Date: 11/10/2025

ADDENDUM -1

BEML SRM Tender Ref : 6300039970 dated 26/09/2025

Tendered Item : Procurement of "Cab Side Window Glass & Frame Assy"

Project : Standard Gauge High Speed Train Project.

1) Procurement Technical Specification (PTS) document is **revised**. The **latest PTS document ref: FPIIC/TD/063 dated 10/10/2025 (Rev. No. 01)** is enclosed. Bidders to consider this latest revised PTS document.

2) "PRE-BID MEETING SUMMARY" against the tender as per the below details.

SN.	Description	M/s. Saini Electricals (OEM: M/s. Bode-Global) Queries / Requests	BEML Response
1	Delivery Schedule / Time Line	As per tender, it is indicated as, Mock Up – by 4th week of Jan'26 1st Train Set by Mar'26. 2nd Train Set by Dec'26. The lead time for development of tender items is not less than 12 months. Hence, it is not possible to commit the delivery schedules indicated in NIT.	Bidders may please be noted that considering the stringent project time lines, subject requirement to be executed immediately on finalization of the order. Delivery schedules indicated in NIT holds good at present. However, the same would be mutually discussed & finalized during subsequent stages.
2	Tender Due Date Extension	Due date extension is requested for preparation of Tender Documents and submission of the Bid as we are yet to receive confirmations from our sub suppliers.	M/s. BEML has requested Bidders to participate in the Tender before due date considering the stringent time lines of the project.

3) Tender closing date for the above tender is extended **from 13.10.2025 to 21.10.2025.**

TRAIN B28

Procurement Technical Specification of Cab Side Window Glass with Frame assembly

Approved	10-10-2025	Mahanthesh G M	
Reviewed	10-10-2025	Krishna Prasad B N	
Prepared	10-10-2025	R Abinaya	
	Date	**Name**	**Signature**

REVISION HISTORY:

Rev. No.	Clause No.	Page No.	Changes	Revision Date
Nil	-	-	First Issue	16-09-2025
01	4(1, 3), 6.2(1)6. 3(2, 21), 6.3.1(24 , 25)	8,11, 12, 13, 16	Operating speed changed to 200kmph Pressure loads updated. Changes are made ITALIC	10-10-2025

Table of Contents

1. Introduction

1.1. General

1) This document specifies the technical requirements of Cab Window Glass with frame to be supplied for Train B28 project designed to operate at 249 kmph and test speed of 280kmph. The Cab side window glass with frame with frame shall comply in all respects to this PTS.
2) BEML will carry out all required works and activities as Contractor to the Employer for this project, while the subcontractor shall be responsible for all works required in this PTS with regard to Cab side window glass with frame and shall be responsible for supporting the BEML activities as contractor for NHSRCL/ICF project.
3) The scope of work covers design, development, testing, manufacture, supply, commissioning and integrated testing of the Cab side window glass with frame and the training of Operation and Maintenance personnel of the owner on the Cab side window glass and frame.
4) The scope of work includes all items of work which will 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. Trainset Configuration

The trainset configuration is as follows:

For 8-Car formation: 2 basic units, each unit consisting of 4 cars.

*DTC1 + MC1 + TC1(PRM) + MC2 + MC1 + TC2(Ex)+ MC2 + DTC2 *

DTC1/ DTC2 : Driving Trailer Car,

MC1 / MC2 : Motor Car

TC1(PRM) : Trailer Car with PRM seat,

TC2-Ex - Trailer Car (Executive Car with PRM)

Below shown the reference image for Cab Window Glass identification.

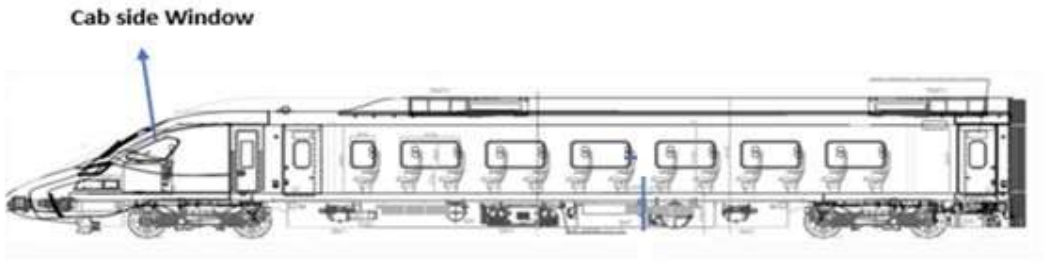


Figure 1: Window arrangement

2. General Requirements

2.1. Climatic and Environmental Conditions

The car shall operate reliably and safely under the climatic and environmental conditions as specified below. Accordingly, the glasses shall be designed to operate with satisfactory performance under the following conditions.

Description	Limiting Values
Atmospheric Temperature	Minimum temperature -5°C Maximum temperature 50°C Maximum touch temperature of metallic surface under the sunlit and shade shall be considered and calculated as per ASHRAE 2021.
Humidity	100% saturation during rainy season
Solar radiation	Value and calculation method shall be based on ASHRAE 2021.
Altitude	1000 meter above mean sea level
Rainfall	Very heavy and continuous rainfall in certain areas (heavy continuous rainfall up to 2500mm, rainy season is as long as 5 months in some stretches)
Atmosphere conditions	Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/m3.
Coastal area	Humid, salt laden and corrosive atmosphere as prevailing in coastal region.
Wind speed	High wind speed in certain areas, with wind pressure reaching 216 kg/m2. [Note-2]
Flood level	The Train shall function in accordance with these Specifications and Standards in the event of flooding up to 50 mm above Rail Level as follows: • In the event of flooding at any level below Rail Level, the Train shall operate in full compliance with these Specifications and Standards.

	• In the event of flooding at a height between Rail Level and 50 mm above Rail Level, the Train shall operate in full compliance with these Specifications and Standards with the exception that it is permissible to restrict the operation of the Train to a maximum of 10 km/h. Allowance is to be made in addition for increase in the height of water level due to the "bow wave" effect of the Train passing through the water.

