DEPARTMENT OF COMMERCE

# Bureau of Standards

## Certificate of Analyses

OF

## STANDARD SAMPLE No. 35a

## ACID OPEN-HEARTH STEEL, 1.0% CARBON

| ANALYST* | C | Mn | | P | | S | | Si | Cu | Ni | Cr | V | Mo | As | Al |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CARBON Direct combustion | MANGANESE 1. Bismuthate ($FeSO_4$-$KMnO_4$) | 2. Other methods | PHOSPHORUS 1. Alkali-Molybdate[a] | 2. Gravimetric (Weighed as $Mg_2P_2O_7$ after removal of arsenic) | 1. SULPHUR Gravimetric (Direct oxidation and final precipitation in reduced solution) | 2. SULPHUR Evolution with HCl (1:1) ZnS-Iodine (theoretical sulphur titre[b]) | SILICON Sulphuric acid dehydration | COPPER $H_2S$-CuS-CuO | NICKEL Weighed as nickel dimethylglyoxime | CHROMIUM $FeSO_4$-$KMnO_4$ titration | VANADIUM | MOLYBDENUM | ARSENIC | ALUMINUM |
| 1 | 1.03 | 0.344 | ------ | 0.037 | 0.037 | 0.037 | 0.034 | 0.391 | 0.265 | 0.255 | 0.270[e] | 0.012[e] | 0.003[d] | 0.007 | 0.005 |
| 2 | 1.02 | .346 | 0.342[e] | .035 | .034 | .036 | .036 | .387 | .270 | .253 | .262 | .011 | .004 | .011 | ------ |
| | 1.03 | .345 | .35 | .038 | ------ | .035 | .030 | .388 | .263 | ------ | ------ | ------ | ------ | ------ | ------ |
| 4 | 1.03 | .343 | .346[f] | .038 | ------ | ------- | .032 | .385 | .274[g] | .254[h] | .254[i] / .256 | ------ | ------ | ------ | ------ |
| 5 | 1.04 | ------ | .36[f] | ------ | ------ | .039 | .038 | .38 | ------ | ------ | .26 | ------ | ------ | ------ | ------ |
| 6 | 1.03 | .342 | ------ | .037 | ------ | .035 | .035[j] | .39 | .265[g] / .269 | .259[h] | .277 | ------ | ------ | ------ | ------ |
| 7 | 1.02 | ------ | .34[e] | .035 | ------ | .038 | .035 | .390 | .26[g] | .25[h] | .27 | ------ | ------ | ------ | ------ |
| 8 | 1.02 | .335 | .34[f] | .038 | ------ | .035 | .035 | .392 | ------ | ------ | ------ | ------ | .003 | ------ | ------ |
| 9 | 1.03 | .344 | .36 | .038 | .038 | .037 | .037 | .382 | .269 | ------ | .263 | .009 | .005 | ------ | ------ |
| Averages | 1.03 | .343 | .348 | .037 | .036 | .037 | .035 | .387 | .267 | .254 | .264 | .011 | .004 | .009 | .005 |
| General Averages | 1.03 | 0.345 | | 0.037 | | 0.037[k] | 0.035[l] | 0.387 | 0.267 | 0.254 | 0.264 | 0.011 | 0.004 | 0.009 | 0.005 |

[a] Precipitated at 40°C., washed with a 1 per cent solution of $KNO_3$ and titrated with alkali standardized by means of B. S. benzoic acid and the 23:1 ratio.

[b] Value obtained by standardization of titrating solution against sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$.

[c] Electrometric titration.

[d] Colorimetric by developing color with KSCN and $SnCl_2$.

[e] Bismuthate-Arsenite method.

[f] Persulphate-Arsenite.

[g] Finished electrolytically.

[h] Finished by titration. with KCN.

[i] Perchloric acid oxidation.

[j] Results as low as 0.030 per cent were obtained.

[k] Recommended value.

[l] This steel is not recommended as a standard for sulphur by the evolution method. The results obtained at the Bureau of Standards varied between 0.033 and 0.039 per cent. Some of the cooperators also reported difficulties with this determination.

## *LIST OF ANALYSTS

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**This standard is not recommended for colorimetric carbon determinations, because of uncertainty as to the condition of the carbon.**

*Washington, D. C.*
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George K. Burgess
*Director.*

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