CHAPTER 5

BASE COURSE

5-1. General. The base course is subjected to high vertical stresses and must have high stability and be placed properly.

5-2. Suitable materials. Suitable materials include natural, processed, manufactured, and stabilized materials. See table 5-1 for listing and description of commonly used base materials. The information contained in this table is to provide an overview of the materials available for base. Use should be made of local material; full use should be made of local experience and requirements. It is recommended that quality controlled material reserves such as those maintained by state and local agencies be utilized where possible.

5-3. Design CBR of base course. Base course materials complying with the requirements of table 5-1 will be assigned CBR values as shown in the following tabulation.

Type	Design CBR
Graded crushed aggregate (stone, gravel, slag)	100
Dry bound and water bound macadam	100
Limerock	80
Shell sand	80
Coral	80
Shell rock	80
Mechanically stabilized aggregate	80

5-4. Minimum base course and surface thicknesses. The minimum allowable thicknesses for base and surface courses are listed in table 5-2. These thicknesses have been arbitrarily established so that the required subbase CBR will always be 50 or less.

5-5. Base course gradation and tests.

a. Testing. Under mobilization conditions, sophisticated testing equipment may be limited together with an increased workload on testing laboratories which will hamper expeditious construction. Therefore, an emphasis should be placed on quick results from field testing or

Table 5-1. Base Course Materials for Flexible Pavements

Materials	Description-Source	Processing	Requirements-Comments
Crushed Stone and crushed gravel	Stone quarried from formations of granite, traprock and limestone. Gravel from deposits of river or glacial origin	The quarried rock and gravel are crushed and screened to produce a dense graded mix. See table 5-2 for gradation	Percentage of wear not to exceed 40. Liquid limit not to exceed 25. Plasticity index not to exceed 5.
Slag	Air-cooled, blast-furnace slag is by-product of steel manufacturing. Material is competitive in areas adjacent to steel mills. Slag is lighter in weight than stone, highly stable, hard, and rough textured. Slag also has ability to drain rapidly	Slag is air-cooled, crushed, and and graded to produce dense mix. Fines from other sources may be used for blending. See table 5-2 for gradation	Requirements for crushed stone apply. Slag weight to be not less than 65 pcf.
Macadam	Crushed stone, crushed slag, or crushed gravel	Crushed aggregate is screened and graded to produce coarse aggregate, choker aggregate, key aggregate, and screenings. See Type specifications for gradation	Procedure is to place alternate layers of the various size aggregate to form dry-bound, or wet-bound macadam base.
Shell Sand	The shells are dredged from dead reefs in the gulf coast waters of the United States. Shells consist of oyster and clam shells	Shells are washed, crushed, screened and blended with sand filler. Ratio of the blend shall be not less than 67 percent shell to 33 percent sand. Refer to local guide specificiations where available	Liquid limit not to exceed 25. Plasticity index not to exceed 5. Minimum CBR requirement is 60 at 100 percent compaction for layers following construction
Coral	Coral consists of hard, cemented deposits of skeletal origin. Coral is found in the reefs and inland deposits at atolls and islands in tropical regions. Caroline limestone, quarried from inland deposits and designated as quarry coral, is structurally soundest of the various coral materials available. Other types also useful for base material are reef coral and bank run coral. Cascajo or "gravelly coral" found as lagoon sediment at Guam, is also useful as base	Reef coral is removed by blasting and dredging and is stockpiled ashore, prior to crushing and grading. Quarry coral is obtained by blasting, and is crushed and graded to produce a dense mix. Use the following gradation: Sieve Designation — Percent Passing 2 inch — 100 1-1/2 inch — 70-100 3/4 inch — 40-90 No. 4 — 25-60 No. 40 — 5-20 No. 200 — 0-10	Percentage of wear not to exceed 50. Liquid limit not to exceed 25. Plasticity index not to exceed 5. Minimum CBR requirement is 60 at 100 percent compaction for layers following construction
Limerock	Limerock is a fossiliferous limestone of the oolitic type. Its main constituents are carbonates of calcium and magnesium. Commercial limerock deposits are located in Florida	Limerock is crushed, screened, and uniformly graded from 3-1/2 inches maximum to dust. Refer to local guide specifications where available	Minimum CBR requirement is 60 at 95 percent compaction. Liquid limit not to exceed 25. Plasticity index not to exceed 5.
Shell-Rock	Shell-rock or marine limestone are deposits or hard, cemented shells. Deposits are located in the coastal areas of North and South Carolina	Shell-rock is crushed, screened and graded to a dense mix. Refer to local guide specifications where available.	Percentage of wear not to exceed 50. Liquid limit not to exceed 25. Plasticity index not to exceed 5. Minimum CBR requirement is 60 at 100 percent compaction for layers following construction
Mechanically Stabilized Aggregate	Crushed and uncrushed coarse aggregate, fine aggregate, and binder	A blend of crushed and natural materials processed to provide a dense graded mix. See table 5-2 for gradation	Liquid limit not to exceed 25; plasticity index not to exceed 5. Percentage of wear not to exceed 50.
Stabilized Materials	See EM 1110-3-137	See EM 1110-3-137	See EM 1110-3-137

Table 5-2. Minimum Surface and Base Thickness Criteria

Class I Aircraft

Aircraft with gross weights less than 20,000 pounds

	Minimum Thickness (in.)					
	100-CBR Base			80-CBR Base[1]		
Traffic Area	Surface	Base	Total	Surface	Base	Total
B and C	2	6	8	2	6	8

Class II Aircraft

Aircraft with gross weights between 20,001 and 50,000 pounds

	Minimum Thickness (in.)					
	100-CBR Base			80-CBR Base[1]		
Traffic Area	Surface	Base	Total	Surface	Base	Total
B and C	2	6	8	3	6	9

Class III Aircraft

Aircraft with gross weights between 50,001 and 175,000 pounds

	Minimum Thickness (in.)					
	100-CBR Base			80-CBR Base[1]		
Traffic Area	Surface	Base	Total	Surface	Base	Total
B and C	3	6	9	4	6	10

[1]Florida limerock and mechanically stabilized aggregate permitted.

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certification by the supplier that the materials meet the project specification whenever possible.

b. Gradation. See table 5-3 for gradation requirements for crushed stone, gravel, and slag. Consult guide specifications for gradation of materials not included in table 5-1.

Table 5-3. Gradation of Aggregates for Graded Crushed Aggregate Base Course

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve - No. 1	No. 2	No. 3
2-inch	100	-	-
1-1/2 inch	70-100	100	-
1-inch	45-80	60-100	100
1/2-inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

5-6. Base course compaction. Compact the base course to a minimum of 100 percent maximum density.

5-7. Proof rolling. In addition to compacting the base course to the required density, proof-rolling on the surfaces of completed base courses is required. The proof roller is a heavy rubber-tired roller having four tires, each loaded to 30,000 pounds or more and inflated to at least 150 psi. A coverage is the application of one tire print over each point in the surface.