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DEPARTMENT OF COMMERCE

UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

REPORT OF INVESTIGATIONS

ACCELERATED LABORATORY TEST FOR DETERMINATION OF SLACKING CHARACTERISTICS OF COAL

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ACCELERATED LABORATORY TEST FOR DETERMINATION OF SLACKING CHARACTERISTICS OF COAL[1]

By A. C. Fieldner[2], W. A. Selvig[3], and W. H. Frederic[4]

INTRODUCTION

Low-rank coals have a pronounced tendency to disintegrate or "slack" when alternately dried and wetted by exposure to the weather. The more readily a coal slacks the greater is its tendency to ignite spontaneously and the more care must be used in its shipment and storage. Lignite slacks very readily when exposed to the weather. Slacking trouble is also experienced in shipping and storing subbituminous coal, but not to the same extent as with lignite. As a rule, bituminous coals are only slightly affected by weathering and in general may be classified as nonslacking coals. The slacking tendency of subbituminous coal is one of the characteristics that is used to distinguish it from bituminous coal. An accelerated laboratory method of test was developed to measure such slacking tendencies. This method was applied to a number of coals, principally from the State of Washington, and the method and the results obtained are given herein.

ACKNOWLEDGMENT

Helpful information concerning slacking tendencies of coal was received from Marius R. Campbell, senior geologist, U. S. Geological Survey.

CAUSE OF SLACKING

Coals that slack readily contain relatively large amounts of moisture. When exposed to the weather such coals lose moisture rapidly. As the coal loses moisture at the surface there is a gradual drift of moisture from the interior of the piece to the surface. If the loss of moisture at the surface proceeds at a faster rate than it is replaced by moisture from the interior of the coal piece, there undoubtedly is greater shrinkage of the coal at the surface as compared to the interior of the piece and stresses are generated in the surface coal. These stresses in the surface coal cause it to crack and disintegrate.

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1 The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Report of Investigations 3055."

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Likewise, when the air-dried coal is wetted by rain, the exposed surface of the coal pieces gain moisture more rapidly than the interior of the piece, causing greater expansion in the surface coal and the coal breaks down further. As this process of air drying and wetting is continued when the coal is exposed to the weather, the slacking proceeds and the exposed lumps of coal may disintegrate completely.

A scheme of rapid drying and wetting was made the basis of the accelerated method for testing slacking characteristics of coal described in this paper. It is believed that this accelerated method of test gives information of value in determining the relative slacking tendencies of various coals.

PRELIMINARY EXPERIMENTS

Lumps of lignite and subbituminous coal were dried over concentrated sulphuric acid until they practically lost no more moisture. The coal was then exposed in an atmosphere of 100 per cent humidity until it stopped gaining moisture. This method of test took a long time so was not considered suitable as an accelerated method of test.

Experiments made by drying the coal in a drying oven at 10 to 15° C. above room temperature and then immersing the coal in water and drying again, accelerated the slacking of the coal and so was made the basis of the method adopted.

As the method of test is necessarily empirical in nature it is evident that a definite procedure is necessary to obtain comparable results. It was decided to use a sample consisting of pieces of coal approximating 1¼-inch cubes, as this is the largest size that will pass through the opening of the standard coal-sample can used by the Bureau of Mines. It was also decided to air-dry the coal for approximately 24 hours at a temperature of 30 to 35° C., immerse the air-dried coal in water, drain off the water, air-dry again, and then measure the amount of slacking or degradation and weakening of the coal by sieving on a square-mesh sieve with openings of approximately one-fourth inch. The oversize on the sieve could then be immersed in water again, air-dried and sieved, and this process continued for a number of cycles if desired.

SAMPLING

Samples for the slacking test should be taken at not less than three, and preferably five separate places in a given mine, and from that part of the coal adjacent to the cut made in collecting the sample for analysis. This procedure was used in sampling the Washington coals for slacking.

The sample is collected by making a cut from top to bottom of the face of the freshly exposed coal according to the method for collecting face samples as described in "The Sampling of Coal in the Mine," Bureau of Mines Technical Paper 1 (1911). The gross sample is cut so as to obtain lumps from all parts

of the bed. Large lumps in the gross sample are broken to approximate 1¼-inch cubes, and such pieces are carefully taken from all parts of the gross sample and placed in the standard coal-sample can of the bureau. The opening in the top of this can is 1¾ inches in diameter, and pieces of coal that will just pass through this opening are satisfactory. After filling the can with lumps, fine coal is added to fill the voids to prevent abrasion of the lumps in transit, also to displace the air and protect the lumps from possible oxidation. It is desirable to collect duplicate samples from the same gross sample at one of the sampling points in each mine. This was done in most of the Washington coals on which slacking tests were made.

METHOD OF TEST

The contents of the sample can are emptied on a sieve with 1.05-inch square openings, the sieve gently shaken, and the oversize retained for the test. The pieces are brushed to remove any adhering coal dust or loose pieces of coal. As a rule, the sample of lumps obtained from one coal sample can weighs 500 to 600 grams and consists of 18 to 25 pieces.

As the extent of slacking is determined from the amount of degradation as measured by sieving, it is desirable to make a blank sieving on the coal before starting the test in order to determine normal breakage due to sieving. Low-rank coals are not generally friable, so breakage due to sieving is relatively small as compared to that of some bituminous coals which are more friable in nature.

The blank sieving is done in the same manner as employed in determining the slacking. The sieve used is an 8-inch circular sieve with 0.263-inch square openings. The coal is sieved in such increments that approximately one-third of the sieve surface is covered. In sieving, the sieve is gently shaken by hand through a horizontal distance of about 8 inches at a rate of 100 strokes per minute. A forward and backward motion is considered as one stroke. Sieving is continued for 1 minute, after which the undersize and oversize are weighed to within 0.1 gram and the percentage of undersize is designated as the "blank sieving."

For the slacking test the oversize from the blank sieving is placed in a sheet-iron pan and dried for approximately 24 hours in an air-drying oven[5] maintained at a temperature of 30 to 35° C. Through this oven a current of warm air is drawn by means of a fan.

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5 For description of air-drying oven see Stanton, F. M., Fieldner, A. C., and Selvig, W. A., Methods of Analyzing Coal and Coke: Tech. Paper 8, Bureau of Mines, 1929, p. 2.

After air-drying for approximately 24 hours the sample is removed from the oven, allowed to cool to room temperature, and immersed in water at room temperature for one hour. The water is then carefully drained off and the sample again dried for about 24 hours in the air-drying oven, cooled to room temperature, and sieved on an 8-inch circular sieve with 0.263-inch square openings. The sieving is performed in the same manner as described for the blank sieving. The undersize and oversize are weighed and the percentage of undersize is calculated. This figure is designated as the first cycle slacking index. The oversize is then immersed in water again, air-dried, and sieved. From the weights of the undersize and oversize the cumulative per cent passing through the sieve for the two cycles is calculated and designated as the second cycle slacking index. This procedure of wetting, drying, and sieving was continued for six cycles, except in those cases where the coal had disintegrated sufficiently to pass the sieve before that time.

The blank sieving factor can be deducted from the first cycle slacking index, but it would be difficult to estimate the breakage due to friability for the other cycles as the size and number of pieces of coal change from cycle to cycle. The test could be simplified by arbitrarily selecting the number of cycles to be employed and omitting the sieving between cycles, making only one sieving at the end of the test. For any given number of cycles it is obvious that this would give a lower slacking index than would sieving at the end of each cycle, because the coal would not be subjected to as much breakage due to sieving action.

RESULTS OF TESTS

Table 1 gives the results of the accelerated slacking tests on all coals tested from Washington and elsewhere. Samples of the Washington coals for analysis were collected at the same place as for the slacking test. The laboratory number shown under the column "bed sample" is that of the sample collected for analysis so reference can be made to the published analyses of these coals.[6]

The rank of coal as designated in Table 1 is that assigned it by the collector of the samples. In some cases it is doubtful whether the coal should be classed as subbituminous or bituminous.

The blank sieving percentages were deducted from the average first cycle slacking indices for each mine and these corrected figures are shown in parenthesis. In general, the subbituminous coals are not friable so in most cases the blank sieving figures for these coals are small and can be neglected.

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6 Analyses of Washington Coals, Technical Paper 491, Bureau of Mines (in press).

With some of the subbituminous coals tested, however, the blank sieving produced sufficient degradation to be considered in the interpretation of the slacking indices. The bituminous coals tested varied considerably in friability, as indicated by the blank sieving percentages, and these in many cases are of considerable magnitude as compared to the slacking indices. If the blank sieving percentages are about the same magnitude as the uncorrected first cycle slacking indices, it is apparent that the degradation as measured by sieving at the end of the first cycle was due to friability and not to the effects of the drying and wetting of the coal in the slacking test, and that the coals are of the nonslacking class.

One sample of lignite (Texas) shows almost complete degradation at the end of the first cycle of test. On the other extreme, a number of the bituminous coals tested showed no degradation by slacking at the end of the first cycle. Between these extremes are bituminous coals with slacking tendencies and the subbituminous coals which show considerable slacking tendencies varying in amount with the particular coal. As the coals show such a wide range of slacking at the end of the first cycle of test the authors believe the method had best be standardized so as to be suitable for testing all coals, by running only one cycle and deducting the blank sieving correction. It is doubtful whether any additional information of value can be obtained by continuing the test for more than one cycle.

The reader is cautioned not to place too strict an interpretation on the significance of the results of the accelerated slacking test as a measure of the slacking tendencies of the various coals when exposed to the weather, but it is believed that the test is of value in estimating such slacking tendencies. The authors do not have sufficient information concerning the known slacking tendencies of the coals tested to correlate the results obtained by the method of test with the weathering characteristics of the various coals tested.

The slacking indices of the coals tested from Washington indicate a wide range in slacking characteristics. This is to be expected as these coals range from high-rank bituminous to low-rank subbituminous. There is a wide range in the slacking indices of the subbituminous coals, indicating considerable difference in slacking properties of these coals. A correlation of these slacking indices with the known weathering characteristics of these subbituminous coals should show the value of the accelerated method of test as a measure of slacking. The first cycle slacking indices (less blank sieving) of the Washington coals tested range from less than 1 per cent in case of some of the high-rank bituminous coals to as much as 80 per cent in case of a subbituminous coal from Lewis County. Samples collected from different places in some of the mines exhibit considerable differences in the slacking indices, showing that the coal may vary in different parts of the mine.

