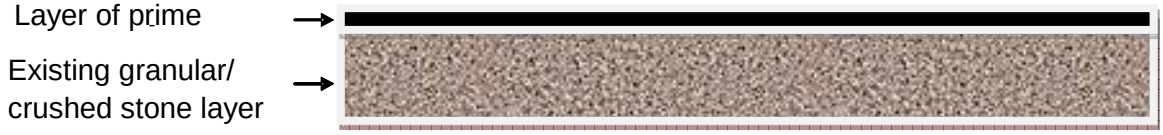
Method statement for labour based construction of:

Prime layer – using invert bitumen emulsion



Definition

Prime is a coating of a particular bituminous binder applied to a granular or crushed stone pavement layer as a preliminary treatment prior to the application of a bituminous base, or surfacing.

Application

The prime layer is intended to impregnate the top 3 - 10 mm of a granular pavement layer to:

- Act as a bonding agent between the granular layer and the following bituminous layer to improve the adhesion between the two layers
- Inhibit the ingress of moisture into the primed layer from rain while allowing the evaporation of the moisture from the layer. This protection will only be effective for a short period, especially if it is exposed to construction traffic or general traffic.
- Improve the strength of the upper portion of the layer (up to approximately 10 mm) by binding the finer particles together. This will assist in keeping the surface intact while it is being trafficked by light construction vehicles for a relatively short period of time. Trafficking under rainy conditions will shorten this period.
- Limiting the absorption of the next spray application into the primed layer.

The benefits of using an invert bitumen emulsion are:

- It is very suitable for labour intensive applications as it can be sprayed at ambient temperatures
- It has a relatively quick drying time compared to cutback bitumen
- Its use has less impact on the environment through less heating and solvent emissions.

The application rate for an invert prime will be specified by the client or his agent based on the condition of the road surface, but will generally be 0.95 L/m^2 with the net quantity of bitumen residue in the region of 0.35 L/m^2.

- For open graded or coarse layers the spray rate can be increased by 0.15 L/m^2.
- For fine, very dense layers the spray rate can be decreased by 0.15 L/m^2.

Material requirements

Invert Bitumen Emulsion: - complying with SANS 1260. The products can be obtained in 200 litre drums or in bulk

Note: Should insufficient penetration of the invert emulsion occur the supplier of the product should be contacted for assistance. In the interests of safety of workers and care of the environment, the addition of illuminating paraffin on site should not be permitted.

Plant and equipment requirements

Item	Number of items
Hand operated spray cart with 210 Litres emulsion drum holder	1
Or	
Spay tanker towed with tractor or bakkie	1
Hand brooms	4

Labour requirements

Below is the typical composition of a hand spray team required to spray 400 L/hr i.e. 2 drums of prime per hour. The sweeping operation needs to be balanced with the correct amount of labourers to ensure the spray operation is not delayed by the sweeping team.

Activity	Number of workers
Loading & spraying operation	2 or 3
Sweeping of surface (75 m^2/labourer/hr)	Min of 4 (depending on area to be prepared)

Construction

Site and Base Preparation

Prime may only be applied once the base layer has dried sufficiently. Specifications may vary, but as a general guide, the moisture content in the top 25 mm of the layer should be less than 50% of the Optimum Moisture Content (OMC)

Kerbing and channels, if present, will need to be covered and protected with black plastic, metal or thin timber sheets or other suitable material

The surface on which the prime is to be applied must be swept free of dust and other unwanted material. An exposed stone matrix is required to ensure a good interlock with the following layer. Sweeping should be done in a down-wind direction so as to aid the removal of dust from the surface. *(See SABITA DVD200 for more detailed information on kerb protection and sweeping operations)*

The base can be moistened with a light sprinkling of water prior to priming to assist in breaking the surface tension and avoid the formation of "fish eyes" in the primed surface. Care must be taken not to over-moisten the base as the excess moisture will inhibit penetration of the prime and adversely affect the bonding to the base layer.

Loading the prime

The emulsion can be sprayed direct from the 200 L drums if the hand pulled cart is used. Should a towed tanker be used, the required number of drums will need to be pumped into the cart at ambient temperature,.

The invert emulsion prime does not require heating for hand spraying operations.

Weather constraints

Spray applications should only be applied during the day and only in good weather conditions and when rain is not imminent. The expected weather conditions for the following 7 days should

be dry to allow the prime to penetrate the upper layer and the volatiles to evaporate. This drying and curing period may vary depending on the weather conditions.

When priming takes place the road surface temperature should be above 10 ^{o}C. Priming in the late afternoon is not advisable as the reduction in air temperature by dusk will result in the prime being less effective.

Care should be taken when spraying on a windy day as the spray may be carried some distance and damage property or passing vehicles down-wind of the operation.

Spraying the prime by using a hand lance:

Whether using a spray tanker (drawn by either a tractor or bakkie) a hand pulled spray cart with motor driven pump or a hand pulled spray cart with a manually operated pump, the preparation is essentially the same

The piping should be checked for leaks and the motor, where present, for correct operation, having no leaks, with pulley sufficiently tight and having sufficient oil and fuel.

Nozzles should be cleaned with diesel, if necessary, away from the road surface. Care should be taken not to cause spillages that will damage the environment. The trial spray can be done back into the drum to avoid pollution.

When using a hand pulled spray cart one or two additional team workers are required to pull the cart and assist with handling of the equipment on site. When using a spray cart with a manually operated pump a further additional person will be required to operate the pump action to spray the emulsion.

Calculate the area to be sprayed from the quantity of prime. **Example:** 200 L of prime (or 1 drum) will cover 210m^2 at an application rate of 0.95 L/m^2. Therefore, if the road is 5 m wide, the drum will cover a total length of 42 m. This area should be marked out to assist in obtaining the correct spray rate.

Spraying should be carried out in wide sweeping movements of the hand lance with 1/3 overlaps between successive applications. The actual spray rate should be continuously checked by comparison of the area covered and the area marked. It is preferable to have the

same experienced spray operator undertake this operation each time as the correct application is a critically important factor for satisfactory performance of chip seals.

After the completion of the spraying operation spray plant equipment should be cleaned with diesel and all waste products removed from the site. Remember that the environment must be protected at all times!

Traffic control

Traffic should not be allowed on the newly sprayed prime layer. Light construction traffic may be allowed on the primed surface once the prime has dried sufficiently so as not to adhere to the tyres of the vehicles. This period will depend on the porosity of the base, and the weather conditions. High temperatures and wind will shorten the period of drying.

Traffic accommodation, if required, will require that the entire lane or area being primed is closed to traffic. If needed, flagmen will be required to assist with stop-go traffic control depending on the area in which the work is being undertaken and the volume of traffic experienced. *(see SABITA TRIP Training manual for more details)*

Traffic accommodation needs to be well managed as it places the entire workman team at risk. Training in the correct operation of traffic accommodation at road works is vital for the safety of the workmen team as well as allowing safe, free flowing traffic.

.Quality control

It is recommended that a “paint” test be carried out to verify the application rate of the prime. This is done by applying the prime by brush at various application rates to 1 m^2 of prepared base to determine the ideal application rate.

Should the prime be over-applied it can be “blotted” with 6,7 mm stone chips. Crusher dust is not advisable as it tends to stick together and is more difficult to remove from the road surface.

The application rate of the prime coat should fall within the tolerance limits of $\pm$ 0.06 L/m^2