

4.1 CONSTRUCTION TECHNIQUES PRACTICES OF FLEXIBLE AND CONCRETE PAVEMENT

WATER BOUND MACADAM ROAD

Excavation

The box cutting shall be done in such a way, that the width of cutting is exactly that of the sub-base width. The depth of cutting shall be total thickness of sub-base, consolidated soling, road metalling and bituminous wearing course.

Preparation of the Subgrade

After the box cutting is completed the formation shall be watered and rolled to a proper gradient and camber with a road roller of 8 to 10 tonnes weight minimum, for thorough compaction, care shall be taken to avoid excessive rolling of the formation



Preparation of the Sub-base

- After rolling of the subgrade is completed, the granular sub-base material shall be laid in two separate layers of 150mm and 200mm respectively and consecutively or as specified in the drawing and as instructed by Engineer In Charge.
- The first layer of 150mm, shall be laid over the compacted sub-grade between the edges of box-cutting, watered and rolled to a proper gradient and camber with a road roller of 8 tonnes weight minimum for thorough compaction to achieve a CBR value greater than 20%.
- Subsequently the second layer of 200mm shall also be laid over the first layer, watered and rolled to a proper gradient and camber with 8 tonnes road roller and thoroughly compacted with a CBR value of 10% is achieved. Excessive rolling shall be avoided.



Base Course

- The stones shall be laid closely packed to the profile of the finished road surface in such a way that these shall not move under pressure.
- A thin cushion of murrum shall be placed over the sub-base and packed with the stone. The joints shall preferably be staggered. Soling shall commence from edges and proceed towards the center.
- The profile of the soling shall frequently be checked with templates as the laying progresses. When a sufficient length of soling has been laid this shall be watered and packed with a power road roller of not less than 8 tonnes capacity and the surface shall be evened by blinding with small pieces of stone and chipping during rolling.
- A final thin cushioning with murrum shall be spread over the surface and watered and lightly rolled. Rolling shall be continued till the required compacted thickness is obtained.



Wearing course

- Road metal from road side stacks shall be raked on to the carriage way soling course directly. Spreading shall be done to the specified camber and thickness, but never more than 100mm at a time to make a consolidated thickness of at least 75mm after rolling.
- Two such layers shall be spread and consolidated separately but consequently to form a total compacted thickness of 150mm.
- The surface so laid in each layer shall be checked up by means of wooden templates and spirit levels placed every 6 to 7 meters, the top surface being dressed up and hand packed with smaller pieces of stone between successive templates. Transition strips and curves shall be checked up very carefully



Dry-Rolling

- When spreading has been done for a sufficient length (not less than 15M) and checked up with templates, dry rolling shall be started with a power road roller of 8 tonnes minimum weight, to obtain perfect inter locking of the adjacent pieces of stones.

Adding Screenings

- When the desired degree of compaction has been obtained by dry rolling screenings of approved stone chippings shall be spread uniformly over the surface by brooming and these shall be pushed into the interstices by rolling, successive layers of screenings being added till no more chippings are taken up by the surface.
- Any unevenness observed shall be rectified by removing stones to a depth of 50 to 75mm, refilling the same, hand packing and re-rolling. No watering shall be done till the process is complete.

Spreading of blindage and wet rolling

- Approved quality blindage such as murrum or sandy loam shall then be spread uniformly over the surface to a thickness of about 12mm, copiously watered and rolled.
- The roller wheels as well as the road surface shall be constantly watered during the wet rolling and any stone piece picked up shall be replaced by hand.
- The rolling shall be continued until a slurry is formed over the entire surface and the same moves in a wave in front of the roller wheels as it moves, when rolling may be stopped and the surface allowed to dry.
- The finished surface shall be smooth and uniform, free from waviness and corrugations and as per specified profile and camber.

