

Good shoulders should always be provided to concrete pavements, and if earth, gravel, or macadam, they should not be less than 5 ft. each in width.

At Arlington, Virginia, I inspected sections of concrete road undergoing tests by the Bureau of Public Roads. These tests were being made to determine what relations, if any, exist between the surface behaviour of concrete roads under traffic and the various laboratory tests for the quality of the aggregates. The results of the tests have just been published in the issue of *Public Roads* dated May, 1924.

Other tests were being carried out to determine the stresses induced in a pavement by a loaded lorry travelling at a given rate of speed and passing over a small bump such as a piece of thin board.

#### SHEET ASPHALT.

Sheet asphalt is the most popular form of city pavement in the United States. Sheet-asphalt pavements have a wearing-surface of asphalt-cement combined with an inert aggregate of graded sand and filler, laid upon a foundation which is usually cement concrete, although bituminous concrete, old macadam, brick or stone blocks are sometimes used. The thickness of this wearing-surface is usually from 1½ in. to 2½ in., depending on the amount of traffic to be carried.

The pavement is ordinarily built in two courses. The first, called the "binder" course, is of asphalt and graded crushed stone, and varies in thickness from 1 in. to 1½ in. The aggregate is heated and then mixed in a rotary mixer with a minimum quantity (about 6 per cent.) of refined asphalt. It is then spread on the foundation with shovels or rakes, and rolled with a 5 to 7 ton roller. Sometimes the binder course is replaced by a coat of paint-binder consisting of asphalt-cement dissolved in gasoline, which is applied with a brush to the concrete foundation. The wearing-course is placed directly on the binder course or paint-coat.

The aggregate of the wearing-course consists of carefully graded particles of sand ranging from the size of dust grains to about ⅛ in. in size. The sand constitutes nearly 80 per cent. of the surface mixture, and takes nearly all the wear of the traffic. It should therefore be hard, clean, moderately sharp, and have a suitable surface to which the asphalt may adhere. It should be free from organic matter, and should pack together well when dry.

With the sand there should be used a filler of very fine material, such as powdered chalk or limestone, Portland cement, or slate-dust. This should be fine enough to pass a 200-mesh screen in order to fill properly the voids in the sand. After mixing the sand and the filler, the material should be heated to about 350° F. and then mixed with from 9.5 to 11.5 per cent. of asphalt-cement heated to about 300° F. The mixture is then hauled to the street in canvas-covered wagons or lorries, and spread on the lower course prepared as previously described. Hot rakes, shovels, and tampers are used to place the mixture, which must be thoroughly loosened to ensure uniformity. The course is immediately rolled with an 8-ton roller, sprinkled with Portland cement, and rerolled.

Sheet asphalt is more suited for fast concentrated traffic than for light or slowly moving heavy traffic, but it is disastrous for any horse traffic or for grades steeper than 1 in 25. In Los Angeles after several months dry weather a shower of rain on the sheet-asphalt pavements makes any speed over ten miles an hour exceedingly dangerous, and cars may be observed performing the wildest of evolutions.

Fifth Avenue in New York is laid down in sheet asphalt, and there it has given remarkable service. On the California highways concrete shoulders are being laid down to sheet-asphalt pavement, and where they have been laid down some time the road-surface seems to be in better condition. Sheet asphalt is dustless, easily cleaned, and easily repaired. Its cost in California, including 5 in. concrete base, is about 10s. per square yard.

The following tabulation shows two American specifications for the composition of a sheet-asphalt wearing-surface. Both are representative of this year's practice, and I saw both being laid down.

	Specification No. 1. Per Cent.	Specification No. 2. Per Cent.
Asphalt-cement .. .. .	9½ to 11½	10 to 12
Sand and stone-dust passing 200-mesh screen ..	13 to 18	12 to 15
Passing 80-mesh and retained on 200-mesh screen ..	18 to 28	20 to 34
Passing 50-mesh and retained on 80-mesh screen ..	16 to 24	20 to 34
Passing 30-mesh and retained on 50-mesh screen ..	18 to 26	11 to 20
Passing 20-mesh and retained on 30-mesh screen ..	4 to 9	4 to 10
Passing 10-mesh and retained on 20-mesh screen ..	2 to 5	1½ to 5

A typical sheet-asphalt mixture in England is as follows:—

	Per Cent.
Bitumen soluble in CS2 .. .. .	12
Aggregate passing 200-mesh screen .. .. .	16
"    100-mesh screen .. .. .	12
"    80-mesh screen .. .. .	10
"    50-mesh screen .. .. .	40
"    40-mesh screen .. .. .	4
"    30-mesh screen .. .. .	3
"    20-mesh screen .. .. .	2
"    10-mesh screen .. .. .	1

100

When the climate is humid it is considered good practice to use not less than 12 per cent. of bitumen. 10 per cent. by weight of filler may be regarded as the minimum requirement for any sheet-asphalt mixture.

#### WOOD BLOCK.

It is now comparatively unusual to see wood-block pavements being put down in America.

The practice is to use chiefly long yellow-leaf pine or Douglas fir blocks impregnated with from 16 lb. to 20 lb. of coal-tar creosote per cubic foot of block. The blocks are usually 8 in. by 4 in. by 4 in.,