

## East Central Railway

Office of the  
General Manger (Engg)/Hajipur



### PCE's CIRCULAR No- 21/2007/WORKS

#### **Sub-Preference to Cement Concrete Road in waterlogged areas.**

Bituminous roads are prone to early/severe damage in waterlogged area. In colonies and other railway premises it is being noticed that bituminous road are getting very frequently damaged at such locations during monsoon causing inconvenience to the residents and other users.

**Henceforth it is decided that in the waterlogged area where reason of water logging is primarily due to the area being low lying and not the absence of adequate drainage works, only concrete road as per specification attached the (rough sketch and as annexure-A & B) are to be constructed with the following specification:-**

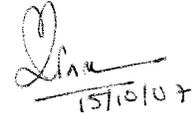
- a) The concrete roads are to be constructed in stretches in entire width of the road and not as a patchwork.
- b) **The concrete roads are to be used only for roads not more than 2.5m in width. For road wider than 2.50m specific approval of THOD is required.**
- c) Concrete roads are to be used for such street roads even in non-water logged areas where mechanical rolling of bituminous road is not feasible,
- d) At all those locations where water logging is due to drainage problems, any repair/construction of roadwork should be done along with the required drainage.

Enclosure: Annexure-A ( Rough Sketch)  
Annexure- B (Specification)

Docket No- W-2/118/09/Works Policy, 574

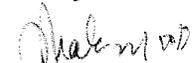
Copy-

1. CAO/Con/N, CAO/Con/S/MHX for information Pl.
2. DRM/DNR, DHN, MGS, SPJ & SEE for information pl.
3. Sr.DEN/ (Co-ord)/DNR, DHN, MGS, SPJ & SEE for information and necessary action.
4. All HOD/Engg Deptt/ECR

  
15/10/07

**(A.K.DUBEY)**  
**Chief Engineer/Works**

Date- 15.10.07  
23

  
Dy Chief Engineer/Works  
For General Manager (Engg)

