

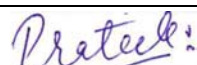


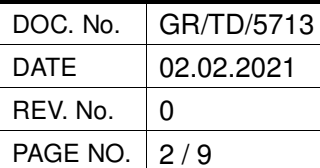


BEML LIMITED BANGALORE

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PROCUREMENT TECHNICAL SPECIFICATION FOR WHEEL PROFILE & WHEELSET MEASUREMENT AND RECORDING SYSTEM

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Reviewed	02.02.2022	SANJAY SINGH R	
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	Date	Name	Signature

[illegible]

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1. Introduction

To monitor the condition of wheel & wheelset under operation for safety of metro rolling stocks, wheels and wheel sets are checked periodically for critical dimensions. This document specifies the general requirements of wheel profile and wheelset measurement & recording system.

2. Definitions and Abbreviations

2.1. Definitions

The following definitions shall be used as applicable:

- "Employer" means end user and its legal successors and assignees.
- "Engineer" means any person nominated or appointed from time to time by the employer to act as engineer for the purpose of the contract and notified as such in writing to the contractor.
- "Engineer's Representative" means any assistant of the engineer appointed from time to time by the engineer
- "BEML" means the contractor to procure the measurement equipment.
- "Vendor/Supplier/OEM" means the supplier of wheel profile and wheelset measurement & recording system to BEML.
- "Equipment" means wheel profile and wheelset measurement and recording system along with all accessories and items as required for effective and efficient operation.

2.2. Abbreviations

The following abbreviations shall be used as applicable:

- WPM: Wheel profile measurement & recording system
- WSM: Wheelset measurement & recording system
- GTC: General Terms & Conditions of Contract of BEML
- PTS: Procurement Technical Specifications of BEML
- LCC: Life Cycle Cost
- OEM: Original Equipment Manufacturer
- DLP: Defect Liability Period
- MRTS: Mass Rapid Transport System
- CBC: Clause By Clause Comments
- AMC: Annual Maintenance Contract

3. General data

The general data applicable to systems and sub-systems are given in the succeeding sections.

3.1. Wheel diameter

Wheel diameter (new)	860 mm
Wheel diameter (half worn)	820mm
Wheel diameter (full worn)	780mm

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3.2. Climatic conditions

The vendor shall supply the equipment and if necessary, customize the same to satisfy climatic & environmental conditions of coastal climate in Mumbai, Maharashtra, India. Some of the details are as given below:

Description	Limiting Values
Maximum temperature (See note-a below)	36 °C
Minimum temperature	14 °C
Humidity	≥ 95% RH
Atmosphere during hot season	Extremely dusty including bird feathers
SO ₂ level in atmosphere	80 – 120 micro gram/m ³
Suspended particulate matter in atmosphere (TSPM)	360 – 540 micro gram/m ³

Note:

- The temperature of the metal surfaces of the vehicles when exposed directly to the sun, for long periods of time, may be assumed to rise to 70 °C.
- Any moisture condensation & coastal climate shall not lead to any malfunction or failure.
- Adequate margin shall specially be built into the design particularly to take care of the higher ambient temperatures, high humidity, dusty and corrosive conditions, etc. prevailing in coastal area.

3.3. Unclear aspects

If any term/clause/definition is unclear in this PTS or there is any conflict among the requirements of particular clauses of the PTS the vendor shall seek clarification from BEML prior to making the proposal, to confirm the same. After signing the contract, vendor shall follow the definition and opinion of design team in BEML.

3.4. Responsibility of vendor

3.5. Standards

- The design, manufacture & testing of the proposed aggregates by vendor shall conform to the latest editions of UIC/EN standards or equivalent international standards on first priority. Metric system with SI units shall be used wherever applicable
- The vendor's own standards shall be on second priority. The vendor shall request and justify with reasonable, sufficient & necessary support documents for choosing alternate standards as compared to UIC/EN/any other international standards.
- BEML/Employer reserves the right to accept or reject any such request(s).
- The vendor shall provide the standards used in his equipment if asked by BEML. The same is considered to be in quoted price.

