

War Department Light Railways Baldwin 4-6-0T

Ref. 16L05

Revised September 2015



INTRODUCTION

Prototype Information

The British Army's War Department Light Railways (WDLR) were built during the Great War (First World War, 1914-18), largely in France, for conveying munitions and supplies up to the front line. Lightly laid 60cm gauge lines near the front line were either hand pushed or operated using small Simplex petrol locos (like our kit, reference 16L04). Better laid 60cm gauge lines further from the front used larger steam and internal combustion locomotives.

The Baldwin 4-6-0T was the most numerous of the steam locomotives used by the WDLR. There were 495 of them built by the Baldwin Locomotive Works in Philadelphia, USA, ordered in October 1916 and completed in April 1917, at a time when a huge amount of equipment was needed, and British locomotive builders were fully occupied. The British War Department wanted something equivalent to the existing Hunslet 4-6-0T locomotives. Fortunately, Baldwin already had a suitable 60cm gauge design available, which had been built for the French Government in Morocco. Some simplification and amendments were made to suit their intended use, but the existence of a design, and Baldwin's manufacturing technology, enabled them to produce this large quantity in a very short time.

Many features of the design were typically American, such as the cast steel frames (so-called "bar" frames), the compensated suspension, the pull-out regulator and the sand dome on top of the boiler. The locomotives had a 4-6-0T wheel arrangement, rather than the more logical 2-6-2T. [For a locomotive which travels equally in both directions, it is better to have a carrying or guiding wheel at each end.] This arrangement was dictated by the need to closely match the Hunslet 4-6-0T; the War Department even wanted the cab cut-outs to be the same shape as the Hunslet design! It is

interesting to note that when even more locomotives were needed, the WD bought a 2-6-2T design from the American Locomotive Company (ALCo). Furthermore, when the USA entered the War, they got Baldwin to build a a very similar, but 2-6-2T design for their army!

Each of the Baldwin 4-6-0T locomotives was identified by three different numbers. The most obvious was the WDLR number carried on a cast iron plate in the middle of each side tank. They were originally numbered from 501 to 1150 (with a gap from 546 to 700), but at an early stage, 995 to 1150 were re-numbered 546 to 700. New number plates were not made - the new numbers merely being painted on. The second number was the makers "works number". This was carried on an oval cast iron plate on each side of the rear bunker. These plates also carried other information: the makers name and location; the date of manufacture; the W[↑]D symbol; and the "order number" from the WD in the form DRT 795 (45 locomotives), DRT 887 (404 locomotives) and DRT 10002 (46 locomotives). The makers numbers were not in a continuous series, but ranged from 44335 to 45433 with many gaps because Baldwin were making lots of other locomotives at the same time - evidently over 600 others were completed in the same seven month period. The third identification number was Baldwin's serial number for that particular class, which was only stamped on some parts (mostly valve gear parts), so were not easy to find. In this case, the class was 10-12D - 10 was the total number of wheels; 12 was a code for the cylinder diameter and D indicated 6-coupled driving wheels. The serial numbers for the WDLR locomotives were 12 to 506 (1 to 11 were for Morocco); no other locomotives of this class were built. Usually, just the number appeared on individual parts, but sometimes the class designation appeared as a prefix. All the numbers were allocated in the same order for all three series.

For such an apparently standardised class of locomotives, there were a number of variations incorporated during the period of building. A number of changes were made after the first few locomotives (presumably the first batch of 45). The majority of the the Baldwin 4-6-0T locomotives had visors (shades) over the cab front windows, a water lifter with prominent pipeworks and hose, and a large brass water tap at the back of each tank, all missing on the early ones. The early locomotives had a cab front plate formed of three sections, but the majority had only two sections, joined in the middle, presumably to accomodate the visors. Another noticeable change made during construction was the removal of the flanges on the centre driving wheels - presumably to assist on sharp curves, although the design of the bogie would have imposed a more significant restriction. The driving wheel tyres were ½in wider on later locomotives, but this is rather less noticeable. A lot of the smaller fittings (boiler backhead, safety valves and whistle) varied according to the availability from suppliers. The final 20 locomotives were supplied as kits of parts.

Survivors

At the end of the War, 50 of the Baldwin locomotives (and a large quantity of rolling stock) were sent to India for use in defending the North West Frontier. These 50 formed the locomotive fleet of the North West Railway, but by the 1930s, many had been sold into industry, some surviving in use until the end of the twentieth century. There may even be one or two still in existence, out of use, but four have been returned to the UK for preservation (see below).

After the War, many of the other remaining locomotives were returned to England for resale. Some damaged ones were repaired with a view to increasing their value, those rebuilt by W G Bagnall in Stafford aquired distinctive rear cab roof extensions. However, there were few sales. Only two are known to have gone to private industrial railways, but several public railways bought them. The **Glyn Valley Tramway** bought one, which was extensively rebuilt to run on its 2ft-4½in gauge. The nearby **Snailbeach District Railways** bought two, but these were altered to their 2ft-4in gauge by the simple expedient of moving the tyres out on the wheel centres! [This is believed to have only achieved about 2ft-3in gauge, but they seemed to have worked OK.] The others did not require their gauge to be changed: the **Welsh Highland Railway** bought one (which was always known by its later WDLR number as "590". The purchaser of the largest number was the **Ashover Light Railway**. They had six altogther, although only five were available for use at the same time, because it was cheaper to buy a replacement than to repair it, when one wore out during construction work! All the British examples were eventually scrapped.

Some of the Baldwins remained in France after the War to help with reconstruction work, and later in industrial service. The remains of one still exist, albeit only the frames and wheels, because it was rebuilt as a diesel locomotive, becoming an 0-6-4 in the process. Others are known to have ended up in Greece and Australia, because one still survives in each country, the former derelict and the later much rebuilt as a "Wild West" tender locomotive.

Preservation

The Baldwin 4-6-0T locomotives still in use in the sugar industry in central India were visited and photographed by enthusiasts towards the end of the twentieth century. Some of these people came back with schemes for preservation and return to the UK. In the early 1980s, **Amberley Chalk Pits Museum** was just developing its railway collection, and one of the Trustees had regular business in India. A scheme was hatched to acquire up to four of the Baldwins, return them to the UK, keep one and sell on the others. In the event, only two came back, one for Amberley (44656/WDLR 778) and one for the **Imperial War Museum** (44699/WDLR794). Later, policy changes meant that the Amberley locomotive moved to the **Leighton Buzzard Narrow Gauge Railway** for restoration, ownership being passed to the **Greensand Railway Museum Trust**, who have completed the restoration to working order. Based at Leighton Buzzard, the locomotive has also visited other railways, and it will be fully serviced in time for its centenary in 2016. The Imperial War Museum has also revised its policy, and their locomotive is now on long-term loan to the **Welsh Highland Heritage Railway** who are well on the way to completing the restoration to working order, masquerading as 590 of the original line.

Much more recently, two further Baldwin 4-6-0T locomotives have returned to the UK from India, having been out of use for many years. One (44657/WDLR 779) has been acquired by the **Statfold Barn Railway** in Staffordshire where undoubtedly it will be restored to working order in their usual speedy and thorough fashion. The other (45190/WDLR 1058/608) has been acquired by a member of the **West Lancashire Light Railway**, and the locomotive is being restored at a private site nearby.

For further information on these locomotives and the WDLR, we can recommend reading:

- ***Light Railways of the First World War***, W J K Davies, David & Charles, 1967.
- ***Narrow Gauge at War***, Keith Taylorson, Plateway Press, 1987.
- ***Narrow Gauge at War 2***, Keith Taylorson, Plateway Press, 1996.
- ***The Light Track from Arras***, T R Heritage, Plateway Press, 1999.
- ***WDLR Album***, Compiled by Roy C Link, RCL Publications, 2014.
- ***The Railway Gazette - Special War Transportation Number***, Moseley Railway Trust reprint, 2014.

The following web site has a wealth of information: www.wdlr.org.uk

Model Information

This kit will enable you to build a model of a typical as-built WDLR Baldwin 4-6-0T from the main batch. (The first 45 locomotives had a three section cab front, no window visors, and no water lifter). There are several hundred numbers to choose from (!), but we have included numberplates from five of them. Four of these are the original WD numbers of the locomotives now preserved in the UK (see above), whilst the fifth is the original WD number (1040) of the locomotive which was re-numbered 590.

Two Rail or Battery Propulsion

This electrically powered model can be used on two rail or battery supply (or even both if you want). The boiler and tanks are hollowed out, and a suitable "platform" is provided to give plenty of space for batteries and radio or other speed control equipment. (Even more space is available in the bunker if needed.) However, no batteries or control equipment are included because of the many options available; if you need help, we suggest you should consult specialists in that field. You may need to make provision for additional wiring routes or other modifications before full assembly is completed. More information can be found on page 27 at the end of the assembly section of these instructions.

HEALTH AND SAFETY

Resin

The main castings are made from Polyurethane Resin, which should not cause any safety problems in normal use. Do not subject the material to excessive heat such as flame or soldering iron as, apart from damage to the fine detail, unpleasant fumes will be given off. For the same reason, do not use a power drill or other power cutting tools, as heat will be generated. When filing or sanding (e.g. to remove moulding 'pips') do not breathe in the fine dust. Ideally you should wear a suitable dust mask or use 'wet and dry' paper (used wet) to prevent dust being caused.

PREPARATION

Tools Needed

The following tools are needed, most of which should already be in the toolkit of the average modeller:

Piercing Saw or Nippers	for removing lost wax castings from their sprues.
"Stanley" type knife	for removing etched parts from the frets.
Assortment of small and medium sized files	for finishing removal of pips, tabs, and general cleaning up.
Tweezers and smooth faced Pliers	for holding small parts whilst cleaning up; for folding small etched parts; for assembling small nuts and bolts.
Soldering Iron, Solder & Flux	for brass to brass fixing.
Cyanoacrylate (Loctite Superglue or similar)	for quick fixing of parts where strength is not important.
2-part Epoxy Glue (Araldite or similar)	for fixing resin to resin or two dissimilar materials, such as resin to brass. (Could also be used as a substitute for much of the soldering if required). The 5 minute setting variety is OK for most of this work, but the 24 hour setting version is better if you have the patience to wait for each bit to set!
Glass Fibre Pencil or Abrasive Rubber Block	for cleaning all materials (but particularly etched brass parts) prior to soldering or glueing and prior to painting.
Assortment of small drills and Pin Chuck (or similar)	for forming or enlarging various holes. The following sizes of drill will be needed: 0.8mm, 1mm; 1.2mm; 1.6mm, 2mm, and 3mm
Taper Reamer or Broach	Useful for slightly enlarging holes in etchings, particularly the crankpin holes in coupling and connecting rods. A round file will do the job, but either of these will do it much easier and better, and will come in very useful on future projects too.
Blue Tack (or similar)	For holding parts in place while you solder them, or while the epoxy is setting.
Small screwdrivers	(Jewellers type). For various screws, particularly for chassis assembly.
14BA spanner	Available from modellers' tool suppliers. [Not essential, but useful for ensuring the nuts and bolts are tight.]

Cleaning Up Resin Mouldings

All moulding sprues and 'pips' should be removed, using a scalpel, then finished off with a file or 'wet and dry' paper. If at any stage during assembly you damage the resin parts the following tips are offered for their repair.

- If the part breaks 'cleanly' and will fit back together properly, it can be stuck with a cyanoacrylate (superglue) type adhesive.

- Other damage, such as gouges or holes drilled too deep, are best repaired with car body filler.
- Badly damaged breaks are better joined with epoxy and the resulting cracks repaired with filler.

Cleaning up Lost Wax Brass Castings

As required, remove pieces from sprues with a piercing saw or nippers and finish off with a fine file. Parts may need straightening; this is easily achieved with the fingers. Remove any blemishes with a file and finish with a quick polish with a glass fibre brush.

Etched Components

Remove components from the sheets only when you need them. This is done by cutting through the small tabs (but see next paragraph) with a Stanley-type knife, or a small chisel blade, whilst resting on a fairly hard surface like a piece of MDF. In many places it is possible to cut the tabs with scissors or nippers, but however you do it, do it carefully to avoid distorting the part you are removing and any adjoining parts. Usually it is best to cut the tab at the end away from the part and then remove the remains with fine nippers, finishing off with a fine file.

Many of the etched components require folding (some fold up several times, like a concertina or like metal origami), and some of the folding joints look very much like the location tabs. Make sure, by studying the instructions, that you cut out parts by removing only the tabs and not the fold joints!

As a general rule, where fold-ups form a right angle, the fold line is on the inside, but where it folds back on itself (i.e. to 180°), the line is on the outside. Before you do any folding or assembly work, clean any edges or surfaces to be soldered with the glass fibre brush or abrasive rubber. This is in addition to using a liquid flux during the soldering operation. The main etched parts of the kit - the footplate and cab - are intended to be folded and assembled "dry", and then soldered afterwards. Indeed, it is possible to complete the whole kit without soldering (although soldering is recommended, both for strength and longevity); just run some superglue into the joints after assembly or smear some epoxy (Araldite) on the faces and joints during assembly. The use of tabs and slots and some fold-over tabs, means that it will virtually hold itself together.

Forming Rivets in Etched Components

In a number of places, it is necessary to form "rivets" (actually the domed head of the rivet) in an etched component. In all cases, there are tiny half etched holes on the reverse side for location purposes, and in most cases they have to be done before folding or assembly. The best tool for forming the rivet heads is a proper rivet press, of which several are commercially made, and can be obtained at specialist shows, such as those run by the Gauge O Guild or the Association of Larger Scale Modellers. These tools consist of a press which locates the piece of metal to be embossed between a hardened pointed tip and a die consisting of a hole of the same diameter as the required rivet (in this case about 1mm). Most tools have some sort of device for spacing the rivets, and locating a row of them a set distance from an edge, but these are not needed for this kit. By pressing the pointed tip (methods vary in different tools) onto the metal and into the hole, a nice, sharp, rounded rivet head results. Note that the female die is the important part for getting the sharpness needed; some riveting tools have only the pointed part, suggesting that you press onto a piece of lead or other slightly yielding surface. Some books suggest that a blunt scribe or centre punch will do the same job. If these methods work for you, that is fine, but a punch with a die will be better.

A test area is included on one of the etched sheets to practise on. Badly formed rivets look much worse than no rivets at all, so, unless you are entirely happy with the results of your embossing method, it would be better to leave them alone.

Assembly Notes

The form of construction adopted in this kit is that there are two main units: boiler cab and tanks, and chassis including the cylinders. There is accessible space for batteries and control equipment. However, we strongly advise against separating the two parts every time you need to charge the batteries etc. You need to consider where to put a charging socket: possible locations include the

tank fillers, the domes, the chimney or in the rear bunker. If you decide on the first two, also devise a method for making sure you don't lose the parts which are not fixed in place!

The main parts of the chassis (frames, cross members and buffer beams) are assembled with a multitude of small nuts and bolts, mostly 14BA. These are near to scale size, and depend on the cumulative strength of all of them to produce a rigid, solid and square chassis. To prevent the screws coming loose over time, the finished assembly can be "locked" together by one of three methods:

- i. careful soldering [Very satisfactory and fairly quick, but difficult to achieve.]
- ii. undo each nut in turn, reassembling with epoxy or industrial threadlock before doing the next one. [Very satisfactory, but a bit slow.]
- iii. carefully running the most liquid "superglue" (ACC) into all the joints; do it very carefully and sparingly or you will end up glueing your fingers to the chassis or gluing it to the workbench when you put it down! [Less satisfactory and potentially very messy, but quick.]

It doesn't matter whether you assemble the boiler unit or the chassis unit first, but the order of assembly particularly within the latter unit, is important because many parts are impossible to add retrospectively.

Throughout these instructions, reference is made to "left" (or LH for left hand) and "right" (or RH), and sometimes "top", "bottom", "front" and "back". These orientations refer to the completed loco standing on the track, from the point of view of the driver in the cab, with the chimney being at the front. Care should be taken, by reference to the photos, notes, etc., to get the correct orientation; often left, top or front, etc., will seem to be the opposite way round before folding and/or assembly, and some of the latter operation is done with the model upside down. Where confusion might arise and it can be done inconspicuously, the etched parts are marked accordingly.

To avoid tedious repetition, it will be assumed in each sub-section of the following assembly instructions that the parts have been removed from the etched fret, casting sprue, etc., that tabs, moulding pips, etc., have been removed, rivets formed, and preliminary cleaning done ready for soldering or glueing.

On the etched frets, parts are numbered in the order they are laid out, to make finding the pieces easier. This means that numbers are not necessarily related to the order that they are needed. Before removing parts, note carefully from the pictures or the description which are tabs and which are folding lines.

Painting and Finishing

You will probably find it easier to paint some parts before you begin the final assembly. Certainly, you will need to paint the inside of the cab before fitting the brass controls and pipework.

The original Baldwin specification for these locos was that they should be painted in dull (matt) black. In service, in wartime, they probably never received a full repaint, but patches and repairs would have required some protection. Pictures of locomotives in the UK after the War and awaiting re-sale, show paintwork in good condition, so these must have been repainted then. The known works photographs appear to show the wheel tyres and other parts coloured white. Close examination shows that this was done with chalk to highlight those parts in the photographs, and no locomotive would have run like that.

The resin parts are supplied ready coloured black, so will not need much work, but the brass parts will require thorough treatment. After cleaning, it is strongly recommended that all brass and steel parts be treated with a chemical black, before being primed (car aerosol) and painted. In fact, only the cab and buffer beams really need to be painted, the chassis will probably be OK with just the chemical black. The resin parts can receive just a light coat of the black paint.

Before any treatment, make sure that all parts are thoroughly clean, dry and free of any grease. Metal parts should be cleaned with the glass fibre brush as the slight scratching helps the paint to key. Everything should be washed with a mildly abrasive kitchen cream cleaner, such as Cif (ex Jif), or more modern alternatives like Cillit Bang, which cleans brass beautifully. Use an old toothbrush to work into the corners and crevices. You may need to repeat if the foam goes grey the first time. When it is clean, rinse in clean water. Once thoroughly clean and dry do not handle the model except

with surgical gloves or tissue paper/kitchen roll. Leave to dry, at least overnight, before applying the primer. Cover with a clean cardboard box or similar to prevent dust settling.

The final job (optional) is to give everything a coat of rust, dust, dirt and grime! There are now many very good books available on the subject should you wish to go further.

ASSEMBLY INSTRUCTIONS

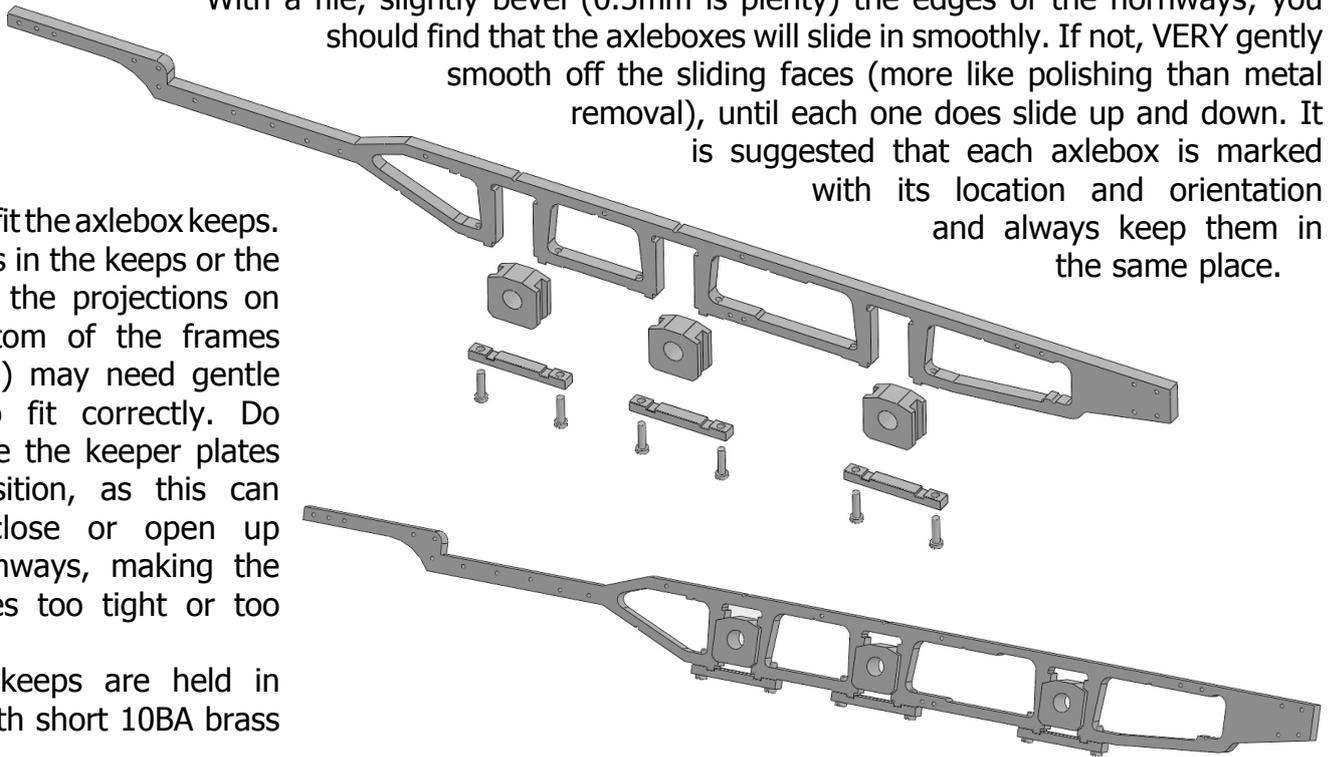
1. Assemble Axleboxes into Frames

The first job is to check all the machined edges and smooth off any slight roughness and burrs. The axleboxes must slide up and down smoothly in the hornways, but without any sloppiness.

With a file, slightly bevel (0.5mm is plenty) the edges of the hornways; you should find that the axleboxes will slide in smoothly. If not, VERY gently smooth off the sliding faces (more like polishing than metal removal), until each one does slide up and down. It is suggested that each axlebox is marked with its location and orientation and always keep them in the same place.

Now fit the axlebox keeps. The slots in the keeps or the sides of the projections on the bottom of the frames (or both) may need gentle filing to fit correctly. Do not force the keeper plates into position, as this can easily close or open up the hornways, making the axleboxes too tight or too lose.

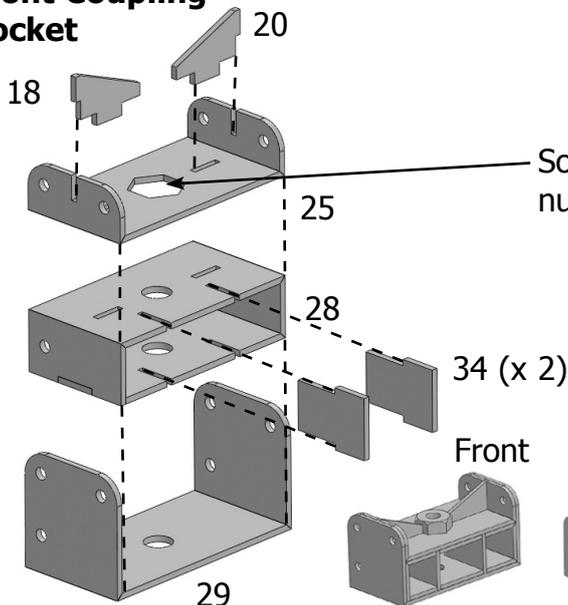
The keeps are held in place with short 10BA brass screws.