Annexure - A

100mm THICK C.C. 1:2:4

150mm THICK ROAD METALLING

BERM 1M WIDE

1 IN 60

BRICK ON EDGE LINING

PREPARED SUB GRADE

ROAD WIDTH

## NEW ROAD

BERM 1M WIDE

1 IN 60

100mm THICK C.C. 1:2:4

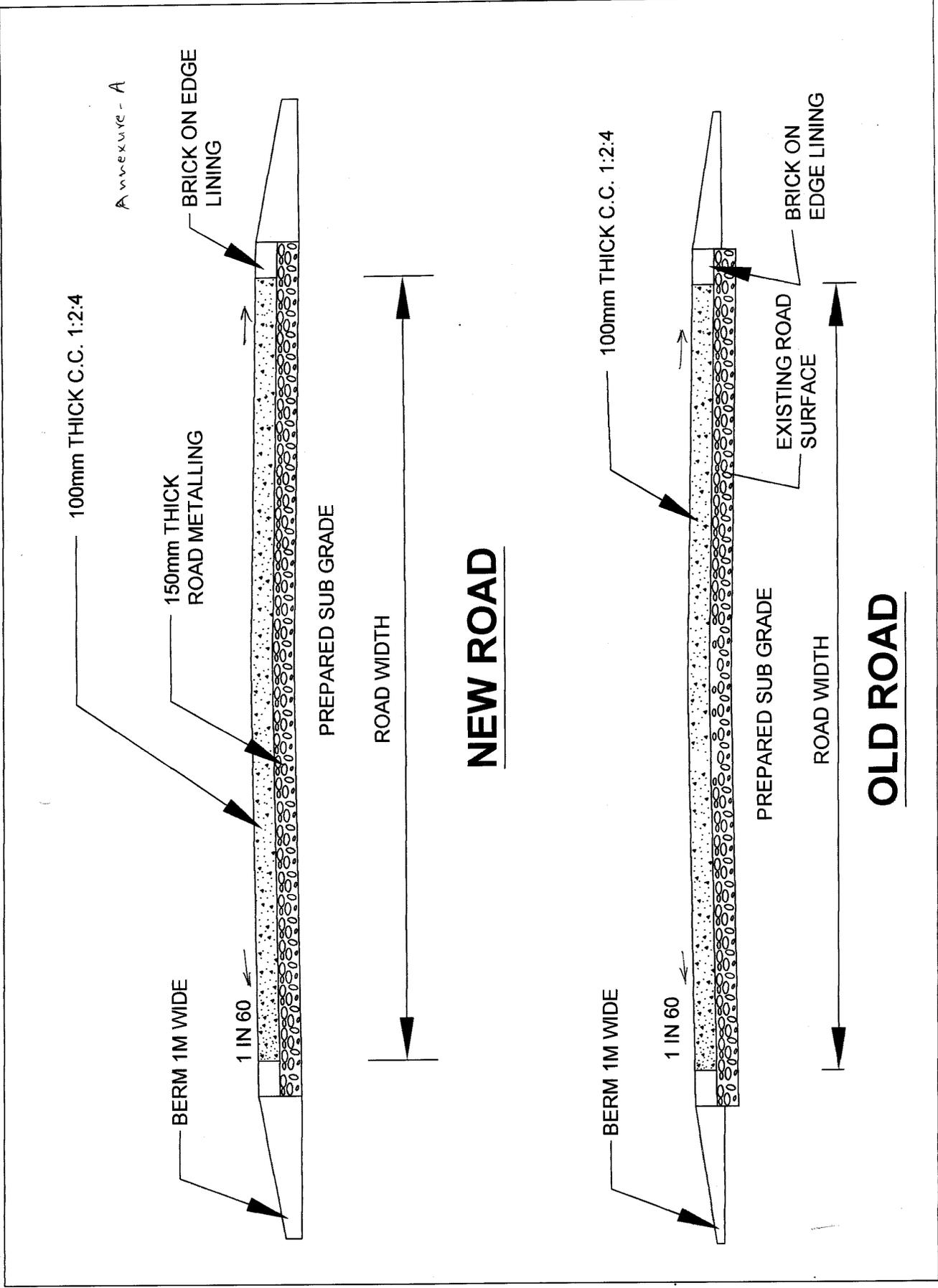
PREPARED SUB GRADE

ROAD WIDTH

EXISTING ROAD SURFACE

BRICK ON EDGE LINING

## OLD ROAD



**SPECIFICATION FOR CEMENT CONCRETE ROADS**

(Part of PCE's Circular No.21/2007/Works)

1. **General-** A cement concrete road consists of a cement concrete slab of a specified mix made with suitable materials laid on a suitable sub-grade. **CC roads are to be used only for street roads not more than 2.5 m width. For road wider than 2.50 m specific approval of THOD is required.** The rough sketch of cross sectional profile of a concrete road is attached as Annexure-A

2. **Camber-** For street roads a straight camber of 1 in 60 is required to be provided. However for wider road, in middle third portion parabolic camber is to be provided.

3. **Subgrade-**

- a. Concrete slab should not be laid on a newly made up formation till the sub grade is thoroughly consolidated by Mechanical means.
- b. A minimum of 150 mm foundation (soling and metalling) must be ensured before the concrete slab is cast for the road surface. If the foundation is on existing metalled road and if the thickness of the metal is 150mm or more, the surface may be left undisturbed if it satisfies the requirement of sub-grade of the concrete slab; otherwise, the surface shall be scarified to a depth of 50 mm. Additional metal should be added if necessary and the whole reconsolidated after shaping to the profile of the underside of the concrete slab.
- c. If the existing foundation is less than 150mm thick a complete new coat or coats of metal shall be given to such thickness that the final thickness of the foundation is not less than 150mm. If one or more new coats of metal are given the newly consolidated foundation should be under traffic for atleast one month before concrete is laid.
- d. It is preferable that the width of the water bound metal should be 150mm to 225mm wider than the slab proposed.
- e. If the concrete slab is to be wider than the existing metalled surface, the latter shall first be widened with metal and consolidated and the final width of the road should be provided with a coat of new metal and consolidated to the shape required.
- f. **Preparation of sub-grade-** All slabs shall be bonded to the sub-grade; the surface of the later shall be brushed so as to remove all fine and loose particles of stone, kanker or moorum and concrete deposited on the surface after thorough cleaning. If the upper portion of the sub-grade is of water bound macadam the surface shall be given a wash of cement and water just prior to

depositing the concrete.

