Sand	$\frac{G-1}{1+e}=b$	d CM.	k CM$\times10^{-3}$ SEC^{-1}	μ Poise $\times10^{-3}$	$\pi_1 = \frac{b.\gamma_w dk}{\mu}$	$k^2 \times 10^{-6}$	i	$\pi_2 = \frac{d.i}{b.k^2}$ $\times10^{-6}$
Artificial Sand No. 1	1.101	0.0307	3.49	12.1	.00976	12.2	14.1	.0322
	1.107		3.64	11.6	.0107	13.2	14.2	.0299
			3.74	11.8	.0108	14.0		.0282
			3.84	11.8	.0111	14.7		.0268
			3.92	11.8	.0113	15.3		.0258
			3.93	11.7	.0114	15.4		.0256
			4.04	11.8	.0116	16.3		.0242
			4.02	11.7	.0117	16.1		.0245
			4.05	11.7	.0118	16.4		.0240
			4.05	11.7	.0118	16.4		.0240
			4.03	11.6	.0117	16.2		.0243
			4.05	11.6	.0118	16.4		.0240
			3.95	11.6	.0115	15.6		.0253
			3.89	11.6	.0113	15.1		.0261

VALUES OF THE CONSTANT "n'" IN THE GENERAL RELATIONSHIP FOR THE FLOW OF WATER THROUGH SOILS

$$\text{viz: } \pi_1 = a\pi_2^{-(n'+p)}$$

Sand	Value of n'	n'-$\bar{n}$'	(n'-$\bar{n}$')^2
Crusher Sand 'A'	0.555	0.029	0.00084
E.R.P.M. Ash	0.505	-0.021	0.00044
E.R.P.M. Dump Sand	0.566	0.040	0.00160
Artificial Sand No. 1	0.430	-0.096	0.00918
Crusher Sand 'B'	0.577	0.051	0.00259
	2.633		0.01465

$\bar{n}' = \frac{2.633}{5} = 0.526$ $\qquad$ $\hat{\sigma}_{n'}^2 = \frac{0.01465}{4} = 0.00366$

n' lies between $\bar{n}' \pm t_{(.95,\,4)}\,\hat{\sigma}_{n'}/\sqrt{5}$ with 95% confidence

n' lies between $0.526 \pm \frac{2.78 \times 0.0606}{2.24}$

n' lies between 0.526 ± 0.075 with 95% confidence

SPECIFIC SURFACE AREA - AREA UNDER GRADING CURVE CORRELATION

Sand	x_1 MM.	x_2 MM.	C %	m+1	m
E.R.P.M. Ash	0.080	5.00	7.5	4.04	3.04
Crusher Sand 'A'	0.30	1.60	3.8	1.58	0.58
E.R.P.M. Dump Sand	0.033	0.170	0.43	0.639	-0.361
Bartlett's Pit Sand	0.050	0.600	9.4	1.86	0.86
Cullinan Sand	0.130	0.500	0.55	0.870	-0.130
Van Ryn Sand	0.084	1.300	0.31	0.926	-0.074
Decomposed Sandstone	0.300	5.00	11.2	3.14	2.14
Witbank Sand	0.070	0.300	0.86	0.781	-0.219
Witdeep Crusher Sand	0.150	2.00	5.8	2.31	1.31

$\frac{6(m+1)}{\rho m}$ a	x_2^m	x_1^m	$x_2^m - x_1^m$ b	x_2^{m+1}	x_1^{m+1}	$x_2^{m+1} - x_1^{m+1}$ c	$\frac{b}{c}$	$a.\frac{b}{c}$ $S_{x_1x_2}$ MM^2/GM	Area Under Grading Curve x_1 to x_2 CM^2
3,190	133	.00056	133	670	-	670	0.199	633	38.9
6,080	1.313	0.498	0.815	2.101	0.149	1.952	0.417	2,540	29.6
-3,950	1.896	3.43	-1.53	0.322	0.113	0.209	-7.32	28,900	5.9
4,920	0.644	0.076	0.568	0.413	0.0038	0.419	1.355	6,660	28.2
-15,160	1.094	1.304	-0.210	0.547	0.169	0.378	-0.555	8,420	8.1
-29,410	0.981	1.201	-0.220	1.275	0.106	1.169	-0.188	5,540	8.7
3,300	31.4	0.0761	31.3	157	0.0212	157	0.1994	668	38.3
-8,170	1.301	1.791	-0.490	0.390	0.125	0.265	-1.850	15,110	12.1
3,940	2.479	0.0834	2.396	4.95	0.0125	4.94	0.485	1,911	21.7