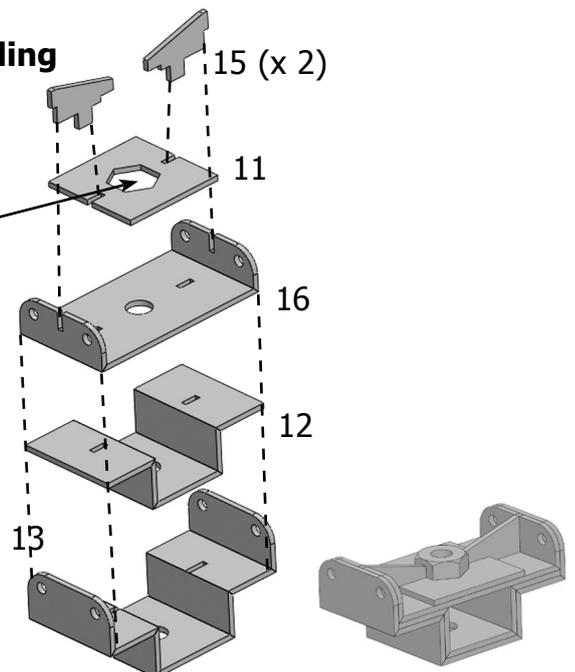
2. Assemble Etched Frame Spacers

There are five of these, together with the two buffer beams. (The two motion bracket supports come later.)

Front Coupling Pocket

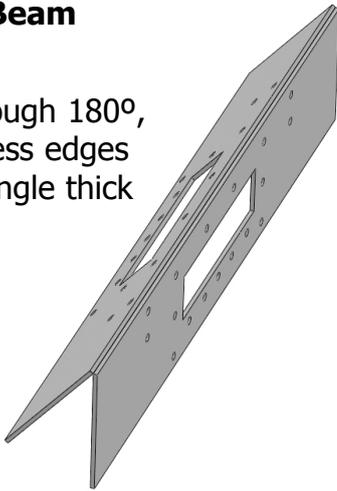


Rear Coupling Pocket

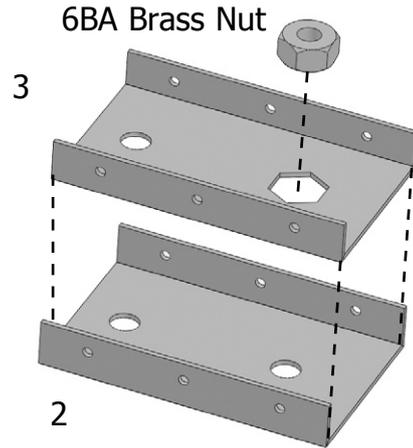


Front Buffer Beam

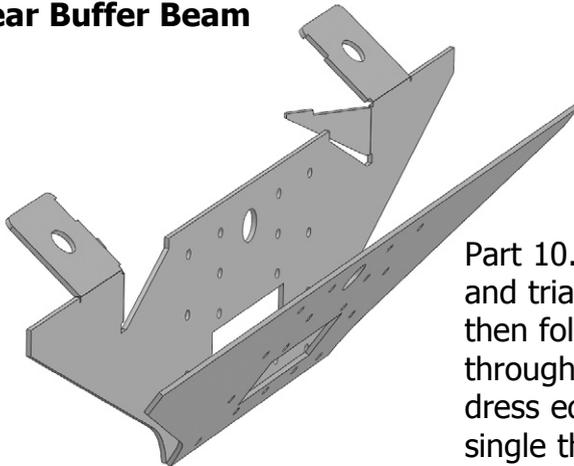
Fold part 6 through 180°, solder, then dress edges to look like a single thick plate.



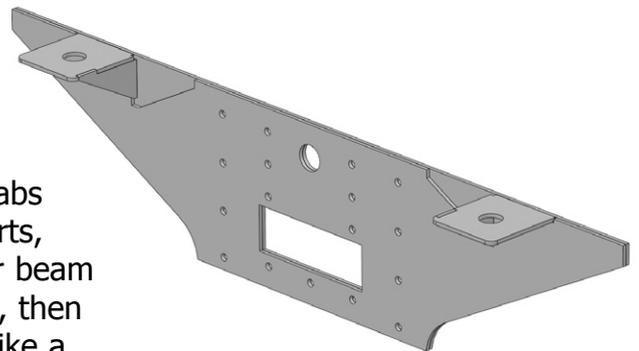
Cylinder Stretcher



Rear Buffer Beam



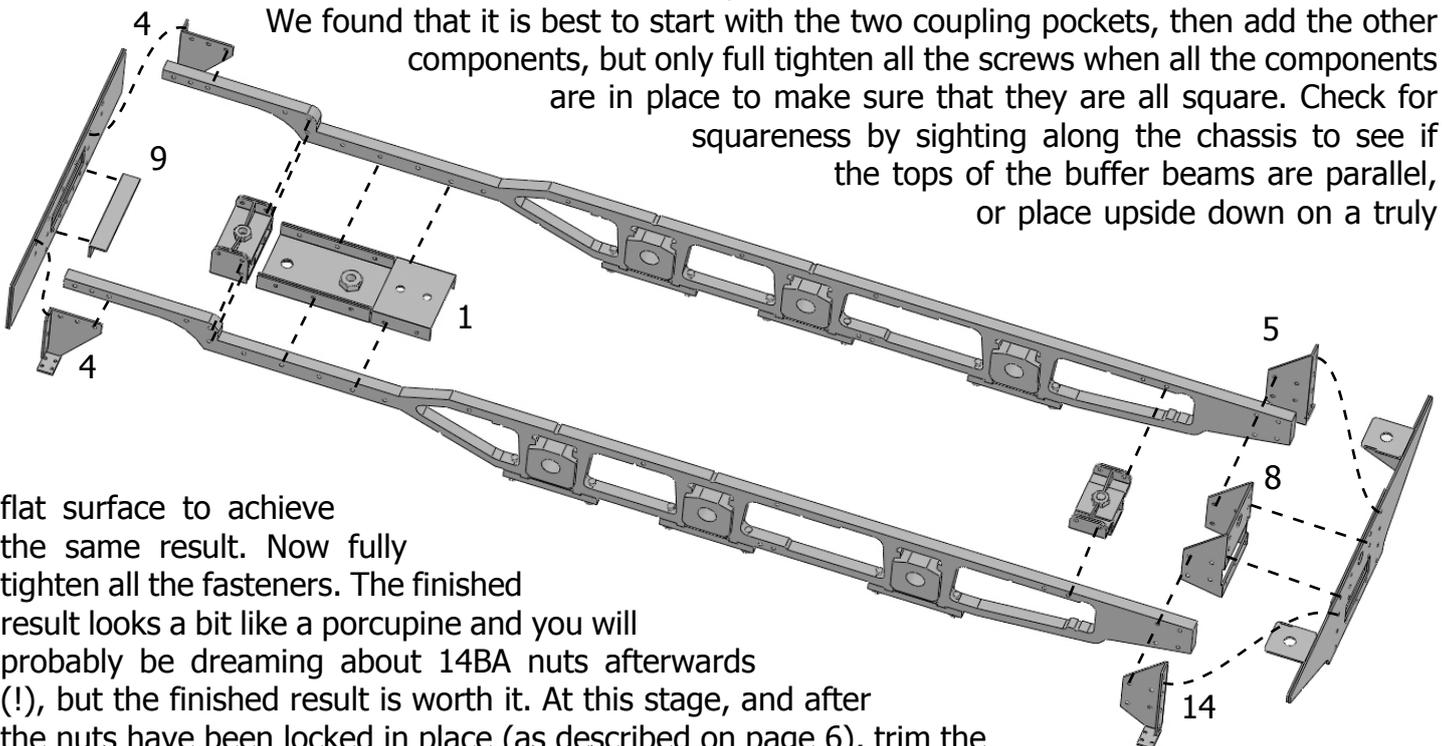
Part 10. Fold fixing tabs and triangular supports, then fold main buffer beam through 180°, solder, then dress edges to look like a single thick plate.



3. Assemble Main Chassis

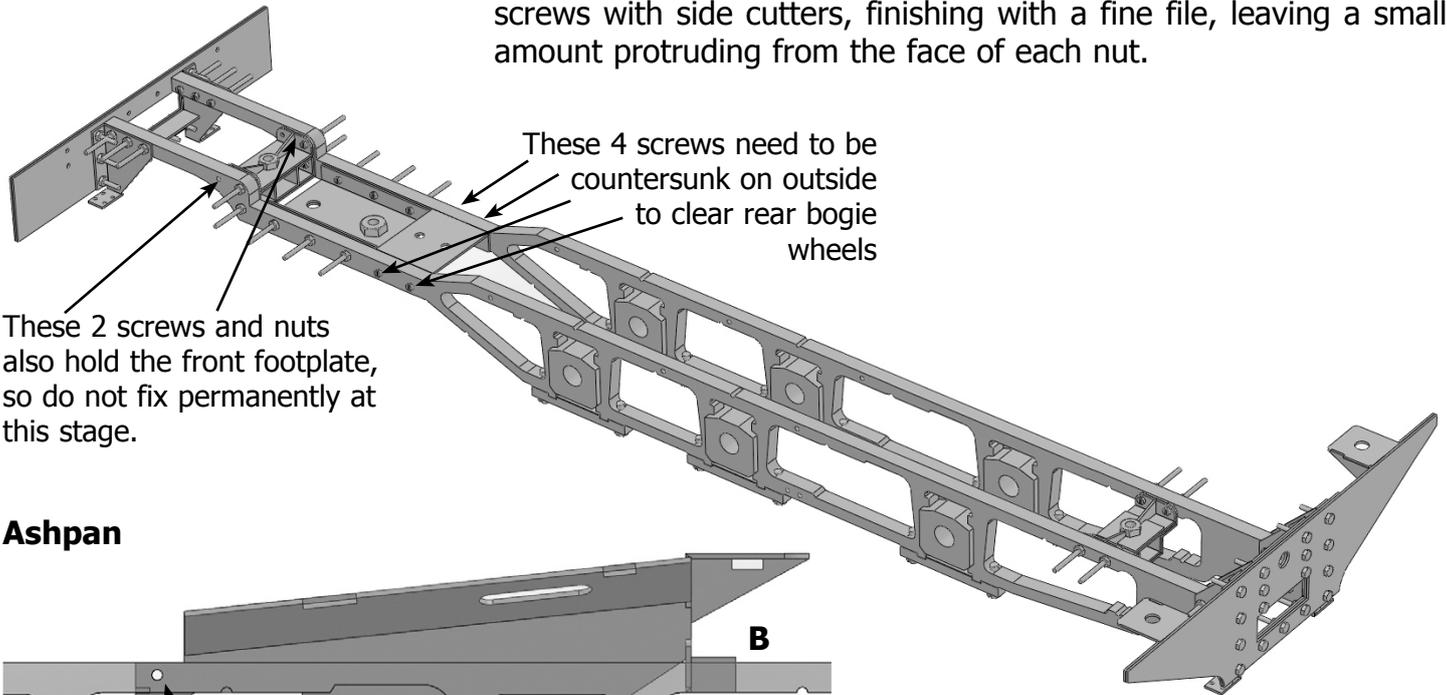
Using the assembled frames and spacers, and few other etched parts as shown below. Use the 14BA cheese-head (slotted) screws where they pass throught the frames, with the heads to the inside and nuts to the outside. Use the 14BA hex head screws where they pass through the buffer beam with the heads to the outside and nuts to the inside. A tip for applying the nuts to the end of the screws is

to use a small screwdriver blade with a tiny blob of Blue Tac to hold the nut on the flat face. We found that it is best to start with the two coupling pockets, then add the other components, but only full tighten all the screws when all the components are in place to make sure that they are all square. Check for squareness by sighting along the chassis to see if the tops of the buffer beams are parallel, or place upside down on a truly

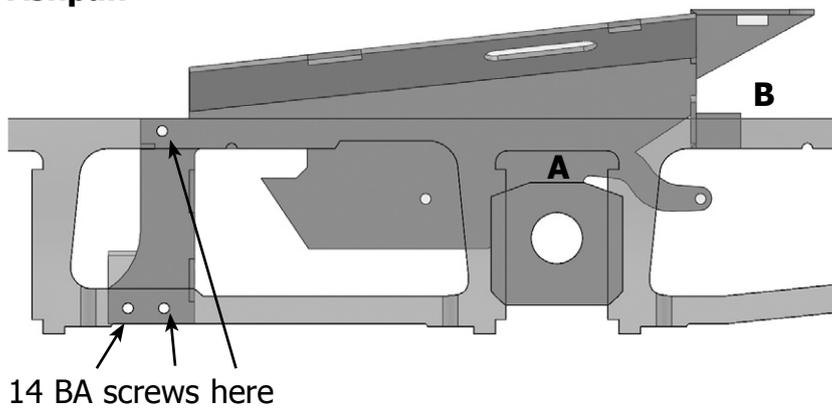


flat surface to achieve the same result. Now fully tighten all the fasteners. The finished result looks a bit like a porcupine and you will probably be dreaming about 14BA nuts afterwards (!), but the finished result is worth it. At this stage, and after the nuts have been locked in place (as described on page 6), trim the

screws with side cutters, finishing with a fine file, leaving a small amount protruding from the face of each nut.



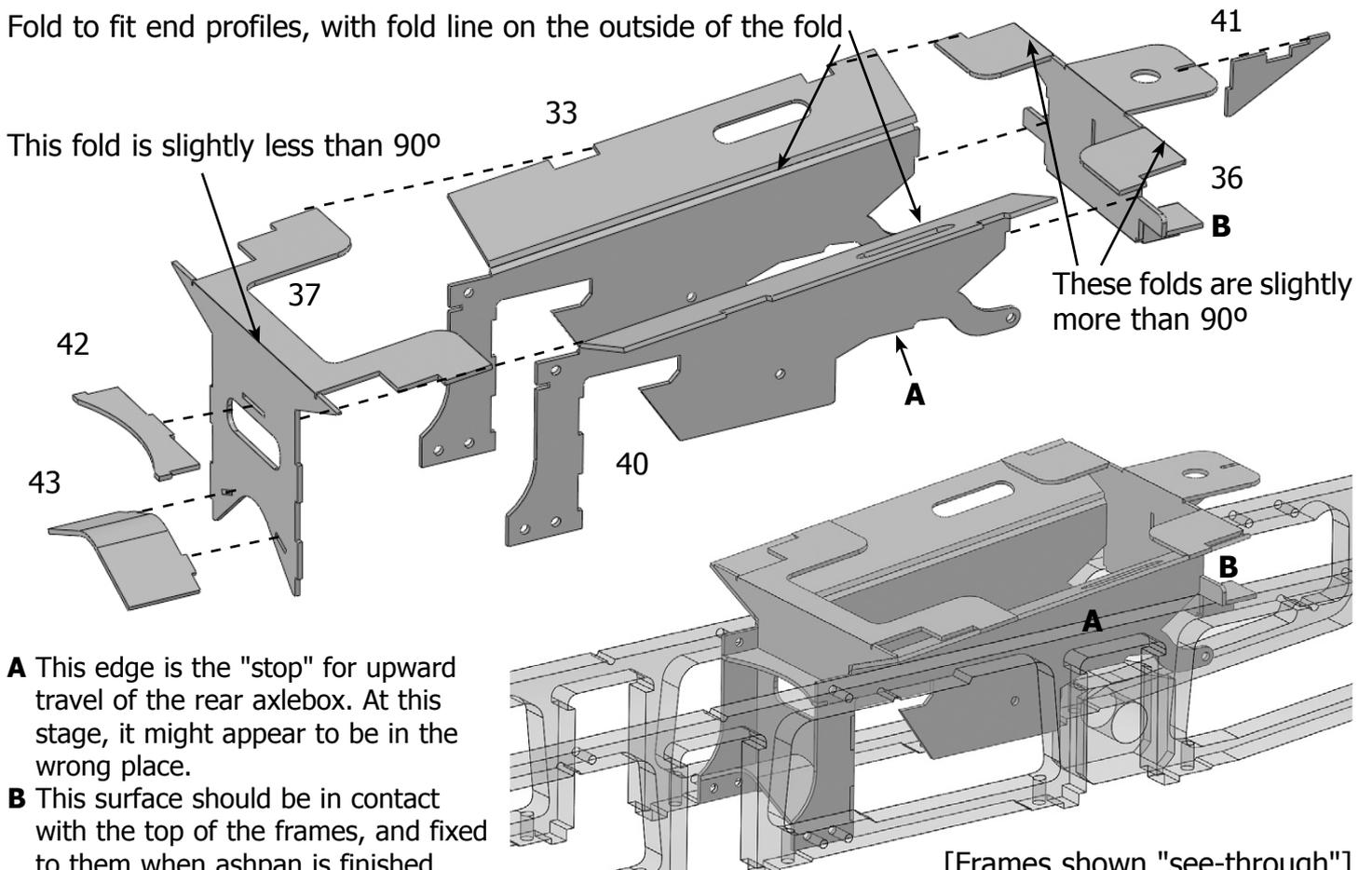
Ashpan



The ashpan is best assembled in the chassis. Screw the two sideplates to the frames, then tack solder the other parts as shown below. Remove from chassis to complete the soldering, then re-insert permanently. Note that the the top slopes to match the bottom of the firebox.

Fold to fit end profiles, with fold line on the outside of the fold

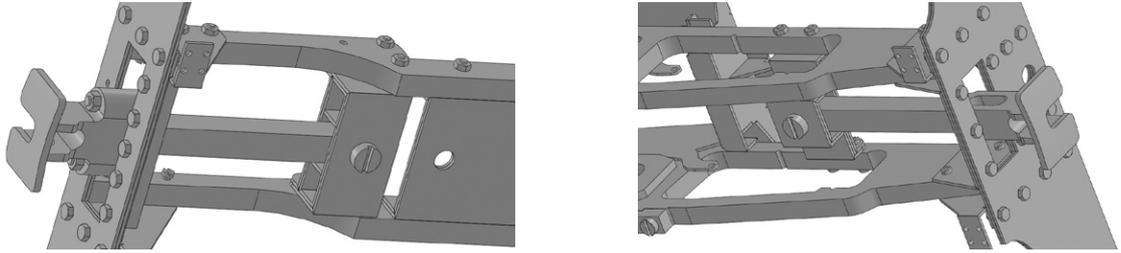
This fold is slightly less than 90°



[Frames shown "see-through"]

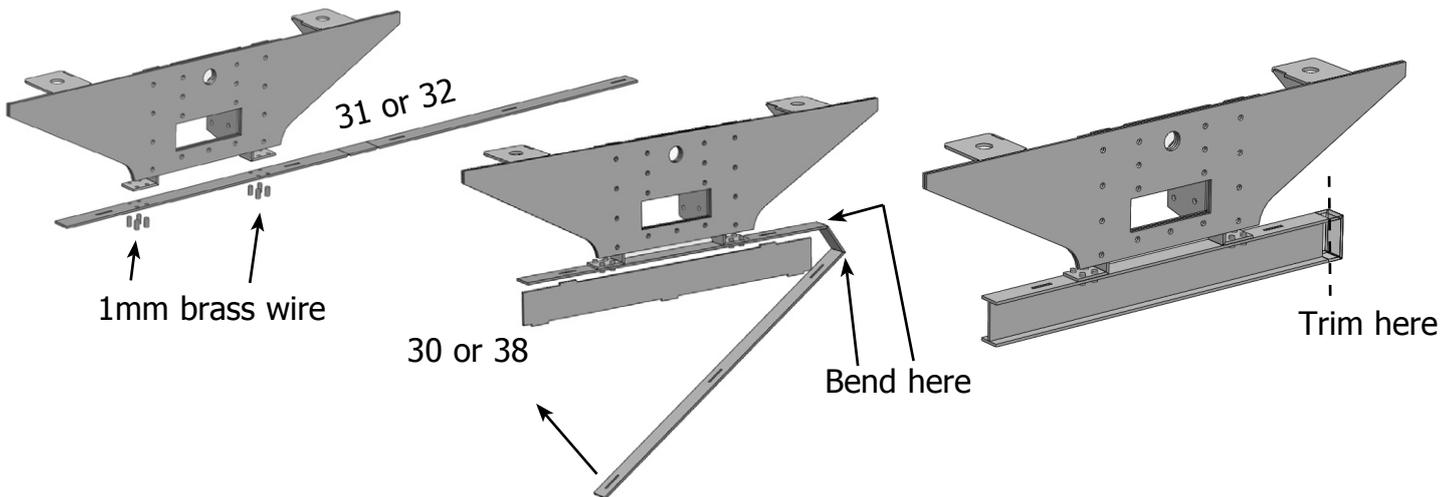
4. Couplings

This is a convenient point to mention the couplings, but they can be done at virtually any stage. Clean up the castings and fit to the pockets by inserting an 8 BA screw from below. Once fitted satisfactorily, remove them and store carefully until fitting permanently after painting. Note that front and rear couplings are different.



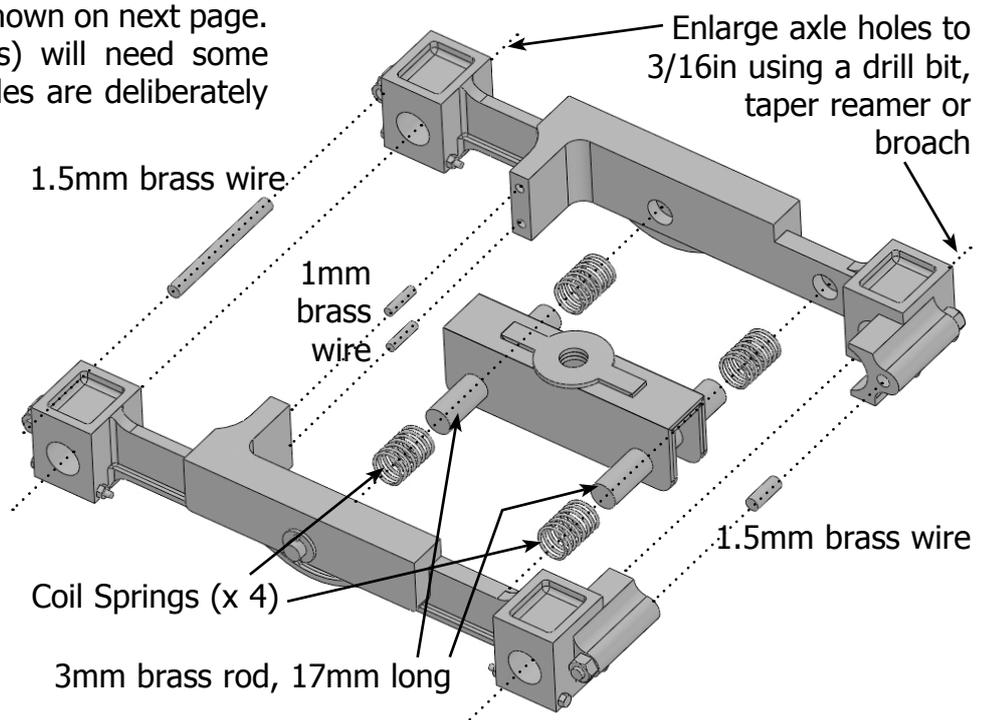
5. Derailing Beams

Both ends are identical, but only the rear is shown. Fit etched part 31 or 32 to the underside of the brackets with sort pieces of 1mm (40 thou) brass rod. Once soldered, trim them all so that about 0.5mm projects above and below. Then bend the strip around part 30 or 37 and solder in place. Finally, trim off the excess so that the beam looks like a proper 'I' section.

