

# **STANDARD SPECIFICATION FOR UN-HOUSE PREMISE ASPALT CONCRETE OVERLAYING WORKS**

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## **Scope**

This clause covers the materials, method of construction and requirement for the construction of asphalt concrete.

## **Definition**

Asphalt concrete means a thoroughly controlled, hot-mixed, hot-laid, plant mixture of well graded dried aggregate and penetration grade bitumen, which, when compacted, forms a dense material.

## **Preparation of Surface**

Immediately before placing the bituminous mix in the pavement, the existing surface shall be cleaned of all loose materials and foreign with mechanical brooms or by other approved methods. The debris shall be deposited well clear of the surface to be covered.

Any defect of the surface shall be made good and no bituminous mix shall be laid until the surface has been approved by the Engineer.

If instructed by the Engineer a tack coat shall be applied in accordance with Clauses 1301 and 1302. If the Engineer considers a tack coat is required prior to laying the bituminous mix or between layers of the bituminous mix, due solely to the Contractor's method of working, then such tack coat shall be at the Contractor's expense.

## **Design And Working Mixes**

The contractor shall demonstrate that he can produce aggregates meeting the grading requirements of Specification.

At least one week prior to commencing work using a bituminous mix, the contractor shall, having demonstrated that he can produce aggregates meeting the grading requirements of the specification, submit samples of each constituent of the mix to the Engineer.

The maximum size of the aggregate for wearing course shall equal to or less than the thickness of wearing course divided by 2.5 and that for binder course shall equal to or less than thickness of binder course divided by 2.

The contractor shall then carry out laboratory tests in order to propose the proportions of each constituent of the initial mix or mixes to be used for site trials to be carried out in accordance with sub-clause 1307 (5)

## **Transportation of The Mixture**

The bituminous mix shall be kept free of contamination and segregation during transportation. Each load shall be covered with canvas or similar covering to protect it from dust and adverse effect of the weather.

## **Laying of Mixture**

Immediately after the surface has been prepared and approved, the mixture shall be spread line and level by the laying plant without segregation and dragging.

The mixture shall be placed in widths of one traffic lane at a time, unless otherwise agreed by the Engineer. The compacted thickness of any layer shall be at least 2.5 time the maximum size of the aggregate for wearing course and at least 2 time the maximum size of the aggregate for binder course.

Only on areas where irregularities or unavoidable obstacles make the use of mechanical laying impracticable, the mixture may be spread and compacted by hand.

## **Compaction**

Immediately after the bituminous mixture has been spread, it shall be thoroughly and uniformly compacted by rolling.

The layer shall be rolled when the mixture is in such a condition that rolling does not cause undue displacement or shoving. The number, weight and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. The sequence of rolling operations shall be as agreed with the Engineer.

Initial rolling with a steel tandem or three-wheeled roller shall follow the laying plant as closely as possible. The rollers shall be operated with the drive roll nearest the laying plant, at a slow and uniform speed (not exceeding 5 km/h).

Rolling shall normally commence from the outer edge and proceed longitudinally parallel to the centerline, each trip overlapping one half of the roller width. On super elevated curves, rolling shall begin at the low side and progress to the high side. Where laying is carried out in lanes care must be taken to prevent water entrapment.

Intermediate rolling with a pneumatic tyred or vibratory roller shall immediately. Final rolling with a steel wheeled roller shall be used to eliminate marks from previous rolling.

To prevent adhesion of mixture to rollers, the wheels shall be kept lightly moistened with water. In areas too small for the roller, a vibrating plate compactor or a hand tamper shall be used to achieve the specified compaction.

## **Finishing, Joints and Edges**

Any mixture that become loose and broken, mixer with dirt or foreign matter or is any way defective shall be replaced with hot mixture, which shall be compacted to conform with the surrounding area.