4. **Material-** For specification of cement, water, coarse, aggregate and fine aggregate relevant IS Codes to be used.
5. **Forms-** Forms shall normally be steel channels, the depth of which is equal to the depth of the outer edge of the slab. The length of steel forms shall preferably be equal to the length of the slabs to be laid but shall in no case be less than 6m. Steel side forms shall be rigidly bedded on the outer 76mm of the sub-grade and pegged to the sub-grade at intervals of not more than 1 metre. If the concrete is being laid to the full width of the existing water bound surface the said forms shall be firmly bedded on the existing sides of the road but must be supported on brick on end lining. Greatest care shall be taken to ensure that side forms are laid absolutely true to level (or gradient) and that the forms on each side of the road are at equal level (except where super-elevation is to be given). Side forms shall be oiled or greased before the concrete is laid and shall not be removed until 24 hours after the concrete has been laid. For curves, side forms of bricks in clay-plastered shall be used unless curved steel forms are available.
6. **Mix-** The concrete Mix unless otherwise specified the ratio will be 1:2:4 by volume. Transverse joints shall be plain and their spacing shall not exceed 15 metres except with the Engineer's approval.
7. **Method of Construction-** The slab shall be constructed by-
  - (i) The alternate bay or
  - (ii) The continuous bay method.

**a. Alternate bay method-** Alternate bays shall first be laid to the cross sectional dimensions shown on the plan and when ordinary cement is used, the intermediate bays shall not be laid till concrete in the first set of bays is five days old. When rapid hardening cement is used the alternate bays may be laid after two days. Joints shall be provided between all bays. Joints shall be 10mm thick and shall be filled with hard grade bitumen after laying intermediate bays.

**b. Continuous bay method-** In the second method, bays shall be laid continuously, joints shall be provided between all bays. Joints shall be 10mm. thick and shall be filled with hard grade bitumen. Joints shall be formed as follows:-

A dividing strip of steel shall be cut to a shape corresponding in the cross section of the slab, and if the width of the road exceed 3m it shall then be cut into two equal halves, the length of each being equal to one half the width of the slab.

If the slab width is 3m or less, the dividing strip shall be used in one piece, its length being equal to the width of the slab. At the outer end of each half when the dividing strip is in two portions or at one end, when the strip is used as a single unit, a small projection with a hole is provided to take an iron rod for lifting. When the concrete approaches the position of the construction joints the dividing strip or strips, are placed on the sub-grade and supported on further side (away from the bay being constructed) by a wooden

bulk head. The number of sections into which the bulk head is divided will depend on the width of the slab but shall never be less than three and the length of the sections shall not be more than 1 metre. If preferred the steel dividing strip may be greased with a soft grade motor grease or covered with grease proof paper folded under the steel strip and of such a width that the upper edges of the paper are slightly below the top of the strip.

When the concrete on one side of the strip has been laid, alternate sections of the bulkhead are removed and concrete rapidly deposited in the gaps thus made, the remaining sections are then removed and concrete deposited and rammed.

Thirty to forty five minutes after laying the concrete at the joints, the strip or strips shall be removed by lifting the outer end by the aid of an iron rod slipped through the hole. Where the dividing strip is in two halves. One shall be removed at a time. The outer end is lifted until about half the strip is exposed and the strip is then removed by drawing it in the direction of its own length, care being taken to prevent the farther end from damaging the surface.

When the strip or strips have been removed, any slight abrasions, of the edge of the joint shall be repaired with a trowel and the edges then slightly rounded with a special float.

**8. Longitudinal Joint-** When the width of the road to be constructed exceeds 4.8 meters, it shall be laid with a longitudinal joint or joints so that the width of each strip does not exceed 4.8 meters. The joints shall be formed by painting the side of the first set strip with hard grade bitumen.