CHECK SAMPLES

In sampling a number of the Washington mines, two or more can samples were collected from the same gross sample. These were run separately in the laboratory to obtain information as to how well duplicate determinations would check. These check determinations are shown in Table 2, which contains 20 different sets of samples. The average deviation in slacking indices from the mean values for all the sets of duplicates tested are as follows: First cycle, 0.72; third cycle, 0.90; and sixth cycle, 1.02. These deviations calculated to percentages of the slacking indices are as follows: First cycle, 15.6 per cent; third cycle, 8.8 per cent; and sixth cycle, 6.8 per cent.

These differences include the limits of accuracy of the accelerated slacking test and differences due to sampling errors. If the coal in the various benches of the bed differ noticeably in slacking tendencies, it is apparent that it is difficult to select at random from the gross sample a limited number of lumps that would be strictly representative of the coal. As mentioned, each sample consisted of only 18 to 25 lumps approximating 1¼-inch cubes. A larger sample would lessen possible sampling errors. As the test can be run conveniently on a larger sample, it would be better practice to double the size of sample by collecting two sample cans of coal for each test.

RELATION OF BED MOISTURE TO SLACKING INDICES

Low-rank coals contain relatively large amounts of moisture. The rapid loss and gain of moisture on weathering has been mentioned as the cause of slacking of coal. To determine if any definite relation could be established between the bed moisture of coal and the slacking tendencies, a plot (fig. 1) was made of the average first cycle slacking indices, less blank sieving, and the average bed moisture, for each mine. This figure shows a general increase of slacking with increase of moisture in the coal, but there is no definite relation, as many of the coals with approximately the same bed moisture differ widely in slacking characteristics. Similar graphs constructed from the third and sixth cycle slacking indices also failed to show a definite relation and therefore are not reproduced. Although Figure 1 shows no definite relation between bed moisture and slacking it does indicate that (1) coals with less than 10 per cent bed moisture should give little or no slacking trouble, (2) coals with from 10 to 20 per cent bed moisture may slack considerably, and (3) coals with from 20 to 30 per cent bed moisture will slack excessively.

RELATION OF SLACKING INDICES TO RANK OF COAL

It is convenient to place coals under more or less arbitrary groups according to rank--that is, according to the stages it has passed through on its metamorphism from peat to anthracite. Such grouping is more or less arbitrary and recognizes that coals of one rank may gradually merge into the coals of lower or higher rank, and that there is no sharp line of division between the groups. Different schemes have been proposed as a basis for coal

classification.[7] One of these is based on the ultimate analysis and consists of plotting the carbon, hydrogen, and oxygen by means of a system of trilinear coordinates. This system was used by Ralston[8] in plotting some 10,000 ultimate analyses of American coals. To see if there is any definite relation between the coals plotted according to ultimate analysis and the slacking indices of the accelerated slacking test, the graph shown in Figure 2 was constructed from the average values for each mine. The analyses are calculated to the as-received basis but are ash-free, nitrogen-free, and sulphur-free, so that C + H + O = 100 per cent. This represents the coal with its normal content of bed moisture, as the hydrogen and oxygen includes the hydrogen and oxygen of bed moisture as well as that of the coal substance. This was done, as the authors believe the bed moisture to be an important factor in slacking tendencies of coal. The lower area of the graph gives the first cycle slacking indices (less blank sieving) for the coals plotted on the upper trilinear area. These slacking indices are plotted directly below the points on the upper trilinear area. For instance, the point on the extreme right of the upper trilinear area represents the as-received ultimate analysis (nitrogen, sulphur, and ash-free) of a sample of lignite. Directly beneath this point, in the lower area of the graph, is plotted the first cycle slacking index, which in this case is seen to be 97 per cent. The coals on the left of the upper trilinear area are high-rank bituminous coals, and the rank decreases from left to right down to the lignite on the extreme right. The graph shows a general increase in slacking tendencies with decrease in rank of the coals, but there is not a close correlation between slacking indices and rank as measured by ultimate analyses. The large majority of bituminous coals tested show less than 5 per cent slacking except in case of some of the lower-rank bituminous coal on the border line between typical bituminous and typical subbituminous coal. These low-rank bituminous coals and high-rank subbituminous coals show first cycle slacking indices ranging from 5 to 25 per cent. A considerable number of typical subbituminous coals have first cycle slacking indices ranging from 35 to 85 per cent, and these high slacking indices indicate that this group would give considerable trouble by excessive slacking when exposed to the weather.

Another scheme useful as a standard for coal classification is based on the proximate analysis and consists of plotting the calorific value and the fixed carbon or the volatile matter. This scheme has the advantage of using determinations that are made in commercial analyses of coal. Figure 3 shows the relation between the first cycle slacking indices (less blank sieving) and the coals as plotted according to calorific value and fixed carbon. The proximate analyses of the coals are plotted on the upper area on rectangular coordinates, the British thermal units as abscissas, and the percentage fixed carbon as ordinates. The values are expressed on the as-received, ash-free

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7 Fieldner, A. C., The Classification of North American Coals: Information Circular 6094, Bureau of Mines, 1929, 13 pp.

8 Ralston, O. C., Graphic Studies of Ultimate Analyses of Coals; Tech. Paper 93, Bureau of Mines, 1915, 41 pp.

basis, so represent the ash-free coal with its normal content of bed moisture. The first cycle slacking indices of the coals are plotted on the lower area directly below the points on the upper area. The graph is similar to that based on the ultimate analyses (fig. 2), as it shows a general increase in slacking tendencies with decrease in rank of the coals but does not indicate a close relation between slacking indices and rank as measured by proximate analyses.

CLASSES OF SLACKING

The first cycle slacking indices (less blank sieving) of all the coals tested range from 0 to 97 per cent. These coals range from high-rank bituminous coal to lignite. The order of slacking of these coals may be expressed by subdividing this range of first cycle slacking indices into six groups, as follows:

Class	First cycle slacking index (less blank sieving)
1. Nonslacking	0 - 1
2. Very slight slacking	1 - 5
3. Slight slacking	5 - 15
4. Moderate slacking	15 - 35
5. Strong slacking	35 - 90
6. Very strong slacking	90 - 100

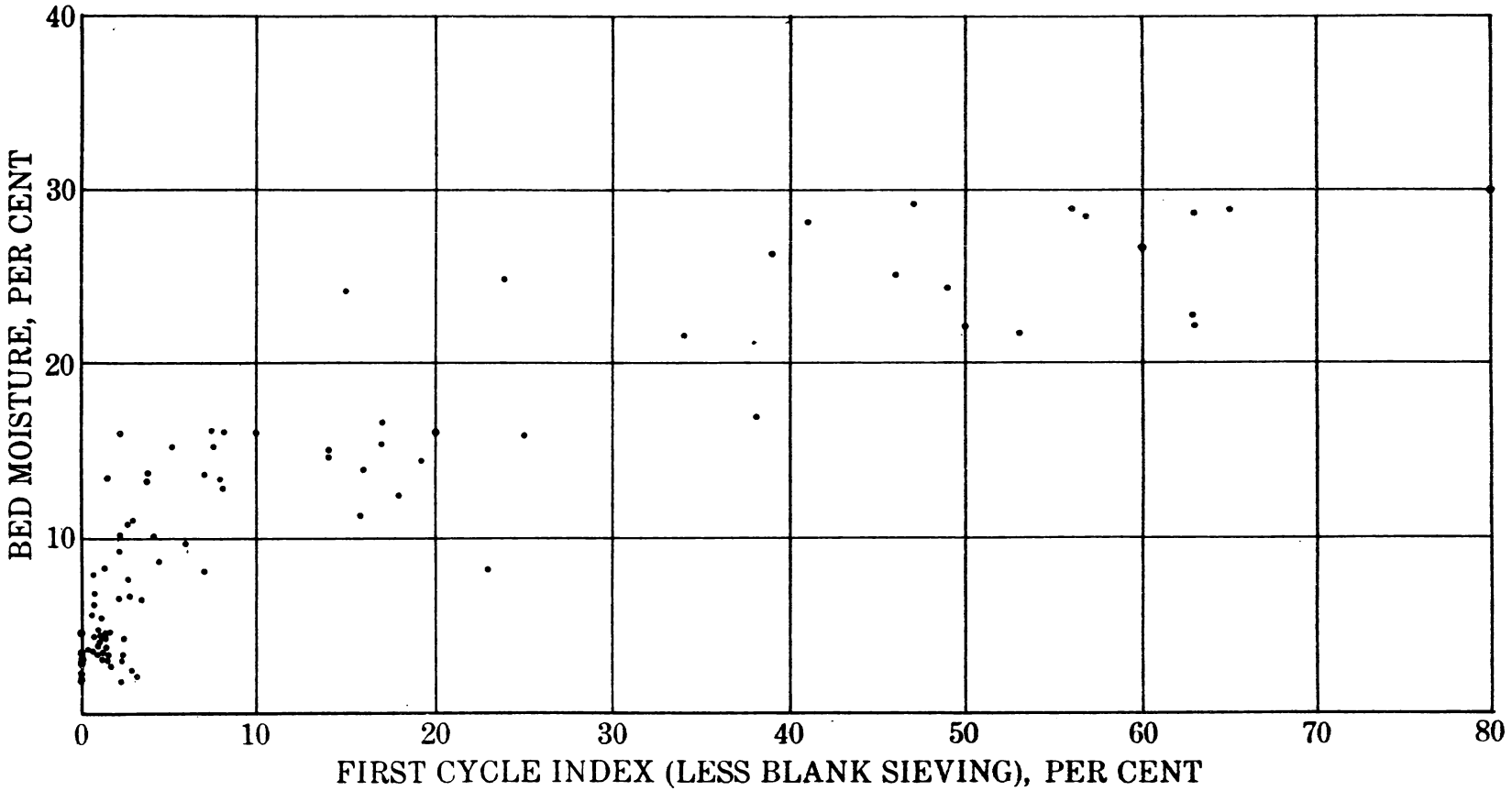

Figure 1.- Relation of bed moisture to first cycle slacking indices (less blank sieving)

