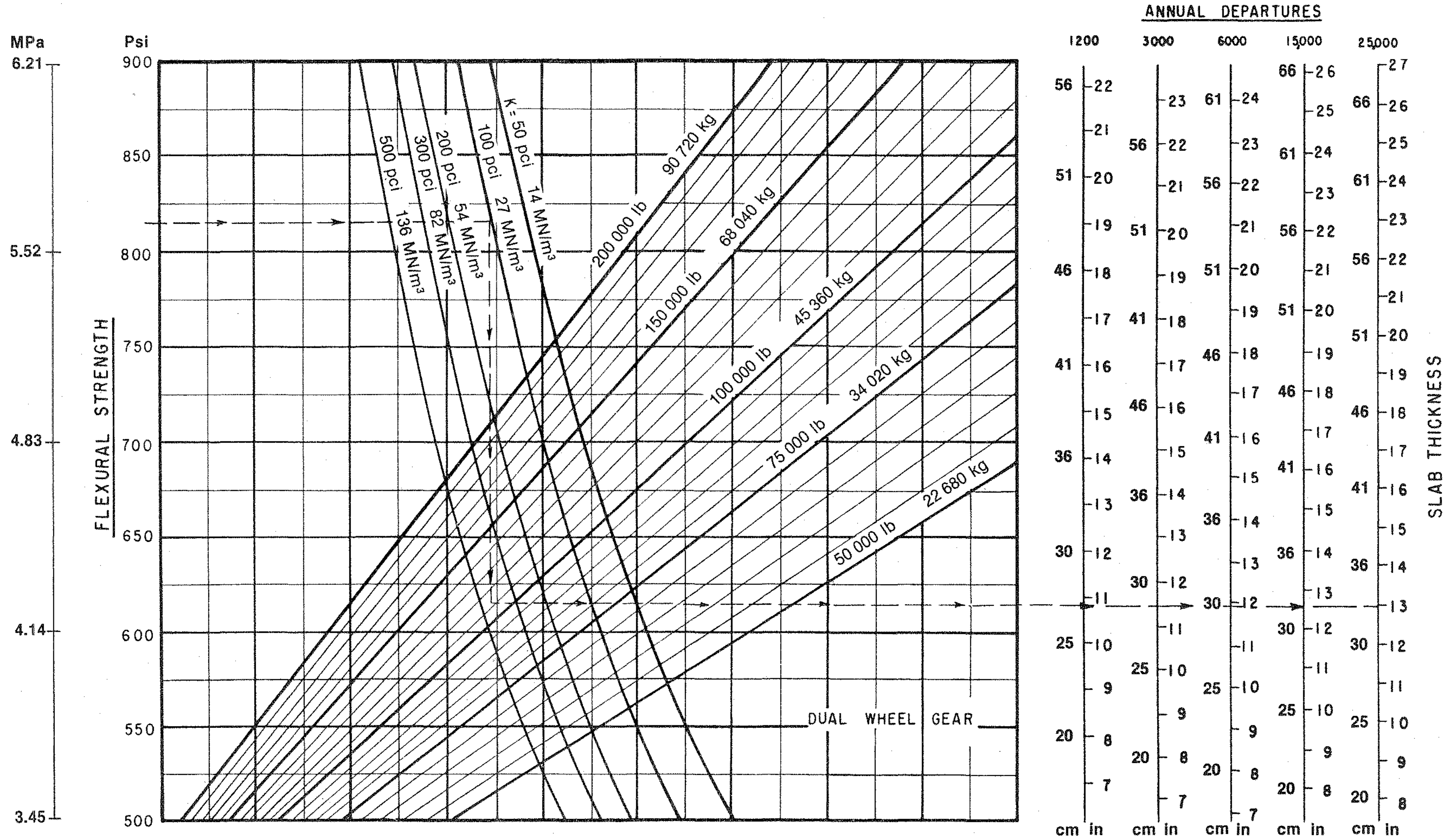

Figure 4-47. Rigid pavement design curves - dual wheel gear

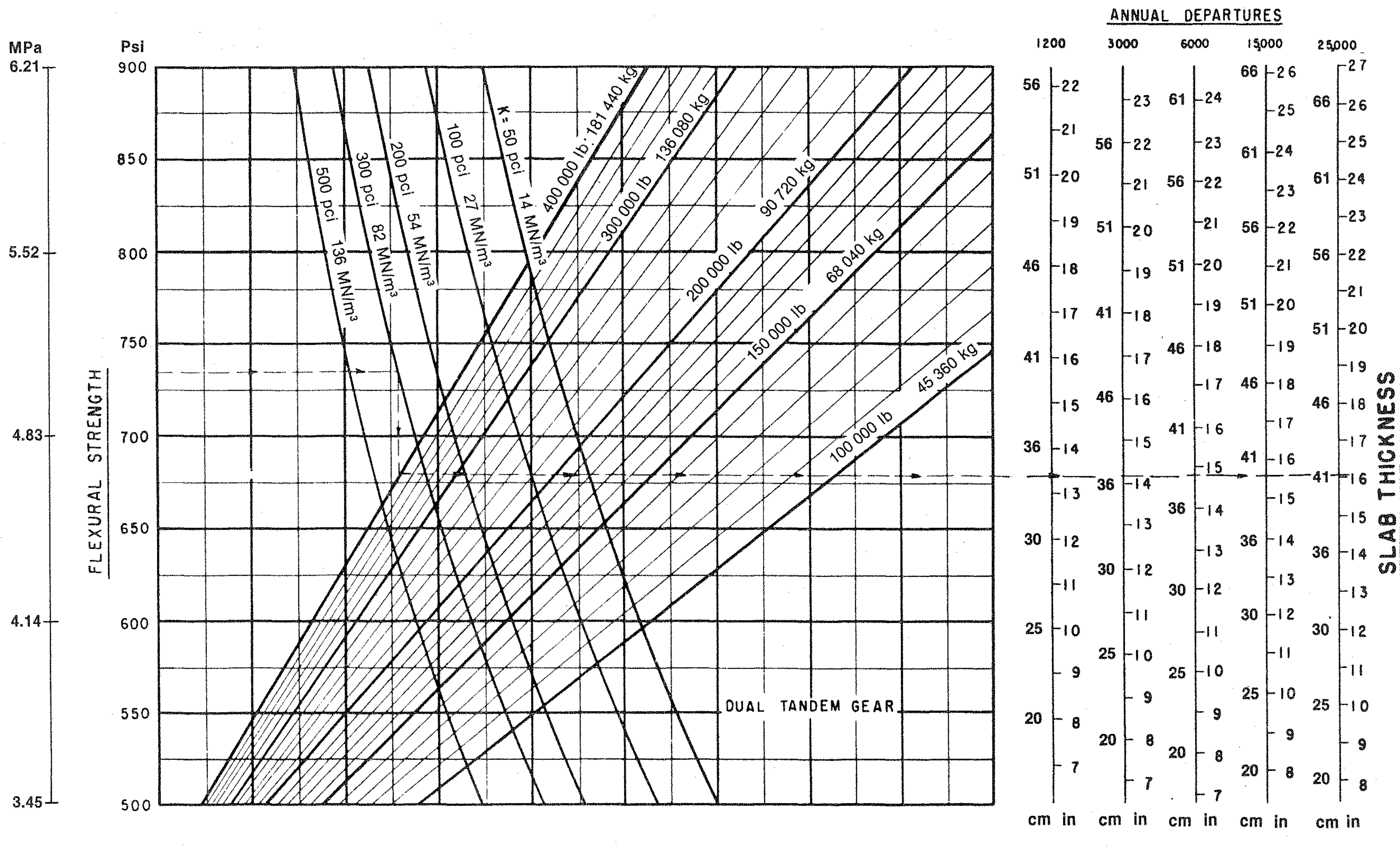

Figure 4-48. Rigid pavement design curves - dual tandem gear

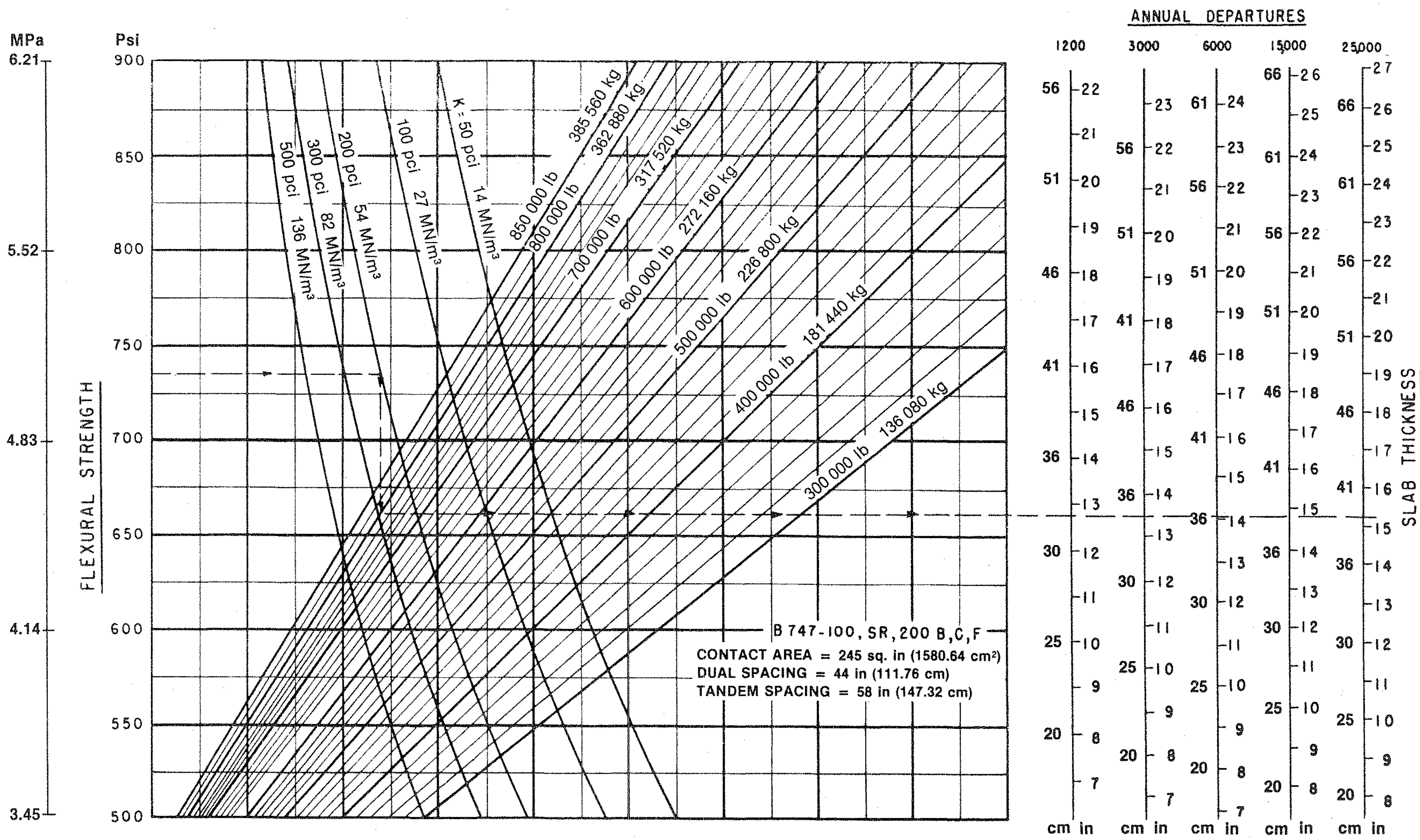

Figure 4-49. Rigid pavement design curves - B-747-100, SR, 200 B, C, F

