CHAPTER 17
BASE AND SUB-BASES
SECTION 78 – TYPES OF BASE AND SUB-BASE

Bases

1701. The function of a base course is to transmit the applied load from the surface to the sub-base or subgrade. The base provides the main strength of the pavement. A vehicle subjects a relatively small area of the pavement surface to a heavy pressure, and the base course must be capable of spreading and reducing the intensity of this pressure so it does not exceed the bearing capacity of the sub-base or subgrade. Excessive loading causes deformation and rutting of the subgrade, and the structure of the overlying pavement begins fail.

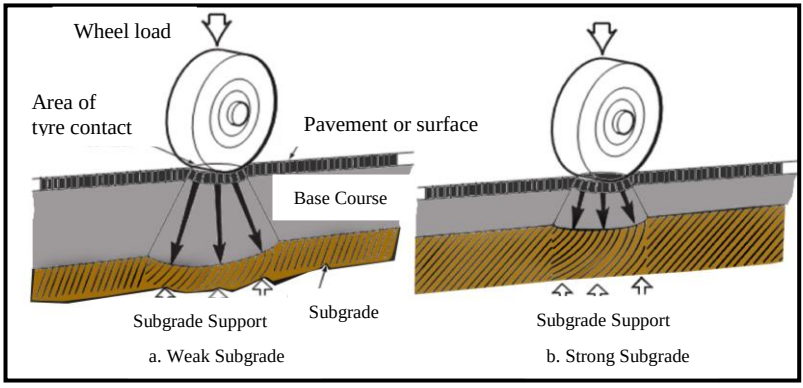

Figure 17-1: Distribution of load by Pavement.

1702. Rigid bases. In military work, concrete is always used. Their tensile strength enables them to bridge small depressions in the subgrade. They are preferable only where heavy traffic is anticipated over a long period.A flexible base is part of a structure of superimposed layers of materials capable of distributing applied vehicle loads to a subgrade.

1703. Flexible bases. Can be formed from a wide variety of natural materials, either in their natural state or after crushing, or after blending two or more types. They are quicker and easier to lay than concrete, do not need curing, are generally simple to recondition, and can often be used even while under repair.A rigid base is made of a concrete slab either with or without the addition of a separate wearing surface; all other forms of construction are regarded as flexible. An advantage of the rigid type is that concrete has flexible strength, so the applied load is spread over the subgrade partly by pressure and partly by beam action,

while local weak spots or irregularities in the subgrade can be bridged over. For this reason, the total pavement thickness can usually be thinner than a similarly loaded flexible pavement.

1704. Common types of base are summarized in Table 17.1. Some special materials are dealt with in Chapter 31.

1705. Bitsand, lean mix concrete, and soil cement are strictly neither rigid nor flexible. They are dealt with in Sections 97, 105, and 106.

Sub-Bases

1706. A sub-base is essentially a compacted layer of selected material. The best type and thickness depend upon the required function (see Section 70).

1707. Common materials are gravel, sand, ashes, clinker, broken brick, and good quality hardcore of small gauge. Soil cement or lean mix concrete are sometimes used.

1707. Construction details are given in Section 79.

1708. The functions of the sub-base are as follows:

a. The sub-base complements the function of the base course in reducing the pressure exerted by a wheel on the road surface to a pressure at the subgrade less than its bearing capacity, except in cases where the subgrade is of sufficient strength.

b. In a form of granular material, it is designed to act as a drainage layer in cases where the road surfacing is not sufficiently waterproof.

c. In the case of a fine-grained subgrade, a sub-base:

(1) Provides a working platform on which paving materials can be transported, laid and compacted.

(2) Acts as an insulating layer against the freezing of a susceptible subgrade soil. Sub-base material must be frost resistant.

(3) Acts as a cut-off blanket to prevent moisture or subgrade material from migrating into the base course.

d. On hard, rough subgrades, a sub-base trues up the formation to provide an even bearing for the base course.

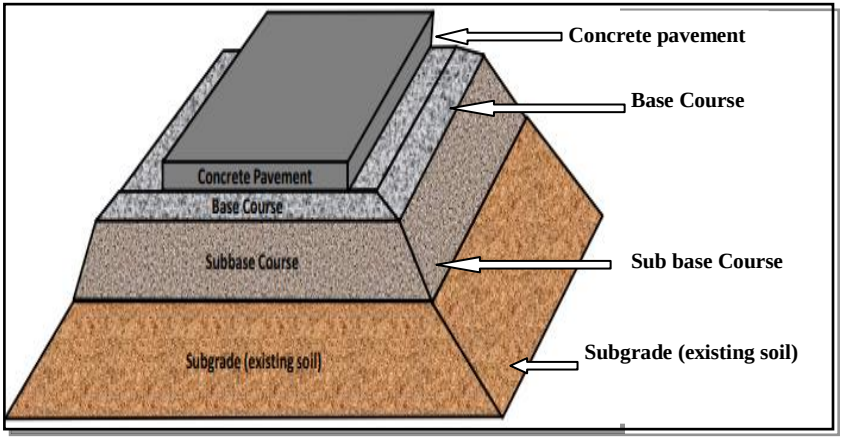

Figure 17-2: Base and Sub-base Layers.

TABLE 17.1 – A GENERAL GUIDE TO ROAD BASES

Ser No	Type	Materials required	Remarks
1	Rigid-Concrete	Coarse aggregate: crushed or broken stone, gravel. Fine aggregate: natural and or crushed rock screenings Cement	Proper size grading of coarse aggregate essential. All materials should be free from clay and organic impurities. A sub-base of clinker or sand is advisable
2	Flexible-Stone pitching	Large quarried stone or river boulders laid by hand 6 to 12 ins thick	Sub-base usually desirable. Surface interstices filled with smaller gauge stone. Temporary traffic helps compaction, but surfacing essential for unrestricted use.

3	Hard core	Hard building rubble. Broken limestone and hard slag can also be used	Spread and compact in 4 to 6-in layers. Eliminate pockets of soft material. Temporary traffic helps compaction; final compaction, by smooth wheel rollers (about 8 tons)
4	Macadam	Coarse crushed or broken stone, or screened gravel, gauge 1 to 3 in voids filled with fine particles	Spread in layers of thickness slightly greater than largest size of aggregate. Compact with heavy roller. Best results if water-bound or granted with tar or bitumen
5	Gravel or gravel-sand	Well graded material required eg: 1-in to $\frac{3}{4}$ in – 15% $\frac{3}{4}$ -in to $\frac{1}{4}$ in – 75% Below –in – 10%	Screened gravel unsuitable as fines are essential for binding. Spread and compact in layers 3 to 6 ins thick. Blading and traffic loads are beneficial
6	Stabilized soil	Well graded soil mixture	See Section 80
7	Sand-clay mixture	May occur in natural deposits, or material from separate sources can be mixed	Useful where no stone is available. See Section 79
8	Hoggin	Occurs as a natural deposit of gravel, sand and clay	Forms and excellent base if the clay content is just sufficient to hold the mix together when rolled.

Figure 17-3: Macadam.

Figure 17-4: Hoggin.