HO Scale Structure Kit 933-2972

COKE OVEN

Thanks for purchasing this Cornerstone Series® kit. All parts are made of styrene, so use only compatible paints and glues. Please read the instructions and study the drawings before starting.

Iron was one of the last metals used by ancient humans due to its high melting temperature. Crude furnaces were finally developed that burned charcoal and used a natural air blast to generate sufficient heat for melting. For centuries, charcoal remained the primary fuel for smelting iron. As supplies of suitable wood dwindled, charcoal slowly gave way to coke, made by baking impurities out of coal. Coke was successfully used to smelt iron in England in the early 1700s. Early attempts at coking were simple: a pile of coal was ignited, then covered with sod or wet straw. This cut off the oxygen, but kept the coal hot enough to bake out some impurities. When the gas was driven off, the result was crude but usable coke.

To produce coke in larger quantities, "beehive" coke ovens (named for their shape) were built. Never very efficient, they were eventually replaced by coal chemical ovens. This enclosed design recovered chemicals and gases, and produced stronger coke from a variety of coals. With their rectangular shape, several could be built side by side, creating a "battery." In 1893, a Belgian firm constructed the first in the United States at Syracuse, New York.

Today, coke is made in ovens of this type for use by steel mills and heavy industries. Coal is the essential ingredient, and the first choice is bituminous from Appalachia, rich in metallurgical and volatile elements. Both high and low volatile coals are used, but are first pulverized and blended. Ovens serving a steel works make coke suitable for the blast furnace. It's strong enough to resist minimal breaking during handling and under the crushing weight of the furnace burden.

The ovens are the heart of the operation. Refractory lined and equipped with removable doors at each end, a typical oven is 30' long, 14' high and 18 inches wide. A battery can range from several dozen to several hundred ovens. These large facilities are fired with natural and blast furnace gas, plus up to 40% of the gas recovered from the coking process. An average firing time of 12 to 18 hours is needed to remove the chemicals and produce coke.

Operations begin at the dumper, where hoppers are unloaded into an underground pit. A conveyor moves coal to the top of the crusher house, where it is reduced into 1-3" diameter lumps. Another conveyor moves the crushed coal to a coal dock for storage.

Here, coal is weighed then loaded into a larry (or lorry) car, which travels across the top of the battery. It positions itself over the appropriate hatches and charges the oven. At the back of the battery is the "Coke Pusher," a specialized machine riding broad gauge tracks that carries equipment for leveling and pushing the charge.

Next, the coal is heated to between 1600° and 2000° in an oxygen-free environment. It does not burn, but is slowly transformed into coke as the volatile materials are baked out. At the same time, gas and liquid vapors are released, which are collected and piped to a byproducts plant for refining.

When the baking is complete, the coke pusher and other machines go into action. On the coke side of the battery are two tracks. One rides a bench and carries the door machine (used to remove the end door) which also tows the coke guide. The pusher removes the other door. With its ram, it shoves the incandescent coke out of the oven, through the guide and into the waiting quench car, spotted below on the second track. The quench car is a heavy-duty gondola-like car, custom-built for this demanding service with a sloping deck for fast unloading. Screens, sheets or grilles are added to the top and rear of the car to prevent spillage of hot coke. Floor-mounted discharge gates run the length of the car. While loading, it's pulled slowly to place a thin layer of coke across the floor. Because of the tremendous heat, quench cars are handled by a custom built loco called a "coker," which may be battery, electric or diesel powered.

Once loaded, the quench car and the coker head to the quench tower. Essentially a large, concrete shower stall, this facility douses the hot coke with a measured amount of water. With tremendous clouds of steam and a furious hiss, the water stops combustion, but keeps the coke hot enough to dry almost instantly. Steam rises into wooden suppressors inside the tower, where droplets form to trap particulates.

Quenched coke has a silver-gray color and a porous, almost sponge-like appearance. The loaded quench car is moved to the coke wharf and dumped for further cooling, while any hot spots are hosed down. A conveyor runs the length of the wharf at its lower edge and elevates the coke into a tipple for crushing and screening.

The blast furnace charge must be even in size and coke chunks about 4-1/2" are most desirable. Additional screening eliminates pieces smaller than 3/4", and separates dust or "coke breeze," which becomes catalyst for the sintering plant.

Coke is lighter than coal so more can be carried. Special high-capacity hoppers are used for in-plant and interchange service to move coke to the blast furnaces.

ON YOUR LAYOUT

The Coke Oven and Quench Tower is an integral part of any steel works, so it's right at home alongside the Blast Furnace (933-2973), Electric Furnace (933-3056) and Rolling Mill (933-2971). Some coke plants receive coal by boat and it's unloaded by a Hullett Unloader (933-2966) or Bridge Crane (933-2906) and stored in dockside bins. At some plants gases are processed at a Gas Plant (933-2905) and stored in a Gas Storage Tank (933-2907). It can also be a stand-alone industry, or part of the operations at a coal mine.

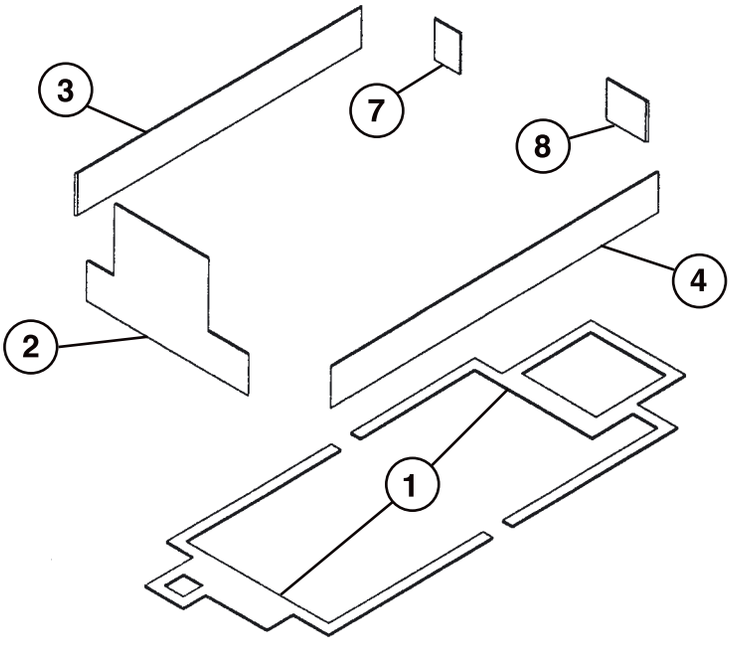
In modern scenes, coal can be delivered in Bethgon®/Coal Porter® (932-5300 series), Bethlehem 4000 Cu. Ft. 3-Bay Coal Hoppers (932-7850 series) or Trinity RD-4 Coal Hoppers (933-7800 series). Realistic, one-piece coal loads are available for both types of cars.

MORE

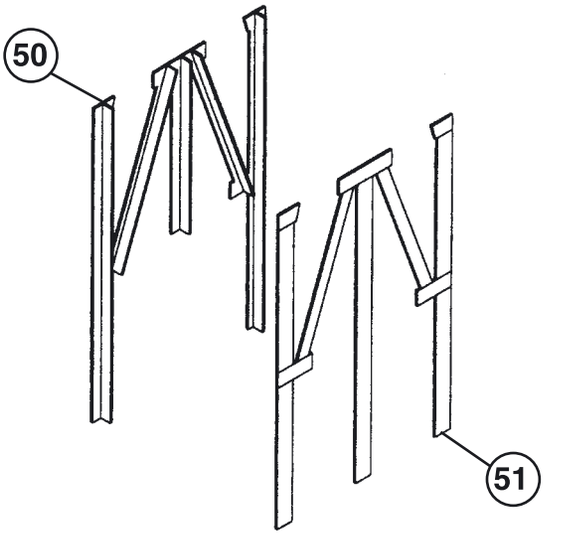
This model, based on Dean Freytag's Davies Steel Coke Plant (featured in the April, June, August and October, 1991 issues of Model Railroader), includes essential parts of a typical coke plant including a larry car and quench car. The buildings can be arranged to fit your available space. To be prototypical, the coal dock and ovens need to be side by side for charging. Our model shown on the box cover offers one possibility for a smaller location. At prototype facilities, conveyors are often constructed at odd angles to fit available space. The quench tower is a free-standing building, which can be placed anywhere near the ovens.

