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BRANDSTOFNAVORSINGSINSTITUUT
VAN SUID-AFRIKA

FUEL RESEARCH INSTITUTE
OF SOUTH AFRICA

ONDERWERP:
SUBJECT: SIZE DISTRIBUTION OF RUN-OF-MINE COAL FROM 11 COLLIERIES MINING NO. 2 SEAM IN THE WITBANK-MIDDELBURG COALFIELD. COMPARISON OF SIZE DISTRIBUTION OF RUN-OF-MINE COAL, CUTTINGS AND DRILLINGS.

AFDELING:
DIVISION:

NAAM VAN AMPTENAAR:
NAME OF OFFICER: G. A. RAAB

Cosml 1320-B4

KEY TO COLLIERIES

A = Landau

B = TNC

C = Tweefontein

D = Tavistock

E = Eikeboom

F = New Clydesdale

G = Koornfontein

H = Douglas

J = Van Dyks Drift

X = Delmas

Y = Coronation Bank

FUEL RESEARCH INSTITUTE OF SOUTH AFRICA

REPORT NO. 11 OF 1974

SIZE DISTRIBUTION OF RUN-OF-MINE COAL FROM 11 COLLIERIES MINING NO. 2 SEAM IN THE WITBANK-MIDDELBURG COALFIELD. COMPARISON OF SIZE DISTRIBUTION OF RUN-OF-MINE COAL, CUTTINGS AND DRILLINGS.

I. SIZE DISTRIBUTION OF RUN-OF-MINE COAL

1. Purpose of the investigation

A knowledge of the size distribution of the coal produced is of obvious interest to the coal industry and suppliers of mining and coal preparation equipment. Since little information on the subject was available, the Fuel Research Institute, on the recommendation of its Pilot Plant Advisory Committee, tried in 1966 to collect this kind of information. Only limited success was attained.

The Research Advisory Committee of the Board took up this matter again, as a result of which its Advisory Committee on Coal Preparation prepared a questionnaire which was issued on the 3rd of October, 1969 to the various organizations and collieries.

However, not all parties were able to supply the desired information and it was decided that the Institute should also carry out some investigations.

This report is confined to collieries mining No. 2 Seam in the Witbank-Middelburg coalfield.

2. Work carried out by the Institute

From August, 1971 until March, 1974 the size consist of run-of-mine coal from 7 collieries mining No. 2 Seam was investigated. A total of 130 907 kg of coal was screened (mostly on site) over

/a .....

a series of calipers and screens ranging from 300 to 6,35 mm. The minus 6,35 mm fraction was in each case sent to the Institute for further screening.

The particulars of the sampling and samples are given in Table 1.

At some of the mines, the size distribution of the crusher product, cuttings from coal cutters and drillings obtained from a number of blastholes, was also determined.

3. Screen analyses provided by collieries

Included in the investigation are the screen analyses supplied by 7 collieries. Three of them were subsequently investigated by the Institute. The indices "1", "2" or "3" beside the capital letter indicate that these results were reported by the mine.

4. Evaluation of screen analyses

The cumulative percentage oversize of the screen analyses is given in Table 2. The profusion of screen sizes (some 33 in the size range from 300 to 0,5 mm) makes it impossible to obtain a general impression from the data by a cursory examination.

In order to get a clearer picture, the data in Table 2 were plotted on the Rosin-Rammler diagram. Rosin and Rammler applied their equation to pulverised coal, but T.G. Bennett et al found that the Rosin and Rammler law is also applicable to the size distribution of run-of-mine coal.

The form suggested by Bennett for the Rosin-Rammler size distribution is

$$R = 100e^{-\left(\frac{x}{\bar{x}}\right)^{n}}$$

/where .....

where R = the residue, or percentage of oversize particles of minimum particle size x, or, in practice, the weight percentage retained on a sieve of size opening x.

$\bar{x}$ = absolute size constant.

n = size distribution constant.

"$\bar{x}$" is a measure of the relative coarseness or fineness of the material. Its dimension is the same as the length of unit used to express the particle diameter or the sieve aperture. Its value is defined as that at which $x = \bar{x}$, so that

$$R = 100e^{-(\frac{x}{\bar{x}})^{n}} = 100e^{-1} = 100/e = 36,79\%.$$

"n" is a measure of the degree of dispersion of the particle size. If $n \longrightarrow \infty$, all particles will have the same size and therefore a size distribution does not exist. Conversely, when n is small the range of sizes is large and a considerable portion of the material consists of fines.

When the cumulative percentages of oversize material of a screen analysis are plotted on a special type of co-ordinate paper, the resulting curve R = f(x) is a straight line from which the two constants "$\bar{x}$" and "n" may be read off. "$\bar{x}$" is the particle size at which R = 36,79% (37%), and "n" is given by the slope of the line.

Consequently, a size distribution is specified by the two constants "n" and "$\bar{x}$". However, this method of representation is not easily understood by the layman and therefore the data have been supplemented by stating the three sizes at which the material contains 25%, 50% and 75% oversize.

The screen analyses of Table 2 were plotted on the special ruled paper (Figures 1 to 4) and the values read off from the diagram are reported in Table 3.

/The .....

The size distribution factor "n", with a few exceptions, applies for most of the mines around 0,81, but the size constant "$\bar{x}$" varies from 26 to 145 mm.

In Table 4, the grain sizes relevant to 25%, 37%, 50% and 75% oversize for mine A are taken as a unit. The corresponding values for the other mines indicate clearly that the size distribution is almost the same for all the mines. This fact also becomes evident from Table 5 where the screen size for 25% oversize is taken as a unit and the corresponding ratios for 37%, 50% and 75% oversize are given. The average ratio of 1 : 0,66 : 0,43 : 0,15 for 25%, 37%, 50% and 75% oversize is very closely maintained.

In Tables 2, 3, 4 and 5, the Roman numerals I to VI are affixed to the letter X. Samples I to V are daily averages and sample VI refers to the overall average of the 5-day sampling period in the current investigation.

/II. .....

II. COMPARISON OF SIZE DISTRIBUTIONS OF RUN-OF-MINE COAL, CUTTINGS FROM COAL CUTTER AND DRILLINGS OBTAINED FROM THE BLASTHOLES

From Mine "F" two samples from the cuttings of the coal cutter were also taken. Sample A comprising 10 bags, Sample B 11 bags, with a total mass of 970,9 kg, were screened individually and the average analyses are reported in Table 6.

Two samples of cuttings and 6 samples of drillings obtained from the blastholes were taken at Mine "X". The size composition of these samples is given in Tables 7 and 8.

In Figure 5, the cumulative percentages of oversize for the run-of-mine coal and the cuttings from Mine "F", and in Figure 6 the same values, including those of the drillings from Mine "X" have been plotted on the special ruled paper. The values deduced from these diagrams are recorded in Table 9. Analogously to the procedure as outlined in Part I, the various ratios, taking either the run-of-mine coal or the screen opening for 25% oversize as a base, were calculated and tabulated in Tables 10 and 11, respectively.

From Tables 10 and 11 it becomes obvious that the method of mining does not alter the size distribution but only the coarseness or fineness of the coal. In conventional mining the greatest portion of the coal is won by explosives. Cutting and drilling can be considered as mechanical mining. The products obtained from these various methods of mining have the same size distribution. Taking the screen openings for 25%, 37%, 50% and 75% oversize for the run-of-mine coal as a unit, the ratio for the same percentages of oversize for the cuttings would be 0,23 for Mine "F" and 0,09 for Mine "X", see Table 10.
The same ratio for the drillings in comparison to the run-of-mine coal for Mine "X" would average 0,013.

/In .....

In Table 11, the screen aperture for 25% oversize is taken as a unit. The ratios for the screen openings at which 37%, 50% and 75% of the material is retained on the screen are

1 : 0,67 : 0,44 : 0,14.

These ratios are almost the same for the run-of-mine coal as for the cuttings and drillings. (Table 11). The small variations can be partly ascribed to sampling and screening errors, especially where sub-sieve sizes are concerned.

III. GRAPHICAL REPRESENTATION OF SCREEN ANALYSES

The sizes, encountered in the screen analyses of run-of-mine coal extends over a range of 6000 : 1. Presentation of the results in a normal histogram with linear scales is thus awkward. Therefore, in Figures 7 to 10 a logarithmic scale has been used for the abscissae which represent the particle size.

The ordinates are now so calculated that the areas under the "curve" are still proportional to the quantity of the material present in each size range. More specifically, 1% is represented by 1 cm^2, so that the area under the curve is in each case equal to 100 cm^2. Further, a size ratio of 10 : 1 has been represented by 5 cm on the axis of the abscissae.