Note-1]: Ambient temperature for HVAC calculations shall be based on the highest temperature of the Indian region specified in ASHRAE-2021.

[Note-2]: Depending on the operational rule, special speed limits shall be imposed on the Train Sets in conditions where wind speed is 20 m/s or greater. Train Set operation shall cease at wind speeds of 30 m/s or greater.

In developing the detailed design, the Subcontractor shall acquaint himself and take note of the environmental operating conditions prevailing on IR specially during heavy monsoon, track flooding conditions, saline, humid and dusty atmosphere etc.

2.2. Performance Requirements of Train

The performance requirements of the train shall be governed according to following table.

Item	Values
Maximum operational speed during service	249 kmph
Maximum Design speed	280 kmph
Minimum deceleration during full service braking followng jerk limit as specified	0.8 m/s2
Maximum deceleration at any speed	1.2 m/s2
Jerk rate (Maximum)	0.7 m/s^3 during full service braking (for all speed range) 1 m/s^3 during emergency braking (for speeds >10kmph
Passenger load	80 kg/person Appx. 76 persons/ car.
Averaage running distance of a rake	2,000 km/day

3. Definitions and Abbreviations

3.1. Definitions

The following definitions and abbreviations are applicable to the PTS.

- "Employer" means ICF -Chennai, its legal successors and assignees.
- "Nominated Agency" shall mean NHSRCL and its representatives including an ISA (if any) deployed by NHSRCL for the purpose of carrying out Design approvals, Tests, Trials etc.
- "BEML" means the Contractor to procure the Cab side window glass with frame for High-speed rail project (Train B28).
- "Subcontractor" means the Subcontractor who supplies the required Cab side window glass with frame to BEML for Train B28 project. Subcontractor shall carry out the works in accordance with this PTS with regard to Cab side window glass with frame.
- "Contract" means the contract between Subcontractor and BEML in relation to the supply of Cab side window glass with frame for High-speed Rail project.
- "Engineer" means any person nominated or appointed from time to time by the Employer to act as the Engineer for the purposes of the Contract and notified as such in writing to the Contractor.

3.2. Abbreviations

The following abbreviations shall be used as applicable:

ICF: Integral Coach Factory, Chennai, Indian Railways
NHSRCL: National High Speed Rail Corporation Limited

4. Qualification Criteria

1) Subcontractor shall be an Original Equipment Manufacturer (OEM) of cab side window glass assembly, Insulated Glass Unit (IGU), Laminated Safety Glass and Toughened Safety Glass for High-speed trains (*operating speed – 200 kmph and above*) having experience in Design, manufacturing, testing and commissioning of cab side window glass assembly, or an authorized distributor with declaration from OEM on their letter head for technical support for cab side window glass assembly during design/development, testing and commissioning, service trials and revenue service.
2) The proposed type of cab side window glass assembly shall be of sound proven design and reliable engineering practices.
3) The proposed type of cab side window glass assembly meeting the projectile requirements as per EN 15152 should have should have been manufactured and supplied by the subcontractor against regular order (not development order) and have been in revenue service with satisfactory performance in train sets operating at speed of *200 kmph and above, in at least one (01) project* for minimum 3 years prior to the bid opening date.

4) Satisfactory revenue service performance certificates for a period 03 years or more from high-speed train operators/Rolling Stock manufacturers for the above shall be submitted along with technical offer.
5) The subcontractor meeting this requirement only will be considered for technical evaluation
6) The cab side window glass assembly should not have any quality issues in the on-going / completed supplies.
7) The subcontractor shall hold ISO 9001-2015 / IRIS certification and shall manufacture the products accordingly.
8) The subcontractor shall submit company profile with infrastructure facilities, product range, credentials of sub-contractors made to high-speed rail project etc., along with technical offer.
9) The firm should undertake to provide the support during Testing & Commissioning, service trials and revenue service either by themselves or through sister company or a partner in India. The firm shall submit detailed proposal in this regard.
10) The firm should give an undertaking to supply spares and service support for a minimum period of 15 years from the date of commercial operation of each trainset.

5. Standards

The design, testing and manufacturing of window glass shall conform to the latest editions of internationally recognized Standards viz., Indian, American, European, Japanese, ISO, etc.
Following standards shall be considered as minimum:

Sl No.	Standard No./ Code No.	Title
1.	EN 15152:2019+A1:2023	Railway applications - Windscreens for trains
2.	GMRT 2100 Issue: Six Date: March 2020	Rail Vehicle Structures and Passive Safety
3.	ISO 22752:2021	Railway Applications – Bodyside windows for rolling stock
4.	IS: 2553 Part-I: 2018	Safety Glass – Specification Part 1: Architectural, Building and General uses
5.	IS: 2553 Part-II, Annex A: 2019	Safety Glass – Specification Part 2 For Road Transport
6.	EN 17460:2022	Railway applications – Adhesive bonding of rail vehicles and their components
7.	EN 50126-1:2017	Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process
8.	IEC 61133:2016	Railway applications - Rolling stock - Testing of rolling stock on completion of construction and before entry into service
9.	UIC 660: 2002	Measures to ensure the technical compatibility of high-speed trains
10.	EN 45545-1:2013+A1: 2015 (Part 1-7)	Railway applications - Fire protection on railway vehicles.
11.	EN 45545-2 : 2020 + A1 :2023	Railway applications -Fire protection on railway vehicles -Part 2: Requirements for fire behaviour of materials and components
12.	EN 45545-4	Railway applications - Fire protection on railway vehicles - Part 4: Fire safety requirements for rolling stock design
13.	EN 12663-1, Cat P-1: 2023	Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons).
14.	UIC 564-1, 1979	Coaches - Windows made from safety glass
15.	UIC 566:2004	Loadings of coach bodies and their components
16.	EN 17530:2022	Railway applications. Interior glazing for rail vehicles
17.	ASTM E903, 2020	Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
18.	ASTM E308: 2008	Standard Practice for Computing the Colors of Objects by Using the CIE System
19.	EN 410:2011	Glass in building. Determination of luminous and solar characteristics of glazing

20.	EN 673:2011	Glass in building- Determination of thermal transmittance.
21.	EN 12150	Glass in Building: Thermally toughened soda lime silicate glass
22.	EN 12758/EN ISO 10140	Glass in building – glazing and airborne sound insulation.