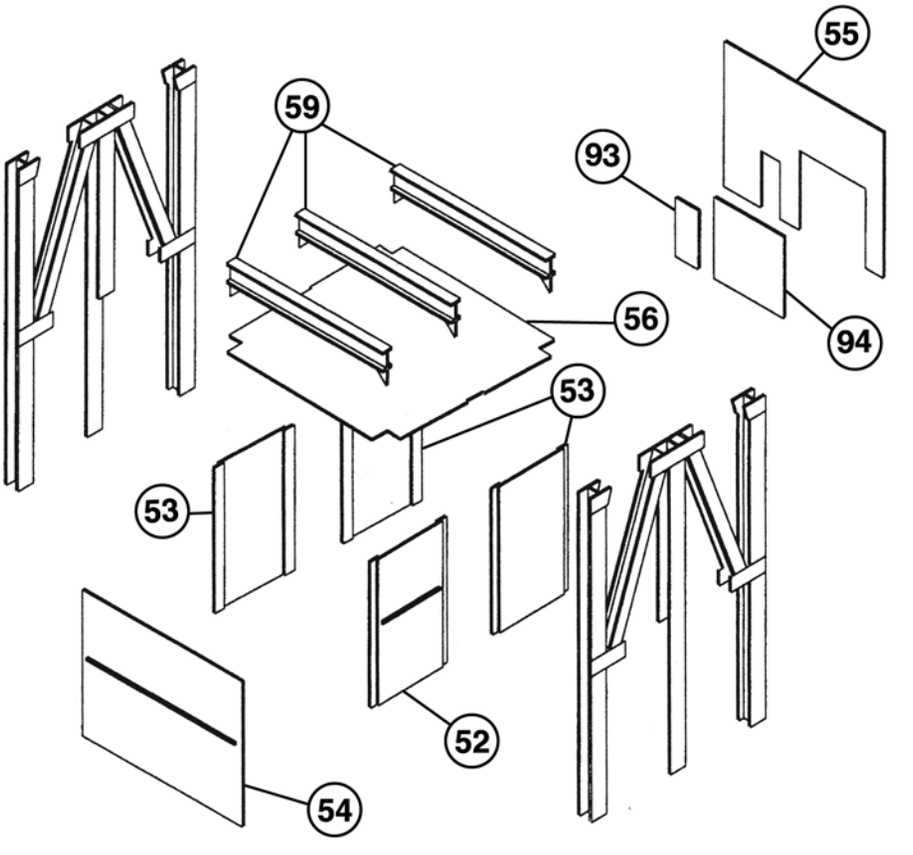
Oven

1. Glue the main base (1) together. Then glue the walls (2, 3, 4, 7, 8) to each other and the base.



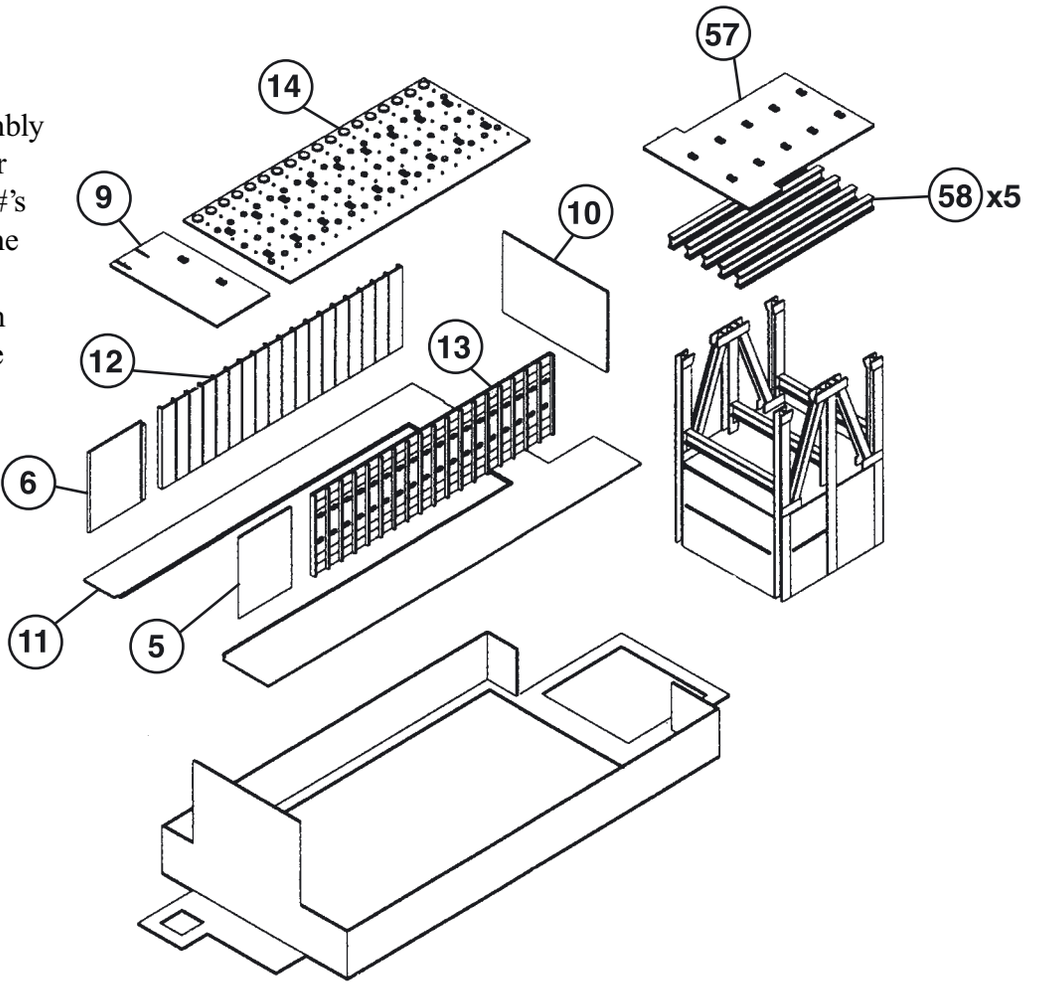
2. Glue two sets of the bunker supports (50, 51) together, making sure the tops are flush.