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4. Qualifying Criteria

- Vendor should be a reputed OEM of the proposed equipment for rolling stock. The vendor shall provide details of his supply experience for the same clearly stating the customer and year of supply.
- Company profile shall be submitted by the vendor. The vendor shall be ISO: 9001 certified.
- The OEM should undertake to provide support during warranty period either by themselves or through sister company or a partner in India. The OEM shall submit detailed proposal in this regard.
- It is preferred that the proposed equipment shall have been in use and have established satisfactory performance and reliability on at least one mass rapid transit systems in revenue service over a period of one year or more.
- The vendor shall be capable of providing AMC support after end of warranty period. The warranty period starts after successful testing and commissioning of the proposed equipment.
- Company profile, product description, catalogue, box contents etc shall be submitted along with offer. Operating and maintenance instructions must be submitted after placement of order.
- The vendor should give an undertaking to supply spares for a minimum period of 10 years from the date of commissioning of the equipment.
- The OEM (in case of foreign supplier) can also supply the equipment through an authorized distributor in India. A letter of authorization shall be submitted for review along with technical offer. Validity of the authorization letter shall be clearly mentioned in the letter.

5. Functional parameters

5.1. General features of measurement system

The proposed equipment shall have in general following features:


- The proposed equipment shall be a portable, reliable & proven system. It shall be light in weight and easy to use.
- Inspection, measurement and recording shall be carried out in site without necessarily dismantling the wheelsets/wheels.
- The proposed equipment shall be capable of taking measurements on wheelset/wheels which are either free standing or in assembled condition with the bogie/vehicle in depot and/or main line. Indoor as well as outdoor measurements shall be carried out in day time as well as night time
- The proposed equipment shall be capable of taking measurements for wheelsets/wheels designed as per UIC (510-2, 812-2, and 812-3), DIN, EN (13260, 13262) standards or any other internationally accepted standards.
- The proposed equipment must have calibration tools & software so that calibration of measuring equipment can be done by the end-user/BEML itself.
- The software shall be capable of recording information like wheel no, wheel set no, train no, date, operator name, project id, time, standard profile name & no, standard reference values, tolerance limits etc.
- In case the values are out of range warning signals shall be generated.

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- h. The equipment display and scanning device shall provide information regarding battery strength, measured parameters, reference data etc and shall have backlit option. The measurement shall be done in sunlight and in during night time.
- i. The proposed equipment shall be capable of storing minimum 500 recordings preferably.
- j. The proposed equipment shall have a minimum battery operation of 8hrs per day.
- k. The proposed equipment shall be shock & vibration proof, water, dirt and dust proof as per IEC 60529 IP-65 rating or higher is preferred.
- l. The measurements are done in surroundings where high voltages and current exists. The vendor shall ensure electromagnetic compatibility for the same.
- m. The climatic and environment conditions must not have any impact on the accuracy and precision of the equipment.
- n. Updates for the software shall be provided without any financial implications on BEML/end-user during warranty period. The software provided shall be easy to install and compatible with a general computing device working on windows/Mac-OS/Linux system, without the need of a high end industrial system configuration.
- o. The measurement results from the system shall be able to be exported in a format compatible with CAD software and spread sheet solutions. Reports shall be generated in pdf format also.
- p. It shall be possible to print the reports and measurement results to a connected printer.
- q. All materials and workmanship in every aspect shall be as per proven up-to-date best international practices even if not specifically mentioned.

