



# Lloyd's Register of British & Foreign Shipping,

Collingwood Buildings, Newcastle-on-Tyne.

LLOYDS REGISTER  
LONDON.

6th. October 1904.

REC<sup>d</sup> 7 OCT 1904

Reference

The Secretary,

Lloyd's Register.

Sir,

I beg to forward herewith particulars of the experimental tests made from four plates of high tensile (carbon) steel manufactured by Messrs. John Spencer & Sons of Newburn with a view to material of this higher tenacity being used in parts of the structure of the S.S. No. 735 building by Messrs. Swan Hunter & Wigham Richardson Ltd. for the Cunard Co.

Tensile tests of normal annealed and quenched samples, cold and temper bends and fatigue tests have been made as arranged by Mr. Cornish during his visit to the steel works on the 15th. September, and also fatigue tests of ordinary mild steel plates for comparison.

One plate 1" thick and one  $\frac{3}{4}$ " thick were rolled from charge E.532; one plate  $\frac{1}{2}$ " thick and one  $\frac{3}{8}$ " were rolled from charge D.455.

The analysis of charge E.532 is:-

Carbon	.32%
Manganese	.62%
Silicon	.073%
Sulphur	.030%
Phosphorus	.050%



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and of D.455 is:-

Carbon	.30%
Manganese	.62%
Silicon	.035%.
Sulphur	.036%
Phosphorus	.048%

This material has been rolled with a view to meeting the following conditions, viz:-

Breaking strain per square inch of not less than 34 tons and not greater than 38 tons

Elastic limit not less than 20 tons per square inch.

Elongation not less than 20% on a length of 8".

The samples for testing were taken from different parts of the plates as shewn on the sketches in order to test if the plate was homogeneous.

#### $\frac{3}{8}$ " plate. Tensile Tests:-

The breaking strain per square inch of the 7 normal test piece varied from 34.8 Tons to 36.6 with a mean of 35.8; the mean elongation is 23.0% on a length of 8" and in no case falls below 20%; the mean elastic limit is 20.6 tons per square inch and in no case falls below 20 tons.

Bends. The cold and temper bends were all satisfactory in most cases closing up beyond the rule requirements.

$\frac{1}{2}$ " plate. Tensile Tests. The breaking strain per square inch of the seven normal samples varied from 34.8 to 36.3 tons with a mean of 35.2 tons; the mean elongation is 23% on a length of 8" and in no case falls below 20%, the mean elastic limit is 20.2 tons and in two of the samples falls slightly below 20 tons.



Bends. The cold and temper bends were satisfactory.

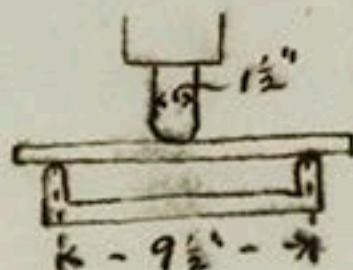
$\frac{3}{4}$ " plate. Tensile Tests. The breaking strain per square inch of seven normal samples varies from 34.3 tons to 35.5 tons with a mean of 34.8 tons; the mean elongation is 23% on a length of 8" and in no case falls below 20%; the mean elastic limit is practically 20 tons, one sample being slightly below this and one being  $\frac{8}{10}$  of a ton below, but these two samples were slightly defective.

The cold and temper bends were satisfactory.

1" plate. Tensile Tests. The breaking strain per square inch of the 8 normal samples varies from 31.6 tons to 36.9 tons with a mean of 35.4 tons; the mean elongation is  $20\frac{1}{2}\%$  on a length of 8" and in two cases falls below 20%; the mean elastic limit is 20.17 tons but in three cases it falls below 20 tons.

The cold bends of the pieces taken lengthwise of the plate, and the temper bends were satisfactory.

The fatigue tests were made on samples 2" wide with edges planed. The samples were supported on a block as shewn in sketch



and bent under a hydraulic ram with a plunger  $1\frac{1}{2}$ " wide rounded at the end.

From the results of the tests given herewith I am of opinion that the manufacture of the  $\frac{3}{8}$ " and 10/20" high tensile plates by Messrs. John Spencer & Sons may be approved, subject to the same conditions as to numbers of tests as required by the



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the Rules for ordinary mild steel plates, the Surveyor to be at liberty to increase the number of tests if the results obtained shew that it is desirable to do so.

For plates above 10/20 and not exceeding 15/20 I am of opinion that a tensile test and cold and temper bend should be made from each plate at present. The number of tests might be somewhat reduced later after further experience of the material

For plates above 15/20" to 1" thick, in view of the samples which have fallen below the conditions laid down, I am of opinion the matter should be deferred pending further experiments on another 1" plate which Messrs. Spencer propose to roll for this purpose.

As Messrs. Spencer wish to roll the  $\frac{3}{8}$ " and 10/20" plates next week they desire to know as early as possible if this material will be approved of, and what tests are to be applied to it.

I am, Sir,

Your obedient Servant,

E. C. C. Humphreys



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and plates for ordinary mild steel plates, the answer to be

at liberty to increase the number of tests if the results

obtained show that it is desirable to do so.

For plates above 10/80 and not exceeding 12/10 I am of

opinion that a tensile test and cold and temper bend should

be made from each plate at present. The number of tests might

be somewhat reduced later after further experience of the material

for plates above 15/80 to 1" thick in view of the samples

which have failed below the conditions laid down. I am of opinion

the matter should be deferred pending further experiments

on another 1" plate which remains. Spencer proposes to roll for

this purpose.

As before. Spencer will roll the 10/80 plates

next year and will also roll the 12/10 plates

material will be approved of and that tests are to be made

to it.

I am, Sir,

Yours faithfully,

*al*

7 OCT 1904

*Early attention  
requested  
J. M. F. 10/10/04*

Referred to the Chief Ship Surveyor  
and the Chief Engineer Surveyor.