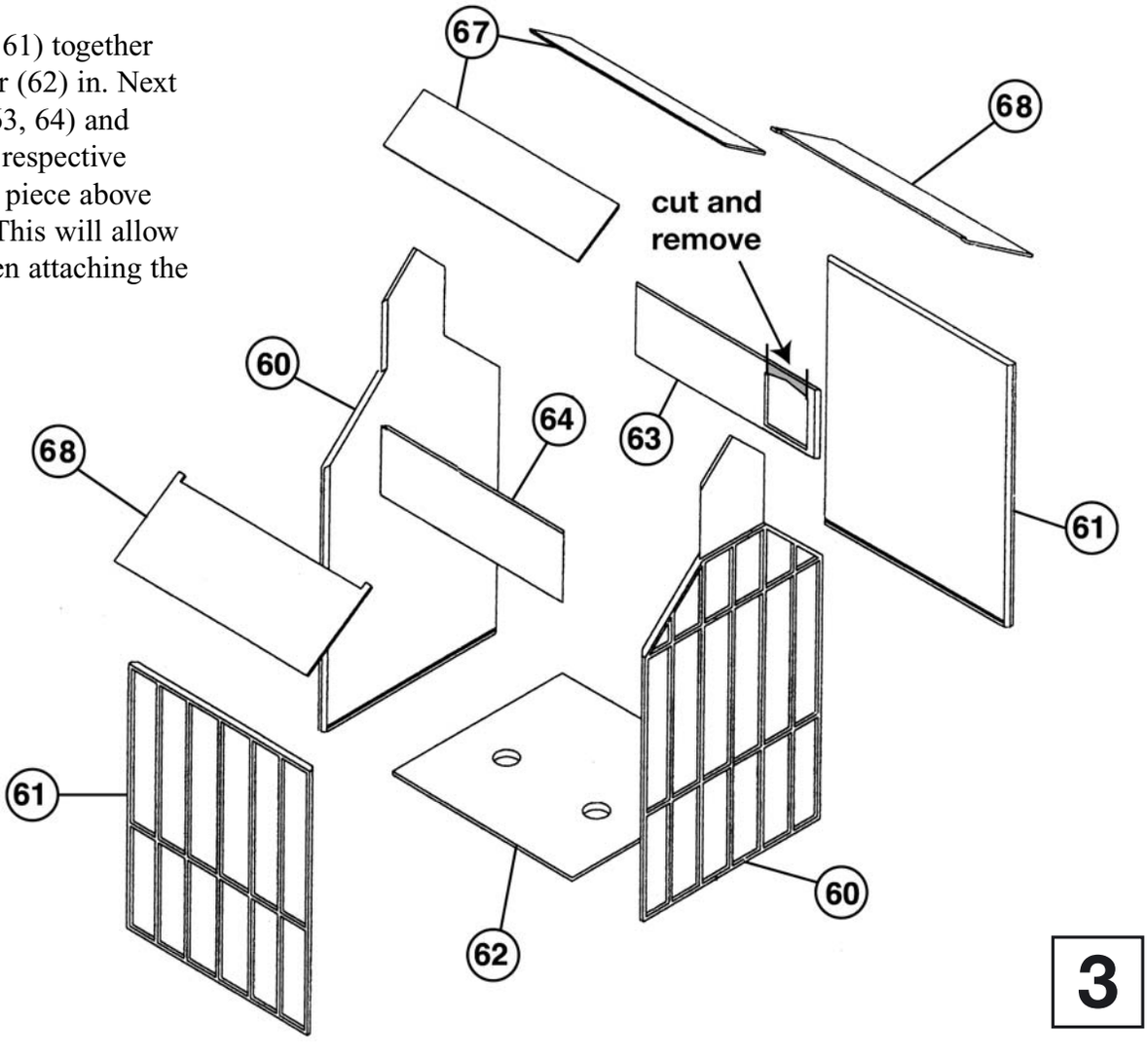


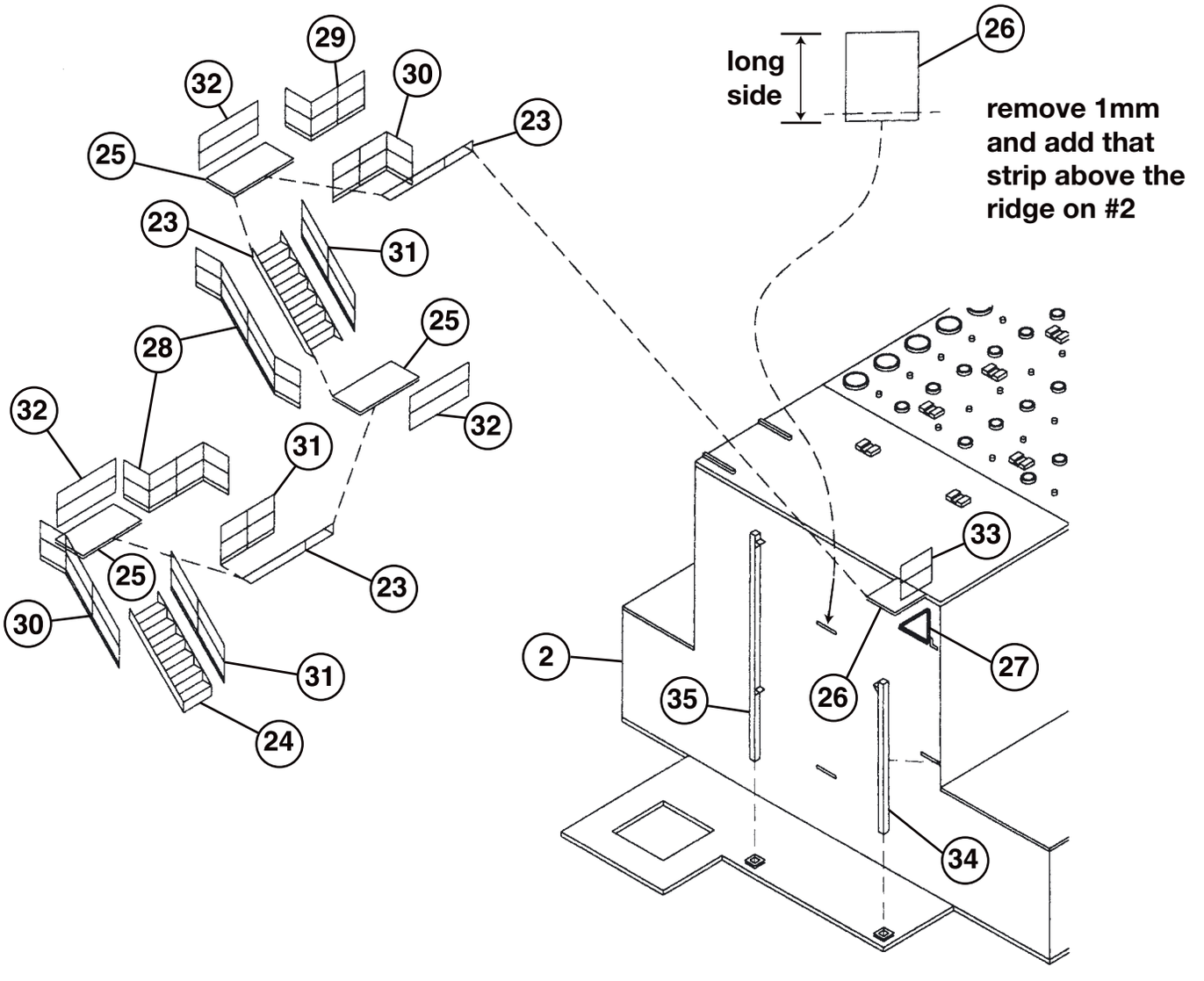
3. Glue the floor (56) and crossbeams (59) to the bunker supports. Note: The crossbeams fit into the holes on the insides of the supports. Next, glue the doors (93, 94) in place on the outside end wall (55) and then glue this wall between the supports. Glue the remaining wall segments (52, 53, 54) in position as shown. Note: Make sure #52 is located as illustrated. Also note that the outside ridges on part #'s 52 and 54 will be above center when positioned correctly.

4. Glue the bunker support assembly onto the base. Then glue the floor (11) on using the ledges on part #'s 52 and 54 to rest on. Now glue the upper superstructure walls (5, 6, 10, 12, 13) in place. Next glue on the floor (9, 14) pieces. Glue five I-beams (58) to the bottom of floor #57, using the ridges for positioning. Next glue this assembly on top of the crossbeams with the end butting up flush against floor #14. Note: Disregard the locating ridges on part #10, they are too low.



5. Glue the walls (60, 61) together and then glue the floor (62) in. Next glue the short walls (63, 64) and roofs (67, 68) in their respective places. Note: Remove piece above opening on part #63. This will allow easier positioning when attaching the conveyor later.