Spreading of the mixture shall be as continuous as possible. Transverse joints shall be formed by cutting neatly in a straight line across previous run to expose the full depth of the course. The vertical face so formed shall be painted lightly with hot 80/100 penetration grade bitumen just before the additional mixture is placed against it.

Longitudinal joints shall be rolled directly behind the paving operation. The first lane shall be placed true to line and level and have an approximately vertical face. The mixture placed in the abutting lane shall then be tightly crowded against the face of the previously placed lane. The paver shall be positioned to spread material overlapping the joint face by 20-30mm. Before rolling, the excess mixture shall be raked off and discarded.

When the abutting lane is not placed in the same day, or the joint is destroyed by traffic, the edge of the lane shall be cut back as necessary, trimmed to line and painted lightly with hot 80/100 penetration grade bitumen just before the abutting lane is placed.

Any fresh mixture spread accidentally on the existing work at a joint shall be carefully removed by brooming it back on to uncompacted work, so as to avoid formation of irregularities at the joint. The finish at joints shall comply with the surface requirements and shall present the same uniformity of finish, texture and density as other sections of the work.

The edges of the course shall be rolled concurrently with or immediately after the longitudinal joint. In rolling the edges, roller wheels shall extend 50-100mm beyond the edge.

#### Tolerances

Surfacing and base shall be constructed within the geometric tolerances specified in section 1100.

The contractor shall maintain the composition of the mixture as determined from the laboratory and site trials within the following tolerances, per single test:-

- a> Bitumen Content :  $\pm 0.3\%$  of ] (Total weight of bitumen in total mix]
- b> Aggregates
  - i> Passing through 10mm sieve and larger sieve]  $\pm 0.6\%$  \*total wt of aggregate& filler material
  - ii> Passing through 10 mm sieve and retained on 1mm sieve](  $\pm 0.4\%$  \*total wt of aggregate& filler material)
  - iii> Passing through 1 mm sieve and retained on 0.75mm sieve](  $\pm 0.3\%$  \*total wt of aggregate& filler material)
  - iv> Passing through 0.075 mm sieve](  $\pm 0.2\%$  \* of filler material)

The average amount of bitumen in any length of any layer, calculated as the product of the bitumen contents obtained from single tests and the weight of the mixture represented by each tests, shall not vary beyond the limit of tolerance of the amount specified.

The average amount of bitumen for each day's production calculated from the check weights of mix shall not vary beyond the limit of tolerance of the amount specified.

The final average overall width of the upper surface of a bituminous mix layer measured at six equidistant points over a length of 100m shall be at least equal to the width specified. At no point shall the distance

between the centerline of the road and the edge of the upper surface of a bituminous mix layer be narrower than that specified by more than 13mm.

#### Measurement and payment

No separate measurement and payment shall be made for complying with the requirements of the clause 1307. The contractor shall allow compensation for compliance of the clause 1307 in the rates of items covered by clauses from 1308 to 1311.

### **Construction plant for pavement work**

#### a> Bitumen Distributer

Bitumen distributer shall be truck mounted and shall have sufficient power to maintain uniform speeds for the proper application of the binder. The truck shall be equipped with an accurate tachometer showing the driver the speed in meters per minute. The truck shall be fitted with a gauge bar and chain or any other acceptable device clearly visible to the driver to enable him to follow the required edge. The distributer tank shall have a capacity of at least 4000 liters and shall be fitted with a device for indicating the quantity temperature up to 200 °C and be fitted with an accurate thermometer.

The circulation system shall permit pumping around the spray bar without actually spraying. Spray bars shall be available for spraying in widths varying from 0.5m to 4m and shall be adjustable transversely so that the operator can follow the required edge independently. The spray nozzles shall be arranged to give a uniform spray and the shut off shall be quick-acting with an antidrip device. The pressure in the spray bar shall be sufficient to give a good distribution and spraying of the binder.

Distributors shall be capable of applying bituminous binder within the limits of  $\pm 5\%$  of the specified rate of application over any portion of the surface.

