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*Wolmarans*

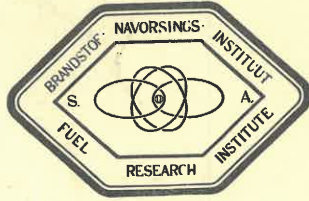
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OF 1950

VAN 1950



WU/A/8/3

# FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

## BRANDSTOF-NAVORSINGS-INSTITUUT VAN SUID-AFRIKA.

SUBJECT: WASHABILITY AND OTHER CHARACTERISTICS OF COAL FROM  
ONDERWERP:

THE NO.5 SEAM, SOUTH WITBANK COLLIERY.

DIVISION: CHEMISTRY.  
AFDELING:

NAME OF OFFICER: C. C. LA GRANGE & J.J. WOLMARANS.  
NAAM VAN AMPTENAAR:

FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

REPORT NO. 15 OF 1950.

WASHABILITY AND OTHER CHARACTERISTICS OF COAL FROM THE NO.5 SEAM,  
SOUTH WITBANK COLLIERY.

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A bulk face sample (No. T124) of approximately 1 ton was taken on 12/4/1950 from the No.5-Seam, South Witbank Colliery at a point about 70' east of a point 100' south of peg 104 (see F.R.I. map No. A40). The seam here was about 69" thick.

The procedure adopted in crushing and screening the sample and in numbering the various size fractions obtained is shown in Diagram 1. The yields of various grades will be found in Table 3.

All the size fractions (except those smaller than 1 m.m.) were saturated with moisture and washed in  $ZnCl_2$  solutions at the following specific gravities:- 1.350, 1.400, 1.450, 1.500 and 1.600.

The yields and analytical data (air-dry state) of the fractions obtained appear in Table 1, while the cumulative results (calculated in most instances from the data of Table 1) are given in Table 2. From the combined results the ash contents of the various size fractions and the original bulk sample were calculated, the results appearing in Table 3.

Washability curves for the various size fractions appear in Figures 1 to 6. In each figure there are three curves viz.:-

1. Cumulative yield against specific gravity.
2. Cumulative yield against cumulative ash content.
3.  $\pm 0.1$  S.G. Distribution (i.e. difference between yields) against S.G.

The washability data of the samples at the three arbitrarily chosen specific gravities 1.55, 1.45 and 1.40 have been summarised in Table 4.

BRIEF REMARKS:/.....

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Both the roof and floor of the seam were weathered, and the possibility exists that the coal had also suffered subsurface weathering. The high air-dry moisture contents recorded in Tables 1 and 2 suggest that such weathering has occurred.

With the natural arisings (represented to some extent by the A-samples) there would, according to Table 3, be a decrease in ash content with decrease in size, but the material smaller than 1 m.m. has a remarkably high ash content. In the case of the B and the C samples a similar trend is noticeable.

Judging by the  $\pm 0.1$  S.G. Distribution at S.G. 1.55 (see washability curves and Table 4) the washing of, for example, cobbles could not entirely satisfactorily be carried out in a jig type of washer, but with smaller sizes results would be reasonable. At lower specific gravities this type of washer would probably not be suitable for effecting the desired separations.

Regarding the coking possibilities of the coal the volatile matter content is normal for this seam, while the ash content would not present any obstacle, especially if the coal is crushed to minus 1" in size before washing. The swelling characteristics are disappointing, however. This may or may not have some connection with the suggested subsurface weathering of the coal mentioned above. By washing the crushed coal at a specific gravity of about 1.45 a reasonable yield of low-ash coal would be obtained but the swelling number would only be  $1\frac{1}{2}$ , and it remains to be demonstrated whether such a poor-swelling coal could be used as a blend coking coal. Lowering the separation gravity to, say, about 1.40 would seriously impair the yield and make the separation more difficult, while the swelling number would not be improved to more than 2. However, the possibilities of utilising coal from this/.....

3.

this seam for gas or coke making will be investigated in greater detail at a later date.

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and

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TECHNICAL ASSISTANT.

PRETORIA.

2nd June, 1950.

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DIAGRAM 1.

SAMPLE NO: T124

SEAM: No. 5.

COLLIERY: South Witbank

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ca. 1 ton sample crushed (by hand) to -4" and divided into two.