How the calculation proceeds is best illustrated by an example.

Example

	Size range x_1 - x_2	Weight percentage within this range Q (%)
a.	150 - 102	16,6
b.	102 - 76,2	9,0
c.	76,2 - 50,8	9,6
	etc.	etc.

/Calculation .....

Calculation

If S = log x, each size range is represented by a length

$$\Delta S = \log {}^{x_1}/_{x_2} \times \frac{5}{\log 10} = 5 \log {}^{x_1}/_{x_2}.$$

Thus $\Delta S_a = 5 \log \frac{150}{102} = 0,84$

$\Delta S_b = 5 \log \frac{102}{76,2} = 0,63$

$\Delta S_c = 5 \log \frac{76,2}{50,8} = 0,88$

The ordinate pertaining to each size fraction then follows from

$Y_a = Q_1 \div \Delta S_1$, $Y_b = Q_2 \div \Delta S_2$, $Y_c = Q_3 \div \Delta S_3$, etc.

This then produces the following results:

	Size range mm	Represented by ΔS, cm	Weight Fraction, %	Ordinate Q : ΔS, cm
a.	150 - 102	0,84	16,6	19,8
b.	102 - 76,2	0,63	9,0	14,3
c.	76,2 - 50,8	0,88	9,6	10,9

Though strictly speaking the figure should be drawn in the manner of a histogram (as indicated in Figure 7 for the first three fractions of curve A), this makes the representation of more than one curve per diagram rather confusing. The successive points were therefore joined by straight lines.

The contour of the diagram is dependent on the individual size ranges used. To compare two or more size distributions it is therefore essential to use the same size ranges in each case.

IV. SOME FACTORS WHICH INFLUENCE THE SIZE DISTRIBUTION

In conventional mining the run-of-mine coal is composed of three different products:

1. Drillings.
2. Cuttings.
3. Coal won with the aid of explosives.

It appears from the investigation that each product has the same size distribution factor (n) and the only difference lies in the size factor $\bar{x}$. However, when the three products are mixed in various proportions, a slight alteration in the size distribution will occur.

Shale or sandstone bands in a coal seam can also affect the size composition of a run-of-mine coal.

When top-coaling is applied, the amount of coarse coal is much higher since cutting falls away. In this case the size composition is also somewhat affected.

Breaking and tearing the coal from the face produces a certain size distribution pattern. The much milder forces of handling the coal from the face to the washery produce a slightly different pattern, superimposed on the first one.

Generally, however, the influence of all these factors on the size distribution of a run-of-mine coal is negligible.

/V. .....

V. SUMMARY

The size composition of run-of-mine coal from 11 collieries mining No. 2 Seam in the Witbank-Middelburg coalfield was investigated. It became evident that the size distribution of run-of-mine coal for all collieries was almost the same. They differed only in the coarseness or fineness of the products.

The screen aperture at which 37% of the coal is retained, is taken as a yardstick for the relative coarseness of a coal. From Table 3 it can be seen that this size varies between 26 and 145 mm, and further that the size factor for one and the same mine was not always constant but changed with the time (for example comparing B - B1, D - D1, H1 - H2, etc.) This effect is due to lighter or heavier blasting.

The investigation proved also that the mining method (drilling, cutting, blasting) does not alter the size distribution.

Table 9 shows that the size factors for cuttings and drillings vary considerably. The size distribution, however, stays constant, see Table 10.

Shape, sharpness and number of bits in the cutter are responsible for the size factor. A sharp and correctly designed bit will favour penetration by chipping and fracturing, whereas a blunt bit will produce much more fines due to its promoted grinding action.

Cutting, drilling, hole placement and shot patterns determine the production of different sizes. Most of the fines in a run-of-mine coal arise from drilling and cutting, whilst blasting produces mostly large lumps and little fines.

G.A. Raab
RESEARCH OFFICER

PRETORIA.
28/6/1974.
GAR/KW.

TABLE 1

PARTICULARS OF SAMPLES

Colliery	Sampling		Sample		Cut of Seam at:	Loading: M=mechan. H=hand	Remarks
	Date	Point	Mass, kg	No. of Increments			
A	Aug.71	Conveyor	8 776	111	M	M	After stockpile, Bain Breaker and Surge Bin underground.
B	Nov.71	Conveyor	5 889	36	M	M	After stockpile, Bain Breaker and Surge Bin underground.
C	Aug.72	Tub	43 055	53	T&M	H	
D	Nov.72	Tub	21 737	21	M	H	
E	June 73	Tub	20 053	22	M	H	
F	Aug.73	Conveyor	11 926	27	B	M	
X	March 74	Conveyor	19 471	34	B	M	Underground Surge Bin
Total			130 907				
B1	1970	Conveyor	5 500	3			Data supplied by Collieries
B2	1969	Conveyor	N.A.	N.A.			
D1	1970	Conveyor	N.A.	N.A.			
G1	1970	Conveyor	N.A.	2			
H1	1970	Conveyor	1 150	14			
H2	June 71-June 72	Conveyor	170 000	56			
J1			4 268	1			
X1	Feb.66	N.A.	N.A.	N.A.			After crushing
X2	1969	N.A.	4 500	5			
X3	April 70	N.A.	5 189	22			After crushing

/Table 2 .....

TABLE 3

VALUES DEDUCED FROM ROSIN-RAMMLER DIAGRAMS

Mine	Rosin-Rammler Parameters		Screen Apertures in mm for various Percentages Oversize		
	n	$\bar{x}$ (37%)	25%	50%	75%
A	0,78	30	44	19	6,0
B	0,80	42	60	26	8,4
B1	0,81	30	42	19	6,2
B2	0,81	42	60	26	8,6
C	0,84	76	105	48	16,0
D	0,81	105	157	68	22,0
D1	0,81	145	220	95	32,0
E	0,80	90	135	58	19,0
F	0,82	37	57	24	8,0
G1	0,83	80	120	53	18,0
H1	0,78	75	110	45	15,0
H2	0,81	40	60	25	8,8
J1	0,79	88	130	56	18,0
X I	0,81	64	98	40	13,0
X II	0,83	47	70	30	10,5
X III	0,90	63	91	42	16,0
X IV	0,85	57	85	38	13,5
X V	0,89	47	69	32	12,0
X VI	0,88	54	80	36	13,0
X7	0,74	32	50	19	6,0
X8	0,80	60	90	38	12,5
X9	0,81	26	38	17	5,6
Y1	0,72	34	50	21	6,0
Average	0,81				

Samples X I - X VI = Own Investigations.

Samples X 7 - X 9 = Data Supplied by Colliery.

Samples X 7 and X 9 = After Crushing of +6" Coal and Recombining.

/Table 4 .....

TABLE 4

SCREEN OPENING RATIOS FOR VARIOUS MINES, WITH SCREEN OPENINGS OF MINE A, TAKEN AS ONE, FOR OVERSIZE AMOUNTING TO 25%, 37%, 50% AND 75%

Ratio	Oversize			
	25%	37% ($\bar{x}$)	50%	75%
A	(44)	(30)	(19)	(6,0)
A	1	1	1	1
A/B	1,37	1,40	1,37	1,40
A/B1	0,96	1,00	1,00	1,02
A/B2	1,37	1,40	1,37	1,43
A/C	2,40	2,52	2,52	2,62
A/D	3,54	3,50	3,57	3,65
A/D1	5,00	5,00	5,00	5,30
A/E	3,05	3,00	3,05	3,14
A/F	1,30	1,23	1,28	1,33
A/G1	2,72	2,65	2,80	3,00
A/H1	2,50	2,50	2,40	2,50
A/H2	1,35	1,33	1,32	1,42
A/J1	2,97	2,94	2,94	3,00
A/X I	2,22	2,15	2,10	2,17
A/X II	1,60	1,58	1,58	1,75
A/X III	2,07	2,10	2,20	2,65
A/X IV	1,90	1,90	2,00	2,25
A/X V	1,57	1,57	1,68	2,00
A/X VI	1,82	1,80	1,90	2,16
A/X7	1,13	1,07	1,00	1,00
A/X8	2,04	2,00	2,00	2,07
A/X9	0,86	0,86	0,89	0,93
A/Y1	1,13	1,13	1,10	1,00

/Table 5 .....

