CORNERSTONE®

HO Structure Kit
SWING BRIDGE
933-3088

Thanks for purchasing this Cornerstone Series® kit. This model is designed to operate, so please read these instructions and study the drawings before starting. All parts are molded in styrene, so use only compatible paint and glue. Gears in the drive mechanism are made of Delrin® plastic and should only be lubricated with plastic-compatible oil or grease.

Rivers have always challenged railroad bridge builders. Where the waterway is used for commercial shipping, sufficient clearance must be provided so vessels can pass safely below. For example, pleasure boats need very little room, so a standard bridge could be used. But if the same channel handles ocean-going freighters or large naval vessels, far more clearance is needed. In these locations, the answer is usually a moving bridge.

Also known as drawbridges or spans, there are three basic types; Vertical Lift, Bascule and Swing. Vertical Lift bridges operate like an elevator, raising the center span (known as a leaf) on towers at either side of the channel. Although less expensive to build and fast to operate, the height of vessels is limited by the clearance remaining under the raised leaf. The Bascule bridge is fixed at only one end so it opens and closes like a jackknife. This design is typically used in congested areas and is easier to operate and align than the vertical lift. It also has fewer moving parts, so it's more economical to construct and maintain. Its greatest advantage is that the leaf can be partially raised, reducing the amount of time needed to close the bridge, making it ideal for busy rail lines. But in areas where the channel is very wide or vessels of considerable height must pass, railroads once relied on Swing bridges.

Before 1900, the swing bridge was the most commonly used of all railroad moving bridges. In this design, the entire span turned a full 90°, pivoting on a fixed central pier. While this provided unlimited overhead clearance, there were other problems. The support pier had to be built in the navigable channel, which reduced the total side-to-side clearance and required that the bridge be opened all the way every time a vessel passed. This made swing bridges more expensive to operate and maintain, as more power was needed to move the bridge and more strain was placed on the machinery. In addition, the increased operating time meant that trains might be delayed waiting for the bridge to open or close.

To prevent damage to the pier and the open span, the entire structure was protected by a larger barrier called a "fender." This was built with smooth sides so that if a vessel did make contact, it would simply slide off with only a minor scrape.

Over time, the economic and operating advantages of other styles of moving bridges made them more desirable. While many swing bridges were eventually replaced by other types, in some locations it was simply impossible or more economical to rebuild the swing bridge.

In operation, the bridge must be manned 24 hours a day (Where a channel is closed all winter, the bridge will be left in the closed position and unmanned until spring.) and each operator spends his or her shift in a small shanty, located so as to provide a clear view of the tracks and the channel. Today, the operator is in radio contact with passing trains, as well as approaching vessels. Advance notice is required to coordinate safe movements of trains and ships through the area.

Before centralized traffic control, an interlocking tower was an integral part of the bridge operations. The tower controlled all of the signals protecting the bridge, which interlocked with the turning mechanism, so a clear signal could only be given if the bridge was closed and aligned. To prevent costly accidents that might damage the bridge or close the waterway, derails (special track switches which actually derail the train) were also installed. Some roads also added "smash boards" to the block signals protecting the bridge. Similar to semaphore blades, they actually came down over the tracks, where they would be hit (smashed) if the engineer failed to stop.

In addition to the signals controlling trains, the bridge also had to be equipped with colored lights visible to approaching vessels after dark. The colors identify the type of bridge, and draw spans were fitted with lamps showing both red and green in alternating 60° arcs.

Many swing bridges were constructed over rivers, harbor mouths and similar wide channels, where several standard bridges were needed as approaches. The swing bridge would be installed over the deepest part of the channel, where the largest vessels would pass.

Due to their heavy steel construction and regular maintenance, some of these bridges have provided decades of service and remain in daily operation. In some areas where shipping or rail traffic was diverted or eliminated, moving bridges are no longer needed. But since they are expensive to replace and are often in useable condition, the existing bridge is simply left in place.

ON YOUR LAYOUT

Adding detail and animation to your layout, your finished bridge is sure to be an important part of any busy rail line. Your model has sufficient clearance for use with virtually any locos or cars, including modern double-stack equipment.

