

## Rolling Stock General Build Guidelines

In order to provide reliable operation of rolling stock, builders should strive to ensure that their cars adhere to established norms for weight, balance, rollability, etc. The sections below outline requirements and techniques for achieving these goals.

### Weight

Each car should be weighed according to the NMRA weight schedule outlined here:

<https://www.nmra.org/beginner/weight>

However, these matrixes are not well laid out and can be difficult to interpret for the scale length of either N or HO scale cars. Use the appropriate matrix below to accurately add weight to your rolling stock.

Measurement should be performed with a digital kitchen scale for the most accurate results. Spring scales should be avoided, especially for N scale, as they only allow accurate measurements in the middle of their range. Use of grams for N scale is highly recommended to achieve correct weight.

When weighing your rolling stock, be sure to include all trimmed parts, couplers, coupler boxes, axles, and fasteners. For N scale cars, be sure to include the weight tape as the allowed variance is much smaller.

Weights of either lead or steel/iron composition can be used. **However, take care when working with lead as its poisoning effects on the body are cumulative – wear gloves when handling and avoid breathing dust from older, oxidized lead pieces. When placing weights in exposed areas, lead weights should be painted.**

Weights can be adhered with double side industrial tape, wood glue, or silicon adhesive

Weights should be placed at the lowest possible point in a car and should not be visible when observing the car from track level, or, should be incorporated into the model in such a way that it is not discernable from a normal part of the car such as open coal loads, scrap metal, etc.

For flat cars, bar weights can be attached to the underside of the car body and are often included in kits. If a load is affixed to the car, this weight should also be included when calculating the final weight of the car.

HO Weight/Grade Schedule (Taken from Lamesa Model Railroad Club Bylaws)

% Grade →	1/2%	1%	1-1/2%	2%	2.50%	Max
Car Length ↓	Weight oz					
30	3.25	3.25	3.25	3.5	3.75	4.0
35	3.5	3.5	3.5	3.75	4.0	4.25
40	3.5	3.5	3.75	4	4.25	4.5
45	4.0	4.25	4.5	4.75	5.0	5.25
50	4.5	4.75	5.0	5.25	5.5	5.75
55	4.75	5	5.25	5.5	5.75	6.0
60	5.0	5.25	5.5	5.75	6.0	6.25
65	5.25	5.5	5.75	6	6.25	6.5
70	5.75	6	6.25	6.5	7.0	7.25
75	6.0	6.25	6.5	6.75	7.25	7.5
80	6.25	6.5	6.75	7.25	7.5	7.75
85	6.5	6.75	7.25	7.5	7.75	8.0
90	7.0	7.25	7.5	7.75	8.0	8.25
95	7.25	7.5	7.75	8	8.25	8.5
100	7.5	7.75	8.0	8.25	8.5	8.75

N Scale Weight Schedule

Scale Feet	Inches	OZ Weight	Gram
30	2.25	0.7125	20.19902
35	2.625	0.83125	23.56552
40	3	0.95	26.93203
45	3.375	1.06875	30.29853
50	3.75	1.1875	33.66503
55	4.125	1.30625	37.03153
60	4.5	1.425	40.39804
65	4.875	1.54375	43.76454
70	5.25	1.6625	47.13104
75	5.625	1.78125	50.49755
80	6	1.9	53.86405
85	6.375	2.01875	57.23055
90	6.75	2.1375	60.59706
95	7.125	2.25625	63.96356
100	7.5	2.375	67.33006

When applying the above schedules, round down when car lengths are in between lengths on the matrix.

### **Truck Journal Dressing**

For HO scale cars, a journal cutting tool is available from Micromark. There is no tuning tool available for N scale at this time.

Remove wheelsets from the truck while off of the rolling stock. Insert the cutting tool into the truck journals. Use a small square jawed set of pliers to apply light pressure to the outside of the truck journal to insure a good cut. Spin the tool until the tool can be felt moving without cutting. Remove the tool and cut the other journal on the same side of the truck and then repeat on the opposite side. Be sure to inspect the journal after cutting for left over plastic. This can prevent the wheelset from spinning freely. The use of this tool is very beneficial. It can take a poor rolling car that even has metal wheelsets and transform its free rolling ability.

### **Truck Installation**

Once the truck has been properly dressed and the wheelsets installed, it can be mounted to the car. Two checks should be performed to ensure proper operation: a flat plane test and a free play test.

#### **Flat Plane Testing**

Install the trucks on the car body, ensuring that they are square fore to aft. Tighten the screws fully so that the trucks are unable to rotate. Place the car on a flat surface such as a picture frame glass, or other suitable surface. The wheels should sit flush on all four corners and the car should not be able to rock back and forth. If there is movement, the trucks are not flat and the offending truck mounting point will need to be modified as needed until the trucks are flat.

#### **Truck Tightness**

Once the flat plane test is passed, back the truck screw out until the truck can freely rotate on the car body. The truck should be able to be flicked to once side easily. However, do not loosen the truck so much that it wobbles on the car body as this will result in poor car performance.

### **Center of Gravity Index**

Car balance is important to reliable operation. While scale trains may seem exempt from the physics that apply to real trains, the reality is that they are affected the same forces, and considerations must be made when constructing a car. Cars with weights that sit too high are susceptible to tipping over on tight curves. Cars with little to no weight are more likely to suffer a string derailment on tight curves or derail when traversing rail joints, frogs and uneven sections of track.

Completed cars, when placed at a 35 degree angle measured by a protractor or calibrated gauge, should be able to return their wheel to the rail when released. Cars that are unable to return on both sides should be modified by removal of or repositioning of weight. HO scale cars should refer to the grade/weight table above to ensure that their rollability index is adhered to. HO scale cars should weigh no less than 3.25 oz.

## **Rollability**

Smooth rolling cars should be paramount in building rolling stock. This can be achieved by adhering to the following guidelines:

Metal wheelsets should be used. This is required for the HO layout and highly recommended for the N scale layout. Wheelsets must be insulated. Where it is not immediately discernable as to which side of the wheelset is insulated, a red band should be painted on the inner face or axle of the insulated side for easy identification. Cars with metal underframes must use double insulated wheelsets.

Why is this important? With DCC control, it is imperative that good electrical conductivity is maintained between the locomotive and rail. Plastic wheel sets not only have poor rolling performance, but they leave residue on rails and reduce conductivity, which can result in poor locomotive performance. Wheelsets that are not insulated properly can result in shorts on the layout, which can damage control equipment or locomotive decoders.

### **Testing for rollability**

Use of a test track is required to verify a cars rollability. Refer to the HO weight/grade schedule above. Place the car on the track set at the appropriate grade. A passing car should be able to spontaneously move at least one car length on grade without intervention. If a car is unable spontaneously roll, check for proper weight and ensure that truck journals are properly dressed and free from obstruction. Alternate wheelsets can also help address this issue.