



BEML LIMITED
BANGALORE
R & D CENTER

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Page 1/14

**Procurement Technical Specification of
Labels (Interior labels, Wrapping films &
Exterior labels) for Metro Cars**

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	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	2/14

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	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	3/14

Table of Contents

1	Introduction	4
1.1	General.....	4
1.2	Climatic Conditions	4
2	Definitions and Abbreviations	7
3	Scope of work.....	7
3.1	General.....	7
3.2	Submission of Documents.....	8
3.3	Packing	8
4	Defining of unclear aspects	8
5	Standards.....	8
6	Area of application	8
7	Rolling Stock details.....	9
8	Quality Assurance Program.....	9
8.1	General.....	9
8.2	Quality Assurance Plan	10
9	Application of Labels.....	10
10	Technical Requirements.....	10
10.1	General.....	10
11	Removal of Wrapping film, Interior labels & Exterior labels	13
12	Submittals with Technical Offer.....	13

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	4/14

1 Introduction

1.1 General

This Procurement Technical Specification (hereafter PTS) describes the technical requirements for the Interior Labels, Wrapping Films & Exterior Labels to be supplied for use in Metro Cars.

The supplier shall be responsible for all works required in this PTS with regard to Interior labels, Wrapping films and exterior labels and shall be responsible for supporting the BEML activities as contractor for manufacture of Metro Cars.

The scope of work includes all items of work which may be required to meet the performance requirements, reliable and efficient operation of trains and meeting the best international practices even if not specifically mentioned in this PTS.

1.2 Climatic Conditions

The Metro Cars have to operate reliably and safely under the climatic & Environmental Conditions shown in the following tables for the respective cities and correspondingly the Interior labels, Wrapping films and exterior labels installed in the cars shall perform satisfactorily under the following conditions.

a) Metro Cars in Delhi shall operate reliably and safely under the climatic conditions shown in Table-1 below.

Description	Limiting Values
Maximum ambient temperature	47 °C (Refer Note below)
Minimum temperature	3 °C
Humidity	100% saturation during rainy season
Rainfall	Rain occurs generally from June to September. Average annual rainfall is approximately 650mm. maximum rainfall in any 24h period is 50mm.
Atmosphere during hot season	Extremely dusty
Maximum wind load	150 kg/m ²

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	5/14

Vibration & Shocks	The equipment, sub-systems & their mounting arrangements shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified in IEC61 373, IEC 60077 and IEC 60571
SO ₂ level in atmosphere	80 - 120 mg/ m ³
Suspended particulate matter in atmosphere	360 - 540 mg/m ³
Life	The Metro cars are designed for min. 30 years life. Accordingly, the Interior labels, Wrapping films and exterior labels shall also not deteriorate in their performance for 30 years in the Car Body

Table-1: Environment conditions for Delhi

Note:

- 1) 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.
- 2) Metro Cars in Kolkata shall operate reliably and safely under the climatic conditions shown in Table-2 below.

Description	Limiting Values
Maximum ambient temperature (See note below)	35.2°C 45 °C (Inside Tunnel)
Minimum temperature	28.6°C
Humidity	60% (100% saturation during rainy season which may be as long as 6 months)
Rainfall	Average annual rainfall is approx. 1582 mm. Maximum recorded rainfall in any 24h period is 306 mm in month of August. Very heavy rain occurs along with high frequency of lightning discharges.
Atmosphere during hot season	Extremely dusty
Maximum wind speed	vehicle stopped on line: 160 km/h Vehicle Running: 130 km/h
SO ₂ level in atmosphere	6.7 – 80 micro g/m ³
NO _x level in atmosphere	16 – 80 micro g/m ³

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	6/14

Respirator Suspended Particles Matter in atmosphere (RSPM)	49 – 120 micro g/m ³
Total Suspended particulate matter in atmosphere (TSPM)	111 – 360 micro g/m ³
Altitude	100 m
Life	The Metro car is designed for min.35 year of life. Accordingly, the Interior labels, Wrapping films and exterior labels shall also not deteriorate in their performance for 35 years

Table-2: Environment conditions for Kolkata

Note:

- 1) The temperature inside of an “inactive” metro train parked in the sun can easily exceed +60°C.
 - 2) The rolling stock must be able to operate regardless of the external conditions. They must also be so designed as to avoid abnormal wear due to adverse weather. They can be parked outdoors regardless of the atmospheric conditions.
- c) Metro Cars in Bangalore shall operate reliably and safely under the climatic conditions shown in Table-3 below.