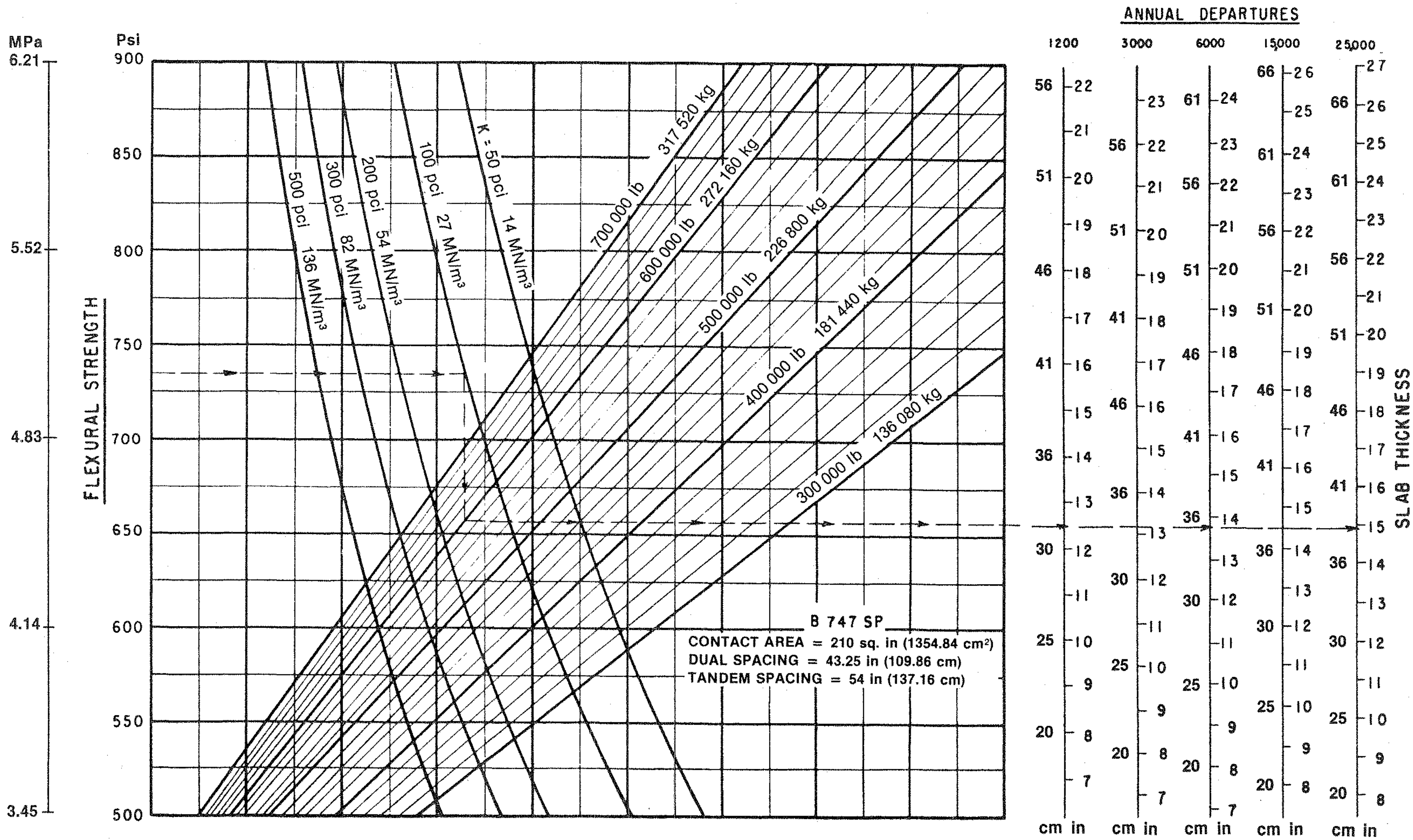

Figure 4-50. Rigid pavement design curves - B-747-SP

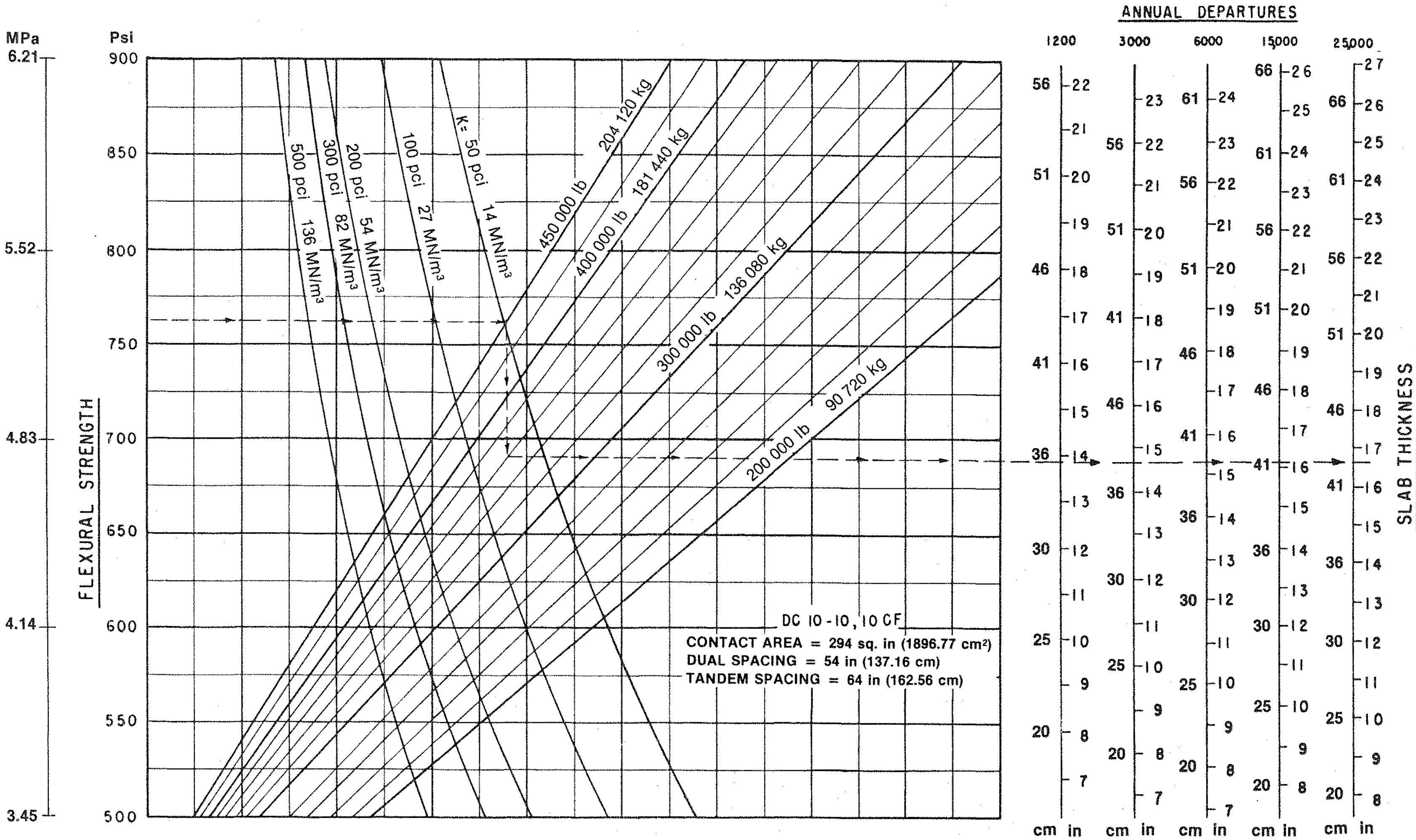

Figure 4-51. Rigid pavement design curves - DC 10-10, 10CF

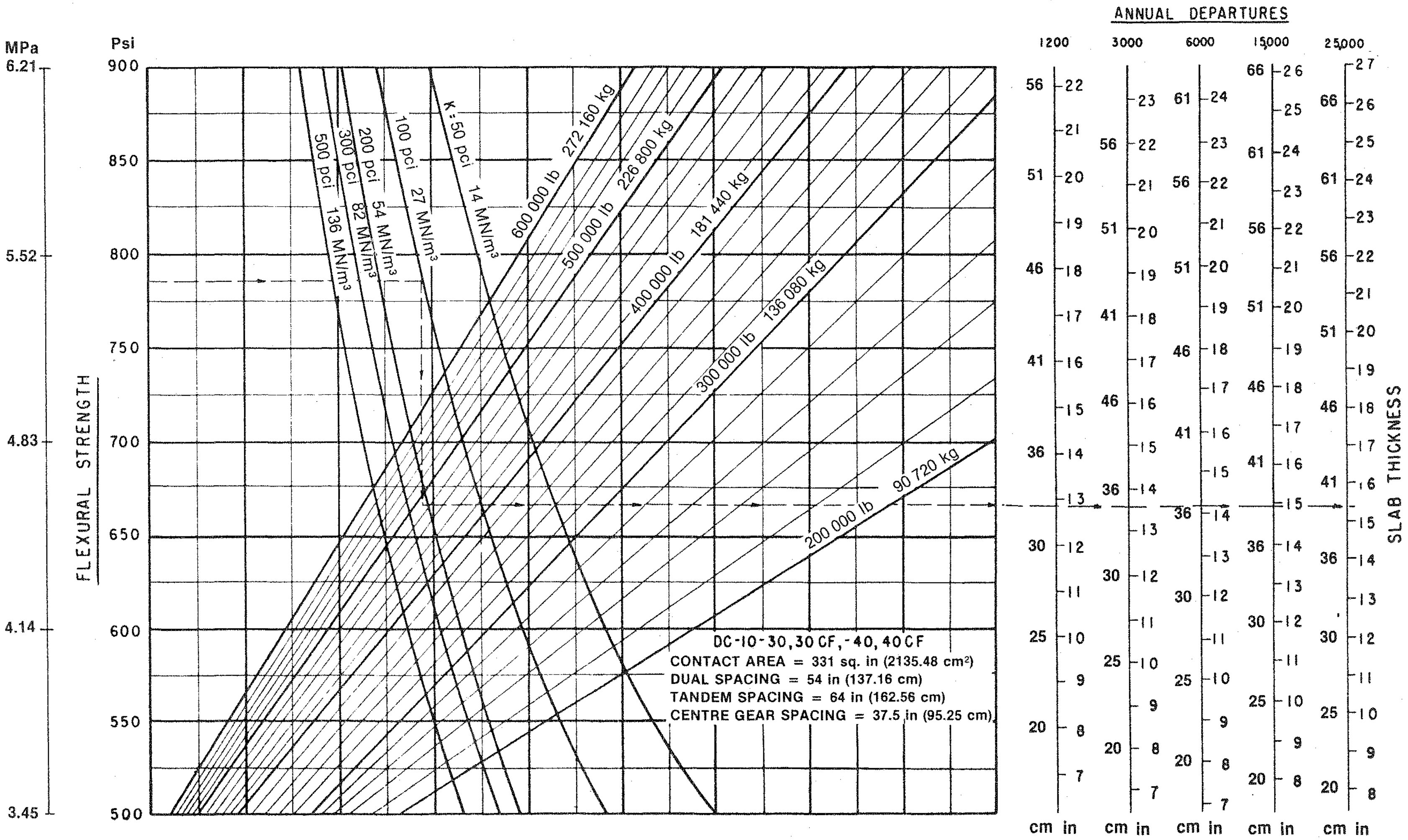

