

Normal variation of *compressive strength* and the *factor m* in Hoek-Brown failure criterion for some rocks (data from Hanssen, 1988; Hoek and Brown, 1980 and Hoek et al., 1992).

Rock name	Uniaxial compressive strength σ_c			Rating of the factor m_i ¹⁾	Rock name	Uniaxial compressive strength σ_c			Rating of the factor m_i ¹⁾
	low	average	high			low	average	high	
Sedimentary rocks		120'?		13	Metamorphic rocks	75	125	250	25 - 31
Anhydrite	16"	21"	26"	(8 - 21)	Amphibolite	95	160	230	31 ?
Coal	2'	5'	10'	4	Amphibolitic gneiss	95	160	230	33 ?
Claystone	70	85	100	(22)	Augen gneiss	35	70	105	
Conglomerate	3	10	18	7	Black shale	75	105	130	
Chalk	60'	100'	300'	10	Garnet mica schist	80	120	155	(19)
Dolomite					Granite gneiss				
	100	120	145	(18)		80'	150	280	
Greywacke	50*	100'	180*	9		80	130	185	33
Limestone	45	95	145		Granulite	65	105	140	30 ?
Mudstone	36"	95"	172"		Gneiss	65	75	85	(4 - 8)
Shale	75	120	160	19	Gneiss granite	120'	170*	280*	25 ?
Sandstone	10'	80'	180'	9	Greenschist				
Siltstone	3'	25'	150'	(15)	Greenstone				(19)
Tuff						60'	130'	230'	9
Igneous rocks	75'	140'	300'	19	Hornfels	55	80	100	30 ?
Andesite	40	125	210		Marble	45	85	125	25 ?
Anorthosite	100	165	355"	(17)	Mica gneiss	20	80*	170*	4 - 8
Basalt	227"	280"	319"	(19)	Mica quartzite				
Diabase (dolerite)	100	140	190	(28)	Mica schist				(30)
Diorite	190	240	285	27		65	90	120	(6)
Gabbro					Migmatite	21	50	80	(10)
	95	160	230	33	Mylonite	70	120	175	
Granite	75	105	135	(30)	Phyllite	75	145	245	24
Granodiorite	85	145	230	30 ?	Quartz sandstone				
Monzonite	125	165	200		Quartzite	45	100	155	
Nepheline syenite	290"	298"	326"	22		65	135	200	
Norite					Quartzitic phyllite	120'	190'	300'	9
	39	50	62		Serpentinite	45	65	90	(4 - 8)
Pegmatite			85'?	(16)	Slate				
Rhyolite	75	150	230	30 ?	Talc schist				
Syenite	80'	160	360						
Ultra basic rock									
Soil materials ²⁾ :									
Very soft clay $\sigma_c = 0.025\text{MPa}$ Soft clay $\sigma_c = 0.025 - 0.05\text{MPa}$ Firm clay $\sigma_c = 0.05-0.1\text{MPa}$									
Stiff clay $\sigma_c = 0.1 - 0.25\text{MPa}$ Very stiff clay $\sigma_c = 0.25 - 0.5\text{MPa}$ Hard clay $\sigma_c > 0.5\text{MPa}$									
Silt, sand $\sigma_c = 0.0001 - 0.001\text{MPa}$ (assumed)									
* Values found by the Technical University of Norway, (NTH) Inst. for rock mechanics.									
' Values given in Lama and Vutukuri (1978).									
" Values given by Bieniawski (1984).									
¹⁾ m_i is the parameter for intact rock in the Hoek-Brown failure criterion for rock masses by Hoek et al. (1998). Values in parenthesis have been estimated by Hoek et al (1992); values with question mark have been assumed									
²⁾ For clays the values of the uniaxial compressive strength is based on ISRM (1978), refer to Table 2.7.									