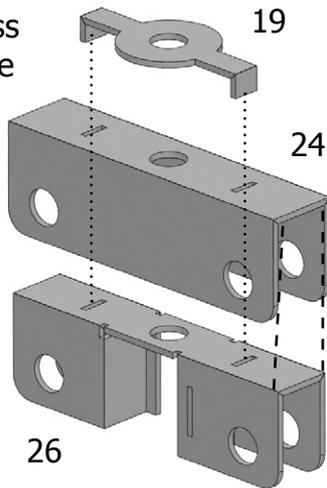


6. Front Bogie

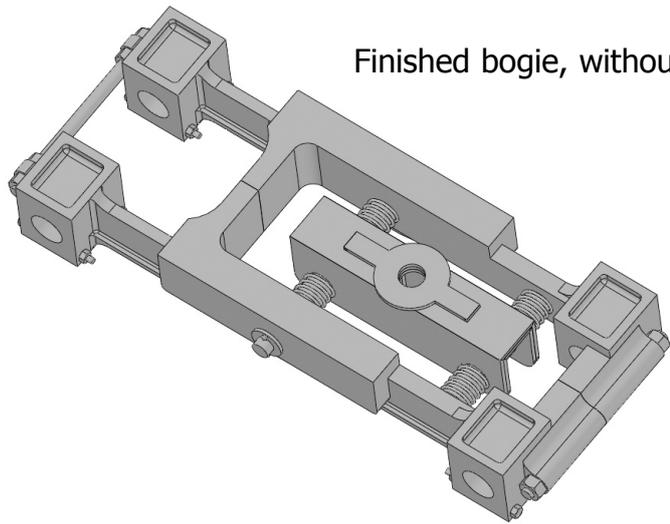
Fold and solder the etchings as shown on next page. The bogie side frames (castings) will need some work with drills etc. The axle holes are deliberately under-sized, because they need to be a good smooth finish to act as bearings. The holes for the location pins will also need to be drilled deeper. Cut the brass wire as shown (pin length will depend on how deep you've drilled). Assemble the two halves together with araldite - making sure all the pins, rods and springs are in place. The 3mm rod should not be glued. We recommend that you **don't solder** the two halves together, as the heat would damage the springs.



Etched brass bogie centre



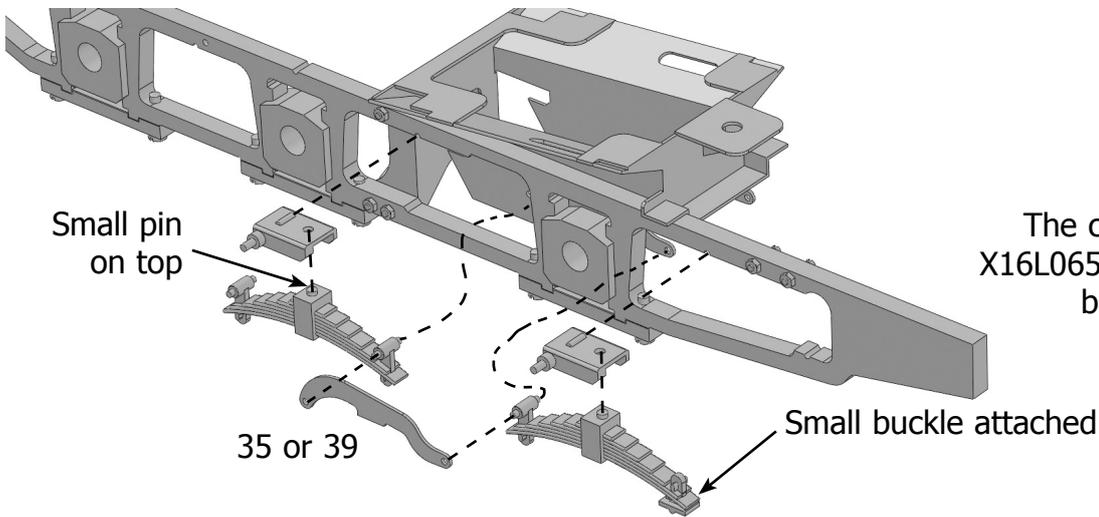
Finished bogie, without wheels



Once assembled, pass a 3/16in drill (or better still, a 3/16in parallel reamer) through the axle holes until the axles are a good rolling fit. Etched washers are provided to ensure that sideplay between the wheels and the bogie is kept to a minimum - a few thou just to allow free running.

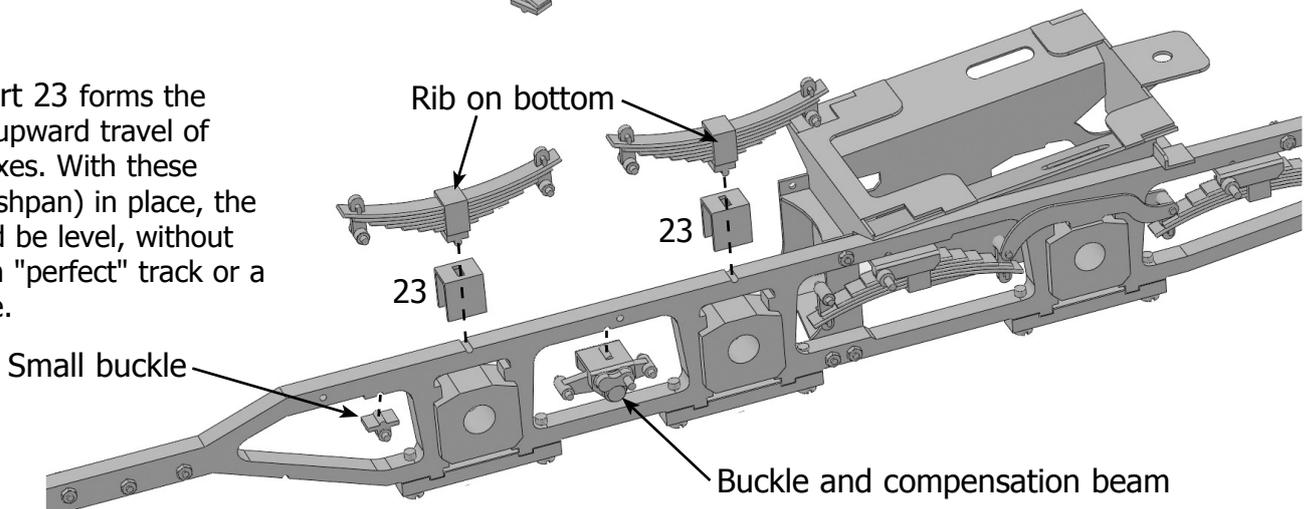
7. Dummy (Cast Brass) Springs

There are 4 leaf springs each side there are slight differences between the springs: one each of two types, and two of the third. Follow the diagrams carefully. The springs on both sides are identical, but the spring buckles are handed (four on one side, four mirror images on the other). Again, follow the diagrams carefully. Three of the buckles on each side also include the pivot pin for the brake hangers.

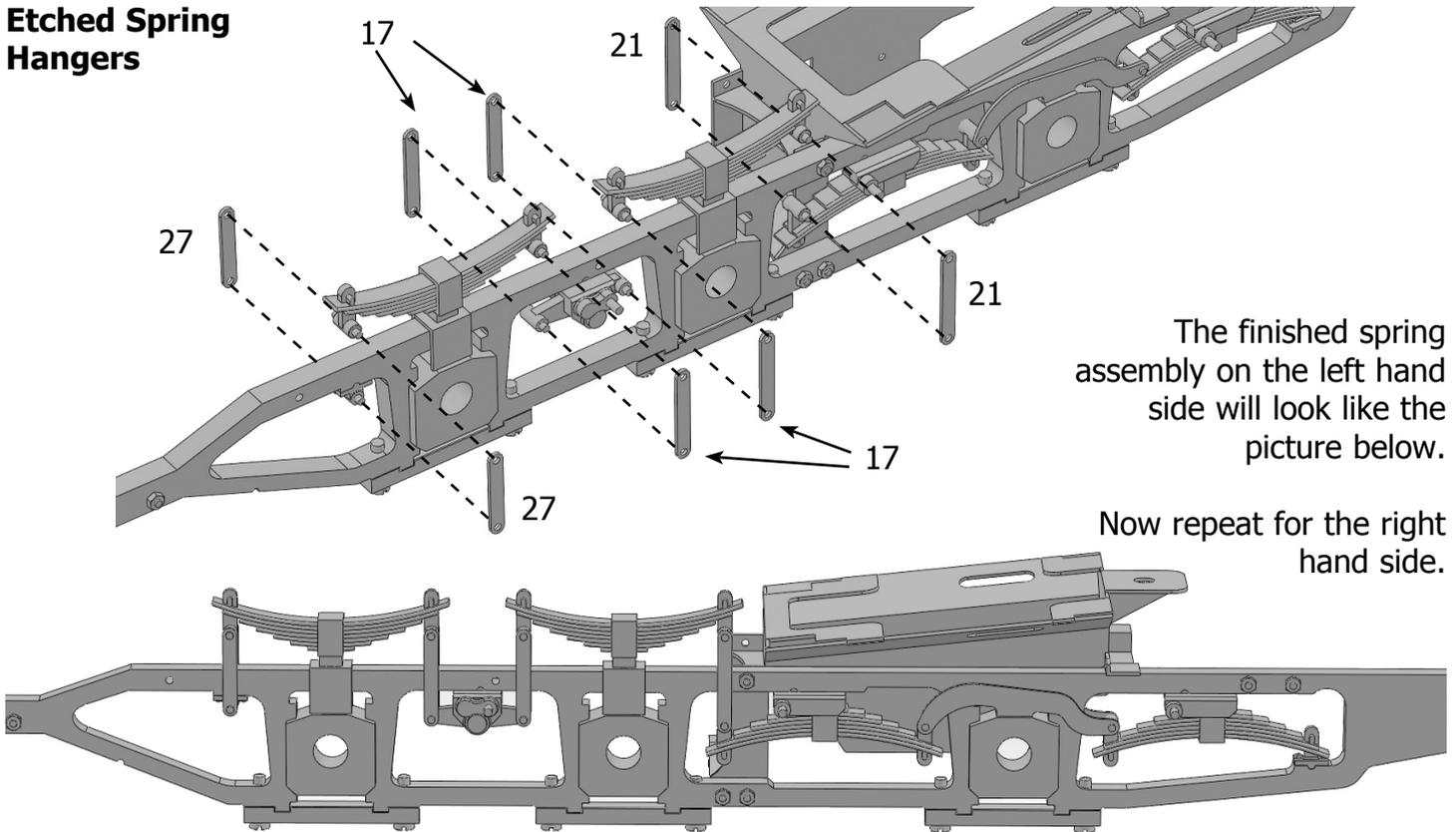


The cast springs are on sprue X16L0656 (2 off), and the spring buckles are on X16L0657.

Etched part 23 forms the "stop" for upward travel of the axleboxes. With these (and the ashpan) in place, the loco should be level, without rocking, on "perfect" track or a flat surface.



Etched Spring Hangers



The finished spring assembly on the left hand side will look like the picture below.

Now repeat for the right hand side.

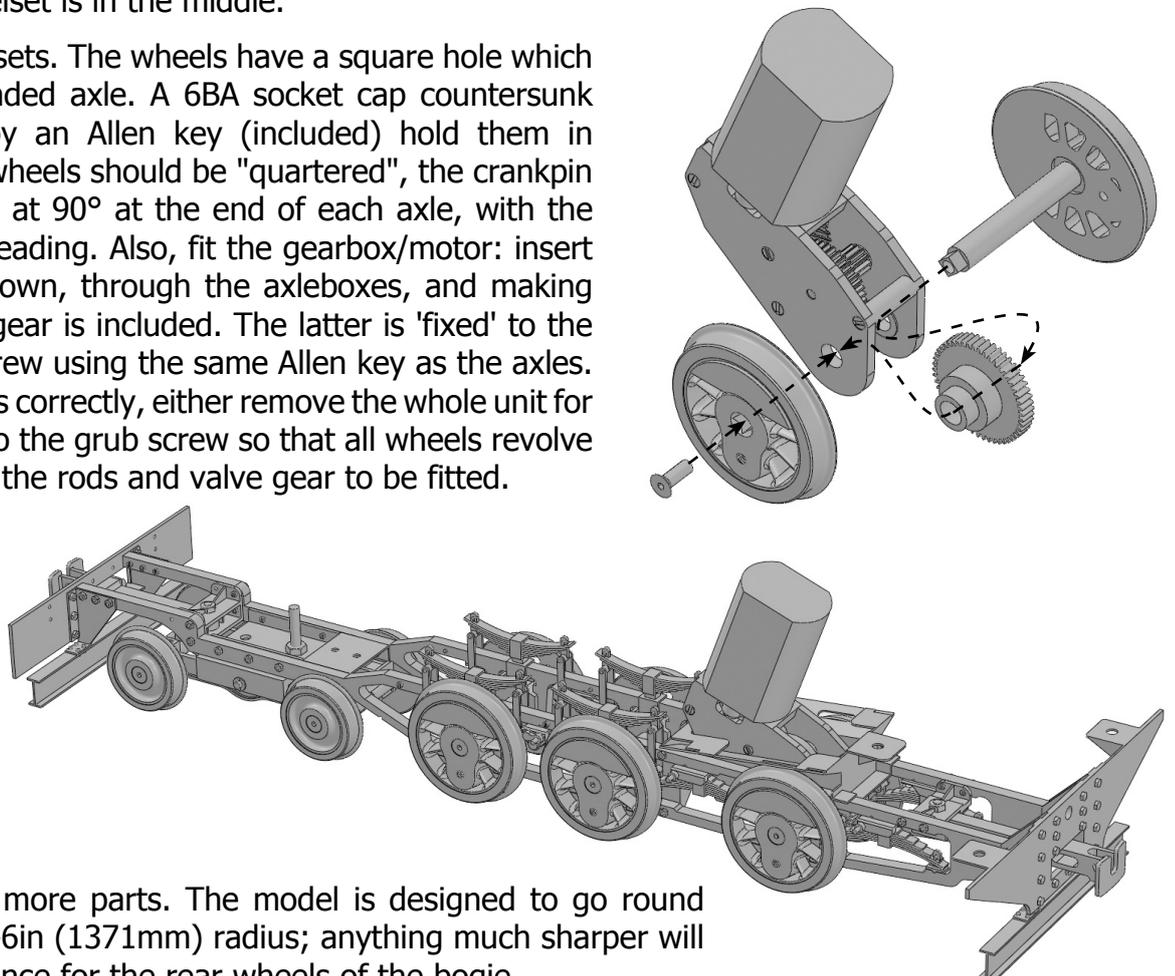
8. Wheels & Motor

Important note: Many of the following illustrations were prepared before the decision was made to provide flangeless centre driving wheels. The assembly method and order is not affected, except that the flangeless wheelset is in the middle.

Insert all the wheelsets. The wheels have a square hole which fits on a square ended axle. A 6BA socket cap countersunk screw, tightened by an Allen key (included) hold them in place. The driving wheels should be "quartered", the crankpin positions should be at 90° at the end of each axle, with the right hand wheels leading. Also, fit the gearbox/motor: insert the rear axle as shown, through the axleboxes, and making sure that the final gear is included. The latter is 'fixed' to the axle with a grub screw using the same Allen key as the axles. Once you know it fits correctly, either remove the whole unit for safekeeping or undo the grub screw so that all wheels revolve smoothly to enable the rods and valve gear to be fitted.

Now is a good time to try the chassis on your sharpest curve by hand or better still, propelled by another loco. It will be easier to make modifications now

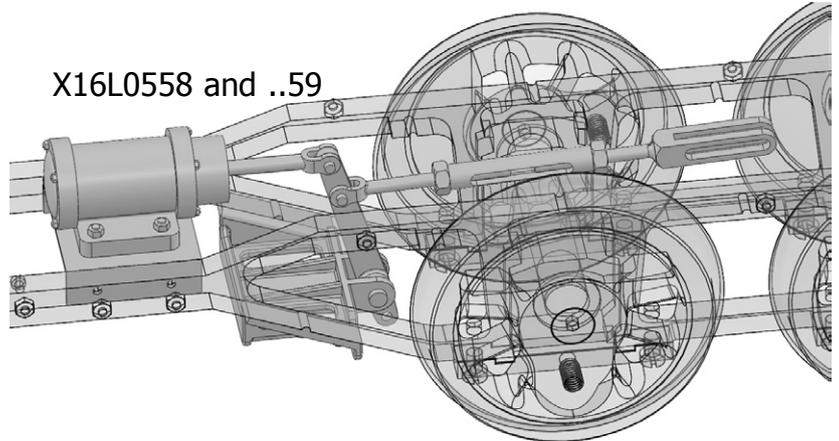
before adding any more parts. The model is designed to go round curves down to 4ft-6in (1371mm) radius; anything much sharper will require extra clearance for the rear wheels of the bogie.



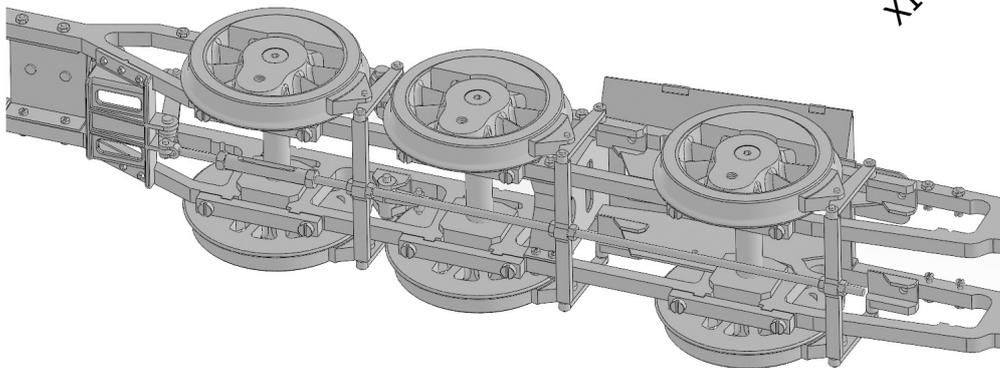
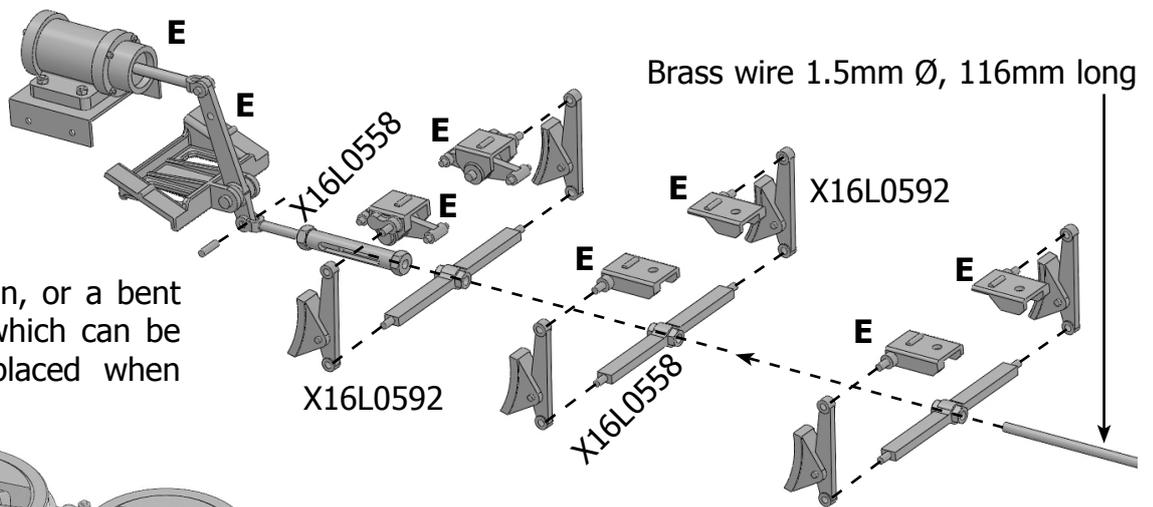
Important Note: in most of the following illustrations, to assist with clarity, we only show those parts relevant to the assembly item being described. Also, assembly of valve gear parts is mostly shown for the Left Hand side of the loco. The right hand side is an exact mirror image unless otherwise noted.

9. Brake Gear

Fit the steam brake cylinder, crank bracket and large crank as shown. The slotted rod with turnbuckle, should be trial fitted, but cannot be fixed until the battery platform is complete (page 17). The remaining brake gear should be assembled and soldered or glued in situ. **Don't** fix the top of the plastic brake block hanger or where the turnbuckle connects to the large crank. This way, the brake block unit can be removed and replaced to enable the wheels and motor to be removed during the remaining assembly work and for future maintenance. The join with the large crank could have a nut and bolt through, or a split pin, or a bent piece of 1mm wire which can be snipped off and replaced when needed.



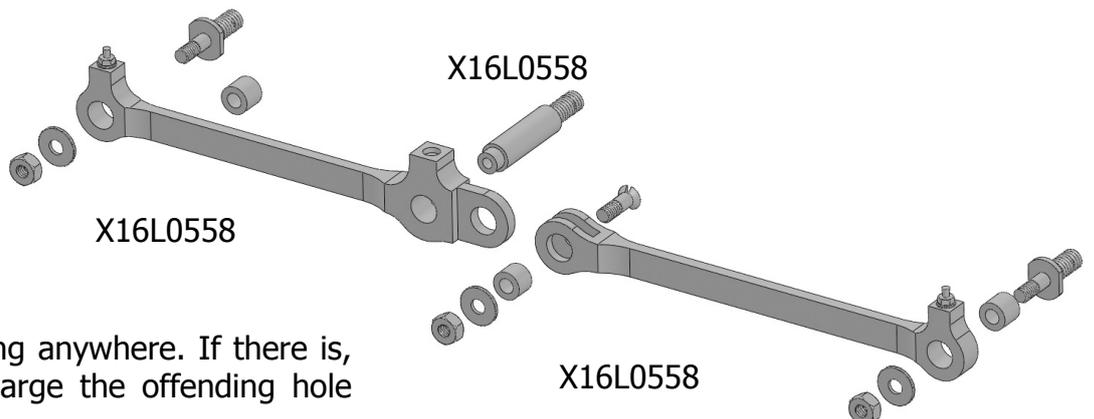
[Above: frames shown "see-through"]



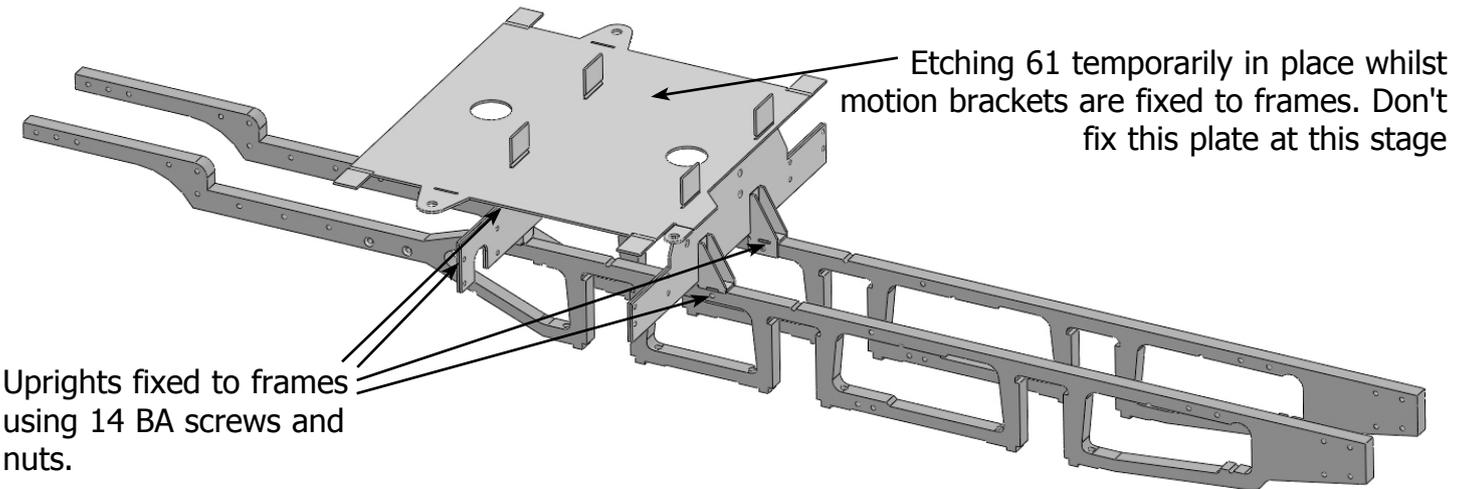
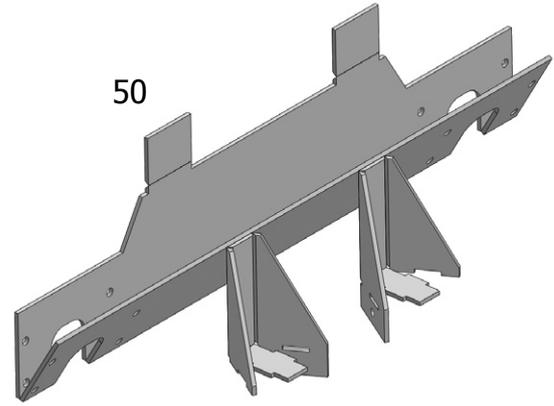
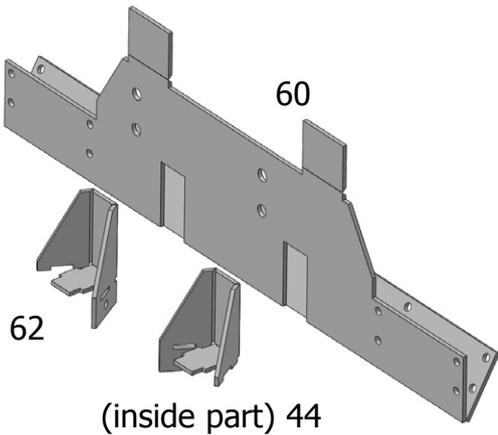
The diagram above shows the relevant parts "exploded" (E = existing part, already fitted), whilst that to the left shows the assembly with wheels, etc.

