

CITY OF DURBAN

STANDARD ENGINEERING SPECIFICATION

PART "ED"

ROAD ASPHALT

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PART ED : ROAD ASPHALT

ED.1 **SCOPE**

ED.1.1 Bituminous Base Course

The base course shall consist of a specified number of consolidated layers of hot continuously graded asphalt laid by an approved spreading and finishing machine. The maximum single layer thickness shall be 80 mm. A tack coat is required between layers unless otherwise specified by the Engineer.

ED.1.2 Wearing Course

The wearing course shall consist of a consolidated layer of either hot continuously graded asphalt or hot semi-gap graded asphalt laid by an approved spreading and finishing machine. A light tack coat shall be used between the previous course and the wearing course.

ED.2 **INTERPRETATIONS**

ED.2.1 Definitions

Definitions for this specification are included in Part AB : General Specifications.

ED.2.2 Supporting Specifications

The following standards are referred to in this specification:

S.A.B.S. 307 of 1972	- Penetration grade bitumen
S.A.B.S. 309 of 1972	- Anionic bitumen road emulsions
S.A.B.S. 548 of 1972	- Cationic bitumen road emulsions
S.A.B.S. 1083 of 1976	- Aggregates from natural sources

all as published in General Notice 463 dated 9 July 1982.

Asphalt Paving Manual (M.S. 8).

ED.3 **MATERIALS**

ED.3.1 Tack Coat

The tack coat shall be a spray grade 60% cationic or anionic emulsion conforming to S.A.B.S. 548 or 309 respectively.

ED.3.2 Bituminous Binder

The binder shall conform to S.A.B.S. 307 and have a penetration of 40/50.

ED.3 **MATERIALS (CONT'D)**

ED.3.3 Course Aggregate

ED.3.3.1 Continuously Graded Asphalt

- (a) Wearing Course - clean, hard, unweathered Natal sandstone conforming to S.A.B.S. 1083, Table 5 and having a Los Angeles abrasion test value of 40 maximum.
- (b) Base Course - either Natal Sandstone or grey/blue Dwyka Tillite, both conforming to S.A.B.S. 1083, Table 5 and having a Los Angeles abrasion test value of 50 maximum.

ED.3.3.2 Semi-Gap Graded Asphalt

Course aggregate shall be clean, hard, unweathered Natal Sandstone, conforming to S.A.B.S. 1083, Table 5 and having a Los Angeles abrasion test value of 40 maximum.

ED.3.4 Fine Aggregate

ED.3.4.1 Continuously Graded Asphalt

Fine aggregate shall be all the mineral matter passing the 2,36 mm sieve and retained on 0,075 mm sieve, shall consist of freshly crushed grey/blue Dwyka Tillite and shall be well graded throughout the range with a minimum sand equivalent of 40.

ED.3.4.2 Semi-Gap Graded Asphalt

Fine aggregate shall be all the mineral matter passing the 2,36 mm sieve and retained on the 0,075 mm sieve and shall consist of a clean, natural hard sand with a minimum sand equivalent of 50. Clean freshly crushed grey/blue Dwyka Tillite screening as specified in ED.3.4.1 may be added to the sand to ensure that the stability of the asphalt meets the specification.

ED.3.5 Filler

ED.3.5.1 Continuously Graded Asphalt

Filler shall consist of finely ground particles of natural freshly crushed stone or other approved commercial non-plastic material having not less than 75% passing a 0,075 mm sieve.

ED.3.5.2 Semi-Gap Graded Asphalt

Filler shall consist of natural filler from the sand plus crushed limestone or Portland Blast Furnace Cement. The mix shall contain 1% commercial filler irrespective of natural filler.

ED.3 **MATERIALS (CONT'D)**

ED.3.6 Addition of Latex Rubber Polymer to Wearing Course Mixes

Where required by the Engineer, a polymerised styrene butadiene latex emulsion shall be added to the asphalt mixes specified in clause ED.5.1 of Part ED of the Departmental Specification. The mixes shall contain 3% synthetic latex calculated on the total bitumen mass.

In the case of a Drum Mix Plant, the latex emulsion must be added to the bitumen at a pre-blending plant and the latex/bitumen delivered to the mixing site ready for use.

In the case of a Batch Mix Plant, pre-blended latex/bitumen can be used as for the Drum Mix Plant or the latex emulsion can be dosed just after the bitumen pump simultaneously with the bitumen via the bitumen feed line into the pugmill.

The unit of measure shall be tonnes (t) and shall be measured as an extra over for each tonne of asphalt wearing containing the latex. The rate shall include for supply of the latex and any additional work required in the mixing and laying process.

ED.4 **PLANT**

ED.4.1 Mixing Plant

Either an approved mechanical batch-mixing or drum-mixing plant shall be used.

