GOVERNMENT OF TELANGANA
ROADS AND BUILDINGS DEPARTNENT

Office of the Engineer-In-Chief(R&B)
Administration& Quality Control,
Errum Manzil, Hyderabad,
Telangana State.

Circular Memo No : 711/ENC-QC/TS/DEE/AEE1/ 2014 dt.:24 -11-2014

Sub: (R&B) Dept-(R&B) Works- Equipment/Machinery to be used for Road and Bridge works at work site/Plant by Contractors - Check list for Plant and Machinery for WMM, bituminous , cement concrete works and QC Laboratory to be maintained by the contractor at Hot Mix Plant site and Bridge site - Communicated-Certain - Instructions -Issued -Reg.

Ref:- 1)T,R&B(R-I) Dept, Telangana Memo No: 576/R.I(1)/2014-2,Dt:08-08-2014
2)T/O Memo No: 711/ENC-QC/TS/DEE/AEE2/2014,Dt:16-10-2014.

****

1) R&B Department executes works as per MORTH Specifications which specifies mandatory use of standard Equipment and Machinery for execution of different items of work as per standard data and agreement conditions. Govt. vide reference 1st cited issued certain instructions to improve the quality of works wherein all contractors shall mandatorily use specified Plant & Machinery.

2) IRC-SP11" Hand Book of Quality Control for Construction of Roads and Runways" specifies testing Equipment required at the HMP and Bridge site for Roads &Bridges works and certain category of Machinery needed to be used in i)E/W Excavation, ii)Forming of embankment, iii) GSB, iv) WMM, v)Bituminous layers and vi) V.C.C Design Mix.

3) The list of Equipment/Machinery needs to be mandatorily insisted by the field officers for above items of work on Road & Bridge works is indicated in Annexure – I. Further the list of QC equipment which shall be insisted in the QC Lab at the Hot Mix Plant for bituminous works and Bridge site are enclosed in Annexure II to III.

4) The indicative requirements of specified equipment in Annexure-I is detailed out as Annexure-IV to IX.
a) Checklist for Pug mill - Annexure-IV
b) Checklist for BMP - Annexure-V

(Contd...,)

c) Checklist for HMP - Annexure-VI

d) Checklist for Paver - Annexure-VII

e) Checklist for Rollers - Annexure-VIII

f) Machinery for VCC - Annexure-IX

The Superintending Engineers(R&B) and Executive Engineers(R&B) are requested to form special teams duly including QC Engineers responsible for their jurisdiction and conduct inspection of all Hot Mix Plants under their jurisdiction to ensure the availability of Plant and Machinery of required specifications as detailed out in the above check lists and submit list of available Plant and Machinery for each Hot Mix Plant, duly signed by the concerned field Engineers (AEEs to SEs) and QC Engineers in the team that have conducted the inspection to the Engineer-In-Chief(R&B) Administration& Quality Control by 06-12-2014.

The above instructions shall be followed scrupulously.

This circular memo along with the Annexures I to IX is also, available "**roadbuild.telangana.gov.in**"

Encl:- Annexures I to IX.

Sri K.BIKSHAPATHI
Engineer-in-Chief(R&B)
Administration &QC

To,

- The Superintending Engineers (R&B) 1) Rural Circle, Hyderabad 2) Head Quarter Circle, Hyderabad 3) Karimnagar 4) Warangal 5) Medak 6) Nalgonda 7)Khammam 8) Nizambad 9) Mahabubnagar 10) Adilabad 11) QC Circle, Hyderabad 12) NH Circle, Hyderabad 13) Electrical Circle ,Hyderabad.
- The Executive Engineers (R&B) 1) Karimnagar 2) Jagithyala 3) Peddapally 4) Khammam 5)Kothagudem 6)Bhadrachalam 7) Warangal 8) Mahabubabbad 9)Roads Division, Hyderabad 10) Vikarabad 11)City Roads Division, Hyderabad 12)Mahabubnagar 13)Wanaparthy14) Kalwakurthy 15)Sangareddy 16)Siddipeta 17)Nalgonda 18)Miryalaguda 19)Bhongiri 20)Nizambad 21)Bodhan 22)Nirmal 23)Manaherial 24) South Building Division,Hyderabad 25)North Building Division, Hyderabad 26) East Building Division ,Hyderabad 27) Assembly Building Division ,Hyderabad 28) Central Building Division ,Hyderabad 29) NH Division, Hyderabad 30)NH Division, Warangal 31) NH Division, Perkit 32) NH Division, Eturunagaram 33) Electrical General Division, Hyderabad 34) Electrical Rural Division, Hyderabad.