TABLE 5

RATIOS OF SCREEN OPENINGS FOR 25%, 37%, 50% AND 75% OVERSIZE, TAKING SCREEN OPENINGS FOR 25% OVERSIZE AS 1

Mine	Screen opening ratios for oversize amounting to			
	25%	37% ($\bar{x}$)	50%	75%
A	1	0,68	0,43	0,14
B	1	0,70	0,43	0,14
B1	1	0,64	0,41	0,14
C	1	0,66	0,42	0,14
D	1	0,64	0,43	0,14
D1	1	0,65	0,43	0,13
E	1	0,67	0,43	0,14
F	1	0,65	0,42	0,14
G1	1	0,67	0,44	0,15
H1	1	0,68	0,41	0,14
H2	1	0,67	0,42	0,15
J1	1	0,68	0,43	0,14
XI	1	0,65	0,41	0,13
XII	1	0,68	0,43	0,15
XIII	1	0,69	0,44	0,18
XIV	1	0,67	0,45	0,16
XV	1	0,68	0,46	0,17
XVI	1	0,67	0,45	0,16
X7	1	0,64	0,38	0,16
X8	1	0,66	0,43	0,14
X9	1	0,68	0,45	0,15
Y1	1	0,68	0,42	0,12

/Table 6 .....

TABLE 6

SIZE DISTRIBUTION OF CUTTINGS, MINE "F".

Sample	Mass kg	PERCENTAGE REMAINING ON SCREEN APERTURE									Undersize -0,18 mm
		25,4	19,1	12,7	6,35	2,6	1,25	0,5	0,25	0,18	
A 1-10	934,6	2,6	5,5	12,3	24,1	20,3	14,3	7,0	5,4	1,8	6,7%
B 12-22	970,9	6,4	8,6	15,5	25,0	18,6	11,0	5,4	4,0	1,2	4,3%
A+B	1905,5	4,6	6,3	13,9	24,7	19,6	12,6	6,3	4,8	1,5	5,7%

TABLE 7

SIZE DISTRIBUTION OF CUTTINGS, MINE "X".

Sample	Mass kg	PERCENTAGE REMAINING ON SCREEN APERTURE									Undersize - 0,25 mm
		25,4	19,1	12,7	9,5	6,35	3,2	1,25	0,50	0,25	
C1	62,0	1,3	3,9	11,9	4,8	-	43,9	13,6	-	12,5	8,1%
C2	99,4	2,3	4,9	11,5	4,4	19,1	19,7	13,8	9,7	5,3	9,3%

TABLE 8

SIZE DISTRIBUTION OF DRILLINGS, MINE "X" (in μ)

Sample	PERCENTAGE REMAINING ON SCREEN APERTURE, μ											Undersize -25 μ
	2000	1000	800	630	400	315	250	125	80	40	25	
D1	19,8	12,6	8,2	9,1	11,7	3,8	5,5	11,4	4,3	4,2	2,2	7,2%
D2	10,8	12,4	4,4	7,4	12,1	8,7	5,4	14,0	5,9	6,8	3,3	8,8%
D3	17,3	17,4	1,8	8,8	11,8	3,7	8,3	11,0	4,2	5,5	2,6	7,6%
D4	8,4	9,1	9,2	9,1	8,6	4,3	8,0	14,4	5,9	7,6	3,9	11,5%
D5	20,9	16,5	6,1	6,7	9,5	6,3	6,7	8,4	2,2	7,0	2,8	6,9%
D6	9,2	12,7	7,7	7,5	12,5	5,7	8,3	11,2	5,5	5,9	2,9	10,9%
Average	14,2	13,3	6,1	8,1	11,4	5,4	7,0	11,7	4,7	6,2	3,0	8,9%

TABLE 9

VALUES DEDUCED FROM DIAGRAM, FIG. 5 AND 6.

Mine	Sample	Rosin-Rammler Parameters		Screen Apertures for various Percentages Oversize		
		n	$\bar{x}$	25%	50%	75%
"F"	R-O-M	0,82	37	55	24,	8 mm
	Cuttings A	0,84	7	10	4,6	1,6 mm
	Cuttings B	0,86	10	15	7,0	2,5 mm
	Cutt. A + B	0,84	8,5	12,5	5,5	1,9 mm
"X"	R-O-M	0,88	54	80	36	13 mm
	Cuttings C1	0,80	4,8	7,2	3,1	1,1 mm
	Cuttings C2					
	Drillings					
	" D1	0,82	900	1400	570	180 µ
	" D2	0,82	590	900	370	125 "
	" D3	0,78	840	1300	520	170 "
	" D4	0,75	540	850	340	100 "
	" D5	0,76	1050	1650	635	190 "
	" D6	0,77	620	950	380	125 "
	Average	0,80	730	1100	460	150 "

TABLE 10

SCREEN OPENING RATIOS FOR VARIOUS PERCENTAGES OF OVERSIZE. RUN-OF-MINE TAKEN AS A UNIT

Mine	Sample	OVERSIZE			
		25%	37%	50%	75%
"F"	R-O-M	1	1	1	1
	Cuttings A	0,18	0,19	0,19	0,20
	" B	0,27	0,27	0,29	0,31
	" A+B	0,23	0,23	0,23	0,24
"X"	R-O-M	1	1	1	1
	Cuttings C1	0,09	0,09	0,09	0,09
	" C2				
	Drillings				
	D1	0,0175	0,0166	0,0160	0,0140
	D2	0,0112	0,0109	0,0103	0,0096
	D3	0,0162	0,0155	0,0145	0,0131
	D4	0,0106	0,0100	0,0095	0,0080
	D5	0,0205	0,0195	0,0176	0,0146
	D6	0,0106	0,0115	0,0106	0,0096
	Average	0,0144	0,0137	0,0128	0,0123

TABLE 11

COMPARISON OF SCREEN OPENINGS FOR RUN-OF-MINE, CUTTINGS AND DRILLINGS FOR VARIOUS PERCENTAGES OF OVERSIZE, TAKING SCREEN OPENING OF 25% OVERSIZE AS A UNIT

Mine	Sample	OVERSIZE, %			
		25	37	50	75
"F"	R-O-M	1	0,67	0,44	0,14
	Cuttings A	1	0,70	0,46	0,16
	" B	1	0,67	0,46	0,11
	" A+B	1	0,68	0,44	0,15
"X"	R-O-M	1	0,68	0,45	0,16
	Cuttings	1	0,67	0,43	0,15
	Drillings D1	1	0,64	0,41	0,13
	" D2	1	0,66	0,41	0,14
	" D3	1	0,65	0,40	0,13
	" D4	1	0,64	0,40	0,12
	" D5	1	0,64	0,39	0,12
	" D6	1	0,65	0,40	0,13
	Average	1	0,64	0,40	0,13

