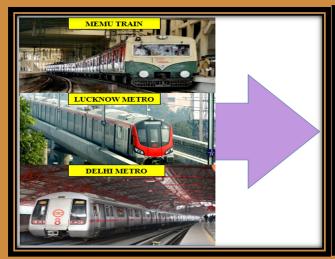


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वंदे मेट्रो ट्रेन में यात्री सुविधाओं का प्रावधान: एक अध्ययन

A STUDY ON PROVISION OF PASSENGER AMENITIES IN VANDE METRO TRAIN

रिपोर्ट संख्या टी.एफ.सी.-110 जनवरी-2024

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यातायात एवं मनोतकनीकी निदेशालय अनुसन्धान अभिकल्प और मानक संगठन मानक नगर लखनऊ - 226011 TRAFFIC & PSYCHO-TECH. DIRECTORATE RESEARCH DESIGNS AND STANDARDS ORGANISATION, MANAK NAGAR, LUCKNOW-226011

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A study on
Provision of
passenger amenities
in Vande Metro train

Provision of passenger amenities in Vande Metro train वंदे मेट्रो ट्रेन में यात्री सुविधाओं का प्रावधान

I. INTRODUCTION

After successful run and widespread popularity of Vande Bharat Exp., Indian Railways decided to introduce another train in this category i.e. Vande Metro. The Vande Metro train, a special version of Vande Bharat Exp., has been designed by RDSO for the commuters and suburban passengers living around the big cities. With its cutting-edge technology and focus on passenger comfort, the Vande Metro train is designed in such a way that it fulfills passengers expectations for a speedy and comfortable journey. It is equipped with world-class amenities that will cater the diversified needs of passengers. It is being manufactured by ICF, Chennai under "Make in India" and "Atmanirbhar Bharat" mission.

Vande Metro is expected to be introduced on tracks by February, 2024. The main objective of introducing this train is to offer a rapid shuttle service for suburban passengers with world-class amenities. It has been designed for the comfort of sitting as well as standing passengers. Since, commuters prefer to travel by train due to its convenient and safe journey therefore demand for this service is expected to be very high.

Vande Metro is a 12 car formation rake built on Vande Bharat platform. The salient features of Vande Metro train are aerodynamically designed driving end, light weight car body, fully air-conditioned coaches, light weight cushioned seats of contemporary design, 4 sets of wider automatic plug-in door, wider panoramic sealed windows, fully sealed gangways, light aluminium luggage rack, mobile

charging sockets, modular toilet with vacuum evacuation system, toilet for PRM (passengers with reduced mobility area), diffused lighting, passenger information system with LCD displays and route indicator displays for the convenience of passengers. Other important features are emergency Talk-Back Unit, automatic fire detection and alarm system and Train Collision Avoidance System (KAVACH) for the safety of passengers.

Vande Metro train is being introduced to provide an alternate to the MEMU services with an objective to serve the commuters with speedier and more comfortable journey. Alongwith the features of MEMU train, this train will have all the major features of the Vande Bharat Exp. Although the



Vande Metro train will not have the facility of a chair car or a pantry car like the Vande Bharat Exp., but it will have light weight seats and also provisions for standing passengers with earmarked space and support which are the desired amenities for commuters.

II. Objective of the study

The objective of this study is to analyse the passenger amenities being provided in the Vande Metro train in comparison to the amenities in other suburban services like MEMUs and the Metros and suggest world-class passenger amenities in this train. The study report mainly focuses on exploring and providing valuable insights about the features that may contribute to a memorable travel experience for the passengers of upcoming Vande Metro train.

III. Scope of the study

Total four types of suburban services have been studied in this report for comparison with the passenger amenities planned to be provided on the Vande Metro train. Analysis of different suburban systems provides a comprehensive understanding of the desired amenities for the commuters. The factors such as adequate availability of space for passengers and their luggage and other on board facilities have been taken into account for the study using technological advancements and compatibility with existing infrastructure. Finally, recommendations have been given with a view to enrich the travel experience of Vande Metro passengers.

Scope of this study has been formulated on the following lines:

- ➤ Amenities Evaluation- This study evaluates the amenities planned to be provided on the Vande Metro train. It involves in-depth analysis of the quality, functionality and comfort of passengers.
- ➤ Comparative Analysis- To provide a comprehensive view, the study includes a comparative analysis of the planned amenities in the Vande Metro train in comparison to the passenger amenities provided on similar types of other trains such as MEMUs, LMRC and DMRC.
- Feasibility and Implementation- The study also explores the feasibility and practicality of the available amenities in terms of implementation and operation in the Vande Metro train.