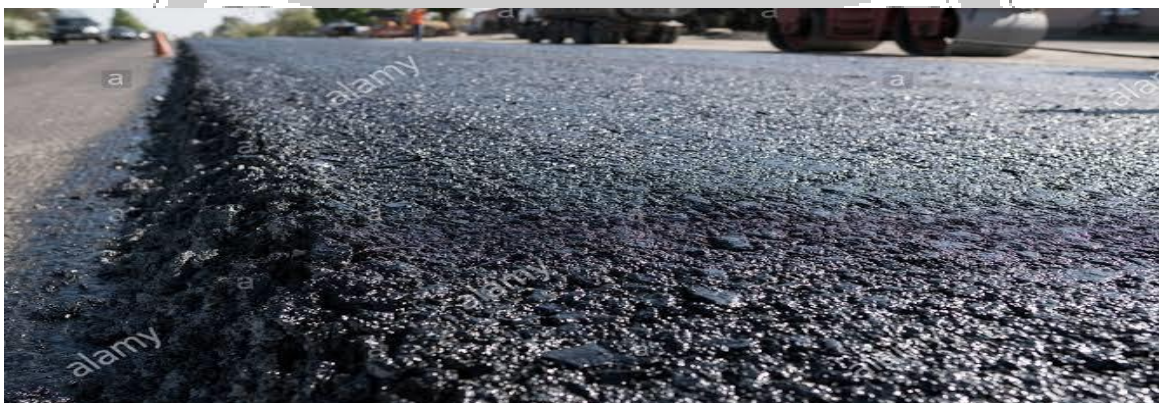
Finishing, curing and opening up the road to traffic

- After 24 hours of wet rolling, the surface shall be covered with a thin layer of sand (about 12mm thick) for curing.
- Ordinarily the newly consolidated surface shall not be opened to traffic till it is dry which may take 2 to 4 days depending on weather conditions. As the surface dries up the road maybe opened to traffic

BITUMINOUS ROAD

Preparation of Existing Water Bound Macadam Surface:

- The existing water bound macadam surface shall be brushed, cleaned properly with wire brushes and coir brooms, so as to free from all loose materials, murrum, earth, silt and caked mud etc.
- If during the process of cleaning the sub grade (water bound macadam), soft spots and pockets, hollows etc. are found, such spots/pockets will be filled with approved precoated bituminous chips, consolidated and finished to proper level, rolled with power roller if necessary.
- The pot holes shall be excavated properly in a rectangular or rhomboidal shape with vertical edges.
- The bottom and sides shall be cleaned as stated above. The sides and bottom shall then be thoroughly painted with heated 80/100 penetration bitumen.
- The pot hole shall thereafter be filled with premixed bituminous chips so that after thorough tamping and rolling, the surface is flush with surrounding road surface.



HOT MIXED HOTLAID BITUMINOUS ROAD:

Tack Coat: Bitumen of the grade as specified in the Schedule of Quantities shall be heated to a temperature of 1630 C to 1770 C (3250 F to 3500 F) in a bitumen boiler and the hot bitumen shall be applied evenly to the thoroughly cleaned and prepared road surface (as specified here- in-before) @ 8.5 kg. per 10 sqm.

- Leaving no part of the surface unpainted. Application shall be done by a mechanical pressure sprayer or if permitted, by perforated pouring cans.
- The tack coat shall be applied just before the macadam is laid. Application of tack coat shall be only slightly in advance of laying premixed chips. In case of surface already asphalted application of tack coat is not necessary.

Compaction : The base bituminous macadam course shall be compacted thoroughly and evenly with 8 to 10 tonne power roller immediately after it is laid. Compacted thickness shall be as specified in schedule of quantity.

- The surface shall be checked for correct grade during and after rolling.
- Any irregularities shall be corrected by adding precoated chips or removing the surplus.
- The disturbed surface shall be well compacted again. If necessary,
- the roller wheel shall be coated with oil to prevent the coated chip from sticking to the wheels.
- Rolling shall be continued till no wheel marks are left on the surface.