FIG. 1

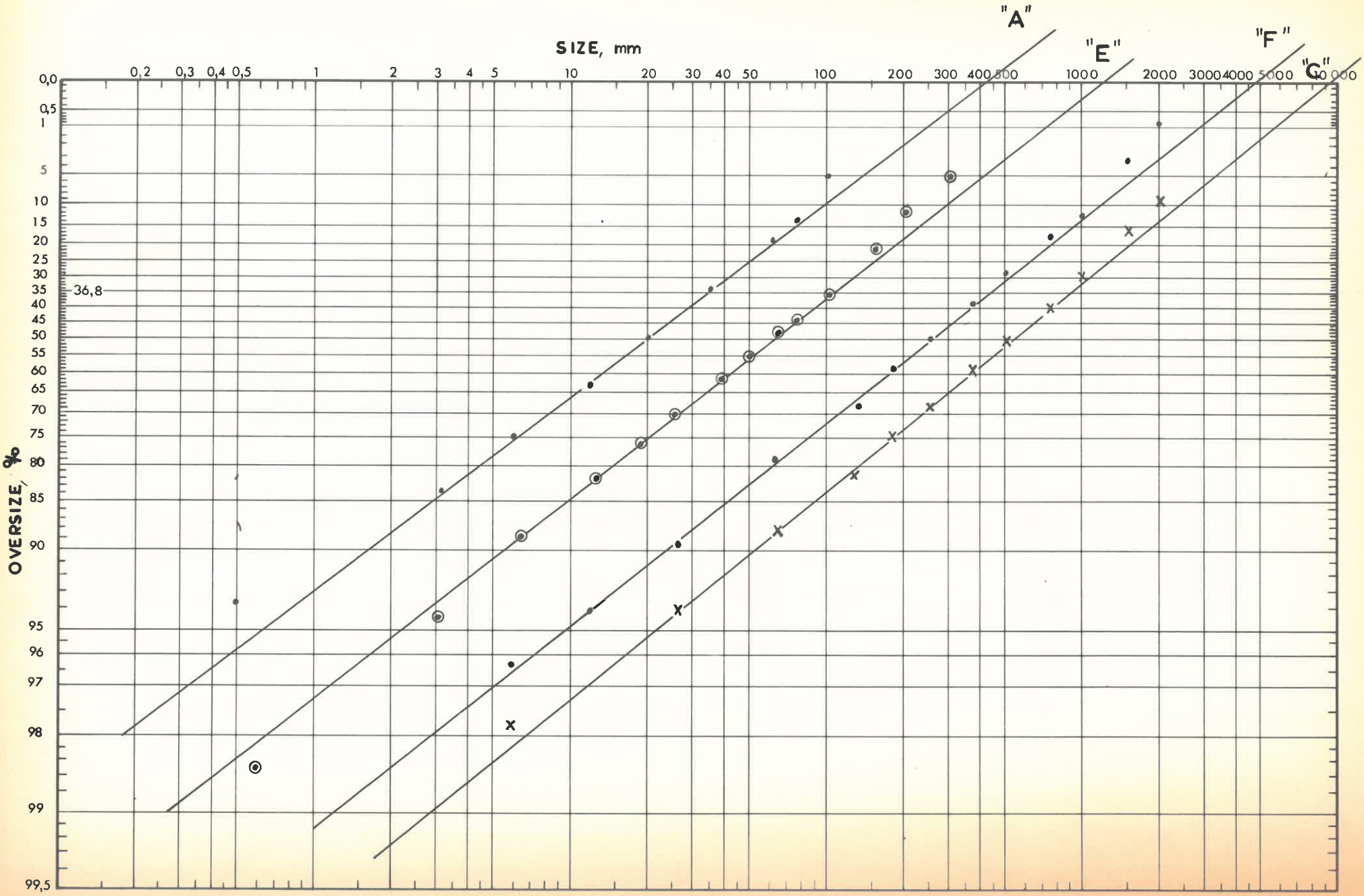
"A"
"E"
"F"
"G"
SIZE, mm
0,2 0,3 0,4 0,5 1 2 3 4 5 10 20 30 40 50 100 200 300 400 500 1000 2000 3000 4000 5000 10 000
OVERSIZE, %
0,0 0,5 1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 96 97 98 99 99,5
36,8

FIG. 2

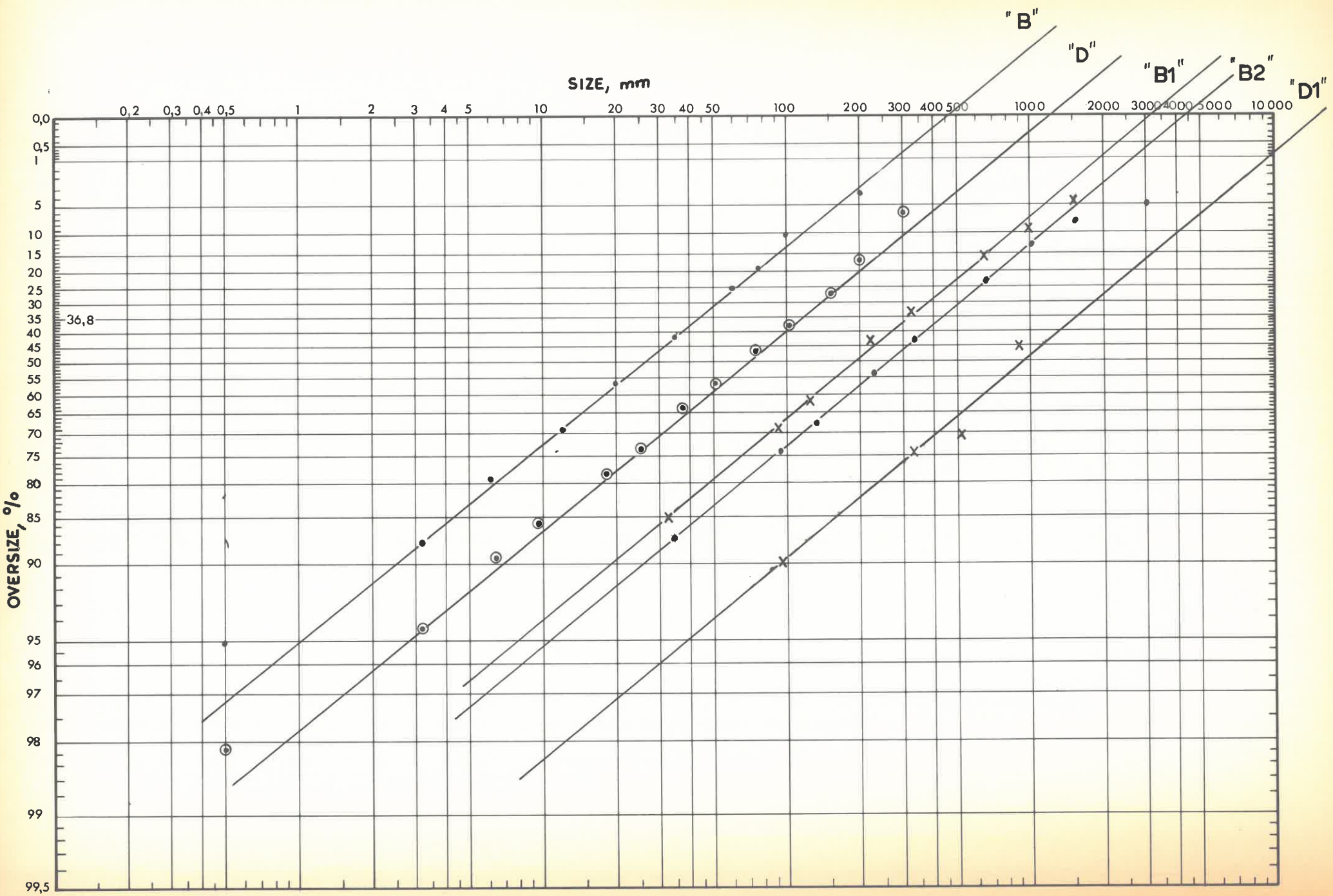
"B"
"D"
"B1"
"B2"
"D1"
SIZE, mm
0,2 0,3 0,4 0,5 1 2 3 4 5 10 20 30 40 50 100 200 300 400 500 1000 2000 3000 4000 5000 10 000
OVERSIZE, %
0,0 0,5 1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 96 97 98 99 99,5
36,8