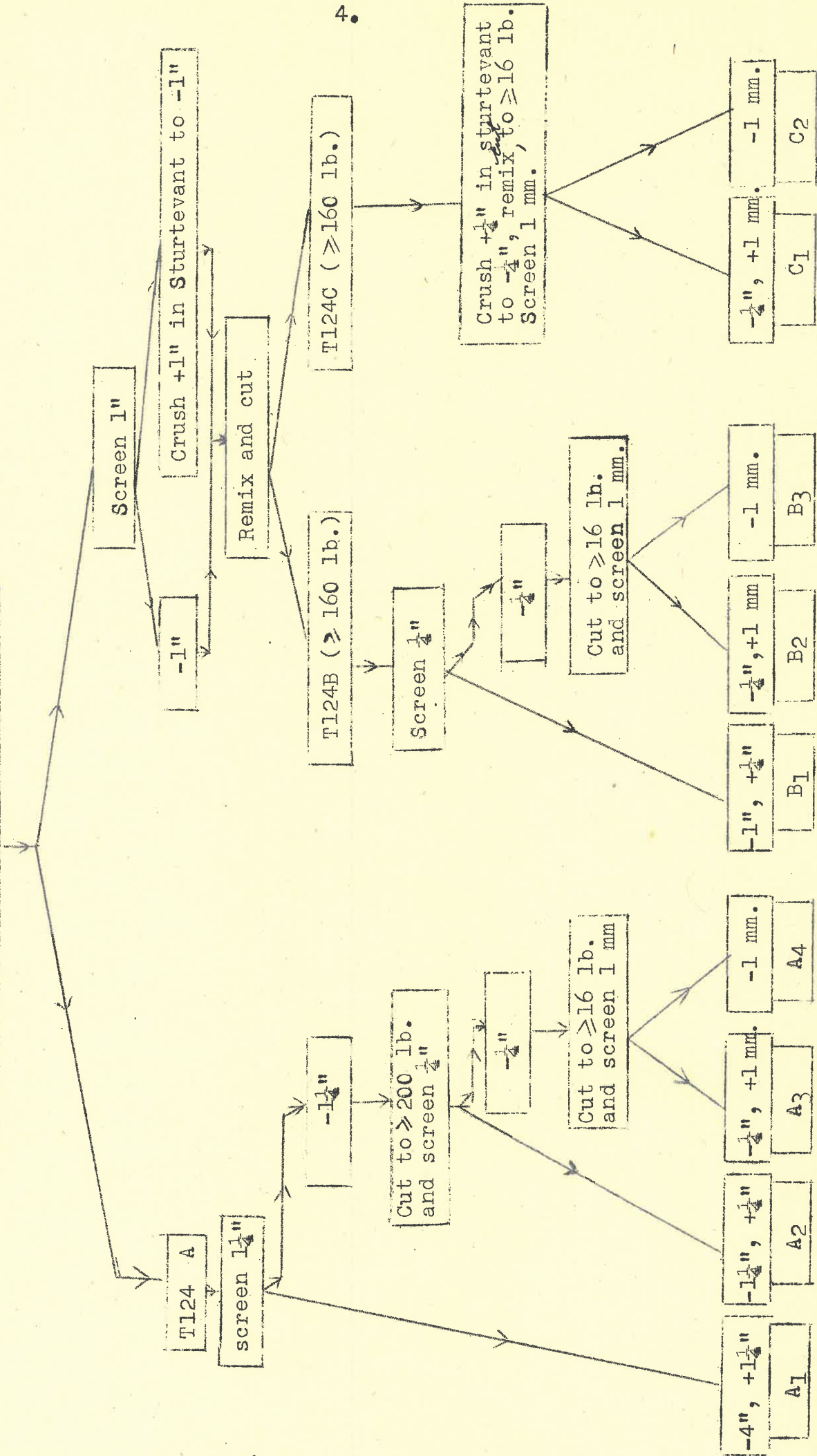


TABLE 1.