Figure 4-52. Rigid pavement design curves - DC 10-30, 30CF, 40, 40CF

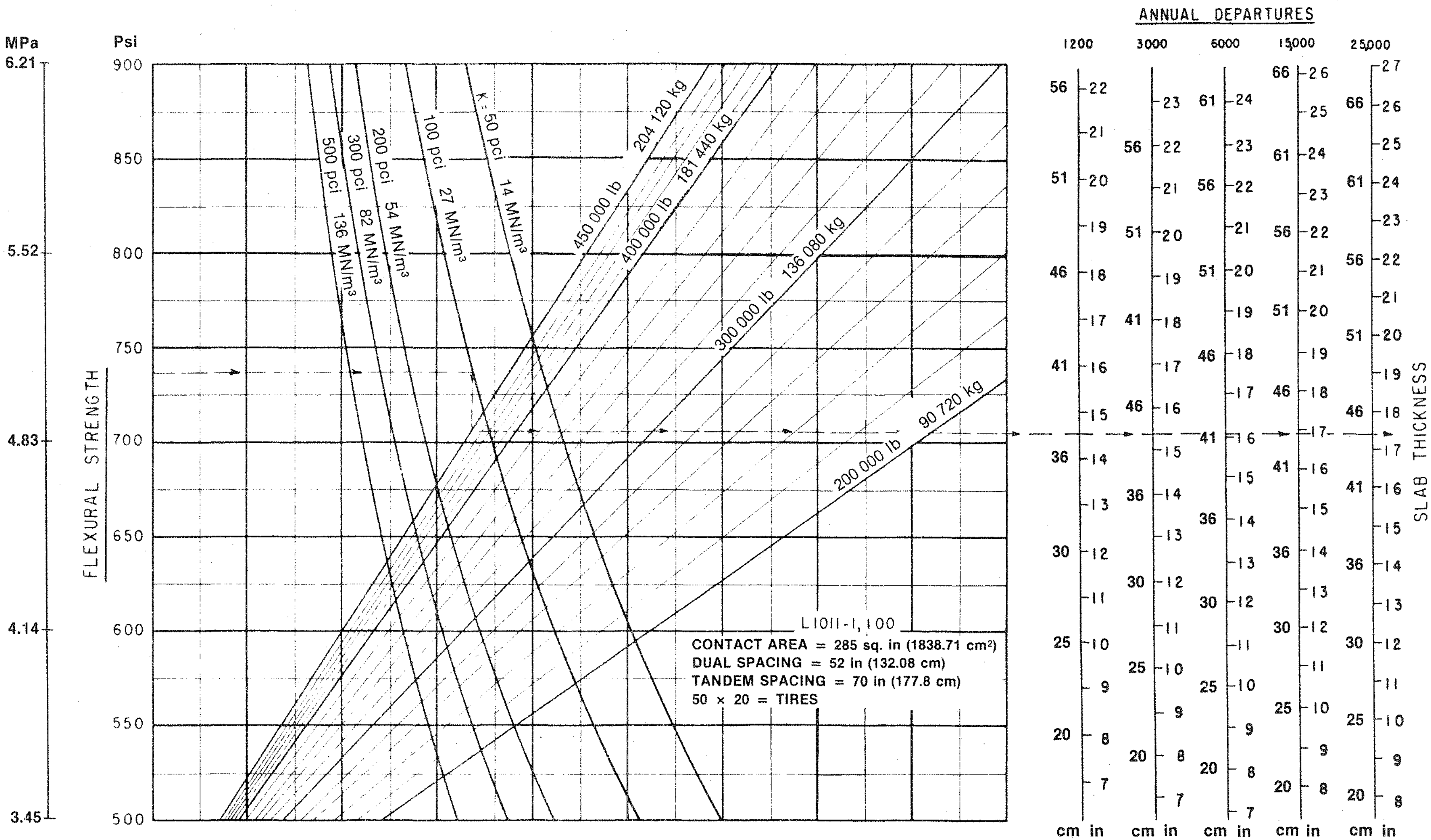

Figure 4-53. Rigid pavement design curves - L-1011-1, 100

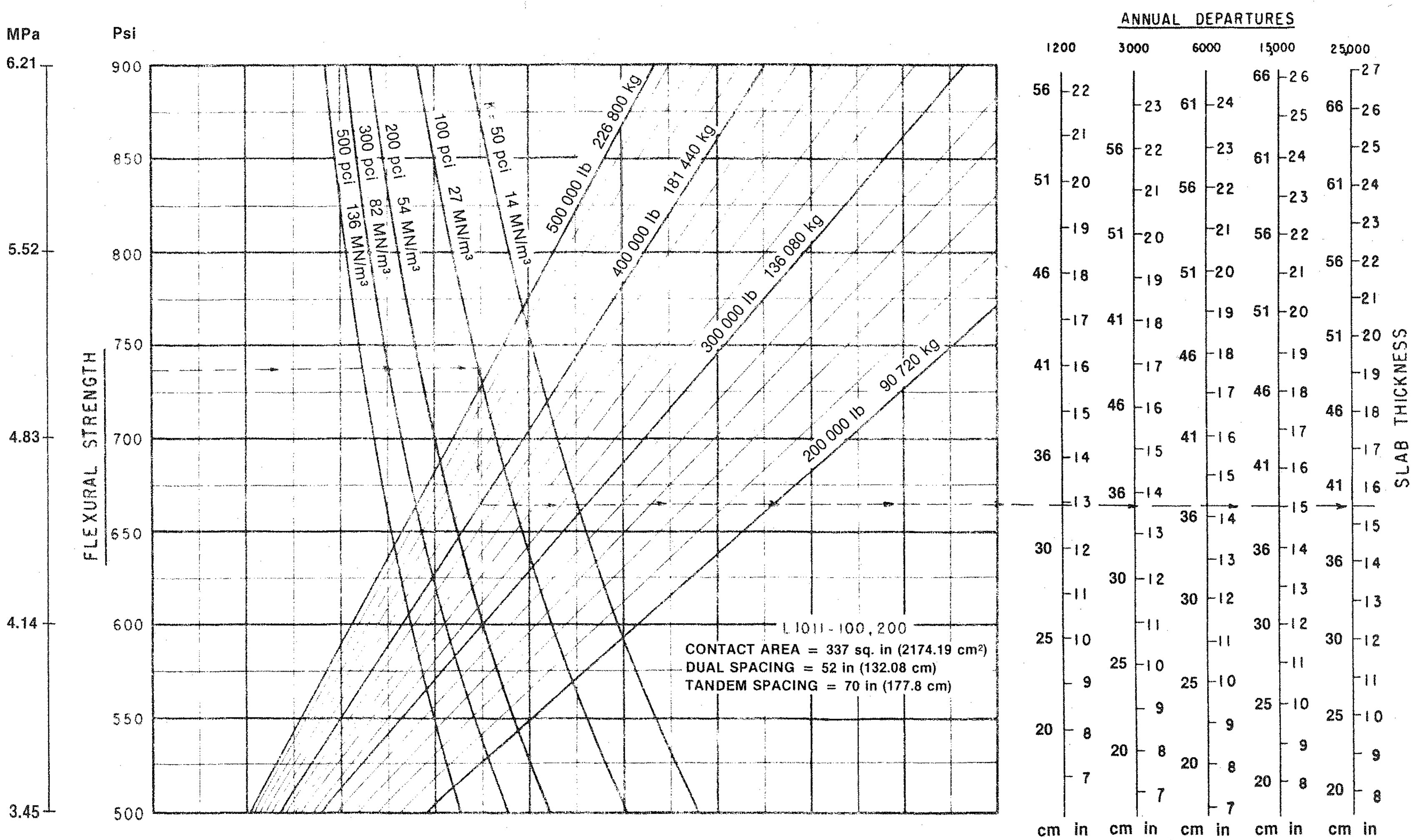

Figure 4-54. Rigid pavement design curves - L-1011-100, 200

4.4.20 Critical and non-critical areas

4.4.20.1 The design curves, Figures 4-46 through 4-54 are used to determine the concrete slab thickness for the critical pavement areas. A 0.9T thickness for non-critical areas applies to the concrete slab thickness. For the variable thickness section of the thinned edge and transition section, the reduction applies to the concrete slab thickness. The change in thickness for transitions should be accomplished over an entire slab length or width. In areas of variable slab thickness, the sub-base thickness must be adjusted as necessary to provide surface drainage from the entire subgrade surface. For fractions of an inch of 0.5 or more, use the next higher whole number; for less than 0.5, use the next lower number.

4.4.21 Stabilized sub-base

4.4.21.1 Stabilized sub-base is to be required for all new rigid pavements designed to accommodate aircraft weighing 100 000 lb (45 400 kg) or more. The structural benefit imparted to a pavement section by a stabilized sub-base is reflected in the modulus of subgrade reaction assigned to the foundation. Exceptions to the policy of using stabilized sub-base are the same as given in 4.4.15.