FIG. 3

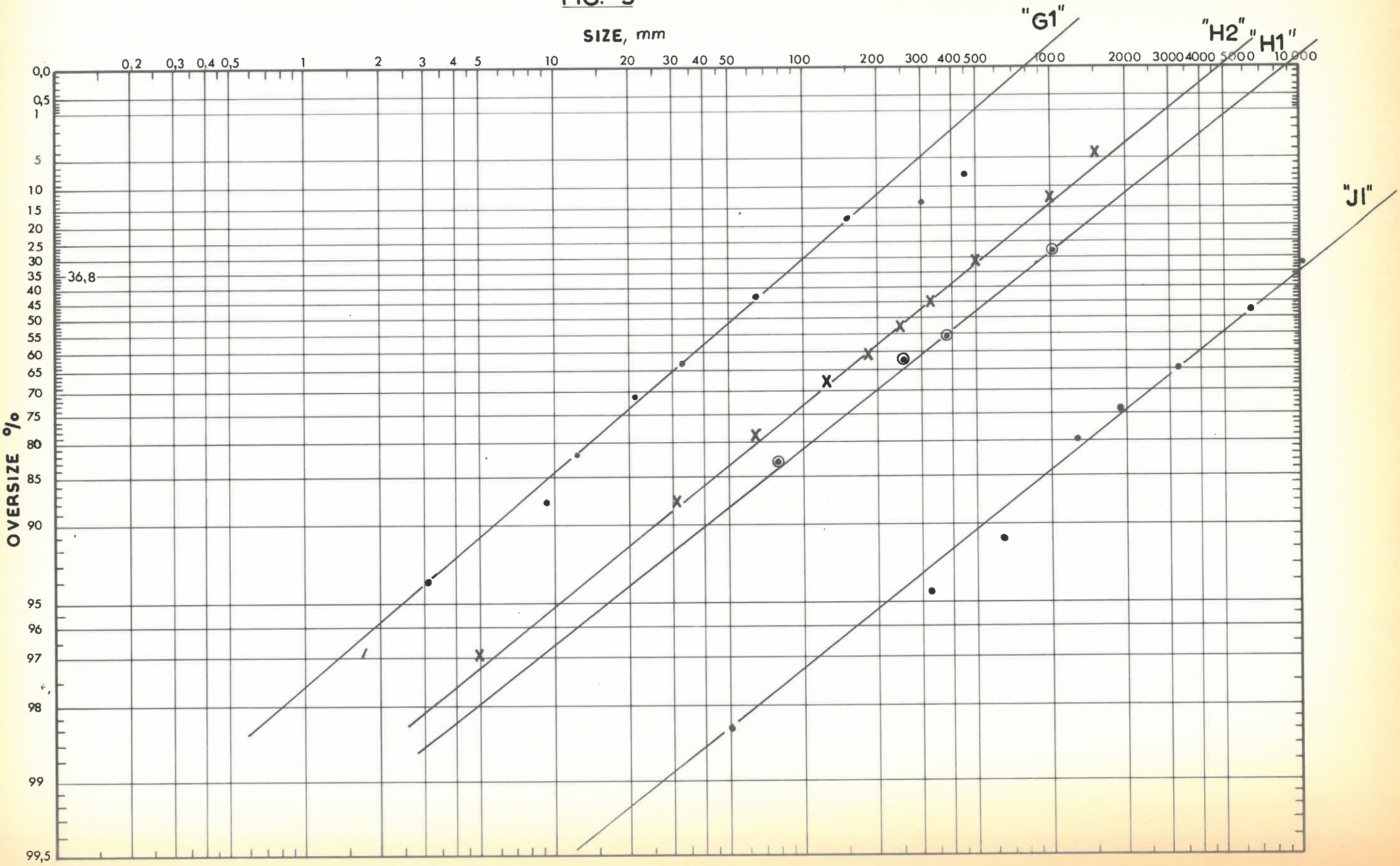
SIZE, mm
0,2
0,3
0,4
0,5
1
2
3
4
5
10
20
30
40
50
100
200
300
400
500
1000
2000
3000
4000
5000
10 000
OVERSIZE %
0,0
0,5
1
5
10
15
20
25
30
35
36,8
40
45
50
55
60
65
70
75
80
85
90
95
96
97
98
99
99,5
"G1"
"H2"
"H1"
"J1"

FIG. 4

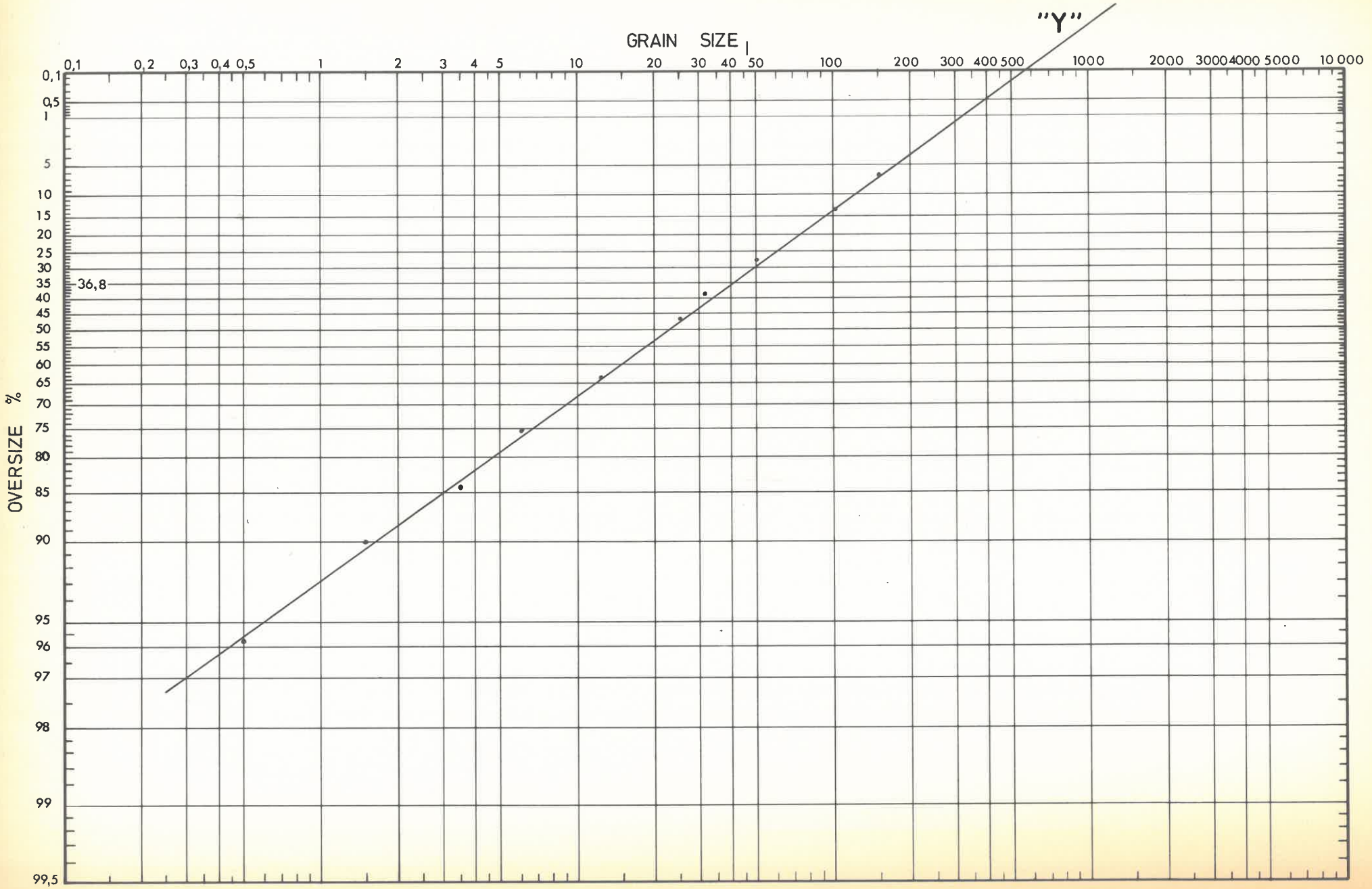
"Y"
GRAIN SIZE
0,1
0,2
0,3
0,4
0,5
1
2
3
4
5
10
20
30
40
50
100
200
300
400
500
1000
2000
3000
4000
5000
10 000
OVERSIZE %
0,1
0,5
1
5
10
15
20
25
30
35
36,8
40
45
50
55
60
65
70
75
80
85
90
95
96
97
98
99
99,5

