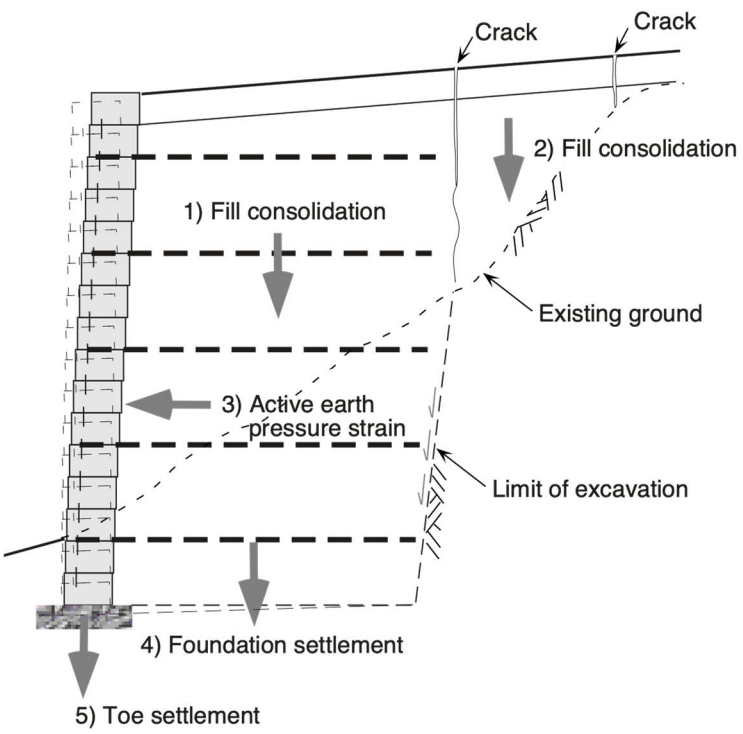
Backfill Movement and Soil Cracks

Keystone retaining walls are flexible reinforced soil masses which interact with the foundation and retained backfill zones to provide a stable retaining structure. These soil zones have different stress/strain/ consolidation properties which can result in differential movement and strain of the reinforced and retained soil matrix.

Relative movement of the soil masses is typically noted in taller wall structures when small soil cracks occur behind the wall structure near the boundary of soil zones with different strain properties. Experience has shown that this type of soil cracking is most noticeable after very heavy rainstorms where the additional saturated soil weight and seepage pressures involved can cause slight differential movement of the masses. A wall schematic and possible causes are shown below:



Typical Section

Possible Causes of Soil Cracking

1) Consolidation of reinforced zone backfill - Any settlement of reinforced fill relative to adjacent soils may cause cracking at end of reinforcement. If soils are placed and compacted in dry condition, water can cause secondary consolidation of the reinforced fill and cracking at the end of reinforced zone.

2) Consolidation of retained soil wedge - Similar to Item 1 causing cracking at back of fill wedge relative to existing soils.

3) Lateral wall movement due to active earth pressure state - Lessor quality backfill soils exhibit higher lateral movement to mobilize the active earth pressure state. If the reinforced wall mass strains laterally, the fill must settle accordingly and cracking can occur.

4) Foundation settlement - The foundation soils of many wall structures have not experienced the loading from the new fill which can cause differential settlement between the wall volume and cut slope soil.

5) Toe Settlement - The wall toe may experience more settlement than the wall heel due to lack of overburden or confining pressure resulting in slight lateral wall movement in the upper wall section and tension cracking at the end of reinforcement.

Soil cracks can also be a sign of global instability or continuing settlement which requires an evaluation by a geotechnical engineer. However, most minor soil cracking observed is structurally insignificant to the long term performance of the wall structure but can lead to reflective cracks in pavement sections and/or separation of curbs when of greater magnitude.

Significantly increasing the length of the upper reinforcement levels to help bridge the potential crack zones can be a prudent precaution for projects with flexible pavements extending over all zones. High quality backfill, proper backfill placement and compaction, and firm foundations are the best precautions against soil cracking.