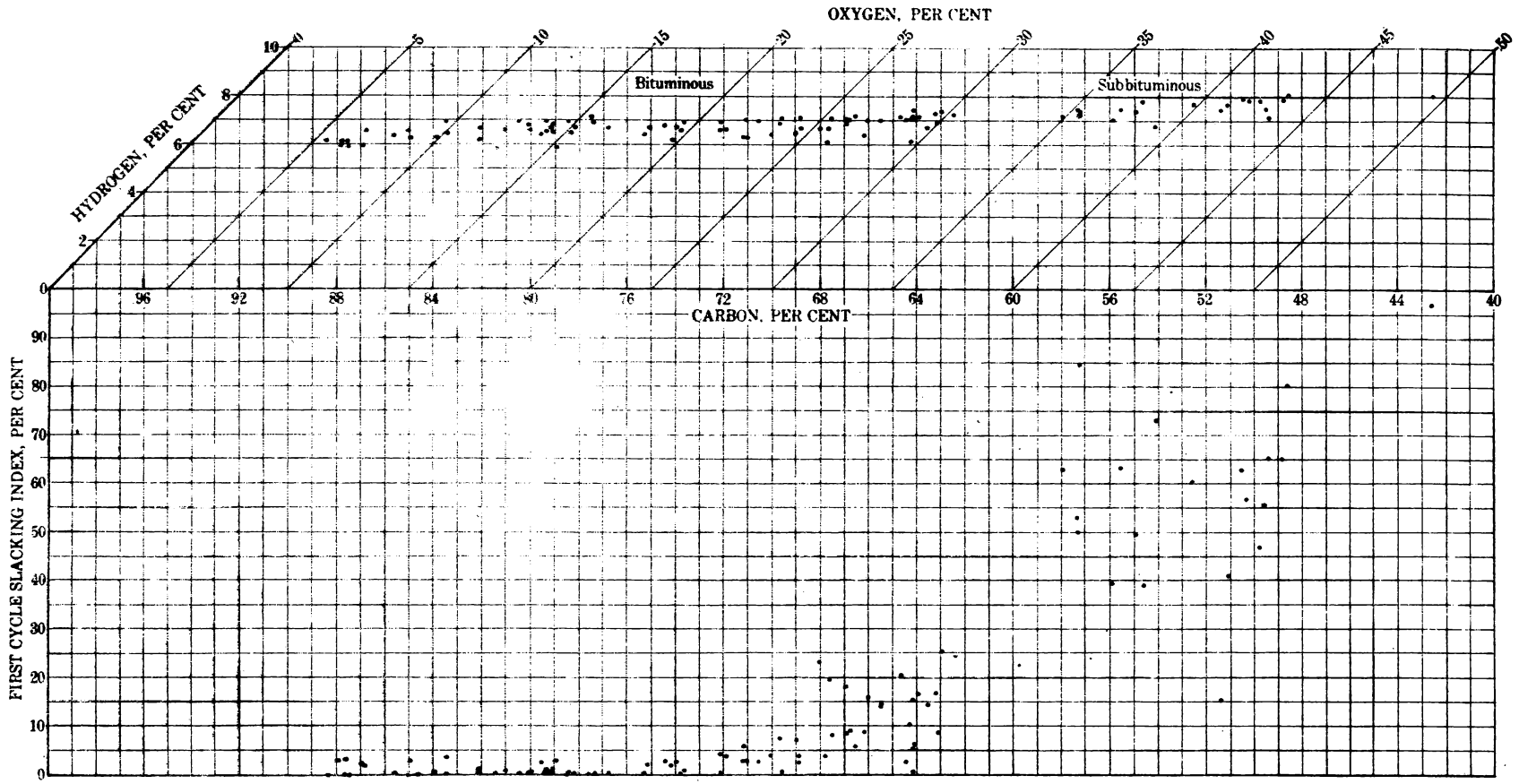

Figure 2.- Relation of first cycle slacking indices (less blank sieving) to rank of coal as measured by "as-received" ultimate analyses (ash-free, nitrogen-free, and sulphur-free basis)

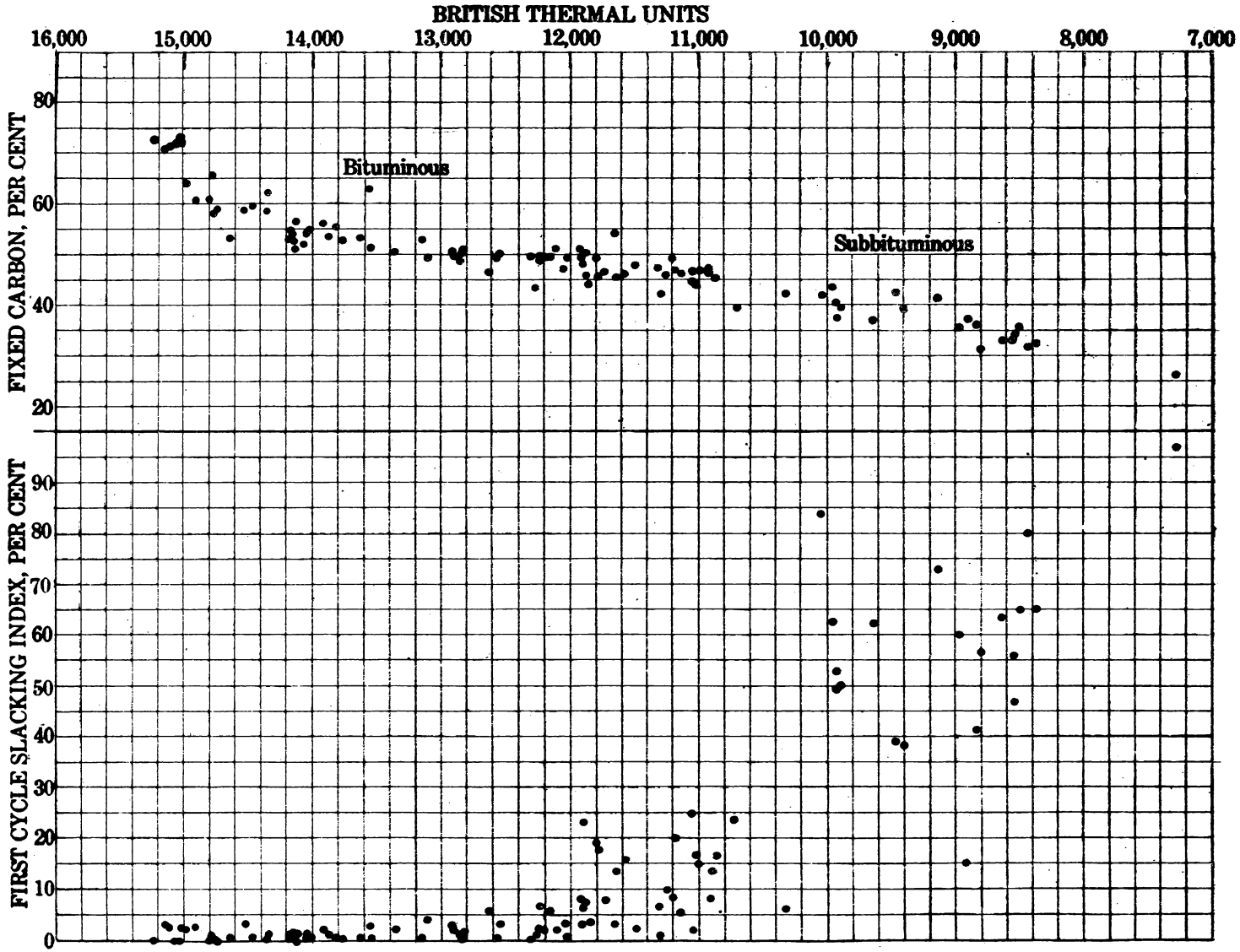

Figure 3.- Relation of first cycle slacking indices (less blank sieving) to rank of coal as measured by calorific value and fixed carbon on the "as-received" ash-free basis

Table 1.- Results of accelerated slacking tests

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	COLORADO												
Delta	- - -	Red Canon	Bit.	38851	(19) 20	32	42	52	63	73	0.9	A36023	14.4
Do.	- - -	Paonia Farmers	do.	38852	(2.4) 3.3	6.3	7.9	10	12	14	0.9	A44877	9.2
Garfield	- - -	Store Canon	do.	38853	(0.6) 1.1	2.0	2.5	3.1	3.6	4.3	0.5	A40969	8.0
Gunnison	- - -	Ohio Creek	do.	38846	(5.7) 6.5	16	19	26	31	37	0.8	93758	11.3
Routt	No. 2 (Pinnacle)	Moffat 1	do.	38519	3.5	6.1	9.2	13	14	16	(3)	A3038	6.1
Do.	do.	do.	do.	38523	1.8	3.1	5.3	6.7	8.0	8.6	(3)	A3038	6.1
				Average	2.7	- -	7.3	- -	- -	12			6.1
Do.	- - -	Babson	do.	38520	10	18	29	43	57	65	(3)	A34975	16.1
Do.	- - -	do.	do.	38524	8.6	17	26	34	48	56	(3)	A34975	16.1
Do.	- - -	do.	do.	38526	6.2	12	19	27	33	44	(3)	A34975	16.1
				Average	8.3	- -	25	- -	- -	55			16.1
Do.	Wadge	Wadge	do.	38517	2.2	4.4	8.4	11	14	18	(3)	A34977	10.5
Do.	do.	do.	do.	38530	3.1	5.4	10	17	32	40	(3)	A34977	10.5
				Average	2.7	- -	9.2	- -	- -	29			10.5
	ILLINOIS												
La Salle	No. 2	La Salle County Carbon 1	do.	38894	(1.6) 1.7	3.5	5.2	6.8	8.6	12	0.1	- - -	13.4
Do.	do.	South Side	do.	38893	(3.9) 4.0	6.9	9.3	11	14	17	0.1	- - -	13.8
Will	do.	Northern Illinois 10	do.	38892	(8.2) 8.3	18	23	25	27	32	0.1	A52982	16.1
	IOWA												
Boone	Lower	Scandia [4]	do.	38532	8.0	15	19	25	33	40	(3)	- - -	- -
Do.	do.	do.	do.	38529	5.3	8.6	12	15	17	19	(3)	- - -	- -
				Average	6.7	- -	16	- -	- -	30			- -
Taylor	- - -	New Market	Subbit.	38528	25	33	46	53	58	62	(3)	A14061	20.9
Do.	- - -	do.	do.	38531	23	32	44	56	73	84	(3)	A14061	20.9
				Average	24	- -	45	- -	- -	73			20.9
	KENTUCKY												
Harlan	High Splint	Closplint	Bit.	39338	(0) 0.3	0.6	1.0	1.3	1.5	1.8	0.3	A61049	3.0
Muhlenburg	Green River	Green River	do.	38544	4.3	7.9	10	12	14	17	(3)	- - -	5.6
	MONTANA												
Blaine	- - -	Milk River	Subbit.	38527	73	95	99	100	- -	- -	(3)	A34014	26.0
Rosebud	- - -	Colstrip	do.	38869	39	56	66	78	84	86	0.5	A52181	26.5
	NEW MEXICO												
Sandoval	- - -	La Ventana	Bit.	38686	(25) 25	34	43	50	58	61	0.3	- - -	- -

