

## TAR OR BITUMEN SURFACING.

Tar or bituminous surfacing may be applied to an old road-surface in good condition, or to a new surface after it has been rolled, consolidated, and dried. Some engineers consider that the tar or bitumen should not be applied until the road has been under traffic for some time, but by others it is regarded as the better practice to keep the traffic off the road until after the tar or bitumen has been applied. In the latter method penetration to some small extent is obtained, so that a road thus surfaced really is an intermediate type between the bituminous macadam road and the road which has been surfaced after having carried traffic for some months.

As regards the preparation of the road-surface, there are three important points which must be observed to obtain successful results :—

- (1.) The road must be properly shaped and consolidated and free from ruts, pot-holes, or bumps. Feather-edged patches should be avoided. If the surface is very rough the road should be lightly scarified and sufficient material added to restore the shape. The road should then be thoroughly rolled, and traffic allowed to season the new surface for some weeks before the bituminous material is applied.
- (2.) The road-surface must be as clean as possible and free from dust. A very good method is to sweep the road with a mechanical sweeper and follow up with a thorough hand-sweeping. A further precaution is to flush the surface with water, using a pressure flushing-tank or a hose. This is an excellent idea, and, provided the surface is allowed to dry out thoroughly, practically guarantees adhesion of the bituminous material.
- (3.) The road-surface must be perfectly dry before the application of any hot tar or bituminous material. The objection to the flushing process is now apparent, as considerable time must elapse between the flushing and the application of the tar or bitumen to enable the surface to dry. It is claimed that for cold treatments there may be a certain amount of moisture present.

Tar or bitumen may be used to surface water-bound macadam and gravel roads. One coat or two coats may be applied. Some further details will be found under the heading of "Bituminous Materials."

Using tar for a first treatment and bitumen for the second treatment produces splendid results. The same class of bitumen or asphaltic oil is often used for both coats, and sometimes two different classes are used. The same remark applies to the use of refined tar.

If a thin bitumen or refined tar is used it should be heated to a temperature of 200° to 250° F. If a 90 to 120 penetration bitumen is used, it should be heated to a temperature of 300° to 350°. Care must be taken not to exceed these temperatures, as thereby the life of the material may be destroyed. Bitumen should not be applied when the open-air temperature is below 60° F.

The first application will vary in amount according to the nature of the surface, but should be about  $\frac{1}{2}$  gallon per square yard. The minimum and maximum limits should be  $\frac{1}{10}$  and  $\frac{1}{2}$  gallon per square yard respectively.

The bitumen should preferably be applied with a pressure distributor, but hand-pouring and gravity spraying may also be used provided the material is well broomed into the road-surface to guarantee equal distribution. If the bitumen is not equally distributed the final surface will not be of uniform hardness, and waves will form. A bitumen surfacing is more apt to wave than a tar surfacing.

The first application of bitumen is covered with a thin coating of dustless broken stone or clean gravel. The Bureau of Public Roads specifies that not less than 85 per cent. of the broken stone shall pass a  $\frac{1}{2}$  in. screen and not less than 85 per cent. shall be retained on a  $\frac{1}{4}$  in. screen. If pea gravel is used it should range between  $\frac{3}{8}$  in. and  $\frac{1}{2}$  in. in size. Over 1 cubic yard of stone will seldom be required for each 20 gallons of bitumen. Considerable allowance must be made for waste, however, if the stone is dumped at intervals on the roadside.

The stone must be spread as evenly as possible, and should be just sufficient to absorb the bitumen, otherwise the particles will not be sufficiently coated to adhere to the road-surface. If spreading is done by hand-shovel a long side swing should be used. It is far better to apply too little stone at first than too much.

After the surface has been rolled or beaten in with traffic, loose chips should be swept off and a second application of bitumen made. This may range from  $\frac{1}{10}$  to  $\frac{1}{2}$  of a gallon per square yard. Another light layer of  $\frac{1}{4}$  in. of chips, coarse sand, or pea gravel is then spread, and either rolled or allowed to be ironed out by traffic. In the case of tar surfacing it is considered good practice to make the second application two or three months after the first.

The following method has been used successfully in surfacing good gravel roads in America :—

"After the gravel road has had traffic sufficient to form a hard crust, the surface should be swept or water-flushed until it is practically free from loose particles or foreign matter. The bitumen should then be applied in two courses, in the same manner as for water-bound macadam. Gravel should be used for covering-material, and it should be clean, sharp, and well graded from 1 in. down to sand. The sand passing a No. 30 sieve should not exceed 30 per cent. A roller should be used on this covering to make sure the larger pebbles are securely bedded, after which the road should be opened to traffic. All breaks which develop in the surface during a period of from three to five months after the road is opened to traffic should be repaired at once by a maintenance gang equipped with a heating-kettle and pouring-pots, and at the end of this period the surface should be scarified for a depth of from 1 in. to 1½ in. By then disk-harrowing the scarified material, reducing it to a mealy condition, the bitumen content will be distributed uniformly throughout the depth scarified. Dress