DESIGN OF THE CROSS-SECTION

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Tests and analyses have firmly established the principle that a concrete pavement with constant thickness is weaker at the edge than in the interior, so far as resistance to wheel loads is concerned [1] Design with thickened edges, therefore, is rational

Tendencies of the concrete to change volume by the setting and hardening, or resulting from changes of temperature or changes of moisture, produce a tendency for the pavement to slide on the subgrade Stresses occur when sliding is restrained It is desirable, therefore, that the bottom of the pavement be smooth A smooth top reduces the impacts, and is obviously desirable

Differences of temperature between top and bottom of the pavement and settlements and other changes in the subgrade cause stresses which will produce cracks in any large continuous slab without joints These stresses may be relieved materially by forming cracks spaced at distances of the order of about 10 feet It follows that it is rational to design a two-lane pavement with a center joint

While bending stresses due to settlements of the subgrade and due to differences of temperature between top and bottom are relieved conspicuously when the horizontal dimensions of the slab are reduced either by cracks or by joints to the order of about 10 feet, the bending stresses due to the wheel loads are not relieved greatly by this reduction of size It follows that excessive bending stresses due to the loads alone should by all means be avoided, even though the critical loads be infrequent Otherwise the pavement will necessarily ultimately crack into small units The prospect of continued progress of cracking presents an argument in favor of the economy of thick pavements The undesirable condition may be avoided by making all parts of the pavement sufficiently thick to resist these bending stresses with a margin of safety

[1] Analyses of stresses in concrete pavements are found in the following papers by H M Westergaard Computation of stresses in concrete roads, Highway Research Board, Proceedings Fifth Annual Meeting, 1925, Part I, p 90 (also in Public Roads, April, 1926), Analysis of stresses in concrete pavements due to variations of temperature, Highway Research Board, Proceedings Sixth Annual Meeting, 1926, p 201 (also in Public Roads, May, 1927) These papers contain numerical examples of the computation of stresses