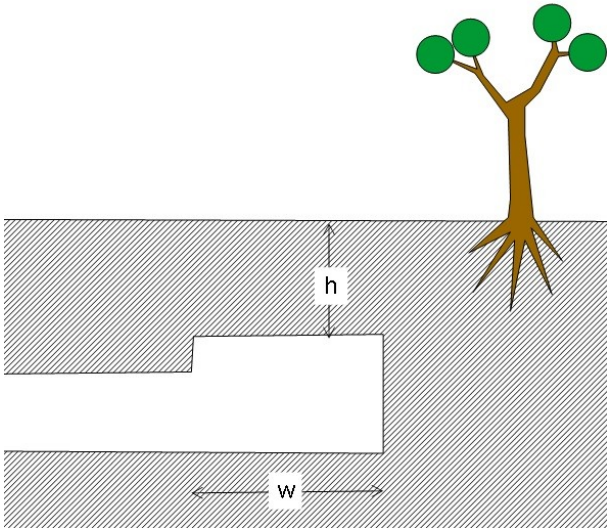


# Dungeon Design 101

Subsidence in Dungeons, Mines, and Caves  
by Sean R. Meaney

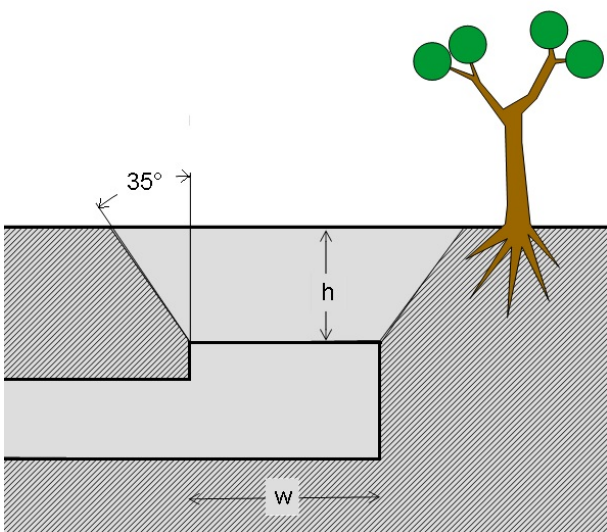
## A. Subsidence



Subsidence in a cave, dungeon, or mineworkings is determined by the ratio of the width of the cave to the thickness of the overlying strata.

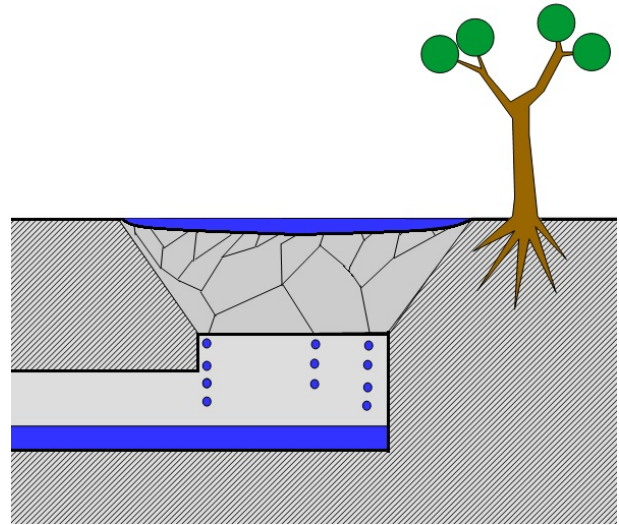
$$h/w = \%$$

Subsidence begins at 10% (0.1) where cracks in the sagging strata reach the surface and ends at 100% (1.0) where the strata fails.

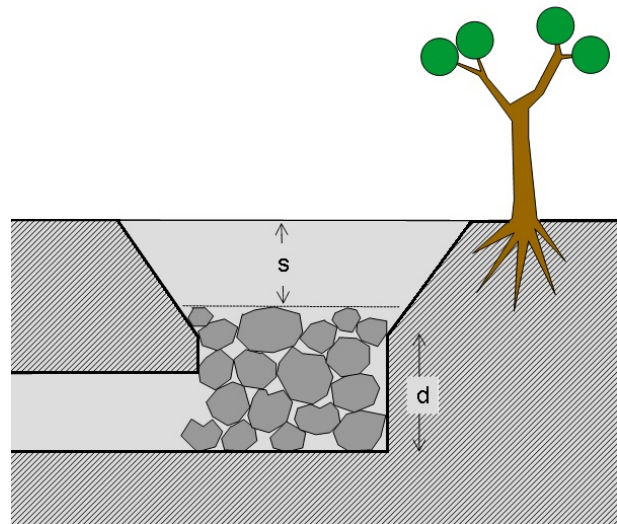


The subsidence footprint at the surface

exceeds the area of the cave, mine, or dungeon by an outward angle of 35° from vertical.



