Chennai Metro Rail Limited
Tender Description: Design, Manufacture, Supply, Testing, Commissioning of Standard Gauge Metro Rolling Stock (78 cars) and Training of Personnel
Tender No. CMRL/PHASE II/SYS/ARE03/2020
Tender ID: 2020_CMRL_605069_1

Addendum No. 3

S. No.	Part/Section	Clause No.	Original Bid Condition	Revised Bid Condition
1	Part 2 : ERTS	1.4.5	During the complete fleet operation conditions of this project, the trains may travel an average of 1,50,000 km per year at a minimum average operating speed of 34 kmph.	During the complete fleet operation conditions of this project, the trains may travel an average of 1,50,000 km per year at a minimum average operating speed of **32 kmph**.
2	Part 2 : ERTS	6.3.7	During all door operations and under all power supply conditions, door movements shall be smooth, controlled and devoid of jerks or any violent motion. Linear motor drive may be used for door operation in case of Sliding Door.	During all door operations and under all power supply conditions, door movements shall be smooth, controlled and devoid of jerks or any violent motion. ~~Linear motor drive may be used for door operation in case of Sliding Door.~~ **The contractor shall supply Service proven motor drive for Door operation.**
3	Part 2 : ERTS	14.10.6.7	The method of downloading data from the event recorder shall be standard wireless means with adequate anti-hacking protection. Additionally, a HDMI or latest compatible interface shall be provided for downloading the data.	The method of downloading data from the event recorder shall be Ethernet or HDMI or USB interface or latest compatible interface shall be provided.
4	Part 2 : ERTS	16.9.4 d (iii)	Failure modes and effects analysis for fail-safe and safety-critical circuits	Failure modes and effects **Criticality** analysis for fail-safe and safety-critical circuits
5	Part 2 : ERTS	18.5.4.4	Failure Modes and Effects Analyses a) The Contractor shall develop a Failure Modes and Effects Analysis (FMEA) [CDRL 18-5]. The FMEA shall provide a systematic, comprehensive, bottom-up evaluation that uses design data to analyze the effects of potential component failures in a system, as installed. b) The FMEA shall assess the impact of failures on subsystem and system operation, and consequently on the operational safety of the transit system. The FMEA shall assess all failures that could cause or contribute to Category I or II hazards.	Failure Modes and Effects **Criticality** Analyses a) The Contractor shall develop a Failure Modes and Effects **Criticality** Analysis (FMECA) [CDRL 18-5]. The FMECA shall provide a systematic, comprehensive, bottom-up evaluation that uses design data to analyze the effects, **their criticality** of potential component failures in a system, as installed. b) The FMECA shall assess the impact of failures on subsystem and system operation, and consequently on the operational safety of the transit system. The FMECA shall assess all failures that could cause or contribute to Category I or II hazards. **c) FMECA analysis shall be submitted for both component level FMECA and Functional level FMECA for all Sub-systems and functions of Rolling Stock.**

S. No.	Part/Section	Clause No.	Original Bid Condition	Revised Bid Condition
6		18.5.4.7	Fault-Tree Analyses The Contractor shall perform a Fault-Tree Analyses (FTAs) that quantify the probability of each Category I and II hazard identified in the PHAs. The FTAs shall consider all interfacing items that, in conjunction with the analyzed system, could lead to the occurrence of the identified hazard.	Fault-Tree Analyses The Contractor shall perform a Fault-Tree Analyses (FTAs) that quantify the probability of each Category I and II hazard identified in the PHAs. The FTAs shall consider all interfacing items that, in conjunction with the analyzed system, could lead to the occurrence of the identified hazard. **FTA shall comply with IEC 61025.**
7	Part 2 : ERTS	18.6.3.4	Where appropriate, the Contractor shall include additional reliability analysis to shown how compliance with the reliability requirements is to be achieved. Such analysis may include reliability block diagrams, reliability FMEA, etc	Where appropriate, the Contractor shall include additional reliability analysis to shown how compliance with the reliability requirements is to be achieved. Such analysis may include reliability block diagrams, reliability **FMECA**, etc
8	Part 2 : ERTS	18.6.8		New Clause: 18.6.8 Reliability for Retrofits/Modifications
9	Part 2 : ERTS	18.6.8.1		New Clause: 18.6.8.1 In case of any retrofits or modifications done by RS contractor or their sub-supplier in any specific system / sub- system / function / component / software of any train or on spares, these retrofit / modifications shall be applicable to specific system / sub-system / function / component / software for all other trains and spares supplied under the contract.
10	Part 2 : ERTS	18.6.8.2		New Clause: 18.6.8.2 In case of any retrofits or modifications done by RS contractor or their sub-supplier in any specific system / sub- system / function / component / software of any train or spares, these specific system / sub-system / function / component / software shall be subjected to 24 months warranty from the date of completion of retrofit / modification in that train or the specific spares. This is in order to mitigate any issues that would arise due to the retrofit / modification. This specific 24 months warranty is irrespective of the train DNP / DLP / warranty.
11	Part 2 : ERTS	18.7.7.1	$\%\text{Availability} = 1 - \left(\frac{DT(SC) + DT(OPM) + DT(CM)}{\text{Total Time}}\right) * 100$	$\%\ \text{Availability} = \left\{1 - \left(\frac{DT(SC) + DT(OPM) + DT(CM)}{\text{Total Time}}\right)\right\} * 100$