Distributors shall be checked and calibrated before starting any work or when required by the engineer. This shall include the calibration of all the metering devices and checking the uniformity of the transverse distribution of spray. All distributors shall be furnished with a “rate of spray/machine speed” chart.

#### b> Chip-Spreaders

Mechanical chip-spreaders shall be capable of spreading the chippings uniformly over variable widths, from 0.5 to 3.5m, at the rates specified.

The number and output of chip-spreaders shall be sufficient to ensure that chippings are spread immediately after the bituminous binder has applied.

Chip-spreaders shall be checked and calibrated before starting any work or when required by the engineer.

#### c> Rollers

The main rolling shall be carried out with self-propelled pneumatic tyred rollers, having a wheel-load of more than 2 tonnes. The tyres shall be smooth and their pressure shall be more than 0.4N/mm<sup>2</sup>.

Where approved by the engineer steel-wheeled rollers shall be used in tandem with pneumatic tired rollers after all excess chippings have been removed and insufficiently chipped areas have been chipped over. Only steel-wheeled rollers weighing less than 8 tones (total weight) shall be accepted.

The number and output of rollers shall be sufficient to ensure that rolling does not lag behind spreading. To the extent possible, two pneumatic tired rollers shall be used for each chip spreader.

d>      **Miscellaneous Equipment**

Sufficient trucks and loading machinery shall be employed to ensure an adequate, prompt and continuous supply of chippings.

Rubber typed mechanical rotary brooms towed by or mounted on rubber tired vehicles shall be provided. Tractor toed air compressor with sufficient length of hose pipes and air het nozzle shall be provided to ensure sufficient cleaning of surface to be sprayed with bituminous layers.

### **Preparation of surface**

Immediately before spraying, all loose material and foreign matter shall be removed by through brushing with mechanical brooms and/or washing or by use of compressors or by other methods acceptable to the engineers. All hardened mud or other foreign matter shall be loosened by scraping before sweeping. The debris shall be deposited well clear of the surface to be sprayed. Road furniture (manholes covers etc.) shall be covered with adhesive paper or similar materials. Kerbstones, road side, and any other objects what shall not benefit from binder spray shall be protected in a manner approved by the engineer.

Any defect of the surface shall be made good as instructed by the engineer and no binder shall be sprayed until the surface has been approved by the engineer. The engineer's approval or otherwise of the surface shall be given immediately prior to the Contractor's intension to start spraying.

### **Application of surface dressing**

Soon after the surface has been prepared and approved, the quantity of binder, chippings, requirement of equipment and other resources shall be worked out so that any operation is not delayed due to lack of required material or resources.

The binder shall be uniformly sprayed at the specified rate. Spraying of the binder shall be in accordance with the requirements specified in sub-clause 1301(4). Spraying shall not be carried out later than 12hours after the surface has been prepared.

Building paper of sufficient width (not less than 600mm) or other approved protective material shall be used at the start and finish of each spray run to enable the distributor to reach its calibrated road speed. Each spray jet shall be kept open before discharging binder onto the pavement under treatment.

Ends of previous surface treatment run shall be trimmed back to make the traverse edge straight and to clean it. This shall form the start point of the subsequent spray run. The spray run shall be limited to 300m of length unless contractor demonstrates his ability to plan and execute longer length without impairing quantity of work. Spray width shall be calculated allowing for 150mm longitudinal overlap with adjoining spray passes and for the width that the following chipping spreader is able to cover. Longitudinal sprayed

butt joint shall not be permitted. The contractor shall submit his spray width and length proposals to the engineer for approval.

The spraying width shall normally be of one lane width so that construction traffic may run over the other lane.

Immediately after the binder has been sprayed, clean and dry chippings shall be uniformly applied at the specified rate by the use of mechanical chip-spreaders. The elapsed time between the spraying of binder and spreading of chippings shall in no case exceed one minute.