IV. Methodology

The basic information of Vande Metro train was collected from the Carriage Directorate of RDSO. Thereafter visits were organized to Integral Coach Factory (ICF), Chennai, Lucknow Metro (LMRC) and Delhi Metro (DMRC) for data collection. All the datas were compared for further analysis of desired passenger amenities in the Vande Metro train. Based on the above information, a bilingual (Hindi and English) questionnaire was formed on nine parameters regarding provision of amenities in Vande Metro train. Feedback and suggestions from the passengers of MEMU train were taken on the said questionnaire and then the report was finalized based on all the above exercises and parameters.

V. Rake formation of Vande Metro train

The design and other parameters of the Vande Metro train have been finalised by RDSO with the help of ICF. Vande Metro rake has been built on Vande Bharat platform and it consists of 12 coaches. Complete rake is divided into three units and each unit contains four coaches. The formation of these units is as follows: -

S. No.	Unit	Formation
1	Unit-1	DTC-MC-TC-MC2
2	Unit-2	NDTC-MC-TC-MC2
3	Unit-3	MC3-TC-MC-DTC

[DTC- Driving Trailer Coach, MC- Motor Coach, TC- Trailer Coach and NDTC- Non-Driving Trailer Coach]

Details of the seating as well as the standing capacity of each type of coach on this train are given in the following table: -

S. No.	Name	Seating	Standing Capacity	Total
	of	Capacity		
	Coach			
1	DTC	48+9*=57	79 (8 Passenger/m ²) +16* (4 Passenger/m ² at	152
			PRM) =95	
			PRM*-Passengers with reduced mobility area	
2	MC	108	166 (8 Passenger/m ²)	274
3	TC	108	166 (8 Passenger/m ²)	274
4	MC2	108	166 (8 Passenger/m ²)	274
5	NDTC	108	166 (8 Passenger/m ²)	274
6	MC	108	166 (8 Passenger/m ²)	274
7	TC	108	166 (8 Passenger/m ²)	274
8	MC2	108	166 (8 Passenger/m ²)	274
9	MC3	108	166 (8 Passenger/m ²)	274
10	TC	108	166 (8 Passenger/m ²)	274
11	MC	108	166 (8 Passenger/m ²)	274
12	DTC	48+9*=57	79 (8 Passenger/m ²) +16* (4 Passenger/m ² at	152
			PRM) =95	
			PRM*-Passengers with reduced mobility area	
To	otal	1194	1850	3044
		Total Capa	ncity in Vande Metro Train	3044

It is clear from the above table that total sitting capacity of this train is 1194 passengers whereas its total standing capacity is 1850 passengers. Thus the total carrying capacity of a Vande Metro train is 3044 passengers.

The configuration of Vande Metro train will be as follows -

Description	DTC	MC	TC	NDTC
No. of Coach	2	6	3	1
Free area available (Doorway/Aisle/Coach ends)	(9.9+4) m ²	20.8 m ²	20.8 m ²	20.8 m ²

The free space includes both the doorway area and the aisle area, but it does not include the knee space provided for the sitting passengers.

VI. Passenger Amenities in Vande Metro train

The Vande Metro train is designed to serve its passenger with world-class amenities and the latest technology. Followings are the detailed passenger amenities being provided in Vande Metro train -

- ➤ **Door:** The door mechanisms have safety provision as the train will not start unless all doors are closed and electrically locked. There are two doors on each side i.e. four doors per coach. Centralised automatic sliding door for coach entry has been provided. Width of the door is sufficient for the passenger movement.
- ➤ **Foot Step:** Footsteps for easy boarding and deboarding of passengers have been provided at body side doors in all the coaches. The design of the footsteps is skid free. It has been designed in such a way that the gap between the platforms and the foot steps is minimal and ensures smooth movement of passengers between the platform and the train.
- ➤ Aisle Area: The aisle or walkway in a Vande Metro train plays a pivotal role in ensuring passenger comfort, accessibility, and the overall efficiency of the metro system. Handholds & grab pillars for passenger support during the journey in aisle area have been provided for standing passengers.
- ➤ Seat: Seating arrangements with light-weight cushioned bench-type seats (for 3x3 passengers) on both sides of the aisle area have been provided with adequate legroom. The total passenger capacity of Vande Metro train is 3044 in which sitting capacity is 1194 (including 9-PRM seats in each DTCs) whereas standing capacity is 1850.