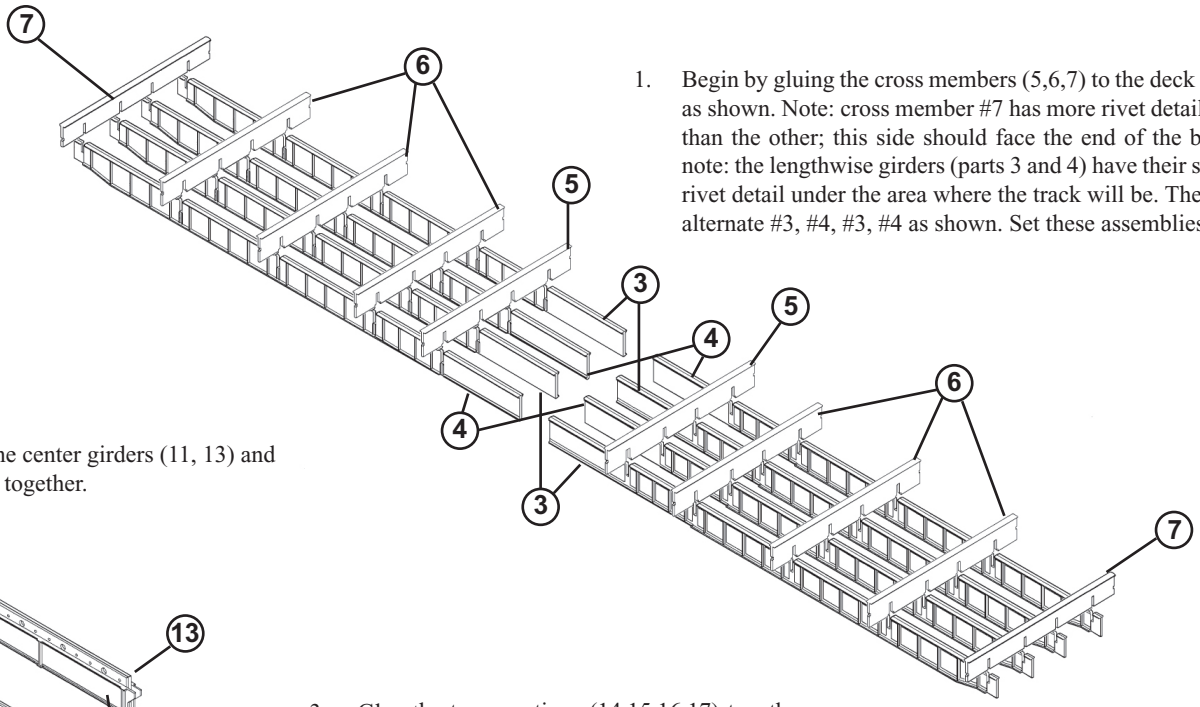
This model has been designed to be turned 90° by hand in a single direction, like the prototypes. A final drive gear and micro switches are provided to convert the model into a powered bridge with the Universal Gearbox & Motor Drive Kit (933-1050), sold separately. This unit is fully assembled and designed for drop-in mounting with this kit. While model trains stop much faster than real ones, you may still wish to install an off switch in your track circuit to stop approaching engines when the bridge is open.

Your new model matches the track spacing of Walthers Double-Track Truss Bridge (933-3012), so several could be used to model the approach bridges. (Typically, only one moving bridge is used in prototype situations). The Abutments (933-558) and Wing Walls (933-560) can also be used to detail the approach bridges and make the scene more realistic.

To prevent derailments on the span, bridges are fitted with special track sections, equipped with an inside guard rail. This detail can easily be added to your model with Walthers Code 83 Bridge Track (#948-886 with "V" end guard rails used at each end of the bridge; for a longer span with approach bridges, #948-886 with no end guard rails can be used), which features code 70 inside rails.

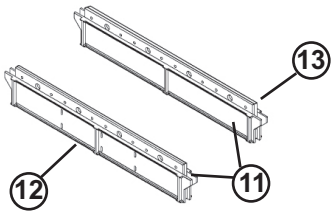
Structures of this type are always carefully inspected and maintained each year, so weathering should be kept to a minimum.