CEMENT CONCRETE ROAD

The various construction steps for laying of cement concrete pavement slab are describe below:-

- Preparation of sub grade
- Preparation of base course
- Placing of form work
- Watering of surface
- Mixing and placing of concrete
- Compaction and finishing
- Belting, Brooming and Edging
- Curing
- Opening to traffic

Preparation of sub grade

The sub grade is the natural soil which is properly compact by rollers and is brought to require camber and gradient. The cross and longitudinal profile should be check by suitable templates.

Preparation of base course

Over the prepare subgrade, base course or sub base course is sometimes providing. In certain cases, where the bearing capacity of subgrade soil is high, base or sub base layer may be omitting. The base for a concrete road may be WBM surface, compact granular material layer or stabilise soil base. The base or sub base layer not only provides a smooth level surface and a supporting layer, but it also reduces the thickness of concrete slab.

Placing of form work

After preparing the base, form work for concrete slab pavement is lay. The forms can be of steel or timber. The depth of form work should be equal to the thickness of slab. Form work should be rigidly fix in position and must be well in advance from the point where concrete mix is to be place. It should be oil properly from inside and must be check to line and grade.

Watering of surface

After laying form work, the surface of base or subgrade must be wet with water before placing of concrete mix. Water should not be allowed to stand on the surface during wetting operation. The main function of watering is to saturate the surface completely so that it should not absorb any water from the concrete mix.

Mixing and placing of concrete

The ingredients of concrete such as cement, sand and coarse aggregates are mix in a dry state in the ratio 1 2: 4. The mixing should be doing preferably in a concrete mixer. The



water should be adding in a measure quantity to obtain the design water cement ratio.

The concrete mix is place in the lay form works by manual labour and it should be deposit in layers of thickness not more than 50 mm to 80 mm. The concrete mix should be lay on the entire width of the form work and always proceed lengthwise. The technique of construction may be alternate bay or continuous bay method. The top most layer should be lay 6 mm to 12 mm higher than the specify profile for further tamping work. The require transverse and longitudinal joints should be provide and it should be ensure that the top layer is lay to the desired camber and gradient.

Compaction and finishing

After placing of concrete mix, it should be compact by vibrating hand screeds or hand tampers. For large scale construction work, power drive vibrators or machines may be use. The hand tampers are use across the bay and tamping of the surface is doing along the length of the bay.

Hand tampers for compaction of concrete mix

For finishing the concrete surface, wooden hand floats are usually used. The main function on floating is to develop a uniform and even surface pavement devoid of any waves or corrugations. The floating is always doing in longitudinal direction. Float is held in position parallel to the centre line of pavement and move gradually from one side to the other. Straight edge with 2 handles is use to check the finish pavement surface for its grade and level in longitudinal direction.



Belting, Brooming and Edging:

Belting is do in transverse direction to the carriage way by a 150 to 300 nm wide strip of canvas or rubber fit with handles at both ends. The belting is doing to finish the surface of concrete just before the concrete sets or hardens.

Canvas belt for finishing

After belting, brooming of pavement surface is carrying out immediately with a fibre broom brush. Brooming is carrying out, to make the pavement surface rough and non-slippery having skid resistance. After brooming, edging tool is use for rounding the transverse and longitudinal edges of the pavement slab. The process of edging is carrying out before the concrete mix develops initial Setting.

Curing

Initial curing of finish pavement is carry out after 12 hours by covering the surface with gunny bags which are keep wet for at least one day. For final curing, gunny bags are removing and surface is cover with a sandy layer which is keep wet for at least 14 days. Curing of finish pavement may also be carry by:

Application of liquid impervious membrane.

Ponding method in which whole surface is dividing into small bays by forming earthen banks which are fill with water. After curing is complete, a surface is clean properly and washes.

Opening to traffic

Road pavement is open to traffic after 28 days of curing slab or even earlier when the concrete has attained require strength. During this period, brick edging is constructing to protect the slab. Earth may be spread on the berms up to the top of brick edging to disallow the traffic.