- ➤ Luggage Space: Provision of light aluminium longitudinal luggage racks above the seats has been made to accommodate small bags and luggage.
- ➤ Window: All windows will be provided with double-glazed safety glass. Wider panoramic sealed windows with fire retardant roller blinds and emergency windows have been provided. The windows have been given additional protection to prevent damage from stone-pelting, etc.
- ➤ **Light:** Well-lit interiors with appropriate lighting systems of LED lights (diffused lighting) has been provided.
- ➤ Mobile Charging Socket: Total 12 mobile charging sockets (Type A & Type C) in every coach near entry/exit gate have been provided for passengers to charge their devices.
- Safety & Security: This train prioritizes the safety and security of its passengers. To enhance security, there are 4 CCTV cameras at various points in each coach of the train to monitor passenger areas. Emergency alarm systems and fire safety measures are available to handle unforeseen situations. Provision of first aid box has been made in each DTC. Instructions for passengers are displayed at relevant places for using emergency alarm push switch and emergency Talk-Button Unit during emergency.
- ➤ Voice Communication System: The train is equipped with a public address (PA) facility so that Loco Pilot /Guard can make announcement for the passengers from driving / non-driving cab. The public address intercom system is equipped with the communication facility between Loco Pilot and Guard and between Loco Pilot/Guard and Passengers. Emergency push buttons and emergency talk back (ETB) units are located near all the doors and gangways so that in case of failure

of one unit of PA system or a passenger communication unit, there shall not be failure of the whole system. Provision for voice recording of the conversations with GPS stamping has also been made available.

- Passenger Information System: GPS based passenger information system (PIS) provides automatic announcement. The display of destination information on Electronic display boards & LED display screens have been provided for showing upcoming stations, route maps and train information inside the coaches throughout the train. Each driving coach is also equipped with two digital destination boards of good visibility in day/night on the outside (one on each side) displaying the train number, name of originating and destination stations, etc. GPS based route map have been provided at all the main exit doors in each coach with adequate visibility angle to cover maximum passengers. Being unreserved coach, coach number indication in display unit has not been planned.
- ➤ Lavatory: Vacuum evacuation system with bio-digester tank has been planned in all the coaches with push button operation. Two toilets have been provided in each coach diagonally. A hand dryer, a soap dispenser, a wash basin with water tap, a grab handle, lighting, an exhaust fan etc. have been provided in each washroom of a coach. One toilet for disabled (Divyang passengers) and another toilet for other passengers have been provided in driving trailer coach. Adequate space has been provided for movement of wheel chair for Divyang passengers. These wheel chairs will be part of the platform service.
- ➤ **Gangways:** All coaches are equipped with fully sealed gangways to reduce the air resistance. The gangway is the flexible part of the train, allowing the movements between the coaches and offering passengers a secure and comfortable passageway.

VII. Features of different types of Multiple Unit (DMU/EMU/MEMU) Trains

DMU, EMU and MEMU trains are being widely used to cater the need of suburban traffic on IR. These trains provide efficient transportation for short distances.

DMU - DMU stands for Diesel Multiple Unit. It is a rapid transit train being operated on suburban networks. It is a multiple-unit train powered by on-board diesel engines. Electricity is generated by the diesel generators inside the train to run the traction motor. It requires no separate locomotive, as the engines are incorporated into the carriages.



The seating arrangement is designed with a focus on both capacity and ergonomic comfort. Wide doors on each side of the coaches facilitate easy boarding and deboarding, contributing to efficient passenger flow. Public Announcement Systems (PAS) and LCD display screens inside the coaches keep passengers informed about journey updates and station details.

EMU - An EMU runs in the suburban sections of major cities. It is a multiple-unit train consisting of self-propelled carriages, using electricity as the motive power. It requires no separate locomotive; as electric traction motors are incorporated within one or a number of carriages. One unit generally



consists of three coaches in which one motor car and two trailer cars are connected with each other. Each rake of this train is a combination of three, four or five of its unit. These trains are popular due to its fast acceleration, deceleration and pollution-free operation.

Adequate ventilation systems maintain a fresh atmosphere inside the coaches. Wide doors facilitate easy boarding and deboarding. LED display screens and Public Announcement Systems keep passengers informed about the journey, station stops, and other relevant updates. Additionally, EMU coaches include amenities such as toilets, grab handles, emergency windows, fans and tube lights.

MEMU - The acronym stands for Mainline Electric Multiple Unit. MEMU has more powerful traction motor than EMU and each basic unit is composed of 4-cars whereas in EMU, there are 3-cars. MEMUs are used for medium and long distance commuter passengers in comparison to EMU trains. It



is widely used for suburban services. During the visit of MEMU train no. 04296; it was observed that the train has three units and each basic unit consists of one driving motor coach and three trailer coaches.

Seats are arranged in a traditional way, there are 5-seats in a row in which 3 seats are placed on one side, and 2 seats on the other side of the aisle area. Toilet has been arranged in such a way that passengers of adjacent coaches may use the same toilet. Wash basin equipped with mirror & water tap have been provided near the toilet area. Luggage racks at suitable height, fans, tube lights, digital display board, emergency windows, overhead grab handles for support of passengers during the journey, alarm chains, etc. have been provided inside the train.