5.2. WPM 525-81012 (Laser based)

- a. The proposed equipment should be capable of measuring the wheel profile and related parameters of interest with high degree of accuracy, 0.1mm or less.
- b. The related parameters of interest to a minimum are- flange height (range 20-40mm), flange thickness (range 20-40mm), flange slope (qr) (up to 15mm) and rim thickness (up to 145mm).
- c. The proposed equipment shall be calibrated in presence of BEML/user for wheel tread profile of RDSO sketch 91146 Alt-3 in a standard gauge (1435mm) wheelset.
- d. The proposed equipment shall be capable of getting interfaced with a laptop or personal computing device for the purpose of downloading measured wheel profiles and exporting/importing data. Interfacing shall be through USB ports or wireless.
- e. There shall be a provision in which a standard wheel profile can be compared as a reference to measured wheel profile.

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5.3. WSM 525-81018

The wheelset measurement & recording system shall be capable of

- Measuring wheel back to back dimension i.e. distance between wheel internal faces (nominal 1358mm, variation $\pm 1\text{mm}$, accuracy 0.1mm or better) in trailing wheel sets and motor wheel sets
- Wheel diameter (range $860\text{mm} \pm 1\text{mm}$ to $780 \pm 1\text{mm}$, accuracy 0.1mm or better) measured at point-A of RDSO sketch-91146 Alt-3.
- Run out (axial and radial, accuracy 0.01mm or better)

6. Scope of Supply

- The vendor shall supply the proposed items as a complete package along with all accessories, attachments, cables, power units etc which enables the equipment in ready to use condition.
- The equipment shall have to a minimum a display device with controls, laser scanning head, connecting cables for power, charging & data transfer, power pack (re-chargeable batteries, battery charger, adapter etc), insulated & shock proof equipment box, calibration block, special tools (if any) for inspection & testing, maintenance spares applicable during warranty period, user interface software & database management system on a portable drive etc.
- The vendor shall provide details of any consumable item like source, specification etc. required for the proposed equipment. If vendor fails to provide the details, the same shall be supplied during warranty period free of cost.
- The vendor shall provide technical documentation of operation, self help manual, device information and usage instructions, fault diagnostics, maintenance instructions, list of special tools, storage and handling instructions, box contents, equipment calibration certificate, technical specification of the part items, software installation manual etc. The medium of language shall be English and documents in colour.
- The vendor shall provide training to personnel of BEML and end-user for usage and operation of the equipment along with calibration. The vendor shall demonstrate the functions and utility of the equipment on 4 wheels and 4 wheel sets, to the satisfaction of the user. Training plan shall be submitted for approval.
- The vendor shall also provide a recorded video of the description and usage of the equipment. This will be used as a reference by the user during inspection.
- Any license required for operating software shall be perpetual i.e. which does not require renewal. Software update during warranty period shall be done free of cost by the vendor.

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SL	PART NO	ITEM	UOM
1	525-81012	WHEEL PROFILE MEASUREMENT & RECORDING SYSTEM (LASER BASED)	NO
2	525-81018	WHEELSET MEASUREMENT & RECORDING SYSTEM	NO
<i>Refer section-6 for scope of supply in detail</i> <i>UOM- Unit Of Measurement</i>			

7. Warranty

- The vendor shall provide a minimum warranty of 24 months for its supplies. In case any part of the equipment turns out to be defective (for reasons attributable to improper workmanship, design defect, inferior material etc) during the warranty period, the warranty of the said equipment after repair/replacement shall be renewed by 24 months from the date of repair/replacement.
- The repair or replacement as necessary shall be done by the vendor free of cost in site, to the satisfaction of the user.
- The useful life of the proposed equipment shall be minimum 5 years from date of commissioning. A higher life and higher warranty will be an added advantage among different proposals for the subject item.

8. Delivery

- The vendor shall deliver proposed equipment as per delivery schedule mutually agreed.
- The vendor shall pack & deliver the proposed equipment suitably to avoid any damage during transit/transportation.
- The manuals and technical literature shall be supplied by vendor in a week after placement of purchase order or one month before the supply of equipment to BEML, whichever is earlier.