**9. Watering-** Before placing the concrete, the sub-grade shall be sprinkled with as much water as it will readily absorb but there shall be no pools of water standing on it. It is preferably to have the sub-grade sprinkled or thoroughly wet from 12 to 36 hours in advance of placing concrete.

**10. Laying-** The concrete shall be placed in its final position before setting has commenced and shall not subsequently be disturbed. Concrete shall be laid in two layers if the thickness of the slab is to be more than 100mm and in one layer if it is 100mm or less. More than 30 minutes shall not elapse before the lower layer is covered with the upper. The upper layer shall be laid 12 to 32 mm higher than the profile to permit of its being rammed into position with the tamper. Concrete shall be laid over the entire width of the slab and between joints, in one continuous operation. While being laid the top surface to be brought to the correct camber. Only vibrated concrete will be used. During tamping the surface shall be carefully inspected for high and low spots and any correction necessary be made by adding or removing concrete.

**11. Longitudinal floating-** After tamping, the entire surface shall be floated longitudinally with a wooden board not less than 4.8 metres in length and 20 cm wide with handles at each end. The float shall be operated by a man at each end standing on a suitable moveable bridge spanning the road. The float is drawn backwards and forwards with strokes of about 60 cm and advancing slowly from one side of the slab to the other. Where the bridges are moved forward they should be so placed that the next floating overlaps the first by about 1 metre.

As an alternative to longitudinal floating the surface may be rolled transversely with a roller about 1.5 metre long and 200 mm to 300mm in diameter made of sheet, or preferably, concrete axle and shall be worked backward and forward across the slab and gradually advance at the same time.

The concrete shall be finished by using a strong canvas, belt not less than 150mm or more than 300mm wide and at least 600mm longer than the width of the road. The belt is to be applied with a combined cross wise and longitudinal motion, the strokes being not more than about 300mm long but these should be reduced to short strokes of about 100mm as soon as the water sheet has disappeared from the surface of the concrete.

**12. Finished surface-** The finished surface, when tested with a straight edge 2 metres long placed longitudinal on the road should not show deviations more than 6mm from a straight line.

**13. Curing and Protection.-** There shall be kept at the site of the work a number of strips of hessian or jute sufficient to cover at least two bays of the road. These strips shall have bamboo or light wood strips sewn at each end and as soon as finishing is completed, one of these strips previously damped, shall be placed on the surface of the concrete. As the work proceeds, more strips shall be brought so that the moment work on any portion is finished, the concrete is protected from drying. These strips shall be kept moist by light spraying as necessary. When the concrete is about two hours old, the strips may be replaced by the damp cement bags.

On the day following, the cement bags shall be removed and the whole surface of the concrete covered with earth to a depth of 1.5 cm. The earth shall be thoroughly wetted as soon as it is placed and will then be divided into ponds about 1.5 metres square which shall be kept saturated with water in the case of ordinary cement until the 21<sup>st</sup> day after laying. The earth covering shall be allowed to dry out until the 28<sup>th</sup> day after which it may be removed and the road opened to road traffic. If rapid hardening cement is used the earth may be allowed to dry out from the 10<sup>th</sup> day after laying and the road opened to traffic on the 14<sup>th</sup> day.

**14. Filling Joints –** Immediately prior to opening the road to traffic the joints must be filled and protected. The joints should first be cleaned first then filled with bitumen which should overlap the edges of the slab by above 50mm on each side. The bitumen should be of a fairly hard grade so as to avoid undue softening in the hot weather but it must also be of a fairly thin consistency if it is to penetrate fully into the joints. A straight run 80/100 mephalt is a suitable material. During the early months of its life the road must be frequently inspected and where necessary more filler added if that already applied appears to have sunk further into the joints.

**15. Brick on end lining.-** After completion of the concrete, the edges of the slab shall be protected by strips of water bound macadam at least 30cm wide and 11.4 cm thick. Stone, brick aggregate or kanakr or suitable materials may be used.

Brick on end lining shall be provided after the water bound macadam has been completed and the berms and road edges shall then be restarted and surplus earth disposed off.

\*\*\*\*\*