**MAIN EDITION.**

# British Chemical Standards

**issued by**

## Bureau of Analysed Samples Ltd.,

Directors (1956–61) :—

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. Gildon, *F.C.A.*

| British Chemical Standards | |
|---|---|
| **No. 212/1** | |
| **0·2% LEADED STEEL** | |
| | per cent. |
| LEAD ... ... | 0·22– |
| CARBON ... ... | 0·36– |
| SILICON ... ... | 0·23– |
| SULPHUR... ... | 0·030 |
| PHOSPHORUS ... | 0·027 |
| MANGANESE ... | 0·91– |
| See Certificate for further details. | |

## ·rtificate of Analyses

OF

# B.C.S. No. 212/1 0·2% LEADED STEEL

(Replacement of B.C.S. No. 212).

**Prepared under rigorous laboratory conditions and, AFTER STANDARDIZATION BY ANALYSTS IN GREAT BRITAIN, issued by the Bureau of Analysed Samples, Ltd.**

The standard bar, specially selected for its homogeneity, was supplied by Exors. of James Mills Limited, Stockport.

## CO-OPERATING ANALYSTS AND FIRMS.

**REFEREE ANALYST—INDEPENDENT.**

1. Coppins, W. C., *M.Sc., A.R.I.C.*, Ridsdale & Co. Ltd., Middlesbrough.

**GOVERNMENT DEPARTMENT.**

2. Bush, G. H., *B.Sc., F.R.I.C.*, Armament Research and Development Establishment, Sevenoaks.

**ANALYSTS—representing MAKERS and USERS.**

3. Clyde, C., Lanarkshire Steel Co. Ltd., Motherwell.
4. Croall, G., G.K.N. Group Research Laboratory, Wolverhampton.
5. Dunnill, P. B., *B.Sc.*, Steel Peech & Tozer, Rotherham.
6. Henrys, F., *A.M.C.T., A.I.M.*, Exors. of James Mills Ltd., Stockport.
7. Heslop, S., *A.C.T., F.I.M.*, The Rover Co. Ltd., Solihull.
8. Walker, A., Lysaght's Scunthorpe Works, Scunthorpe.

## ANALYSES

| Analyst No. | Pb % | C % | Si % | S % | P % | Mn % | Ni % | Cr % | Mo % | Cu % | V % | As % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0·22 | 0·36 | 0·23 | 0·029 | 0·026 | 0·91 | *0·10* | *0·07* | *0·02* | *0·13* | *<0·01* | *0·02* |
| 2 | 0·22 | 0·35 | 0·24 | 0·029 | 0·027 | 0·91 | ... | ... | ... | *0·13* | ... | ... |
| 3 | 0·22 | 0·36 | 0·23 | 0·029 | 0·028 | 0·93 | ... | ... | ... | ... | ... | ... |
| 4 | 0·22 | 0·36 | 0·23 | 0·029 | 0·027 | 0·90 | ... | ... | ... | ... | ... | ... |
| 5 | 0·22 | 0·36 | 0·23 | 0·031 | 0·026 | 0·91 | ... | ... | ... | ... | ... | ... |
| 6 | 0·22 | 0·36 | 0·22 | 0·032 | 0·029 | 0·91 | ... | ... | ... | ... | ... | ... |
| 7 | 0·22 | 0·35 | 0·23 | 0·029 | 0·027 | 0·91 | ... | ... | ... | ... | ... | ... |
| 8 | 0·21 | 0·35 | 0·22 | 0·029 | 0·028 | 0·88 | ... | ... | ... | ... | ... | ... |
| Average | **0·22** | **0·36** | **0·23** | **0·030** | **0·027** | **0·91** | ... | ... | ... | ... | ... | ... |

**The above figures are those which each Analyst has decided upon after careful verification.**
**Average figures in bold type standardized, figures in small italic type only approximate.**

The following additional results have been supplied by W. T. Elwell, *F.R.I.C.* (I.C.I. Ltd., Metals Division, Birmingham) Pb $0{\cdot}21_5$%, P 0·028%.

[P.T.O.

# B.C.S. No. 212/1 0·2% LEADED STEEL.

## NOTES ON METHODS USED.

### LEAD.

All Analysts except W. T. Elwell used the Standard gravimetric method B.S. 1121 : Part 41 : 1960 in which the lead is separated as sulphide and determined as lead molybdate. W. T. Elwell determined lead by atomic absorption spectrophotometry (Elwell and Gidley, Anal. Chim. Acta, 1961, **24**, 71).

Analyst No. 2 also determined lead turbidimetrically as colloidal lead sulphide (Bush, Analyst, 1954, **79**, 697) and found 0·23%. No. 4 also used a colorimetric dithizone method and found 0·22%. Nos. 5 and 8 also used a gravimetric method involving separation of lead as sulphate followed by conversion to lead molybdate and obtained results of 0·22% and 0·20% respectively.

