404.37

No. RW/NH-33041/2001-S&R (R) **Dated, the 29th June, 2006**

To

The Engineer-in-Chief and Chief Engineers of State PWDs and UTs (Dealing with National Highways and other Centrally sponsored schemes); The Chairman, National Highways Authority of India; The Director General (Border Roads); The Director, Central Road Research Institute

Subject : Use of Rubber and Polymer Modified Bitumen in Road Works–Components and Features of PMB/ CRMB producing Plant–regarding

This Ministry has, from time to time, issued several circulars stipulating guidelines on the use of rubber and polymer modified bitumen in the works pertaining to National Highways and centrally sponsored schemes. The IRC:SP:53 (First Revision–2002) on Guidelines on Use of Polymer and Rubber Modified Bitumen in Road Construction deal with use and advantages of modified bitumen, types of modifiers, including their specifications, applications, choice of appropriate grade, handling at site, precautions needed during their use details of various tests etc.

2. Vide The Ministry's letter of even no. 03.01.2006, the extant stipulations of para 7.7 of IRC:SP:53-2002 regarding procurement of modified bitumen from refinery sources or blended at approved central plants or made by appropriate mobile blending plants with site testing facility were reiterated. Further, it was stipulated that the provisions of IRC:SP:53-2002 as amended from time to time may be used for the National Highways and other centrally sponsored schemes. In this regard, it may be noted that the Ministry has initiated the process of approval of Central/Mobile blending plants for manufacture of modified bitumen.

3. Commensurate to the above mentioned developments, a draft specification on the components and features of PMB/CRMB producing plant is enclosed herewith. It is requested that the comments/observations on this draft may be sent to the Ministry at the earliest so as to reach the Ministry latest by 31.7.2006 for enabling finalizing the same.

Components and Features of PMB/CRMB Producing Plant

The production plant required for the preparation of PMB/CRMB shall be installed at the appropriate site having facilities of power, loading/unloading storage, and a laboratory well equipped with testing equipments for testing various properties of the modified bitumen. The plant should have following basic components:

(i) Mixing tank with agitators for pre-mixing of bitumen and polymer/crumbed rubber..

(ii) Auto-electric Burner/Heat Exchanger for controlled beating of bitumen.

(iii) Bitumen pumps for feeding bitumen.

(iv) Screw conveyors for feeding polymer/crumbed rubber granules.

(v) High shear mill for forming collonidal mix of bitumen and polymer/crumbed rubber.

(vi) Metering arrangements for controlled feeding of bitumen and polymer/crumbed rubber granules.

(vii) Control Room housing the control system for plant operation.

(viii) PMB/CRMB Storage Tanks with agitators for Plants other than in-line type.

(ix) Thermic Oil Tank and thermic oil circulation system.

The plant should have following basic Additional Components:

(x) Dosage pumps for feeding flux dosage to bitumen before feeding the fluxed bitumen.

(xi) Metering arrangements for controlled dosage of flux.

Brief description of the components is as under:

(i) **Mixing Tank**

The mixing tanks are having various capacities ranging between 5 ton, 10 ton, 15 ton, 25 ton and 50 ton or the combination of above capacities. Mixing tank up to the capacity of 15 ton can be installed to the vertical position, whereas the bigger plant shall be installed in the horizontal position. Mixing tanks main shall be provided with agitator for pre-mixing of bitumen and polymer rubber. All tanks are equipped with a heating system which is through circulation pipes and work as heat exchanges. The tank has measuring devices for measuring quantity of bitumen in tank and in let lid for feeding of polymer/crumb rubber. Smaller plant up to 15 ton may have 1 agitator whereas bigger plant shall have a minimum of 2 agitators for the homogeneous mixing of polymer/crumb rubber.

(ii) **Auto electric burner/Heat exchanger**

For the controlled heating of bitumen all heat input system are in the form of fuel fire burners or thermic oil circulation system or through electrical heating coil. This should have automatic feed back of heat input so as to maintain temperature of modified bitumen with ±1°C.

