IRC:SP:76-2015

GUIDELINES FOR CONVENTIONAL AND THIN WHITETOPPING

(First Revision)

INDIAN ROADS CONGRESS
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APPENDIX IV

DEMONSTRATION PROJECT OF TWT

Whitetopping in Pune City

Pune city has adopted the Thin White Topping (TWT) treatment for internal roads as well as wider roads with higher traffic volume. Started in 2008, Pune city has constructed above 75 to 80 km of roads (approx. 9 lakh sq m) with TWT technology. The TWT overlay, 125 mm thick, constructed in 2008 are still in excellent condition. Recently roads with heavy traffic have also been overlaid with 175 mm thick TWT. The project features in brief are as follows:

- **Location:** Road in front of Shivajinagar State Transport depot. Total length of the road is 1.26 km and carriageway width is 11.00 m ROW is 15/18 m.
- **Type of Treatment:** Thin White topping with thickness 175 mm M40 grade concrete overlaid on top of existing bituminous road after milling of 50 to 60 mm.
- **Panel Size:** 1 m x 1 m panels created by saw cutting joints within 24 hours of casting. Width of TWT treatment is 8 m and hence 4 m wide concrete is cast first and then the balance 4 m width is cast after completion of curing and joint sealing (approx. 21 days) on other side. Longitudinal joint is not saw cut and butt joint is kept as it is.
- **Dowel Bars and Tie Bars:** Dowel bars are used only at the construction joint (25 mm bars at 250 mm c/c). Tie bars are used only at the center of the road (longitudinal joint 12 to 16 mm tor steel at 400 c/c)

- **Existing Road Details:** The existing road is in use for more than 25 to 20 years and consisted of well consolidated bituminous treatment of approx. 150 -160 mm thickness underlain by WBM of 250 to 300 mm thickness. Storm water arrangement in the form of 600 and 900 mm RCC pipes was present on the road. There were some locations with failure of base due to leakage of water supply line. The utilities like water supply main, distribution lines, sewer lines run along the carriageway edge and electrical cables, telephone cables, OFC etc run along the footpath. The

road caters to traffic of above 5000 buses daily on account of state transport and the city transport depots on this road.

- **Assessment of Existing Road:** The Benkelman Beam Deflection study was carried out on the existing BT surface to design the bonded overlay treatment as per IRC:SP:76 and IRC:58 guidelines.
- **Milling Operation and Pretreatment:** Milling of existing BT road was done with a milling machine and 50 to 60 mm bituminous layer removed to lower the level of the road as well as creation of bond for concrete overlay. The portions which showed structural defects and settlement (approx. 1 to 2 percent of area) were completely excavated and new layers of hard moorum, GSB and DLC were provided.
- **Mix Design:** M40 grade concrete was used for the work with fibrillated Polypropylene fibers. On-site slump of concrete, prepared in a RMC plant, was kept below 40 mm. The cement content and w/c ratio were kept at 420 kg per cum and 0.37 respectively.

- **Construction Operation:** Concrete was transported with transit mixer and placed, compacted with screed and needle vibrators. The mechanical trowel/ float was used for floatation and finishing operation. The texturing was done with the help of locally available brush. The joints were cut for 1/3rd depth within 24 hours and concrete was cured with water ponding for 21 days. Joints were sealed with polysulphide sealant after 21 days and opened to traffic.
- **Cost Breakup:** Total project cost was Rs.7.24 crore with breakup is as follows:

S. No.	Work Item	Cost (Rs Crore)	Per sqm cost (Rs)
1	TWT pavement	1.91	**946**
2	RCC pipes, chambers, Storm water drainage	1.40	**692**
3	Footpath/ Paver Blocks and ancillary work	3.06	**1516**
4	Utilities (water supply, sewer, Electrical)	0.88	**437**
	Total	***7.24***	***3591***

APPENDIX V

TYPICAL CONSTRUCTION PRACTICES ADOPTED IN URBAN AREAS

1. RCC cross pipes of 300 mm and 450 mm dia are provided at every 50 m interval in congested area to cross utilities at a later stage without cutting the road. The area above pipes is paved with paver blocks.

2. RCC piles are also provided in the longitudinal direction along the road edge to house utility lines like OFC cables, Electrical cables etc and chambers with openable covers are provided at every 15 m interval. The pipe section is also provided with 100 mm removable paver blocks on a concrete bed.

3. Adequate storm water drainage arrangement in the form of collection chambers in individual property, ramps in direction opposite to property entrance (to prevent water entry in property) are provided.


4. Dowel bars are provided only at construction joint and the tie bars only at central longitudinal joint.

5. The RCC mesh of 12 mm dia 150 mm c/c (single mesh) is provided around the sewer/manhole chamber frame for a section of 1.5 m X 1.50 m for strengthening of the section around the manhole chamber cover.


APPENDIX VI

TYPICAL DISTRESSES IN TWT/UTWT PAVEMENTS - CAUSES AND REMEDIAL MEASURES

CORNER BREAK/CORNER CRACKING	Cause	Remedy
  	Corner cracking appears to be the primary failure mode, and fatigue cracking is believed to be the primary failure mechanism in TWT/UTWT. Bonding is an important factor to long-term performance of the overlay. TWT/UTWT provides small joint spacing to minimize restraint stress. However, joint locations and traffic loading should be given significant consideration. In case of loss of support from the underlying HMA layer over time, corner breaks are likely to occur under heavy wheel load.	Full-panel replacement is common repair strategy for the distressed panels of TWT/UTWT such as Corner breaks

TRANSVERSE CRACK		
	Late joint sawing, misalignment of the dowel bars at construction joints leads to transverse cracking.	Make 8-10 mm wide groove along the crack for a depth of 20 mm and refilling with approved sealant.

DAMAGED UTILITY CHAMBERS	Cause	Remedy
	Use of masonry to raise the utility chambers to the road level during overlay operation. Improper workmanship and lack of adequate protection of the edges of the utility chamber.	Raising of utility chambers likely to come in the carriageway should be done in concrete (preferably whole chamber should be recast in concrete). Adequate protection of 0.3 m portion around the chamber should be strengthened using nominal steel mesh
DAMAGED LONGITUDINAL JOINT		
	Poor workmanship, bent steel formwork during construction and unprotected concrete edge after construction results in zigzag longitudinal joint which later on opens up and prone to damage after saw cutting.	Use good and strong formwork during construction and make sealing groove along the longitudinal construction joint

SHATTERED PANELS		
	Settlement and damage of underlying bituminous layer leading to cracking and shattering of panels	Full depth repair of damaged panels