1. Rank assigned coal by collector. 2. Figures in parenthesis are corrected for blank sieving. 3. Blank sieving not determined. 4. Samples taken from same gross sample.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	PENNSYLVANIA												
Allegheny	Bottom of Pittsburgh	B. of M.	Bit.	38554)		0.9	2.2	3.4	4.5	5.6	6.1	1.1	- - -	3.0
Do.	do.	do.	do.	38554)[4]		1.1	1.9	3.1	4.0	4.9	5.4	0.9	- - -	3.0
Do.	do.	do.	do.	38554)		1.3	2.3	3.2	4.2	5.2	5.7	1.2	- - -	3.0
				Average	(0)	1.1	- -	3.2	- -	- -	5.7	1.1		3.0
Do.	Top of Pittsburgh	do.	do.	38949)		0.4	0.7	1.0	1.3	1.6	1.9	0.5	- - -	3.0
Do.	do.	do.	do.	38949)[4]		0.5	0.8	1.1	1.4	1.7	2.2	0.5	- - -	3.0
Do.	do.	do.	do.	38949)		0.5	0.9	1.1	1.5	1.9	2.2	0.5	- - -	3.0
				Average	(0)	0.5	- -	1.1	- -	- -	2.1	0.5		3.0
	TEXAS												
Houston	B	Wooter's	Lignite	38533		97	100	- -	- -	- -	- -	(3)	24898	37.8
	WASHINGTON												
Chelan	Winze	Dry Gulch	Subbit.	38889		1.9	2.6	4.3	5.5	6.6	6.7	0.2	A52422	7.9
Do.	do.	do.	do.	38890		2.0	5.7	9.2	13	16	17	1.1	A52423	8.5
				Average	(1.3)	2.0	- -	6.8	- -	- -	12	0.7		8.2
Cowlitz	Cherry	Cherry	do.	39043)		8.8	23	30	35	39	43	0.3	A56015	24.1
Do.	do.	do.	do.	39044)		17	30	41	49	55	60	0.3	do.	24.1
Do.	do.	do.	do.	39045)[4]		19	31	39	44	50	56	0.2	do.	24.1
Do.	do.	do.	do.	39046)		17	28	41	45	50	55	0.2	do.	24.1
				Average	(15)	15	- -	38	- -	- -	54	0.3		24.1
King	Big Bed	Kangley	Bit.	39125)		0.7	1.5	2.2	2.8	3.5	4.1	0.9	A57244	4.7
Do.	do.	do.	do.	39126)		1.2	2.3	3.2	4.4	5.3	6.0	1.4	do.	4.7
Do.	do.	do.	do.	39127)[4]		0.9	1.6	2.6	2.1	3.9	4.4	1.0	do.	4.7
Do.	do.	do.	do.	39128)		0.8	1.6	2.2	2.8	4.1	4.8	1.0	do.	4.7
				Average	(0)	0.9	- -	2.6	- -	- -	4.8	1.0		4.7
Do.	Lower Bagley	New Castle	Subbit.	38918		6.0	8.3	13	18	20	23	0.4	A53509	5.7
Do.	do.	do.	do.	38920)[4]		9.2	15	19	24	28	30	0.6	A53508	6.5
Do.	do.	do.	do.	38921)		9.9	16	22	26	29	31	0.2	do.	6.5
Do.	do.	do.	do.	38922		6.9	10	16	19	22	24	0.3	A53507	12.2
				Average	(7.1)	7.5	- -	17	- -	- -	26	0.4		8.1
Do.	Upper Bagley	do.	do.	38919	(1.1)	1.3	4.2	8.2	12	13	15	0.2	A53512	4.3
Do.	Carbon	Bayne	Bit.	38979)[4]		0.8	1.5	1.9	2.4	3.3	3.7	0.6	A54391	4.9
Do.	do.	do.	do.	39039)		1.2	2.5	2.9	3.6	4.2	4.5	0.5	A54391	4.9
Do.	do.	do.	do.	38983		1.1	2.1	2.8	3.0	3.4	3.9	0.4	A54390	5.0
Do.	do.	do.	do.	38984		3.2	5.2	6.0	6.9	7.6	8.8	0.6	A54389	3.9
				Average	(1.3)	1.8	- -	3.7	- -	- -	5.6	0.5		4.6

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
King	Cedar Mountain	West Coast	Subbit.	38931	22	31	44	54	63	70	0.5	A53515	12.7
Do.	do.	do.	do.	38932	19	26	35	44	53	57	0.6	A53513	5.9
Do.	do.	do.	do.	38935)[4]	28	50	62	74	83	87	1.0	A53514	9.1
Do.	do.	do.	do.	39004)[3]	35	52	60	71	80	84	0.7	A53514	9.1
				Average	(23) 24	-	47	-	-	71	0.6		9.2
Do.	Dale [4]	Dale-McKay	do.	38954	15	27	47	56	59	64	0.3	A54143	11.9
Do.	do.	do.	do.	38955)[4]	18	27	53	60	63	66	0.4	A54146	17.4
Do.	do.	do.	do.	39017)[3]	15	27	44	52	55	60	0.3	A54146	17.4
Do.	do.	do.	do.	38957	11	23	33	38	43	50	0.4	A54147	15.6
				Average	(14) 14	-	43	-	-	59	0.4		15.0
Do.	Dale 7	do.	do.	38953	(8.5) 9.0	14	22	29	46	52	0.5	A54142	16.3
Do.	Dolly Varden	Harris	do.	39058)[4]	15	29	35	41	48	55	0.6	A56245	13.9
Do.	do.	do.	do.	39059)[3]	21	27	34	41	48	55	0.5	A56245	13.9
Do.	do.	do.	do.	39060)[4]	19	28	36	45	51	54	1.2	A56246	13.9
Do.	do.	do.	do.	39061)[3]	13	21	27	36	44	49	0.9	A56246	13.9
				Average	(16) 17	-	33	-	-	53	0.6		13.9
Do.	Elk 2	Elk	Bit.	38952)[4]	1.6	2.8	3.2	3.5	4.2	4.8	0.4	A54152	4.4
Do.	do.	do.	do.	39019)[3]	0.8	1.7	2.6	3.5	3.8	4.6	0.3	A54152	4.4
				Average	(0.8) 1.2	-	2.9	-	-	4.7	0.4		4.4
Do.	Fraser	Danville	Subbit.	39050)	23	53	75	84	88	91	1.4	A56325	16.0
Do.	do.	do.	do.	39051)[4]	23	47	75	83	88	92	0.6	A56325	16.0
Do.	do.	do.	do.	39052)[3]	13	38	62	73	79	86	0.5	A56325	16.0
Do.	do.	do.	do.	39053)	24	40	46	58	77	81	1.1	A56325	16.0
				Average	(20) 21	-	65	-	-	88	0.9		16.0
Do.	Jones	New Black Diamond	do.	39005)[4]	6.5	11	15	18	21	26	0.3	A53667	9.7
Do.	do.	do.	do.	38936)[3]	6.8	12	16	21	25	30	0.3	A53667	9.7
Do.	do.	do.	do.	38937	1.4	3.7	7.4	9.4	12	15	0.2	A53664	10.3
Do.	do.	do.	do.	38938	1.4	3.1	4.5	5.9	7.4	11	0.2	A53666	9.9
Do.	do.	do.	do.	38939	2.0	4.9	7.7	14	18	24	0.2	A53659	10.7
Do.	do.	do.	do.	38940	3.4	4.8	7.7	10	12	14	0.3	A53663	10.7
Do.	do.	do.	do.	38941	2.2	5.1	8.2	11	15	19	0.5	A53658	10.8
Do.	do.	do.	do.	38942	3.2	7.4	10	12	16	18	0.4	A53661	10.0
Do.	do.	do.	do.	38943	5.1	6.7	10	14	16	20	0.3	A53656	12.3