6. Technical Requirements

6.1. General

1) The subcontractor shall meet the Cab side window glass with frame requirements for the design, development, manufacture, supply, testing, delivery, commissioning and integrated testing, including the training of operation and maintenance staff of the ICF/NHSRCL.

2) The subcontractor shall support in all aspects in obtaining customer clearance of the proto type the Cab side window glass with frame after successful completion of tests. The subcontractor shall carry out any modification/alteration based on results of the tests on the prototype if required. The subcontractor shall carry out necessary modifications at no additional charge on all trains and shall support in delivering the prototype train.

6.2. Proven Design

1) The proposed Cab side window glass with frame by the sub-contractor should have been proven design i.e., the design of equipment components etc., shall be based on sound, proven and reliable engineering practices. The proposed type of the Cab side window glass with frame shall have proven credentials in trainsets of *200 kmph* and above operational speed, in at least one project. The sub-contractor may conduct such tests and trials as may be necessary to establish the reliability and efficiency of such technology and designs in accordance with the good industry practice.

2) The subcontractor shall manufacture and supply the Cab side window glass with frame only from such manufacturing units that have supplied the Cab side window glass with frame that fulfill the proven design requirements as above.

3) The subcontractor shall be fully responsible, for the suitability, adequacy, integrity, durability and practicality of the proposed the Cab side window glass and frame. The subcontractor shall warrant that the subcontractor's proposals meet this PTS requirements and is fit for the purpose thereof. Where there is any inadequacy, insufficiency, impracticality or unsuitability in or of the specification requirements or any part thereof, the subcontractor's proposal shall take into account, address or rectify such inadequacy, insufficiency, impracticality or unsuitability at subcontractor's own cost.

4) The subcontractor shall warrant that the works have been or will be designed, manufactured, installed and otherwise constructed and to the highest standards available using proven up-to-date good practice.

6.3. Cab side window glass with frame

1) Cab side windows shall be made of curved / flat PVB laminated glass acc. to EN 15152 (bodyside window), color clear.
2) ~~The glazing must withstand the max. excess pressure 2700 Pa / max. depression -4800 Pa in case of the shock wave at the passing of train~~
3) Light transmission: not less than 70%. Colour will defined in during detail design stage.
4) Noise attenuation: Rw > 32dB
5) Heat transfer coefficient: ~5.0 W/m^2K
6) Cab side window shall be labelled. The label position shall be defined in later stages.The marking shall be readable from inside the cab.
7) Composition of the glass structure is to be defined by sub-contractor considering requirements listed below. Sub-contractor shall calculate thickness of the glass for operation parameters and submit the details along with technical offer.
8) Solid black silkscreen shall be used and the size shall be defined in detail design stage.
9) The cab side window shall reduce the effects of glare, distortions, loss of visibility and loss of recognizability of instruments in the cab. This is deemed to be fulfilled by the use of glass of any degree of tinting or by other types of sun protection.
10) As the cab side window is defined as emergency exit, it should have a minimum unimpeded opening of 0,2 m2 with a minimum inner dimension of 400 mm x 500mm. Detail dimension and size will be provided during detail design phase.
11) The cab side window frame shall comprise of fixed frame and hinged openable window leaf frame.
12) Frame shall be glued and bolted from inner side of FRP. Glazing/glass shall be incorporated by A1 bonded joint in hinged frame.
13) Cab side Windows shall be aligned with outer skin of the carbody.
14) Subcontractor shall be responsible for optimal sealing solutions from external environmental conditions (temperature, wind, rain, snow, dust, salt).
15) For hinged windows, the operating force should not be higher than 62 N and for pulling not higher than 55 N.
16) Where glass is used in glazing (including mirrors), it shall be either laminated or toughened glass which is in accordance with a relevant national or international standard with regard to the quality and area of use, thereby minimizing the risk to passenger and staff being injured by breaking glass.
17) Window leaf shall be hinged and shall be able to open inside.
18) Swivel part of the window shall be capable to be de-attached from the fixed frame for easy service replacement when needed .
19) Fixed dumper to limit opening angle of the window shall be implemented. Max. Opening angle to be defined.

20) Window shall be equipped with open/closed status sensor and communicate with TCMS.

21) The glazing must withstand the max. excess pressure 3700 Pa / max. depression -7000Pa in case of the shock wave at the passing of trains and fatigue loads of ± 1605 Pa.

22) The Sub-contractor shall submit estimated weight and shall be approved by BEML. Weight shall not be more than 20 kg per glazing.

23) The shape and size of the Cab side window glass with frame is tentative. Final shape and size will be revised after the cab mask design.

24) The window frame shall be either powder coated or painted to match exterior colour scheme and shall be perform satisfactory in climatic conditions specified at clause 2.1

6.3.1. Technical Characteristics of Cab side window glass and frame

The subcontractor shall meet the following technical characteristics as a minimum.

Sl. No.	Technical Data		Test Method	Requirement
1	Visual Inspection		EN 15152	-
2	Dimensional Inspection	2D	-	As per drawing dimensions
		3D	Surface profile gauge	To match with 3D CAD model
3	Tolerance	Length	-	To be provided by subcontractor
		Height		
		Thickness		
		Bending		
4	Light transmittance test		EN 15152, CIE 38, Illuminant A	≥ 70%
5	Secondary image test		EN 15152	Secondary image separation shall not exceed: 1) Maximum 15 min of arc in primary vision area 2) Maximum 25 min of arc in secondary vision area
6	Optical distortion test		ISO 3538 EN 15152 Clause 4.2.3	The limit of optical distortion shall be: 1) Maximum 2.5 min of arc in primary vision area.