ASSEMBLY INSTRUCTIONS

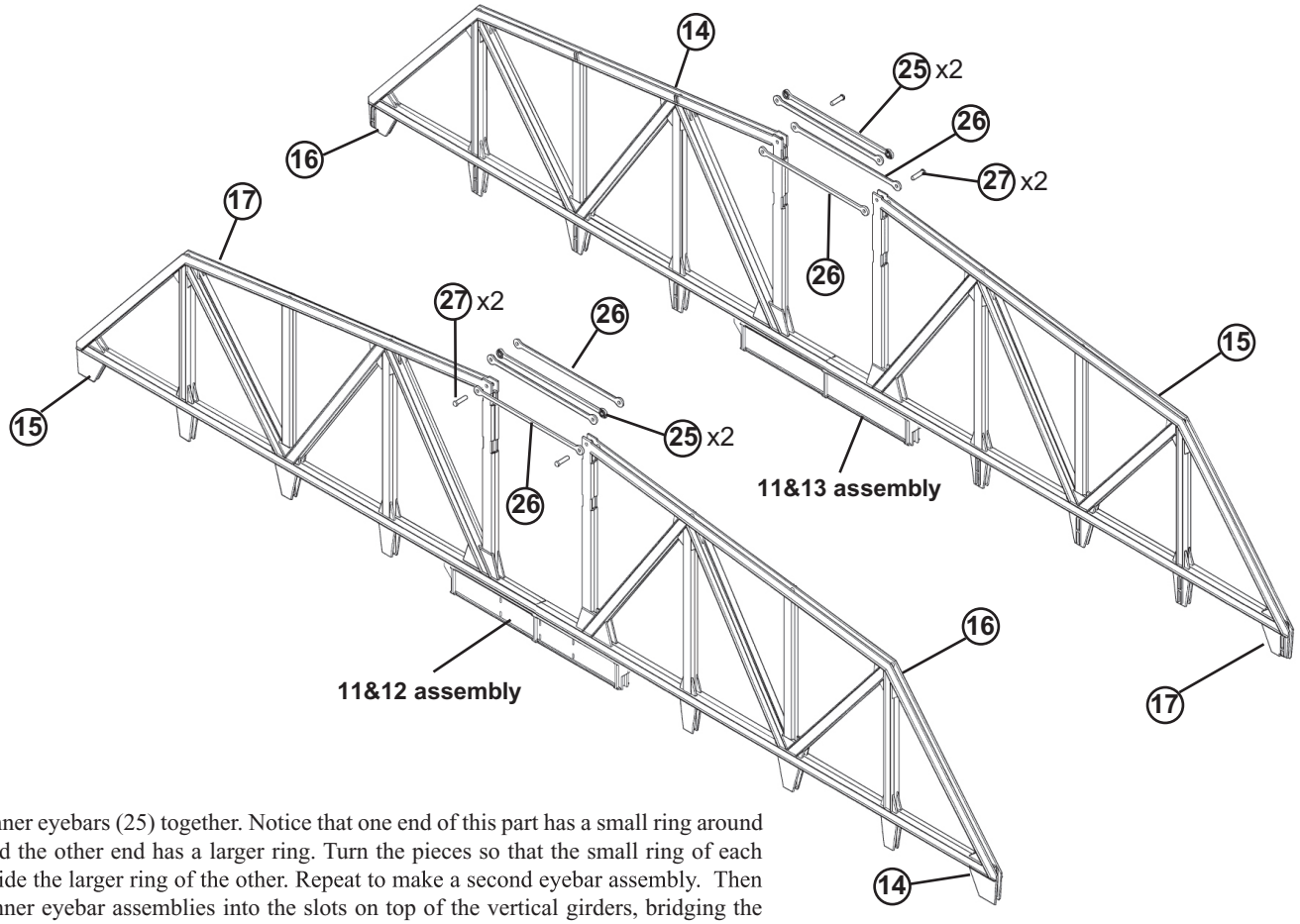


1. Begin by gluing the cross members (5,6,7) to the deck girders (3,4) as shown. Note: cross member #7 has more rivet detail on one side than the other; this side should face the end of the bridge. Also note: the lengthwise girders (parts 3 and 4) have their sides without rivet detail under the area where the track will be. The girders will alternate #3, #4, #3, #4 as shown. Set these assemblies aside.

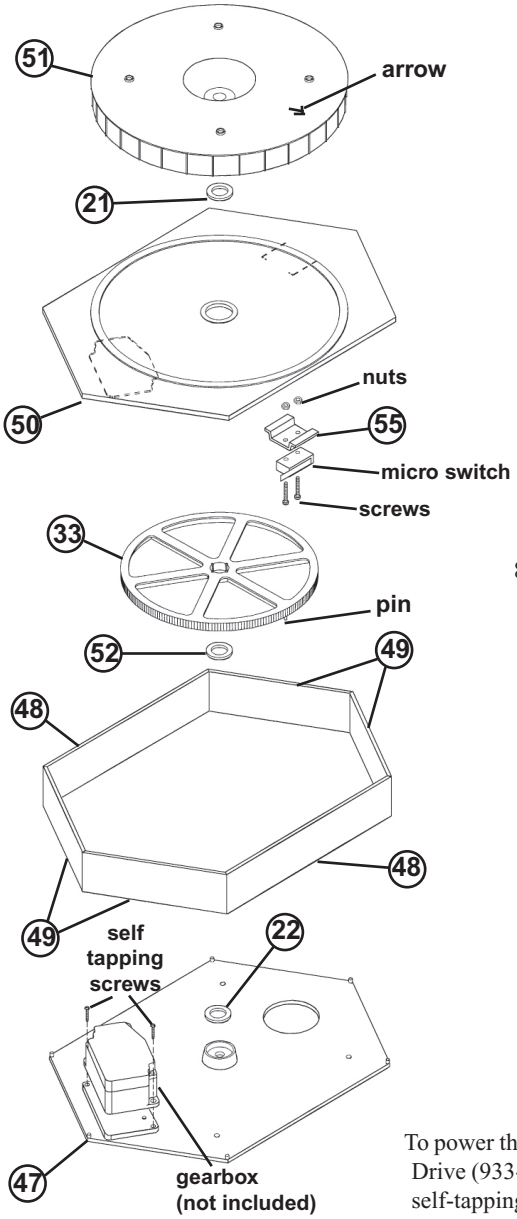
2. Glue the center girders (11, 13) and (12,13) together.



3. Glue the truss sections (14,15,16,17) together as shown, with the center girder assemblies being sandwiched in between the middle ends of these pieces. The pegs of part #'s 14,15,16,17 will snap into the holes in the center girder assemblies (part #'s 11,12,13).

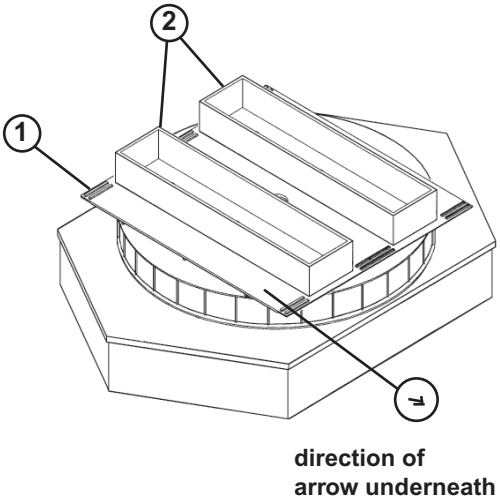


4. Glue two inner eyebars (25) together. Notice that one end of this part has a small ring around the hole and the other end has a larger ring. Turn the pieces so that the small ring of each part fits inside the larger ring of the other. Repeat to make a second eyebar assembly. Then place the inner eyebar assemblies into the slots on top of the vertical girders, bridging the gap between both, and aligning the holes in the eyebar assemblies with the holes in the truss assemblies. Next, position one outer eyebar (26) outside the trusses. It may be helpful to push a toothpick or similar object into the holes to help them line up. Then, push a pin (27) through each end of the outer eyebars (26). Continue pushing the pins through the holes in the vertical girders and through the inner eyebars. When the pins are fully seated, push another outer eyebar (26) onto their free ends. Repeat for the other truss assembly. Apply glue to the inner ends of the pins.



