S.N.– 637

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No.MC/EMU/GP-194

Date:09.11.2017

महाप्रबन्धक (इंजीनियरिंग),

1. मध्य रेलवे, छत्रपति शिवाजी टर्मिनस मुम्बई – 400 001
2. पश्चिम रेलवे, चर्च गेट, मुम्बई – 400 020

Sub: Final speed certificate for operation of 12 car formation BG Air Conditioned AC-EMU coaches with indigenous 3-phase propulsion system of M/s BHEL and having pneumatic suspension in secondary stage, up to a maximum speed of 100 kmph on track maintained to other than C&M-I, Vol.-I standard.

Ref: Railway Board letter no. 2010/Elect/Dev/181/8, dated 23.11.2010.

1.0 Railway Board vide PO contract no. 2010/Elect/Dev/181/8, dated 23.11.2010 had allotted for a quantity of 28 sets of 25 kV AC 3-Phase propulsion and other equipments of AC EMUs (M/s BHEL) for indigenous design, development, manufacture, supply, testing and commissioning Air Conditioned AC EMU rolling stock to be built at ICF, Chennai for operation in Mumbai sub-urban section of Central Railway. Further, Railway Board vide letter no. 2013/Elect.(G)/181/1.Pt 2, dated 19.04.2017 has been decided that prototype air conditioned EMU rake shall be transfer and put in service in Western Railway.

1.1 ICF Chennai has manufactured Air Conditioned AC EMU coaches as per following ICF layout drawings. These ICF layouts have been approved by Railway Board vide letter no.2007/M(C)/137/3 part (ii) dated 23.04.2014 and allotted separate transportation codes for above coaches. Tare weight, gross weight & transportation code of Air Conditioned AC EMU coaches with indigenous 3-phase propulsion system of M/s BHEL are given as below:

S. No.	Type of coach	Drawing no.	Transportation code	Tare weight	Gross weight
1.	Motor coach	ICF/SK3-9-0-115 alt-f	EW/DMC/SAC	57.52t	76.96t,
2.	Trailer coach	ICF/SK3-9-0-116 alt- c	EW/TC/SAC	39.5t,	74.54t
3.	Non driving motor coach	ICF/SK3-9-0-119 alt-d	EW/MC/SAC	56.71t	76.15t

1.2 Air Conditioned AC EMU coaches with indigenous 3-phase propulsion system of M/s BHEL have been designed for maximum service speed of 110 kmph. These coaches have been fitted with semi permanent Schaku coupler and Electro pneumatic air brake system.

1.3 The bogies of Motor coach, Trailer coach and Non-driving Motor coach have been provided with pneumatic suspension in the secondary stage and other details of these coaches are as under:

System/ Drawing no.	Motor Coach (DMC) drawing no.	Trailer Coach (TC) drawing no.	Non driving Motor Coach (NDMC) drawing no.
Bogie General Arrangement	EMU/DMC/AC-0-0-001/cols. 3&4	ICF/MRVC/C/BT-0-0-001/Cols.-2&3	EMU/DMC/AC-0-0-001/cols. 1&2
Suspension arrangement	ICF/MRVC/M-9-0-006	ICF/MRVC/C-9-0-004	ICF/MRVC/M-9-0-006
Wheel and Axle	EMU/DMC/AC- 0-2-001/col.1	DC/EMU/H2-0-1-202/col.1	EMU/DMC/AC- 0-2-001/col.1

Details of Brake System	EP Brake for all coaches		
	EP Brake Schematic EMU/DMC/AC-3-5-001	EP Brake Schematic EMU/C/AC – 3-5-001	EP Brake Schematic EMU/NDMC/AC-3-5-001
	Layout of EP Brake EMU/DMC/AC-3-5-002	Layout of EP Brake EMU/C/AC-3-5-002	Layout of EP Brake EMU/NDMC/AC-3-5-002
Brake arrangement	EMU/M-3-2-064 for all coaches		
Coupler	Semi permanent coupler: Male: EMU-2-1-007/col.8 Female: EMU-2-1-007/col.9		
Details of Buffer	Side buffer at front end of DMC to drawing. No. EMU-2-1-001 col-4	No Buffers	
Max. axle load	20.32t for all coaches		