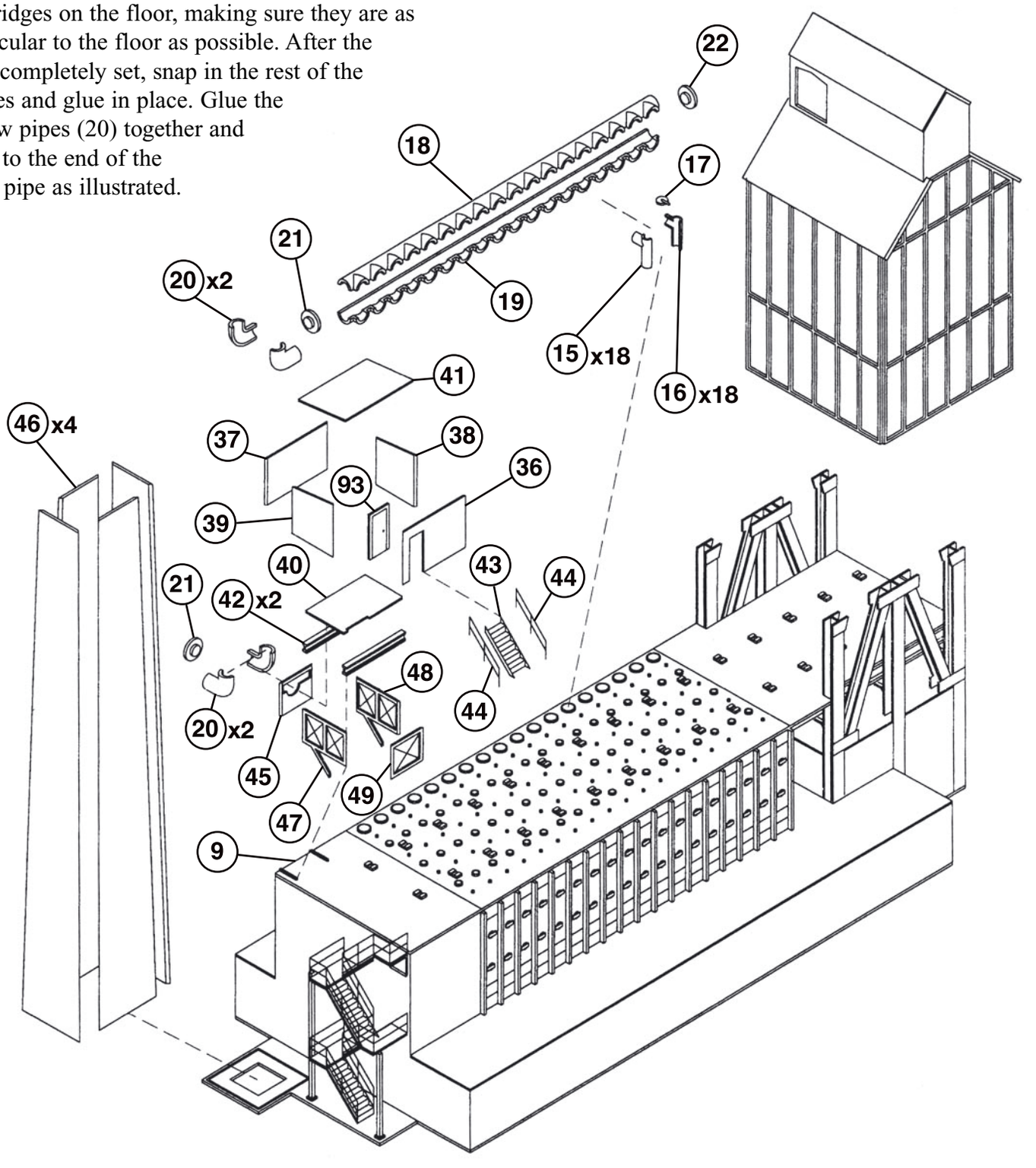


6. Glue the brace (27) to the side of wall #2, using the locating ridges to position correctly. Next cut off 1mm from the end of the long side of part #26. Glue this narrow piece ***above*** the top ridge on #2 as shown. Now glue railing (33) to part #26 (flush with bottom) and then glue to the brace (27). Assemble the stairway by first gluing the railings (28, 29, 30, 32) to the pads (25) as illustrated. Next glue the railings (30, 31, 32) to the stairs (23), flush along the bottom of the stairs. Glue railing #31 to stair #24, with the bottom of the railing flush with the top of the stair. Glue the vertical supports (34, 35) to the base. Glue the partially assembled railings/pads to the side of #2 using the ridges and vertical supports to position correctly. Then glue the stairway/railings combinations in their respective positions.

7. Glue the collector pipe halves (18, 19) together along with the ends (21, 22) as shown. Next glue all of the standpipes (15, 16, 17) together. Glue three of the standpipes to the collector pipe, one at each end and one in the middle. Next glue these three into the large circular ridges on the floor, making sure they are as perpendicular to the floor as possible. After the glue has completely set, snap in the rest of the standpipes and glue in place. Glue the two elbow pipes (20) together and glue one to the end of the collector pipe as illustrated.

8. Cut two pieces of code 70 rail (not included) 13-3/4" and glue them to the pads on floors #'s 14 and 57.

9. Glue the bunker onto the bunker supports.



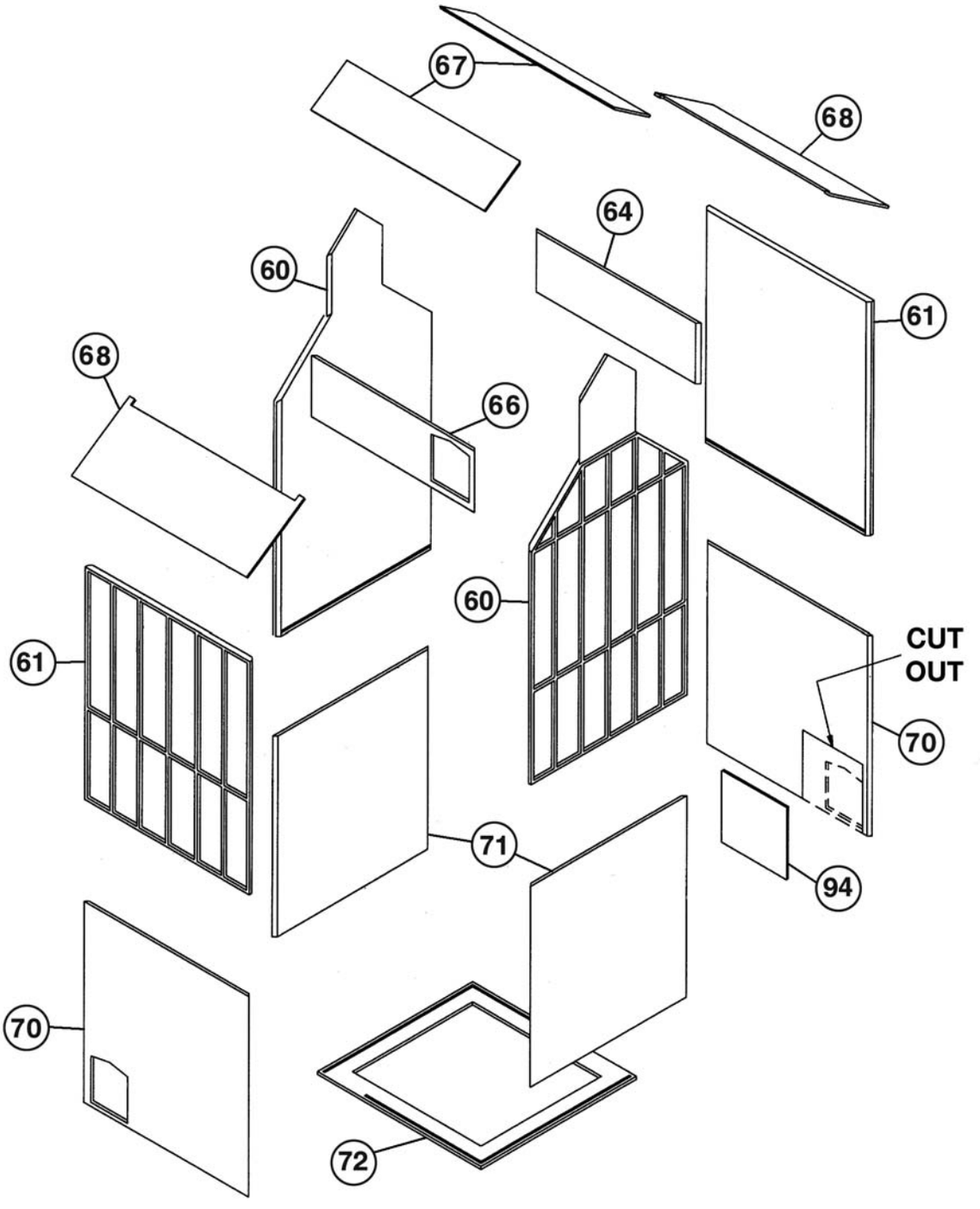
10. Glue the governor house supports (45, 47, 48, 40) together and press fit the other elbow pipe (20), from the inside, through part #45. Trim hole if necessary. Then glue the connector (21) on the pipe. Now glue this assembly in place, using the ridges on part #9 to position. Next glue the governor house (36, 37, 38, 39, 40, 41, 93) together, trimming the base (40) to fit around the door. Glue the I-beams (42) across the bottom of the floor, outside of the ridges. Then glue the house assembly onto the supports, lining up the elbow pipes into the holes in base #40. Glue the handrails (44) to the stair (24) and glue in front of the door of the governor house.

