

(c) All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

11. **Rejection.**—Material which, subsequently to above tests at the mills or elsewhere, and its acceptance, shows any defects, shall be rejected and shall be replaced at the expense of the manufacturer.

12. **Rehearing.**—Samples tested in accordance with this specification, which represent rejected material, shall be preserved for 14 days from date of test report. In case of dissatisfaction with results of tests, the manufacturer may make claim for a rehearing within that time.

**SPECIFICATIONS FOR MILD-STEEL BARS FOR PASSENGER
AND FREIGHT EQUIPMENT CARS.***

STANDARD.

In 1915 the following specifications were adopted. Advanced to Standard in 1917.

1. **Scope.**—This grade of material will be used for miscellaneous parts, such as arch bars, bolts, hand holds, steps and for general threading and welding material.

I. MANUFACTURE.

2. **Process.**—The steel shall be made by the open-hearth process.

II. CHEMICAL PROPERTIES AND TESTS.

3. **Chemical Composition.**—The steel shall conform to the following requirements as to chemical composition:

Carbon	Optional per cent.
Manganese	Optional "
Phosphorus, not over.....	0.05 "
Sulphur, " "	0.05 "

* This material may be used when so desired for rivet steel.

4. **Ladle Analysis.**—An analysis shall be made by the manufacturer from a test ingot taken from the pouring of each melt, to determine the percentage of carbon, manganese, phosphorus and sulphur. Drillings for analysis shall be taken not less than $\frac{1}{4}$ in. beneath the surface of the test ingot. A copy of this analysis shall be given the purchaser or his representative. This analysis shall conform to the requirements specified in Section 2.

5. **Check Analysis.**—A check analysis shall be made from the finished material representing each melt, if so desired by the purchaser or his representative, and shall meet the requirements specified in Section 2.

III. PHYSICAL PROPERTIES AND TESTS.

6. **Tension Tests.**—The steel shall conform to the following requirements as to tensile properties:

Tensile strength, lb. per sq. in....50 000-65 000 for sizes smaller than 1 in. flats and 2 in. rounds.

Tensile strength, lb. per sq. in....50 000-60 000 for larger sizes.

Elongation in 8 in., per cent.....1 500 001 tensile strength.

7. **Yield Point.**—The yield point as determined by the drop of the beam of the testing machine shall be one-half the ultimate tensile strength.

8. **Bend Test.**—The test specimen for rounds, squares and hexagon bars shall bend cold through 180 deg. without cracking on the outside of the bent portion, as follows: For material $\frac{3}{4}$ in. or under in thickness, flat on itself; for material over $\frac{3}{4}$ in. to and including $1\frac{1}{4}$ in. in thickness, around a pin the diameter of which is equal to the thickness of the specimen; and for material over $1\frac{1}{4}$ in. in thickness, the specimen.

9. **Test Specimen.**—Tension and bend-test specimens shall be of the full section of material as rolled, if possible; otherwise the specimen shall be machined from the material as rolled. The axis of the specimen shall be located at any point one-half the distance from the center to the surface of round bars, or from the center to the edge of flat bars, and shall be parallel to the axis of the bar.

10. **Number of Tests.**—(a) All bars of one size shall be piled separately. One bar from each 200 or less shall be selected at random and tested as specified.

(b) If any test specimen from the bar originally selected to represent a lot of material contains surface defects not visible before testing, but visible after testing, or if a tension-test specimen breaks outside the middle third of the gage length, one retest from a bar will be allowed.

IV. PERMISSIBLE VARIATIONS IN GAGE.

11. **Permissible Variations.**—(a) **Round Bars.**—Round bars shall conform to the limits as given in Table No. 1.

TABLE No. 1.

NOMINAL DIAMETER OF STEEL, IN.	Large Size End, In.	Small Size End, In.	Total Variation, In.
$\frac{1}{4}$	0.2550	0.2450	0.010
$\frac{5}{16}$	0.3180	0.3070	0.011
$\frac{3}{8}$	0.3810	0.3690	0.012
$\frac{7}{16}$	0.4440	0.4310	0.013
$\frac{1}{2}$	0.5070	0.4930	0.014
$\frac{5}{8}$	0.5700	0.5550	0.015
$\frac{3}{4}$	0.6330	0.6170	0.016
$\frac{7}{8}$	0.7585	0.7415	0.017
1	0.8840	0.8660	0.018
$1\frac{1}{8}$	1.0095	0.9905	0.019
$1\frac{1}{4}$	1.1350	1.1150	0.020
$1\frac{3}{8}$	1.2605	1.2395	0.021
$1\frac{1}{2}$	1.3860	1.3640	0.022
$1\frac{3}{4}$	1.5115	1.4885	0.023
1 $\frac{7}{8}$	1.6370	1.6130	0.024
1 $\frac{5}{8}$	1.7625	1.7375	0.025
1 $\frac{3}{4}$	1.8880	1.8620	0.026

Round steel 2 in. and over in diameter shall not be under size or more than $\frac{1}{8}$ in. greater in diameter.

(b) Flat Bars.—Thickness shall not vary more than corresponding diameter for rounds; thus, 1 in. thick could vary from 0.9905 to 1.0095 in.

(1) Sizes under 3 in. wide shall not be more than $\frac{1}{8}$ in. under or over size in width.

(2) Sizes 3 in. and over shall not be under size or more than $\frac{1}{8}$ in. wider than ordered.

V. FINISH.

12. **Finish.**—The finished material shall be smoothly rolled and free from injurious seams, slivers, flaws and other defects, and shall have a workmanlike finish.

VI. INSPECTION AND REJECTION.

13. **Inspection.**—(a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications.

(b) The purchaser may make the tests and inspection to govern the acceptance or rejection of the material in his own laboratory or elsewhere. Such tests and inspection shall be made at the expense of the purchaser.

(c) All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

14. **Rejection.**—Material which, subsequently to above tests at mills or elsewhere and its acceptance, develops weak spots or imperfections, or fails to pass any one of the tests herein required, will be rejected, and shall be replaced by the manufacturer at his own expense.

15. **Rehearing.**—Samples tested in accordance with this specification, which represent rejected material, shall be preserved for 14 days from date of test report. In case of dissatisfaction with results of tests, the manufacturer may make claim for a rehearing within that time.

SPECIFICATIONS FOR RIVET STEEL AND RIVETS FOR PASSENGER AND FREIGHT EQUIPMENT CARS.

STANDARD.

In 1915 the following specifications were adopted as Recommended Practice. Modified in 1916. Advanced to Standard in 1917.