(iii) **Bitumen Feed Pump**

The Bitumen Pump should be a position displacement type with thermic oil jacketing of pump and pipelines. The Bitumen pipeline shall be installed with flow meters in all in let and delivery pipelines or proper load cell arrangement have to be there for accurate measurement of bitumen inflow to the mixing tank. Flow meters/load cell should have accuracy of about ± 0.5%. The flow meter should have counter for local read out load cells and transmitter for display in Control Panel.

(iv) **Screw/Belt Conveyor**

For feeding of polymer/Crumb rubber, there should be a Screw Conveyor for smaller plants and may have a Belt Conveyor for the larger plants. The conveyor should be equipped with weighing system for feeding polymer/Crumb rubber granules in the mixing chamber and there shall be loading Cells linked to the display panel available in the control room.

(v) **Homogenous Mill (High Shear Mill)**

The high shear mill should have rotor and stator arrangement of adequate power (HP/KW) and RPM to achieve homogenous mixing of polymer/crumbed rubber with bitumen. It should have a micrometric setting of rotor and stator gap with 0.1 mm step. It shall be driven by high powered rotor to generate stern action.

(vi) **Metering Arrangement for the Controlled Feeding**

Both bitumen as well as polymer/crumbed rubber are to be regulated through measuring devices. In flow/out flow bitumen is controlled by flow meters/load cell installed in the pipe lines load cells. Hence, feeding of polymer/crumbed rubber granules is controlled by weighing system in the form of load cells/digital display of net output of the polymer/crumb rubber granules.

(vii) **Control Room**

The control room should have a PLC/PC based Computerized Control System (CCS) and a Manual Logic System as back up with digital display units for all process variables. The display panel of control room should have alarms for high/low level in tanks, high/low temperatures of bitumen/thermic oil, control/speed of motors, quanity in flow and out flow of bitumen and that of CRMB/polymer. The panel should also have intercom system with the operators and also emergency stopping system in case of emergency.

(viii) **Thermic Oil Tank and Thermic Oil Circulation System**

For the pre-heating of oil, there should a thermic oil heating system which should heat the oil to the desired temperature so that the heated oil is circulated through the bitumen to raise its temperature about a minimum 170°C. The system cal also have a controlled burner to raise the temperature of heating oil. The display panel of Thermic Oil Tank should indicate the maximum temperature heated rate of flow of oil, its quantity inside tank.

(ix) **PMB/CRMB Storage Tank**

The plant should have a suitable capacity storage tank well equipped with heating arrangement by hot oil circulation system and stirrer/agitator which is away from the on line production of PMB/CRMB. The agitator can be in the form of pedals fitted at a spiral agitator or set of pedals fitted on the vertical shapes of the shaft. The storage tank should have loading/unloading facility with all safety arrangements.

(x) **Safety and Warning System**

The mixing tank should have level census monitoring level of bitumen in the pre-mixing tank and automatic high level shut down system to avoid over-loading of mixing tanks.

There should proper railing on all ladders walk ways and siren system to indicate any emergency. All pipes should be well insulated and there should be no leakage of any kind at any stage. All pumps, valves should be indicated in red colour so that they are visible prominently and are handled with care.

Additional Items

(i) **Flux Dosage Pump and Feeding System**

Certain Bitumen modification may sometimes need certain types of chemicals/additives to reach certain properties of bitumen. These fluxes are added at the time of mixing. The mixing should have dosage pump and measuring devices arrangement for the controlled dose of flux.

(ii) **Laboratory**

Each plant must have a well equipped laboratory having all lab instruments and apprentice needed to know the properties of bitumen as well as that of modified bitumen, as described in various IRC/IS Codes.

(iii) **General Storage and cleanliness**

The plant should have arrangement for storage of modified bitumen for transportation, loading/unloading system for both bulk/stored modified bitumen and weighing system both for packed and bulk transportation of modified bitumen.

(iv) **Transportation of Modified Bitumen**

Very long distance transportation of CRMB/PMB is generally discouraged. The tanker carrying CRMB/ PMB shall be fitted with agitators/circulation system and indirect heating system through hot oil circulation/burners. Direct heating of PMB/CRMB to be avoided in all respect.