11. Glue the smokestack (46) together, with the inside ridged pieces opposite each other and then glue to the base (1).

Crusher

1. Before assembling, cut out the panel from one of the bottom walls (70), following the engraved lines on the back of the piece. Glue the door (94) into that opening.

2. Now glue the crusher walls (70, 71) together and to the base (72). Glue the coal bunker walls (60, 67) together. Next glue the short walls (64, 66) in place on the top of walls # 60. Glue the roof sections (67, 68) in position as illustrated. Glue the completed coal bunker on top of the crusher. Note: You may wish to enlarge the openings in walls #66 and 70 when you install the conveyors.

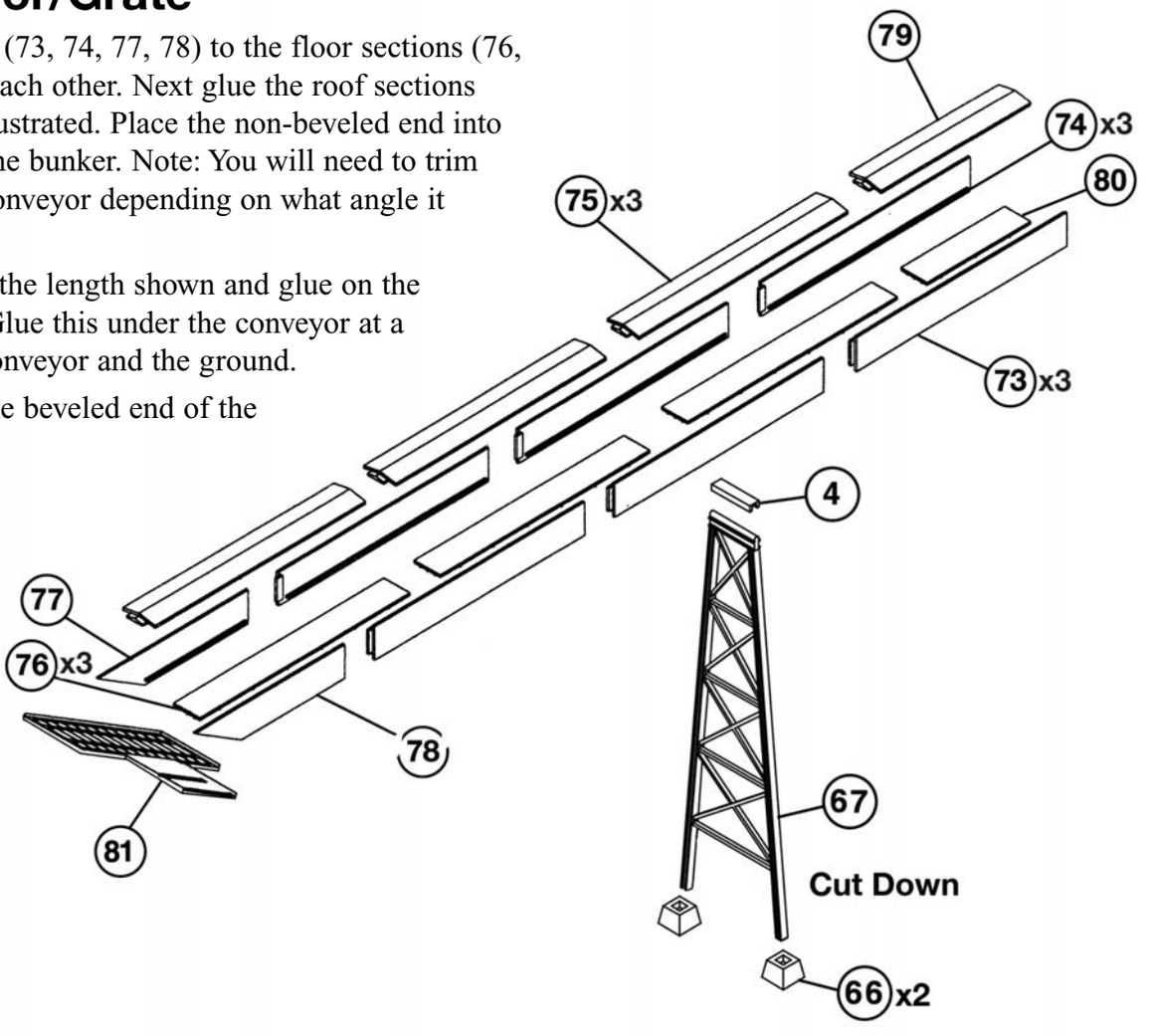


Conveyor/Grate

1. Glue the conveyor sides (73, 74, 77, 78) to the floor sections (76, 80) as shown and then to each other. Next glue the roof sections (75, 79) on, in order, as illustrated. Place the non-beveled end into the opening in the top of the bunker. Note: You will need to trim the roof and sides of the conveyor depending on what angle it exits from the opening.

2. Cut one support (67) to the length shown and glue on the pads (66) and fitting (4). Glue this under the conveyor at a point where it meets the conveyor and the ground.