Calculation of Correlation Coefficient and Line of Best Fit

(i) $S_{x_1x_2}$

$S_{x_1x_2}$ CM^2/GM	$Log_{10} S_{x_1x_2}$ s	$s-\bar{s}$	$(s-\bar{s})^2$
6.33	0.801	-0.804	0.641
25.40	1.405	-0.200	0.040
289.0	2.461	0.856	0.729
66.60	1.820	0.215	0.046
84.20	1.926	0.321	0.102
55.40	1.743	0.138	0.019
6.68	0.825	-0.780	0.620
151.10	2.180	0.575	0.329
19.11	1.282	-0.323	0.104
	14.443		2.630

$\bar{s} = \dfrac{14.443}{9}$

$\bar{s} = 1.605$

$S_s^2 = \dfrac{2.630}{8}$

$S_s^2 = 0.329$

$S_s = 0.574$

(ii) $A_{x_1x_2}$

$A_{x_1x_2}$ CM^2	$Log_{10} A_{x_1x_2}$ a	$a-\bar{a}$	$(a-\bar{a})^2$	$(a-\bar{a})(s-\bar{s})$
38.9	1.590	0.353	0.124	-0.284
29.6	1.471	0.234	0.055	-0.047
5.9	0.[illegible]	-0.466	0.216	-0.400
28.2	1.450	0.213	0.045	+0.046
8.1	0.909	-0.328	0.107	-0.105
8.7	0.940	-0.297	0.088	-0.041
38.3	1.583	0.346	0.119	-0.270
12.1	1.083	-0.154	0.024	-0.089
21.7	1.336	0.099	0.010	-0.032
	11.133		0.788	-1.222

$\bar{a} = \dfrac{11.133}{9}$

$\bar{a} = 1.237$

$S_a^2 = \dfrac{0.788}{8}$

$S_a^2 = 0.0985$

$S_a = 0.314$

$S_{ab} = \dfrac{-1.222}{8}$

$S_{ab} = -0.153$

Correlation Coefficient: $r_{as} = \dfrac{S_{as}}{S_a . S_s} = \dfrac{-0.153}{0.574 \times 0.314}$

$r_{as} = -0.850$

Line of Best Fit: $c = \dfrac{-1.222}{2.630} = -0.465 \quad d = 1.24$

Line of Best Fit: $a = -0.465(s - 1.61) + 1.24$

$a = -0.465s + 1.99$

$Log_{10} A = -0.465 \; Log_{10} S + 1.99$

$$A = 98S^{-0.465}$$

Calculation of Correlation Coefficient and Line of Best Fit

(i) $S_{x_1x_2}$

$S_{x_1x_2}$ CM^2/GM	$Log_{10} S_{x_1x_2}$ s	$s-\bar{s}$	$(s-\bar{s})^2$
6.33	0.801	-0.804	0.641
25.40	1.405	-0.200	0.040
289.0	2.461	0.856	0.729
66.60	1.820	0.215	0.046
84.20	1.926	0.321	0.102
55.40	1.743	0.138	0.019
6.68	0.825	-0.780	0.620
151.10	2.180	0.575	0.329
19.11	1.282	-0.323	0.10[illegible]
	14.443		2.630

$\bar{s} = \frac{14.443}{9}$

$\bar{s} = 1.605$

$S_s^2 = \frac{2.630}{8}$

$S_s^2 = 0.329$

$S_s = 0.574$

(ii) $A_{x_1x_2}$

$A_{x_1x_2}$ CM^2	$Log_{10} A_{x_1x_2}$ a	$a-\bar{a}$	$(a-\bar{a})^2$	$(a-\bar{a})(s-\bar{s})$
38.9	1.590	0.353	0.124	-0.284
29.6	1.471	0.234	0.055	-0.047
5.9	0.771	-0.466	0.216	-0.400
28.2	1.450	0.213	0.045	+0.046
8.1	0.909	-0.328	0.107	-0.105
8.7	0.940	-0.297	0.088	-0.041
38.3	1.583	0.346	0.119	-0.270
12.1	1.083	-0.154	0.024	-0.089
21.7	1.336	0.099	0.010	-0.032
	11.133		0.788	-1.222