Shall it come apparent that the supply of chippings is about to fail, the binder spraying shall be immediately stopped and shall not resume until an adequate supply of chippings is assured.

The correct rate of spread is generally assessed visually, as providing complete coverage, with the film of binder still visible between the chippings. Should the coverage appear to be incorrect, the contractor shall immediately inform the engineer, who shall amend the rate of spread accordingly. Any excess of chippings shall be removed by hand and any insufficiently chipped area shall be chipped over by hand, so that adequate coverage is obtained. Brooming of the material to effect redistribution of chippings shall not be permitted.

Rolling shall begin immediately after the chippings have been spread and in no case later than two minutes after the application of binder.

Rolling shall continue until all chippings are firmly embedded into the binder and until all excess chippings have been removed or insufficiently chipped areas have been chipped over. The number of passes shall be agreed with the engineer. Usually, each point shall receive at least 6 passes of pneumatic tired roller.

Excessive rolling, resulting in crushing of chippings shall be avoided. The roller speed shall not exceed 8km/hr, unless otherwise directed by engineer. Additional rolling on a previously completed section shall be given later in the heat of the day by pneumatic tired rollers in tandem with steel three wheeled rollers unless otherwise instructed by engineer.

#### **Rectification of defects:**

If any defect in surface dressing work is found, the reasons of the defect shall be established and keeping them in view the defect shall be rectified as per direction of the engineer. If required, the engineer shall ask the contractor for redoing the defective portion.

The contractor shall rectify or redo the defective work at its own expense.

#### **Tolerances**

The final average overall width of the surface dressing measured at six equidistant points over a length of 100 m shall be at least equal to the width specified or instructed. At no point shall the distance between the centerline of the road and the edge of the surface dressing be narrower than that instructed by more than 13mm.

The actual rate of application of binder across the lane width shall not vary by more than  $\pm 5\%$  of the rate ordered and for each single run of the spray it shall not vary from the specified rate by more than 0.03 lit per square meter.

The actual rate of application of chippings along and across the lane width for each single run of the chip-spreader shall not vary by more than  $\pm 5\%$  of the rate ordered.

#### **1204 CRUSHER-RUN MACADAM FOR BASE**

Scope This work shall consist of furnishing, placing and compacting crushed stone aggregate sub-base and base courses constructed in accordance with the requirements set forth in this Specification and in conformity with the lines, grades, thickness and cross-sections shown on the plans or as directed by the Engineer. (2) Materials The material to be used for the work crushed rock. If crushed gravel/shingle is used, not less than 90 percent by weight of the gravel/ shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. It shall be from any organic matter and other deleterious substances and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base. The aggregates shall confirm to the grading and quality requirements given in Tables 12. 8 and 12.9 The grading to be adopted shall be as indicated in the C

**Table1: Aggregate Grading Requirements**

Sieve size	Percentage Passing by weight	
	53 mm nominal size	37.5 mm nominal size
63 mm	100	
22.4 mm	87 – 100	100
5.6 mm	50-85	90 – 100
0.71 mm	25 – 45	35 – 55
0.09 mm	10 – 25	10 – 30
	2- 5	2-5

**Table12.9: Physical requirement s of Coarse Aggregates for Crusher run material Base**

	Test	Test method	Requirements
1	Loss Angeles Abrasion Value(LAA) Or Aggregate Impact Value ( AIV)	IS: 2386 -4	40 max 30 max
2	Combined Flakiness and Elongation index	IS: 2386 -1	35 max
3	Water Absorption	IS: 1386 -3	2 % max
4	Liquid limit of material passing 425 micron	IS: 2720- 5	25 max
5	Plasticity index of material passing 425 micron	IS: 2720- 5	6 max

Note:

1. If the water absorption is more than 2 % , soundness test shall be carried out as per IS: 2386 -5
2. To determine combined portion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non flaky) stone metal. Elongation index is weight of elongated particles divided by total non flaky particles. The value of flakiness index and elongation index so found are added up.