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
King	Jones	New Black Diamond	Subbit.	38944	4.2	10	18	28	30	32	0.2	A53657	12.3
Do.	do.	do.	do.	38945	2.1	4.4	11	16	19	21	0.3	A53662	12.0
Do.	do.	do.	do.	38946	4.4	6.4	11	15	17	19	0.2	A53655	10.5
				Average	(3.0) 3.3	- -	10	-	-	20	0.3		11.0
Do.	May Creek	New Castle	do.	38924	(3.6) 4.1	6.2	7.8	9.3	11	12	0.5	A53511	6.5
Do.	McKay	Dale	Bit.	39038)[4]	6.6	12	16	21	28	35	1.0	A54149	12.2
Do.	do.	do.	do.	38958)[3]	6.3	17	23	29	34	40	0.7	A54149	12.2
Do.	do.	do.	do.	38959	12	21	27	31	37	43	1.6	A54150	13.6
				Average	(8.1) 9.3	-	24	-	-	41	1.2		12.9
Do.	Morris	Morris	do.	39080)[4]	3.5	6.0	7.8	8.8	9.6	11	1.6	A56570	3.7
Do.	do.	do.	do.	39081)[3]	2.6	5.4	6.7	8.0	9.0	10	0.9	A56570	3.7
Do.	do.	do.	do.	39082)[4]	1.4	2.4	3.3	4.2	4.9	5.6	1.3	A56571	3.9
Do.	do.	do.	do.	39083)[3]	1.7	3.2	4.4	5.4	6.2	7.3	1.5	A56571	3.9
				Average	(1.0) 2.3	-	5.6	-	-	8.5	1.3		3.8
Do.	Muldoon	New Castle	Subbit.	38925	5.7	7.1	9.5	11	15	16	0.2	A53503	18.3
Do.	do.	do.	do.	38926	6.1	8.2	11	13	16	18	0.4	A53504	13.9
Do.	do.	do.	do.	38930	5.1	8.1	12	15	16	18	0.5	A53505	13.0
				Average	(5.2) 5.6	-	11	-	-	17	0.4		15.1
Do.	Navy 4	Eureka-Navy	Bit.	38977)[4]	1.7	3.3	5.2	6.1	7.0	7.9	0.9	A54397	4.2
Do.	do.	do.	do.	38978)[3]	5.2	6.7	8.2	9.3	10	11	1.1	A54397	4.2
				Average	(2.5) 3.5	-	6.7	-	-	9.5	1.0		4.2
Do.	(Lower Bench) Navy 6	do.	do.	38980	1.2	1.6	1.9	2.1	2.3	2.4	0.3	A54394	4.5
Do.	do.	do.	do.	38982	1.9	2.8	4.5	5.8	6.6	7.4	1.0	A54393	4.4
				Average	(0.8) 1.6	-	3.2	-	-	4.9	0.7		4.5
Do.	(Upper Bench) Navy 6	do.	do.	38981	(0.7) 0.9	1.5	2.0	2.6	3.0	3.4	0.2	A54396	5.6
Do.	Newham	Diamond	Subbit.	39137)	8.9	22	32	40	55	66	1.6	A56975	13.2
Do.	do.	do.	do.	39138)[4]	11	24	35	44	55	64	2.4	A56975	13.2
Do.	do.	do.	do.	39139)[3]	9.2	23	35	45	60	67	1.7	A56975	13.2
Do.	do.	do.	do.	39140)	10	24	36	48	60	70	1.4	A56975	13.2
				Average	(8.0) 9.8	-	35	-	-	67	1.8		13.2
Do.	No. 1	Renton	do.	39018)[4]	15	21	29	35	44	50	0.3	A53870	16.8
Do.	do.	do.	do.	38948)[3]	18	25	33	40	46	55	0.2	A53870	16.8
				Average	(17) 17	-	31	-	-	53	0.3		16.8

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
King	No. 2	Cavanaugh	Subbit.	39133)	9.2	12	14	16	19	21	1.3	A56974	9.7
Do.	do.	do.	do.	39134)4	7.2	10	14	16	19	21	0.9	A56974	9.7
Do.	do.	do.	do.	39135)-	4.2	7.6	11	13	16	18	0.9	A56974	9.7
Do.	do.	do.	do.	39136)	9.2	13.1	17	20	25	27	1.8	A56974	9.7
				Average	(6.0) 7.2	-	14	-	-	22	1.2		9.7
Do.	do.	New Black Diamond	do.	38947	(2.2) 2.7	3.9	6.4	10	12	16	0.5	A53654	10.2
Do.	do.	Renton	do.	38949	(17) 17	24	32	40	48	59	0.3	A53871	15.5
Do.	No. 3	do.	do.	38950	(6.7) 7.1	11	17	23	30	36	0.4	A53872	15.4
Do.	(Middle Bench) No. 3	Occidental	Bit.	39084)4	3.3	5.0	6.1	6.6	7.5	7.7	2.1	A56577	2.1
Do.	do.	do.	do.	39085)-	3.1	4.5	6.5	7.0	7.5	8.0	1.0	A56577	2.1
Do.	do.	do.	do.	39086)4	1.6	2.9	3.7	4.6	5.7	6.3	0.5	A56576	5.8
Do.	do.	do.	do.	39087)-	2.1	3.2	4.1	5.1	5.7	6.6	0.8	A56576	5.8
				Average	(1.4) 2.5	-	5.1	-	-	7.2	1.1		3.9
Do.	(Top Bench) No. 3	do.	do.	39088	1.5	2.6	4.1	5.1	5.8	6.0	0.6	A56574	5.7
Do.	do.	do.	do.	39089)4	3.2	7.7	9.0	11	12	13	2.5	A56573	5.2
Do.	do.	do.	do.	39090)-	4.0	6.5	7.3	9.5	11	12	1.7	A56573	5.2
				Average	(1.2) 2.6	-	6.2	-	-	9.3	1.4		5.5
Do.	No. 4	New Castle	Subbit.	38927	2.2	3.5	5.5	8.1	10	11	0.4	A53501	15.3
Do.	do.	do.	do.	38928	5.2	7.3	10	13	16	17	0.2	A53500	17.6
Do.	do.	do.	do.	38929	3.8	4.5	6.6	8.5	11	12	0.3	A53499	15.1
				Average	(3.4) 3.7	-	7.4	-	-	13	0.3		16.0
Do.	Reynolds	Reynolds	do.	39129)	28	51	64	72	78	85	0.8	A57243	15.9
Do.	do.	do.	do.	39130)4	22	51	63	73	80	86	0.8	A57243	15.9
Do.	do.	do.	do.	39131)-	24	47	60	72	79	84	0.8	A57243	15.9
Do.	do.	do.	do.	39132)	30	54	69	80	84	88	1.3	A57243	15.9
				Average	(25) 26	-	64	-	-	86	0.9		15.9
Do.	Sunbeam	Sunbeam	do.	38799	11	23	31	43	49	60	0.6	A50915	16.2
Do.	do.	do.	do.	38800	8.9	20	28	36	40	44	0.3	A50915	16.2
Do.	do.	do.	do.	38801	9.5	22	30	37	42	45	0.5	A50916	14.3
Do.	do.	do.	do.	38802	25	48	65	75	85	87	2.2	A50917	14.1
Do.	do.	do.	do.	38803	19	33	46	56	66	69	3.8	A50917	14.1
				Average	(14) 15	-	40	-	-	61	1.5		14.9

See page 9 for footnotes.

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Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
Kittitas	Big Bed	Roslyn Cascade 3	Bit.	38873		1.9	3.4	4.5	5.8	7.0	7.7	0.8	A52140	3.3
Do.	do.	do.	do.	38876		1.7	3.6	5.1	5.9	7.1	7.6	0.8	A52141	4.7
Do.	do.	do.	do.	38879)[4]		1.8	2.5	4.4	5.2	6.5	6.9	0.9	A52139	3.5
Do.	do.	do.	do.	38880)[=]		2.9	4.0	4.8	6.2	6.9	7.2	1.4	A52139	3.5
				Average	(1.3)	2.0	-	4.7	-	-	7.5	0.7		3.8
Do.	No. 1	Rothlisberger	do.	38863	(2.9)	3.7	8.3	12	14	15	18	0.8	A52002	7.6
Do.	Roslyn	Cle Elum 1	do.	38874	(4.3)	4.9	8.2	11	13	15	16	0.6	A52143	8.8
Do.	do.	Roslyn 7 and Extension	do.	38836		4.1	5.9	7.0	8.3	9.8	11	1.5	A51666	5.9
Do.	do.	do.	do.	38837		4.5	8.9	11	14	17	18	1.6	A51665	6.4
Do.	do.	do.	do.	38838		4.3	6.1	7.0	8.4	9.8	10	1.0	A51664	6.6
Do.	do.	do.	do.	38839		2.2	3.1	4.7	5.6	6.3	6.9	0.7	A51663	8.3
Do.	do.	do.	do.	38840		1.4	2.6	3.2	4.0	4.6	4.9	0.9	A51662	6.4
Do.	do.	do.	do.	38841		3.6	4.9	5.7	6.2	6.8	7.3	0.5	A51661	6.1
Do.	do.	do.	do.	38842)[4]		1.6	3.2	4.0	5.1	5.8	6.8	0.6	A51660	7.4
Do.	do.	do.	do.	38843)[=]		1.4	2.8	3.8	4.8	6.1	7.0	0.9	A51660	7.4
				Average	(2.1)	3.1	-	6.0	-	-	9.3	1.0		6.7
Do.	do.	Roslyn 3	do.	38804)[4]		1.4	3.3	4.5	6.0	7.0	7.8	0.7	A51004	5.1
Do.	do.	do.	do.	38805)[=]		1.9	4.4	5.8	6.4	7.2	7.8	0.9	A51004	5.1
Do.	do.	do.	do.	38806		2.4	4.2	5.5	7.4	9.2	9.8	1.2	A51008	3.0
Do.	do.	do.	do.	38807		4.3	6.2	8.1	9.8	11	12	3.0	A51005	2.3
Do.	do.	do.	do.	38808		2.5	4.2	4.9	6.0	6.5	6.8	1.7	A51007	2.6
Do.	do.	do.	do.	38809		2.8	7.7	9.9	11	12	14	1.1	A51006	2.6
Do.	do.	do.	do.	38810		1.8	3.9	5.8	6.6	6.9	8.1	0.9	A51003	2.6
				Average	(1.3)	2.6	-	6.6	-	-	9.8	1.3		3.0
Do.	do.	do.	do.	39164)		0.8	2.2	3.7	4.3	5.6	6.6	0.7	A51000	3.5
Do.	do.	do.	do.	39165)[4]		1.1	2.5	3.8	4.5	5.8	6.8	0.8	A51000	3.5
Do.	do.	do.	do.	39166)[=]		2.1	3.3	3.9	4.7	6.7	8.5	0.8	A51000	3.5
Do.	do.	do.	do.	39167)		1.1	2.4	3.2	4.3	5.5	6.3	0.5	A51000	3.5
				Average	(0.6)	1.3	-	3.7	-	-	7.1	0.7		3.5
Do.	do.	Roslyn 5	do.	38823		1.4	2.5	3.9	5.0	5.6	6.5	0.6	A51501	3.8
Do.	do.	do.	do.	38824		1.6	3.1	4.0	6.5	7.7	8.6	0.8	A51503	4.5
Do.	do.	do.	do.	38825		1.2	2.3	3.5	5.4	6.3	7.3	1.4	A51502	3.7
Do.	do.	do.	do.	38826		1.7	3.2	4.6	6.0	7.1	8.1	2.0	A51500	3.5
Do.	do.	do.	do.	38827)[4]		0.7	2.7	3.7	4.2	4.6	5.2	0.9	A51499	3.4
Do.	do.	do.	do.	38828)[=]		0.7	1.7	2.7	3.3	3.8	4.2	0.9	A51499	3.4

