

Water Migration in Pavement Subgrade

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ABSTRACT

The development of residential subdivisions in the Southwestern United States is typically conducted in four basic stages: 1) overlot grading to establish the rough grades and elevations of the subdivision; 2) fine grading to establish individual lot elevations and street grades; 3) installation of utilities, streets, curb and gutter, and sidewalks; and 4) construction of residences and final grading of the individual lots. The time period from start to finish of a subdivision can range from several months to years before the site is completely built out.

Subsequent to installation of the curb and gutter and prior to completion of the home, lots are typically graded to drain toward the street and the soil on the lot is left low to accommodate installation of landscaping after the home is completed. Additionally, joint utilities such as electrical and telephone are installed just behind the curb and gutter or sidewalks. The backfill of joint trench utilities are often poorly compacted. During this time the site is exposed to precipitation in the form of rain and snow. Runoff and snow melt is directed toward the street and often ponds behind the curb and gutter or sidewalk and on top of the joint trench. This ponding provides a source of water that can travel along the interface between the concrete or pavement and the underlying subgrade. This ultimately results in elevated water contents in the pavement subgrade which can cause heave from soil expansion or frost, loss of subgrade support, and settlement of utility trench backfill.

This paper presents actual field data that shows that soil water contents are highest adjacent to the curb resulting in settlement of the trench backfill and heave of the pavement subgrade. Vadose/W modeling was also performed and the results indicate that current grading practices can have a detrimental effect on the ultimate performance of pavements by promoting early saturation of the subgrade materials and utility trench backfill.

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