10. Coupling Rods

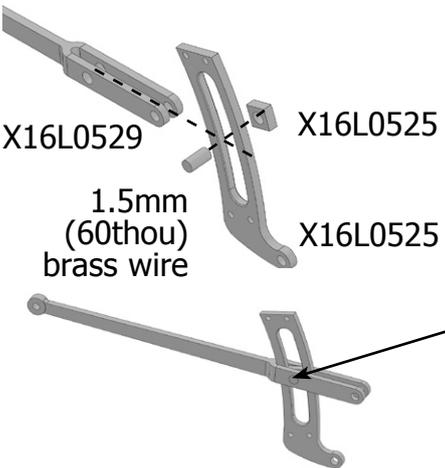
Assemble and fit the coupling rods (left hand side shown). The rods have been jig drilled, so very little "fitting" work should be needed. As part of the fitting process, make sure the wheels and rods move smoothly, with no binding anywhere. If there is, gently (very gently) enlarge the offending hole until it does run well.



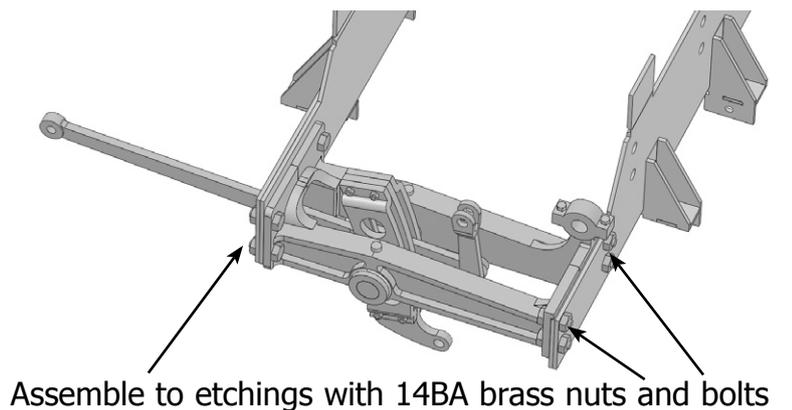
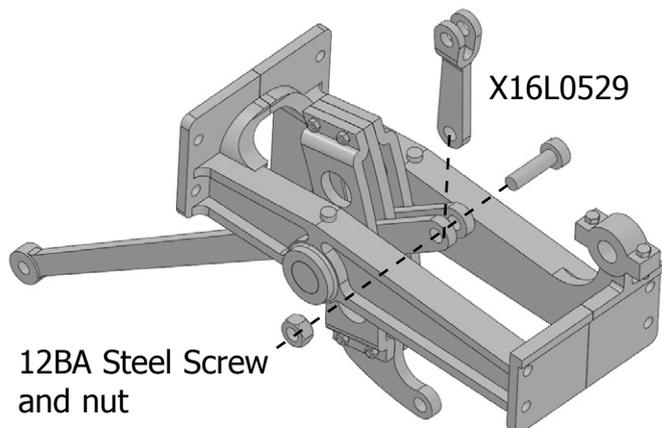
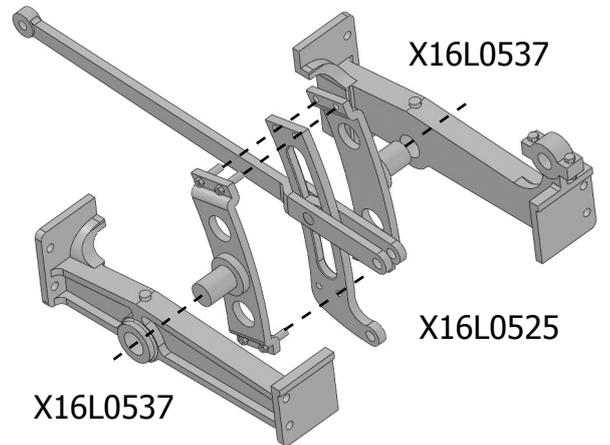
11. Motion Brackets etc.



Expansion Link and Radius Rod

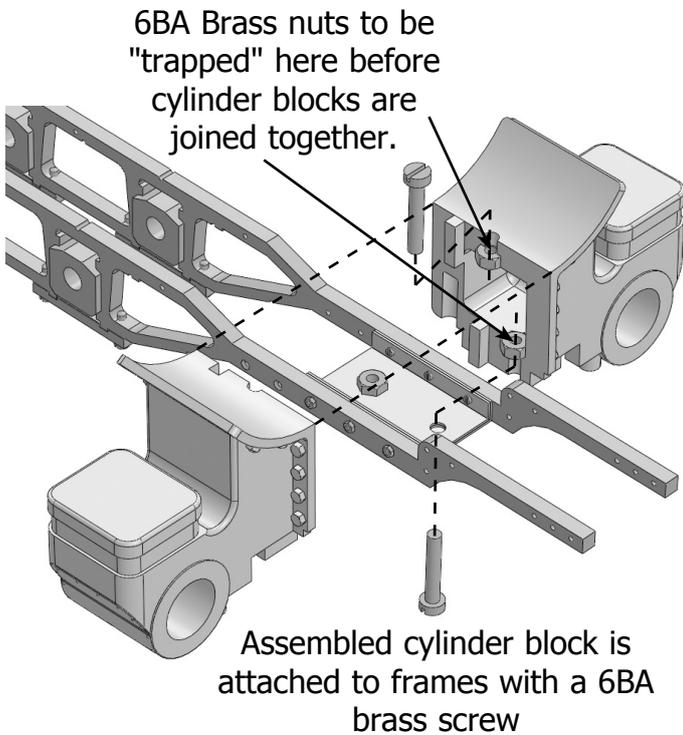


Be very careful when fixing this pin! Make sure that all parts move freely - die block slides up and down, and the radius rod rotates relative to the die block.

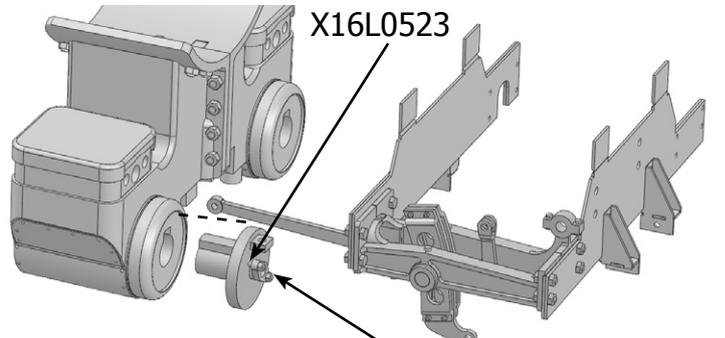


12. Cylinders and Slide Bars

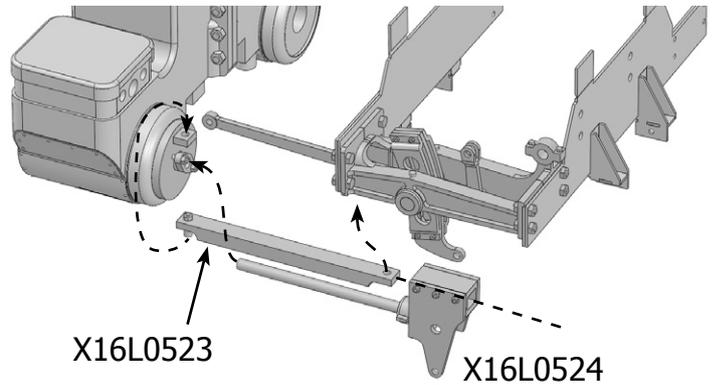
Important: All moving parts, in particular the cylinder and valve slidebars and crossheads, must move smoothly and without slop. As you add each part to the assembly, test the movement. Then, if anything binds, it must be the latest addition which is causing the problem. Sort it out before proceeding!; do not leave it until everything is assembled.



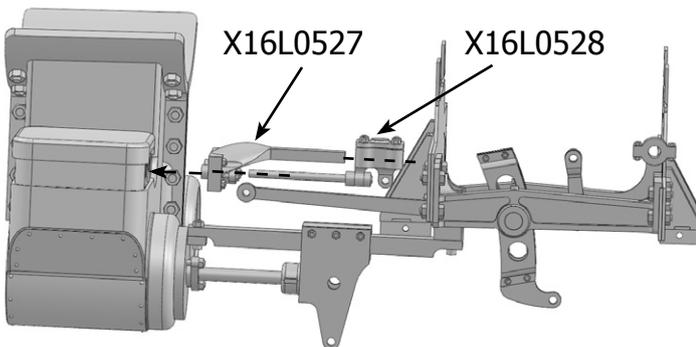
Choose which resin cylinder covers to use. (The domed outer cover was supplied new, but many locos soon lost them, leaving the inner cover with nuts exposed).



The piston rod (next illustration) must be a good sliding fit. The glands slope downwards towards the the middle

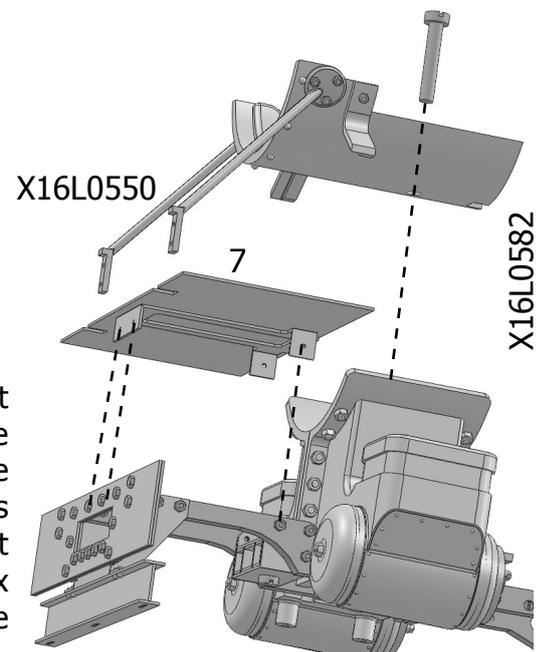


Smooth all faces of the slidebar, then with a small square file smooth the inside of the crosshead until they slide easily, but avoid removing too much material. Also, smooth the piston rod to be a sliding fit in the cylinder end.

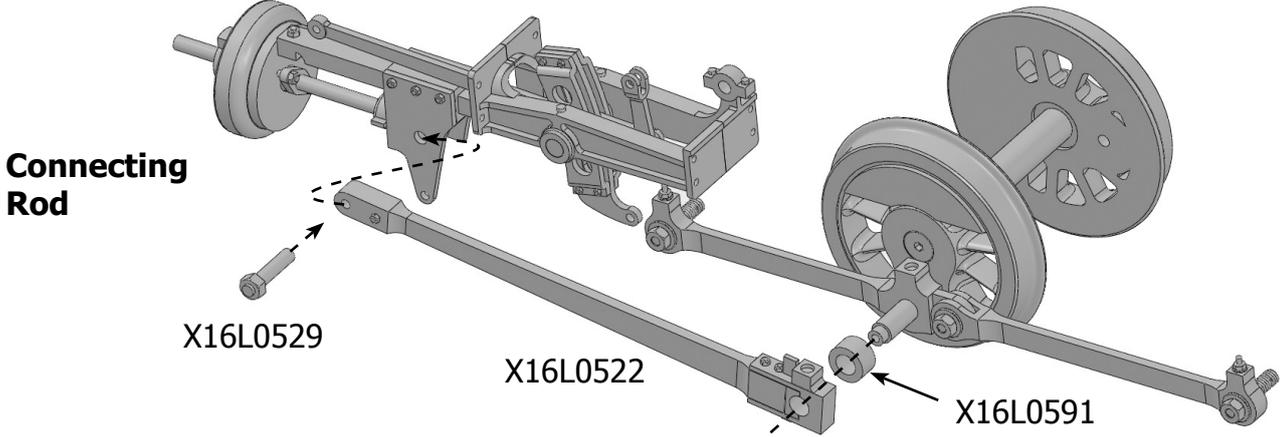


Similarly, the valve guide, valve crosshead and valve rod need to be smoothed to ensure good operation.

Fold the front footplate (7) as shown, and assemble to front of frame. Note that the front fold down flap goes inside the buffer beam, but the rear ones go outside the frames. The bottom section of the smoke box (X16L0582) and the two struts (X16L0550) can now be fitted. Use the screw to ensure the correct location; the rear of the smokebox bottom and the smokebox saddle should be flush, but it is suggested not to glue it in place until the top half is also located as part of the body construction.

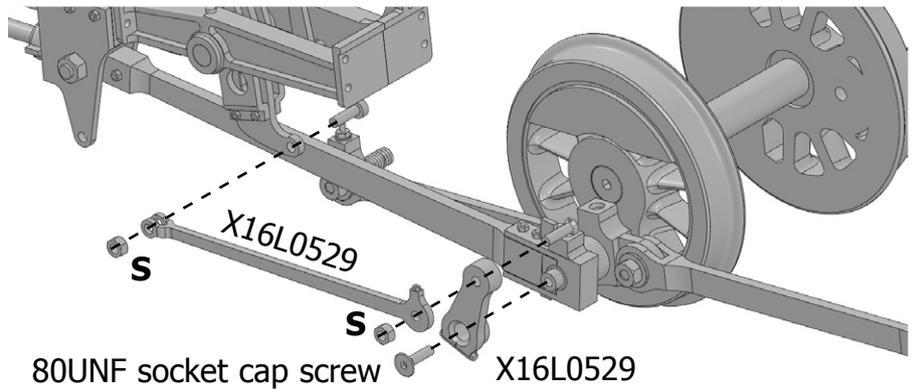
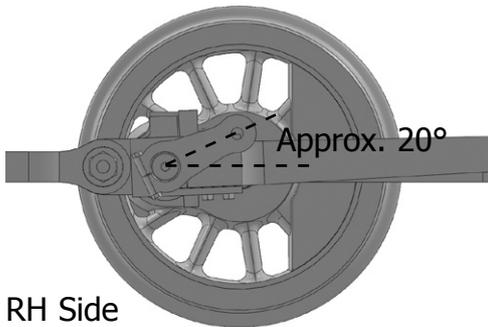
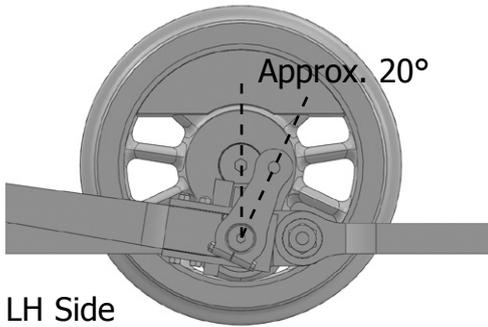


13. Valve Gear (most assembly done with 12BA steel screws and nuts - marked "S")

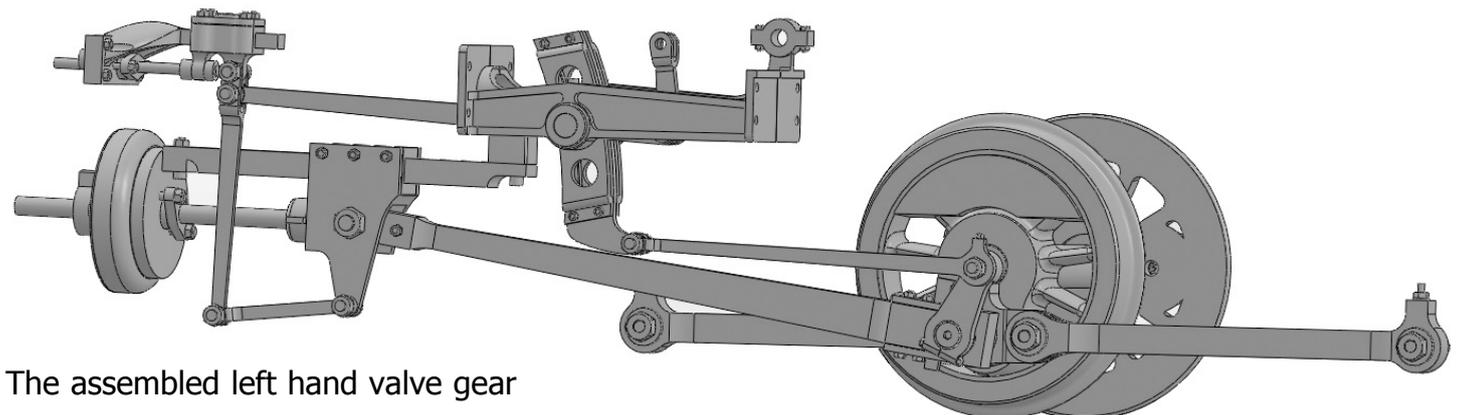
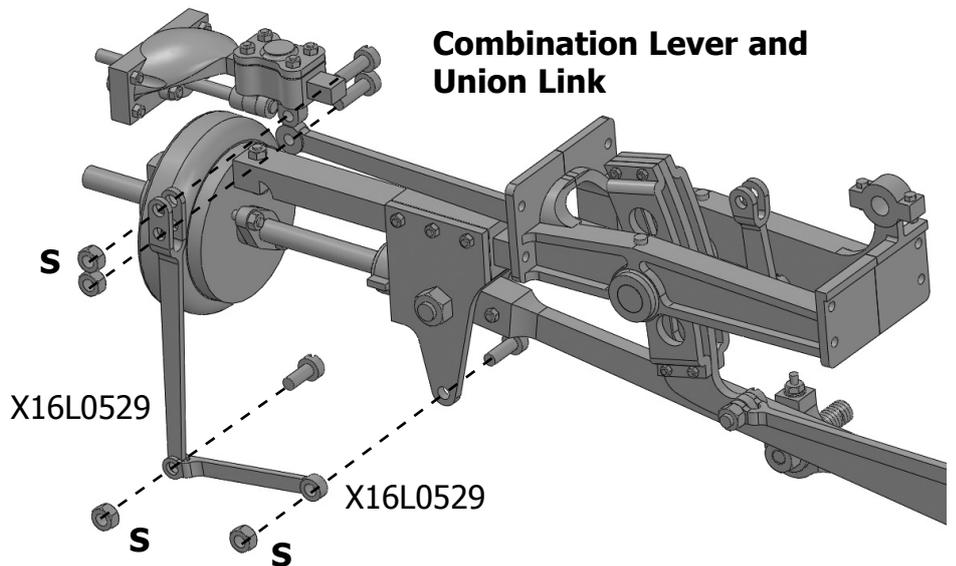


Return Crank and Rod

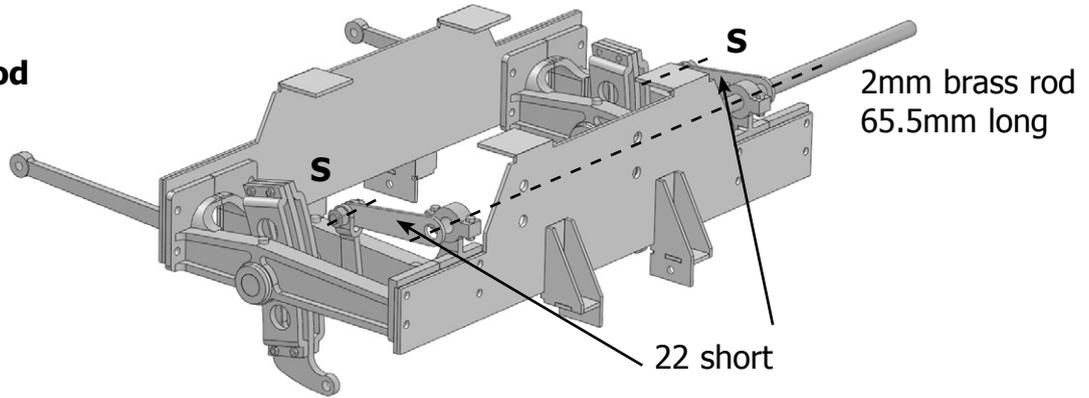
Set the crank as shown below (the angle does not need to be exact), then secure with the 80UNF screw, using the smaller Allen Key.