9. Compliance for PTS

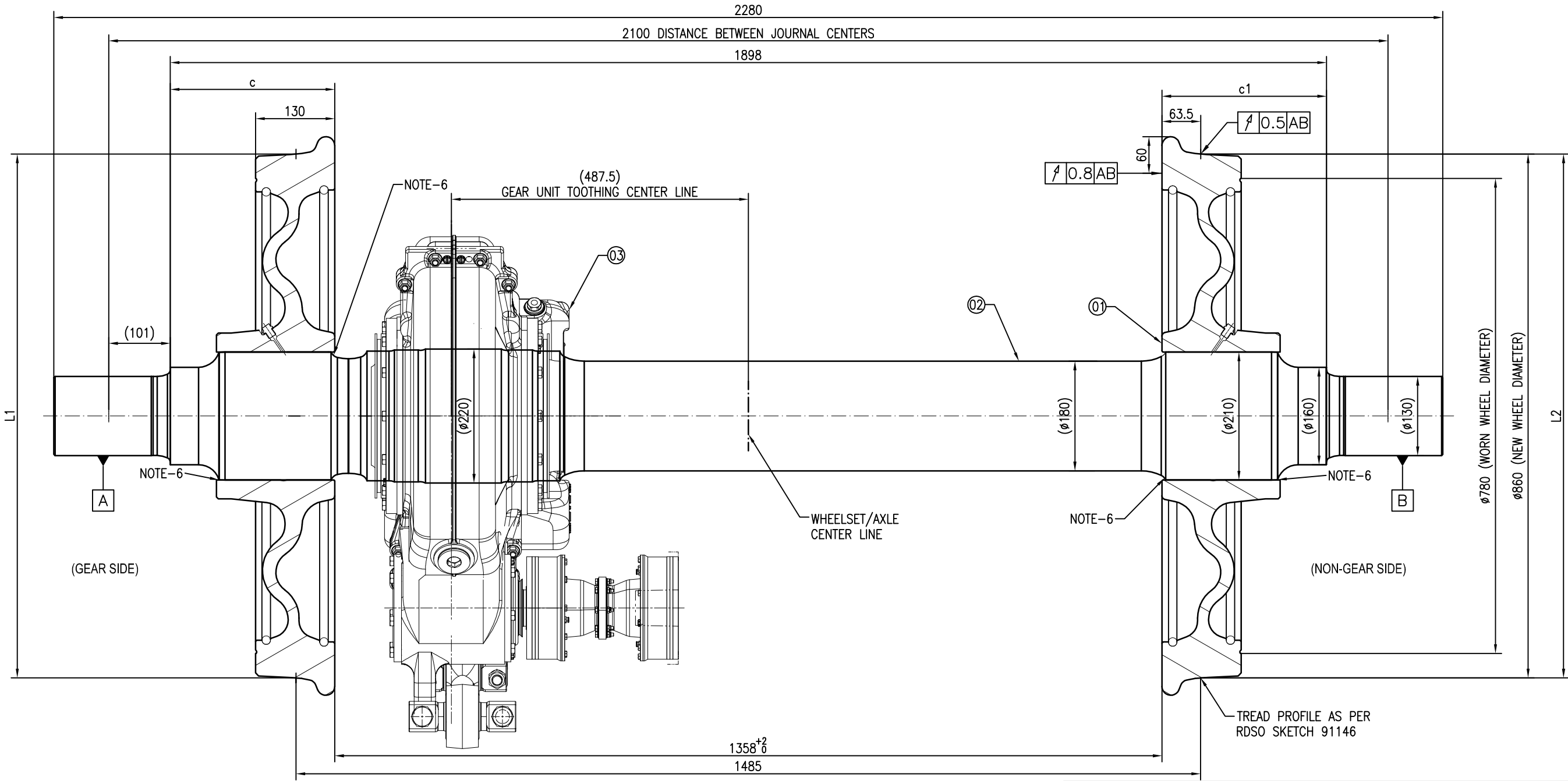
- The vendor shall provide a valid and fully compliant proposal for the proposed aggregates as detailed in the PTS.
- The vendor shall submit a detailed clause by clause commentary (CBC) on the clauses of the PTS.
- Any clause of PTS for which no comments have been provided in CBC by the vendor shall be construed as favourable to BEML/Employer.
- It is suggested that vendor shall list out all deliverables or supply elements mentioned in this PTS and submit offer/ proposal for the same. Any queries can be addressed to BEML before submission of offer. Once the offer is submitted to BEML, it is deemed to be understood as inclusive of all deliverables.