			2) Maximum 6.5 min of arc in secondary vision area.
7	Chromaticity for red and yellow signal lamp	EN 15152	As per section 5.2.5 of EN 15152
8	Residual visibility	EN 15152	As per sec 6.2.3
9	Resistance to abrasion	ISO 3537 EN 15152 Clause 6.3	Resulting change of haze after abrasion shall not exceed 2% for test of outside surface and 8 % for the test of inside surface.
10	Haze	EN 2155-9 EN 15152 Clause 5.2.3	≤ 2.5% for new windshield
13	Accelerated weathering test (QUV)	EN 15152	As per section 7.2.2 of EN 15152
14	Thermal Cycling	EN 15152 clause 7.2.3	No significant change (no bubbling, delamination & whitening) shall be observed more than 10 mm from uncut edges and more than 15 mm from cut edges.
15	Humidity test	EN 15152 Clause 7.2.4	No significant change (no bubbling, delamination & whitening) shall be observed beyond 10 mm from uncut edges and beyond 15 mm from cut edges.
17	Projectile test (Impact)	EN 15152 Clause 6.1.3	The projectile does not penetrate the side windscreen and the windshield remain in its frame.
18	Gravelling Impact Resistance	As per EN 15152 clause 6.4	Outer layer of the side windscreen sample does not break at a projectile speed 20 km/h greater than the design speed of the train.
19	Dew point test	As per UIC 566	As per clause 4.2.2.1, the sealing of glazing shall be checked by determining dew point. There should be no trace of condensation or rime between the panes before the temperature has reached -60 ◦C

20	Noise transmission test	ISO 10140-2	≥ 32 dB
21	U value (heat transfer coefficient)	EN 673	≤ 5.0 W/m^2 K.
22	Emergency escape function	ISO 22752	As per clause 4.2.8 of ISO 22752
23	Endurance test (open and close test)	ISO 22752	As per clause 4.4.2 of ISO 22752
24	Aerodynamic fatigue loading	ISO 22752	*Max. excess Pressure 3700 Pa / max. depression -7000Pa and fatigue loads of ± 1605 Pa.*
25	Static strength of window	ISO 22752, 4.2.2	*Max. excess Pressure 3700 Pa / max. depression -7000Pa*
26	Air tight	-	When closed and locked, there shall be no leakage of air.
27	Painting or Powder coated frame	-	Shall meet minimum 1000 hrs salt spray , cleaning agent resistance, good adhesion and shall perform satisfactory in climatic conditions as per sec. 2.1

6.3.2. Painting of Cab side window frame

1) All exposed surface of the cab side window frame shall be painted / powder coated with system proven in High-speed rail application.
2) The Subcontractor shall propose the system which is proven in high-speed rail Exterior application. The Paint system shall will be with anti-graffiti properties.
3) The paint/coating systems shall have excellent substrate and intercoat adhesion, outstanding long term corrosion protection, good resistance to oils and cleaning agents, very high order of abrasion, chip, impact and scratch resistance.
4) The paint/coating system shall display a uniformity of colour throughout its service and shall not fade.
5) The paint/coating system shall withstand frequent use of various cleaning products (alkaline or acid detergents, petroleum solvents, mechanical action of brushes) without losing their colour or noticeable deterioration of their surface aspect.
6) The paint/coating system shall meet Fire safety requirement of EN45545-Part 2, HL2 condition for and Exterior applications.
7) Paint/coating system used for Exterior applications shall have excellent UV and weather resistance characteristics.
8) Paint/coating system surfaces shall have a service life of at least 15 years.

9) The sub-contractor shall submit the details of the Proven Paint/coating system he proposes to adopt and obtain BEML/NHSRCL approval. The details of the highspeed rail project in which the proposed system is used and its satisfactory performance in revenue service shall be submitted.

10) The supporting mechanical and fire performance test reports for adopted painting system shall be submitted along with offer

6.4. Weight

1) To minimize energy costs, great importance will be placed on achieving practical designs of minimum car weight whilst meeting specified structural and performance requirements. Accordingly, the weight of the Cab side window glass with frame shall be kept to a minimum. The measured weight of Cab side window glass with frame shall not exceed by more than +4% of the estimate weights /as per relevant drawings.

2) The subcontractor shall submit details of estimated weights and center of gravity for Cab side window glass with frame along with the technical offer.

6.5. Bonding and Adhesive Support

The sub-contractor shall provide support by designing bonding joint (bonding area) and its calculations with Adhesive Engineer and shall provide the detail process to establish desired bonding strength, check point/method to ensure correct application of the adhesive bond.

Subcontractor shall adopt bonding EN 17460 Class A1 or A2 requirements.

The Adhesive Engineer may provide the following details required for efficient bonding design/strength:

1) Adhesive properties and surfaces considering modulus of elasticity, Poisson's ratio and flow curve of adhesive for design calculations.
2) Documentation, test records and reports as per requirement.
3) The bonding calculations shall include Load resistance of bond under operating conditions i.e.
   - Quasi static strength.
   - Elongation at break after relaxation.
   - Creep behavior
   - Fatigue behavior
   - Crash/Impact behavior
   - Moisture, chemical and thermal resistance.
4) The subcontractor shall provide proof of reduction of load resistance provided and permissible design load resistance.

6.6. Fire Safety

6.6.1. General

1) All non-metallic Materials used in the construction of Cab side window glass with frame shall be selected to reduce to the maximum extent practical the heat load, rate of heat release, propensity to ignite, rate of flame spread, smoke emission and toxicity of combustion gases
2) The Cab side window glass with frame shall comply with fire safety requirements of EN45545-2, for HL2 for the R1/R7 requirement set.

6.6.2. Fire Load Calculation

1) The maximum heat release rate per car shall be restricted to low levels.
2) Fire load calculation for all non-metallic materials have to be calculated with heat release rate data tested in accordance with EN 45545 HL2 and ISO 1716. The calculations shall be submitted as the source of heat value.

6.6.3. Fire Performance Deliverables

The subcontractor shall submit the fire performance deliverables in accordance with following table, before the production of proto–Cab side window glass with frame .