Combination Lever and Union Link

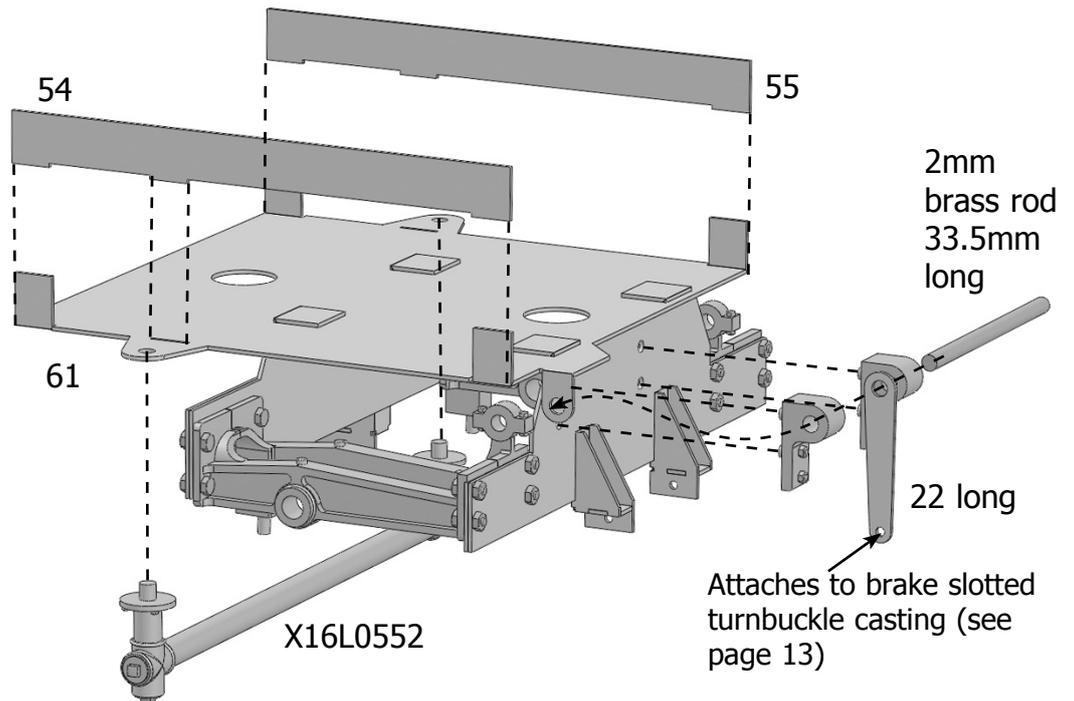


Reverser Cross Rod



14. Battery Platform

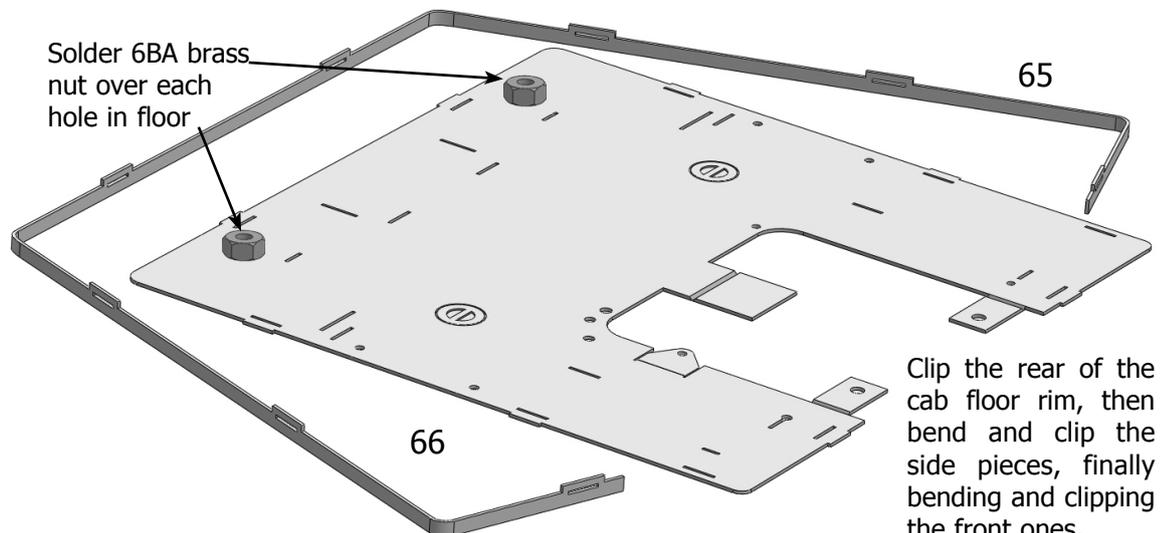
Refit etching part 61. Fold down the tabs at the top of the etched motion brackets. Fold up the stengthener supports, and fold down the brake bracket. Assemble the remaining parts of the brake gear as shown. Add the strengthener parts to the battery platform. Add the tank balance pipe (which has to part of the chassis assembly).



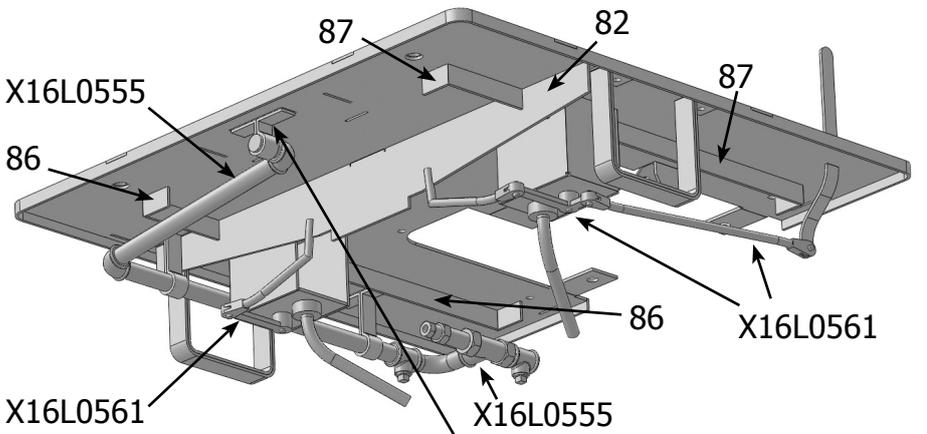
You've now finished the difficult part of the assembly work and completed the "chassis". We now start on the "body":

15. Cab Floor

In the absence of a full length footplate (as in British practice), the cab floor is the foundation on which everything else rests. The rim is on the outside of the floor, with the top level with the floor. The rim and cab floor have tabs and slots to help with location whilst soldering. afterwards they should be filed flush with the floor or rim. If necessary, use filler (Milliput) to make sure that no recesses remain, prior to painting.

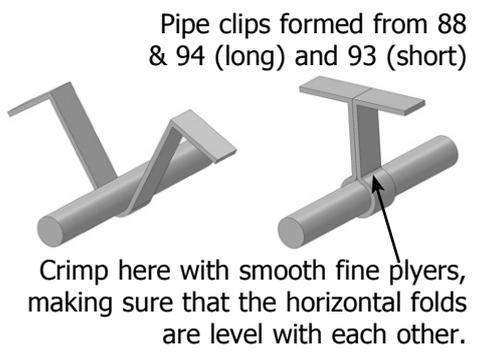
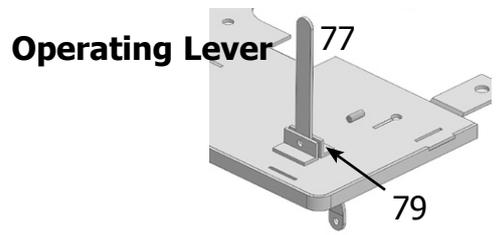
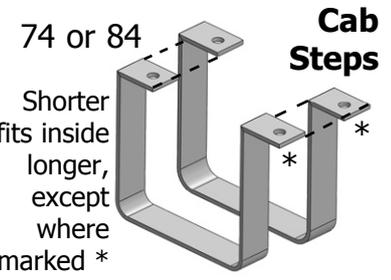
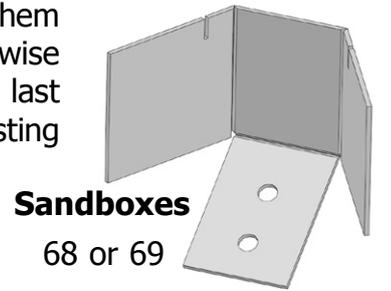
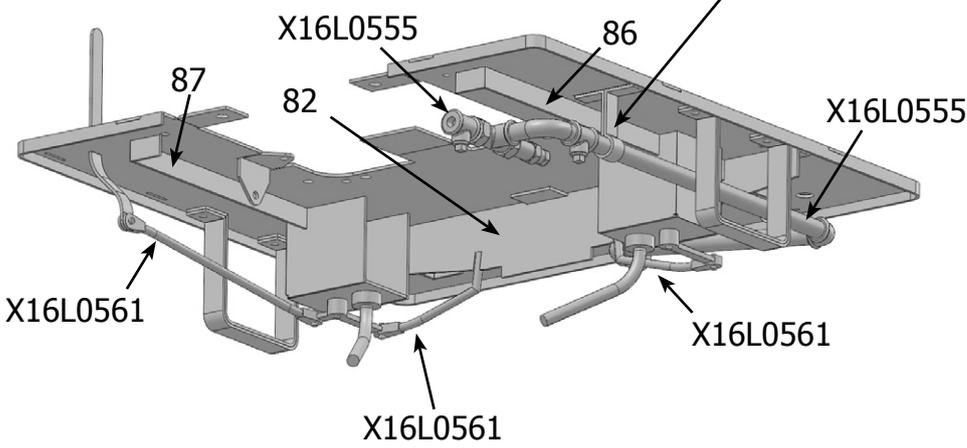


Fit the etchings and castings to the underside of the cab floor. Fix all of them at this stage, except the sandpipe castings (best left until the body is otherwise finished, but shown here for clarity). Leave the sandbox operating lever until last (because all the other parts are easier done with the floor upside down resting on a suitable surface).



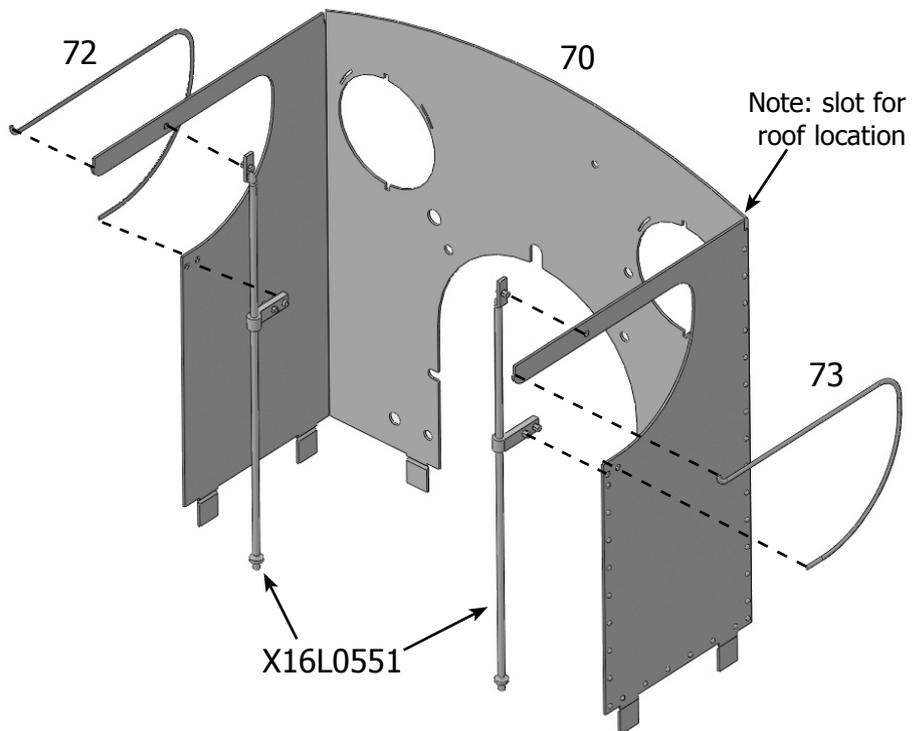
The centre tab on part 82 does not pass through a slot, but folds down and is fixed to the underside of the floor

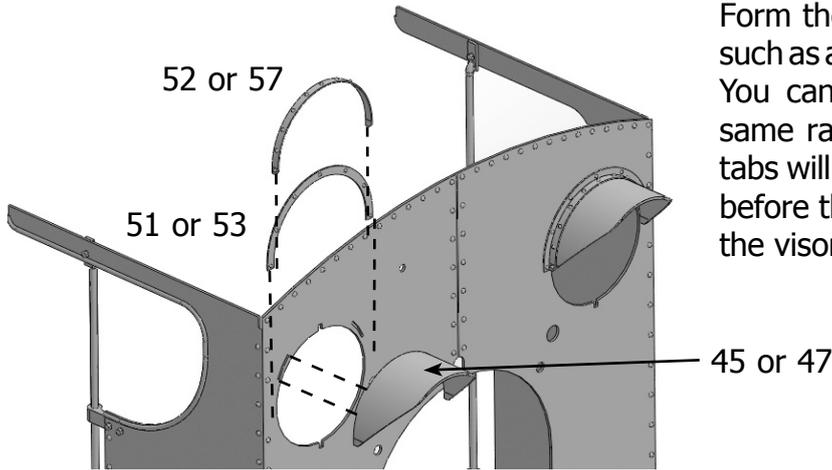
Pipe clips (3 off) located by rectangles half-etched on underside of cab floor



16. Cab Front

Bend the cab front to shape shown, after forming the rivets. Note that there is a half etched line in the middle of the cab front sheet, representing the joint between the sections. Be careful not to bend this accidentally.

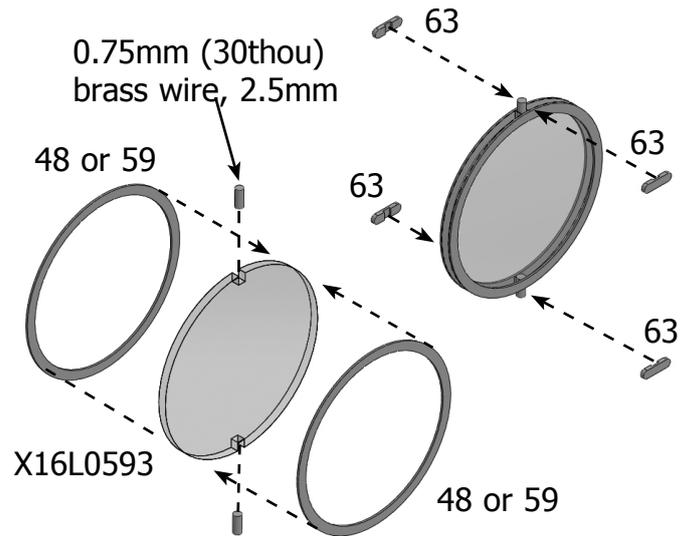




Form the curved visor over a suitable round former, such as a small broom handle (about 3/4 inch diameter). You can check it's right because the inside is the same radius as the hole for the windows. Also, the tabs will fit correctly. Fit the rivetted "horseshoe" first before the second strip which has to be formed over the visor. (Both visors are identical, i.e. not handed).

17. Cab Windows

Each window is formed from a "sandwich" of laser cut clear plastic and two thin brass disks (etched). The rotation pivots are pins formed from brass wire. All held together with two part epoxy (don't be tempted to use superglue/ACC). Note that the clear plastic has a protective film on both faces. The pins are located in slots at the top and bottom of the window holes, held in place by tiny etched plates (part 49). With care, the windows will pivot. Whether you attach them before or after painting the cab front is best decided between you and your painter (if that isn't you!).

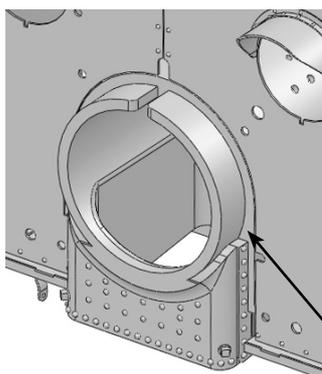


18. Fit Cab Front and Firebox

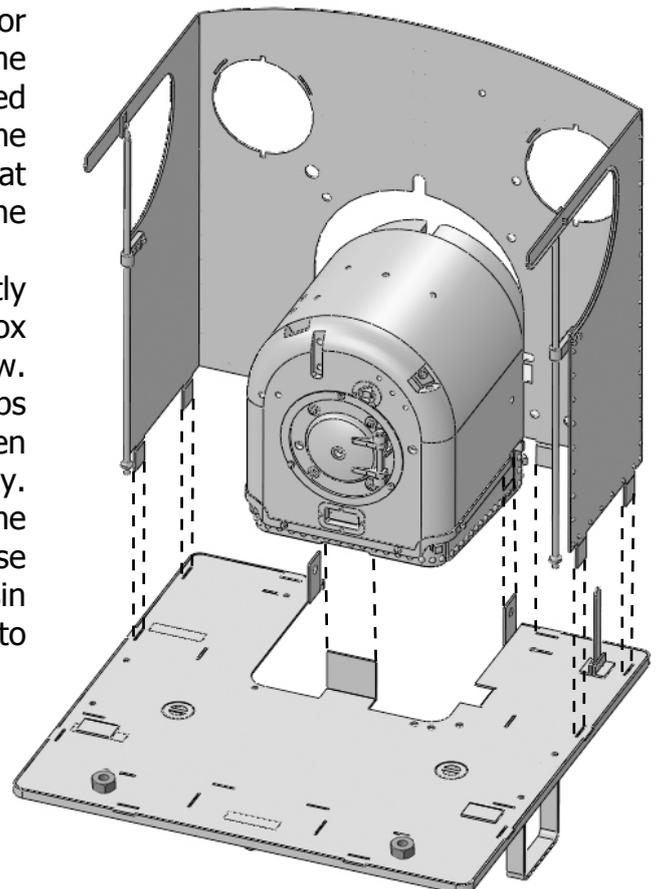
Make sure that all the small holes in the resin firebox for boiler fittings are drilled correctly before some become inaccessible. The firebox slides down onto the upturned tabs, with the two side ones outside and the rear one inside as shown. The bottom of the firebox should be at the same angle and fit onto the top of the ashpan in the chassis.

Now fit the cab front; if both parts are correctly located, the front of the lagged section of the firebox should be flush with the front of the cab, as shown below. When satisfied, remove the firebox, fold over the 6 tabs underneath and solder the cab front to the floor. Then "fiddle" the firebox into place and fix with 2-part epoxy.

Alternatively fix both parts at the same time with epoxy because of the risk of damage to the resin by the amount of heat needed to solder the cab front.



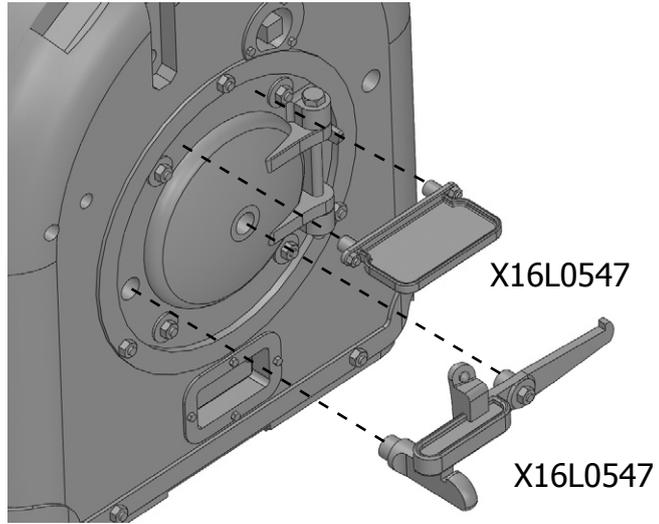
This face should be flush with the cab front.



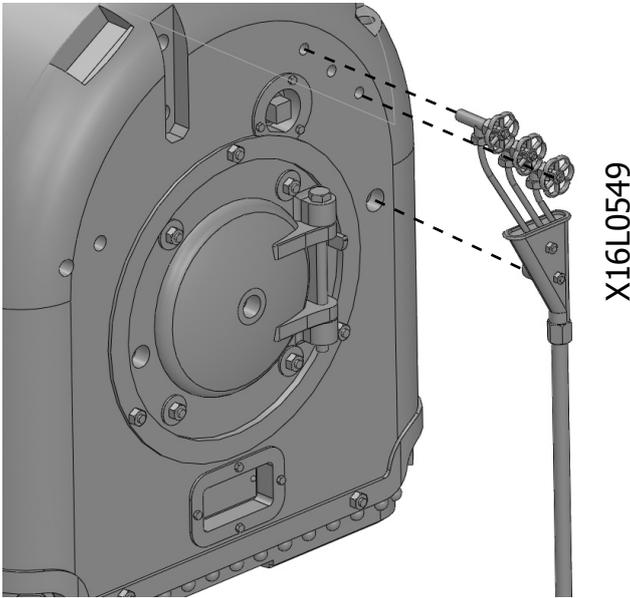
19. Backhead and Firebox Fittings

Assemble all the parts as shown on the next two pages. Most of these fittings require pipework to be formed from the copper wire supplied. For clarity, these are shown in red on the coloured illustrations on the rear cover.

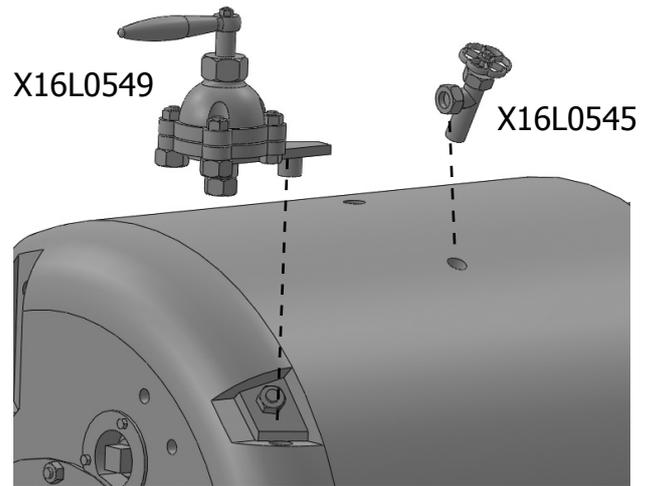
Shelf and firehole door handle



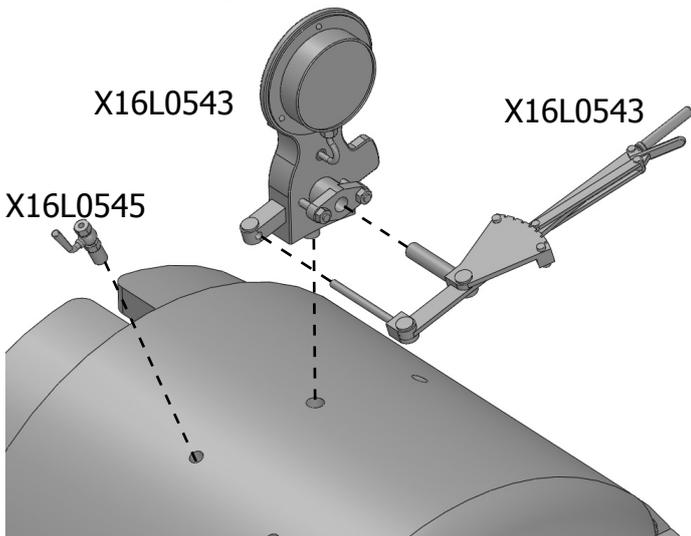
Try Cocks and Tundish



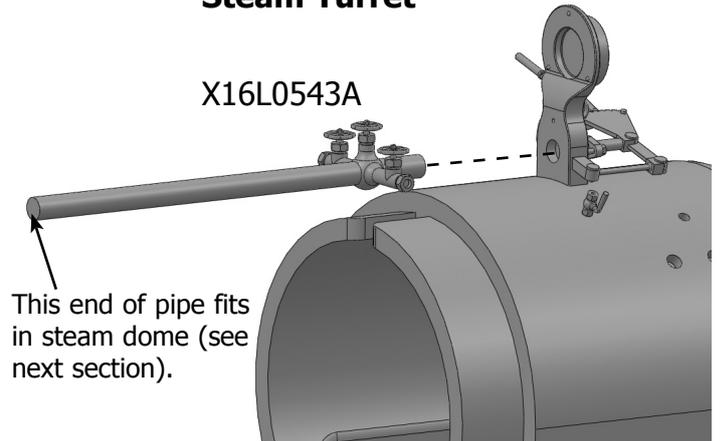
Steam Brake Control and Isolating Cock



Pressure Gauge and Regulator Handle

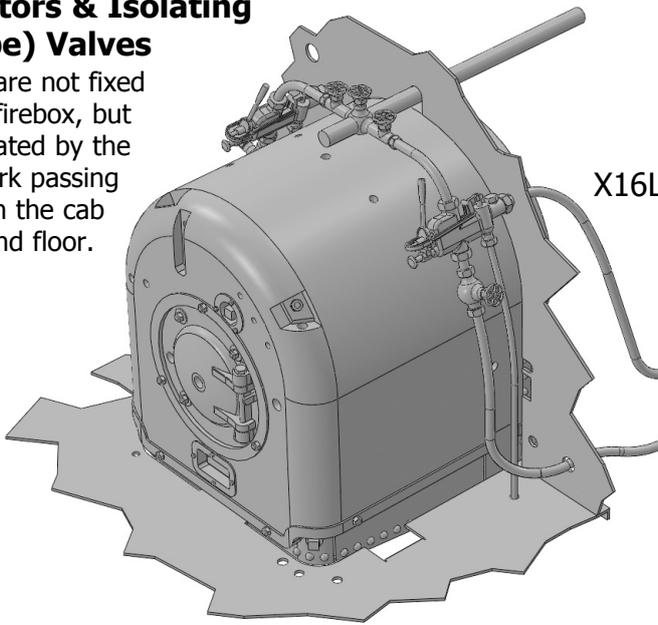


Steam Turret

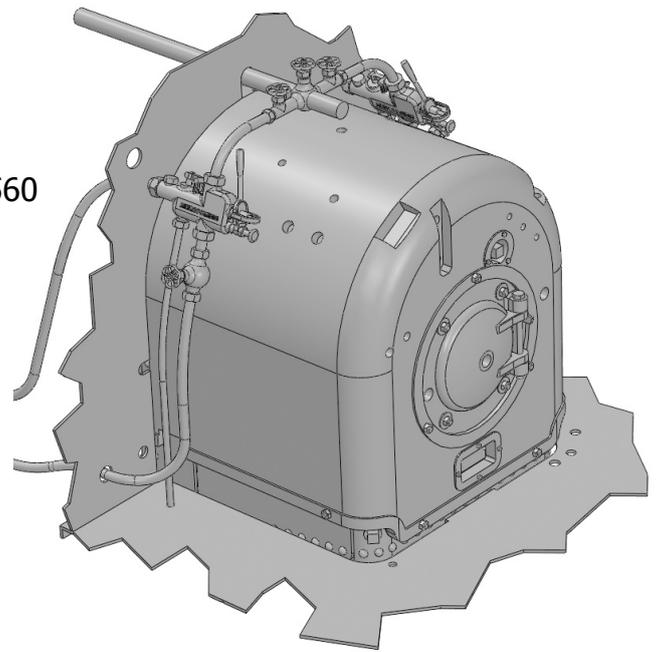


Injectors & Isolating (Globe) Valves

These are not fixed to the firebox, but are located by the pipework passing through the cab front and floor.

