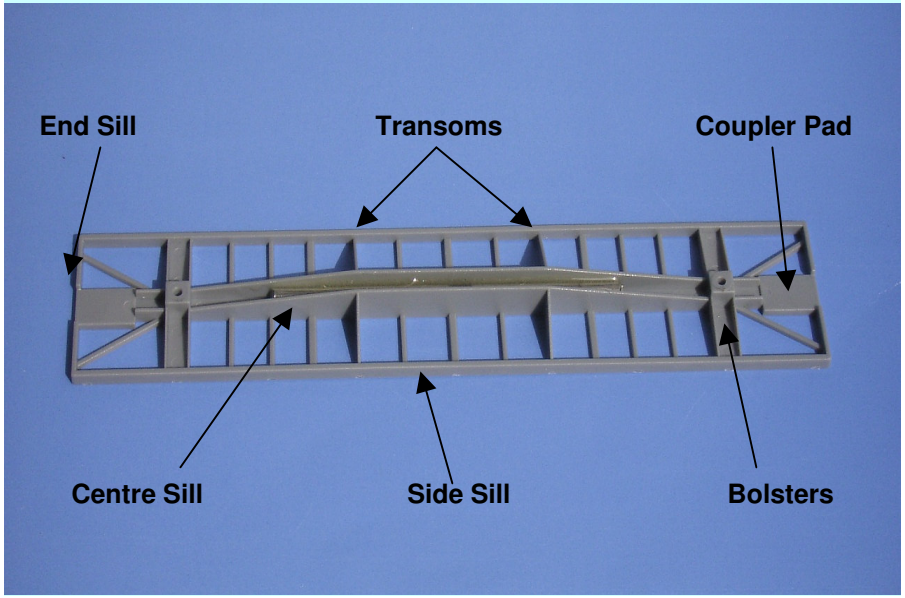
BASIC UNDERFRAMES FOR BOGIE WAGONS

Objective

- This note describes how to build a basic HO scale underframe for a bogie freight wagon in styrene.

Glossary

The picture below shows the typical structural members of a bogie freight wagon underframe (VR E wagon kit).



Step 1. Key Dimensions

- Obtain the three key dimensions for the wagon underframe:
  - Length: Length of wagon (length over end sills)
  - Width: Width of wagon (width over side sills)
  - Height: Floor height of wagon (height above rail)
- Convert the basic dimensions of the wagon to HO scale
  - every 1ft = 3.5mm
  - or every 1m = 11.48mm

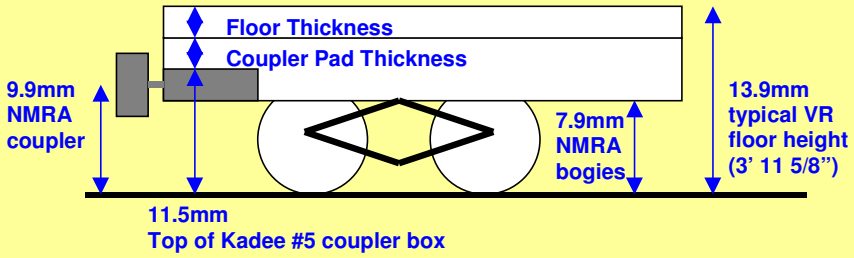
Step 2. Cut Floor Sheet

- I use 0.5mm sheet styrene for the floor. This looks a lot thicker than the prototype, but needs to be thick & stiff to support the model.
- Cut the sheet to the required length (over end sills) and width (over side sills).
- Mark the centre line along the length of the floor in felt pen

Step 3. Calculate Coupler Pad Thickness

- The thickness of the coupler pads can be calculated by

  Height of coupler box above rails + Coupler pad thickness + Floor thickness = Floor height above rails
- For a typical VR bogie wagon with Kadee #5 Couplers and a floor of 0.5mm sheet, the coupler pad thickness will be **1.9 mm**.



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Step4. Coupler Pads

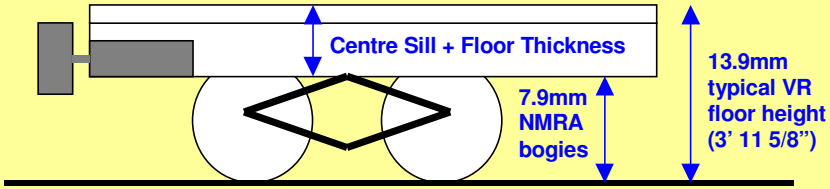
- For Kadee #5 couplers, I use a coupler pad of 8mm wide, 11mm long. Use the thickness calculated in the previous step (typically 2mm)
- Glue the coupler pads to each end of the floor sheet.
- Leave a 0.5mm gap to the ends of the floor to allow the end sill to be glued in at a later stage.