5. If you intend to motorize the bridge, attach one of the micro switches to the mounting bracket (55) using two screws and two nuts. Then glue the bracket in place on the pier top (50). Refer to the illustration for the proper position of the switch.
6. Glue the pier sides (48) and ends (49) together and to the top (50). Note: Do not glue to the base, as you will need to be able to lift the bridge up and off the base for maintenance (see gearbox instructions). There are holes in the base (47) so you can screw it down securely to your layout (screws for this are not included). Place bearing #22 (from the Delrin® parts group) into the cup in the center of part #47.
7. Push the shouldered bearing (21 on the black Delrin® parts group) all the way up the shaft on the pivot ring (51). Insert the shaft of the pivot ring through the pier top (50). Next orient the big gear (33 on the Delrin® parts group) onto the shaft with the protruding pin towards the small arrow on part 51, and pointing downwards. (This pin will trip the micro switch.) Press the gear onto the shaft until it is fully seated against the step on the shaft. Then glue the retainer (52) onto the shaft.

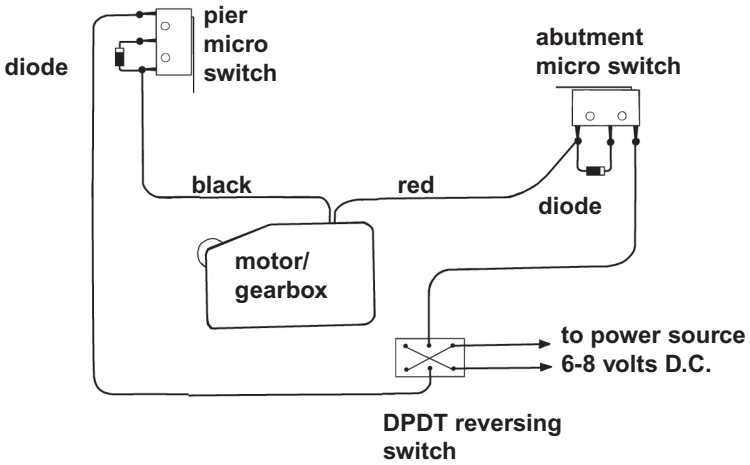
8. Glue the center plate (1) on top of the pivot ring (51). Note: the under side of part #1, the side with the rivet detail, has a small arrow pointing to one end. The top of the pivot ring (51) also has a small arrow. Parts 1 and 51 should be assembled with the arrows pointing in the same direction. Next, glue the girder boxes (2) on top of the center plate (1), putting the holes of the boxes onto the raised rings on the pivot.



IMPORTANT!

To power this bridge you will need to purchase separately Walthers' Gearbox and Drive (933-1050). The gearbox is to be attached onto the pier base (47) with the self-tapping screws provided in the bridge kit, but it should be left off until the following step is completed.

WIRING INSTRUCTIONS (also see step #17)