FIG. 5

MINE: F R-O-M + CUTTINGS

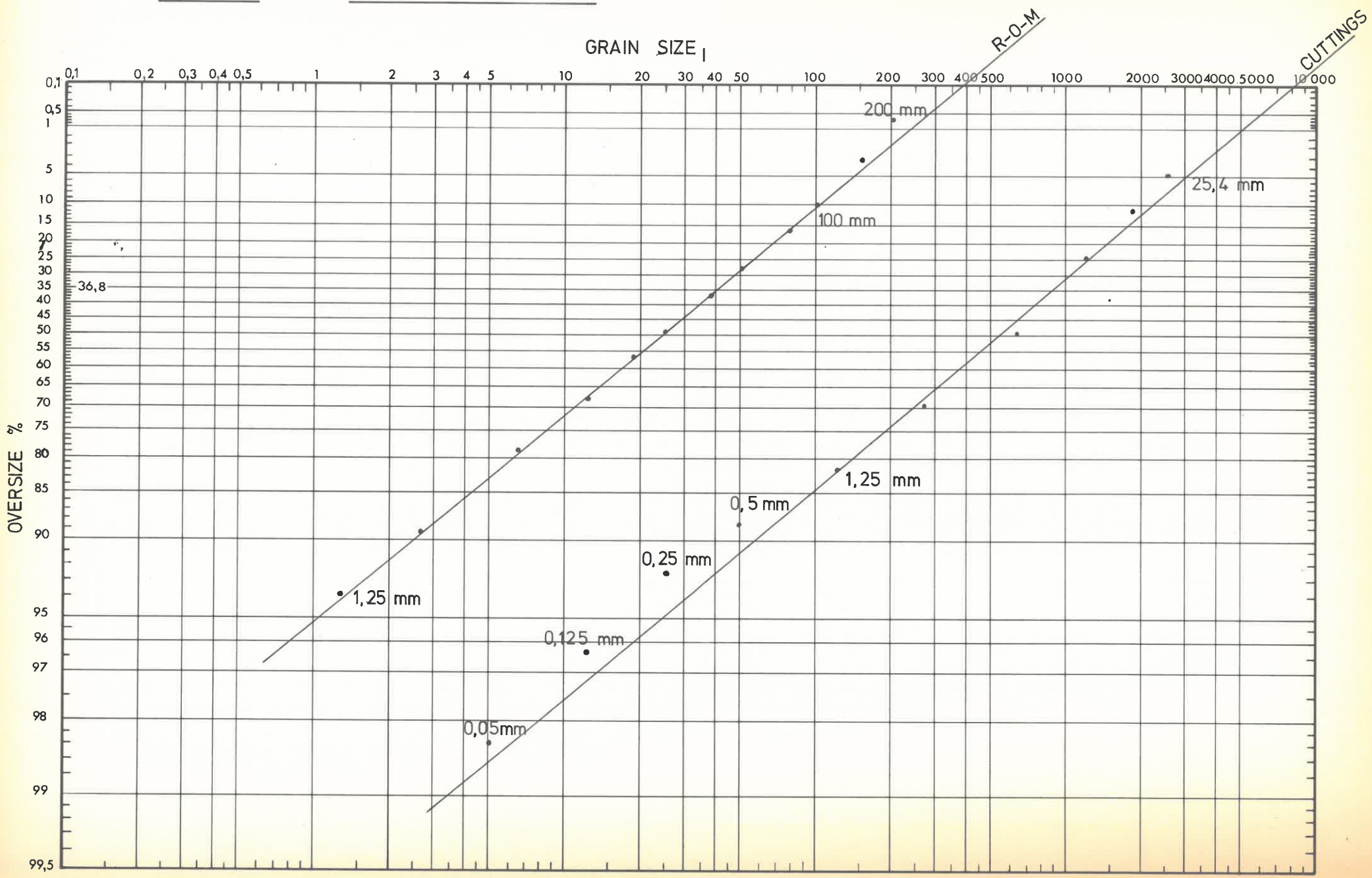

FIG. 6

MINE : X R-O-M, CUTTINGS & DRILLINGS

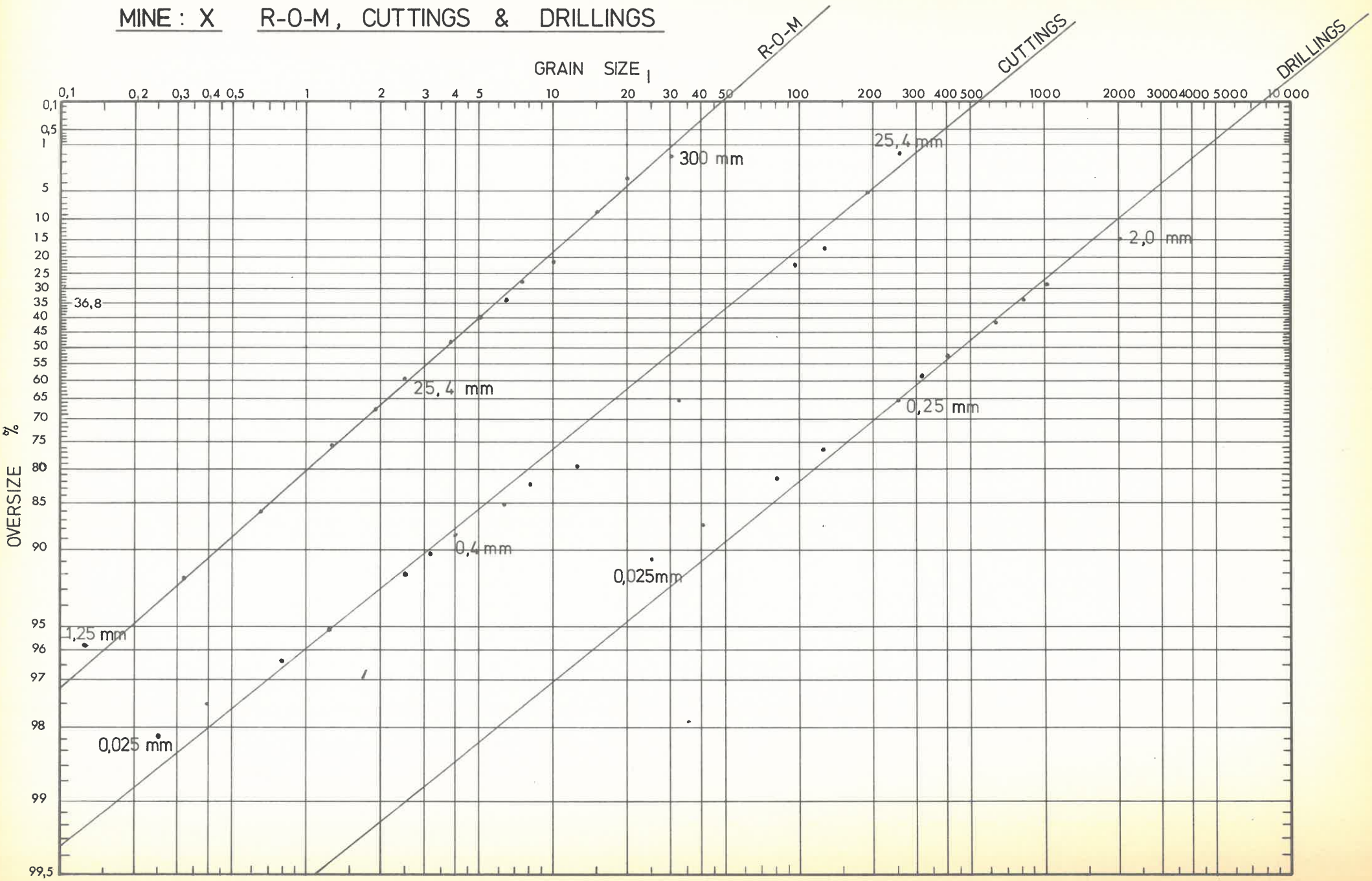

FIG. 7

SIZE DISTRIBUTION : R-O-M COAL

MINE : A AND B

1 %

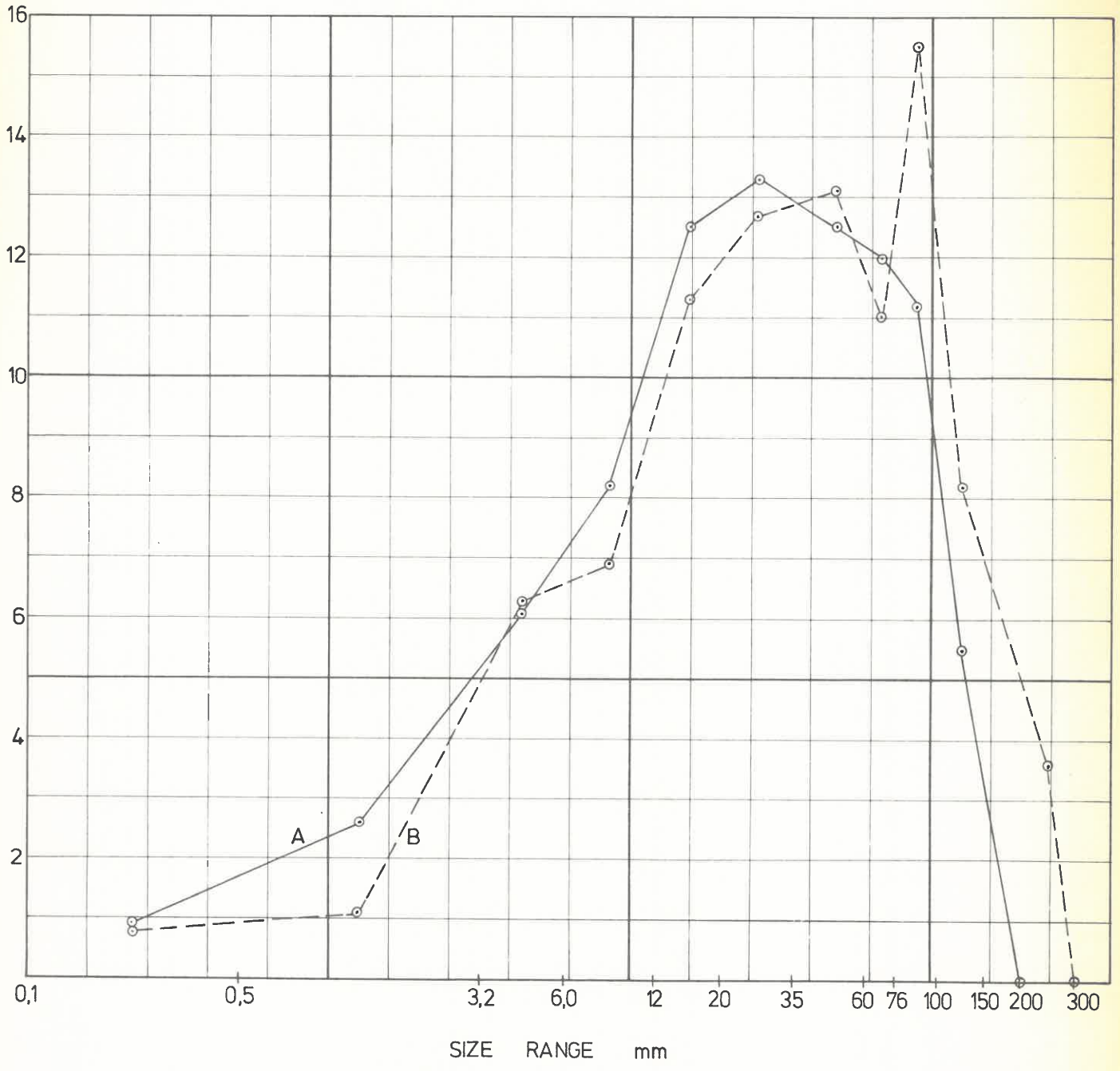

FIG. 8

SIZE DISTRIBUTION : R-O-M COAL

MINE : C, D AND E

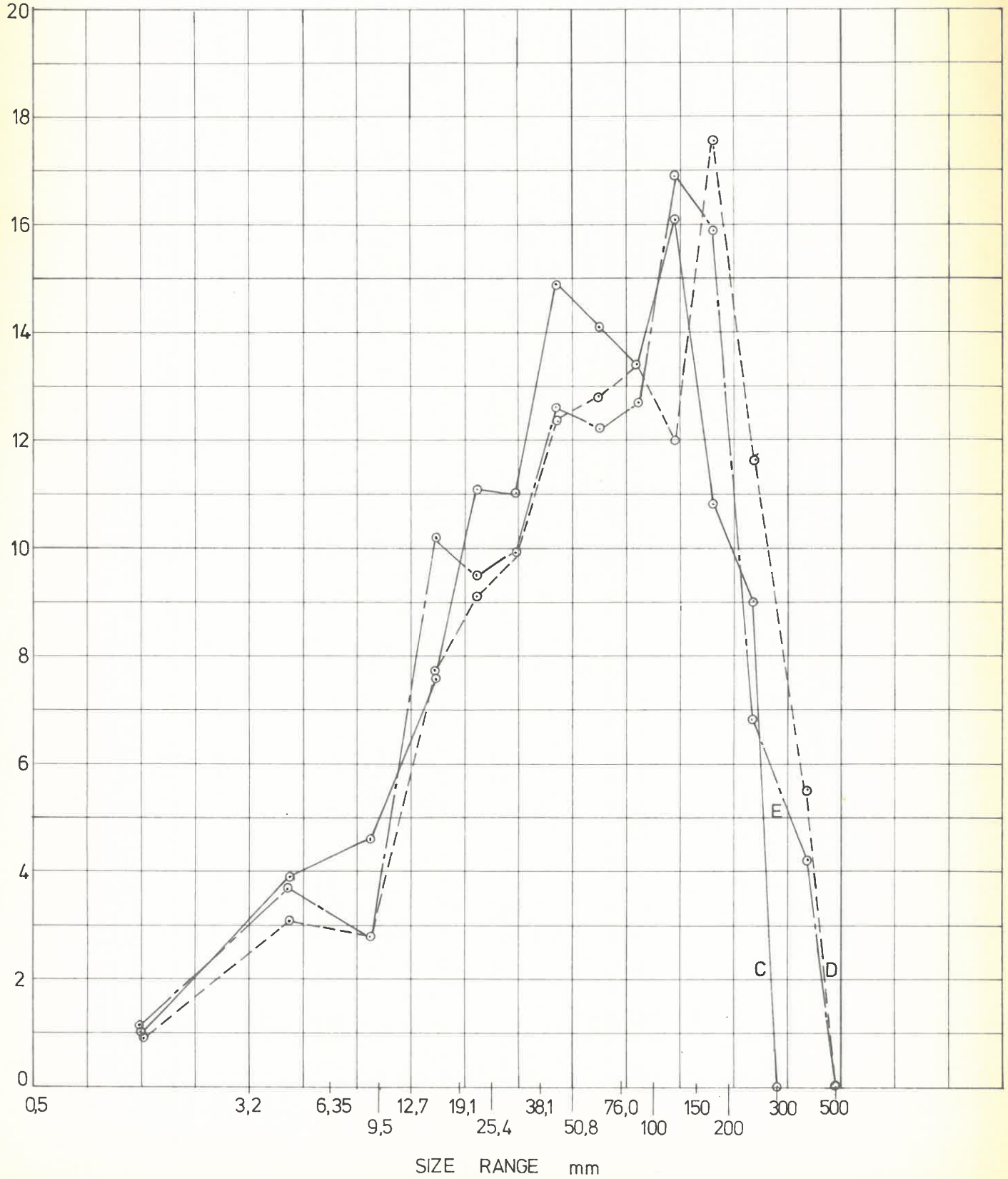

FIG. 9

SIZE DISTRIBUTION R-O-M COAL

MINE: F AND X

1 %

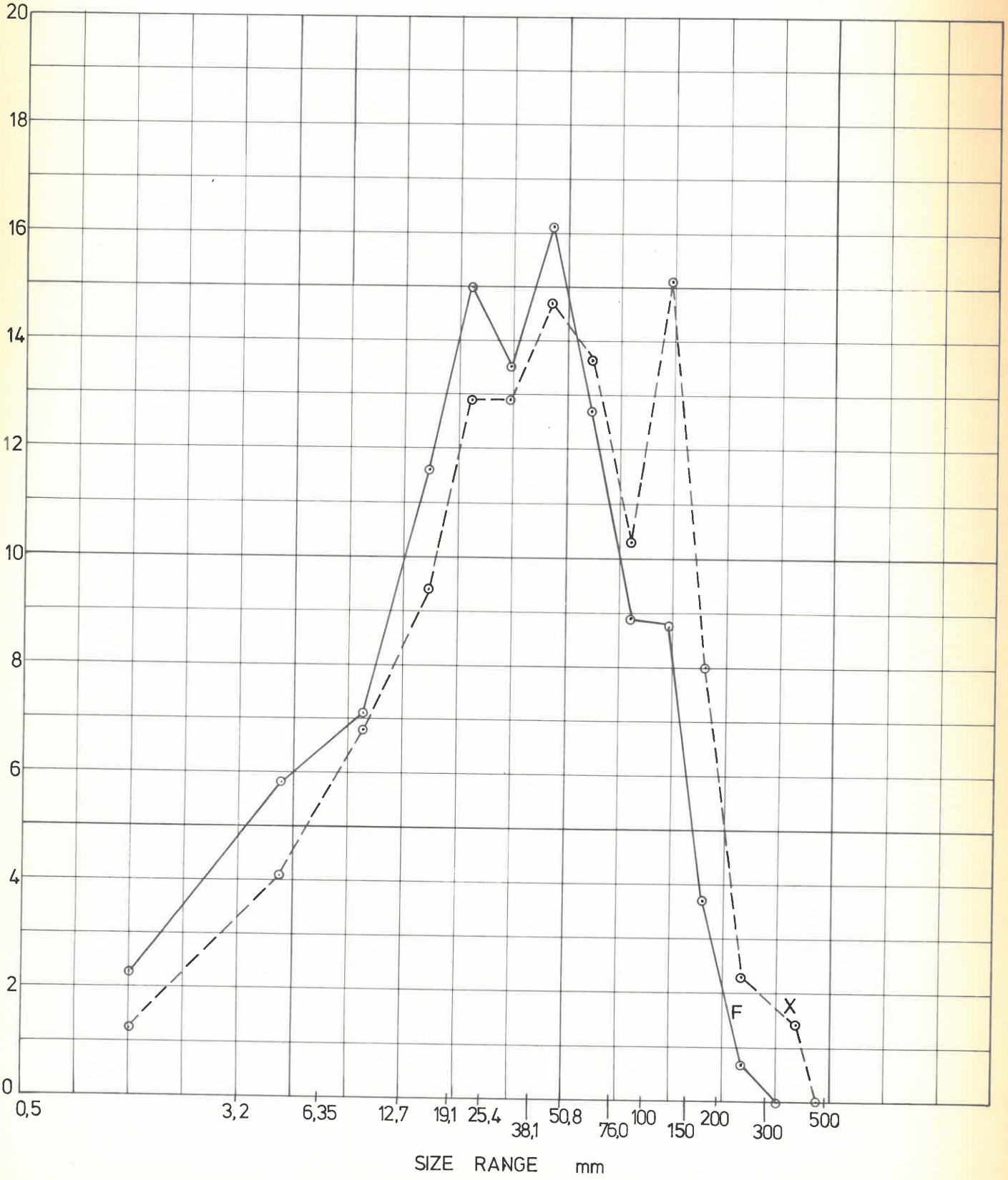

FIG. 10

SIZE DISTRIBUTION : R-O-M, CUTTINGS AND DRILLINGS

MINE : X

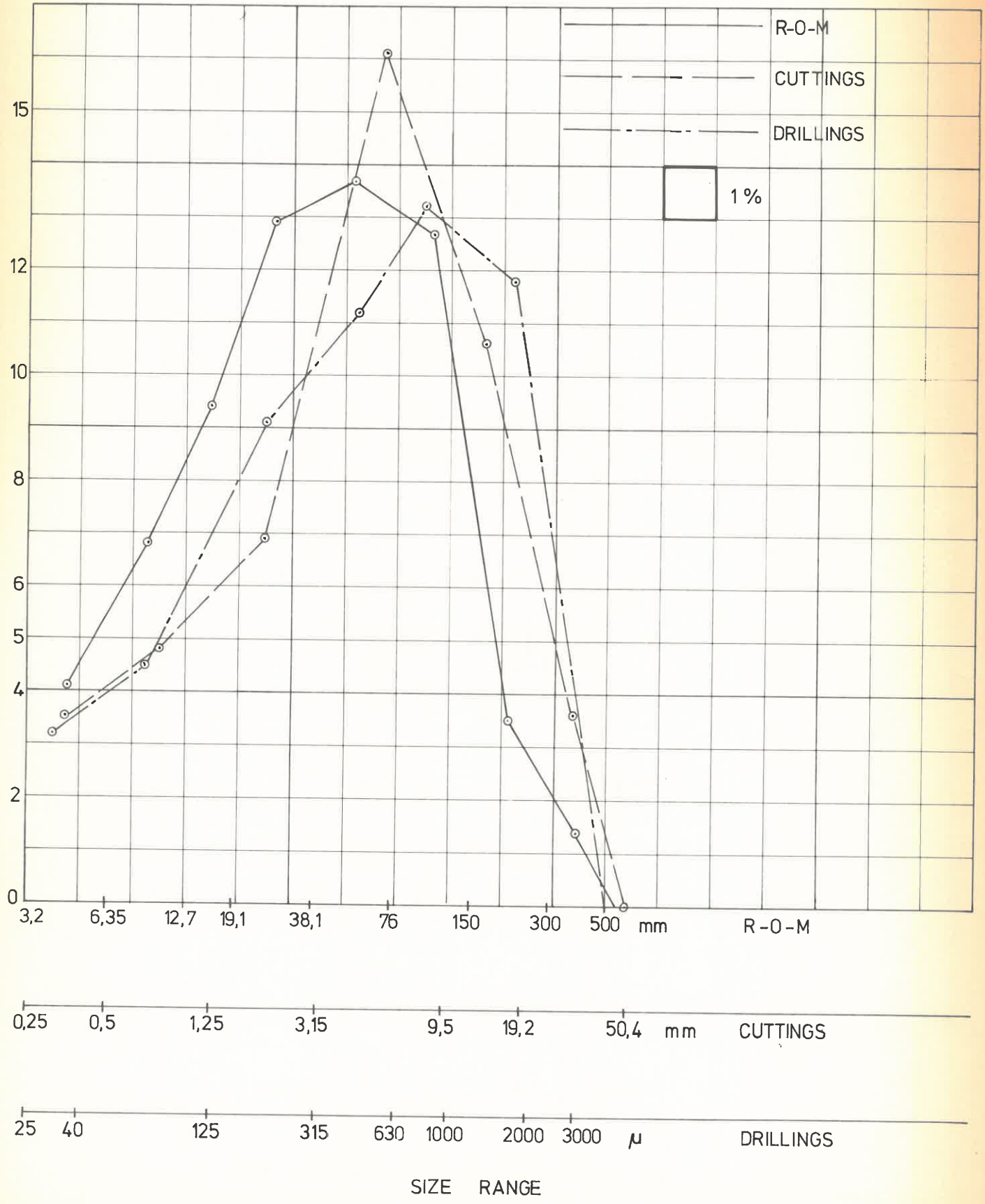

TABLE 2

SCREEN ANALYSES OF RUN-OF-MINE COAL

Colliery	OVERSIZE = PERCENTAGE OF MATERIAL RETAINED ON SCREEN WITH AN OPENING OF																			Undersize, % passing through screen aperture of 0,5 mm
