

## The Terzaghi rock mass classification (1946), with adjustments by Sinha (1989)

Rock class	Type of rock	Definition
I	Hard and intact	The rock is unweathered. It contains neither joints nor hair cracks. If fractured, it breaks across intact rock. The unconfined compressive strength is equal to more than 100MPa. At high stresses spontaneous and violent spalling of rock slabs may occur from sides or roof.
II	Hard stratified and schistose	The rock is hard and layered. The layers are usually widely separated. The rock may or may not have planes of weakness. In such rock, spalling is quite common.
III	Massive and moderately jointed	A jointed rock. The joints are widely spaced. The joints may or may not be cemented. It may also contain hair cracks but the huge blocks between the joints are intimately interlocked so that vertical walls do not require lateral support. Spalling may occur.
IV	Moderately blocky and seamy	Joints are less spaced. Block size is about 1m in size. The rock may or may not be hard. The joints may or may not be healed but the interlocking is so intimate that no side pressure is exerted or expected.
V	Very blocky and seamy	Closely spaced joints. Block size is less than 1m. It consists of almost chemically intact rock fragments, which are entirely separated from each other and imperfectly interlocked. Some side pressure of low magnitude is expected. Vertical walls may require support.
VI	Completely crushed but chemically intact	Comprises chemically intact rock having the character of a crusher run aggregate. There is no interlocking. Considerable side pressure is expected on tunnel supports. The block size could be few centimetres to 30cm.
VII	Squeezing rock - moderate depth	Squeezing is a mechanical process in which the rock advances into the tunnel opening without perceptible increase in volume. Moderate depth is a relative term and could be up to 150m to 1000m.
VIII	Squeezing rock - great depth	The depth may be more than 150m. The maximum recommended tunnel depth is 1000m (2000m in very good rocks)
IX	Swelling rock	Swelling is associated with volume change and is due to chemical change of the rock usually in presence of moisture or water. Some shales absorb moisture from the air and swell. Rocks containing swelling minerals such as montmorillonite, illite, kaolinite, and others can swell and exert heavy pressure on rock supports.