YIELDS AND ANALYTICAL DATA OF SPECIFIC GRAVITY  
FRACTIONS.

| Sample No.         | S.G. Fraction. | Yield %. | C. V. lbs/lb. | Moist. %. | Ash %. | Vol. Mat. %. | Fix. Carb. %. |
|--------------------|----------------|----------|---------------|-----------|--------|--------------|---------------|
| T124A <sub>1</sub> | F1.1.35        | 10.0     | -             | 4.3       | 7.2    | 35.4         | 53.1          |
|                    | Fr.1.35-1.4    | 31.8     | -             | 4.3       | 10.5   | 32.4         | 52.8          |
|                    | Fr.1.4-1.45    | 27.2     | -             | 4.1       | 14.0   | 29.7         | 52.2          |
|                    | Fr.1.45-1.5    | 12.7     | 11.1          | 3.8       | 19.9   | 25.9         | 50.4          |
|                    | Fr.1.5-1.6     | 10.4     | 10.1          | 3.9       | 25.7   | 24.4         | 46.0          |
|                    | Sk.1.6         | 7.9      | -             | -         | 41.0   | -            | -             |
| T124A <sub>2</sub> | F1.1.35        | 36.7     | -             | 4.3       | 6.8    | 35.7         | 53.2          |
|                    | Fr.1.35-1.4    | 22.8     | -             | 4.3       | 9.9    | 32.3         | 53.5          |
|                    | Fr.1.4-1.45    | 16.0     | -             | 4.1       | 13.8   | 28.9         | 53.2          |
|                    | Fr.1.45-1.5    | 5.9      | 11.2          | 4.0       | 19.9   | 26.2         | 49.9          |
|                    | Fr.1.5-1.6     | 5.9      | 10.2          | 3.7       | 25.6   | 23.0         | 47.7          |
|                    | Sk.1.6         | 12.7     | -             | -         | 44.6   | -            | -             |
| T124A <sub>3</sub> | F1.1.35        | 52.2     | -             | 4.3       | 5.3    | 35.4         | 55.0          |
|                    | Fr.1.35-1.4    | 19.9     | -             | 4.1       | 10.2   | 31.6         | 54.1          |
|                    | Fr.1.4-1.45    | 9.3      | -             | 3.8       | 14.3   | 27.5         | 54.4          |
|                    | Fr.1.45-1.5    | 5.3      | 11.2          | 3.5       | 19.4   | 23.6         | 53.5          |
|                    | Fr.1.5-1.6     | 4.0      | 10.1          | 3.7       | 26.0   | 21.7         | 48.6          |
|                    | Sk.1.6         | 9.3      | -             | -         | 53.4   | -            | -             |
| T124B <sub>1</sub> | F1.1.35        | 30.4     | -             | 4.2       | 7.2    | 34.7         | 53.9          |
|                    | Fr.1.35-1.4    | 26.1     | -             | 4.0       | 10.2   | 31.6         | 54.2          |
|                    | Fr.1.4-1.45    | 17.6     | -             | 3.9       | 13.9   | 28.3         | 53.9          |
|                    | Fr.1.45-1.5    | 6.0      | 11.2          | 3.8       | 19.8   | 25.6         | 50.8          |
|                    | Fr.1.5-1.6     | 7.0      | 10.1          | 3.6       | 26.1   | 22.6         | 47.7          |
|                    | Sk.1.6         | 12.9     | -             | -         | 44.0   | -            | -             |
| T124B <sub>2</sub> | F1.1.35        | 45.1     | -             | 4.6       | 5.4    | 34.7         | 55.3          |
|                    | Fr.1.35-1.4    | 22.1     | -             | 4.1       | 10.2   | 31.7         | 54.0          |
|                    | Fr.1.4-1.45    | 11.5     | -             | 3.8       | 14.2   | 27.1         | 54.9          |
|                    | Fr.1.45-1.5    | 6.2      | 11.2          | 3.8       | 19.7   | 24.7         | 51.8          |
|                    | Fr.1.5-1.6     | 2.7      | 10.2          | 3.6       | 25.8   | 22.2         | 48.4          |
|                    | Sk.1.6         | 12.4     | -             | -         | 44.1   | -            | -             |
| T124C <sub>1</sub> | F1.1.35        | 38.2     | -             | 4.5       | 5.8    | 34.8         | 54.9          |
|                    | Fr.1.35-1.4    | 22.7     | -             | 4.3       | 10.1   | 32.5         | 53.1          |
|                    | Fr.1.4-1.45    | 14.5     | -             | 3.9       | 14.1   | 28.2         | 53.8          |
|                    | Fr.1.45-1.5    | 6.4      | 11.1          | 3.5       | 20.0   | 25.5         | 51.0          |
|                    | Fr.1.5-1.6     | 6.4      | 10.2          | 3.4       | 26.1   | 22.5         | 48.0          |
|                    | Sk.1.6         | 11.8     | -             | -         | 47.7   | -            | -             |

TABLE 2.