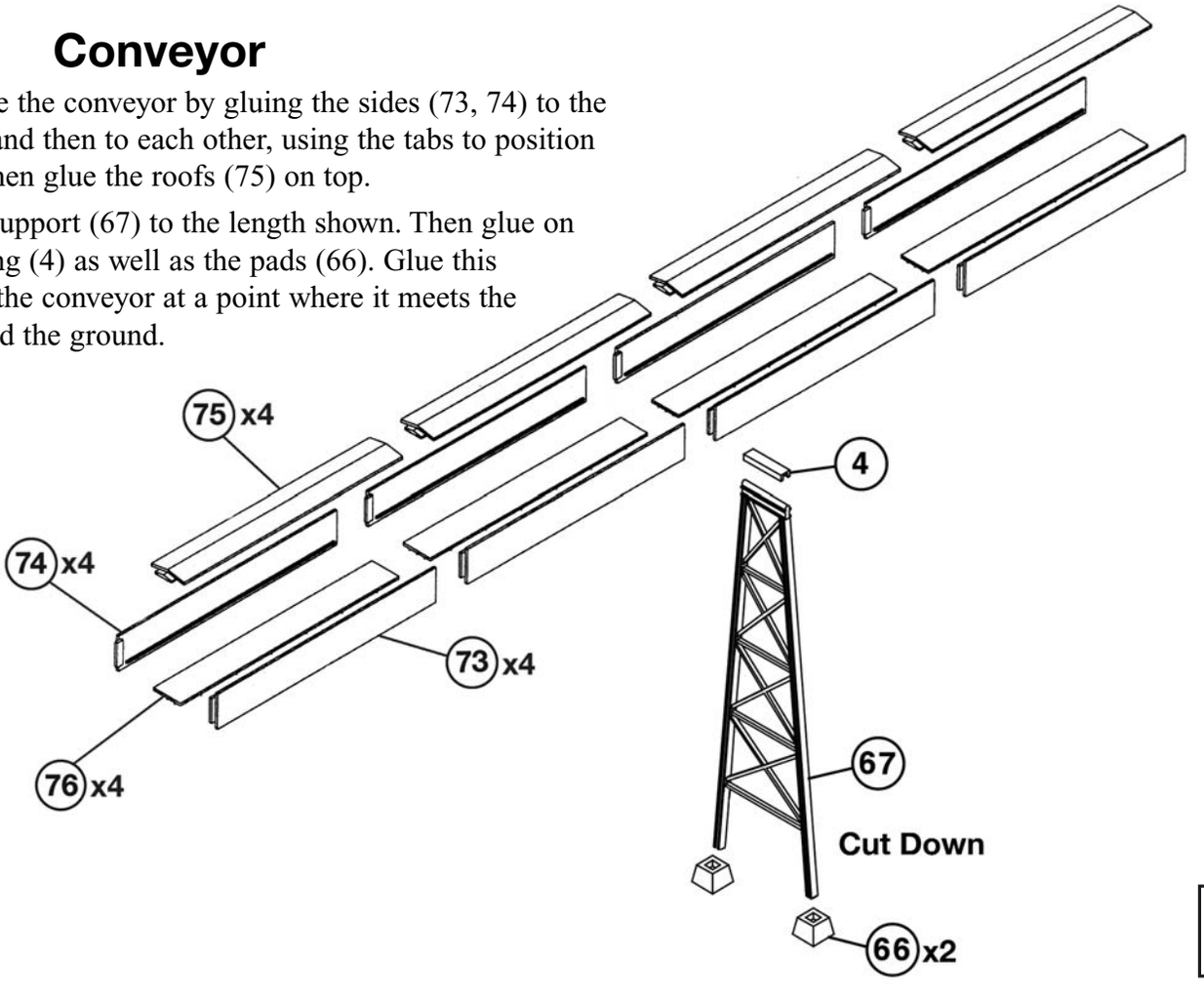
3. Glue the grate (81) to the beveled end of the conveyor.



Conveyor

1. Assemble the conveyor by gluing the sides (73, 74) to the floors (76) and then to each other, using the tabs to position correctly. Then glue the roofs (75) on top.

2. Cut one support (67) to the length shown. Then glue on the top fitting (4) as well as the pads (66). Glue this underneath the conveyor at a point where it meets the conveyor and the ground.



Quencher

1. Glue the suppressors (88), cross bracing facing up, to the ridges on the inside of one of the side walls (82). Next glue the remaining three walls (82, 83) to each other and the base (84). Then glue the wall with the suppressors to the base and end walls, making sure that the suppressors set above the ridges on the opposite side wall.

2. Glue the door (93) into the opening in the back of the front pump house wall (86). Then glue the walls (86, 90, 91, 92) together and to the base (84). Glue the roof (41) in place.

3. Glue the piping and connectors (95, 96, 97, 98) together as shown, with the two I-beams (86) glued underneath the spray head (97). Glue this assembly in place with the elbowed end (95) in the hole in pump house wall #92, and the spray head above the suppressors, between the side walls (82). Note: See fig.1 for proper positioning.

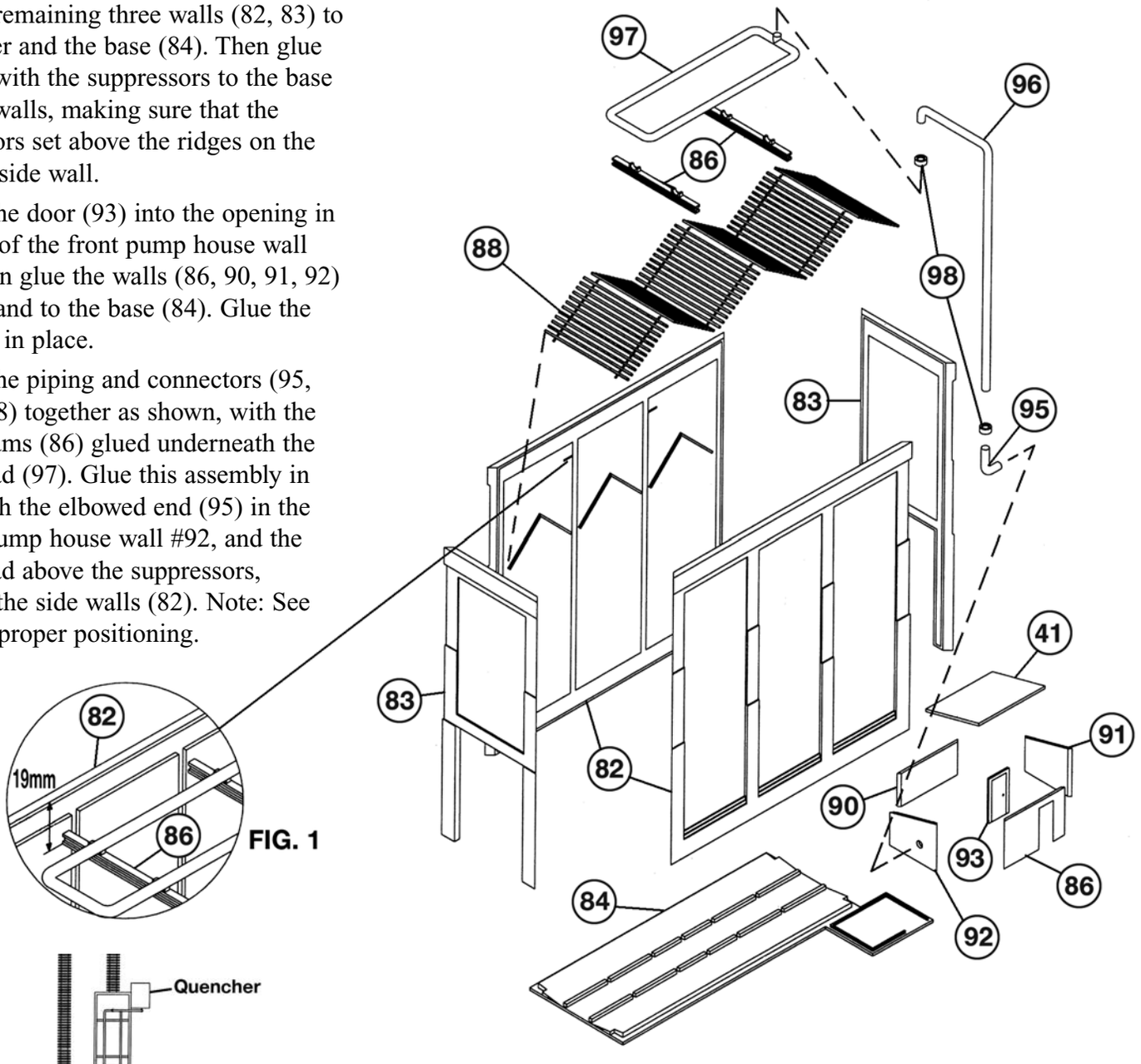
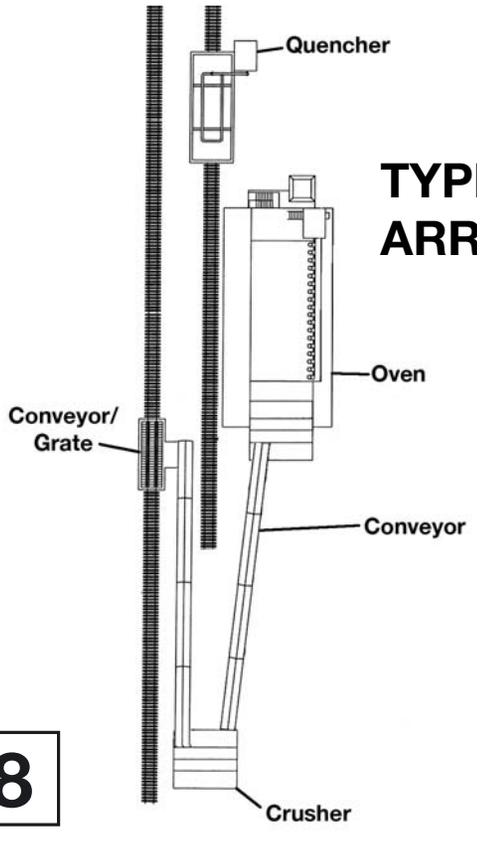


FIG. 1



TYPICAL ARRANGEMENT

Note: When installing track, remove the ties on the part of the track that goes through the quencher as well as the part of the track that goes over the grate.

