembly (similar to fig. 9) with its rivet detail to the outside and its ribs outside of parts **(10)** and **(11)**. Apply cement along the ribs while applying pressure.

14. The first tower strut is complete. Assemble seven more tower struts (three more if building a four story only tower base).

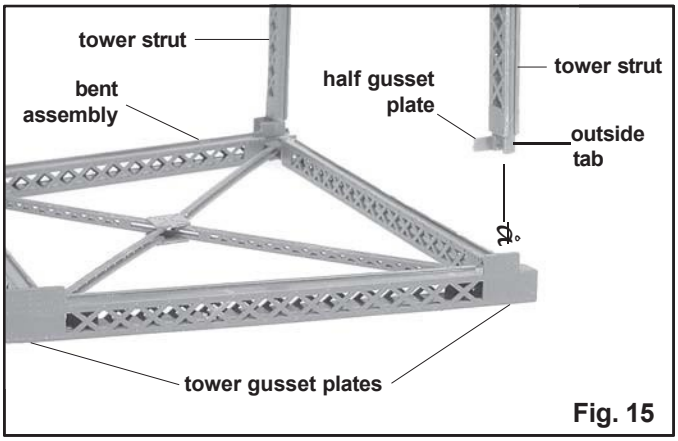


Fig. 15

Tower Assemblies

15. Cement four **tower struts** to a **bent assembly** (two if building a four story only tower base).

a. Lay a bent assembly flat on the work surface with the gusset plate extensions up. Holding a tower strut vertically, place its end on the bent assembly, with its gusset plate to the inside. See fig. 15. The two tower struts with half gusset plates are used at the bottom of the bent with the half gusset plates toward the top of the bent assembly.

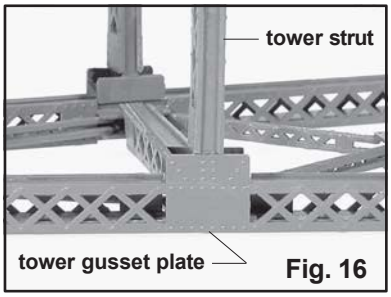


Fig. 16


Fig. 17

b. Check that the ends of the lattice on the tower strut will butt against the tower gusset plate on the bent assembly. See fig. 16. It will probably be necessary to shorten the tower strut for correct fit. Start by trimming off a small amount of the outside tab then, if necessary, file down some of the edge of the half or full gusset plate. Also, see the **Tip** in d. below.

Tip: Check the fit of both ends of each tower strut to both bent assemblies at this time since it will be difficult to trim the second end later. Check the fit at the actual location on the bent assemblies where each tower strut will be cemented.

c. Put cement only on the outside tab of the tower strut and press this tab against the inside of the tower gusset plate with tweezers. See fig. 15.

d. Position each tower strut as follows; **1.** so it is aligned with the double row of rivets on the tower gusset plate. See fig. 16; **2.** with the bent assembly flat on the work surface, place a square on the work surface and check


Fig. 18

that the tower strut is square in both planes, perpendicular to and in line to the bent assembly. See fig. 17; **3.** looking from above, the tower strut should be slightly twisted so it is aligned with the slope of the bent.

Tip: The outside tab on the tower strut or the tower gusset plate on the bent assembly can be twisted or bent with tweezers to help align and square the tower strut.

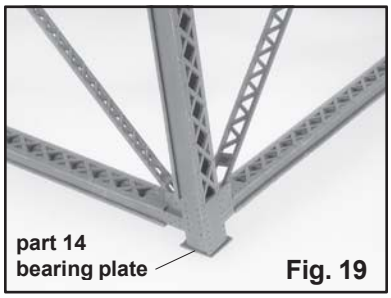


Fig. 19

16. Cement a 2nd **bent assembly** to the opposite ends of the four **tower struts**. Lay a 2nd bent assembly flat on the work surface with the gusset plate extensions up. Hold the tower assembly from step 15 upside down (with the tower struts down) and place the ends of the tower struts on the 2nd bent assembly. Align and cement each tower strut to the 2nd bent assembly as done in step 15. View the tower assembly from above to check the squareness of the bent assemblies to each other. Set the tower upright and use angle plates, a square and weights, or other suitable tools to hold the tower square as the cement dries. See fig. 18.

17. Cement the **tower X-braces** part **(13)** to the tower assembly. (Truss rods can be substituted for the X-braces as described in step 8 of the Tall Steel Viaduct instructions.)

The tower X-braces are assembled in the same manner as the bent X-braces. Follow the instructions in step 7. Part **(13)** is used for both stories, on both sides of the tower. Be sure the lattice straps on the X-braces are facing the top of the tower. After positioning but before cementing the X-braces in place, use angle plates, a square and weights, or other suitable tools to hold the tower square. See fig. 18. Once the tower is square and the X-braces are in their correct position, cement the X-braces in place. Note that the top end of the 4th story X-braces can only be cemented to an outside gusset plate until step 21 is completed.

Fig. 20

18. Cement the **tower rivet plates** part **(9)** at the intersection of the tower X-braces in both stories and on both sides of the tower.

The tower rivet plates are assembled in a similar manner to the bent rivet plates. Follow the instructions in step 8. See fig. 12.

19. Cement the **bearing plates** part **(14)** to the bottom of the tower. Position the bottom bearing plates against the bottom of the bents, centered on the four sides of the bent leg. See fig. 19. File or sand the bottom edges of the bent legs, if necessary, so the bearing plates sit level.

20. The first tower base is complete. Assemble the second tower base.

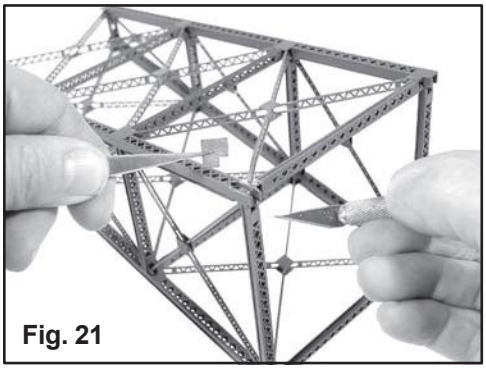


Fig. 21

Assembling a stand alone tower base to an existing three story tower

21. Cement the **top 4th story gusset plates** to the tower base.

The top of the tower base requires gusset plates be installed for the inside leg of the tower x-braces to attach to. Size and use the cut off pieces from step 3 for the gusset plates. Lay the tower base on its bent side and cement these parts to the bent assemblies and to the 4th story tower X-braces. See fig. 20.

22. Remove the four tower gusset plates at the base of the three story tower. See Fig. 21.

The top gusset plates on parts **(3)** at the top of the 4th story will overlap the bottom of the existing three story tower. This will require removal of the bottom gusset plates on the existing three story towers. Use a razor knife to cut the glue joints under the gusset plate using the following sequence. First, free the tower X-brace end by cutting between it and the gusset plate. Second, free the tower strut end. Third, saw through the gusset plate where the lattice straps begin. Fourth, cut between the gusset plate and the bent edges. Repeat for the other three bottom gusset plates.

23. Place the three story tower on top of the tower base and cement in place.