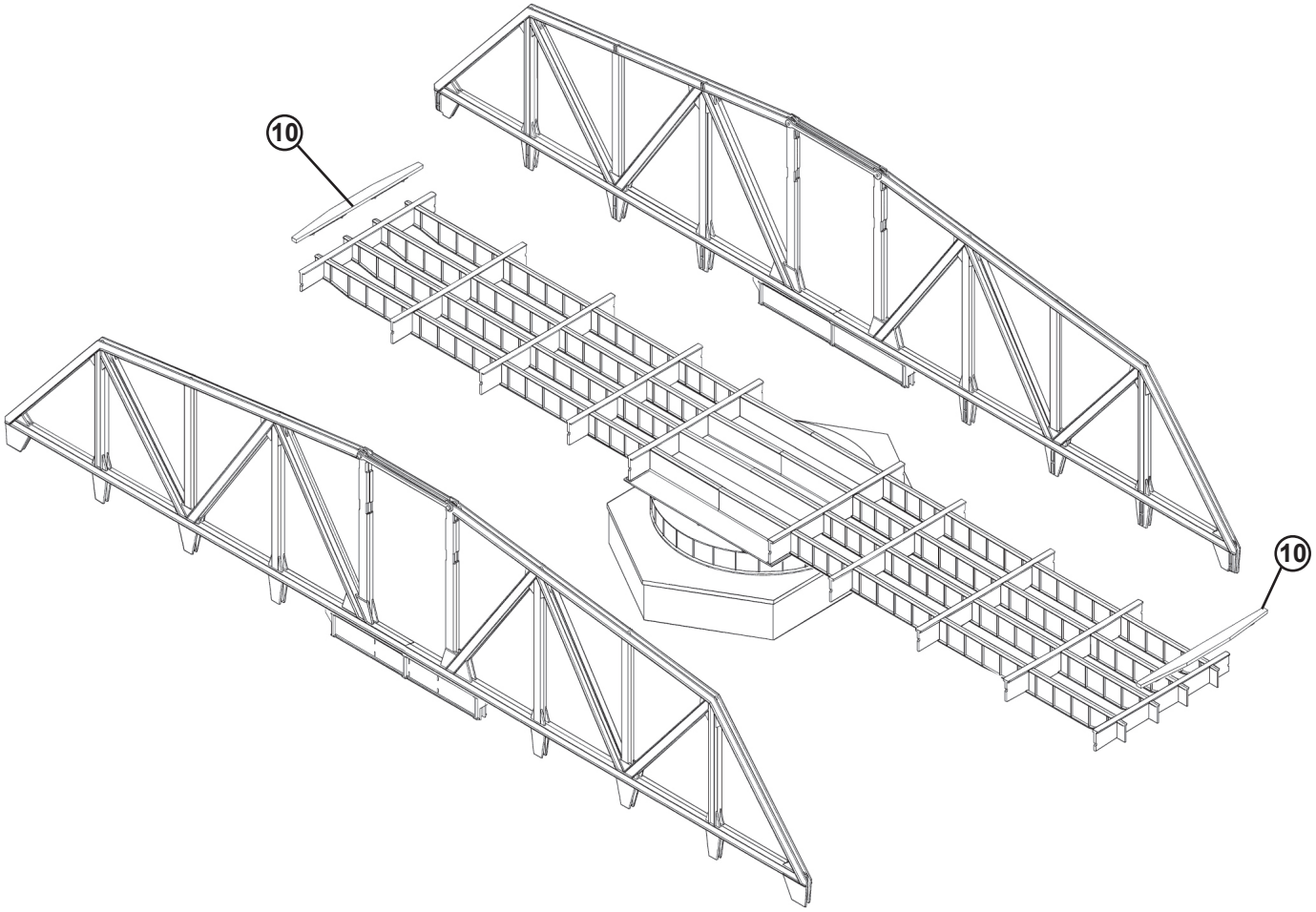


Install the Gearbox and Drive (933-1050) to the pier base (47). Wire the gearbox to the switches as shown in the diagram, using the wire provided. Note the position of the light-colored band on the end of each diode, which indicates its proper orientation. Allow enough slack in the wiring so that the bridge can be lifted away for access to the interior of the pier. The wiring from the gearbox to the pier switch can be held against the inside of the pier with tape to keep it from fouling the big gear. The drive unit should be powered through a double pole, double throw reversing switch to a DC power source that can be adjusted to put out about 6 volts. The easiest way to do this would be to obtain an inexpensive power pack and use the controlled DC output. The rotation speed can then be adjusted to suit. When the wiring is completed, place the bridge onto the base in a partly open position and turn on the power. Throw the reversing switch so that the bridge rotates to the open position. When it reaches the open position, it should automatically stop. Throwing the reverse switch should cause the bridge to rotate to the closed position and again automatically stop.

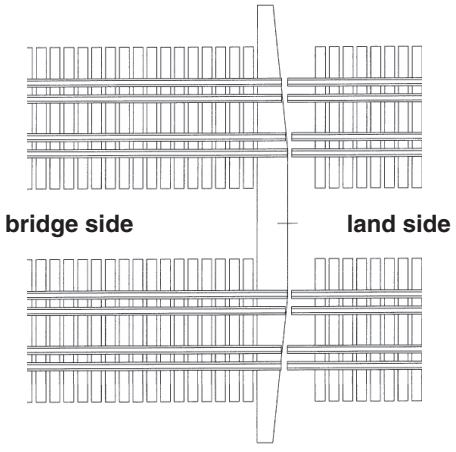
DECALING

1. After cutting out the decal, dip in water for 10 seconds, remove and let stand for 1 minute. Slide decal onto surface, position and then blot off any excess water.
2. Lightly brush on Micro Sol® on top. This will soften the decal allowing it to conform to irregular surfaces. DO NOT TOUCH DECAL while wet!
3. When the decal is thoroughly dry, check for any trapped air bubbles. Prick them with the point of a small pin or hobby knife blade and apply more Micro Sol®.

9. Now glue the assembled cross member/girder sections, from step 1, to the girder boxes and center pivot. Next glue the completed side truss assemblies to the cross members and center plate. Then glue the deck end pieces (10) in place.