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.

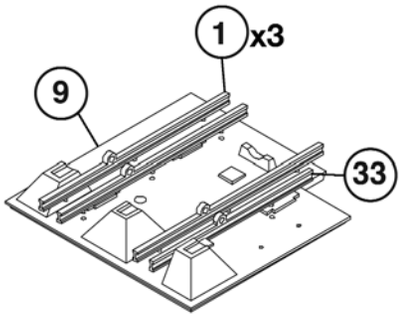
2. Lightly brush Micro Sol® on top. This will soften the decal, allowing it to comform to irregular surfaces. DO NOT TOUCH DECAL while wet!

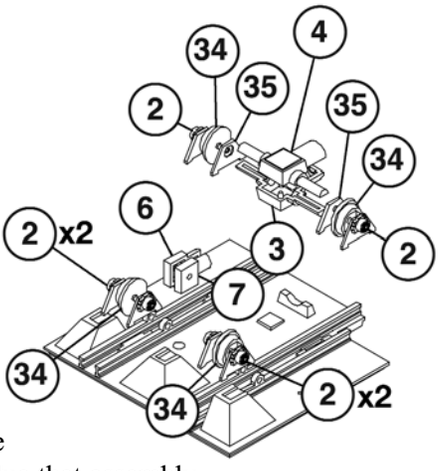
3. When decal is thoroughly dry, check for any trapped air bubbles. Prick them with the point of a small pin or hobby knife blade and apply more Micro Sol®.

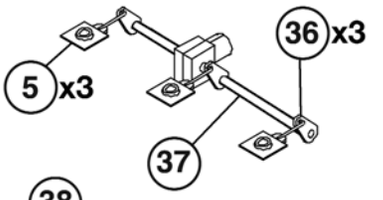
Larry Car

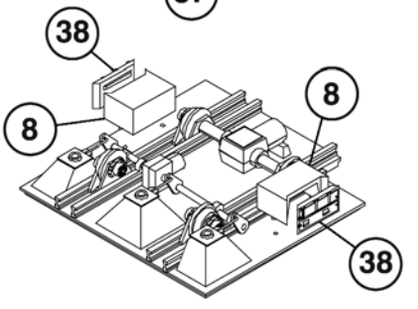
parts found on sprue # 7002972/B

1. Glue the bogie beams (1, 33) to the platform bottom (9) as shown.









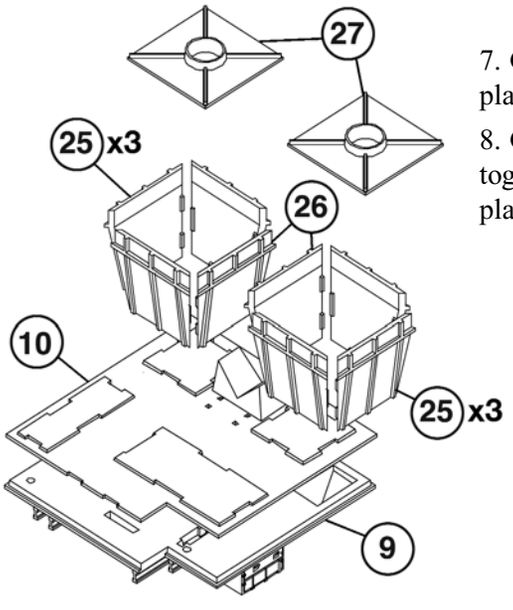
2. Place the pins of the wheels (34) into the holes of both of the bogie details (2) and glue that assembly to the platform bottom, near the hoppers, in between the bogie beams. Note: Make sure that the wheel flanges face towards the inside and that you do not get any glue on the wheel pins. There are slots engraved on the platform bottom where the flanges go over.

3. First glue the gearbox (3, 4) together, and then glue the plates (35) onto the ends of the axles. Place the pins of the wheels (34) into the holes of the end plate and the bogie detail (2) and glue this assembly in position on the platform bottom. Note: Again, the wheel flanges will sit over the slots in the bottom.

4. Glue the hopper gate motor (6, 7) together and in place on the platform bottom.

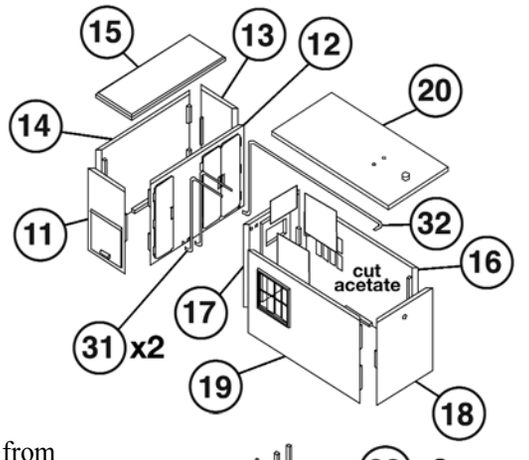
5. Slide the drive shaft (37), first through the rings of the bogie beams on the right side, then slide a hopper gate (5) onto the shaft. Continue sliding the shaft through the hopper gate motor. Add hopper gates (5) at each end and position all the gates so that they will cover the hoppers and then glue the gates in place.

6. Glue the battery boxes (8, 38) together and to the platform bottom.



7. Glue the platform top (10) onto the platform bottom (9).

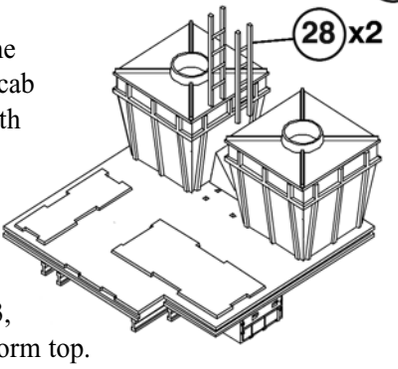
8. Glue the bunkers (25, 26, 27) together, as illustrated, and to the platform top.



9. Glue the ladders (28) in place to the sides of the bunkers.

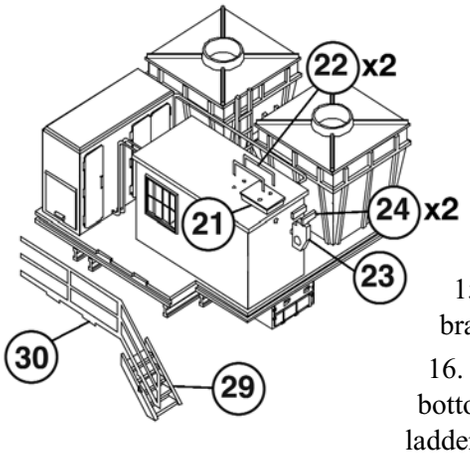
10. Cut out window “glass” panels from the sheet of supplied acetate to fit over the wall and door windows of the operator’s cab walls (16, 17, 19). Glue them in place with a small amount of white glue.