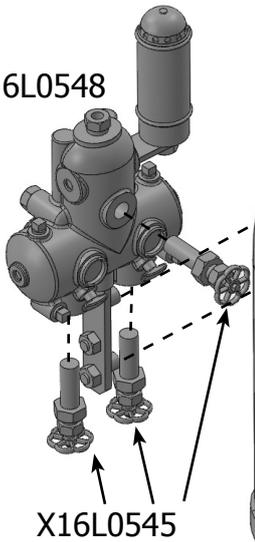


X16L0560

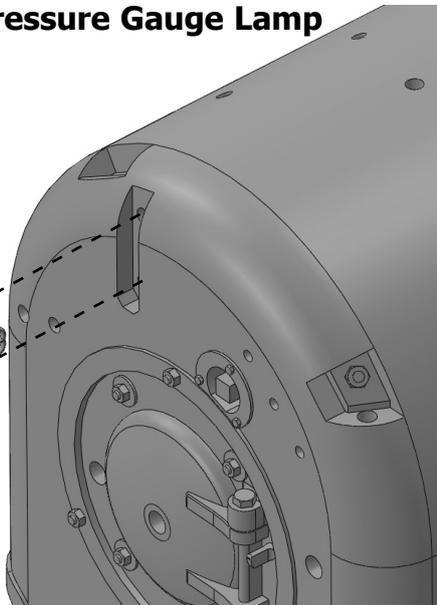


Lubricator and Pressure Gauge Lamp

X16L0548



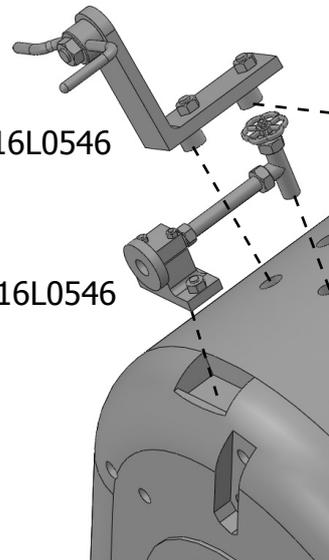
X16L0545



Handbrake Handle and Gauge Glass Isolating Cock

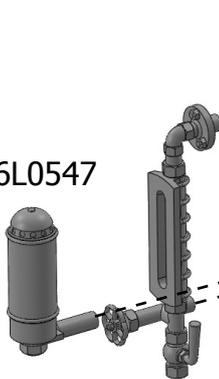
X16L0546

X16L0546

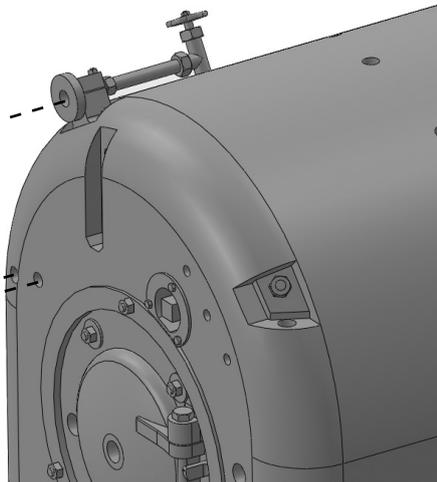


Gauge Glass and Gauge Glass Lamp

X16L0547

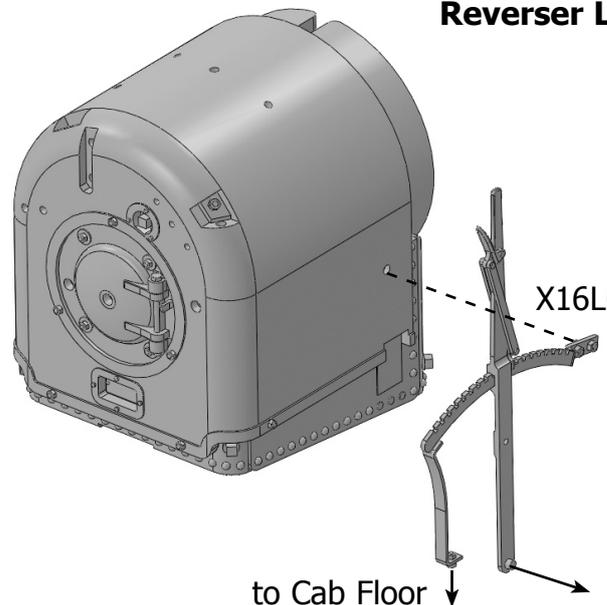


X16L0546



Reverser Lever

X16L0544



to Cab Floor

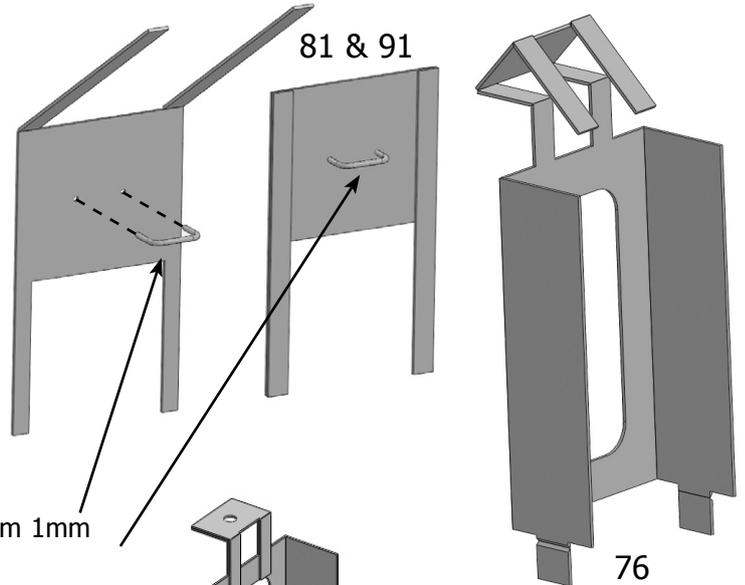
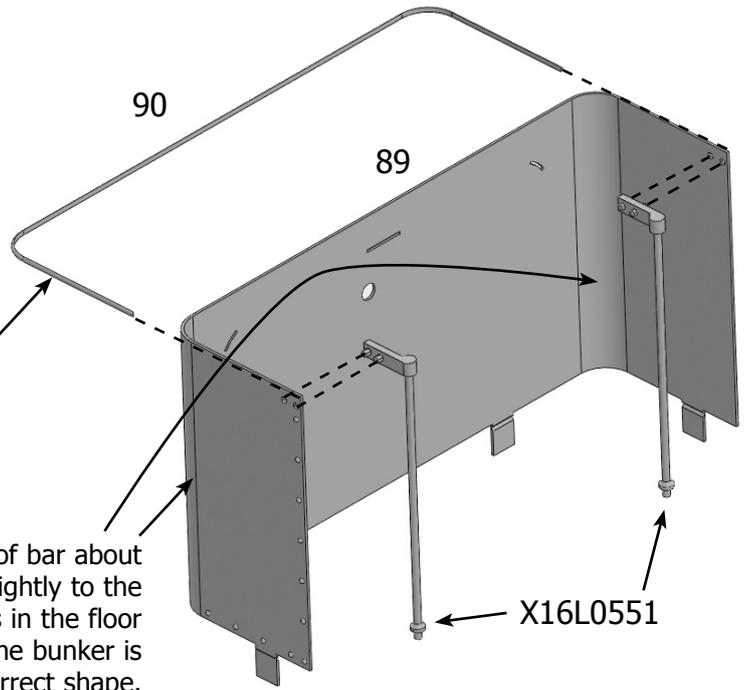
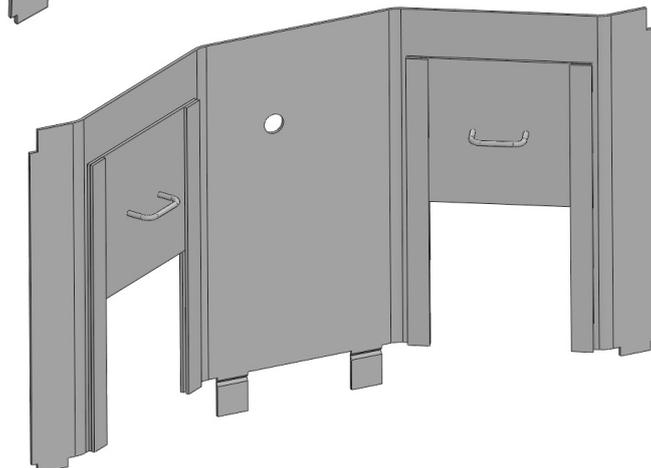
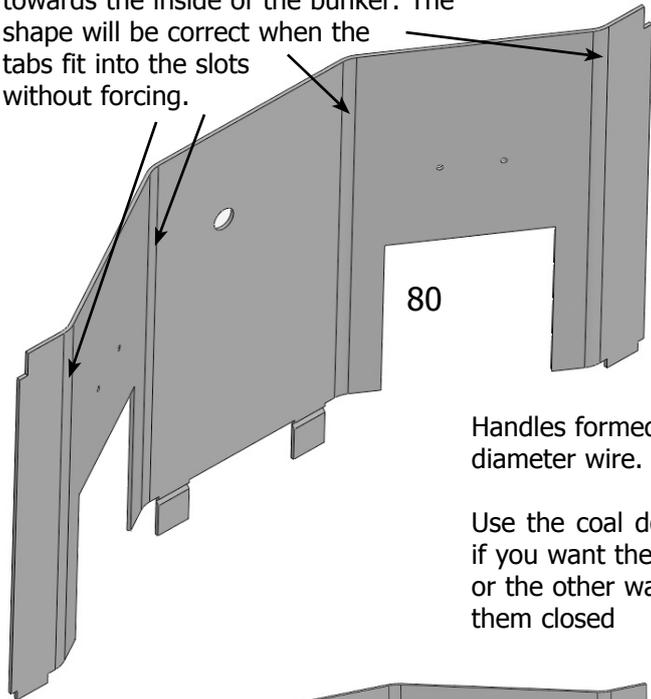
20. Bunker

For clarity, the pictures show the bunker parts separate from the floor, but in practice, you will need to keep referring to the floor to ensure the parts are the right shape. First, form the rivets, as described on page 5.

This strip is intended to represent half-round beading. Once bent and soldered in place, it is worth spending a few minutes with a fine file to add a fillet along its length

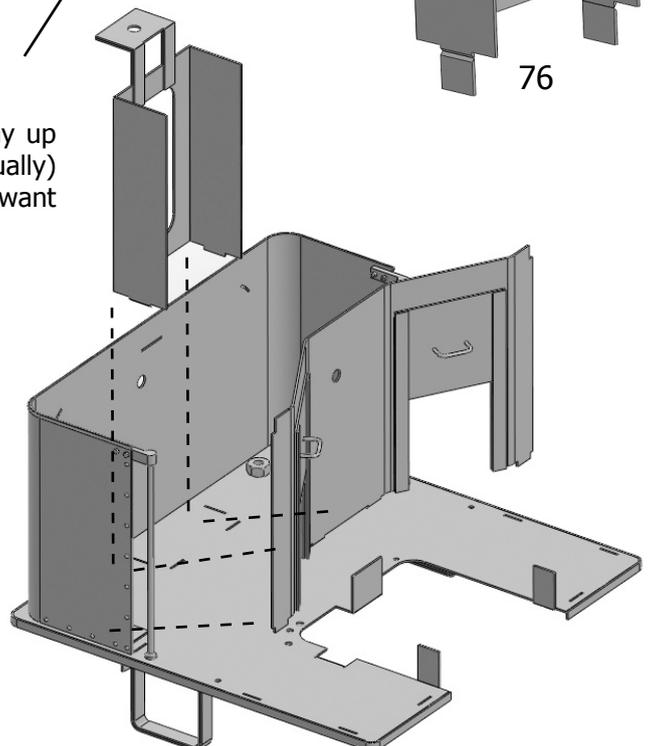
Form these bends around a piece of bar about 3/8in diameter. They will open up slightly to the correct radius. Try the tabs in the slots in the floor - they will fit without forcing when the bunker is the correct shape.

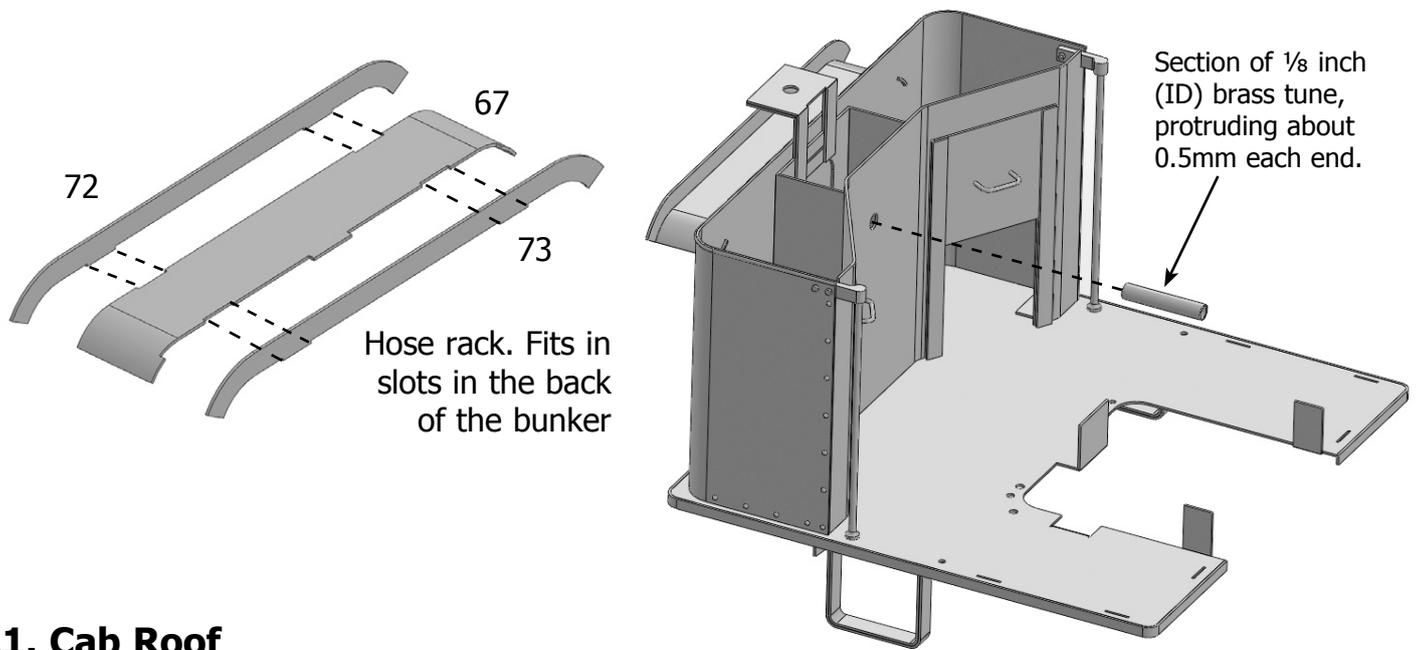
Form these bends with the same 3/8in diameter bar, with the multiple fold lines towards the inside of the bunker. The shape will be correct when the tabs fit into the slots without forcing.



Handles formed from 1mm diameter wire.

Use the coal doors this way up if you want them open (usually) or the other way up if you want them closed

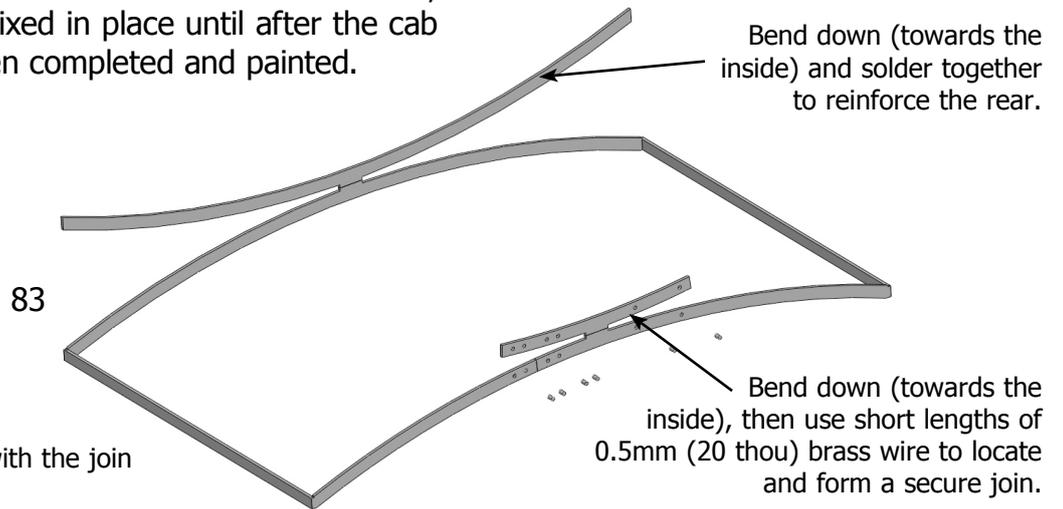




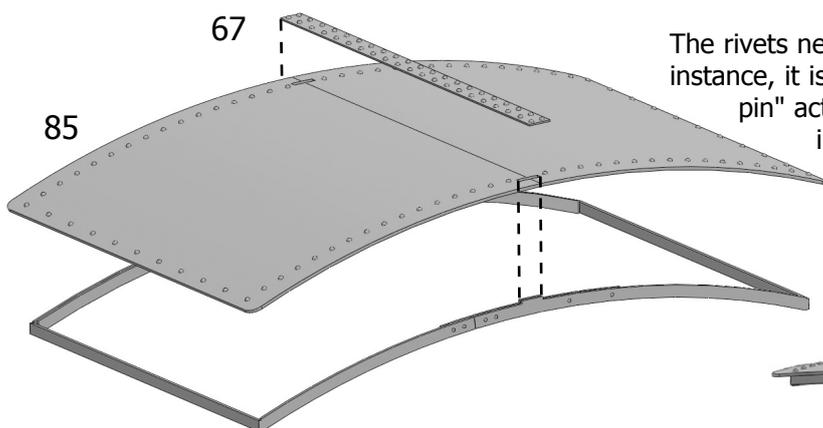
21. Cab Roof

The cab roof forms a unit which can be left removeable, but, either way, is best not fixed in place until after the cab interior and firebox have been completed and painted.

First, form the edge rim.

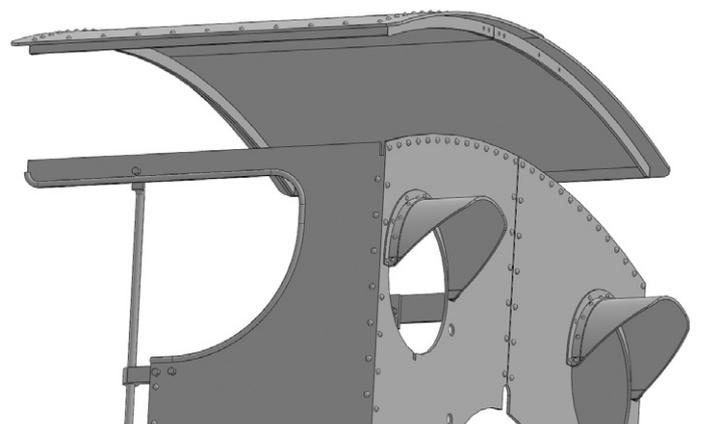


Bend rim to rectangle, with the join at the front



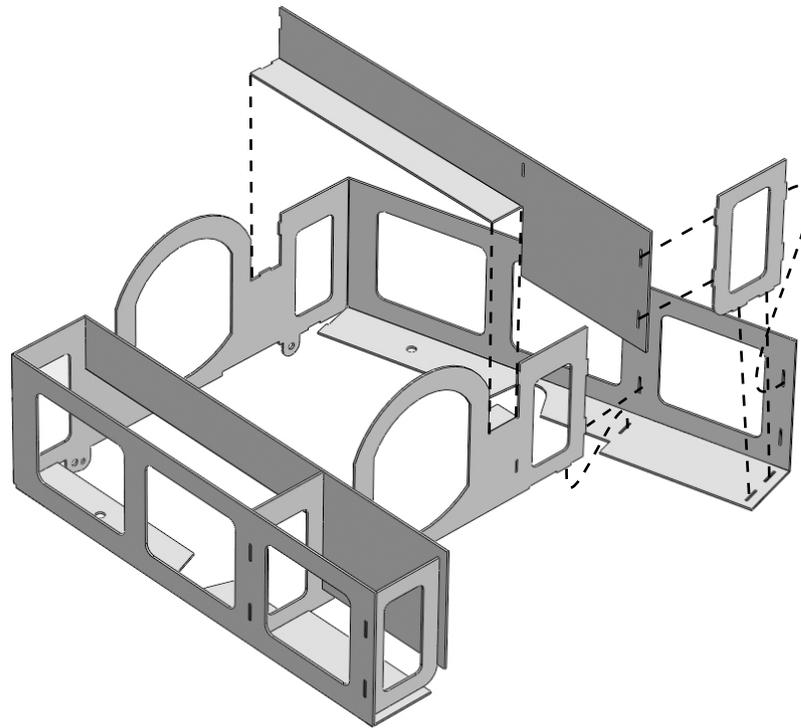
The rivets need to be formed in the cab roof, but in this instance, it is probably best to curve the roof first. Use a "rolling pin" action with a suitable bar (wood or metal) on the inside, whilst resting on a soft surface (your thigh is ideal!). Locate the roof on the tabs on the rim, then fix the rivetted cover strip.