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
WASHINGTON (Continued)													
Kittitas	Roslyn	Roslyn 5	Bit.	38829	0.9	2.0	3.1	3.7	4.0	4.3	0.9	A51498	3.1
				Average	(0.3) 1.3	-	3.7	-	-	6.6	1.0		3.7
Do.	do.	Roslyn Cascade 1	do.	38870	1.9	3.9	4.8	5.6	6.5	7.3	0.3	A52136	3.8
Do.	do.	do.	do.	38871	1.4	2.5	3.1	3.9	4.1	4.8	0.6	A52137	3.9
Do.	do.	do.	do.	38872	3.9	5.5	6.9	8.1	9.5	10.5	2.3	A52135	5.9
Do.	do.	do.	do.	38881)[4]	1.4	2.2	4.6	5.2	5.5	5.8	0.5	A52134	4.0
Do.	do.	do.	do.	38882)[4]	1.0	3.4	4.0	5.3	5.6	6.0	0.4	A52134	4.0
				Average	(1.2) 2.1	-	4.8	-	-	7.1	0.9		4.4
Do.	do.	Roslyn 8	do.	38856	1.2	2.7	4.3	5.4	6.8	8.0	0.6	A52000	4.1
Do.	do.	do.	do.	38857	1.7	2.8	4.0	5.2	6.2	7.0	0.6	A51998	3.8
Do.	do.	do.	do.	38858)[4]	1.3	3.2	4.3	5.2	5.9	6.9	1.2	A51999	3.9
Do.	do.	do.	do.	38859)[4]	1.9	3.4	5.0	5.9	7.0	7.6	1.0	A51999	3.9
				Average	(0.7) 1.5	-	4.3	-	-	7.4	0.8		3.9
Do.	do.	Roslyn 9	do.	38844	3.3	5.6	8.0	9.1	10	11	1.6	A51669	3.8
Do.	do.	do.	do.	38845	1.8	3.2	4.2	5.2	6.4	7.0	1.3	A51668	4.3
				Average	(1.1) 2.6	-	6.1	-	-	9.0	1.5		4.1
Do.	Roslyn 3	Roslyn 3	do.	38878	3.1	6.4	8.6	9.9	13	14	1.3	A52146	4.0
Do.	do.	do.	do.	38883	2.2	3.6	4.4	5.6	7.2	8.3	1.8	- - -	- -
				Average	(1.1) 2.7	-	6.5	-	-	11	1.6		4.0
Do.	Roslyn 6	Roslyn Cascade 1	do.	38875	(0.8) 1.5	2.2	3.0	3.9	5.1	5.7	0.7	A52145	5.4
Lewis	Columbia	Columbia Collieries	Subbit.	39030)[4]	59	70	77	82	86	89	0.6	A55763	28.0
Do.	do.	do.	do.	39031)[4]	50	61	69	75	78	82	0.5	A55763	28.0
Do.	do.	do.	do.	39032)[4]	66	80	87	89	91	92	0.2	A55762	29.3
Do.	do.	do.	do.	39033)[4]	53	77	86	89	91	93	0.4	A55762	29.3
				Average	(57) 57	-	80	-	-	89	0.4		28.7
Do.	Foron	Ford Praire 1	do.	38990	56	73	85	91	94	96	0.4	A54765	28.4
Do.	do.	do.	do.	38991)[4]	55	67	76	78	81	82	0.7	A54764	29.1
Do.	do.	do.	do.	38992)[4]	63	75	81	85	88	88	1.1	A54764	29.1
Do.	do.	do.	do.	38993	55	66	73	78	80	81	0.8	A54766	29.4
				Average	(56) 57	-	79	-	-	87	0.7		29.0
Do.	Hi Carbon	Hi Carbon	Bit.	39054)	4.5	6.1	7.8	9.1	10	11	1.2	A56324	6.7
Do.	do.	do.	do.	39055)[4]	3.9	6.7	8.4	13	14	15	0.6	A56324	6.7
Do.	do.	do.	do.	39056)[4]	3.5	5.7	7.1	8.1	9.6	12	0.5	A56324	6.7
Do.	do.	do.	do.	39057)	2.3	3.5	5.2	6.3	7.8	8.8	1.0	A56324	6.7
				Average	(2.8) 3.6	-	7.1	-	-	12	0.8		6.7

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve. cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
Lewis	Monarch	Monarch	Subbit.	39026)4	53	65	70	78	81	84	0.4	A55756	26.8
Do.	do.	do.	do.	39027)-	65	77	81	85	86	88	0.3	A55756	26.8
Do.	do.	do.	do.	39034)4	66	75	80	82	84	85	0.5	A55755	26.3
Do.	do.	do.	do.	39035)-	55	70	78	82	86	88	0.7	A55755	26.3
				Average	(59) 60	-	77	-	-	86	0.5		26.6
Do.	Non Pareil	Non Pareil	do.	39040)4	52	66	78	87	89	91	0.3	A56017	29.5
Do.	do.	do.	do.	39049)-	43	53	74	87	91	94	0.1	A56017	29.5
Do.	do.	do.	do.	39048	45	62	79	88	89	91	0.3	A56016	29.1
				Average	(47) 47	-	77	-	-	92	0.2		29.3
Do.	No. 3	Crystal 1	Bit.	39076)	1.4	1.9	2.3	2.6	3.5	3.9	0.6	A56494	6.3
Do.	do.	do.	do.	39077)4	1.8	2.3	2.6	3.0	3.4	3.9	0.5	A56494	6.3
Do.	do.	do.	do.	39078)-	1.3	1.8	2.2	2.7	3.1	3.6	0.7	A56494	6.3
Do.	do.	do.	do.	39079)	1.3	2.1	2.6	3.0	3.4	4.1	0.7	A56494	6.3
				Average	(0.8) 1.5	-	2.4	-	-	3.9	0.7		6.3
Do.	No. 4	Wabash	Subbit.	39006	30	41	51	56	66	75	0.5	A55350	28.4
Do.	do.	do.	do.	39007	55	71	79	83	85	87	0.2	A55351	28.4
Do.	do.	do.	do.	39008)4	37	50	62	69	75	80	0.5	A55352	27.6
Do.	do.	do.	do.	39024)-	40	51	59	66	72	77	0.4	A55352	27.6
				Average	(41) 41	-	64	-	-	80	0.3		28.1
Do.	Parkin	Black Prince 2	do.	39066)	50	61	70	73	77	79	0.6	A56243	24.9
Do.	do.	do.	do.	39067)4	46	62	70	75	78	79	0.4	A56243	24.9
Do.	do.	do.	do.	39068)-	48	62	70	73	75	78	0.7	A56243	24.9
Do.	do.	do.	do.	39073)	55	64	68	70	72	75	0.7	A56243	24.9
				Average	(50) 50	-	70	-	-	78	0.6		24.9
Do.	Reliance 1	Reliance 1	do.	39028)4	58	78	81	84	86	86	0.3	A55758	29.0
Do.	do.	do.	do.	39029)-	51	70	75	78	81	83	0.4	A55758	29.0
Do.	do.	do.	do.	39036	75	88	91	92	94	94	0.3	A55759	28.2
Do.	do.	do.	do.	39037	64	86	91	94	95	96	0.3	A55760	30.0
				Average	(65) 65	-	87	-	-	92	0.3		29.1
Do.	Salzer Valley	Salzer Valley	do.	39012)4	70	90	96	96	97	98	0.2	A55440	29.2
Do.	do.	do.	do.	39021)-	50	78	90	92	96	98	0.4	A55440	29.2
Do.	do.	do.	do.	39014	68	91	95	98	98	99	0.4	A55442	25.3
Do.	do.	do.	do.	39015	62	83	90	93	94	95	0.3	A55441	32.2
				Average	(63) 63	-	93	-	-	97	0.3		28.9