S. No.	Part/Section	Clause No.	Original Bid Condition	Revised Bid Condition
12	Part 2 : ERTS	Table 21-1 Design Deliverables Milestone	CDRL 18-5 Failure Modes and Effects Analyses	CDRL 18-5 Failure Modes and Effects **Criticality** Analyses (FMECA)
13	Part 2 : ERTS Addendum 2 Point 89	Appendix C 2.4.47	The operation of the mechanical coupling in the front and rear end automatic couplers of the rake shall be completely automatic when coupling and un-coupling between rakes. With one uncoupling command from TCMS & RSC console of OCC / BCC / DCC, it shall enable sequential dis-engagement of electrical head, pneumatic head and mechanical head uncoupling within each front end coupler of train. Uncoupling shall be possible only when the rake is stationary. In front-end automatic coupling operation, RS Contractor shall ensure that the operation of the electrical head coupling occurs only after effective and successful engagement of both mechanical and pneumatic coupling between rakes. There shall always be a manual command provision from TCMS and RSC console of OCC/BCC/DCC to allow/not-allow the engagement of electrical heads between rakes after effective and successful mechanical & pneumatic coupling. As trains shall operate in UTO mode (with GoA 4), automatic couplers shall be used in such a way that in all degraded operation modes, in general operational modes and in emergency cases, no manual intervention at coupler is required to couple/uncouple the defective train with healthy train (and vice-versa) in the complete alignment of CMRL Phase 2. Interface plan to address the procedures to be adopted for rescuing the immobile train on line by un manned & un attended coupling of the failure train with healthy train and clearing the line in Pull/Push mode with healthy train. These procedures shall be proposed for UTO and Non-UTO modes of operations.	Coupling of trains for call-on or push out shall normally be performed in RM mode.
14	Addendum 01 Sl no : 20		ERTS Clause 1.2.6 The at-grade, underground and elevated sections have ballast less track in mainline and Ballasted track in depots.	**ERTS Clause 1.3.6** The at-grade, underground, Madhavaram Depot and elevated sections have ballast less track and Ballasted track in Poonamalle depot.

S. No.	Part/Section	Clause No.	Original Bid Condition	Revised Bid Condition
15	Addendum 01 Sl no : 28		ERTS Clause 2.9.5	**ERTS Clause 2.9.4 (Table 2-4)**
16	Addendum 01 Sl no : 46		New clause included : 3.4.23 : The psophometric current of one 3 car train at full rated power shall not exceed 5 amperes. Psophometric current of train shall be measured according to the requirements of EN 50121-3-1 and ITU-T O.41.	Clause deleted.
17	Part 2 : ERTS	Appendix D Alignment		Revised Alignment data for Corridor 3, Corridor 4 & Corridor 5 is attached in the below link. ALIGNMENT DRAWINGS
18	Part 3 : PCC	11.3	Replace sub-clause 11.3 with the following: The Employer shall be entitled subject to Sub-Clause 2.5 [Employer's Claims] to an extension of the DNP for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) (a)does not meet the reliability targets set in ERTS clause 18.6. If the Works or a Section cannot be used by reason of such defect and/or making good of such defect, the Defect Notification Period of the Works or a Section, as the case may be, shall be extended by a period equal to the period during which the Works or a Section cannot be used by the Employer because of any of the aforesaid reasons or until the reliability targets set in ERTS clause 18.6 is met, whichever is later."	Replace sub-clause 11.3 with the following: The Employer shall be entitled subject to Sub-Clause 2.5 [Employer's Claims] to an extension of the DNP for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) (a)does not meet the reliability targets set in ERTS clause 18.6. The Defect Notification Period of the Works or a Section, as the case may be, shall be extended until the reliability targets set in ERTS clause 18.6 is met. In case of any retrofits or modifications done by the Contractor or their sub-supplier in any specific system / sub- system / function / component / software of any train or spares, these specific system / sub-system / function / component / software shall be subjected to 24 months warranty from the date of completion of retrofit / modification in that train or spares. This is in order to mitigate any issues that would arise due to the retrofit / modification. This specific 24 months warranty is irrespective of the train DNP / DLP / warranty.
19	Part 1 : BDS	ITB 1.1		New Clause Inserted : **Order Quantity of Rolling Stock :** 78 cars *(26 Trainsets of 3 car configuration)* .