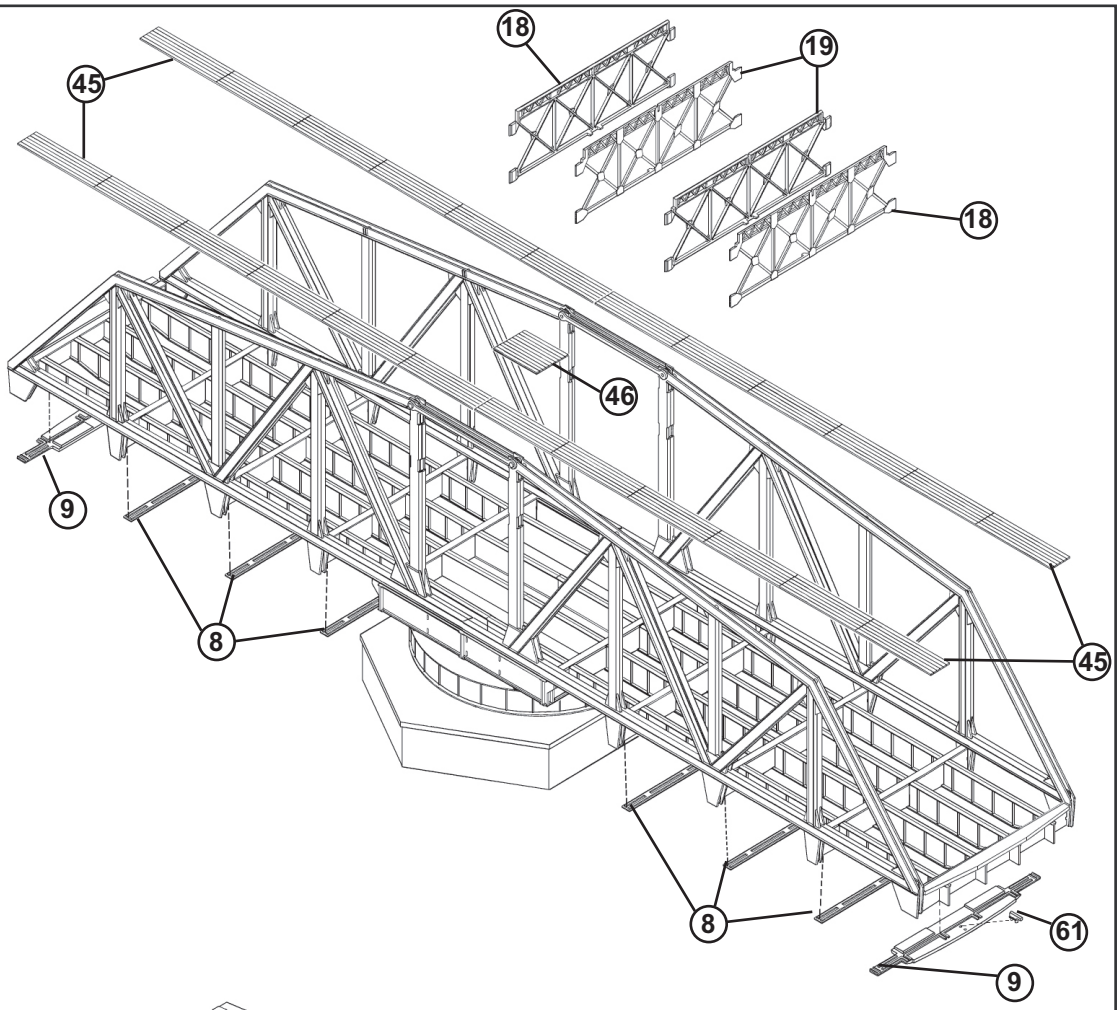
TRACK INSTALLATION

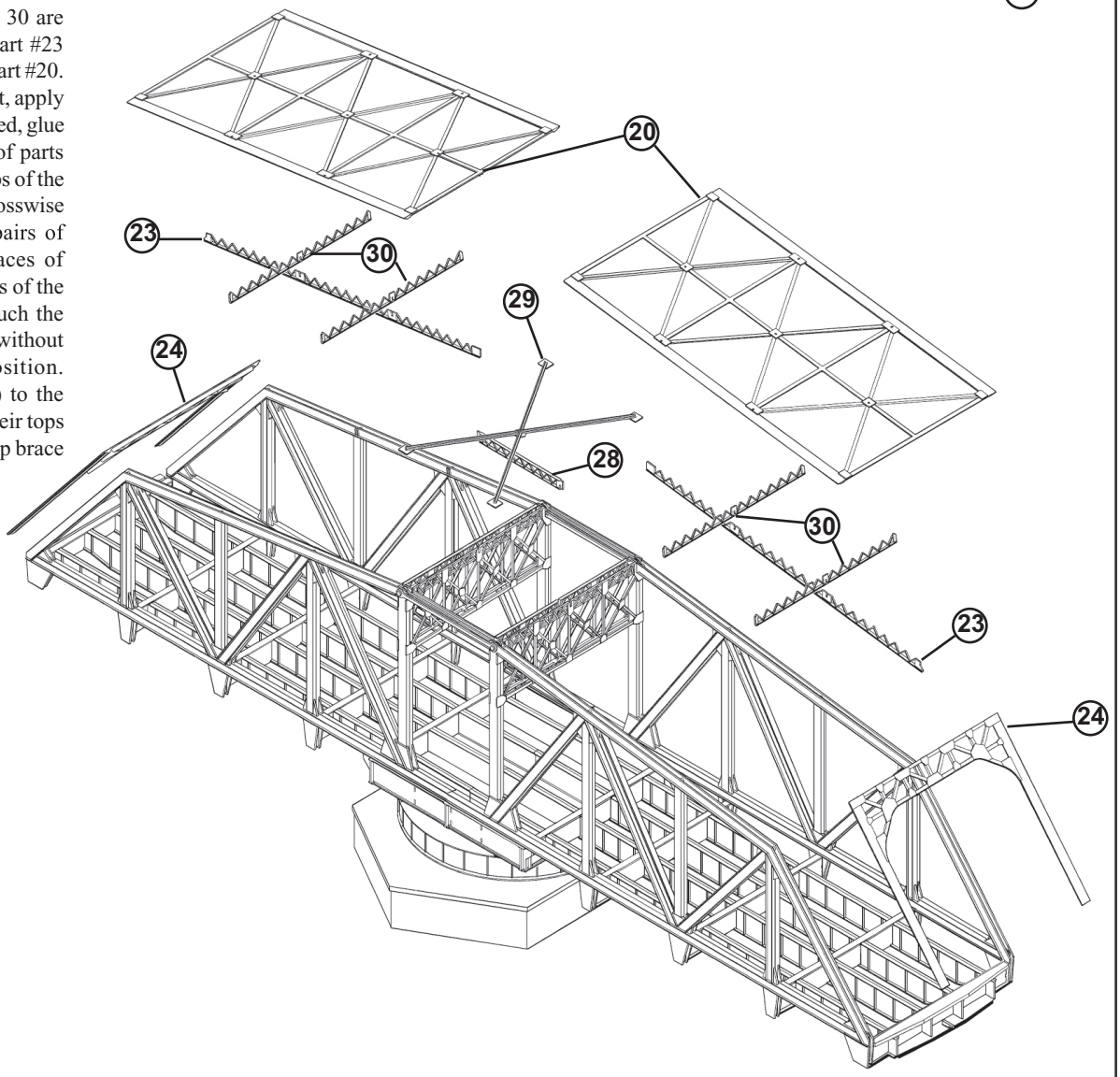


Now is the time to mount the track. We recommend using Walthers' Bridge Track (948-886). Three pieces will be required (they are ½ meter, or about 19", long). For each of the two tracks, use one whole piece and cut part of the remaining piece to make up the full length, which should be 27-3/16 inches. Use code 83 rail joiners (948-841) to join the sections. Test-fit the track sections onto the bridge, centering the ties in relation to the lengthwise girders. Remove ties if needed so as not to interfere with parts #10. The rails should be trimmed so that they do not extend beyond part #10. Before installing the track permanently, solder power feeder wires to the running rails, using the red and black wire supplied. The wires should be routed down the center of pivot piece #51. Be sure to allow enough length for the track feeders so that the bridge can be lifted away from the base for adjustment and maintenance. Slow-setting cyanoacrylate type cement or contact cement can be used to attach the track to the bridge girders. Laying the approach tracks should be left until after the bridge is installed. But note that the ends of the approach rails need to be trimmed as shown to avoid interfering with the bridge rails while leaving as small a gap as possible.

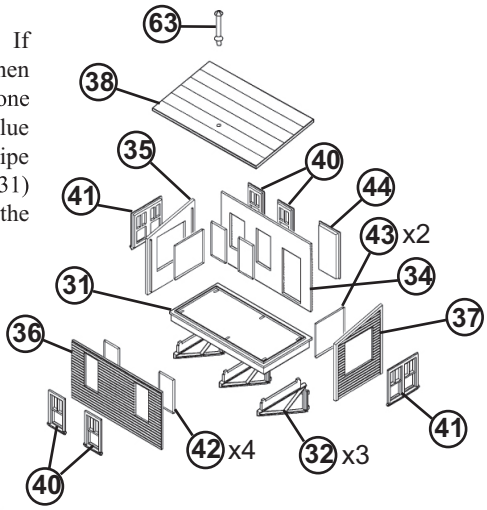
10. Glue the bottom caps (8) and also the end plates (9) to the cross members as shown. On one end plate, glue a switch actuator pin (61).
