

Discuss the effects of repeated applications of loads on pavements.
explain equivalent wheel load factors for load repetitions.

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Repeated applications of loads on pavements lead to pavement deterioration over time. The repeated application of heavy loads causes a permanent deformation in the pavement, which reduces its ability to bear future loads. The primary effects of repeated applications of loads on pavements include fatigue cracking, rutting, and permanent deformation.

Fatigue cracking is caused by repeated applications of heavy loads that create tensile stresses in the pavement surface, leading to surface cracking. Rutting is caused by repeated applications of loads that create shear stresses in the pavement surface, causing the surface to deform and develop depressions. Permanent deformation is caused by the repeated applications of loads that lead to a cumulative plastic deformation of the pavement structure, resulting in the development of ruts and depressions.

To account for the effects of repeated applications of loads,

equivalent wheel load factors are used in pavement design. The equivalent wheel load factor is the number of standard axles of a particular type that will have an equivalent damage effect on the pavement as one axle of the actual load. The equivalent wheel load factor is calculated based on load repetitions, which take into account the number of passes by a vehicle over a particular section of the pavement.

The most commonly used equivalent wheel load factors are the 18-kip single-axle load (ESAL) and the 80-kip tandem-axle load (EEAL). The ESAL is the number of 18-kip single-axle loads that will have an equivalent damage effect on the pavement as the actual load. The EEAL is the number of 80-kip tandem-axle loads that will have an equivalent damage effect on the pavement as the actual load.

In summary, repeated applications of loads on pavements cause pavement deterioration, leading to fatigue cracking, rutting, and permanent deformation. Equivalent wheel load factors are used to account for the effects of repeated applications of loads in pavement design.