As the subsidence increases the size of the cracks in the strata increases until they are large enough to allow water to move downward through the cracks into the underlying cave, dungeon, or mine. This occurs at a subsidence of 85% (0.85). Downflows of 10-30 gallons per minute have been seen in Mines.



At a subsidence of 100% (1.0) the strata fails and falls in, breaking up. This means it fills a larger volume than it previously occupied. This is seen at the depth of subsidence as a ratio of cave height to surface depth.

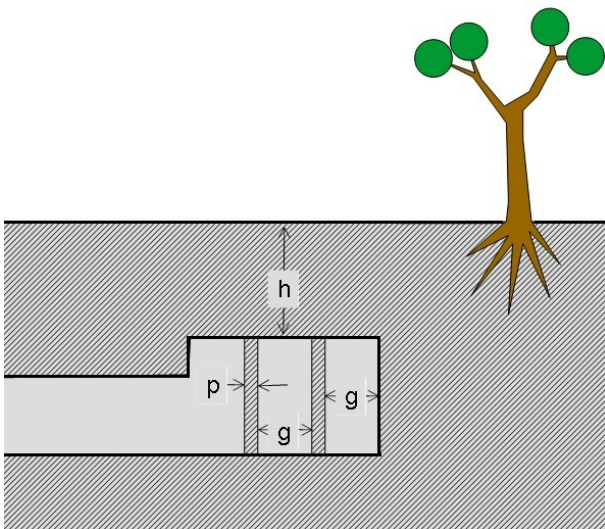
$$s = 0.8 \times d$$

Subsidence also changes over time. This varies with the rate at which excavation has occurred. This means that instantaneous extraction (see Disintegrate) results in instantaneous collapse.

Varying types of subsidence occur – from chimneying (where a shaft will form), a fissure, or a block slip where the overlying strata will retain a physical volume and drop as a single volume.

### B. Columns

The purpose of columns is to reduce the subsidence of a cave, mine, or dungeon by retaining insitue support structures.



The diameter of the column is determined by its relation to the thickness of the overlying strata.

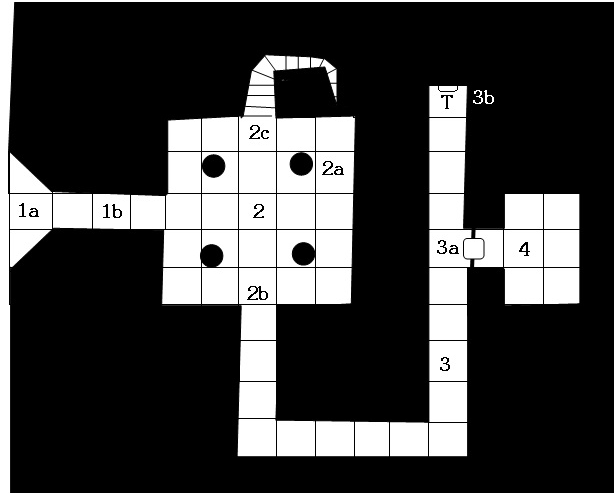
$$p = 0.12 \times h$$

The distance between the column and the wall or the distance between two columns is also related to the thickness of overlying strata.

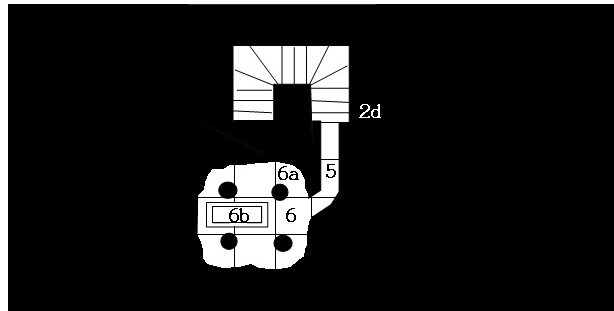
$$g = 0.6 \times h$$

The purpose of Insitu Columns is to reduce subsidence to 10%.

### Example: The Village Chief's Tomb



A small hill into which someone has carved a dungeon for the burial of the village chief. The entry (1a) is faced by a vertical cut of white stone into which a 5' wide, 7' high corridor (1b) is cut. It enters a large 25' x 25' chamber supported by stone pillars of the same rock as the hill. This is because the ceiling thickness is 15' thick at minimum which means that without the columns the 10' high ceiling would have subsided. The columns (2a) are 9' apart and about 2' in diameter (80hp each).



In the lower level the stairs having descended 12' you reach a 3' diameter crawlway (5) which provides access to the lower crypt (6). Because of the thin 8' thick ceiling the lower crypt is 4' to the ceiling supported by 1' diameter columns (20hp) that are 5' apart. In the floor of the tomb is a sunken coffin carved into the stone floor covered by a stone lid (50hp to access). The enraged spectre in the sarcophagus attacks the columns with its claws. Destroying the small columns will cause the ceiling, upper columns, and hill-top to subside.