1.4 With a view to assess the speed potential, riding quality and stability of Motor coach, Trailer coach & Non driving motor coach of Air Conditioned AC-EMU coaches with indigenous 3-phase propulsion system of M/s BHEL and having pneumatic suspension in secondary stage, detailed oscillation trial was conducted up to a maximum test speed of 110 kmph on straight track & station yard and 105 kmph at 2° curve over KURLA-KASARA (Down line) & KYN-KJT (Down line) section of Central Railway on track maintained to other than C&M-I, Vol.-I standard. The results as contained in RDSO report no. RDSO/2017/TG/MT-1492/F/Rev.0/Amendment-nil, dated 19.05.2017 indicated satisfactory riding up to the maximum test speed of 110 kmph in empty inflated & loaded inflated condition over Station Yard and Straight track and up to 105 kmph over 2° curve & up to 60 kmph in deflated condition of air springs in empty & loaded condition.

1.5 With a view to assess the emergency braking distance (EBD) and brake performance of EP brake system blended with regenerative brakes in 12 car rake formation of Air Conditioned AC-EMU coaches with indigenous 3-phase propulsion system of M/s BHEL and having pneumatic suspension in secondary stage, EBD trial was conducted up to a maximum test speed of 105/100 kmph (Empty/Loaded) over KURLA-KASARA (Down line) & KYN-KJT (Down line) section of Central Railway. The results as contained in RDSO report no. RDSO/2017/TG/MT-1493/F/Rev.0/Amendment-nil, dated 19.05.2017 indicated that the emergency braking distance in Empty condition at max. speed of 105 kmph, in Emergency (EP+Auto Brake) through Master Controller in dry condition was 570.17 m & Emergency (Auto Brake) through Auto brake controller disabling EP through EBL in wet condition was 594.60 m. On the basis of Emergency Braking Distance trials in Loaded condition at max speed 100 kmph, in Emergency (Auto brake) through Auto brake controller disabling EP through EBL in dry condition was 820.20 m & Emergency (EP+Auto Brake) through Master Controller in wet condition was 849.43m.

2.0 Based on the above, it is certified that 12 car formation BG Air Conditioned AC-EMU coaches with indigenous 3-phase propulsion system of M/s BHEL and having pneumatic suspension in secondary stage manufactured by ICF/Chennai, is fit for operation up to a maximum speed of 100 kmph on track maintained to other than C&M-I, Vol-I. standards subject to following conditions:

2.1 The rake formation shall consist of 12 coach (DMC + TC + TC + TC + TC + NDMC + NDMC + TC + TC + TC + TC + DMC) rake.

2.2 Track

2.2.1 (a) Speed up to 75 kmph

The track shall be to a minimum standard of 52 kg (72UTS) rail laid on PSC sleeper with 1540 No/Km on 250 mm ballast cushion below the sleepers which may consist of 100 mm clean and rest in caked up condition, on compacted and stable formation.

(b) Speed up to 100 kmph

The track shall be to a minimum standard of 52 kg (90UTS) rail laid on PSC sleeper with 1540 No/Km on 250 mm ballast cushion below the sleepers which may consist of 100 mm clean and rest in caked up condition, on compacted and stable formation.

2.2.2 The maximum permissible speed on curves shall be decided on the basis of the existing provisions of the Indian Railways Permanent Way Manual, second reprint, 2004 with simulating cant deficiency of 75 mm.