S. No.	Part/Section	Clause No.	Original Bid Condition	Revised Bid Condition
20	Part 1 : BF	Sec. 2	Schedule of Adjustment Data (Table A & Table B) Non-adjustable (Fixed) (Weightage : 0.33) Labour (Weightage : 0.10) Stainless steel (Or) Aluminium (Weightage : 0.20) Carbon Steel (Weightage : 0.30) Copper (Weightage : 0.07)	Schedule of Adjustment Data (Table A & Table B) Non-adjustable (Fixed) (Weightage : 0.33) Labour (Weightage : 0.10 ~ 0.25) Stainless steel (Or) Aluminium (Weightage : 0.15 ~ 0.25) Carbon Steel (Weightage : 0.10 ~ 0.30) Copper (Weightage : 0.04 ~ 0.10) Note : in case if the bidder fills in weightages whose sum is not equal to 0.67 (excluding Nonadjustable), then CMRL will adjust the indices on pro-rata basis based on bidder's submission.
21	Part 1 : BF	3.2.2	"b", "c", "d", "e" and "f" are coefficients representing the estimated proportion of each cost element (Stainless steel/Aluminium, Copper, Carbon steel and Labour) in the Works or sections thereof, as specified in Schedule of Adjustment Data in Section IV - Bidding forms.	"b", "c", "d", "e" and "f" are coefficients representing the estimated proportion of each cost element (Stainless steel/Aluminium, Copper, Carbon steel and Labour) in the Works or sections thereof, **as quoted by the bidder in** 'Schedule of Adjustment Data' in Section IV - Bidding forms.
22	Part 2 : ERTS	2.9.4		Revised clause 2.9.4 and its Tables are as below,

2.9.4 Track Maintenance

The tolerances within which the main track will be maintained is provided in the Schedule of Dimensions in Appendix D.

Table 2-2 contains information on the track design values.
Table 2-3 provides information on the track structure parameter;
Table 2-4 provides information on the track tolerances and
Table 2-5 provides information on the platform interfaces.

Table 2-2: Track Design Values

Dimension	Maximum	Minimum
Track gauge	1,435 mm (nominal)	
Horizontal curve radius: Mainline a) Under Ground Sections b) Elevated and At grade Sections **c)** Depot and Sidings at Stations	 ----- -----	 200 m (minimum) 120 m (minimum) 100 m (minimum)
Minimum radius of vertical curve		1,500 m
Cant deficiency	85 mm	-----
Cant	110 mm	-----
Cant gradient	—-	1 in 440
Gradient At station At turnout Other sections in Mainline Depot	0.25% (1 in 400) 2.5%(1 in 40) 4 % (1 in 25) Including compensation level Level	 ----- -----
Rate of grade change	-	1 in 440
Rail type: CWR	60E 1 Profile as per IRS T 12 – 2009 (With Latest Amendments/ Correction Slips) canted at 1 in 20	
Platform curve	1000m	—-

Track characteristics

The Track Structure Parameters for At-grade, Elevated and Underground sections are set out in Table 2.3.