CUMULATIVE YIELDS AND ANALYTICAL DATA OF SPECIFIC GRAVITY SEPARATIONS.

| Sample No.         | S.G.     | Float Yield (%) | Cal.Val. lbs/lb. | Moist. % | Ash % | Vol.Mat. % | Fix.Carb. % | Sw. No.             |
|--------------------|----------|-----------------|------------------|----------|-------|------------|-------------|---------------------|
| T124A <sub>1</sub> | 1.35     | 10.0            | -                | 4.3      | 7.2   | 35.4       | 53.1        | 2 $\frac{1}{2}$     |
|                    | 1.4      | 41.8            | -                | 4.3      | 9.7   | 33.1       | 52.9        | 1 $\frac{1}{2}$     |
|                    | 1.45     | 69.0            | 12.5             | 4.2      | 11.4  | 31.8       | 52.6        | 1-1 $\frac{1}{2}$   |
|                    | 1.5      | 81.7            | 12.3             | 4.2      | 12.7  | 30.9       | 52.2        | F                   |
|                    | 1.6      | 92.1            | 12.0             | 4.1      | 14.2  | 30.1       | 51.6        | -                   |
|                    | Unwashed | 100             | -                | -        | 16.3  | -          | -           | -                   |
| T124A <sub>2</sub> | 1.35     | 36.7            | -                | 4.3      | 6.8   | 35.7       | 53.2        | 2-2 $\frac{1}{2}$   |
|                    | 1.4      | 59.5            | -                | 4.3      | 8.0   | 34.4       | 53.3        | 2                   |
|                    | 1.45     | 75.5            | 12.9             | 4.3      | 9.2   | 33.2       | 53.3        | 1Ag-1 $\frac{1}{2}$ |
|                    | 1.5      | 81.4            | 12.8             | 4.2      | 10.0  | 32.7       | 53.1        | 1Ag-F               |
|                    | 1.6      | 87.3            | 12.6             | 4.2      | 11.1  | 32.0       | 52.7        | -                   |
|                    | Unwashed | 100             | -                | -        | 15.3  | -          | -           | -                   |
| T124A <sub>3</sub> | 1.35     | 52.2            | -                | 4.3      | 5.3   | 35.4       | 55.0        | 2-2 $\frac{1}{2}$   |
|                    | 1.4      | 72.1            | -                | 4.2      | 6.7   | 34.4       | 54.7        | 2-2 $\frac{1}{2}$   |
|                    | 1.45     | 81.4            | 13.0             | 4.2      | 7.5   | 33.6       | 54.7        | 1 $\frac{1}{2}$     |
|                    | 1.5      | 86.7            | 12.9             | 4.2      | 8.3   | 33.0       | 54.5        | 1Ag-F               |
|                    | 1.6      | 90.7            | 12.8             | 4.1      | 9.0   | 32.5       | 54.4        | -                   |
|                    | Unwashed | 100             | -                | -        | 13.2  | -          | -           | -                   |
| T124B <sub>1</sub> | 1.35     | 30.4            | -                | 4.2      | 7.2   | 34.7       | 53.9        | 2 $\frac{1}{2}$     |
|                    | 1.4      | 56.5            | -                | 4.1      | 8.6   | 33.3       | 54.0        | 1 $\frac{1}{2}$     |
|                    | 1.45     | 74.1            | 12.8             | 4.1      | 9.9   | 32.1       | 53.9        | 1Ag-1 $\frac{1}{2}$ |
|                    | 1.5      | 80.1            | 12.7             | 4.0      | 10.6  | 31.6       | 53.8        | F                   |
|                    | 1.6      | 87.1            | 12.5             | 4.0      | 11.8  | 30.9       | 53.3        | -                   |
|                    | Unwashed | 100             | -                | -        | 16.0  | -          | -           | -                   |
| T124B <sub>2</sub> | 1.35     | 45.1            | -                | 4.6      | 5.4   | 34.7       | 55.3        | 2 $\frac{1}{2}$ -3  |
|                    | 1.4      | 67.2            | -                | 4.4      | 7.0   | 33.7       | 54.9        | 2                   |
|                    | 1.45     | 78.7            | 13.0             | 4.3      | 8.0   | 32.8       | 54.9        | 1 $\frac{1}{2}$     |
|                    | 1.5      | 84.9            | 12.9             | 4.3      | 8.9   | 32.2       | 54.6        | 1Ag-F               |
|                    | 1.6      | 87.6            | 12.8             | 4.3      | 9.4   | 31.9       | 54.4        | -                   |
|                    | Unwashed | 100             | -                | -        | 13.7  | -          | -           | -                   |
| T124C <sub>1</sub> | 1.35     | 38.2            | -                | 4.5      | 5.8   | 34.8       | 54.9        | 2 $\frac{1}{2}$     |
|                    | 1.4      | 60.9            | -                | 4.4      | 7.4   | 33.9       | 54.3        | 2                   |
|                    | 1.45     | 75.4            | 12.9             | 4.3      | 8.7   | 32.8       | 54.2        | 1-1 $\frac{1}{2}$   |
|                    | 1.5      | 81.8            | 12.8             | 4.3      | 9.6   | 32.3       | 53.8        | 1Ag                 |
|                    | 1.6      | 88.2            | 12.6             | 4.2      | 10.8  | 31.6       | 53.4        | Ag-F                |
|                    | Unwashed | 100             | -                | -        | 15.1  | -          | -           | -                   |

