

SPECIFICATION FOR BITUMEN SLIP LAYER

1.0 GENERAL

The bitumen slip layer should satisfy the following criteria to produce a practical and technically suitable material for general site use :

- (i) It should resist flow at ambient temperatures sufficiently long so that installation of piles would not cause significant sagging of the slip layer
- (ii) The slip layer should resist detachment when piles are hammered
- (iii) The slip layer should not shear off the pile during driving through soil of the nature expected to cause negative skin friction
- (iv) It must resist possible upward flow due to horizontal soil pressures
- (v) The slip layer must resist significant penetration of coarse angular soil particles after driving
- (vi) It must not reduce the effective soil support needed to prevent buckling of a pile

2.0 MATERIAL PROPERTIES

The technical details of the bitumen slip layer are as follows :

- (i) Storage Life : Infinite
- (ii) Flash Point : 200°C to 250°C (Cleveland Open Cup)
- (iii) Ductility : Minimum 3cm at 25°C (ASTM D113-86)
- (iv) Pouring Temperature Limits : 150°C to 180°C
- (v) Softening Point : 80°C to 90°C (ASTM D-36)
- (vi) Chemical and Water Resistance: Resistance to water, most dilute acids, most dilute alkalis (ASTM D2314)
- (v) Lost of Heating : 0.2% by weight (ASTM D-6)

3.0 REQUIREMENTS OF BITUMEN SLIP LAYER

3.1 General

The Contractor should submit detailed method statement and materials to be used for the approval of the Engineers prior to work at site. The method statement should covers the storage, transportation, driving, remedial measures, preparation of the surface for bitumen coating and application of the bitumen coating. The types of material to be used together with all the relevant specification should also be submitted. Failure to satisfy the above requirements shall cause the method or material to be rejected and revised submission has to be made to the satisfaction of the Engineer. The method statement and materials not approved by the Engineer shall not be used at site and the Contractor will not entitle to any claim on the

loss of time and money due to the delay.

3.1 Storage

In hot weather, coated piles need to be kept in the shade to prevent creep of the slip layer. If this is not possible, the slip layer should be painted with light/heat reflective finish like bituminous aluminium paint to reflect heat. If temperatures are such that, despite precautions, excessive creep of the slip layer suspected, the piles shall be sprayed with water and/or rotated periodically.

3.2 Transport

Where coated piles have to be transported, they should be separated to prevent the slip layers sticking together. In hot weather, if the piles can not be fully covered from the sun during transportation, the bitumen coated surface should be protected with light/heat reflective paint as a precaution against prolonged exposure to heat from sun which may result in excessive creep.

3.3 Damage and Surface Irregularity

The bitumen slip layer should be continuous. If small areas of the slip layer is removed or damaged, the exposed area shall be covered back properly with the bitumen coating in the method agreed by the Engineer.

The variation of thickness shall not exceed -1mm and for an area not exceeding 30% of the total coated area of each pile. Failure to satisfy the above criteria will cause the bitumen slip layer to be rejected.

4.0 APPLICATION OF BITUMEN SLIP LAYER

4.1 Area to be Coated

The part of the pile upon which negative friction is anticipated, need to be coated. Those parts of a pile which rely primarily upon positive friction for their bearing capacity should be left untreated.

A distance of ten times the pile diameter or width from the positive skin friction or end bearing section shall be left untreated unless otherwise directed by the Engineer.

4.2 Condition of Surface to be Coated

4.2.1 Concrete and Steel Surfaces

Concrete should have cured sufficiently to achieve its required strength and should be surface-dry. Concrete piling should also be allowed to cure out of the moulds as long as possible prior to coating, to permit maximum dissipation of internal moisture. The surface should also be clean and free from laitance. Excess moisture, if trapped, could adversely affect adhesion of the bitumen slip layer.

Steel surfaces should be clean, dry and free from any poorly adhered coating, loose rust or millscale.

It is important that any surface (including primed surfaces) to which bitumen coating is to be applied, should be dry. The presence of free moisture could severely impair adhesion.

4.2.2 Priming

The concrete and steel surfaces should always be primed before application of the bitumen coating. The steel or concrete surfaces can be primed by brush or spray of about 0.2 litres/m² of penetration primer. After primed, the surface should be completely dry before over-coating. At least 24 hours or longer should be allowed to let the primer to dry completely and depends on the type of primer used. The Contractor should submit the details of the primer to be used for the approval of the Engineer.

If steel surfaces are grit-blasted down to bare clean steel, and all remaining dust/powder removed, the bitumen coating can be applied without primer with the condition that the coating is carried out immediately before the cleaned surface starts to oxidise or collect dirt. However, the Contractor should seek approval from the Engineer if priming is not to be carried out on the steel surfaces.

5.0 DRIVING OF PILES WITH BITUMEN COATING

5.1 Cracking of Bitumen Coating during Driving

To prevent cracking of the bitumen coating during driving, the stiffness modulus of the bitumen coating during driving should be less than 10⁸ N/m² with loading time of 2x10⁻² second.

5.2 Shear during Driving

To prevent shearing and displacement of the bitumen coating during driving of the piles, the stiffness modulus of the bitumen slip layer shall be higher than the following values :

Thickness (mm)	4	6	8	10
Stiffness Modulus (N/m ²)	> 6 x 10 ⁶	> 9 x 10 ⁶	> 12 x 10 ⁶	> 15 x 10 ⁶

The stiffness modulus of bitumen is temperature susceptible, care should be taken to ensure that the temperature of the bitumen slip layer during driving is within the allowable limit and the stiffness modulus is higher than the values tabulated above for different thickness.

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