Step 5. Calculate Centre Sill Thickness at Bolsters

- The thickness of the centre sills at the bolsters (the point at which the wagon sits on the bogie) can be calculated by

  Bogie height + Centre Sill thickness + Floor thickness = Floor height above rails

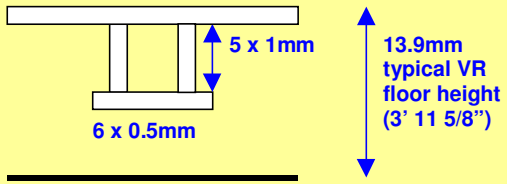
- For a typical VR bogie wagon with a floor of 0.5mm sheet, the centre sill height will be **5.5mm**.



Step 6. Centre Sills

- The centre sills are made of two strips styrene glued parallel to the centre line of the wagon floor, and are cut to length to fit between the coupler pads.
- They are typically spaced 18" apart (5mm in HO scale). However, if you are modelling a flat or open wagon and want to hide lead ballast between the centre sills, you can space them further apart.
- The centre sills need to provide the wagon with bending strength, thus depth of the centre sill should be maximised where possible, and a box section can be used to give additional strength.
- In the vicinity of the bolsters, the centre sill thickness is the same as the bolster thickness. Note that some wagons have "fishbelly" shaped sills, such as the VR "E" wagon.
- For a typical VR wagon, I use a 5 x 1mm strip styrene for the centre sills, with a 0.5 x 6mm strip glued on the bottom edge to form a box section. This also makes a good pad for the bogies.

Cross section through floor and centre sills



Step 7. Side Sills

- Side sills on VR wagons were typically made from 10" deep channel.
- Since the channel section typically faced inwards, I use a plain strip of 3 x 1mm strip styrene for each side sill.
- Cut the side sills to the length of the wagon, and glue each along the edge of the floor.

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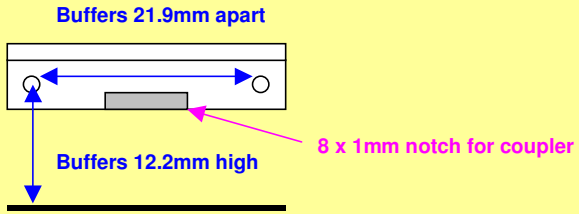
Step8. End Sills

- The end sills are also typically 10” deep channel facing inwards.
- I use 3x 0.5mm styrene strip for the two end sills. The end sills fit in between the side sills, so width of the side sills can be cut to suit.
- Before gluing the side sills to the floor, a notch needs to be cut out to fit the coupler box. For Kadee #5 couplers sitting on 2mm coupler pad, the notch is 8mm wide by 1mm deep.
- Wagons originally built with buffers will need holes drilled in the end sills. Dimensions of the buffer holes are given below.



Step 9. Bolsters

- If desired, bolsters can be cut from 0.5mm styrene sheet. The bolsters fit between the centre and side sills.

Step 10. Transoms

- Transoms can also be cut if desired. These can also be cut from 0.5mm styrene sheet and fit between the centre and side sills.

Step 11. Ballast

- Add ballast weight to get the wagon to a sufficient weight to ensure it does not derail.
- If the wagon will be in a long train that traverses tight curves, you may need to add up to the NMRA recommended mass. Otherwise, you will probably only ever need the wagon weighed to half the NMRA recommended mass.

NMRA Recommended Practice RP-20.1 “Car Weight”

- For HO Scale Wagons:
  - Total Weight = 30g + 6g / cm length
- Example for a 43 foot wagon
  - 120g (!!!!!)
  - So you would only ever really need about half that.

Step 12. Couplers and Bogies

- Kadee coupler boxes can be glued or screwed onto the coupler pad.
- Drill holes in the bogie pads so that the bogies can be screwed onto the wagon.

Step 13. Detailing

- Underframe can be detailed with:
  - handbrake and airbrake rigging
  - shunters steps and handrails