CHAPTER 1

GENERAL

1-1. Purpose and scope. This manual provides criteria for the design of rigid pavements for roads, streets, walks, and open storage areas at U. S. Army mobilization installations for the loadings and conditions set forth herein.

1-2. Basis of pavement design.

a. Design factor. The prime factor influencing the structural design of a pavement is the load-carrying capacity required. For rigid pavements, the slab thickness necessary to provide the desired load-carrying capacity is a function of five principal variables: (a) vehicle wheel load or axle load, (b) configuration of the vehicle wheels or tracks, (c) volume of traffic during the design life of the pavement, (d) modulus of rupture (flexural strength) of the concrete, and (e) modulus of subgrade reaction.

b. Pavement stresses. The rigid pavement design procedure presented herein is based on the critical tensile stresses produced within the slab by the vehicle loading. Maximum tensile stresses in the pavement occur when the vehicle wheels are tangent to a free or unsupported edge of the pavement. Stresses for the condition of the vehicle wheels tangent to a longitudinal or transverse joint are less severe due to the use of load-transfer devices in these joints to transfer a portion of the load to the adjacent slab. Other stresses which, due to their cyclic nature, will at times be additive to the vehicle load stresses include: (a) restraint stresses resulting from thermal expansion and contraction of the pavement and (b) warping stresses resulting from moisture and temperature gradients within the pavement.

c. Vehicle loadings. The criteria presented in this manual are applicable to rigid pavement design requirements for all Army vehicles. For determining pavement design requirements, all vehicles have been divided into three general classifications: (a) pneumatic-tired vehicles, (b) track-laying vehicles, and (c) forklift trucks (including both solid and pneumatic tires). By relating each vehicle, based on the wheel configuration and loading, to an equivalent number of operations of some arbitrary basic loading, pavement design requirements are established for any given type or volume of traffic. For the pavement design procedures presented in this manual, all vehicular traffic has been expressed in terms of an equivalent number of 18,000-pound single-axle load on dual wheels spaced 13-1/2 by 58-1/2 by 13-1/2 inches.

1-3. Frost conditions. When freezing temperatures penetrate a frost-susceptible subgrade or when frost may have a significant effect

on pavements or pavement bases, the design procedures outlined in EM 1110-3-138 should be followed.

1-4. Soil stabilization. In some instances, unsuitable or adverse soils may be improved economically by stabilization with such materials as cement, fly ash, lime, or certain chemical additives whereby the characteristics of the composite material become suitable for subgrade purposes. When this is the case, the design procedures outlined in EM 1110-3-137 should be followed.

1-5. Concrete quality. The criteria contained in EM 1110-3-135 are applicable to the design of rigid pavements for facilities covered by this manual. Particular attention must be given to providing a nonslippery surface. Concrete flexural strength will be determined in accordance with ASTM C 78.

1-6. Walks. Portland cement walks may be provided where pedestrian traffic justifies this type of construction. Normally, the design thickness for walks will be 4 inches. Where it is necessary and desirable to continue the walk across driveways, private entrances, etc., provided for vehicle crossings, the thickness of the walk should be increased to provide sufficient strength to support the vehicular loads to which such portions of the walks will be subjected. Concrete walks should be grooved transversely into rectangular areas at 3- to 5-foot intervals to create planes of weakness for control of contraction cracking. The depth of such grooves should be a minimum of one-fourth the thickness of the slab. Expansion joints consisting of approved preformed bituminous filler or wood, approximately 1/2-inch thick, should be installed to surround or to separate all structures or features which project through or against the sidewalk slab. Expansion joints of a similar type should be installed at regularly spaced intervals transversely across the sidewalk slab. The spacing for such joints should be not less than 30 feet nor more than 50 feet.