	mm 300	200	150	102	(89) 76	(60) 63,5	(50) 50,8	(35) 38,1	31,8	(25) 25,4	(21) 20	(15,9) 19,1	(12,0) 12,7	(7,9) 9,5	(6,0) 6,35	(3,0) 3,2	(1,6) 2,6	(1,5) 1,25	0,5	
A	-	-	-	4,6	11,8	(17,8)	-	(32,5)	-	-	48,6	-	(62,4)	-	(74,6)	83,2	-	-	93,7	6,3
B	-	3,2	-	10,0	19,9	(25,5)	-	(40,9)	-	-	56,4	-	(68,9)	-	(79,3)	88,2	-	-	95,0	5,0
C	-	7,9	14,6	28,0	36,6	-	48,9	57,7	-	67,4	-	74,3	81,0	-	87,9	93,8	-	-	97,9	2,1
D	6,0	16,2	27,1	37,0	45,6	-	56,7	64,0	-	72,6	-	78,2	-	85,5	89,7	94,4	-	-	98,2	1,8
E	4,6	10,6	20,4	34,4	42,5	47,1	53,1	60,6	-	69,3	-	75,9	81,4	84,4	88,7	94,2	-	-	98,5	1,5
F	-	0,6	2,9	10,2	15,9	-	27,0	36,5	-	48,4	-	57,7	67,9	-	78,6	-	89,3	94,0	96,3	3,7
X IV	1,5	3,5	8,5	21,0	27,6	33,2	39,4	48,1	-	59,5	-	67,5	75,8	-	86,1	92,3	-	95,8	97,8	2,2
B1	-	-	4,8	8,7	-	15,4	-	-	32,9	-	(43,2)	-	61,3	69,0	-	85,0	-	-	-	-