Sl. No.	Deliverables
1	Fire safety Test Reports of all non-metallic items including heat release rate, as per EN 45545 HL2 and ISO 1716

6.7. Quality Assurance Program

6.7.1. General

The subcontractor shall hold ISO 9001:2018 / IRIS certification and shall manufacture the product accordingly. The subcontractor shall submit a copy of ISO 9001:2018 / IRIS certification along with the offer. The subcontractor shall monitor and control the Quality systems as per ISO 9001:2018/IRIS guidelines. BEML and/or ICF's representative may periodically conduct compliance audits of the Subcontractor’s Quality management system.

6.7.2. Quality assurance plan

The subcontractor shall submit Quality Assurance Plan (QAP) based on ISO 9001-2018 / IRIS guidelines during the preliminary design phase for manufacture and inspection of the Cab side window glass with frame and to be submitted for BEML/NHSRCL/ICF for approval.

7. Scope of Supply

7.1. General

1) The subcontractor shall be responsible for the scope of supply of the Cab side window glass with frame which shall comprise, unless specifically excluded, the design, manufacture, testing, delivery, commissioning, and rectification of defects. Further the sub-contractor shall supply the necessary associated equipment to facilitate operation and maintenance of Cab side window glass with frame which includes special tools and testing equipment, spare parts, operation and maintenance manual and training
2) Note: If any special tools / equipment's are required for installation of Cab side window glass with frame onto carbody, the subcontractor shall supply 2 sets of such equipment at his own cost.
3) The Subcontractor shall meet the system technical requirements for Cab side window glass with frame as per sec .6.3.

7.2. Cab side window glass and frame

1) The Subcontractor will be provided with concept 3D model of cab side window frame.
2) The subcontractor shall be responsible for following activities.
   a) The subcontractor shall get involved with BEML nominated design consultant for detail designing of cab side window glass with frame.
   b) Complete cab side window glass and its fittings shall be designed by subcontractor inline with concept design. The design shall include 3D model and 2D drawings
   c) Subcontractor shall develop full 3D model (namely component level installation/mounting methodology viz., bracket, hinges, locks, rubber profiles extrusions etc.,) and 2D manufacturing drawings of all parts including mounting brackets, hinges, passenger amenities and installation drawings with carbody.
   d) Sub-contractor shall submit all 3D models and 2D drawings to BEML/NHSRCL for approval before taking up for manufacture
   e) All the fittings including concealed hinges, locks, rubber profiles, brackets, sealants, fasteners, handles etc required to mount the panels to carbody shall be in subcontractor scope.
   f) Develop required tooling for manufacturing.
   g) Shall carryout Type tests at any NABL approved laboratory and routine tests and submit the reports.
   h) Manufacture and supply cab side window glass with frame.
   i) Installation of cab side window glass on the car at BEML Ltd will be in BEML scope. Subcontractor shall support BEML team in installation to carbody, for first proto train set.

3) The sub-contractor shall be responsible to ensure that the Cab side window glass with frame supplied meet the environmental condition specified at Clause 2.1 of this document.

7.3. Process and Raw material

Sub-Contractor shall submit details of process and raw materials, proposed to be used in manufacturing of Cab side window glass and frame.

7.4. Submission of Documents

The sub-contractor shall submit the following documents as a minimum, as per the timelines specified by BEML, during detail design phase.

- ✓ Type test procedure document covering all the tests as per PTS and applicable standard.
- ✓ FAI Procedure document.
- ✓ Type test & FAI reports
- ✓ Fire safety test reports on the Cab side window glass with frame produced for this project
- ✓ Weighment document with Actual weights of the glass
- ✓ Material test certificates.
- ✓ Dimensional check sheets

7.5. Packing

The sub-contractor shall pack properly in order that in transit and after supply of the Cab side window glass with frame to the place allocated by BEML, no damage to the Cab side window glass with frame shall occur.

7.5.1. Engineering Support

The subcontractor shall provide technical assistance by attending the design discussion & Design review meeting with NHSRCL/ICF, along with BEML team, until design is approved by NHSRCL/ICF.

7.6. ICF's Spec. & PTS Compliance

1) The subcontractor shall offer a valid and fully compliant proposal for the Cab side window glass with frame as detailed in ICF's Spec. and PTS.
2) The subcontractor shall submit, along with the technical offer, the Clause-by-Clause Compliance for ICF's Spec. and PTS.

Offers with Non-compliance and deviations to any of the in ICF's Spec. and PTS clauses with regard to above items, are liable for rejection.

8. Testing and commissioning

8.1. General

1) The subcontractor shall submit Inspection, Testing and Commissioning Plan according to the technical requirements during the design stage.
2) The Cab side window glass and frameshall be type and routine-tested in accordance with detailed respective test procedures to be drawn up by subcontractor and agreed by BEML/NHSRCL/ICF which shall take into account the requirements of respective international standards and this PTS and test program drawn up by the subcontractor to demonstrate that the individual equipment, sub-systems and systems meet the specified technical requirements. The test plan shall be approved by BEML/NHSRCL/ICF.
3) Wherever any equipment, system or sub-system is not specifically covered by an internationally recognized specification or test procedure, or where the type and routine tests prescribed by IEC or other international standard do not adequately cover the requirement, tests which are acceptable both to the subcontractor and to BEML/NHSRCL/ICF, shall be devised.
4) Type tests for certain equipment may be waived if these were carried out earlier on equipment of identical design, witnessed by a reputed organization and the service performance of such equipment was found to be reliable. The subcontractor shall submit a proposal in this regard to BEML/NHSRCL/ICF for review. The waiver of Type Test is entirely at the discretion of BEML/NHSRCL/ICF.
5) Change of manufacturing place may require re-type test.
6) BEML / ICF reserves the right to witness any or all of the tests, and to require submission of any or all test specifications and reports. BEML/NHSRCL/ICF reserves the right to reasonably call for additional tests as are considered necessary. BEML/NHSRCL/ICF may, if considered necessary, call for conducting optional tests as per relevant standards without any additional cost to BEML/NHSRCL/ICF. In case of repetition of tests, as decided by BEML/NHSRCL/ICF, entire cost including that of BEML/NHSRCL/ICF representative(s) shall be borne by the subcontractor.
7) The results of all tests shall be submitted to the BEML/NHSRCL/ICF, who will record his conclusions as to whether or not the equipment being tested has passed satisfactorily.
8) The Subcontractor shall be responsible for undertaking and passing all necessary testing activities for Cab side window glass and frame.
9) Prior to the start of testing, BEML & ICF shall have all approved test plans and procedures for the test and all relevant prerequisite testing shall have been completed by subcontractor.
10) Type test of Cab side window glass with frame at train level will be responsibility of subcontractor. Subcontractor shall depute their engineers to conduct the vehicle level type test at BEML factory and Depot /Mainline for testing as per schedule prepared by BEML's project management team.