Description	Limiting Values
Maximum ambient temperature	42°C
Minimum ambient temperature	8°C
Humidity	92% saturation during rainy season
Rainfall	Rain occurs generally from May to October. Average annual rainfall is approximately 1065 mm. Maximum rainfall in any 24h period is 178mm.
Atmosphere during hot season	Extremely dusty
Maximum wind speed	Standstill exceptional: 160 km/h
SO ₂ level in atmosphere	6.7 - 80 micro g/m ³
NO _x level in atmosphere	16 - 80 micro g/m ³
Respiratory Suspended Particles Matter in atmosphere (RSPM)	49 - 120 micro g/m ³
Total Suspended Particles Matter in atmosphere (TSPM)	111 - 360 micro g/m ³
Altitude	1000 m

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	7/14

Life	The Metro car is designed for min.35 year of life. Accordingly, the Interior labels, Wrapping films and exterior labels shall also not deteriorate in their performance for 35 years
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Table-3: Environment conditions for Bangalore

Note:

- 1) The temperature inside of an “inactive” metro train parked in the sun can easily exceed +60°C.
- 2) The rolling stock must be able to operate regardless of the external conditions. They must also be so designed as to avoid abnormal wear due to adverse weather. They can be parked outdoors regardless of the atmospheric conditions.

2 Definitions and Abbreviations

The following definitions and abbreviations are applicable.

- “Customer” means the order placing authority of the Mass Rapid Transport System (MRTS).
- “Customer’s Representative” mean such persons appointed by customer to act as Engineer for the purpose of the MRTS.
- “BEML” means the Contractor to procure the bulk head panel for metro cars.
- “Supplier” means the Supplier of bulk head panel to BEML.

3 Scope of work

3.1 General

The scope of work includes Interior Labels, Wrapping films & exterior labels used for Metro cars on “Supply and Apply basis” by the sub-contractor. The scope of work covers the supply of Interior Labels, Wrapping Films & Exterior Labels and all materials including the tooling and consumables required for their application on Metro carbody in the premises of the designated Depots or BEML factory. The sub-contractor shall make his own arrangement for the required labour, materials and any other accessories, deemed essential, for the proper application of the graphic films.

The Supplier shall supply Interior labels, Wrapping films and exterior labels conforming to this PTS and the applicable drawings.

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	8/14

Interior labels shall be either regular labels or fluorescent labels with surface screen printed as per applicable drawings. The supplier shall do art work as per applicable drawings and obtain approval before mass printing. These labels are applied in the saloon area and cab area.

Wrapping films are exterior grade, weather resistant pre pigmented high grade cast vinyl films applied to the exterior of the car body as per applicable drawings.

Exterior labels are exterior grade, weather resistant cast vinyl labels. The exterior labels generally include company logo, Car Nos., lifting & Jack points. These labels are applied on the external surface of car body.

3.2 Submission of Documents

Supplier shall submit the following documents as a minimum along with the offer.

- Technical Data Sheet (TDS) & Material Safety Data Sheet (MSDS) for Label (Interior and Exterior)
- Type test & routine Test reports

3.3 Packing

Supplier shall pack properly in order that in transit and after supply of the labels to BEML works, no damage shall occur.

4 Defining of unclear aspects

If any term or clause is not described or not clear in the specification, supplier shall discuss those with design team in BEML, prior to making a contract, to confirm their definitions.

After making a contract, supplier shall follow the definition and opinions of design team in BEML.

5 Standards

Test and inspection standard applicable for the Interior, wrapping films & Exterior labels shall conform to the national and international standards as at clause - 10.

6 Area of application

The wrapping film & exterior labels is to be applied to the exterior of the SS Metro car side wall. Spot-welding is the major welding process adopted for joining of the side wall skin to inner frame and hence thousands of spot welds exist on the outer side wall skin. Two Longitudinal

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	9/14

seam-weld joints running along the entire length of the car are provided on the outer side wall skin.

The colour scheme and the respective area of application shall generally be as per the drawings. However, the subcontractor shall take actual measurements on the Metro cars in accordance with design at his own cost and expense after award of the contract.

The sub-contractor shall take note of the car body exterior window glasses and the exterior sealant application on the complete side wall.

The subcontractor shall offer compatible and durable wrapping film considering the above car body details.

7 Rolling Stock details

The wrapping & exterior labels is to be applied to the exterior of the Metro car side wall.