Table No 2-3: Track Structure Parameters

Description	**Elevated and at-grade sections**	**Tunnel sections**
Track Laying Gauge	1435mm ± 2mm	
Rail Type		
Main Line	60E 1 Head hardened as per IRS T 12 - 2009 With All Amendments / Correction Slips. (1080 deleted as per latest draft no more 1080)	
Depot	60E 1 (880 Grade) as per IRS T 12 – 2009 With All latest Amendments / Correction Slips.	
Rail Profile	60 E1 Profile	
Inclination Of Rail	1 / 20	
Rail Seat spacing, Main line	Nominal 650 mm ± 5 mm	
Sleeper Spacing, depot	650mm± 5 mm; Inspection Lines 1000 mm	
Ballast Cushion		
Depot	Ballast less Track in Madhavaram Depot Ballasted Track in Poonamalle Depot	
Rail Panel Lengths	Continuous welded rails	
Minimum Radius of Curvature	Depot-100m Main line -At grade and elevated-120m	200m
Minimum Turn Out Radius. Main Line	140m	
Minimum Turn Out Depot	Madhavaram Depot : 1 in 5 100 R Poonaamalle Depot : 1 in 5 100 R,	
Minimum Turn Out Main line	1 in 7 R 140	
Maximum Cant Permissible in curves	110 mm	
Maximum Cant Deficiency Permissible	85mm	
MinimumPermissible Cant Gradient	1 in 440	

Description	Elevated and at-grade sections	Tunnel sections
Turn-out Speed : Turn-out (Main line)	1 in 9 R 300=45 kmph; 1 in 9 R 190=35 kmph 1 in 7 R 190=35 kmph; 1 in 7 R 140=25 kmph	
Maximum Gradient (Main Line)	4% Including Grade Compensation.	
Minimum vertical curve radius crest	1500m	
Maximum track axle load (AW4)	16 tons	
Widening of track Gauge on curves	Up to 9 mm	
Structural gauge and passing clearance in straight line, in curves, in open air grade, in tunnel	As per SOD of CMRL Refer to Appendix D of this document for typical Sections	
Tunnel Profile	As per SOD of CMRL Drawings showing section of cut and cover and bored tunnel in the Underground sections and details of various equipment's/cables etc located therein are mentioned in are enclosed in Appendix D	
Line profile	The drawings showing the line profiles of all corridors are enclosed in Appendix D of this document:	

The Track tolerances for At-grade, Elevated and Underground sections are set out in Table 2.4. Final track tolerances will be confirmed by CMRL during the preliminary design of the vehicle.

Table 2-4Track Tolerances:

Description	Ballasted	Ballast-less (DFF)
Laying Tolerance of Vertical Alignment measured by 10m chord (Designed level)	± 4 mm	± 4 mm
Alignment (Laying) (Base 10m)	±5mm	(±4mm for 20m chord as per CMRL maintenance manual)
Cross Level Laying Tolerance (Designed)	±3mm	+\-2mm

Description	Ballasted	Ballast-less (DFF)
Twist (Other than transition curve)	1mm/250mm	Target value not to exceed 6mm over 3m; isolated locations up to 5mm over 3m; Threshold value for speed restrictions 10mm over 3m.
Cross Level Difference (Maintenance)	15mm	10 mm
Gauge measured at a point 14mm below crown of rail (laying) (with respect to 1435 mm)	-6to +6 mm	Target value +6 / -6 mm; Threshold value for speed restrictions +20mm / -10mm
Unevenness (Maintenance) – 3 ,m chord	3 ,m chord : 15mm	Target value not to exceed 6 mm; isolated locations up to 10 mm; Threshold value for speed restrictions 15mm.
Alignment (Maintenance) (Base 7.5m)	15mm	Target value not to exceed 5 mm; isolated locations up to 10 mm; Threshold value for speed restrictions 15mm .
Gauge variation maintenance (sleeper to sleeper)	-6/+6mm	(±6mm as per CMRL maintenance manual)
Gauge (Maintenance) – Tangent track (with respect to 1435 mm)	-10 to + 20 mm	Target value +6 / -6 mm; Threshold value for speed restrictions +20mm / -10mm
Gauge (Maintenance) - >500m radius (with respect to 1435 mm)	-10mm to -20mm over widened gauge	-10 to +20mm over widened gauge
Gauge (Maintenance) - <500m radius (with respect to 1435 mm)	-10 to + 20 mm	-10 to +20mm over widened gauge
Gauge Face Wear	8mm	8mm

Platform interfaces are set out in Table 2.5

Table 2-5: Platform interfaces:

Particulars	Measurements
Length	136 m (6 coaches)
Width: Island type	8.0 to 12.0 m

Width: Side type		4.0 to 6.0 m
Height above Top of Rail level	Ballasted Track	1095mm to 1085mm
	Ballast-less Track	1095mm to 1085mm
Distance between track center and platform edge		In underground -1510mm-1515mm In Elevated and At grade- 1515-1520mm
Minimum horizontal curvature at platform		1000m
Structural gauge and passing clearance in platform		Refer to Appendix D of this document