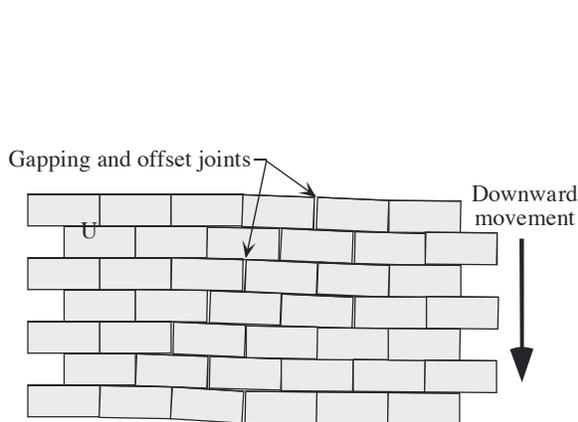




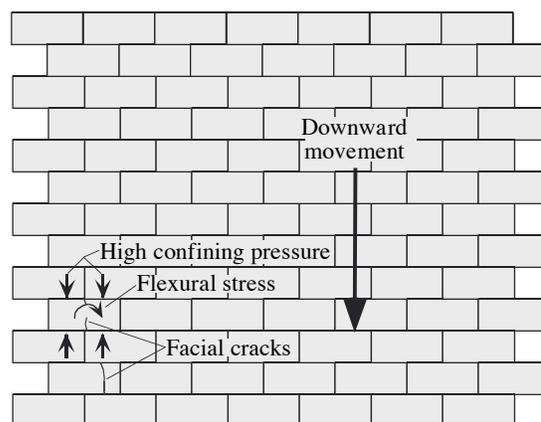
## Unit Cracking/Gapping - Settlement

Keystone modular retaining wall structures can tolerate a certain amount of settlement due to the flexible nature of the system and small individual unit size. Differential settlement limits of 1/100 or 1% and 1/200 or 1/2 % have been suggested by NCMA and FHWA respectively for modular block systems. These limits appear to be reasonable for most cases. When greater settlement is anticipated, ground improvement techniques are warranted and possibly the use of slip joints to increase the flexibility of the wall facing system and provide facial stress relief.

Observation of a number of completed structures that have undergone settlement indicates that the wall's tolerance for settlement without cracking is inversely proportional to the wall height. Lower height walls ( $H < 15'$ ) appear to have considerably more facial flexibility than taller walls ( $H > 15'$ ). This increased flexibility is due to lower confining forces and load transfer taking place on each block which permits small individual movements to occur accommodating the settlement experienced without facial distress. Taller walls place the lower wall units under considerable confining pressure, restricting unit movement and permitting shear and flexural stresses to build up to the point where a block cracks as a means of stress relief.



Low Wall Settlement



Tall Wall Settlement

Low wall settlement problems are typically observed in residential projects where soils adjacent to houses are uncompacted and the walls settle differentially over a short distance. Usually gapping or offset joints are visually noted and the settlement is obvious.

Tall wall settlement is not as obvious but occasional facial cracks can be observed in areas of flexural stress concentration, typically in small groupings in the bottom 1/3 of a tall wall. Settlement induced cracks are usually not structurally significant and just a means of facial stress relief for the unreinforced dry-stack facing system.

Cracked units can also be a symptom of other types of more serious problems so a review by a qualified engineer is always recommended.