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
Lewis	Smith 1	Smith 3	Subbit.	39069)	66	87	92	94	96	97	1.5	A56244	22.4
Do.	do.	do.	do.	39070)[4]	59	79	84	91	93	94	0.9	A56244	22.4
Do.	do.	do.	do.	39071)[4]	57	81	87	90	92	93	0.6	A56244	22.4
Do.	do.	do.	do.	39072)	72	86	93	97	98	99	0.9	A56244	22.4
				Average	(63) 64	-	89	-	-	96	1.0		22.4
Do.	Sunshine 1	Sunshine 1	do.	39011	77	95	97	97	98	99	0.4	A55517	33.5
Do.	do.	do.	do.	39013	79	92	95	96	98	99	0.4	A55519	27.5
Do.	do.	do.	do.	39016	83	96	97	98	99	99	0.4	A55518	29.3
				Average	(80) 80	-	96	-	-	99	0.4		30.1
Pierce	Morgan	Carbonado	Bit.	38813	1.6	2.8	4.0	4.7	5.3	5.7	0.6	A51189	3.9
Do.	do.	do.	do.	38814	2.6	5.1	6.4	8.6	9.1	10	1.6	A51187	2.5
Do.	do.	do.	do.	38815	4.6	10	12	13	14	15	2.4	A51188	2.6
Do.	do.	do.	do.	39156)	3.9	5.9	7.6	9.8	12	14	3.1	- - -	- -
Do.	do.	do.	do.	39157)	6.2	9.0	11	12	14	15	4.2	- - -	- -
Do.	do.	do.	do.	39158)[4]	6.1	9.3	12	14	16	17	6.2	- - -	- -
Do.	do.	do.	do.	39159)	3.2	6.0	8.1	10	14	15	4.9	- - -	- -
Do.	do.	do.	do.	39160)	4.2	7.5	10.4	12	14	16	4.0	- - -	- -
				Average	(1.3) 3.8	-	8.1	-	-	14	2.5		3.0
Do.	No. 1	Fairfax	Semi-bit.	39111	(0) 7.0	9.9	12	15	18	20	7.3	A56655	2.9
Do.	do.	Wilkeson	Bit.	38908	4.6	13	17	19	22	23	3.1	A52877	2.2
Do.	do.	do.	do.	38909	2.5	6.2	8.7	10	11	12	0.9	A52878	2.0
Do.	do.	do.	do.	38910	5.3	7.2	8.4	8.8	10	11	1.8	A52879	1.5
				Average	(3.7) 4.1	-	11	-	-	15	1.9		1.9
Do.	No. 2	Fairfax	Semi-bit.	39113)[4]	12	19	22	24	27	30	6.0	A56646	3.0
Do.	do.	do.	do.	39114)[4]	9.1	14	18	21	23	25	7.0	A56646	3.0
Do.	do.	do.	do.	39115	18	24	36	40	41	43	12.3	A56645	2.8
Do.	do.	do.	do.	39116)[4]	5.2	9.1	12	14	15	16	8.2	A56644	3.3
Do.	do.	do.	do.	39117)[4]	4.0	7.7	11	13	15	16	6.3	A56644	3.3
				Average	(2.3) 11	-	22	-	-	29	8.7		3.0
Do.	do.	Wilkeson	Bit.	38911	(1.5) 3.6	4.7	5.6	7.2	8.7	9.0	2.1	A52876	2.5
Do.	No. 3	Fairfax	Semi-bit.	39100)	6.2	8.9	11	12	13	14	7.2	A56650	3.0
Do.	do.	do.	do.	39101)[4]	5.0	7.5	8.8	11	11	13	4.6	A56650	3.0
Do.	do.	do.	do.	39102)[4]	5.1	9.2	11	12	13	13	5.8	A56649	3.0
Do.	do.	do.	do.	39103)	7.0	10	12	13	14	14	6.3	A56648	3.9

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
Pierce	No. 3	Fairfax	Semi-bit.	39104	10	13	15	17	21	22	4.7	A56648	3.9
				Average	(2.5) 7.9	-	12.6	-	-	18	5.4		3.3
Do.	do.	Wilkeson	Bit.	38912	1.1	2.7	5.0	7.9	9.1	11	2.6	A52881	2.1
Do.	do.	do.	do.	38913	6.7	8.1	9.8	15	17	19	7.0	A52882	2.7
Do.	do.	do.	do.	38914	1.3	2.4	3.7	4.4	5.2	5.7	1.0	A52883	2.0
				Average	(0) 3.0	-	6.2	-	-	12	3.5		2.3
Do.	No. 4	Carbonado	do.	38816	11	15	17	20	22	24	3.5	A51193	2.4
Do.	do.	do.	do.	38817	2.4	5.5	7.4	9.5	11	12	3.0	A51192	2.1
Do.	do.	do.	do.	38818)[4]	6.4	11	13	15	16	17	1.5	A51191	2.7
Do.	do.	do.	do.	38819)[4]	2.4	3.9	4.6	5.5	6.6	7.4	2.6	A51191	2.7
Do.	do.	do.	do.	39151)	12	17	22	24	26	28	6.7	- - -	- -
Do.	do.	do.	do.	39152)	9.2	13	17	22	26	28	8.3	- - -	- -
Do.	do.	do.	do.	39153)[4]	7.2	11	14	18	20	22	4.7	- - -	- -
Do.	do.	do.	do.	39154)	8.7	13	15	18	21	22	6.7	- - -	- -
Do.	do.	do.	do.	39155)	7.7	10	13	18	21	22	9.4	- - -	- -
				Average	(2.8) 6.7	-	12	-	-	18	3.9		2.4
Do.	do.	Fairfax	Semi-bit.	39109)[4]	1.3	3.8	5.4	6.4	7.4	8.4	2.0	A56656	2.0
Do.	do.	do.	do.	39110)[4]	2.5	5.3	6.2	7.4	8.2	9.0	2.0	A56656	2.0
				Average	(0) 1.9	-	5.8	-	-	8.7	2.0		2.0
Do.	do.	Prospect	Subbit.	39094)[4]	0.9	1.5	2.5	3.1	4.0	4.3	0.9	A56769	4.7
Do.	do.	do.	do.	39095)[4]	3.7	5.2	6.3	7.1	7.9	8.5	0.5	A56769	4.7
				Average	(1.6) 2.3	-	4.4	-	-	6.4	0.7		4.7
Do.	do.	Wilkeson	Bit.	38917)[4]	2.2	2.8	3.3	3.7	4.0	4.2	1.2	A52699	2.8
Do.	do.	do.	do.	38901)[4]	2.3	3.0	3.5	4.0	4.3	4.6	1.8	A52699	2.8
Do.	do.	do.	do.	38902	3.8	7.3	8.6	9.6	9.9	10	0.7	A52701	3.7
Do.	do.	do.	do.	38903	1.1	3.2	5.4	7.8	8.7	9.2	0.9	A52700	3.5
				Average	(0.8) 2.4	-	5.8	-	-	7.9	1.6		3.3
Do.	No. 5	Fairfax	Semi-bit.	39105)[4]	7.1	9.6	12	14	15	17	5.7	A56652	2.9
Do.	do.	do.	do.	39106)[4]	5.9	8.7	13	15	17	19	6.0	A56652	2.9
Do.	do.	do.	do.	39107)[4]	4.9	9.7	14	17	21	23	6.1	A56653	3.4
Do.	do.	do.	do.	39108)[4]	4.1	10	12	14	17	21	5.3	A56653	3.4
				Average	(0) 5.5	-	13	-	-	20	5.8		3.2

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
Pierce	No. 7	Wilkeson	Bit.	38904	2.5	6.8	14	19	20	20	1.8	A52705	3.0
Do.	do.	do.	do.	38905	5.7	9.6	18	22	24	26	2.4	A52704	1.4
Do.	do.	do.	do.	38906	4.3	6.7	11	16	17	18	1.5	A52703	2.0
Do.	do.	do.	do.	38907	11	15	17	19	20	21	4.5	A52875	1.9
				Average	(3.3) 5.9	-	15	-	-	21	2.6		2.1
Do.	No. 8	Carbonado	do.	38820	6.4	9.7	11	12	14	15	2.1	A51197	3.1
Do.	do.	do.	do.	38821	6.5	9.2	12	15	16	17	3.1	A51196	3.3
Do.	do.	do.	do.	38822	11	15	19	22	24	26	8.6	A51195	3.0
Do.	do.	do.	do.	39146)	4.4	6.2	8.2	9.4	11	13	4.8	- - -	- -
Do.	do.	do.	do.	39147)	3.3	5.9	7.6	11	14	16	5.5	- - -	- -
Do.	do.	do.	do.	39148)[4]	5.3	7.6	9.9	11	12	14	4.9	- - -	- -
Do.	do.	do.	do.	39149)	4.8	7.7	9.1	11	12	13	7.8	- - -	- -
Do.	do.	do.	do.	39150)	4.8	6.9	8.2	9.5	11	12	6.1	- - -	- -
				Average	(1.3) 7.1	-	13	-	-	18	5.8		3.1
Do.	No. 10	Black Carbon	Subbit.	39118)[4]	0.9	1.9	2.5	2.8	3.7	4.0	0.3	A56770	4.5
Do.	do.	do.	do.	39119)[4]	1.6	3.1	3.7	4.4	4.9	5.4	0.7	A56770	4.5
				Average	(0.8) 1.3	-	3.1	-	-	4.7	0.5		4.5
Do.	Crocker	Crocker	do.	39096)	20	23	30	42	54	64	0.2	A56771	12.4
Do.	do.	do.	do.	39097)[4]	17	26	36	47	67	72	0.3	A56771	12.4
Do.	do.	do.	do.	39098)[4]	19	27	37	50	62	68	0.2	A56771	12.4
Do.	do.	do.	do.	39099)	15	19	27	40	50	57	0.2	A56771	12.4
				Average	(18) 18	-	33	-	-	65	0.2		12.4
Thurston	Bagley	Bucoda 1	do.	38985	53	65	72	77	79	81	0.3	A54770	22.9
Do.	do.	do.	do.	38986	52	67	74	81	85	87	0.2	A54769	21.7
Do.	do.	do.	do.	38989	45	58	68	74	78	81	0.5	A54768	21.7
				Average	(50) 50	-	71	-	-	83	0.3		22.1
Do.	(Lower Bench) Bagley	Bucoda 1	do.	38987	(34) 34	49	61	66	70	73	0.1	A54773	21.7
Do.	(Upper Bench) Bagley	Bucoda 1	do.	38988	(46) 46	65	77	80	81	83	0.3	A54772	25.0
Do.	Black Bear	Pleasant Hill	do.	39062)	38	52	75	80	83	88	0.7	A56242	17.9
Do.	do.	do.	do.	39063)[4]	41	59	79	86	88	--	0.4	A56242	17.9
Do.	do.	do.	do.	39064)[4]	43	58	78	82	86	--	0.9	A56242	17.9
Do.	do.	do.	do.	39065)	32	50	72	79	83	86	0.7	A56242	17.9
				Average	(38) 39	-	76	-	-	87	0.7		17.9

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number						Blank sieving, per cent	Typical bed sample	
County	Bed	Mine			1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WASHINGTON (Continued)												
Thurston	Tono 1	Tono 1	Subbit.	38998	42	55	64	72	76	81	0.2	A55112	21.4
Do.	do.	do.	do.	38999	47	65	69	73	77	80	0.3	A55113	21.4
Do.	do.	do.	do.	39000	56	72	79	85	87	90	0.5	A55114	22.2
Do.	do.	do.	do.	39001	70	83	91	96	97	98	0.6	A55115	22.7
Do.	do.	do.	do.	39002)[4]	57	69	75	80	84	86	0.5	A55116	22.5
Do.	do.	do.	do.	39025)[4]	44	57	64	68	74	78	0.5	A55116	22.5
				Average	(53) 53	-	75	-	-	86	0.4		22.0
Whatcom	Bellingham 1	Bellingham	do.	38972	0.7	1.8	2.5	3.3	5.3	6.8	0.1	A54527	6.9
Do.	do.	do.	do.	38973	1.0	2.0	4.1	5.0	8.8	11	0.1	A54527	6.9
Do.	do.	do.	do.	38974	1.2	1.9	3.0	5.6	7.5	8.6	0.1	A54527	6.9
Do.	do.	do.	do.	38975	0.7	1.5	2.3	4.4	6.1	7.9	0.1	A54527	6.9
Do.	do.	do.	do.	38976	1.6	2.9	6.0	7.8	10	11	0.1	A54527	6.9
				Average	(0.9) 1.0	-	3.6	-	-	9.1	0.1		6.9

See page 9 for footnotes.