► Copy to the

1) Engineer-in-Chief(R&B) State Roads &CRN

2) Chief Engineer(R&B) NH, CRF, LWE&PPP

3) Chief Engineer(R&B) Buildings, NABARD&HUDCO.

4) Chief Engineer(R&B) CTE& Member, COT.

► Copy to

1) The Superintending engineer(R&B)I&QC Circle, Hyderabad

2) The Executive Engineer(R&B),QC Division, Hyderabad and

3) The Executive Engineer(R&B)QC Division, Warangal

For Engineer-in-Chief(R&B)Admn.,&QC

24/11

ANNEXURE-I

PLANT AND MACHINERY TO BE USED FOR FOLLOWING ROAD WORKS/BRIDGE WORKS

I) Earth work excavation for trench cutting by mechanical means upto SDR and depositing the spoils for forming embankment including pre-watering of soil, removal of top soil, excavation of soils, spreading soil, breaking clods, sectioning, grading and consolidation with 8 to 10 tonnes vibratory road roller @ OMC to meet requirement of table 300-2 MORT&H, including all hire and operational charges of T&P and seigniorage charges, complete for finished item of work as per MORT&H specification 305 (4^{th} /5^{th} Revision) (Payment will be made based on levels for finished item of work)

1) Proclain/JCB for excavation.
2) Motor Grader for grading.
3) Water tanker 6 KL.
4) Vibratory Roller 8 T

II) Forming embankment with borrowed useful earth from outside road boundary by mechanical means up to SDR with all leads and lifts including pre-watering of soil at borrow area, removal of top soil, excavation of soils at borrowed area, conveyance of soil, depositing the soil on the embankment, spreading soil, breaking clods, sectioning, grading and consolidation with 8 to 10 Tonnes Vibratory Road Roller @ OMC to meet requirement of table 300-2 of MORT&H, including all hire and operational charges of T&P and seigniorage charges, complete for finished item of work as per MORT&H specification 305.

1) Tipper/Tractor for conveyance.
2) Dozer 80 HP for spreading at 200 cum/hr.
3) Motor Graders for grading at 100 cum/hr.
4) Water Tanker 6 KL
5) Vibrator Roller 8 T.

III) G.S.B. (is applicable for Grade 1/ Grade-3 metal)

Construction of Granular sub-base by providing HBG material confirming to Grading-I/Grading-III of MORT&H Table-400-1/400-2 including cost, seigniorage charges and conveyance of all materials to work site and spreading in uniform layers with motor grader or by approved means, on prepared surface mixing by mix in place method with Rotavator/approved means at OMC and compacting with vibratory roller to achieve the desired density etc., complete for finished item of work as per MORT&H specification 401 (4^{th}/5th revision) and as directed by the Engineer-in-Charge. (payment will be made based on levels for finished item of work)

(Contd...2)

Machinery

1) Motor Grader 3.35M blade @ 50 cum/hr.
2) Tractor – Rotavator
3) Water Tanker – 6 KL.
4) Vibratory Roller – 8T
5) Tippers for conveyance.

IV) Providing, Laying, Spreading and compacting graded HBG crushed stone aggregate to Wet Mix Macadam specification including cost, seigniorage of all materials and including premixing the material with water at OMC in Mechanical mix plant carriage of mixed material by tipper to site, laying in uniform layers with paver in base courses on well prepared surface and compacting with Vibratory roller to achieve the desired density etc., as directed by the Engineer-in-Charge and as per MORT&H specification 406 (4^{th}/5th revision) for finished item of work (payment will be made based on levels for finished item work)

graded HBG or HBT, compacting at OMC etc, complete as per finished item of work as per MORTH specification 406.

Machinery

1) Wet Mix Plant of 60 T/hr (minimum)
2) Electrical generating set 125 KVA
3) Front end Loader 1 cum capacity.
4) Mechanical paver finisher at 100 Tph
5) Vibratory Roller – 8 to 10 Tonnes
6) Water Tanker
7) Tippers for conveyance.

V) Providing and applying Prime coat/Tack coat with bitumen emulsion (medium setting) bulk using emulsion pressure distributor on prepared surface of Granular base including cleaning of road surface and spraying emulsion at the rate of 0.60 kg/sqm/ 0.20 kgs per sqm using emulsion pressure distributor for finished item of work etc. complete for finished item of work as per MORT&H specification 502/503 (4^{th}/5th revision) and as directed by the Engineer-in-Charge.