11. The long walkways (45) glue to the deck end pieces (10) and to the ends of the track ties. The short walkway (46) goes between the tracks in the center of the bridge.
12. Glue the outer center portals (18) and inner center portals (19) in place. Then glue the center lengthwise brace (28) into the notches in parts #19. Next, glue the center cross-brace (29) to the 4 vertical truss members. Brace #28 goes between the pegs on the underside of brace #29.

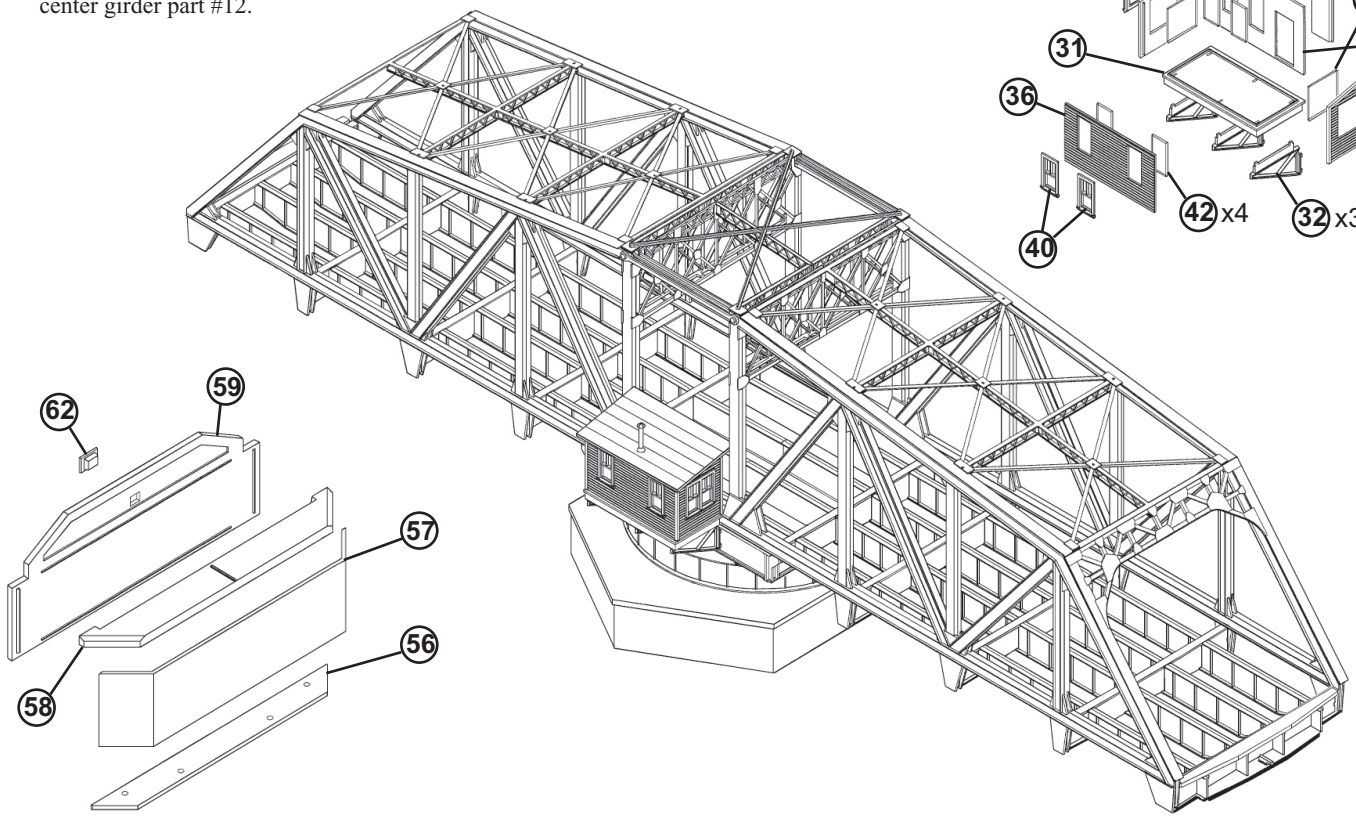
13. Glue the crosswise zigzag braces (30) onto the top crossbraces (20). The pegs on the ends of parts #30 go into the square holes in #20. Test-fit the lengthwise zigzag braces (23) to the assemblies you just made, noting how the slots in part #23 fit into the slots in parts #30. Note that one panel of part #20 is slightly shorter that the other two, so be sure that when the slots in parts #23 and 30 are interlocked, the ends of part #23 are even with the ends of part #20. When the assembly is right, apply glue. After the glue has dried, glue the top brace assemblies of parts #20, 23 and 30 onto the tops of the trusses. The ends of the crosswise braces (30) fit between pairs of ridges on the inner surfaces of the trusses. The upper ends of the assemblies should just touch the outer center portals (18) without pushing them out of position. Glue the end portals (24) to the ends of the trusses, with their tops touching the ends of the top brace assemblies.