11. Glue the operator’s cab (16, 17, 18, 19, 20) together and in place on the platform top.



12. Glue the electrical cabinet (11, 12, 13, 14, 15) together and in place on the platform top.

13. Glue the short conduits (31) into the holes at the bottom of wall #12 and into the holes at the top of wall #17. Glue the long conduit (32) into the hole at the bottom of wall # 12 and also the hole at the top of wall #16.



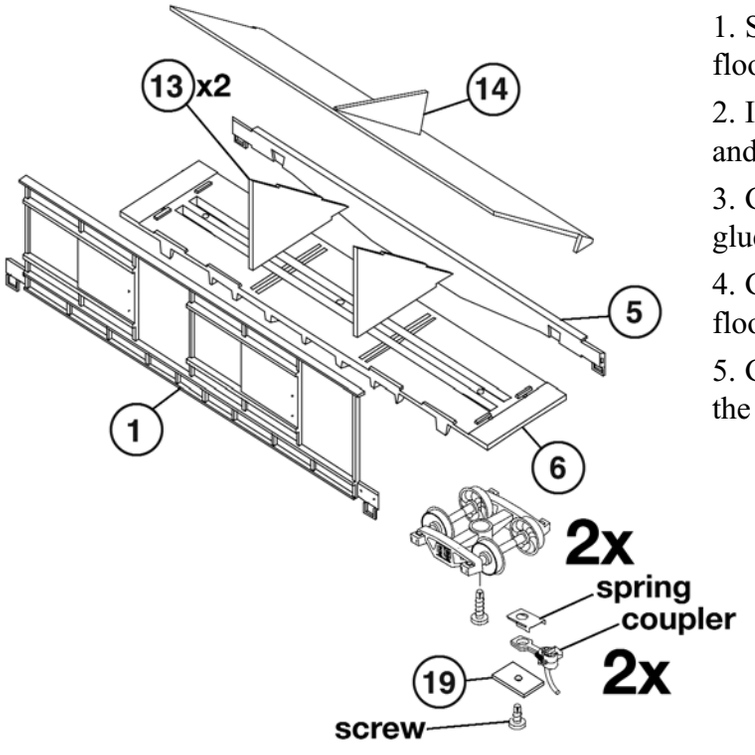
14. First glue the electrical box (21) on top of the operator’s cab. Then glue the small conduits (22) into the holes in both the box and the roof.

15. Glue the pick up shoes (24) to the top of the trolley bracket (23). Then glue the bracket into the hole on the side of wall #18.

16. Glue the railing (30) to the edge of the platform. Note: The tabs on the bottom of the railing fit into the slots on the edge of the platform. Glue the ladder (29) in place.

Quench Car

parts found on sprue # 7002972/A



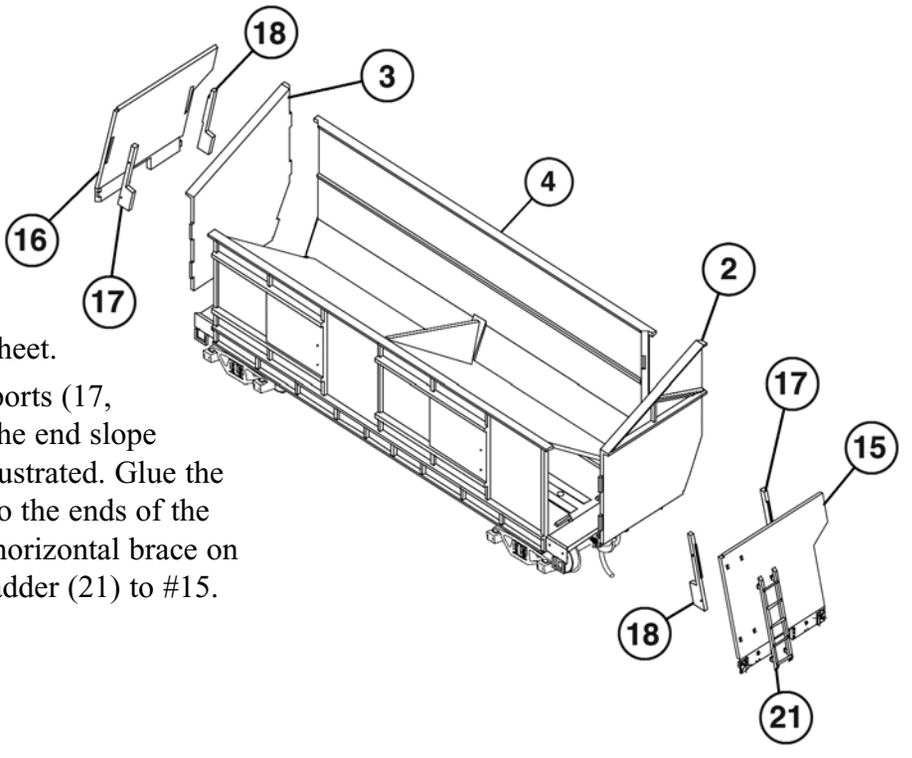
1. Screw trucks in place on the bottom of the floor (6).

2. Insert spring and coupler into coupler pocket and screw on the coupler pocket cover.

3. Glue the low side (1) to the floor (6). Then glue the supports (13) to the floor and side.

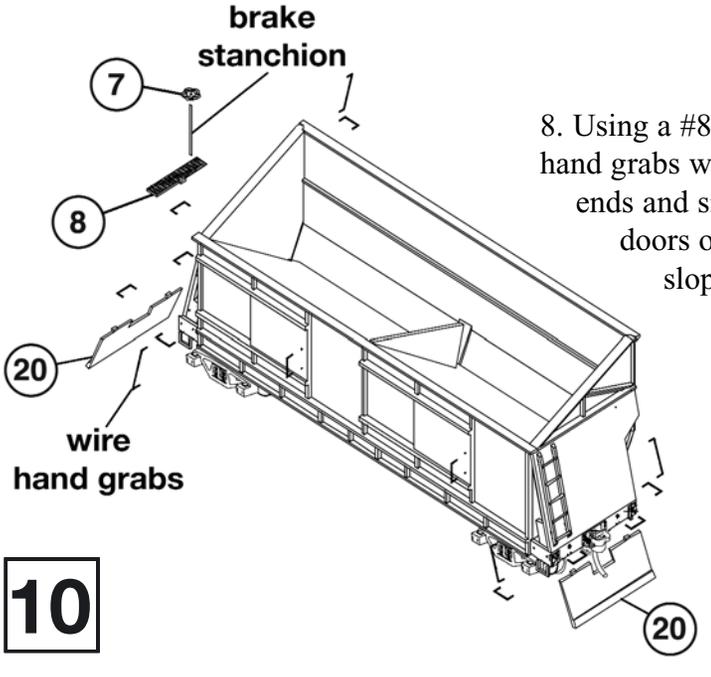
4. Glue the side frame (5) to the side of the floor (6).

5. Glue the slope sheet (14) in place on top of the supports.



6. Glue the ends (2, 3) in place. Then glue the high side (4) to the ends and the slope sheet.

7. Glue the end supports (17, 18) to the backs of the end slope sheets (15, 16) as illustrated. Glue the end slope sheets onto the ends of the car, underneath the horizontal brace on the ends. Glue the ladder (21) to #15.



8. Using a #80 drill bit, drill holes at all dimples where the metal hand grabs will be inserted. Note: The smallest grabs are for the ends and sides of the frame. The middle size grabs are for the doors on the side. The longest grabs go on the sides of the end slope plates. After drilling, insert the grabs into the holes. Use a small drop of glue or paint to hold them in place.

9. Glue the end truck shields (20) to the bottom of the floor. Note: There are holes in the bottom of the floor that accommodate the notches on the top edge of the shields.

10. Glue the brake platform (8) into the notch in #3, above the supports. Glue the brake wheel (7) to the top of the metal brake stanchion. Then insert the stanchion through the hole in the platform and glue in place.