2.2.3 For Track maintained to lower standard than that mentioned above, the Chief Engineer of Railways shall decide the lower maximum permissible speed on the basis of maintenance condition. In this connection, Railway Board's letter No. 65/WDO/SR/26 dated 19/20.10.1966 may be seen. When the Chief Engineer considers that the road bed is not compacted or there is improper drainage, he may suitably restrict the maximum permissible speed depending on the local conditions.

2.2.4 The welds shall be protected by joggled fish plates as per provision of para 6.4 and para 8.14 of USFD Manual and para 6.3 of AT welding manual and other policy instructions of Railway Board. The maintenance of Rails and Rail joint shall be ensured as per para 250 & 251 of IRPWM. In addition, wherever condition warrants on account of corrosion on rail/weld collar, wear on rail, cupping of welds etc., necessary precautions shall be taken for fish plating/joggled fish plating.

2.2.5 Zonal Railway may ensure further detailed examination of track as deemed fit, based on age cum condition basis, overdue renewal and condition of formation etc. as per provisions of Chapter-III of IRPWM.2004 regarding permanent way renewals.

2.3 Bridges

2.3.1 The clearance refers to bridges "Standard Spans" with standard design of girders, slabs, pipe culverts, piers and abutments etc. issued by RDSO for BGML, RBG and MBG-1987 standard loadings. However, the bearings of span 76.2 m (clear) designed for BGML standard loading as per RDSO's drawing no.BA-11154 should be strengthened by providing two additional anchor bolts.

2.3.2 Superstructures and bearings of "Special Span" (designed and constructed by Zonal Railways based on site requirements) including arches and sub-structures of all bridges (all Standard & Special Spans) are to be examined under the directions of the Chief Bridge Engineer concern and certified safe with respect to current Indian Railway standard codes with up to-date correction slips.

2.3.3 The clearance is subject to the following parameters of Air Conditioned AC-EMU coaches with indigenous 3-phase propulsion system of M/s BHEL:

(i) Maximum axle load (Design) of MC/NDMC	= 20.32t
(ii) Maximum axle load (Design) of TC	= 20.32t
(iii) Max. Tractive effort of MC	= 13.76 t
(iv) Max. Braking force of MC	= 5.116 t
(v) Max. Braking force of TC/NDMC	= 3.82 t
(vi) C.G. Height from Rail Level (MC/NDMC/TC)	= Not exceeding 1830 mm

2.3.4 The above clause have been arrived considering bridges are in physically sound condition. In case the bridges are not in satisfactory physical condition, necessary speed restriction to be imposed by concerned Chief Bridge Engineer of Zonal Railway.

2.3.5 Location of bridges on which speed restrictions are imposed shall be notified by the Railways and incorporated in the working timetable.

2.4 Signaling

2.4.1 Provision of GR, SR, SEM and all extant instructions issued from time to time shall be complied with.

2.4.2 While running through a station, speed of the train shall be restricted to the maximum permissible speed as per standard of interlocking provided at the station.

2.4.3 On the sections where EBD of more than 1 Km is to be catered for, second distant signal or automatic signalling should be available falling which suitable speed restriction is to be imposed.

2.4.4 In the normal single phase 25 KV AC electrified section where electric locomotive is used, provisions given in para 22.6, 22.7, 22.8, 22.9 & 22.10 of SEM Pt.II regarding maximum permissible length of track circuits, signal feeding, maximum permissible length for operation of point motor, use of block instruments and use of AFTC/axle counters for higher catenary currents limited to 800A on single track section and 1000A on double track section shall be ensured by the Railway.

2.4.5 The condonation regarding infringements in schedule of dimensions, if any, shall be obtained in accordance with local conditions, before movement.

2.5 Traction Installation:

2.5.1 The 25 kV AC OHE shall have swivelling type Cantilever Assembly having tension in the conductors, regulated automatically with a presag. The presag of 50/100 mm is on the Contact Wire for a maximum span of 72 m, proportionately less for smaller spans.