11) Subcontractor shall arrange all necessary tools & instruments for relevant Vehicle/ train level type tests.

12) If there is a problem during testing & commissioning, the subcontractor should depute his engineer to solve the problem within 24 hours of BEML's request to do so.

13) All test & inspection specifications and reports including all repair activities and check-lists shall be submitted to and approved by BEML/NHSRCL/ICF.

8.2. Equipment Type Test & Routine Test

1) The Cab side window glass with frame shall be type and routine tested in accordance with technical requirements and to relevant standard at subcontractor's works, at his own cost.

2) All such tests, wherever performed, in the presence of and to the satisfaction of BEML/NHSRCL/ICF, who reserves the right to witness any or all of the tests and to require submission of any or all test specifications and reports.

3) BEML/NHSRCL/ICF reserves the right to reasonable call for additional test, if necessary.

4) The subcontractor shall carryout the following type tests and routine tests as a minimum and shall submit the reports.

Sl. No.	Technical Data	Test Method	Type Test	Routine Test
1.	Visual Inspection	ISO 22752	O	Every batch production
2.	Dimensional Inspection	As per drawing dimensions	O	Every batch production
3.	Light Transmittance test	EN 15152	O	-
4.	Secondary image test	EN 15152	O	-
5.	Optical distortion test	EN 15152	O	-
6.	Chromaticity for red and yellow signal lamp	EN 15152	O	-
7.	Resistance to abrasion	EN 15152	O	-
8.	Haze	EN 15152	O	-
9.	Thermal Cycling	EN 15152	O	-
10.	Residual visibility	EN 15152	O	-
11.	Accelerated weathering test (QUV)	EN 15152	O	-
12.	Humidity test	EN 15152	O	-

Sl. No.	Technical Data	Test Method	Type Test	Routine Test
13.	Gravelling Impact Resistance	EN 15152	O	-
14.	Endurance test (open and close test)	ISO 22752	O	-
15.	Aerodynamic fatigue loading	ISO 22752	O	-
16.	Static strength of window	ISO 22752, 4.2.2	O	-
17.	Dew point	UIC 566	O	-
18.	Noise transmission test	ISO 10140-2	O	-
19.	U value(heat transfer coefficient)	EN 673	O	-
20.	Painting or Powder coated frame	-	O	-
21.	Air tightness	-	O	Every batch production

‘ O’ ; to be tested
‘ – ‘ : Not applicable

9. First Article Inspection (FAI)

1) The subcontractor shall offer the first set of Cab side window glass with frame for First Article Inspection by BEML/ ICF in accordance with the Engineer approved FAI plan prior to serial production, in order to confirm that the item produced fully complies with the technical specifications, System design and manufacturing process. After clearance from BEML/NHSRCL/ICF, mass production shall be taken up.
2) FAI shall be carried out by the ICF/ICF nominated agency as per relevant standard/International practices/specifications. If ICF desires, in process inspection can be carried out at manufacturing stage also.
3) At the FAI, the subcontractor shall make available all pertinent design and manufacturing process documentation, test records, material certifications, gauges calibration/certificate etc.
4) If FAI has to be repeated due to non-compliances/ deficiencies noticed, the cost towards the same and the cost towards BEML/NHSRCL/ICF ’s visit to subcontractor’s place for witness of re-FAI shall be to subcontractor’s responsibility
5) Subcontractor shall note that the Engineer FAI clearance will not relieve the subcontractor’s responsibility towards design, production, quality, reliability, availability, maintainability and safety of the systems and sub-systems during the revenue service.

10. Installation and Commissioning

1) After the Cab side window glass with frame are delivered, the subcontractor shall depute his Engineer for the installation and commissioning of the Cab side window glass with frame on the First Train set.
2) Modifications/ corrections, if any, shall be carried out by the subcontractor at his own cost.

11. Warranty

Please refer to GTC.