10. Attachments

- Motor wheel set drawing 525-81001
- Trailer wheel set drawing 525-81002
- Wheel profile RDSO sketch-91146 Alt-3

Attachment-1

3		2							1			
MACHINING DEVIATIONS FOR LINEAR DIMENSIONS	RANGE	0 - 6	6 - 30	30 - 120	120 - 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA		
	TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	~		
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227												
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF. IS 2102 (PT-1) (MEDIUM)							QUALITY OF WELD JOINTS REF. RD 230 MEDIUM					
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY STD DS. 1012.C.							STATUS:	PRODUCTION				
WELDING SHALL BE CARRIED OUT AS PER IS: 9595-96												



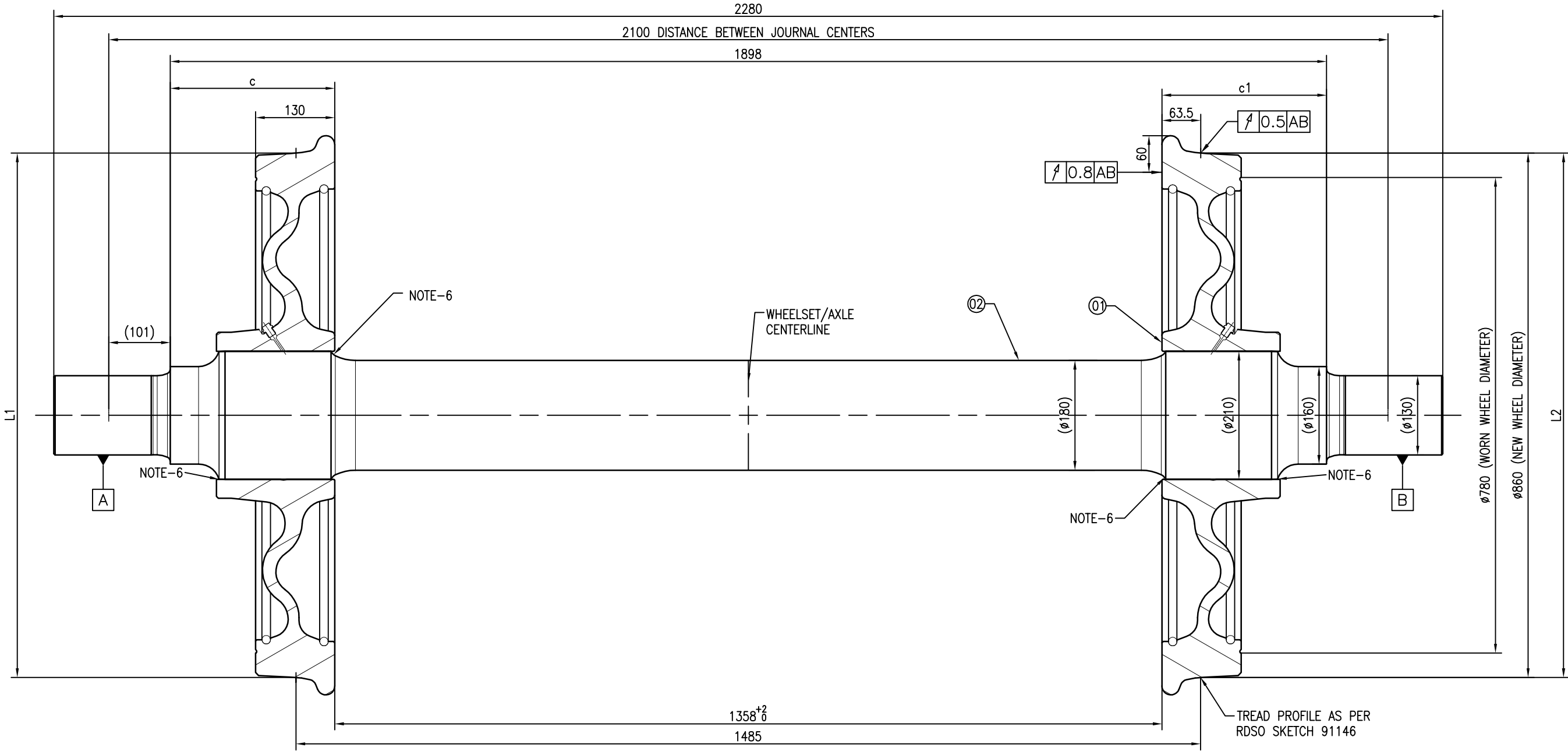
NOTE:

1. DIFFERENCE IN TREAD DIAMETER OF WHEELS ON SAME AXLE $|L1-L2| \leq 0.5\text{mm}$
2. $|C-C1| \leq 1 \text{ mm}$
3. IMBALANCES OF BOTH WHEELS OF WHEEL SET ARE ON THE SAME PLANE WHICH PASSES THROUGH THE AXIS OF AXLE AND IMBALANCES ARE POSITIONED AT SAME SIDE OF AXLE.
4. MAXIMUM AXLE LOAD IS 17T AND MAXIMUM OPERATING SPEED IS 80KMPH.
5. PRESS FITTING: THE PRESS FITTING FORCE REACHED DURING THE PRESS-FITTING OPERATION SHALL BE MIN. 714kN, MAX. 1218kN.
6. SPACE WILL BE FILLED WITH SEALING COMPOUND LOCTITE 5699.
7. WHEEL SETS SHALL BE MANUFACTURED & DELIVERED AS PER EN 13260 CATEGORY 2a.
8. MARKING ACCORDING TO BEML DRAWING 525-81011 (SUPPLIER DRAWING D11-4-01805)

3	1	525-81003	GEARBOX ASSEMBLY			
2	1	525-81005	DRIVING AXLE			
1	2	525-81004	WHEEL			
SL.No.	QTY	PART / STOCK No.	DESCRIPTION	SIZE	COMPANY STD./IS	
△			PRODUCT	MUMBAI METRO CARS L2 & L7		
△			REF DRG	455.9.252.226.00-21.48		
△			MATERIAL			
△			HEAT TREAT.		APPD	M SUDHARSHAN 28.11.2018
△			SURFACE TREAT.		REVD	R SANJAY SINGH 27.11.2018
△			TITLE		CHKD	R SANJAY SINGH 27.11.2018
2	Note revised	04.09.2020	DATE		DRWN	PRATEEK MISHRA 26.11.2018
1	ECN no-52510264		BY		POWERED WHEEL SET	
1	Revised and redrawn		CHKD			
1	ECN no-52510261		APPD		SCALE	1 OF 1
ALT.NO.	ECN NO/CHANGES	DATE	BY	CHKD	Wt.(Kg)	1490
					DRG No.	ALT
					BEM BEML LIMITED	
					525-81001	