Contd...3

Machinery

1) Mechanical broom at 1250 sqm/hr for cleaning purpose
2) Air compressor 250 cfm for cleaning purpose.
3) Emulsion pressure distributer @ 1750 sqm/hr
4) Water Tanker 6 KL (for Prime coat)

VI) Providing and laying of Bituminous Macadam/SDBC/BC etc. with hot mix plant producing an average output of 37.5 tonnes per hour using hard blasted granite crushed aggregates of Grading all as per table 500-4/500-15/500-17 premixed with VG 30 (60/70) grade of bitumen @ 3.3% to 5.5%(as the case may be) by weight of TOTAL mixture, transported to site, laid over a previously prepared surface with mechanical paver finisher to the required grade, level and alignment and rolled as per clauses 501.6 and 501.7 to achieve the desired compaction for finished item of work as directed by Engineer-in-Charge including hire and operational charges all T&P and all other contingent charges necessary including cost of seigniorage charges on all materials etc., complete and as per MORT&H specification No.504/508/

Using Drum Mix

Machinery

Hot Mix Plant ranging from 40 – 60 tph to 80 – 120 tph including electronic monitoring bus bay.

1) Air Compressor 250 cfm.
2) Mechanical paver/sensor paver (as the case may be)
3) Generator 250 KVA.
4) Front end loader at 1 cum capacity.
5) Smooth wheeled Roller 8 – 10 Tonnes capacity (three wheeled Roller) for initial break down rolling.
6) Vibrator Roller 8 – 10 Tonnes capacity for intermediate Rolling.
7) Smooth wheeled tandem Roller with 6 – 8 Tonnes capacity for finishing Rolling.

VII) Providing and laying of Bituminous Macadam/SDBC/BC etc. with hot mix plant producing an average output of 37.5 tonnes per hour using hard blasted granite crushed aggregates of Grading all as per table 500-4/500-15/500-17 premixed with VG 30 (60/70) grade of bitumen @ 3.3% to 5.5%(as the case may be) by weight of TOTAL mixture, transported to site, laid over a previously prepared surface with mechanical paver finisher to the required grade, level and alignment and rolled as per clauses 501.6 and 501.7 to

(Contd...4)

achieve the desired compaction for finished item of work as directed by Engineer-in-Charge including hire and operational charges all T&P and all other contingent charges necessary including cost of seigniorage charges on all materials etc., complete and as per MORT&H specification No.504/508/

using Batch Mix

Machinery

Hot Mix Plant ranging from 75 tph. (minimum)

1) Air Compressor 250 cfm.
2) Mechanical paver/sensor paver (as the case may be)
3) Generator 250 KVA.
4) Front end loader at 1 cum capacity.
5) Smooth wheeled Roller 8 – 10 Tonnes capacity (three wheeled Roller) for initial break down rolling.
6) Vibrator Roller 8 – 10 Tonnes capacity for intermediate Rolling.
7) Smooth wheeled tandem Roller with 6 – 8 Tonnes capacity for finishing Rolling.

VIII) Vibrated Cement Concrete M 35 grade using 20mm & 10mm HBG crushed stone aggregate (coarse aggregate conforming to table 1000-1 and fine aggregate conforming to table 1000-2) including cost, seigniorage conveyance of all materials to site and labour charges, centering, machine mixing, laying, vibrating, curing etc., including all other incidental and operational charges of all T&P etc., complete for finished item of work as per MORT&H specification 1500, 1700, 2100 & 2702 (4TH/5th Revision) and as directed by the Engineer-in-Charge for C.C. Pavement.

Providing vibrated cement concrete from all grades for nominal mix.

Machinery

1) Concrete mixer 0.28 cum/0.40 cum.
2) Generator set 33 KVA.
3) PIN vibrator/PAN vibrator.

Contd...5

IX) Vibrated Cement Concrete M 35 grade using 20mm & 10mm HBG crushed stone aggregate (coarse aggregate conforming to table 1000-1 and fine aggregate conforming to table 1000-2) including cost, seigniorage conveyance of all materials to site and labour charges, centering, machine mixing, laying, vibrating, curing etc., including all other incidental and operational charges of all T&P etc., complete for finished item of work as per MORT&H specification 1500, 1700, 2100 & 2702 (4TH/5TH Revision) and as directed by the Engineer-in-Charge for bridge works/ CC pavement.

Providing vibrated reinforced cement concrete with Design Mix.

1) Weigh batch @ 20 cum/hr
2) Transit mixer for conveyance.
3) PIN vibrator/PAN vibrator.
4) Generator 100 KVA.
5) Concrete pump.

ANNEXURE-II

List of Plant/ Equipment for **QUALITY CONTROL LABORATORY** to be maintained by the Hot Mix Contractor at plant site.