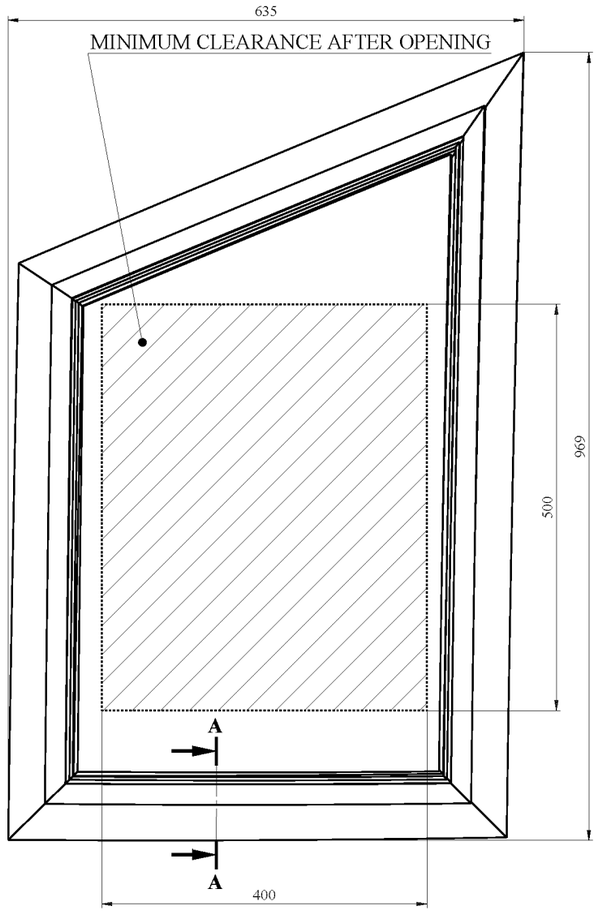
12. Appendices

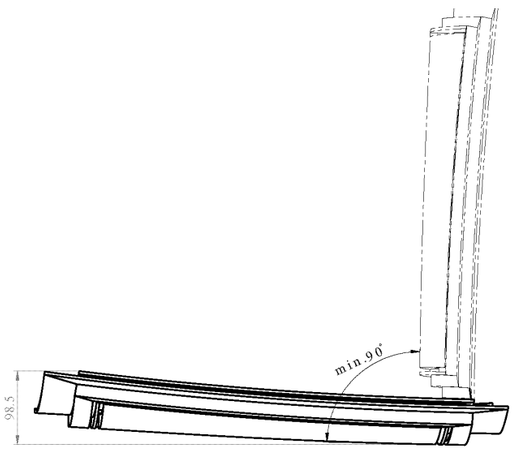
1) Drawings
2) Technical offer submittals check list.

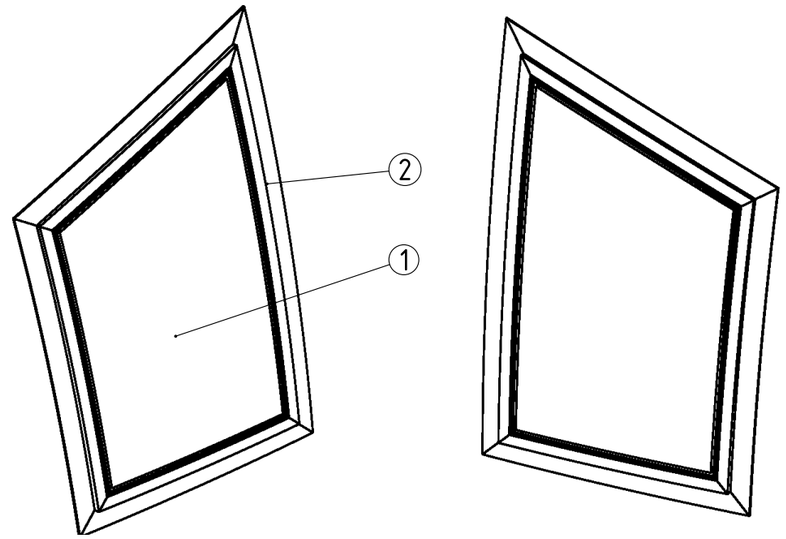
13. Submittals with Technical Offer

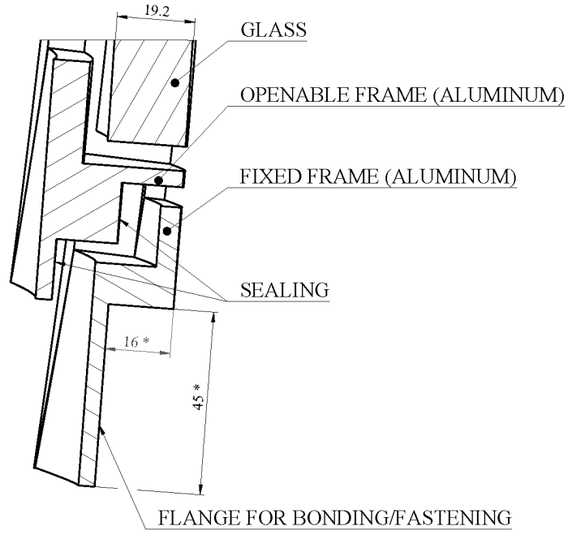
The Subcontractor shall provide as a minimum, the following along with the technical offer.

1) Complete Technical Offer Cab side window glass with frame including compositions/construction details, thickness proposed, technical description and technical data sheets of raw materials of Cab side window glass and frame, PVB & edge protection sealant, etc.
2) Supporting documents for Qualification Criteria compliance including, company profile with infrastructure facilities, product range, supply credentials etc., (Clause 4)
3) Estimated weight of Cab side window glass and frame.
4) Fire safety test report copies of earlier projects.
5) Clause-by- Clause compliance for this PTS









Section view A-A
Scale: 1:1

NOTE
1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL : LAMINATED GLASS COMPOSITION WITH FRAME.
3. THIS DRAWING SHALL BE TREATED AS REFERENCE ONLY AND MINOR CHANGES MAY OCCUR DURING DETAIL DESIGN AND SAME SHALL BE ACCOMODATED.
4. WINDOW ENVELOPES, UNDIMENSIONED RADII, INNER AND OUTER SKIN ACCORDING TO 3D
5. LH WINDOW AS DRAWN, RH WINDOW IS SYMMETRICAL.
6. TECHNICAL PROPOSAL SHALL INCLUDE ALL RELEVANT ZONES IN DETAIL DESCRIBED ON 3D/2D.
7. SUPPLIER SHALL INDICATE REQUIRED MOUNTING DIMENSIONS WITH TOLERANCES.
8. DETAILED SEALING TYPE AND DIMENSIONS IS IN SCOPE OF SUPPLIER (MARKED ON DRAWING)
9. SCOPE OF DELIVERY :
   a) WNDOW GLASS
   b) WINDOW FRAME
   c) SPARE PARTS
10. THE FRAME SHALL BE PAINTED OR POWDER COATED.