Attachment-2

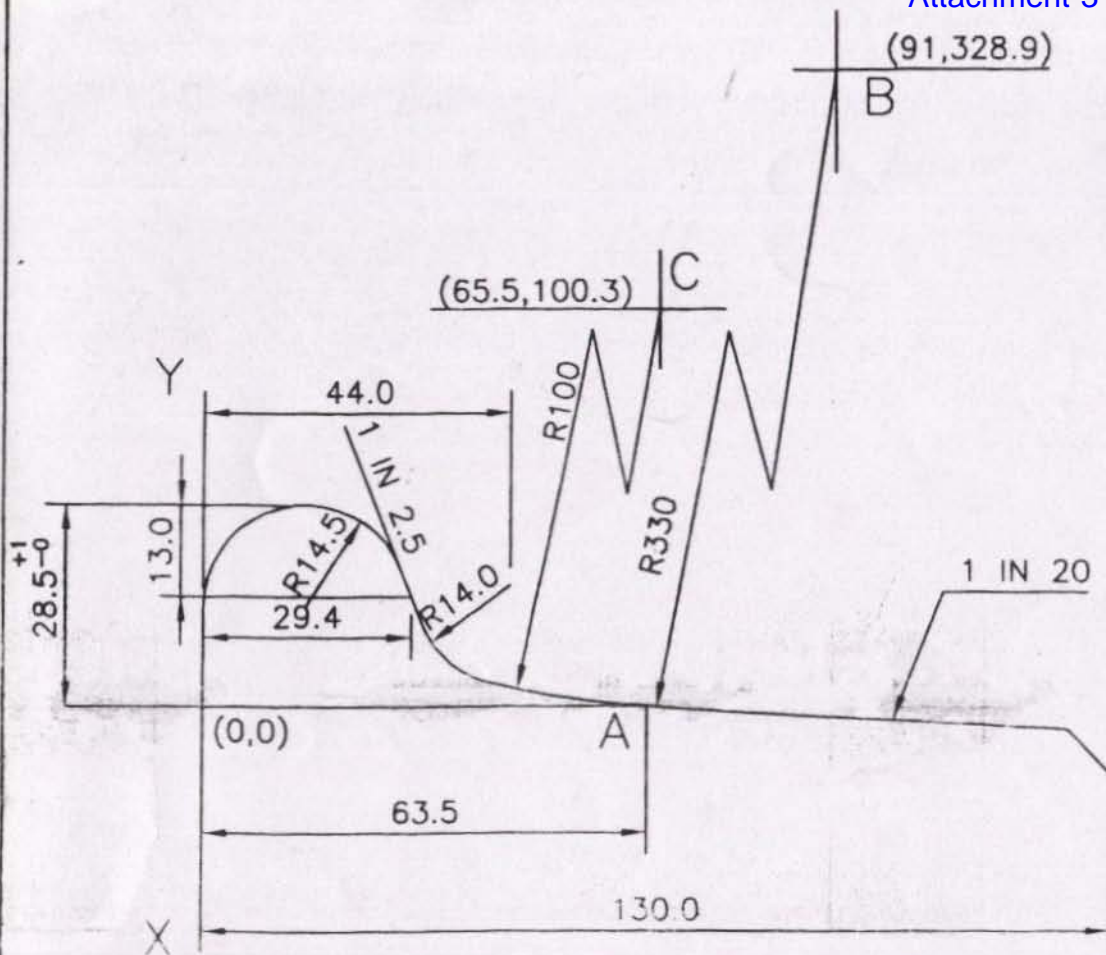
3		2							1			
MACHINING DEVIATIONS FOR LINEAR DIMENSIONS	RANGE	0 - 6	6 - 30	30 - 120	120 - 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA		
	TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	~		
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227												
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF. IS 2102 (PT-1) (MEDIUM)							QUALITY OF WELD JOINTS REF. RD 230 MEDIUM					
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY STD DS. 1012.C.							STATUS:	PRODUCTION				
WELDING SHALL BE CARRIED OUT AS PER IS: 9595-96												



NOTE:

1. DIFFERENCE IN TREAD DIAMETER OF WHEELS ON SAME AXLE $|L1-L2| \leq 0.5\text{mm}$
2. $|C-C1| \leq 1 \text{ mm}$
3. IMBALANCES OF BOTH WHEELS OF WHEEL SET ARE ON THE SAME PLANE WHICH PASSES THROUGH THE AXIS OF AXLE AND IMBALANCES ARE POSITIONED AT SAME SIDE OF AXLE.
4. MAXIMUM AXLE LOAD IS 17T AND MAXIMUM OPERATING SPEED IS 80KMPH.
5. PRESS FITTING: THE PRESS FITTING FORCE REACHED DURING THE PRESS-FITTING OPERATION SHALL BE MIN. 714kN, MAX. 1218kN.
6. SPACE WILL BE FILLED WITH SEALING COMPOUND LOCTITE 5699.
7. WHEEL SETS SHALL BE MANUFACTURED & DELIVERED AS PER EN 13260 CATEGORY 2a.
8. MARKING ACCORDING TO BEML DRAWING 525-81011 (SUPPLIER DRAWING D11-4-01805)

2	1	525-81007	TRAILER AXLE		
1	2	525-81004	WHEEL		
SL.No.	QTY	PART / STOCK No.	DESCRIPTION	SIZE	COMPANY STD./IS
△			PRODUCT	MUMBAI METRO CARS L2 & L7	
△			REF DRG	455.9.252.235.00-21.28	
△			MATERIAL		
△			HEAT TREAT.	APPD	M SUDHARSHAN 28.11.2018
△			SURFACE TREAT.	REV D	R SANJAY SINGH 27.11.2018
△			TITLE	CHKD	R SANJAY SINGH 27.11.2018
△			TRAILER WHEEL SET	DRWN	PRATEEK MISHRA 26.11.2018
△	Revised and redrawn	DATE 04.09.2020	BY PRATEEK MISHRA	SCALE	1 OF 1
1	ECN no-52510261	DATE 04.09.2020	BY PRATEEK MISHRA	NTS	1044
ALT.NO.	ECN NO/CHANGES	DATE	BY	CHKD	ALT
				APPD	
BEML LIMITED				525-81002	



PROCEDURE OF DRAWING:-

1. DRAW A VERTICAL LINE X-Y.
2. DRAW SEMI-CIRCLE OF 14.5R TANGENTIAL TO LINE X-Y.
3. DRAW LINE 1:2.5 TANGENTIAL TO 14.5R SEMI-CIRCLE.
4. DRAW A HORIZONTAL LINE AT 28.5mm FROM THE TOP OF THE FLANGE. AND LOCATE Pt. 'A' AT 63.5mm FROM THE LINE X-Y.
5. FROM Pt. A LOCATE CENTRE 'B' OF ARC OF 330R ON A VERTICAL LINE AT 91mm FROM X-Y.
6. DRAW ARC OF 330R FROM CENTRE 'B'
7. LOCATE CENTRE 'C' ON VERTICAL LINE AT A HORIZONTAL DISTANCE OF 65.5mm FROM THE LINE X-Y SUCH THAT BC = (330-100) ie 230mm.
8. DRAW ARC OF 100R WITH CENTRE AS 'C'.
9. DRAW ARC OF RADIUS 14mm TANGENTIAL TO 100R ARC AND LINE 1:2.5.
10. DRAW LINE 1:20 TANGENTIAL TO 330R ARC.
11. DRAW A VERTICAL LINE AT A DISTANCE OF 130mm FROM THE FLANGE END.

பெரிய கருத்துடன் கவனம்

NOTE:

CO-ORDINATES OF POINTS B & C ARE BASED ON NOMINAL DIMENSION OF 28.5mm.

③	SS/24/04	DIMENSION 73.7 DELETED	9/04
②	J.S. CD/3/94	REVISED & REDRAWN	3/94
①	J.S. CD/7/92	CO-ORDINATES OF ARCS SHOWN	3/92
ALT.	AUTH.	DESCRIPTION	DATE

SUPERSEDED BY:	
SUPERSEDES:	
SCALE	P
1:1	C
	D G.V.RAMAN
	T
	J.S.
B.G.	R.D.S.O.
	(C)

WORN WHEEL
PROFILE

SKETCH-91146

GROUP					
XX3					