2.5.2 In case of locations where 25 kV AC Porcelain Section Insulators are installed on main line and lies within first $1/10^{th}$ and $1/3^{rd}$ of the span, immediately after the OHE structure and the Runners are in trailing direction, the maximum speed shall be 120 kmph. At all other locations where 25 kV AC Porcelain Section Insulators are installed, the speed shall be limited to 80 kmph.

2.5.3 It is recommended that the cantilevers in the section should have BFB Steady Arm (RI No. 2390) with 25mm Drop Bracket Assembly (RI No. 2360) instead of Tubular Steady Arm (RI No. 2520). Bent Steady arm at overlap locations shall continue.

2.5.4 In 25 kV AC traction area, the CEE of the Railway shall have to ensure that the minimum height of Contact Wire and electrical clearances as stipulated in provisions of Chapter –V and V-A, Electric Traction `Schedule of Dimensions of 1676 mm gauge (BG) revised 2004' with latest Addendum & Corrigendum Slips is not violated and strictly followed to ensure its safe running.

2.5.5 In addition to above, the Chief Electrical Engineer of the concerned Railway may impose any temporary speed restriction on the basis of personal knowledge, experience of the Sectional OHE and the field conditions prevailing on the particular section.

2.6 Rolling stock

2.6.1 Before starting the operations, CME/CEE of the concerned Railway shall certify track worthiness and safety of the rolling stocks. He shall also ensure proper maintenance of the rolling stocks.

2.6.2 Brakes of coaches shall be in good working order during the operation.

2.7 General

2.7.1 All the permanent and temporary speed restrictions in force and those that may be imposed from time to time due to track, bridges, curves, signaling and interlocking etc. shall be observed.

2.7.2 The profile of Air Conditioned AC EMU coaches with indigenous 3-phase propulsion system of M/s BHEL infringes clause nos. 10, 14, 24, 25, 26, & 29 of chapter IV (A) of IRSOD (BG), revised 2004. Railway Board has condoned these infringements vide their letter no. 2017/CEDO/SD/RS/05 dated 30.10.2017.

2.7.3 For operation of 3658 mm wide EMU stock, stipulation under relevant under para of IRSOD (BG) revised -2004 should be ensured by Zonal Railway for required clearances.

2.7.4 Movement of subject rolling stock would be at restricted speed at locations of structures belonging to Schedule-II of IRSOD, (BG) Revised, 2004. Necessary conditions for such movement would be addressed and identified by Zonal Railways.

2.7.5 Zonal Railway must ensure the removal of existing infringements on operating routes for the running of subject rolling stock.

2.7.6 Zonal Railway to ensure improved maintenance of EMU rakes, improved maintenance of Track for unevenness, twist and cross level etc., and improved monitoring and corrective action to control sinkage of vertical level of track, as mentioned in Para 1.4 of RDSO's letter no. CT/DEL/AC/EMU/BG, dated 11.10.2017.

2.7.7 Zonal Railway to ensure that height of platform does not go beyond 900 mm as measured in accordance to note (c) for item 4, 5 & 6 of Chapter II of IRSOD, Revised-2004.

संलग्नक:-

1. ICF layout drawing no. ICF/SK3-9-0-115
2. ICF layout drawing no. ICF/SK3-9-0-116
3. ICF layout drawing no. ICF/SK3-9-0-119
4. ICF bogie general arrangement drawing nos.
   (i) EMU/DMC/AC-0-0-001for motor & non driving motor coach
   (ii) ICF/MRVC/C/BT-0-0-001for Trailer coach
5. Railway Board letter no. 2017/CEDO/SD/RS/05 dated 30.10.2017.
6. RDSO letter no. CT/DEL/AC/EMU/BG dated 11.10.2017.

(सी. मधुसूधन राव)
कार्यकारी निदेशक मानक /चालन शक्ति

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संलग्नक:-

1. ICF layout drawing no. ICF/SK3-9-0-115
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