TABLE 3.

ASH CONTENTS OF SIZE FRACTIONS AND ORIGINAL COAL CALCULATED  
FROM THE AVAILABLE DATA.

| Sample No.     | %.   | Ash %.            | Sample No. | Ash %. | Sample No. | Ash %. |
|----------------|------|-------------------|------------|--------|------------|--------|
| A <sub>1</sub> | 44.1 | 16.3              | A          | 15.7   | T124       | 15.7   |
| A <sub>2</sub> | 36.1 | 15.3              |            |        |            |        |
| A <sub>3</sub> | 14.7 | 13.2              |            |        |            |        |
| A <sub>4</sub> | 5.1  | 20.0 <sup>*</sup> |            |        |            |        |
| B <sub>1</sub> | 70.8 | 16.0              | B          | 15.7   |            |        |
| B <sub>2</sub> | 22.7 | 13.7              |            |        |            |        |
| B <sub>3</sub> | 6.5  | 19.1 <sup>*</sup> |            |        |            |        |
| C <sub>1</sub> | 81.4 | 15.1              | C          | 15.6   |            |        |
| C <sub>2</sub> | 18.6 | 17.6 <sup>*</sup> |            |        |            |        |

\* Actually determined.

TABLE 4.

WASHABILITY DATA OF SAMPLES AT ARBITRARILY CHOSEN S.G.'s.

| S.G.                | 1.55       |         |        |                                  | 1.45    |         |       |                                  | 1.40    |         |       |
|---------------------|------------|---------|--------|----------------------------------|---------|---------|-------|----------------------------------|---------|---------|-------|
|                     | Sample No. | Yield % | Ash %  | +0.1 S.G. Distrib. <sup>xx</sup> | Sw. No. | Yield % | Ash % | +0.1 S.G. Distrib. <sup>xx</sup> | Sw. No. | Yield % | Ash % |
| T124 A <sub>1</sub> | 88         | 13.5    | ca. 30 | -                                | 69      | 11.4    | 78    | 1-1½                             | 42      | 9.7     | 1½    |
| A <sub>2</sub>      | 85         | 10.6    | " 15   | -                                | 76      | 9.2     | 48    | 1-1½                             | 60      | 8.0     | 2     |
| A <sub>3</sub>      | 89         | 8.7     | " 10   | -                                | 81      | 7.5     | 37    | 1½                               | 72      | 6.7     | 2-2½  |
| B <sub>1</sub>      | 84         | 11.2    | " 15   | -                                | 74      | 9.9     | 54    | 1-1½                             | 57      | 8.6     | 1½    |
| B <sub>2</sub>      | 87         | 9.3     | " 10   | -                                | 79      | 8.0     | 42    | 1½                               | 67      | 7.0     | 2     |
| C <sub>1</sub>      | 85         | 10.2    | " 15   | -                                | 75      | 8.7     | 47    | 1-1½                             | 61      | 7.4     | 2     |

<sup>xx</sup> The +0.1 S.G. Distribution is a quantitative indication of what is usually referred to as the 'near-gravity material' at the particular specific gravity.