B2	4,6	-	7,0	11,9	-	21,7	-	-	42,1	-	(52,6)	-	67,7	74,4	-	87,3	-	-	-	-
D1	-	-	-	-	(44)	-	70,0	74,0	-	-	-	-	-	90,0	-	-	-	-	-	-
G1	12,8	-	17,8	26,1	-	42,5	-	-	62,0	-	(70,5)	-	82,1	88,4	-	94,2	-	-	-	-
H1	-	-	-	26,6	-	-	-	55,1	-	63,0	-	-	-	(83,3)	-	-	-	-	-	-
H2	-	-	3,8	11,6	-	-	30,1	-	45,2	51,7	-	59,7	68,1	-	78,7	87,5	-	-	96,8	3,2
J1	-	-	18,9	32,8	-	47,8	-	-	65,1	-	-	74,7	79,9	-	91,6	94,3	-	-	98,4	1,6
J2	-	-	-	-	(39,7)	-	-	-	66,7	-	-	81,4	-	-	-	92,5	-	-	-	-
Y1	-	-	6,0	12,5	-	-	(27,0)	-	38,5	(46,5)	-	-	63,5	-	(75,0)	(84,0)	-	(90,0)	95,7	4,3
X1	-	-	-	10,2	-	20,4	-	31,0	-	-	-	48,0	60,7	-	73,3	83,2	-	-	94,9	5,1 (After crushing)
X2	2,8	-	15,6	22,5	-	37,0	-	48,2	-	-	-	63,2	-	(82,2)	-	-	-	-	-	-
X3	-	-	-	2,6	-	11,7	-	31,4	-	-	(42,2)	(48,6)	58,9	-	73,0	83,3	89,5	-	91,2	8,8 (After crushing)

/Table 3 .....