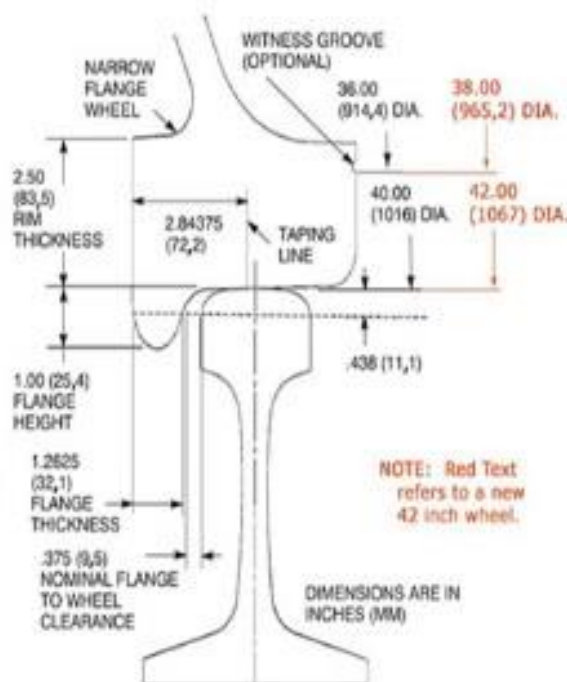


Wheel Measurement



Measuring Wheels

The figure (shown below) illustrates the interface between a new wheel and a new rail in its nominal position when the wheels are centered between the rails. As positioned, there is a lateral clearance of 0.375 inches (9.5 mm) between the wheel and the rail. The wheel pair can move laterally in each direction towards this clearance.



The new wheel tread is tapered with a 1:20 taper, also referred to as a 1:20 conicity, as its shape resembles a cone, and the diameter is always measured at the "tape position". The tape position is 2.844 inches (72.2 mm) from the back face of the flange. The diameter of a new wheel is nominally 40 inches (1016 mm) or 42 inches (1067 mm), depending on the customer.

The flange thickness is measured from the back face of the flange at a position 7/16 inches (11.1 mm) off the tread at the tape line. The wheel flange thickness for a new narrow flange wheel is 1.2656 inches (32.1 mm).

The flange height is also measured radially outward from the tread at the tape line, and for a new wheel, this height is 1 inch (25.4mm). Another important dimension is the rim thickness, which for a new wheel is 2.5 inches (63.5 mm).

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While the locomotive is operating, wheel wear takes place either on the tread of the wheel or on the flange of the wheel, or at both places. If the minimum dimensions for flange thickness or rim thickness (wheel diameter), or maximum dimension of flange height, are exceeded, the wheel must be "reprofiled" or discarded.

To fully understand the analysis, it is important to understand the following points:

- If the wear takes place on the flange of the wheel only, the gauge can measure the lateral wear exactly. If the wear takes place on the tread only, the gauge indicates that the flange "grew" thicker, because it sets more deeply into the wheel. The condemning limit for wheel flange thickness is 15/16 inches (23.8 mm), as measured by the gauge.
- Wheel diameter can be measured using the gauge by measuring from the "witness groove" on the front face of the wheel rim. This witness groove is specifically cut to 36 inches (914.4 mm) diameter for a new 40-inch diameter wheel or 38 inches (965.2 mm) diameter for a new 42-inch diameter wheel. On wheels that do not have the witness groove, you must use a rim thickness measurement to ascertain the wheel diameter. Measurement of rim thickness to determine wheel diameter is not nearly as accurate as using the witness groove.
- If wheel wear takes place on the tread only, the wheel can be condemned in two ways as follows:
 - Excessive radial tread wear will cause the flange height to increase, and the wheel must be reprofiled or discarded when the flange height exceeds 1.5 inches (38.1 mm). Excessive flange height will cause distress when the wheel crosses a switch.
 - Eventually radial wear will result in reduced rim thickness, and the wheel will have to be discarded when the rim thickness is less than 1.0 inch (25.4 mm).
- Although narrow flange wheels are commonly used, wide flange wheels, with a flange thickness of 1.484 inches (37.7mm) may also be used. For the same gauge track (distance between the rails), the use of wide flange wheels causes the lateral clearance between the flange and the rail to be reduced from 0.375 inches (9.5 mm) to only 0.154 inches (3.9 mm).



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Thus, a wheel will have to be reprofiled or discarded when the flange becomes too thin, the flange height becomes too high, or the rim thickness becomes too thin. Wheel life is a function of the wear and the number of reprofiling that may take place during the wearing process.

Note that the wheel diameter is measured by reading the scale on the long arm of the wheel gauge in relation to the top of the witness mark on the wheel using the following conversion chart:

Conversion Chart
8 = 37"
9 = 37-1/8"

49 = 42-1/8"
50 = 42-1/4"

If the wheel is reprofiled because of high flanges, then the wheel diameter is reduced 1 inch (25.4 mm). If the wheel is reprofiled because of thin flanges, the wheel diameter is reduced approximately 1 inch (25.4 mm). The minimum allowable wheel diameter, as determined by rim thickness, is 37 inches (939 mm) for a standard 40-inch diameter wheel or 39 inches (990.6 mm) diameter for a standard 42-inch diameter wheel.