Table 1.- Results of accelerated slacking tests - Continued

Source of coal			Rank of coal[1]	Laboratory number	Slacking indices, cumulative per cent through ¼-inch square mesh sieve cycle number							Blank sieving, per cent	Typical bed sample	
County	Bed	Mine				1[2]	2	3	4	5	6		Laboratory number	Total moisture
	WYOMING													
Campbell	Roland	Wyodak	Subbit.	38518		61	76	86	88	95	98	(3)	A34350	31.5
Do.	do.	do.	do.	38521		62	78	85	89	97	100	(3)	A34351	31.1
Do.	do.	do.	do.	38522		73	87	96	100	--	--	(3)	A34349	29.6
				Average		65	--	89	-	-	99	(3)		30.7
Carbon	No. 2	Hanna 4	Bit.	39391		6.9	13	19	25	29	34	1.5	A62405	11.8
Do.	do.	do.	do.	39392		4.6	8.7	13	17	22	26	1.3	A62406	11.4
Do.	do.	do.	do.	39393		5.0	7.7	11	14	15	17	0.9	A62407	9.9
Do.	do.	do.	do.	39394		4.8	7.4	11	13	16	17	1.1	A62408	9.7
Do.	do.	do.	do.	39395		6.5	9.4	14	18	23	26	1.0	A62409	8.4
				Average	(4.2)	5.6	-	14	-	-	24	1.4		10.2
Hot Springs	Gebo	Owl Creek	Subbit.	39091	(7.0)	7.7	16	22	29	34	38	0.7	A56568	13.7
Park	- -	Fred Biesemeier	do.	38811	(3.7)	4.4	15	22	27	32	38	0.7	A42291	13.3
Sheridan	Monarch	Hotchkiss	do.	39003	(63)	63	79	87	92	94	96	0.5	A55108	23.0
Do.	(Lower Bench) Monarch	do.	do.	38525		84	90	100	--	--	--	(3)	A34352	22.2
Sweetwater	No. 1	Rock Springs 4	Bit.	39380		3.6	5.4	8.1	12	14	17	0.9	A62225	10.8
Do.	do.	do.	do.	39381		2.6	4.0	6.0	8.5	11	14	0.8	A62226	10.0
Do.	do.	do.	do.	39382		4.9	7.7	12	15	20	24	0.9	A62227	11.2
Do.	do.	do.	do.	39383		2.5	6.8	10	16	21	27	0.8	A62224	11.0
Do.	do.	do.	do.	39384		3.3	6.9	10	14	18	21	0.7	A62228	11.5
				Average	(2.6)	3.4	-	9.0	-	-	21	0.8		10.9
Do.	No. 3	Winton 3	do.	39385		11	21	33	42	51	63	1.0	A62222	17.2
Do.	do.	do.	do.	39386		15	26	40	53	62	65	0.6	A62221	18.1
Do.	do.	do.	do.	39387		8.9	16	24	32	39	43	1.0	A62220	16.8
Do.	do.	do.	do.	39388		12	18	25	33	39	43	1.4	A62218	16.7
Do.	do.	do.	do.	39389		8.5	16	22	31	39	44	0.7	A62219	16.2
				Average	(10)	11	-	29	-	-	52	0.9		16.8

See page 9 for footnotes.

Table 2.- Check determinations on individual samples obtained from same gross sample

Source of coal			Laboratory numbers of individual samples	Slacking indices, cycle number			Average deviation of individual slacking indices from mean,[1] cycle number					
County	Bed	Mine		1	3	6	1		3		6	
King	Big Bed	Kangley	39125	0.7	2.2	4.1						
			39126	1.2	3.2	6.0						
			39127	0.9	2.6	4.4						
			39128	0.8	2.2	4.8						
			Average	0.9	2.6	4.8	0.15	(16.7)	0.35	(13.5)	0.53	(11.0)
Do.	Morris	Morris	39080	3.5	7.8	11						
			39081	2.6	6.7	10						
			Average	3.1	7.3	11	0.45	(14.5)	0.55	(7.5)	0.5	(4.5)
Do.	do.	do.	39082	1.4	3.3	5.6						
			39083	1.7	4.4	7.3						
			Average	1.6	3.9	6.5	0.15	(9.4)	0.55	(14.0)	0.85	(13.0)
Do.	Newham	Diamond	39137	8.9	32	66						
			39138	11.0	35	64						
			39139	9.2	35	67						
			39140	10.0	36	70						
			Average	9.8	35	67	0.73	(7.4)	1.0	(2.9)	1.8	(2.7)
Do.	No. 2	Cavanaugh	39133	9.2	14	21						
			39134	7.2	14	21						
			39135	4.2	11	18						
			39136	9.2	17	27						
			Average	7.5	14	22	1.25	(16.7)	1.5	(10.7)	2.7	(12.3)
Do.	(Middle Bench) No. 3	Occidental	39084	3.3	6.1	7.7						
			39085	3.1	6.5	8.0						
			Average	3.2	6.3	7.9	0.10	(3.1)	0.20	(3.2)	0.15	(1.9)
Do.	do.	do.	39086	1.2	3.7	6.3						
			39087	2.1	4.1	6.6						
			Average	1.7	3.9	6.5	0.45	(26.5)	0.20	(5.1)	0.15	(2.3)
Do.	(Top Bench) No. 3	do.	39089	3.2	9.0	13						
			39090	4.0	7.3	12						
			Average	3.6	7.7	13	0.40	(11.1)	0.85	(11.0)	1.0	(7.7)

1/ Deviations expressed as percentages of slacking indices are shown in parenthesis.

Table 2.- Check determinations on individual samples obtained from same gross sample - Continued

Source of coal			Laboratory numbers of individual samples	Slacking indices, cycle number			Average deviation of individual slacking indices from mean,[1] cycle number					
County	Bed	Mine		1	3	6	1		3		6	
King	Reynolds	Reynolds	39129	28	64	85						
			39130	22	63	86						
			39131	24	60	84						
			39132	30	69	88						
			Average	26	64	86	3.0	(11.5)	2.5	(3.9)	1.3	(1.5)
Kittitas	Roslyn	North Western Improvement 3'	39164	0.8	3.7	6.6						
			39165	1.1	3.8	6.8						
			39166	2.1	3.9	8.5						
			39167	1.1	3.2	6.3						
			Average	1.3	3.7	7.1	0.43	(33.1)	0.20	(5.4)	0.75	(10.6)
Lewis	No. 3	Crystal 1	39076	1.4	2.3	3.9						
			39077	1.8	2.6	3.9						
			39078	1.3	2.2	3.6						
			39079	1.3	2.6	4.1						
			Average	1.5	2.4	3.9	0.20	(13.3)	0.18	(7.5)	0.13	(3.3)
Pierce	Morgan	Carbonado	39156	3.9	7.6	14						
			39157	6.2	11	15						
			39158	6.1	12	17						
			39159	3.2	8.1	15						
			39160	4.2	10	16						
			Average	4.7	9.7	15	1.2	(25.6)	1.5	(15.5)	0.8	(5.3)
Do.	No. 2	Fairfax	39113	12	22	30						
			39114	9.1	18	25						
			Average	11	20	28	1.5	(13.6)	2.0	(10.0)	2.5	(8.9)
Do.	do.	do.	39116	5.2	12	16						
			39117	4.0	11	16						
			Average	4.4	12	16	0.6	(13.6)	0.5	(4.2)	0.0	0
Do.	No. 4	Carbonado	39151	12	22	28						
			39152	9.2	17	28						
			39153	7.2	14	22						
			39154	8.7	15	22						
			39155	7.7	13	22						
			Average	8.6	16	24	1.3	(15.1)	2.6	(16.3)	2.8	(11.7)

1/ Deviations expressed as percentages of slacking indices are shown in parenthesis.

Table 2.- Check determinations on individual samples obtained from same gross sample - Continued

Source of coal			Laboratory numbers of individual samples	Slacking indices, cycle number			Average deviation of individual slacking indices from mean,[1] cycle number					
County	Bed	Mine		1	3	6	1		3		6	
Pierce	No. 4	Fairfax	39109	1.3	5.4	8.4						
			39110	2.5	6.2	9.6						
			Average	1.9	5.8	9.0	0.60	(31.6)	0.40	(6.9)	0.60	(6.7)
Do.	No. 5	do.	39105	7.1	12	17						
			39106	5.9	13	19						
			Average	6.5	13	18	0.6	(9.2)	0.5	(3.8)	1.0	(5.5)
Do.	do.	do.	39107	4.9	14	23						
			39108	4.1	12	21						
			Average	4.5	13	22	0.40	(8.9)	1.0	(7.7)	1.0	(4.5)
Do.	No. 8	Carbonado	39146	4.4	8.2	13						
			39147	3.3	7.6	16						
			39148	5.3	9.9	14						
			39149	4.8	9.1	13						
			39150	4.8	8.2	12						
			Average	4.5	8.6	14	0.54	(12.0)	0.72	(8.4)	1.2	(8.6)
Do.	No. 10	Black Carbon	39118	0.9	2.5	4.0						
			39119	1.6	3.7	5.4						
			Average	1.3	3.1	4.7	0.35	(26.9)	0.60	(19.4)	0.70	(14.9)
			Grand average of deviation from mean				.72		.90		1.02	
			Grand average of per cent error					(15.6)		(8.8)		(6.8)

1/ Deviations expressed as percentages of slacking indices are shown in parenthesis.