$\bar{a} = \frac{11.133}{9}$

$\bar{a} = 1.237$

$S_a^2 = \frac{0.788}{8}$

$S_a^2 = 0.0985$

$S_a = 0.314$

$S_{ab} = \frac{-1.222}{8}$

$S_{ab} = -0.153$

Correlation Coefficient: $r_{as} = \frac{S_{as}}{S_a . S_s} = \frac{-0.153}{0.574 \times 0.314}$

$$r_{as} = -0.850$$

Line of Best Fit: $c = \frac{-1.222}{2.630} = -0.465 \quad d = 1.24$

Line of Best Fit: $a = -0.465(s - 1.61) + 1.24$

$$a = -0.465 s + 1.99$$

$$Log_{10} A = -0.465 \ Log_{10} S + 1.99$$

$$A = 98 S^{-0.465}$$

PARTICLE MIGRATION REPRESENTED BY CHANGES IN SPECIFIC SURFACE AREA

INITIAL				FINAL					
$i^{1/3}$	$q^{2/3}$	$\left(\frac{1+e}{G-1}\right)^{4/3}$	σ_i	$i^{1/3}$	$q^{2/3}$	$\left(\frac{1+e}{G-1}\right)^{4/3}$	σ_f	$\sigma_i-\sigma_f$	$\frac{L}{CM^2}$
2.420	3.91	3.22	1.994	2.433	3.43	3.40	2.412	-0.418	-12.2
2.412	3.19	1.081	0.818	2.412	4.40	1.081	0.592	0.226	+3.2
2.409	2.29	1.161	1.227	2.423	2.62	1.155	1.067	0.160	+2.2
2.412	1.99	1.365	1.655	2.519	1.37	1.148	2.110	-0.455	-6.5
2.912	4.17	1.096	0.765	2.934	4.92	1.057	0.629	0.136	+2.1
2.918	4.97	1.186	0.696	2.918	4.77	1.199	0.733	0.037	+0.1
2.441	1.82	1.177	1.579	2.519	1.71	1.042	1.534	0.045	+1.7
2.500	1.72	1.196	1.739	2.556	1.89	1.097	1.484	0.255	+1.0
2.427	1.01	0.983	2.361	2.453	0.881	0.937	2.610	-0.249	-7.8

Calculation of Correlation Coefficient and Line of Best Fit

(i) $\sigma = \sigma_i - \sigma_f$

σ	$\log_{10}\sigma$ a	$a-\bar{a}$	$(a-\bar{a})^2$
0.418	-0.379	+0.400	0.160
0.226	-0.646	+0.134	0.018
0.160	-0.796	-0.017	0.000
0.455	-0.342	+0.437	0.191
0.136	-0.866	-0.087	0.008
0.037	-1.432	-0.653	0.425
0.045	-1.347	-0.568	0.321
0.255	-0.594	+0.185	0.034
0.249	-0.604	+0.175	0.031
	-7.006		1.188

$$\bar{a} = \frac{-7.006}{9} = -0.779$$

$$S_a^2 = \frac{1.188}{8} = 0.148 \qquad S_a = 0.386$$

(ii) L:

L	Log_{10} L b	b-$\bar{b}$	$(b-\bar{b})^2$	$(b-\bar{b})(a-\bar{a})$
12.2	1.086	0.732	0.534	0.293
3.2	0.505	0.151	0.023	0.020
2.2	0.342	-0.012	0.000	0.000
6.5	0.813	0.459	0.210	0.200
2.1	0.322	-0.032	0.001	0.002
0.1	-1.000	-1.354	1.838	0.885
1.7	0.230	-0.124	0.015	0.071
1.0	0.000	-0.354	0.125	-0.066
7.8	0.892	0.538	0.289	0.094
	3.190		3.035	1.499

$$\bar{b} = \frac{3.190}{9} = 0{,}354 \qquad S_{a,b} = \frac{1.499}{8} = 0.187$$

$$S_b^2 = \frac{3.035}{8} = 0.379 \qquad S_b = 0.618$$

Correlation Coefficient: $$r_{a,b} = \frac{S_{ab}}{S_a \cdot S_b} = \frac{0.187}{0.618 \times 0.386}$$

$$r_{a,b} = 0.785$$

Line of Best Fit:

$$c = \frac{1.499}{1.188} = 1.26$$

$$d = 0.354$$

Line of Best Fit:

$$b = 1.26\ (a + 0.779) + 0.354$$

$$b = 1.26a + 1.337$$

$$\text{Log}_{10}\ L = 1.26\ \text{Log}_{10}\ (\sigma_i' - \sigma_f') + 1.337$$

$$L = 21.8\ (\sigma_i' - \sigma_f')^{1.26}$$

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