The Car body side wall skin is made of Austenitic Stainless steel to grade SUS 301L-DLT with 2J finish or dull finish. Spot-welding is the major welding process adopted for joining of the side wall skin to inner frame and hence thousands of spot welds exist on the outer side wall skin. Two Longitudinal seam-weld joints running along the entire length of the car are provided on the outer side wall skin. The door outer skin material is Austenitic Stainless steel to grade SUS 304 2J finish or dull finish.

The sub-contractor shall take note of the car body exterior window glasses and the exterior sealant application on the complete side wall.

The subcontractor shall offer compatible and durable wrapping films & exterior labels considering the above carbody details.

The Exterior labels are exterior grade, weather resistant cast vinyl labels. The exterior labels generally include company logo, Car Nos., lifting & Jack points.

The interior labels are generally applied on GFRP painted panels.

8 Quality Assurance Program

8.1 General

The supplier shall hold ISO 9001 certification and shall manufacture the product accordingly. The supplier shall submit a copy of ISO 9001 certification along with the offer. The supplier shall monitor and control the quality systems as per ISO 9001 guidelines. BEML and / or customer's representative may periodically conduct compliance audits of the supplier's quality management system.

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	10/14

8.2 Quality Assurance Plan

The supplier shall develop and submit a Quality Assurance Plan (QAP) to BEML for review and approval based on ISO 9001 guidelines.

9 Application of Labels

Applications of Graphics must be done using recommended application tools as mentioned by the manufacturer of the graphic film. The applicator must show experience/training certificate of doing similar application on Railway vehicles, by the manufacturer of the graphic film. The application must be in accordance with the approved Procedure. The sub-contractor shall submit the procedure and obtain BEML/Customer approval before application.

Application of the graphic film must be done on the surface preferably not using any soap solution and water.

The application tool shall not make any scratches on the graphics. The graphic film shall adherable on the weld areas.

All the application tools required for application and removal of the graphic films is to subcontractor scope. The list of tools shall be submitted along with the technical offer.

The sub-contractor submit 3 no. of A4 size samples of each of the wrapping Film, Interior labels and exterior labels, meeting the technical requirements of this PTS and obtain BEML/Customer approval, before application.

The Subcontractor shall pack properly in order that in transit and after supply of the labels & films to the place allocated by BEML, no damage to the labels & films shall occur.

10 Technical Requirements

10.1 General

The Wrapping material shall be cast vinyl pre-pigmented graphic films with self adhesive. The finished product shall consist of three layers viz., graphic film, adhesive and release liner and an over laminate film and edge sealed after application. The graphic film (along with adhesive and Liner), the Over laminate and edge sealer shall be offered by the graphic film OEM taking into account 7 years durability in the environmental conditions in which the graphic film has to operate and Metro car running and maintenance conditions. Technical Data sheets shall be submitted along with the technical offer. Physical properties & mechanical properties shall generally conform to Table-1 & Table -2 shown below

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	11/14

The adhesive should have features of controlled adhesive release, which will protect the surface of the coach. After the release liner has been removed, the films having controlled release adhesive shall be able to slide freely on the substrate before its final installation. Film can be positioned and finally applied by squeezing out permanent adhesive without using any activator such as solvent or heat. The graphics film should have inbuilt air channels in the adhesive layer to ensure release of air bubbles during application which will result in fast application and the same should be clearly marked on the backing liner as “controlled release type” or “With inbuilt air release Channels”.

The Interior labels, and exterior labels shall conform to requirement of drawings for printing matter and for physical properties & mechanical properties shall generally conform to Table-1 & Table -2 shown below.

All the Interior Labels, Wrapping films & exterior labels, which include but not limited to overlaminates, pigmented or screen printed films, adhesives and edge sealers shall be essentially be free of halogen and shall be environmental friendly and shall not include any elements that may cause environmental problems or handling hazards. No material should be used which, in their normal installed state, emit products that are known to be toxic or irritative. Accordingly, Material Safety Data Sheet (MSDS) shall be submitted along with the tender.

Metro cars may be cleaned using mechanized cleaning brushes and detergent sprayers. Hence the Wrapping films and exterior labels shall be rub resistant in such scenarios.