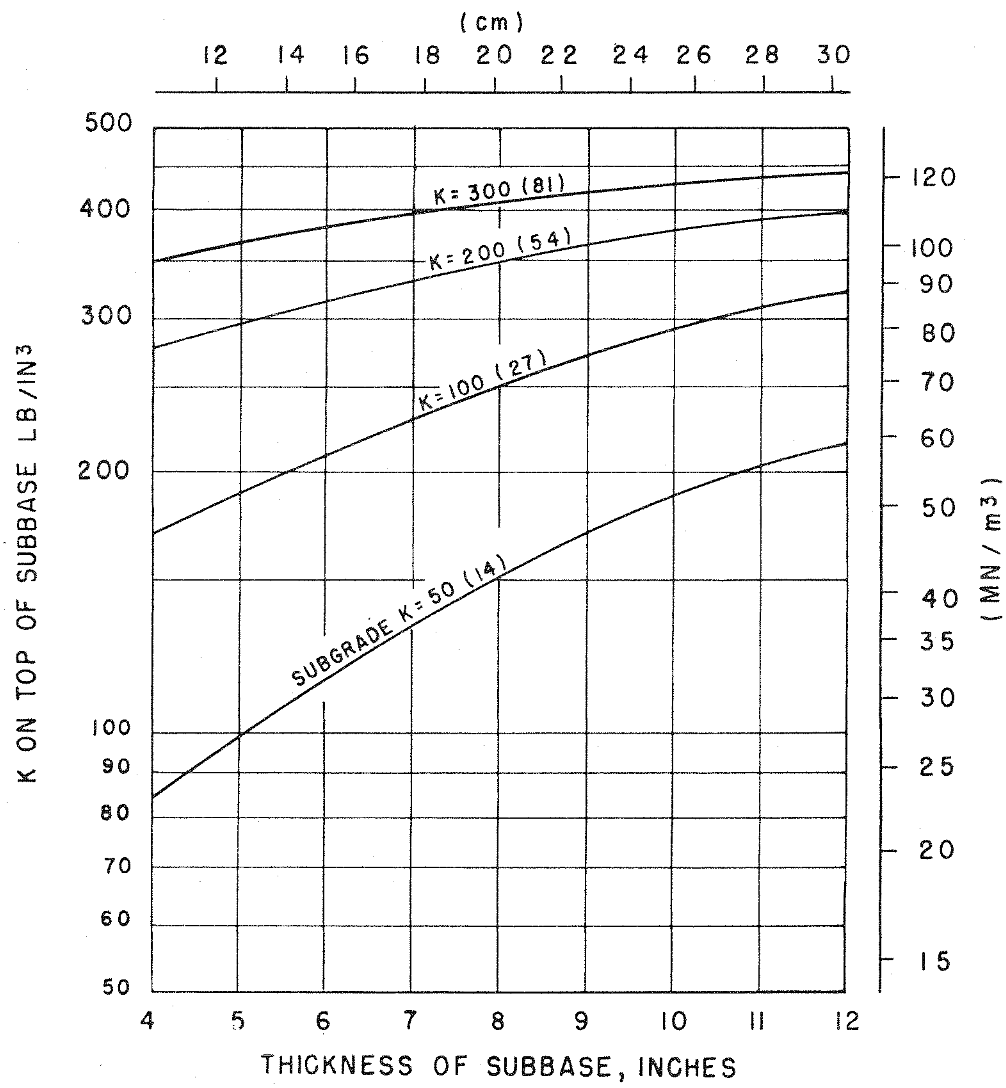

Figure 4-55. Effect of stabilized sub-base on subgrade modulus

4.4.21.2 Determination of k value for stabilized sub-base. The effect of stabilized sub-base is reflected in the foundation modulus. The difficulty in assigning a foundation modulus is that test data will not be available during the design phase. Figure 4-55 shows the probable increase in k value with various thicknesses of stabilized sub-base located on subgrades of varying moduli. Figure 4-55 is applicable to cement stabilized and bituminous stabilized layers. Figure 4-55 was developed by assuming a stabilized layer is twice as effective as a well-graded crushed aggregate in increasing the subgrade modulus. Stabilized layers of lesser quality should be assigned somewhat lower k values. After k value is assigned to the stabilized sub-base, the design procedure is the same as described in 4.4.18.

4.4.22 Design example

4.4.22.1 As an example of the use of the design curves, assume that a rigid pavement is to be designed for dual tandem aircraft having a gross weight of 350 000 lb (160 000 kg) and for 6 000 annual equivalent departures of the design aircraft. The equivalent annual departures of 6 000 includes 1 200 annual departures of B-747 aircraft weighing 780 000 lb (350 000 kg) gross weight. The subgrade modulus of 100 pci (25 MN/m^3) with poor drainage and frost penetration is 17 in (45 cm). The feature to be designed is a primary runway and requires 100 per cent frost protection. The subgrade soil is CL. Concrete mix designs indicate that a flexural strength of 650 psi (4.5 MN/m^2) can be readily produced with locally available aggregates.

4.4.22.2 The gross weight of the design aircraft dictates the use of a stabilized sub-base. Several thicknesses of stabilized sub-bases should be tried to determine the most economical section. Assume a cement stabilized sub-base will be used. Try a sub-base thickness of 6 in (15 cm). Using Figure 4-55, a 6 in (15 cm) thickness would likely increase the foundation modulus from 100 pci (25 MN/m^3) to 210 pci (57 MN/m^3). Using Figure 4-48 dual tandem design curve, with the assumed design data, yields a concrete pavement thickness of 16.6 in (42 cm). This thickness would be rounded off 17 in (43 cm). Since the frost penetration is only 18 in (45 cm) and the combined thickness of concrete pavement and stabilized sub-base is 23 in (58 cm), no further frost protection is needed. Even though the wide body aircraft did not control the thickness of the slab, the wide bodies would have to be considered in the establishment of jointing requirements and design of drainage structures. Other stabilized sub-base thicknesses should be tried to determine the most economical section.

4.4.23 Optional rigid pavement design curves

4.4.23.1 When aircraft loadings are applied to a jointed edge, the angle of the landing gear relative to the jointed edge influences the magnitude of the stress in the slab. Figures 4-46 and 4-47, single wheel and dual wheel landing gear assemblies, are at the maximum stress when the gear is located parallel to the joint. Dual tandem assemblies do not produce the maximum stress when located parallel to the joint. Locating the dual tandem at an acute angle to the jointed edge will produce the maximum stress. Design curves, Figures 4-56 through 4-62, have been prepared for dual tandem gears located tangent to the jointed edge but rotated to the angle causing the maximum stress. These design curves can be used to design pavements in areas where aircraft are likely to cross the pavement joints at angles at low speeds such as runway holding aprons, runway ends, runway-taxiway intersections, aprons, etc. Use of Figures 4-56 to 4-62 is optional and should only be applied in areas where aircraft are likely to cross pavement joints at an angle and at low speeds.