If a drum-mixing plant is used, all cold aggregates shall be stockpiled separately on concrete slabs and shall be covered with a waterproof reinforced plastic cover at all times when mixing is not in progress. Natural sand aggregates shall be prescreened through a 13 mm screen before being fed into the drum-mixer. Each feed from a cold aggregate hopper must be calibrated so that the plant controller can see at any time on gauges in the control cabin, the mass of each cold aggregate falling onto the main aggregate conveyor. All thermometric equipment shall be clearly visible to the plant operator. At no time shall the mixing temperature exceed 170°C.

ED.4.2 Laying

The asphalt shall be laid by an approved self-powered, mechanical paving machine correctly adjusted.

ED.4.3 Rolling

The asphalt shall be rolled with a minimum of two approved steel wheel rollers of which one shall be a three wheel type.

ED.5 **CONSTRUCTION**

ED.5.1 Mix Requirements

ED.5.1.1 Continuously Graded Asphalt

The coarse and fine aggregate and filler shall be combined to produce a continuously graded material, the grading of which shall conform to the following:

Grading Envelope	
Sieve Size in mm	% Passing by Mass
19,0	100
13,2	96 ± 4%
9,5	82 ± 8%
4,75	60 ± 8%
2,36	44 ± 8%
1,18	32 ± 8%
0,6	23 ± 5%
0,3	15 ± 5%
0,15	9 ± 3%
0,075	6 ± 2%

Residual bitumen by mass (40/50 pen): - Specified percentage 5,0 ± 0,3%.

ED.5.1.1 Semi-Gap-Graded Asphalt

The materials of the mix when tested shall conform to the following:-

Grading Envelope	
Sieve Size in mm	% Passing by Mass
19,0	100
13,2	94 ± 6%
9,5	72 ± 8%
4,75	58 ± 8%
2,36	52 ± 8%
1,18	48 ± 8%
0,6	40 ± 8%
0,3	26 ± 6%
0,15	12 ± 4%
0,075	8 ± 2%

Residual bitumen by mass (40/50 pen): - Specified percentage 5,7 ± 0,3%.

ED.5 CONSTRUCTION (CONT'D)

ED.5.1.3 Mechanical Properties

The asphalt shall be tested by the Marshall method and shall have values within the following limits:

Stability of between 10 - 16 kN

Void 3 - 6% (for hot continuously graded asphalt)

Void 4 - 8% (for hot gap-graded asphalt)

Flow 2 - 3 mm

Stiffness : Stability
flow 3 - 6 kN/mm

ED.5.2 Trial Mixes

The Engineer may require the Contractor to supply and place in an approved portion of the roadway one or more of the mixes. In such a case approximately 25 tons of the mix shall be laid and shall be paid for at the rates in the Schedule of Quantities.

After the Engineer has approved a mix design, the type of mix, shape of grading curve and source of the aggregate used in that mix shall not be changed without the prior approval of the Engineer.

ED.5.3 Tack Coat

The approval of the surface of the underlying layer, and immediately before laying asphalt, a tack coat shall be applied by approved means at the rate of 0,3 l/m² if required by the Engineer.

The Contractor shall take whatever measures are necessary to protect concrete kerbs and channels and other street furniture from overspray.

ED.5.4 Delivery

The asphalt shall be transported to the site in vehicles having bins consisting of metal sides and bottoms. The insides of the bins shall be free of all foreign matter and be lightly oiled to prevent adhesion of asphalt. The opinion of the Engineer regarding the amount of oiling necessary shall be final. The bins shall be covered with tarpaulins or other suitable material when loaded to protect the asphalt from inclement weather and to prevent loss of heat during transportation. The temperature of asphalt on arrival on site shall be between 130°C and 170°C for mixes not containing Latex and between 140°C and 170°C for mixes containing Latex.

ED.5 CONSTRUCTION (CONT'D)

ED.5.5 Placing

The temperature of the asphalt shall be not less than 130°C when delivered to the paver.

The laid widths of wearing course shall be so arranged that longitudinal joints shall coincide with future lines marking traffic lanes in the roadway.

ED.5.6 Joints and Compaction

The preparation of joints and the compaction of asphalt shall be done in accordance with methods described in the latest edition of the Asphalt Paving Manual (M.S.8) relating to joints and compaction. Rolling shall commence before the temperature of the asphalt falls below 100°C.

Where the new surfacing is required to tie into the existing road surface the joint shall depend on the class of road.

Generally joints shall consist of one of the following types which shall be billed separately in the Schedule of Quantities:

- (a) Transverse Joint: The joint is to be formed by milling out an area 3 m wide over the full width of the existing roadway, the area to be tapered from 0 to -40 mm in depth.
- (b) Longitudinal Joint: The joint is to be formed by cutting into the existing road surface by 150 mm to a depth of 40 mm where the new surfacing is to be tied longitudinally into the adjacent existing pavement.
- (c) Feathered Transverse Joint: The joint shall be formed by cutting a 50 mm wide by 30 mm deep key into the existing surface. The new wearing course shall be tapered over to tie in at the key a distance of not less than 1,0 m.

The position of the joint shall be indicated by the Engineer on site.

After cutting/milling the joint shall be swept of all loose material and painted with a tack coat.