The roof locates on the cab front with the front rim on the inside, and the side rim on the outside (this is what the slot is needed for).



22. Tank Framework

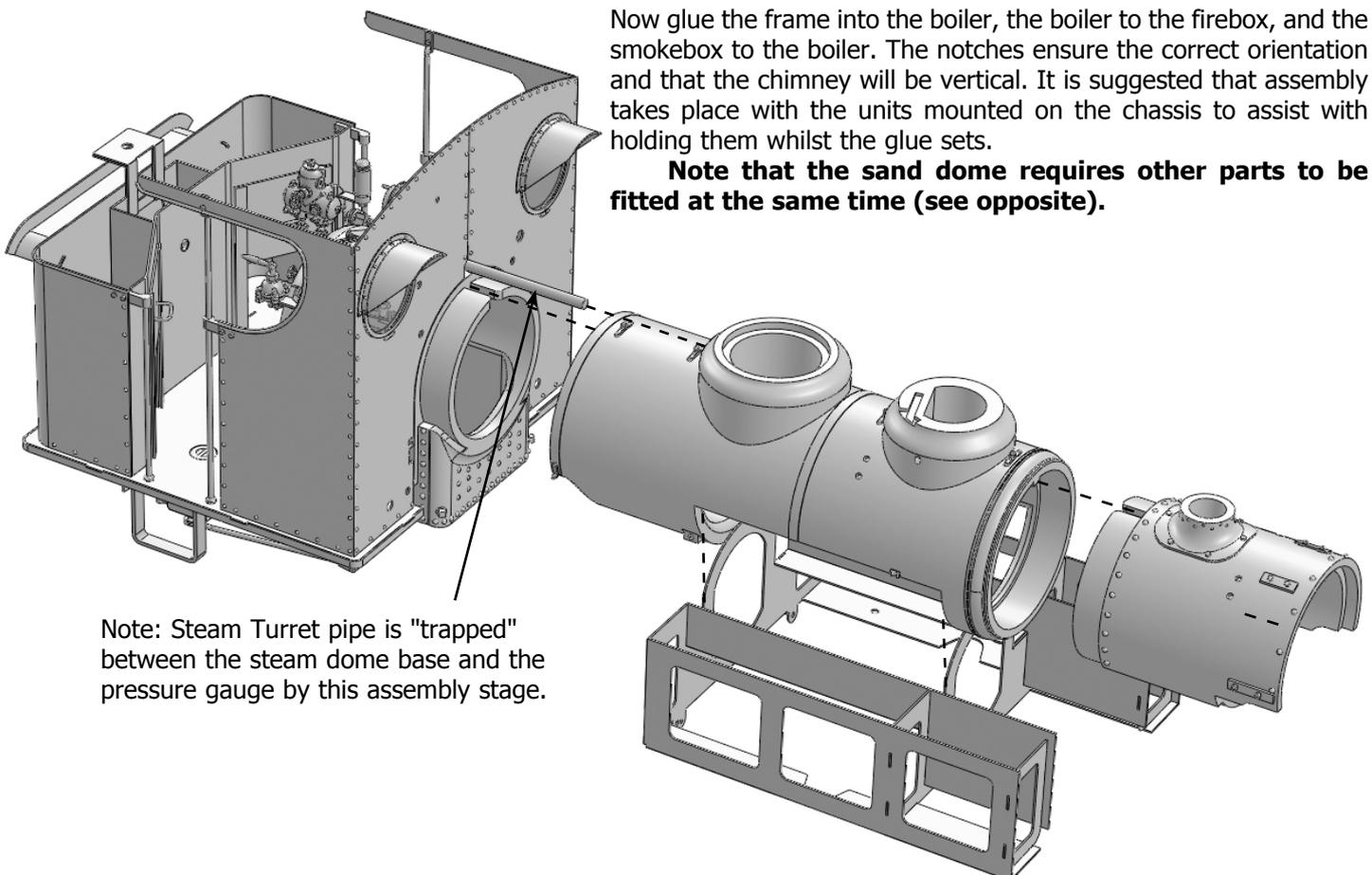
Fold up and solder together as shown.



23. Assemble Main Body Components

Now glue the frame into the boiler, the boiler to the firebox, and the smokebox to the boiler. The notches ensure the correct orientation and that the chimney will be vertical. It is suggested that assembly takes place with the units mounted on the chassis to assist with holding them whilst the glue sets.

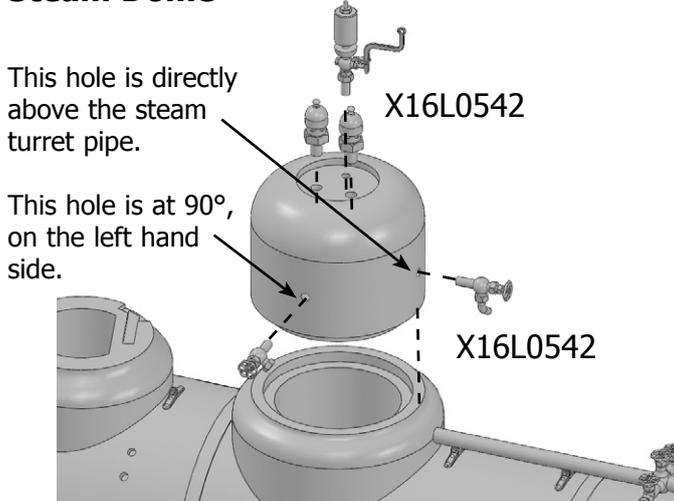
Note that the sand dome requires other parts to be fitted at the same time (see opposite).



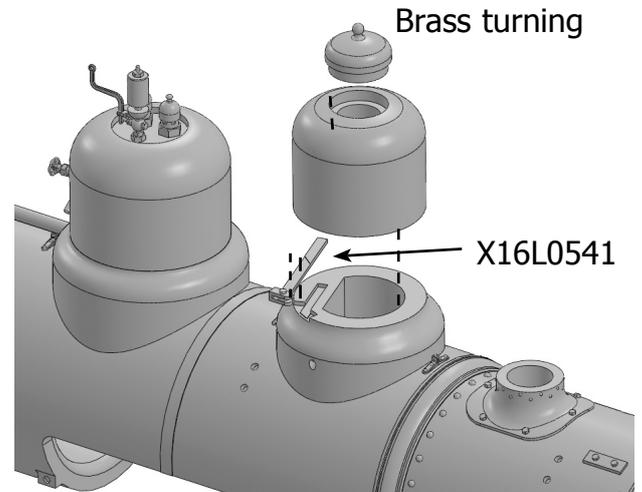
Note: Steam Turret pipe is "trapped" between the steam dome base and the pressure gauge by this assembly stage.

It is very important to fix the domes and the chimney in the correct orientation - study the illustrations carefully. On the resin domes, there will be remains of feed pips to remove to ensure that they "sit" correctly. In the case of the sand dome, you may have to remove some of the D shaped bottom projection in order to make sure that the top is concentric with the base

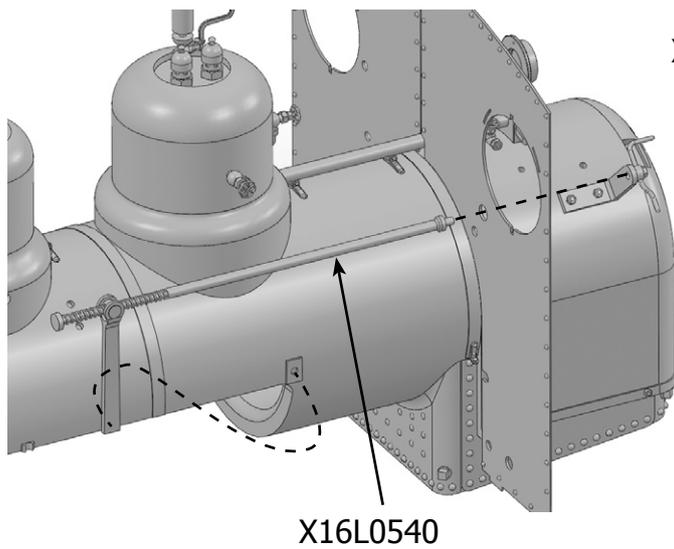
Steam Dome



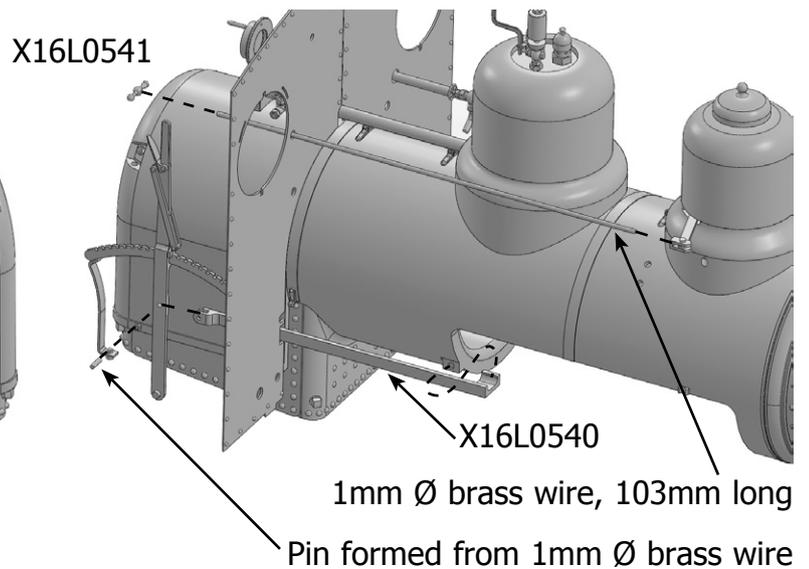
Sand Dome



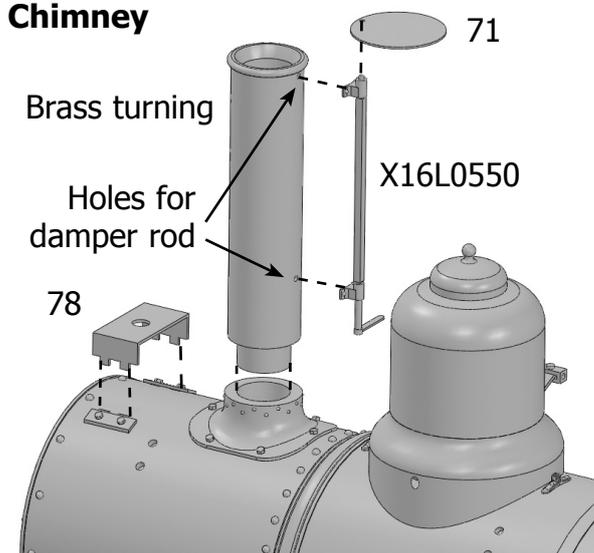
Handbrake Screw



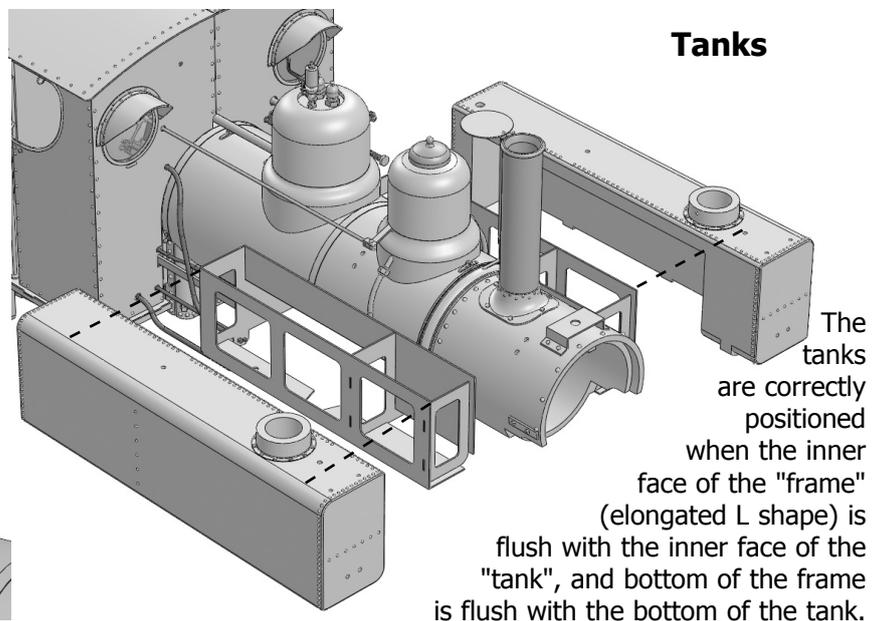
Reverser Rod and Sandbox Rod



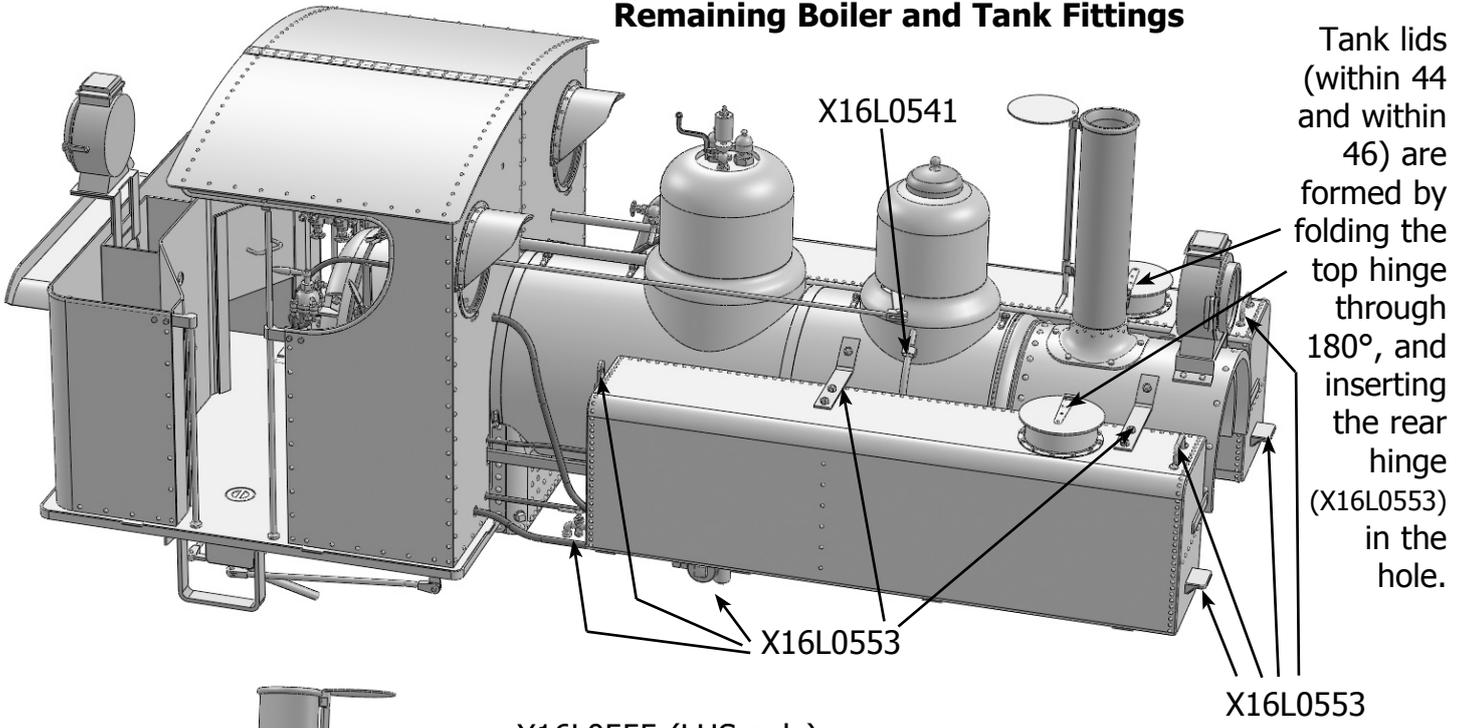
Chimney



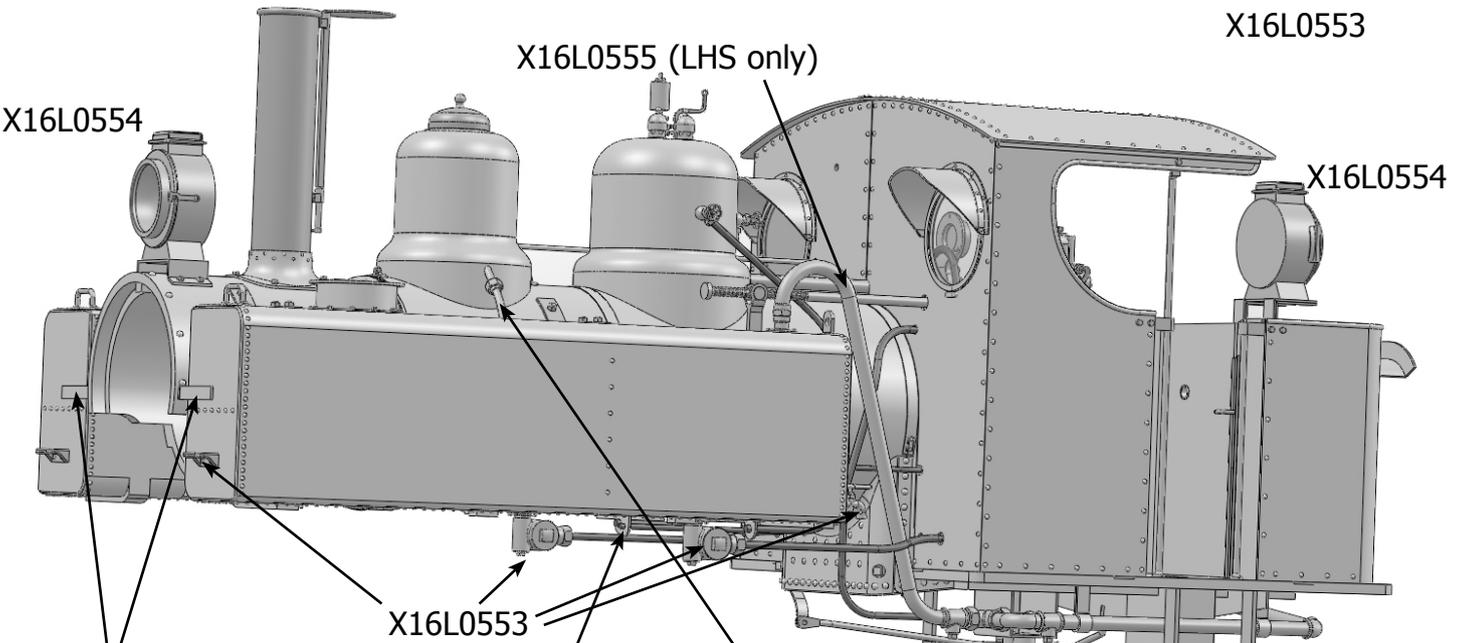
Tanks



Remaining Boiler and Tank Fittings



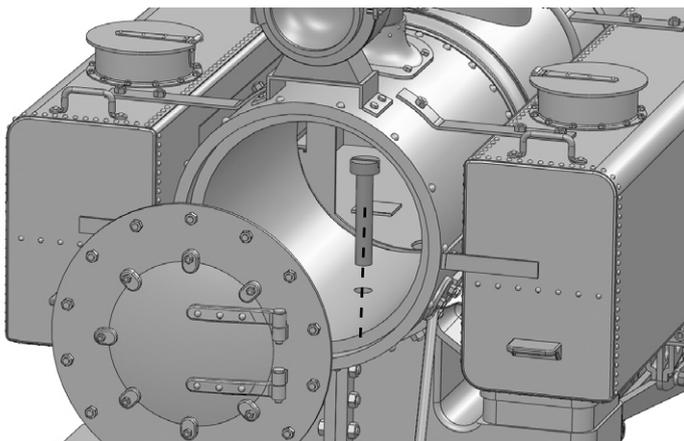
Tank lids (within 44 and within 46) are formed by folding the top hinge through 180°, and inserting the rear hinge (X16L0553) in the hole.



Etched tank restraints (within 44). Align front ones (long) with the "other half" moulded into the smokebox. Align rear ones (short) at same level.

Holes in etching to retain end of copper pipes

The front sandbox pipes are supported at the lower end by a small projection on the boiler.



The "body" and the "chassis" are attached to each other using three 6BA screws. Two go through the lugs on the rear buffer beam and into the bunker floor. The third is through the bottom of the smokebox and in to the trapped nut in the cylinder block; a screwdriver through the chimney is used to tighten it up. Finally attach the smokebox front, perhaps with a blob or two of "blue-tack" to enable it to be removed later.

Well done, you've now finished the main assembly work, and it can be painted, as described on page 6.

BATTERY OPERATION

This kit is designed to be suitable for 2-rail pickup or battery operation, or even both. The motor is intended to operate on 12volts DC. A large space has been included between the tanks, and a suitable cut-out in the boiler, to allow for batteries and radio control, and more space is available in the bunker. However, no battery or radio control equipment is included because of the many choices available. Details of suppliers who specialise in 16mm garden railways are listed below. Others can be found by searching the internet or magazines.

There seems to be three available choices of control systems for battery operation. First is a very simple on/off and forward/reverse switching system. This gives very little control over stopping and starting, but is perfectly suitable for a simple continuous run layout.

The second uses readily available model aircraft radio control equipment, usually using the two "joysticks" for direction and speed. The locomotive contains a decoder and the battery pack. This type of "controller" is commonly used for radio control of live steam locomotives, so if you have both steam and battery, then this is the obvious system.

The third system uses a push button hand held device. One type uses a key fob similar to those used to unlock car doors and other security systems. One button initiates acceleration and another initiates deceleration. There may also be an emergency stop button. Again, the locomotive contains a decoder and the battery pack. The other type uses something similar to a TV remote control, and has the ability to control several locomotive independantly, using the additional number buttons to select the loco you want to control.

A few decisions will have to be made before work starts. Whatever battery control system is used, the batteries will need regular charging, but this should very definitely **not** involve dismantling the locomotive. A charging socket should be arranged in a suitable orifice, such as one of the tank fillers, the sand dome, or in the bunker, which is more easily accessible and therefore less likely to cause damage through regular use. The wiring routes need to be planned to suit the equipment in use before assembly takes place

Should you wish to have a dual purpose battery and 2-rail model you should add a switch which isolates the battery or the pick-ups when the other is in use. The biggest snag with dual power working is that the wheels can accumulate a lot of dirt in the garden which has to be cleaned off before the model can be used on track power again.

Supplier of model aircraft type radio control equipment:

Brian Jones, Kingsley Lodge, School Lane, Raithby by Spilsby, Lincolnshire, PE23 4DS
Tel/Fax: 01 790 752042; www.brianjonesmodels.co.uk

Suppliers of push button type radio control equipment:

Cliff Barker, 28 Church Road, Barling Magna, Southend on Sea, Essex, SS3 0LS
Tel: 01702 217422 (Monday–Saturday 9 am - 7 pm)
Email; cliff@cliffbarker.me.uk; www.cliffbarker.talktalk.net

Red Arrow (A1 Micromotive), 38 Coney Green Business Centre, Wingfield View, Clay Cross, Derbyshire S45 9 JW. Tel: 01246 252360; www.redarrowcontrol.co.uk

Supplier of switches and other parts for a "simple" system:

Squires Model & Craft Tools, 100 London Road, Bognor Regis, West Sussex, PO21 1DD
Tel: 01243 842424
Email: sales@squirestools.com; www.squirestools.com

It should be noted that there is no connection between Slater's Plastikard Ltd. and these named organisations, nor can Slater's Plastikard Ltd. be held responsible for their actions. The information is given in good faith.