### **(3) Construction Operations**

#### **(i) Preparation of sub-grade**

The surface of sub-grade shall be prepared in accordance with procedure mention in water bound macadam. Any ruts, deformations or soft yielding places which occur in the sub-base or sub-grade shall be corrected and compacted to the required density before the aggregate base course is placed thereon

(ii) Spreading, Watering, Mixing and Compaction The aggregate shall be uniformly deposited on the approved sub-base by means of hauling vehicle with or without spreading devices. Aggregate will be distributed over the surface to the depth specified on the drawings or as directed by the Engineer. After the base course material has been deposited, it shall be thoroughly blade- mixed to full depth of the layer by alternately blading the entire layer to the centre and back to the edges of the road. It shall then be spread and finished to the required cross section by means of a motor grader. Water shall be applied prior to and during all blading and processing operations to moisten the material sufficiently to prevent segregation of the fine and coarse particles. Water shall be applied sufficient amounts during construction to assist compaction. Compaction shall commence immediately after to placement of the base. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer up to 200 mm the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity. The speed of the roller shall not exceed 5 km/h. Each layer of material shall be compacted to not less than 98 per cent of the maximum density as determined by IS: 2720 (Part - 8).

### **(4) Surface Finish and Quality Control of Work**

The surface finish of construction shall conform to the requirements of section 1100. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 500.

### **(5) Measurement**

Crusher-run macadam base shall be measured in cubic meter by taking cross Sections at intervals of 20 meters or as directed by the Engineer in the original position before the work starts and after its completion and computing the volumes in cubic meters by average end area method.

### **(6) Payment**

The Crusher-run macadam base construction shall be paid at their respective contract unit rate. In addition to stated in Clause 112, the contract unit rate shall be also the full and the final compensation for cost of



making arrangement for traffic control and other costs required to complete the work complying with the requirement of Section 500, 800 and Clause 1204.

### **1401 CONCRETE KERBS**

**(1) Scope**

This Clause covers the works for construction of kerbs in the central median and/or along the footpaths or separators.

**(2) Materials**

The kerbs shall be provided in cement concrete of grade M 20/20 in accordance with Section 2000. These shall be either precast concrete blocks or cast-in-situ concrete. Cement sand mortar used for bedding and joint shall be in 1:3 ratios and shall comply with the Sub-clause 2502 (2).

**(3) Laying**

The kerbs shall be laid on either concrete or compacted sand-gravel as indicated in the Drawing. In the case of concrete, it shall consist of grade M 10/20 or m 10/40 (as defined in Section 2000) laid to the dimensions, lines and levels shown in the Drawing and well compacted by ramming or other means. The foundation shall have a projection of 50 mm beyond the kerb in plan. Before laying the foundation of lean concrete, the base shall be leveled and slightly watered to make it damp. In the case of a sand gravel it shall consist of a material approved by the Engineer having a property complying with Clause 1201. The kerb shall then be laid out and bedded on 12 mm thick cement sand mortar of 1:3 ratios.

**(4) Tests and Standard of Acceptance**

Concrete shall be tested in accordance with Section 2000 and shall meet the specified criteria. All kerbs shall be laid true to the lines and levels shown on the Drawing or as instructed by the Engineer.

**(5) Measurement**

Concrete kerbs shall be measured in linear meter. Concrete and/or sand-gravel foundation shall be measured in cubic meters. Excavation for foundation shall not be measured. It is deemed included in the measurement of kerbs.

**(6) Payment**

The concrete kerbs measured as above shall be paid at the contract unit rate which shall be the full and the final compensation to the Contractor as per Clause 112 including cost for excavation and backfilling, if any, and all other incidental costs so as to complete the work as specified. Concrete and/or sand-gravel foundation shall be paid for separately, as provided under respective Sections of these Specifications.