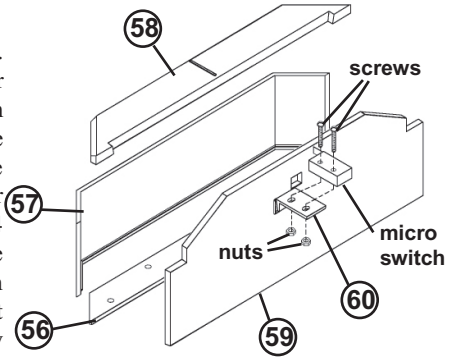


14. Glue the windows (40 and 41) and the door (44) into the operator's cabin walls (34, 35, 36 and 37). If you want to paint the walls, do it now. Then glue the glass pieces (42 and 43) behind the windows. Then glue the walls to the cabin floor (31) and to each other. Note: the cabin floor has a wider "lip" along one of its long sides than there is on the other 3 sides. The wall with the door should be on this side. Glue the roof (38) to the walls, with the stovepipe hole away from the door side. Then glue the stovepipe (63) into the roof hole so that it stands vertically. Glue the 3 cabin supports (32) to the cabin floor (31) with their wide ends facing the door side of the cabin. This assembly is then glued into the slots in the center girder part #12.





15. Assemble the abutments by gluing the base (56) to the front (57). Then glue the front and base to the back (59). Next, glue the top (58) to the front and back. Since only one of the abutments needs a hole for the motor actuator switch, there is a piece (62) to fill the hole in the other abutment. Two parts #62 are provided, so that if you do not intend to motorize the bridge, both abutment holes can be filled. On the abutment that will have the switch, glue the mounting bracket (60) to the back inside the U-shaped locating ridge.



16. Determine the bridge location on your layout. An absolutely level surface about 30" long is required. Draw a line on the layout surface representing the long center line of the bridge. Where the bridge center of rotation will be, draw a line at right angles to this. From this line, measure a distance of 13-25/32" in each direction, and draw lines at right angles to the long center line at these points. These lines are the locations of the backs of the abutments. Determine the pier base location by centering the center hole on the intersection of the long center line and crosswise center line. Then line up the "points" of the pier base with the crosswise line. Using screws to attach the pier base to the layout surface, through the 4 holes provided, will provide a secure mounting while allowing some adjustment. Drill pilot holes for the mounting screws. Also, drill a hole for the track feeder wires in the center location. Drill a hole within the large opening in the base for the bridge motor wiring, if you will be using the motor. It is important that the pier and the abutments be level and in a straight line. Determine the location of one abutment by centering it on the long center line with its back against the crossline. Small amounts of contact cement can be used to lightly tack the abutments into place until the locations are satisfactory. Place the bridge and pier onto the pier base. Rotate the bridge until the "stop" on end plate (9) hits the bumper molded onto the abutment top (58). Check the clearance between the deck end piece #10 and the abutment; it should be about 1/16". Place the other abutment so that the stop at that end also rests against the bumper. When the locations are satisfactory, you can install the abutments permanently by applying thickened cyanoacrylate cement around the abutments. When the bridge is finally installed, the end with the actuating pin (61) will face the abutment with the switch mounting bracket.

17. Install the Gearbox and Drive (933-1050) to the pier base (47). Wire the gearbox to the switches as shown in the diagram, using the wire provided. Note the position of the light-colored band on the end of each diode, which indicates its proper orientation. Allow enough slack in the wiring so that the bridge can be lifted away for access to the interior of the pier. The wiring from the gearbox to the pier switch can be held against the inside of the pier with tape to keep it from fouling the big gear. The drive unit should be powered through a double pole, double throw reversing switch to a DC power source that can be adjusted to put out about 6 volts. The easiest way to do this would be to obtain an inexpensive power pack and use the controlled DC output. The rotation speed can then be adjusted to suit. When the wiring is completed, place the bridge onto the base in a partly open position and turn on the power. Throw the reversing switch so that the bridge rotates to the open position. When it reaches the open position, it should automatically stop. Throwing the reverse switch should cause the bridge to rotate to the closed position and again automatically stop.