Grain Size Scales and Conversion Tables

The grade scale most commonly used for sediments is the Wentworth (1922) scale which is a logarithmic scale in that each grade limit is twice as large as the next smaller grade limit. The scale starting at 1mm and changing by a fixed ratio of 2 was introduced by J. A. Udden (1898), who also named the sand grades we use today. However, Udden drew the gravel/sand boundary at 1mm and used different terms in the gravel and mud divisions. For more detailed work, sieves have been constructed at intervals $\sqrt[2]{2}$ and $\sqrt[4]{2}$. The ϕ (phi) scale, devised by Krumbein, is a much more convenient way of presenting data than if the values are expressed in millimeters, and is used almost entirely in recent work.

U. S. Standard Sieve Mesh #		Millimeters	Microns	Phi (ϕ)	Wentworth Size Class	
		(1 Kilometer)		-20		
		4096		-12		
		1024		-10	Boulder (-8 to -12ϕ)	GRAVEL
Use		256		-8		
wire		64		-6	Cobble (-6 to -8ϕ)	
squares		16		-4	Pebble (-2 to -6ϕ)	
5		4		-2		
6		3.36		-1.75		
7		2.83		-1.5	Granule	
8		2.38		-1.25		
10		2.00		-1.0		
12		1.68		-0.75		SAND
14		1.41		-0.5	Very coarse sand	
16		1.19		-0.25		
18		1.00		0.0		
20		0.84		0.25		
25		0.71		0.5	Coarse sand	
30		0.59		0.75		
35	1/2	0.50	500	1.0		
40		0.42	420	1.25		
45		0.35	350	1.5	Medium sand	
50		0.30	300	1.75		
60	1/4	0.25	250	2.0		
70		0.210	210	2.25		
80		0.177	177	2.5	Fine sand	
100		0.149	149	2.75		
120	1/8	0.125	125	3.0		
140		0.105	105	3.25		
170		0.088	88	3.5	Very fine sand	
200		0.074	74	3.75		
230	1/16	0.0625	62.5	4.0		MUD
270		0.053	53	4.25		
325		0.044	44	4.5	Coarse silt	
		0.037	37	4.75		
	1/32	0.031	31	5.0		
Analyzed	1/64	0.0156	15.6	6.0	Medium silt	
	1/128	0.0078	7.8	7.0	Fine silt	
by	1/256	0.0039	3.9	8.0	Very fine silt	
		0.0020	2.0	9.0		
Pipette		0.00098	0.98	10.0	Clay (Some use 2ϕ or 9ϕ as the clay boundry)	
		0.00049	0.49	11.0		
or		0.00024	0.24	12.0		
		0.00012	0.12	13.0		
Hydrometer		0.00006	0.06	14.0		

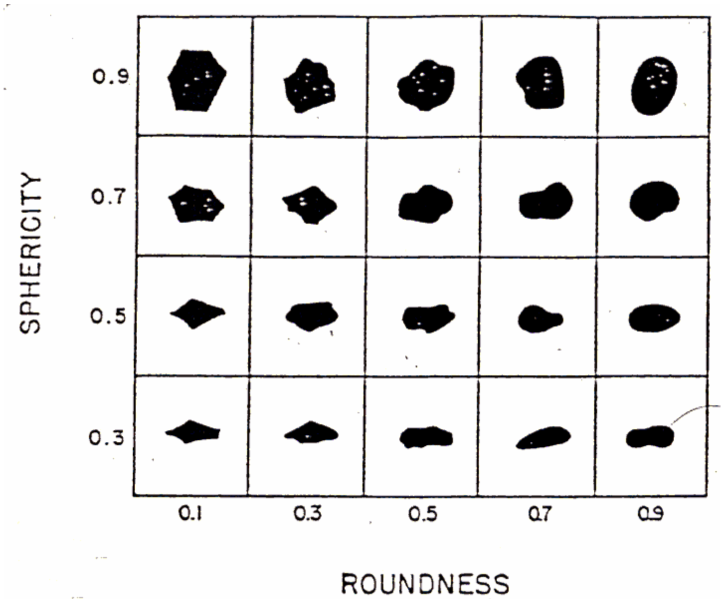

TABLE 1–2 COMMON GRAPHIC STATISTICAL CALCULATIONS USED IN GRAIN SIZE ANALYSIS

Statistic	Formula
Graphic mean	$M_z = \dfrac{ø_{16} + ø_{50} + ø_{84}}{3}$
Graphic standard deviation	$\Sigma_G = \dfrac{ø_{84} - ø_{16}}{2}$
Inclusive graphic standard deviation	$\Sigma_I = \dfrac{ø_{84} - ø_{16}}{4} + \dfrac{ø_{95} - ø_{5}}{6.6}$
Graphic skewness	$Sk_G = \dfrac{ø_{16} + ø_{84} - 2ø_{50}}{ø_{84} - ø_{16}}$
Inclusive graphic skewness	$Sk_I = \dfrac{ø_{16} + ø_{84} - 2ø_{50}}{2(ø_{84} - ø_{16})} + \dfrac{ø_{5} + ø_{95} - 2ø_{50}}{2(ø_{95} - ø_{5})}$
Graphic kurtosis	$K_G = \dfrac{ø_{95} - ø_{5}}{2.44(ø_{75} - ø_{25})}$

Source: After Folk, 1974, pp. 45–48.

Mean: $\bar{x}_\phi = \frac{\sum fm_\phi}{100}$

(f = frequency of sieve weight; m = mid-point of data, which is halfway between your sieve and the next larger one)

Standard Deviation: $\sigma_\phi = \sqrt{\frac{\sum f(m_\phi - \bar{x}_\phi)^2}{100}}$

Skewness: $Sk_\phi = \frac{\sum f(m_\phi - \bar{x}_\phi)^3}{100\sigma_\phi^{\ 3}}$

Mean Cubed Deviation: $\alpha_3\sigma^3 = \frac{\sum f(m_\phi - \bar{x}_\phi)^3}{100}$

Simple Sorting: $So_s = \frac{(\phi_{95} - \phi_5)}{2}$

Simple Skewness: $\alpha_s = (\phi_{95} + \phi_5) - 2(\phi_{50})$