

following modifications shall be made in the requirements for elongation:—

(a) For each increase of one-eighth inch ( $\frac{1}{8}$  inch), in thickness above three-fourths inch ( $\frac{3}{4}$  inch), a deduction of one per cent. (1%) shall be made from the specified elongation.

(b) For each decrease of one-sixteenth inch ( $\frac{1}{16}$  inch) in thickness below five-sixteenths inch ( $\frac{5}{16}$  inch) a deduction of two and one-half per cent. ( $2\frac{1}{2}\%$ ) shall be made from the specified elongation.

#### Bending Tests.

6. The three classes of open-hearth, boiler plate and rivet steel shall conform to the following bending tests; and for this purpose the test specimen shall be one and one-half inches ( $1\frac{1}{2}$  inch) wide if possible, and for all material three-fourths inch ( $\frac{3}{4}$  inch) or less in thickness the test specimen shall be of the same thickness as that of the finished material from which it is cut; but for material more than three-fourths inch ( $\frac{3}{4}$  inch) thick, the bending test specimen may be one-half inch ( $\frac{1}{2}$  inch) thick:

Rivet rounds shall be tested of full size as rolled.

(c) Test specimens cut from the rolled material as specified above shall be subjected to a cold bending test, and also to a quenched bending test. The cold bending test shall be made on the material in the condition in which it is to be used, and prior to the quenched bending test, the specimen shall be heated to a light cherry-red as seen in the dark and quenched in water, the temperature of which is between 80 degrees and 90 degrees Fahrenheit.

(d) Flange or boiler steel, fire box steel and rivet steel, both before and after quenching, shall bend cold one hundred and eighty degrees ( $180^\circ$ ) flat on itself without fracture on the outside of the bent portion.

#### Homogeneity Tests.

7. For fire box steel a sample taken from a broken tensile test specimen shall not show any single seam or cavity more than one-fourth inch ( $\frac{1}{4}$  inch) long in either of the three fractures obtained on the test for homogeneity as described below in paragraph 12.

### TEST PIECES AND METHODS OF TESTING.

#### Test Specimen for Tensile Test.

8. The standard test specimen of eight (8 inch) gauged length, shall be used to determine the physical properties specified in paragraphs Nos. 4 and 5. The standard shape of the test specimen for sheared plates shall be as shown by the following sketch:

For other material the test specimen may be the same as for sheared plates, or it may be planed or turned parallel throughout its entire length and, in all cases where possible, two opposite sides of the test specimens shall be the rolled surfaces. Rivet rounds and small rolled bars shall be tested to full size as rolled.

#### Number of Tensile Tests.

9. One tensile test specimen will be furnished from each plate as it is rolled, and two tensile test specimens will be furnished from each melt of rivet rounds. In case any one of these develops flaws or breaks outside of the middle third of its gauged length, it may be discarded and another test specimen substituted therefor.

#### Test Specimens for Bending.

10. For material three-fourths inch ( $\frac{3}{4}$  inch) or less in thickness, the bending test specimen shall have the natural rolled surface on two opposite sides. The bending test specimens cut from plates shall be one and one-half inches ( $1\frac{1}{2}$  inches) wide, and for material more than three-fourths ( $\frac{3}{4}$  inch) thick the bending test specimens may be one-half ( $\frac{1}{2}$  inch) thick. The sheared edges of bending test specimens may be milled or planed. The bending test specimens for rivet rounds shall be of full size as rolled. The bending test may be made by pressure or by blows.

#### Number of Bending Tests.

11. One cold bending specimen and one quenched bending specimen will be furnished from each plate as it is rolled.

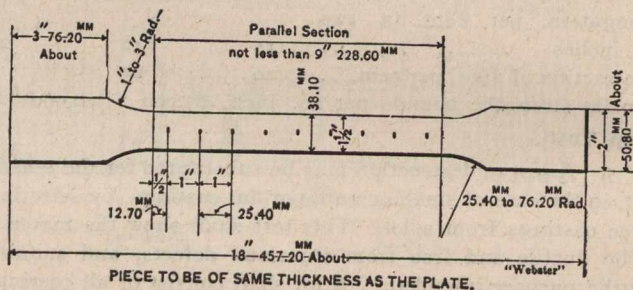
Two cold bending specimens and two quenched bending specimens will be furnished from each melt of rivet rounds. The homogeneity test for fire box steel shall be made on one of the broken tensile test specimens.

#### Homogeneity Tests for Fire Box Steel.

12. The homogeneity test for fire box steel is made as follows:—A portion of the broken tensile test specimen is either nicked with a chisel or grooved on a machine, transversely about a sixteenth of an inch ( $\frac{1}{16}$  inch) deep, in three places about two inches (2 inches) apart. The first groove should be made on one side, two inches (2 inches) from the square end of the specimen; the second, two inches (2 inches) from it on the opposite side; and the third, two inches (2 inches) from the last, and on the opposite side from it. The test specimen is then put in a vise, with the first groove about a quarter of an inch ( $\frac{1}{4}$  inch) above the jaws, care being taken to hold it firmly. The projecting end of the test specimen is then broken off by means of a hammer, a number of light blows being used, and the bending being away from the groove. The specimen is broken at the other two grooves in the same way. The object of this treatment is to open and render visible to the eye any seams due to failure to weld up, or to foreign interposed matter, or cavities due to gas bubbles in the ingot. After rupture, one side of each fracture is examined, a pocket lens being used if necessary, and the length of the seams and cavities is determined.

#### Yield Point.

13. For the purpose of this specification, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.



#### Sample for Chemical Analysis.

14. In order to determine if the material conforms to the chemical limitations prescribed in paragraph No. 2 herein, analysis shall be made of drillings taken from a small test ingot. An additional check analysis may be made from a tensile specimen of each melt used on an order, other than in locomotive fire box steel. In the case of locomotive fire box steel, a check analysis may be made from the tensile specimen from each plate as rolled.

#### Variation in Weight.

15. The variation in cross section or weight of more than  $2\frac{1}{2}\%$  per cent. from that specified will be sufficient cause for rejection, except in the case of sheared plates, which will be covered by the following permissible variations:—

(e) Plates  $12\frac{1}{2}$  pounds per square foot or heavier, up to 100 inches wide, when ordered to weight, shall not average more than  $2\frac{1}{2}\%$  per cent. variation above or  $2\frac{1}{2}\%$  per cent. below theoretical weight. When 100 inches wide and over, 10 per cent. above or 5 per cent. below the theoretical weight.

(f) Plates under  $12\frac{1}{2}$  pounds per square foot, when ordered to weight, shall not average a greater variation than the following:—

Up to 75 inches wide,  $2\frac{1}{2}\%$  per cent. above or  $2\frac{1}{2}\%$  per cent. below the theoretical weight. 75 inches wide up to 100 inches wide, 5 per cent. above or 3 per cent. below the theoretical weight. When 100 inches wide and over, 10 per cent. above or 3 per cent. below the theoretical weight.

(g) For all plates ordered to gauge, there will be permitted an average excess of weight over that corresponding to the dimensions on the order equal in amount to that specified in the following table:—