S. No	Sub assembly no.	Part no.	Description	Remark
1	843-13006-01	843-13107-01	CAB SIDE WINDOW GLASS - LH	AS DRAWN
		843-13108-01	CAB SIDE FRAME - LH	
2	843-13006-02	843-13107-02	CAB SIDE WINDOW GLASS-RH	OPP. HAND DRAWN
		843-13108-02	CAB SIDE FRAME-RH	

SL.No.	QTY	PART / STOCK No.	DESCRIPTION	SIZE (mm)	COMPANY STD./I.S	WT. (Kg)
2	1	SEE TABLE	CAB SIDE FRAME	~ 969 X 635 MM	MATERIAL	
1	1	SEE TABLE	CAB SIDE WINDOW GLASS	~ 760 X 490 MM		

ALT.No.	ECN No./CHANGES	DATE	BY	CHKD	APPD

PRODUCT: TRAIN B28
REF. DRG: --
MATERIAL: -
HEAT TREAT: --
SURFACE TREAT: --
TITLE: CAB SIDE WINDOW GLASS & FRAME ASSEMBLY

APPD	KRISHNA PRASAD	19.09.25
REVD	KRISHNA PRASAD	19.09.25
CHKD	KRISHNA PRASAD	19.09.25
DRWN	ABINAYA	19.09.25

SCALE: 1:1 | SHEET: 1 OF 1 | WT.(kg): -

BANGALORE COMPLEX
DRG No. 843-13006 | ALT 0

STATUS: PROTO

MACHINING DEVIATIONS FOR LINEAR DIMENSIONS CLASS - MEDIUM	RANGE	0.5 - 3	3 - 6	6 - 30	30 - 120	120 - 400	400 - 1000	1000 - 2000	2000 - 4000
	TOLERANCE	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2

GENERAL TOLERANCES FOR LINEAR & ANGULAR DIMENSION SHALL BE AS PER ISO 2768-1 | GENERAL GEOMETRICAL TOLERANCES SHALL BE AS PER ISO 2768-2
GENERAL TOLERANCES FOR WELDED STRUCTURE SHALL BE AS PER ISO 13920 | VALUES OF SURFACE TEXTURE SHALL BE AS PER ISO 1302.
WELDING SHALL BE CARRIED OUT AS PER EN 15085-3 | WELDING PROCESS SHALL BE AS PER EN ISO-4063
WELDING SYMBOLS SHALL BE AS PER EN ISO-2553 | WELDING POSITIONS SHALL BE AS PER EN ISO 6947
QUALITY LEVELS FOR IMPERFECTIONS IN FUSION WELDED JOINTS SHALL BE AS PER EN ISO 5817
WELD JOINT PREPARATIONS SHALL BE AS PER EN ISO 9692 & EN 15085-3 | INSPECTION & TESTING OF WELDED JOINTS SHALL BE AS PER EN 15085-5

GRADE No. | VALUE | SYMBOL
SURFACE ROUGHNESS

APPENDIX-2 OF PTS

बी ई एम एल BEML Beyond Possibilities	**TECHNICAL OFFER SUBMITTALS CHECK SHEET**	**Project** Train B28 project
Aggregate:	**Cab Window Glass with Frame assembly**	**PTS DOC No.: FPIIC/TD/063**
BEML Enquiry/ RFQ Reference:		

SL.NO.	DETAILS	SUBMITTED	NOT SUBMITTED
1	Complete Technical Offer Cab side window glass with frame including compositions/construction details, thickness proposed, technical description and technical data sheets of raw materials of Cab side window glass and frame, PVB & edge protection sealant, etc.	☐	☐
2	Supporting documents for Qualification Criteria compliance including, company profile with infrastructure facilities, product range, supply credentials etc., (Clause 4)	☐	☐
3	Estimated weight of Cab Window Glass and frame		
4	Fire safety test report copies of earlier projects.	☐	☐
5	Clause-by- Clause compliance for this PTS.	☐	☐

Note : Incomplete submissions are liable for Rejection.

Signature of the Bidder with Seal

Cab Side Window Glass with Frame Assy
for
High-Speed Rail (B280) Project

QUALIFICATION / ELIGIBILITY CRITERIA
(As per Clause 4 of PTS Doc No. FPIIC/TD/063 dated 10-10-2025 Rev. No. 01)

SL No	Particulars
1	**4. Qualification Criteria** 1) Subcontractor shall be an Original Equipment Manufacturer (OEM) of cab side window glass assembly, Insulated Glass Unit (IGU), Laminated Safety Glass and Toughened Safety Glass for High-speed trains (operating speed – 200 kmph and above) having experience in Design, manufacturing, testing and commissioning of cab side window glass assembly, or an authorized distributor with declaration from OEM on their letter head for technical support for cab side window glass assembly during design/development, testing and commissioning, service trials and revenue service. 2) The proposed type of cab side window glass assembly shall be of sound proven design and reliable engineering practices. 3) The proposed type of cab side window glass assembly meeting the projectile requirements as per EN 15152 should have should have been manufactured and supplied by the subcontractor against regular order (not development order) and have been in revenue service with satisfactory performance in train sets operating at speed of 200 kmph and above, in at least one (01) project for minimum 3 years prior to the bid opening date. 4) Satisfactory revenue service performance certificates for a period 03 years or more from high-speed train operators/Rolling Stock manufacturers for the above shall be submitted along with technical offer. 5) The subcontractor meeting this requirement only will be considered for technical evaluation 6) The cab side window glass assembly should not have any quality issues in the on-going / completed supplies. 7) The subcontractor shall hold ISO 9001-2015 / IRIS certification and shall manufacture the products accordingly. 8) The subcontractor shall submit company profile with infrastructure facilities, product range, credentials of sub-contractors made to high-speed rail project etc., along with technical offer. 9) The firm should undertake to provide the support during Testing & Commissioning, service trials and revenue service either by themselves or through sister company or a partner in India. The firm shall submit detailed proposal in this regard. 10) The firm should give an undertaking to supply spares and service support for a minimum period of 15 years from the date of commercial operation of each trainset.

बी ई एम एल BEML Beyond Possibilities	Clause by Clause Compliance Sheet	Project	High Speed Rail
		Page	1/1
	Procurement Technical Specification of Cab Side Window Glass with Frame assembly for High Speed Rail (B28) Project	PTS DOC No.: FPIIC/TD/063 dated 10/10/2025 Rev. No. 01	

PTS Clause No.	Description	Complied	Not Complied	Remarks

NOTE: Above format is for reference only. Bidders to refer PTS DOC No.: FPIIC/TD/063 LATEST REVISION (if any) for submitting the compliance for all clauses.