LIST OF PARTS

Part No.	Description	No. in Kit
Machined Brass		
X16L0501	Frames.....	2
X16L0502	Axleboxes.....	6
X16L0503	Keeper Plates	6
X16L0504	Chimney.....	1
X16L0505	Sandpot Lid	1
Etched Brass		
X16L0511	Sheet 1	1
X16L0512	Sheet 2	1
X16L0513	Sheet 3	1
X16L0514	Sheet 4	1
Lost Wax Castings		
X16L0520	Front Coupling Rods (LH & RH) (2 items).....	1
X16L0521	Rear Coupling Rods (LH & RH) (2 items).....	1
X16L0522	Connecting Rods (LH & RH) (2 items).....	1
X16L0523	Cylinder Rear/Slidebar (LH & RH) (4 items).....	1
X16L0524	Crosshead/Piston Rod (LH & RH) (2 items)	1
X16L0525	LH Expansion Link (4 items)	1
X16L0526	RH Expansion Link (4 items)	1
X16L0527	Valve Cover/Slidebar (LH & RH) (2 items).....	1
X16L0528	Valve Crosshead (LH & RH) (2 items)	1
X16L0529	Valve Rods (7 items)	2
X16L0535	Couplings (Front and Rear) (2 items).....	1
X16L0536A	Right Hand Bogie Frame.....	1
X16L0536B	Left Hand Bogie Frame.....	1
X16L0537	Motion Bracket Left (2 items).....	1
X16L0538	Motion Bracket Right (2 items).....	1
X16L0539	Cylinder drain cock mechanism (3 items).....	1
X16L0540	Handbrake Rod & Reverser Rod (2 items).....	1
X16L0541	Sand Dome Fittings (4 items).....	1
X16L0542	Steam Dome Fittings (5 items).....	1
X16L0543	Regulator & Pressure Gauge (2 items).....	1
X16L0543A	Steam Turret and Pipe (1 item).....	1
X16L0544	Reverser Lever (1 item).....	1
X16L0545	Small Steam Cocks/Taps (5 items)	1
X16L0546	Gauge Glass and Handbrake Handle (3 items).....	1
X16L0547	Firedoor Handle, Shelf and Gauge Glass Lamp (3 items)	1
X16L0548	Lubricator (1 item)	1
X16L0549	Try Cocks and Steam Brake Control (2 items)	1
X16L0550	Chimney Damper Lever & Smokebox/BufferBeam Stuts (3 items).....	1
X16L0551	Cab Handrails (4 items).....	1
X16L0552	Tank Balance Pipe (1 item).....	1
X16L0553	Tank Fittings (9 items)	2
X16L0554	Headlamp (1 item)	2
X16L0555	Water Lifter Pipe (3 items).....	1
X16L0556	Springs (4 items)	2
X16L0557	Spring Buckles (8 items).....	1
X16L0558	Brake Linkage (7 items).....	1
X16L0559	Steam Brake Cylinder & Bracket (2 items).....	1
X16L0560	Injectors and Globe Valves (4 items)	1
X16L0561	Rear Sandbox Parts.....	1
X16L0562	Cab Steps (2 items).....	1

Resin Castings

X16L0570	LH Cylinder Block.....	1
X16L0571	RH Cylinder Block.....	1
X16L0572	Cylinder Inner Covers (4 items).....	1
X16L0573	Cylinder Outer Covers (4 items).....	1
X16L0574	Smokebox Top.....	1
X16L0575	LH Tank.....	1
X16L0576	RH Tank.....	1
X16L0577	Firebox.....	1
X16L0578	Boiler.....	1
X16L0579	Sand Dome.....	1
X16L0580	Steam Dome.....	1
X16L0581	Smokebox Door/Front.....	1
X16L0582	Smokebox Bottom.....	1

Moulded Plastic

X16L0592	Brake Blocks (6 items).....	1
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Wheels & Drive Components

16824B	Driving Wheelset (2 wheels, axle and screws)..... (one pair flangeless)	3
16816B	Bogie Wheelset (2 wheels, axle and screws).....	2
X78001	Allen Key (for wheel screws and gearbox).....	1
X78003	Allen Key (for return crank screws).....	1
—	Crank Pin (G1 short version, with brass bush, nut and washer).....	4
X16L0590	Driving Axle Crankpin.....	2
X16L0591	Driving Axle Crankpin Spacer.....	2
7320	80 UNF C/S screw for return crank.....	2
—	Brass Bush (G1 short version) (for coupling rod join).....	2
GB40L	Gearbox/Motor unit.....	1
—	7mm Loco Buffer Spring (for bogie side control).....	4
7803 (part of)	Axle spacing washers (4 x 18 thou and 4 x 12 thou).....	4 + 4
—	Copper clad paxolin sleeper strip (for pickups).....	1
1220	Phosphor bronze strip (6") (for pickups).....	2

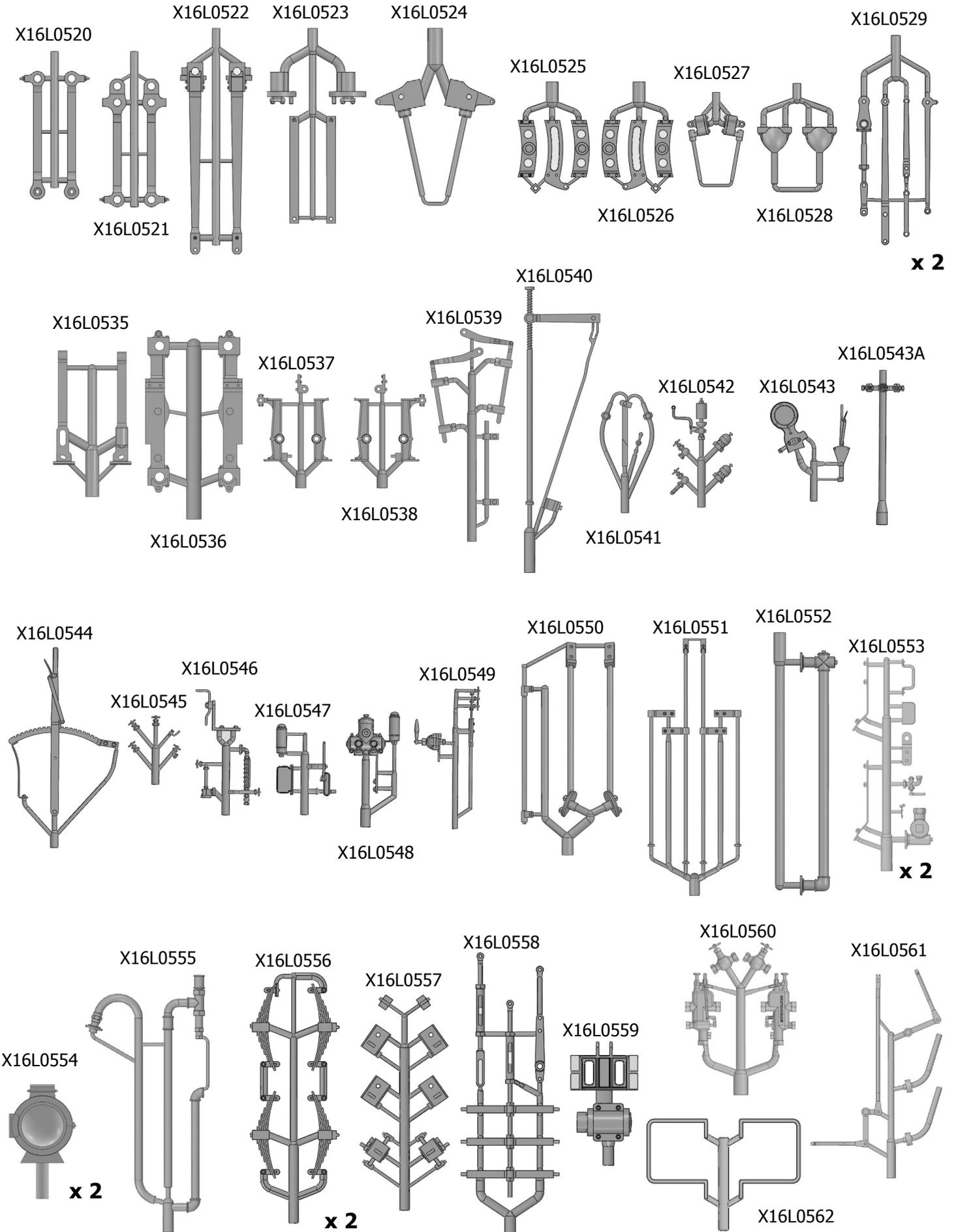
Nuts and Screws

—	6BA Brass C/H Screw 1/2" (chassis/body).....	5
—	6BA Brass Nut (chassis/body).....	5
—	8BA Brass C/H Screw 1/2" (coupling pivot).....	2
—	8BA Brass Nut (coupling pivot).....	2
—	10BA Brass C/H Screw 1/4" (keeper plates).....	12
—	10BA Steel C/S Screw 1/4" (for coupling rod join).....	2
—	10BA Steel Nut (for coupling rod join).....	2
—	10BA Steel Washer (for coupling rod join).....	2
—	12BA Steel C/H Screw 3/8" (valve gear).....	14
—	12BA Steel C/S Screw 1/4" (return crank).....	2
—	12BA Steel Nut (valve gear and return crank).....	16
—	14BA Brass Hex Head Screw 1/4" (buffer beam assembly).....	34
—	14BA Brass Cheese Head Screw 1/4" or 1/2" (frame assembly).....	56
—	14BA Brass C/S Screw 1/4" or 1/2" (steam brake cylinder spacer).....	4
—	14BA Brass Nut (buffer beam and frame assembly).....	94

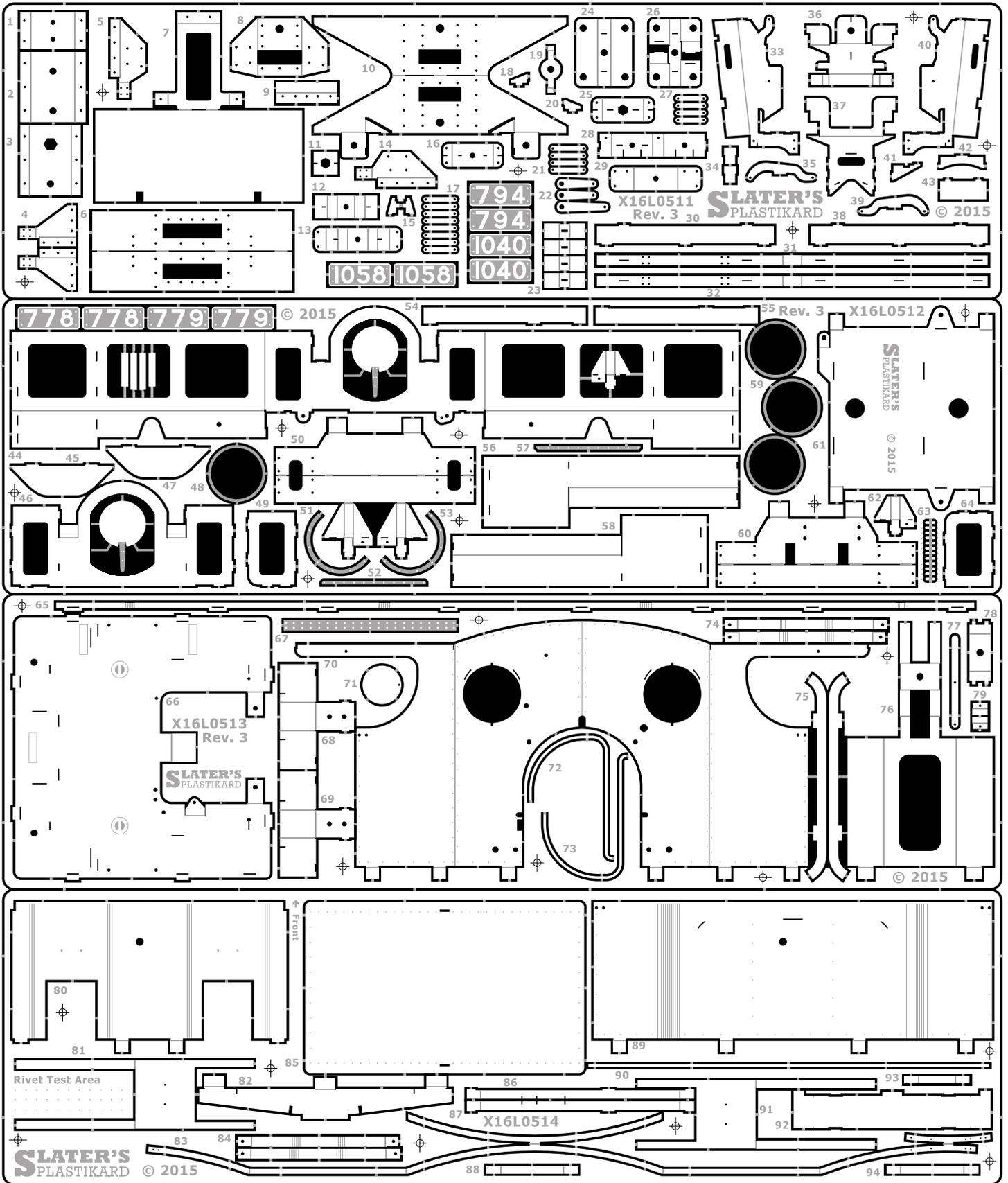
Other Parts

X16L0593	Window "Glass" [Laser cut clear plastic] (2 items).....	1
—	1.0mm Brass Wire (12").....	2
—	1.5mm Brass Wire (12").....	2
—	2.0mm Brass Wire (66mm) [reverser cross rod].....	1
—	3.0mm Brass Rod (50mm) [bogie suspension].....	1
—	1/8" OD Brass Tube (1") [coal bunker].....	1
—	1.0mm Copper Wire (8") [pipework].....	2
—	1.5mm Copper Wire (8") [pipework].....	3

CASTINGS (Not to scale)

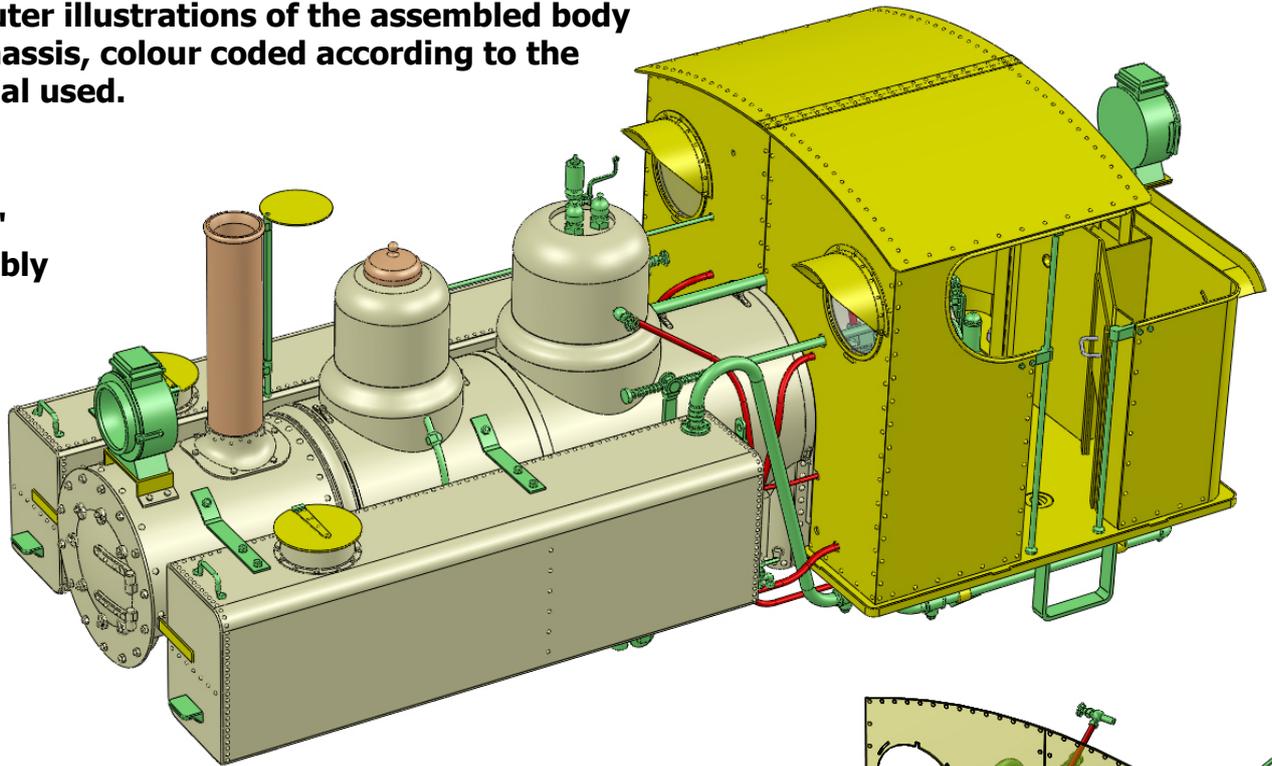


ETCHED BRASS SHEETS



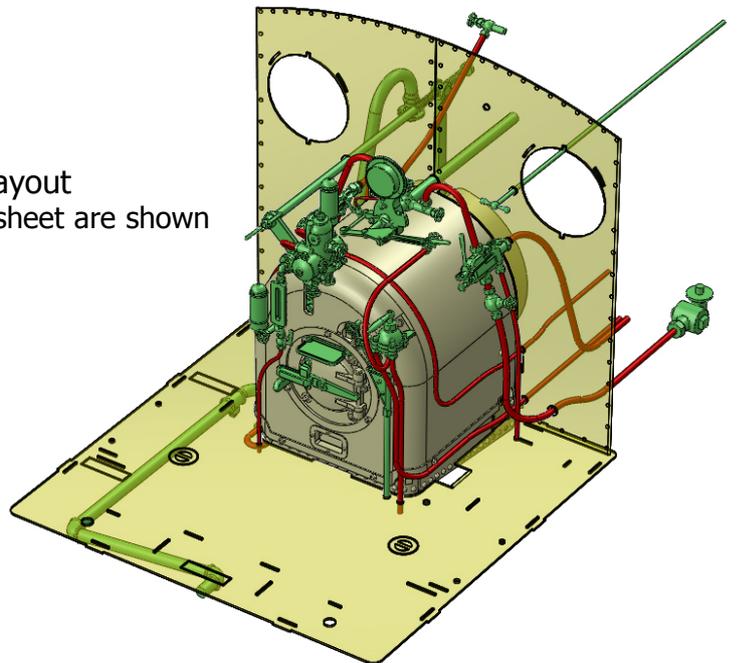
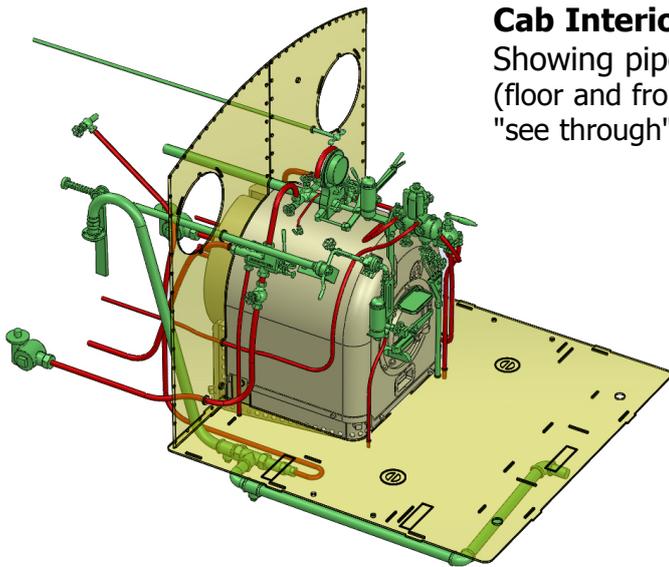
Computer illustrations of the assembled body and chassis, colour coded according to the material used.

"Body" Assembly

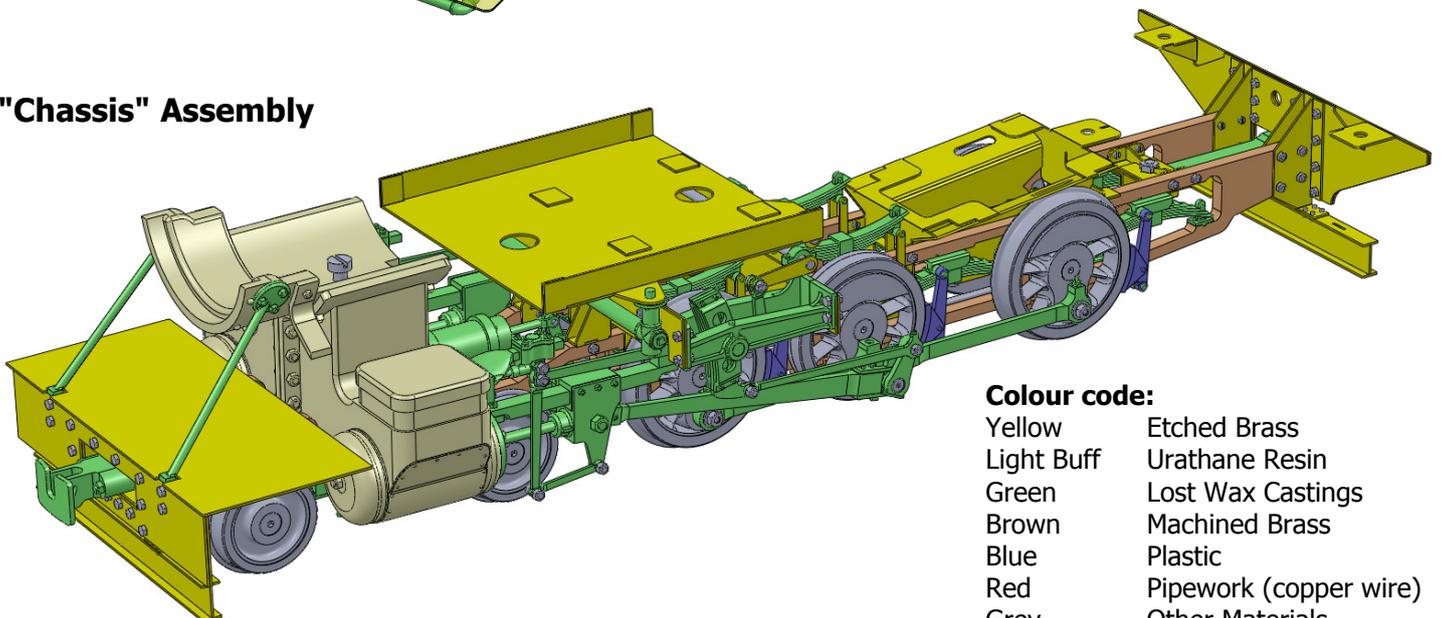


Cab Interior

Showing pipe layout (floor and front sheet are shown "see through")



"Chassis" Assembly



Colour code:

Yellow	Etched Brass
Light Buff	Urathane Resin
Green	Lost Wax Castings
Brown	Machined Brass
Blue	Plastic
Red	Pipework (copper wire)
Grey	Other Materials