

CHAPTER 16
FLEXIBLE PAVEMENT DESIGN
SECTION 73: INTRODUCTION

1601. The function of flexible pavement design is to select a structure of superimposed layers of materials capable of distributing applied vehicle loads to the subgrade. The greater the depth of pavement, the lower the stress in the subgrade. The requirement is to design the minimum pavement structure capable of distributing the load without overstressing and deforming the subgrade.

1602. Whereas a flexible pavement normally deforms to match any deformation of the subgrade, rigid pavements are able to bridge, by beam and slab action, localised failures and small areas of inadequate support of the subgrade. Design of the latter is much less affected by the quality of the subgrade. Rigid pavement design is described in Chapter 8. For convenience most engineers term all pavements other than rigid concrete pavements as 'flexible' although some pavements can exhibit beam and slab action and are not truly flexible.

1603. The design of a flexible pavement involves determination of the strength and thickness of construction necessary over a particular subgrade to provide a stable and smooth surface for traffic loads. Such a design is, in effect, a practical application of soil mechanics. The tests required to establish compaction, moisture content and strength of soil below pavements are described in Military Engineering Volume IV Soils and Construction Materials.

1604. Correct application of reliable methods of design prevents failure from the laying of insufficiently thick pavements on weak subgrades and reduces the waste of material and effort in laying unnecessarily thick pavements on strong subgrades.

Purpose of Road Structure

1605. The purpose of a road structure is to provide a means of reducing pressure from wheel load to a value that the ground under the structure can support. A vehicle standing on a road structure exerts a direct load (static stress) on the small area of contact between its tyres and the road surface. When the vehicle is moving, there is additional dynamic stressing due to the up and down movements of the vehicle, caused by slight unevenness of the surface, gusting wind, etc. This has the effect of hammering the surface as the vehicle travels along the road.

1606. Intensity of static and dynamic stress is greatest at the surface of the road and spreads in a pyramidal shape throughout the depth of the structure. As the

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spread of load increases, so stress is reduced until, at the formation level, stress is low enough for natural ground to support it without damage or distortion. For simplicity, the pyramidal spread of the load can be considered to be at 45° to the horizontal and this gives an approximately correct stress Figure. In reality, spread is slightly greater in the upper layers of road structure.

1607. Flexible construction carriageways are usually designed to last 20 years, allowance being made for traffic growth year by year. However, a road can only achieve its designed life period and carrying capacity if construction is correctly carried out and all materials are of the required standard for the design specification and correctly used. Flexible construction allows a small amount of vertical movement of the road structure under load.

1608. Adequate drainage of the area is of the greatest importance in providing a sound formation on which to build a road structure. Waterlogged ground allows excessive movement of the structure, leading to early damage and destruction.