LMS D1666 high-sided goods wagon

This is a model of what I believe was one of the most common wagon designs to run on Britain’s railways, the LMS diagram 1666 open goods wagon. This was a Midland Railway design There were 54,400 examples built during the 1920s and they lasted into the 1960s.

I have designed it with resin printing in mind but it should print successfully using an FDM printer – with a possible exception of the brake gear. I have built it using Peter Korzilius buffer heads, Walsall 3 link couplings, and Slaters wheels running in ball bearings.

A blue container on a train track

Description automatically generated with low confidence

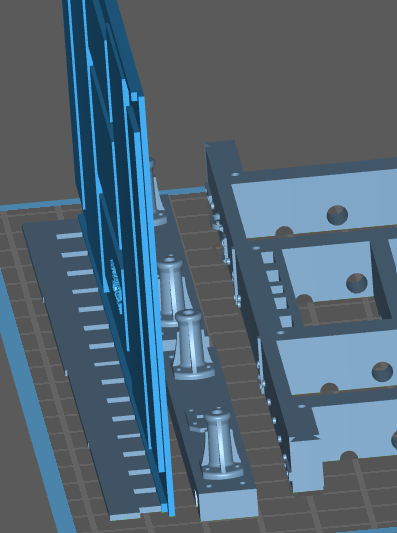
**Notes on building**

The underframe is separate to the buffer beams with dovetail joints. The dovetails are not full height for the underframe so from below it will not be visible. There are vent holes as grooves in the base of the underframe (for resin printing). These should be against the build plate and prevent blooming and blow holes appearing.

The buffer beams should be printed on their “backs” with the buffer stocks pointing upwards. I use a small drill in a Dremel to mill out the coupling holes – the plastic is soft. I open out the holes for the buffer posts using drill bits held in pin vices. Open up gradually – you need to end up with a 2.5 or 2.6 mm hole for the buffer shank which needs to be deep enough to hold the spring but not to break through so the spring is not retained, and 1.5mm for the remaining part which goes right through to the inside of the underframe.

The dovetails may need a bit of cleaning up with needle files and a sharp knife to allow them to engage fully. Once they sit correctly they should be glued in place.

The floor is separate to facilitate printing on a resin printer. There are locating projections which fit into the holes in the underframe. On a filament printer the floor can be printed upside down on the build plate – ensure the initial Z height is not too low to prevent the grooves between the planks from being filled by “squishing” of the first layer. For a resin printer the planking grooves tend to get filled in if against the build plate so the floor is intended to be printed on its side. To aid adhesion I superimpose a home-made raft using either 10mm squares or a longer “comb” which only projects on the base side of the floor so when they are cut off the cut face is not visible. See picture of the Chitubox project. The STLs of the comb and square.



I print the fixed W iron unit – the one with the two pin holes – upside down on the bed. The rocking W iron (assuming you don’t want a rigid chassis) should be printed on its side with some supports. If using Slaters wheelsets I use SR2-5 ZZ Ball Bearings - 1/8x5/16x9/64 while if using printed wheels (see RCH underframe) I would use 3mmx8mm bearings. In either case I use an 8mm hand reamer to gently clean up the bearing holes (5/16 inches is just under 8mm) so the bearing can be slid into the hole with some resistance, but not much. There is enough spring in the W irons to get the bearings in on one side then the other – with care. The W irons are fitted with the printed pins – these are printed lying on the flats on the side of the pin. I tend to print a range of these in slightly different diameters and select one which gives the right amount of grip – STLs included. The hole at one end of the rocking W iron is D shaped so make sure this end is away from the middle of the wagon and the pin is the right way up.

I print the axleboxes upside down with just the mounting pads on the build plate. I put in a few supports for the spring. The axleboxes are screwed to the underframe using small metric machine screws – 1.4mm or 1.6 mm depending on the grip achieved. For final assembly I also superglue them.

The body sides are intended to be printed upside down with the top on the build plate. I have now incorporated the bevel which was removed from the inside top edge of the door as a barrow ramp -I did not bother with the matching one at the bottom of the door. I have included the previous version without this barrow ramp in case anyone prefers to print it without – the top of the door is quite thin with the bevel. For each version, with or without the barrow ramp, there are two STLs, one for FDM printers which is complete, and one with a missing section of top plank for resin printing. The gap allows the resin to flow in and out of the body during printing. The STL for the missing section of plank is also included, it should be printed on edge and needs to be glued into the gap. There is a slight overhang of the strapping to help position this section.

The brakes are printed on their backs with supports for the brake lever and racks. I have not tried printing these in filament and I imagine they will be a challenge. I have modified the design so the rack does not protrude as much as the first version. For resin I generate light auto supports in Chitubox and then manipulate the pads for the supports for the Vee hangers etc so they do not overlap with the brake units themselves – they are a devil to clean up otherwise.

**Resins**

Different parts work better in different resins. The more rigid resins are good for structural components but tend to be too brittle for fine details, while flexible “tough” resins are good for the details but not rigid enough for fine details or thin sections – like the body sides of an open wagon. The W irons tend to sag if printed in flexible resin.

I have very successfully used Elegoo ABS like clear blue or clear green resin for the parts which require rigidity – the body, underframe, buffer beam and W irons. This resin is relatively low viscosity which makes it easier to print with.

For the rather flimsy details such as the axlebox and spring units, and the brakes, I use Anycubic Tough. This is very flexible when cured – too flexible for the bodies – the sides warp either inwards or outwards - or W irons which sag, but the ABS like is much too brittle for these details.

**Conclusion**

Let me know on the forum if anything is unclear. It is always good to have feedback from anyone who tries printing this model.

A picture containing floor, indoor, handcart

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