Sl. No.	Description	Interior Labels		Wrapping films	Exterior Labels
		Vinyl labels	Fluorescent Labels		
1.	Face film				
	Material	High grade cast vinyl	High grade polymeric, photo luminescent complying to ASTM E 2072	High grade cast vinyl (Pre pigmented film)	High grade cast vinyl
	Thickness	50 $\mu\text{m} \pm 10\%$	250 $\mu\text{m} \pm 10\%$	50 $\mu\text{m} \pm 10\%$	
2.	Adhesive				
	Material	Clear Acrylic pressure sensitive	Clear Acrylic pressure sensitive	Clear, Repositionable, acrylic, pressure sensitive	

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	12/14

	Thickness	25 μm		
3.	Over laminate film			
	Thickness	40 μm ± 10%	40 μm ± 10%	40 μm ± 10%
	Gloss	Min 80 at 60 ^o	Min 80 at 60 ^o	Min 80 at 60 ^o
	UV Stabilized	No	No	Yes
4.	Liner	One side Coated with white kraft paper 135 g/sq.m		
5.	Surface printing	screen printing		Pre-pigmented Screen Printing
6.	Finish	Clear Coat		-
7.	Gloss	High (70-80 at 60 ^o incidence)		
8.	Conformability to irregular surfaces	Excellent		
9.	Durability	5 years		7 Years
10.	Dimensional stability	0.20mm		
11.	Temperature Range			
	Application	10°C min.		
	Service	-40°C to 90 °C		

Table -1: Physical Properties of Labels

Test Types	Interior Labels		Wrapping films	Exterior Labels	Test method /Remarks
	Vinyl labels	Fluorescent Labels			
Adhesion on steel on 24 hrs on application.	Min.1600 gm/2.5 cm	Min.1200 gm/ 2.5 cm	Min.1750 gm/ 2.5 cm		IS 7809 Part II
Weather Resistance as per SAE J 2527	1500 hrs on Xenon arc weather meter	400 hrs on Xenon arc meter	1500 hrs on Xenon arc meter		No fading of printed matter or colour fading
Flammability	Self -Extinguishing				
Chemical Resistance.	Resistant to most acid alkalis and salt solutions				No peeling off, edge lifting or deterioration in properties/appearance
Iluminescent Characteristics as per ASTM E-2072	--	Yes. Min. 2 hours in dark.	--		
Humidity Resistance (exposed for 168 hrs	Very good		Excellent		No peeling off, edge lifting or deterioration

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	13/14

at 50°C and 95%RH			in properties/appearance
Sea Water resistance as per BS 5609	Very good	Excellent	No peeling off, edge lifting or deterioration in properties/appearance
Abrasion resistance as per BS 3110	Rubbed with dry cloth for 200 cycles under 2 kg		Printed text shall remain legible
Ant-graffiti	Min 8 as per ASTM D6578		

Table -2: Mechanical Properties of Labels

11 Removal of Wrapping film, Interior labels & Exterior labels

In case removal of vinyl film/residual adhesive film is required within the warranty period because of manufacturing/application defects, the subcontractor shall arrange to get the film/labels replaced at no cost to BEML.

The time taken for removal of previous graphic & application of new graphic films should not be more than eight hours per Metro car. The removal of the applied film should not be tedious. The removal should be done using a hot air blower but the temperature should not exceed 70°C. In case any film or adhesive residue is observed after removal, it should be possible to remove the residue by use of Iso propyl alcohol and lint free cloth or other proprietary solution, by the subcontractor, without any surface damage. Within the warranty period, the removal has to be done by the subcontractor.

The removal should in no way damage the Stainless steel surface of the coach or GFRP panels. The subcontractor shall be liable for damages evident after removal of the film. The coach should be returned in the same condition as it was handed over initially. Further, The subcontractor shall submit the detailed procedure for wrapping film, removal and repair work, along with the technical offer.

12 Submittals with Technical Offer

The supplier shall provide, as a minimum, the following along with the technical offer:

- 1) Complete Technical Offer for Lables (Interior & Exterior).
- 2) Technical Data Sheet (TDS) & Material Safety Data Sheet (MSDS) of Lables (Interior & Exterior)
- 3) Complete technical details as per clause 10.

	Procurement Technical Specification of Labels (Interior & Exterior) for Metro Cars	Doc No.	GR/TD/3778
		Date	29/07/2020
		Rev. No	1
		Page	14/14

- 4) Technical Data Sheet of the Interior labels , Wrapping films, exterior label with adhesive, liner & overlamine
- 5) The supplier shall provide clause by clause compliance against the PTS Doc No. GR/TD/3778
- 6) Type test reports.
- 7) The supplier has to submit the Art-work along with the technical offer.