### CARBON.

All Analysts used gravimetric combustion methods closely similar to the Standard method B.S.1121 : Part 11 : 1948. Nos. 1 and 2 used no flux.

Analyst No. 8 also found 0·35% by a Ströhlein method.

### SILICON.

All Analysts used the Standard gravimetric method B.S. 1121 : Part 10 : 1948 involving double dehydration with perchloric acid.

Analyst No. 2 also found 0·22% by means of a single dehydration with perchloric acid. Nos. 3, 6 and 8 also used colorimetric molybdenum-blue methods and found 0·23%, 0·23% and 0·22% respectively.

### SULPHUR.

All Analysts except No. 2 determined sulphur gravimetrically as barium sulphate. Nos. 1, 3, 4, 6, 7 and 8 used the Standard method B.S. 1121 : Part 1A : 1957. No. 5 used a similar method but reduced the ferric iron with zinc instead of with hydroxyammonium chloride. No. 2 determined sulphur by combustion at 1250°C without flux ; the sulphur gases were absorbed in hydrogen peroxide and titrated with sodium borate solution.

Analysts Nos. 1, 3, 4, 5, 6 and 8 also determined sulphur by combustion and found 0·030%, 0·030%, 0·028%, 0·031% 0·029% and 0·029% respectively. No. 4 also used an evolution method and found 0·030%.

### PHOSPHORUS.

Analysts Nos. 1, 2, 3, 7 and 8 determined phosphorus gravimetrically by precipitation as ammonium phosphomolybdate and conversion to lead molybdate. Nos. 1 and 8 used the Standard method for phosphorus in high chromium-nickel steels B.S. 1121 : Part 9 : 1948. Nos. 2, 3 and 7 used the Standard method B.S.1121 : Part 1 : 1943. Nos. 4, 5 and 6 determined phosphorus volumetrically after precipitation as ammonium phosphomolybdate. No. 4 followed the procedure of B.S. 1121 : Part 9 up to the precipitation of the phosphomolybdate. No. 5 used the perchloric acid method given in the United Steel Companies' handbook (Standard Methods of Analysis, 1951). W. T. Elwell used a colorimetric phosphovanadomolybdic acid method (Elwell and Wilson, Analyst, 1956, **81**, 136 ; 1957, **82**, 435).

Analysts Nos. 2, 3, 5 and 8 also used direct volumetric methods and found 0·028%, 0·032%, 0·026% and 0·028% respectively.

### MANGANESE.

Analysts Nos. 1, 2, 3, 4, 5 and 8 determined manganese volumetrically. No. 1 disolved the sample in sulphuric/phosphoric/nitric acid mixture, oxidised with persulphate/silver nitrate and titrated with arsenite/nitrite solution. No. 2 used a bismuthate method after carrying out a zinc oxide separation. Nos. 3, 4, 5 and 8 also carried out zinc oxide separations, but oxidized with persulphate/silver nitrate. Nos. 3, 4 and 8 followed the procedure of the Standard method B.S. 1211 : Part 16 : 1949, while No. 5 used the United Steel Companies' method (Standard Methods of Analysis, 1951). Nos. 6 and 7 used the Standard absorptiometric method B.S.1121 : Part 23 : 1951 depending on oxidation with periodate.

Analysts Nos. 2 and 6 also used bismuthate methods without a preliminary zinc oxide separation and found 0·91% and 0·90% respectively. Nos. 2, 4 and 5 also determined manganese colorimetrically by oxidation with periodate (Nos. 2 and 4) or persulphate/silver/nitrate (No. 5), No. 4 following the procedure of the Standard absorptiometric method ; the results were 0·89%, 0·90% and 0·91% respectively. Analysts Nos. 3 and 8 also obtained figures of 0·94% and 0·88% respectively by direct persulphate/arsenite volumetric methods.

**NICKEL.**

Dimethylglyoxime colorimetric method (Analoid method No. 44).

**CHROMIUM.**

Persulphate volumetric method (Analoid method No. 37).

**MOLYBDENUM.**

Thiocyanate colorimetric method (Analoid method No. 42).

**COPPER.**

Analyst No. 1 used the Standard absorptiometric method B.S. 1121 : Part 36 : 1956. No. 2 separated the copper as sulphide and determined it electrolytically.

**VANADIUM.**

Standard volumetric method B.S. 1121 : Part 25 : 1956.

**ARSENIC.**

Hypophosphite volumetric method.

BUREAU OF ANALYSED SAMPLES, LTD.,
per P. D. Ridsdale,
Managing Director.
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Newham Hall,
Middlesbrough,
England.

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