

9.3.5 Settlements caused by underpinning and piling

9.3.5.1 The process of underpinning a wall inevitably leads to a degree of settlement of that wall. The amount of settlement depends on a wide variety of issues, such as ground conditions, the depth of underpinning, presence of ground water, the condition of the wall being underpinned, the extent of shoring provided and the quality of workmanship. Small uniform settlements of a building do not generally cause distress, but when differential settlement occurs, this may result in cracking.

9.3.5.2 If feasible, the whole structure should be underpinned. When this is not practical, transition pins can be provided to reduce the effect of a sudden change in founding level. However, this is not feasible where one owner is forming a basement next to an adjoining building with no basement. There will be steps in founding levels between adjacent walls of adjoining buildings. This can be significant for terraced or semi-detached houses founded on fill or in London Clay which exhibit a history of movement (see 9.2.5).

9.3.5.4 The process of installing a bored pile wall or a king post wall also causes a degree of settlement of adjacent structures, as the lateral support to the soils beside the piled wall is removed temporarily during its construction.

9.3.6 Ground heave caused by excavation within an underpinned perimeter

9.3.6.1 Following the installation of the underpinning either a "top-down" or "bottom up" method of construction is used for the basement excavation. (Fig 18)

9.3.6.2 A top-down construction forms the ground level slab first which provides lateral support to the top of the walls. It is then under-dug to form the basement. A bottom up construction adopts a system of temporary props while excavation is carried out and the new basement constructed in a conventional manner.

9.3.6.3 Either solution is acceptable and the choice is usually site specific. Most basements built in residential buildings are bottom up, unless they are unusually large or deep. Generally bottom up causes slightly greater ground movements to occur.

9.3.6.4 As the excavation progresses, the loading on the underlying soil reduces and it expands or heaves. Some of this happens immediately. In London Clay part of the heave can occur over many years. In sands and gravels there are no long term effects and the short term effects tend to be small. Clay underlying sand and gravel will heave even if it is below the level of the new basement floor.

9.3.6.5 The overall heave which can occur for a single level basement is generally not a significant issue but for two storey or deeper basements, ground heave needs to be carefully considered by the designers.