1) Weighing Machine: 5 – 20 kg capacity Electronic type – Accuracy 1 gm.
2) Oven – electrically operated, thermostatically controlled (including thermometer), stainless steel interior
3) I.S. sieves 450mm internal dia of sieve sets as per BIS of required sieve sizes complete with lid and pan.
4) IS sieve 200mm internal dia (brass frame and steel/ or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with lid.
5) Liquid limit device with ASTM grooving tools as per IS: 2720
6) Compaction apparatus (Proctor) as per IS:2720 (part 7) complete with collar, base plate and hammer and all other accessories
7) Sand pouring cylinder with conical funnel and tap and complete as per IS:2720 (part 28) 1974 including modern equipment.
8) Lab CBR testing equipment for conducting CBR testing, load frame with 5 Tonnes capacity, electrically operated with speed control as per IS:2720 (part 16) and consisting of following:
9) Soxhlet extraction or centrifuge type apparatus complete with extraction thimbles with solvent and filter paper.
10) Marshall compaction apparatus automatically operated as per ASTM 1559-62 T complete with accessories (with 180 N Marshall Moulds)
11) Flakiness index test apparatus
12) Thermometer for measuring temperature.
13) Aggregate impact test apparatus as per IS; 2386 (part 4) 1963

ANNEXURE-III

List of equipment for **QUALITY CONTROL LABORATORY** to be maintained at Bridge site.

1) 200 tonnes compression testing machine
2) IS sieves for testing aggregate
3) Flakiness index test apparatus
4) Aggregate impact value apparatus
5) Slump Test equipment
6) Moulds for casting CC cubes
7) FM sieves
8) Bulkage test equipment.

ANNEXURE-IV

Checklist for Pug Mill for execution of **W.M.M.**

1) **Cold aggregate Bins :** A minimum of 4 in number, fitting with discharge gates which can be adjusted and calibrated to control the flow of aggregates of different sizes in the desired amounts, required by the grading of the mix.

2) Pug mill unit : Twin shaft pug mill to have uniform and homogeneous mix.

3) Water tank and metering : The water tank has adequate storage capacity, a self-priming pump, control valve and spray bar with water flow meter for accurate metering.

4) Control and Automation: The protected cabin houses the user-friendly controls that are specifically for required output.

ANNEXURE-V

Checklist for **BMP** execution of Bituminous work as per IRC-72 1978 and also as per manual for Construction and Supervision of Bituminous Works published by IRC, New Delhi.

1) **Cold aggregate Bins :** A minimum of 4 in number, fitting with discharge gates which can be adjusted and calibrated to control the flow of aggregates of different sizes in the desired amounts, required by the grading of the mix.
2) **Conveyer and cold elevator**: The cold bin aggregate feeding system discharges onto a conveyor in pre-set quantities to give the required grading and then into the cold elevator which discharges into the dryer.
3) **Dryer**: The main functions of the dryer are (a) removal of moisture from the aggregate accomplished by the head of the dryer which vapourises the moisture and the vapour is drawn off by the draught (b) to heat the aggregate so that they are at the right temperature for mixing with bitumen in the plug mill.
4) **Dust collector:** For prevention of air pollution as well as reduce loss of fines upsetting design grading the modern hot mix plants have a dust collection system.
5) **Hot elevators:** These consist of a system of bucket elevators housed within a covered chamber.
6) **Hot Screening Unit:** The hot materials carried by the elevators are discharged over a multi deck (usually 4 deck) vibrating table screen which separates the different aggregate fractions into the different hot bins. The top deck has an additional fixture to remove all oversize material which is discharged into a reject chute, provided for the purpose. In rotary screens, the production gets reduced; therefore, these may be used only where lesser output is acceptable.
7) **Pug Mill:** The coarse aggregate and bitumen are get mixed as per Job Mix Formula.
8) **Hot aggregate bins:** Hot bins are the temporary storage for the hot aggregates of different sizes they have discharge gates opening at the bottom.
9) **Electronic Bus bay:** All the coarse aggregates and bitumen which fed onto pug mill, whose percentage by weight as formulated in Job Mix which are connected by electronic sensors to the electronic bus bay for effective monitoring.

ANNEXURE-VI

Checklist to for **HMP** for execution of Bituminous work as per IRC-72 1978 and also as per manual for Construction and Supervision of Bituminous Works published by IRC, New Delhi.

1) **Cold aggregate feeding system:** 4 bins are required. The drum mix system essentially depends on a calibrated cold feed flow to maintain the job mix grading. The gate opening and feeder setting for each bin control the cold feed from that bin. The belt feeder are driven by a variable speed electric motor. The materials are then fed onto a main conveyer belt, generally with electronic load sensors.