Cutting of the joints shall only take place immediately prior to the laying of the wearing course.

ED.5.7 Minimum Lengths to be placed

Where possible a minimum length of 100 m of base course or 200 m of wearing course shall be placed at any one time. The delivery shall be at a uniform rate and shall be within the capacity of the paver and compaction equipment to ensure that the paver works continuously.

ED.6 **TOLERANCES**

ED.6.1 **Bituminous Base Course**

The base course layer shall be tested to comply with the following requirements:

(a) **Thickness**

The average thickness of completed base course layer in any section, as determined from a minimum of five test holes, shall not be less than the thickness specified. The allowable tolerance at any one test hole shall be $\pm 10\%$ of the specified thickness.

(b) **Smoothness**

The maximum number of surface irregularities permitted with a 3 m rolling straight edge shall be as follows:

- | | |
|------------------------|------------------------|
| (i) In any 300 m | (ii) In any 75 m |
| 4 mm and above - 40 | 4 mm and above - 18 |
| 7 mm and above - 4 | 7 mm and above - 2 |
| 19 mm and above - None | 10 mm and above - None |

(c) **Accuracy of Levels**

The elevation tolerance shall be as specified under Part "DA" Earthworks Bulk - clause DA.6(d) except that the standard deviation of the differences between the actual and design levels shall not be greater than 6 mm.

ED.6.2 **Wearing Course**

The wearing course shall be tested to comply with the following requirements:

(a) **Thickness**

A tolerance of 5 mm will be allowed above or below the design levels for any single reading.

(b) **Smoothness**

The minimum number of surface irregularities permitted with a 3 m rolling straight edge will be as follows:-

	CATEGORY A ROADS		CATEGORY B ROADS		CATEGORY C ROADS	
LENGTH	300 m	75 m	300 m	75 m	300 m	75 m
4 mm and above	10	4	20	9	40	18
7 mm and above	1	1	2	1	4	2
10 mm and above	Nil	Nil	Nil	Nil	Nil	Nil

The category of the roads in this contract will be as described in Part AA : Project Specification.

ED.6 TOLERANCES (CONT'D)

ED.6.3 Rectification

The full depth of the layer shall be removed and replaced with fresh material laid and compacted to specification.

Where the surface level is too high or too low the area rectified shall be not less than one lane wide and at least 5 m long for base course and 15 m long for wearing course.

Where the number of surface irregularities exceeds the specified limits the area to be rectified shall be 300 m long and not less than one lane wide.

ED.7 TESTING

The following minimum tests shall be carried out by the Engineer or by an independent materials testing laboratory employed by the Engineer:

NATURE	FREQUENCY OF TESTING
(a) Penetration and softening point of binder	1 test per day
(b) Temperature of mix in °C	Every load as it arrives on site
(c) Marshall density (C.D.M.)	1 test per 200 tons of output or part thereof per day
(d) Marshall stability in kN	1 test per 200 tons of output or part thereof per day
(e) Marshall flow in mm	1 test per 200 tons of output or part thereof per day
(f) Bitumen content in % by mass of mix	1 test per 200 tons of output or part thereof per day
(g) Mixed aggregate grading analysis	1 test per 200 tons of output or part thereof per day
(h) Density of laid asphalt using a Nuclear Testing Device	7 tests per section paved

The density of the layer shall satisfy the following:

$$X \quad 96\% \text{ Marshall Density} + 0,5 S \text{ where} \quad \begin{array}{l} X - \text{arithmetic means of densities} \\ S - \text{standard deviation} \end{array}$$

A copy of the test results will be handed to the Contractor as soon as they are available but not later than 48 hours after the asphalt is laid.

ED.8 MEASUREMENT AND PAYMENT

ED.8.1 Asphalt Base Course

Measurement shall be tons (t) as recorded on printed weigh-bridge tickets.

The rates tendered for the asphalt shall cover all materials, storage, handling, mixing, transporting, sweeping the previous surface where necessary, spreading, jointing, compacting, protection to adjacent concrete kerbing, paving and street furniture, and testing other than those tests carried out by the Engineer in accordance with the specification.

ED.8.2 Asphalt Wearing Course

The unit of measure shall be tons (t) as recorded on printed weigh-bridge tickets. Item coverage shall be as specified in ED.8.1.

ED.8.3 Tie in Joints

ED.8.3.1 Transverse Joint

The unit of measurement shall be the linear metre (m). The rate tendered shall cover the neat cutting of the joint, removal of the old premix to tip off site.

ED.8.3.2 Longitudinal Joint

The unit of measure is the linear metre (m) with the item coverage as detailed in ED.8.3.1.

ED.8.3.3 Feathered Transverse Joint

The unit of measure is the linear metre (m) with the item coverage as detailed in ED.8.3.1.

ED.8.4 Tack Coat

The unit of measurement shall be square metres (m²). The rate tendered shall include for sweeping the previous surface where necessary, protecting the adjacent concrete kerbing, inlet covers and street furniture and testing in accordance with the specification. The application rate shall be 0,3 l/m².