2) **Drum Mixer** : The heating unit or flame is at the upper end of the drum and the cold aggregate enters the drum at flame end.
3) **Instrumentation**: The record of various sizes of aggregates by weight as per Job Mix Formula shall be automatically connected to a electronic bus bay including the quantum of bitumen fed, as per electronic load cells. The temperature of aggregate and that of bitumen shall also be executed on a computer screen.

ANNEXURE-VII

Checklist for **PAVER** for execution of Bituminous work as per IRC-72 1978 and also as per manual for Construction and Supervision of Bituminous Works published by IRC, New Delhi.

1) **Hopper unit:** The hopper is the receptacle for receiving the mixed material from a tipper truck. In the case of rubber tyred paving machines the load of the hopper unit is borne separately on its own solid rubber tyres. In front of the hopper, there is a pair of free running puch rollers which remain in contact with the rear tyres of the delivery truck.
2) **Tractor Unit:** The tractor unit is carried on the drive wheel and contains the twin slot conveyors built with articulated steel strip components to carry the material from the hopper in front to the augers (screws) for spreading the material at the rear of the machine. The unit also carries the automotive power unit, the fuel tanks, the drive controls and the operator's seat.
3) **The Screed unit:** The paving element of the machine is the screed, which is a self-levelling float mechanism whose function is to lay the material (sometimes referred to as the mat) to the specified (loose) thickness. This function is realized mainly through the held of a pait of long leveling arms connected to freely-moving hinge-points (pivots) on either side near the central part of the body of the tractor, much removed in space from the point of action of the screed. The pivot is also the tow-point for the tractive force for the screed.

NOTE: The above description is only a general in nature, apart from fulfilling the general requirement, the field officers has to insist whether a mechanical paver/ electronic sensor paver as the case may be as per agreement condition.

ANNEXURE-VIII

Checklist for **Rollers** for execution of Bituminous work as per IRC-72 1978 and also as per manual for Construction and Supervision of Bituminous Works published by IRC, New Delhi.

1) **Smooth wheeled rollers**: The smooth-wheeled rollers can be sub-divided into two categories, the conventional three-wheeled rollers (often called a three point roller) and the two-wheeled tandem rollers. A recent addition to the range is the tyred roller with a single vibrating steel drum. The two tyred wheels have treaded tyres, and are for driving the roller, rather than for compaction. Typically, for an 8 to 10 tonnes smooth-wheeled roller, the width of the front wheel is about 107 cm while each of the two rear wheels is 45cm wide, with an overlap of 10 cm. this is the best type of roller on which to fit a cutting wheel, to trim the longitudinal joints in the mat, between passes.

2) **Pneumatic tyred Rollers (PTR):** The main advantage of a pneumatic tyred roller is that it compacts by "kneading" action rather than 'crushing' action and is able to provide more uniform compaction than smooth-wheeled rollers; the compaction load is distributed equally on every point of the surface irrespective of the ground profile.

   Pneumatic tyred rollers may be of two categories:

   (a) Towed pneumatic tyred rollers, and

   (b) Self-propelled pneumatic tyred rollers.

   In general, for bituminous laying work, only self-propelled pneumatic rollers are used.

3) **Vibratory rollers:** The usual method of affecting vibration in the compacting drum is with the help of a rotating eccentric mass within the drum which causes an upward as well as a downward acceleration to the drum during each cycle of its rotation. The periodic force generated by the eccentric mass against the drum may be several times larger than the weight of the drum so that the drum tends to be raised free from the ground once during each cycle and then in the next instant slammed down against the ground producing large compactive effort. Thus, a combination of static and dynamic loads overcomes the internal friction in the mix, so as to create improved condition for re-orientation for packing of the particles, thus improving the compaction.

NOTE: The field officers are informed to insist/use rollers as specified in the agreement condition. a) for example: smooth wheeled rollers are to be used for initial breakdown rolling, b) pneumatic rollers are to be used for intermediate rolling, c) vibratory rollers are to be used for intermediate rollers, d) smooth wheeled tandem roller for finishing rolling.

ANNEXURE-IX

Checklist for **USING FOR VIBRATORY CEMENT CONCRETE DESIGN MIX** For Bridge Works, Pavement Etc.,

A) Weigh Batch at 20 cum/hr
B) Transit mixer for conveyance
C) PIN vibrator/PAN vibrator
D) Generator 100 KVA
E) Concrete pump.

NOTE: The above mentioned equipment are in general in nature. Actual requirement is to be implemented based on agreement condition.

For Engineer-In-Chief (R&B)
Admin. & Q.C.