VIII. Passenger Amenities in Metro train services

A. Lucknow Metro

LMRC (Lucknow Metro Rail Corporation) commissioned the services of Lucknow Metro train between the CCS Airport and Munshipulia on 8th March, 2019. Every rake of this train consists of two types of coaches- DMC and TC. There are total four coaches i.e. DMC₁, TC₁, TC₂ and DMC₂ in a rake of Lucknow Metro train.



Passenger Capacity:

	Coach/Cars Capacity								
Coach/	Sta	nding	Seating	Total	Total				
Car	$6/m^2$	$8/m^2$		6/m ²	8/m ²				
DMC	204	272	43	247	315				
TC	220	290	50	270	340				
TC	TC 8 Seats designated for Elderly/Handicapped/Women.								
DMC	· · · · · · · · · · · · · · · · · · ·								

Total passengers for composition: $DMC_1+TC_1+TC_2+DMC_2 = 1034$ (6 Pass/m²) Total passengers for composition: $DMC_1+TC_1+TC_2+DMC_2 = 1310$ (8 Pass/m²)

Passenger Amenities: Various passenger amenities have been provided for comfort and safety of the commuters. All the coaches are fully Air-conditioned, ensuring a pleasant travel. The longitudinal ergonomic seating arrangement in this train maximizes the space for standing passengers. A special type of emergency door has been provided on both ends for emergency exits on the track

side. Automatic door operation enhances safety and efficiency, complemented by low noise levels inside the train.

In addition to safety measures, ergonomically designed handrails & grab handles provide comfortable standing. The inter-car wide gangways facilitate smooth passenger movement during the journey. The provision of four wide doors on each side expedites boarding and deboarding of passengers. Public announcement system, passenger emergency intercom, visible display system, large size glass windows and scratch proof stainless steel bucket type seats, have been provided as passenger amenities in the Lucknow Metro train.

B. Delhi Metro

Presently, Delhi Metro network is expanded over 391 km, covering 286 stations. There are 2 types of Gauge in DMRC i.e. Broad Gauge (1676 mm) & Standard Gauge (1435 mm). The DMRC has over 300 train sets in different compositions of four, six and eight coaches/cars.



The train Formation consists of- Driving Trailer Car, Motor Car and Trailer Car. Each of these cars have different carrying capacity of passengers-

S. No.	Car	Seating Capacity	Standing Capacity	Total Capacity
1	Driving Trailer Car	43	318	361
2	Motor Car	50	342	392
3	Trailer Car	50	342	392

Therefore, the total carrying capacity depends on the composition of the train set.

Passenger Amenities: In all the train sets of Delhi Metro system, world-class passenger amenities have been provided. The coaches are equipped with automatic doors that open and close at each station. The longitudinal ergonomic seating arrangement, with seats facing each other along the length of the coach and large size glass windows have been provided. Toilet facility is not available inside the train. The coaches are equipped with air conditioning system to maintain a comfortable temperature. For convenience of standing passengers, handrails and straps are provided. Lighting inside the train is fully LED type. One can also get to know the next station and platform side on which it arrives. In emergency situations, PEA (Passenger emergency alarm) and communication between passenger and train operator has been made available in all coaches. Passengers can go outside through emergency door which has been provided at both ends of the train in DTC cab. It may be opened in emergency situation towards the track side at both ends. Every coach consists of an alarm control panel & fire detector. Its monitoring panel has been provided inside the train and at OCC. Fire extinguishers have been placed inside the train below the nominated seat.





Emergency door (inside DTC)

Emergency door (outside DTC)

The internal security of the Delhi Metro is ensured by the Central Industrial Security Force. CISF offers undisturbed and speedy security check as it is done by baggage scanners, door frame metal detectors as well as convenient hand-held

metal detectors. Security is enhanced through the presence of CCTV cameras inside the coaches.

Catering the needs of women, Delhi Metro has reserved a car in each train, especially for women passengers. Also, provision of reserved seats for women passengers, senior citizens and disabled passengers has been done in all the coaches.



UTO (Unattended Train Operation) is the future of Delhi Metro. It is going to operate driverless trains in which starting, stopping and operation of doors are all fully automated without any on-board train staff. These trains are equipped with cameras and sensors. These are remote-controlled trains, all operations including start, halt and acceleration will be handled from an operation control centre (OCC). More space with increased seating capacity exists in this train to accommodate 40 more passengers in driver's car as train is unmanned.

I. Comparison of Suburban train services <u>Passenger amenities in MEMU, Lucknow Metro (LMRC), Delhi Metro (DMRC) & Vande Metro</u>

S. No.	Description	MEMU	LMRC	DMRC	Vande Metro (Main Line)
1	Total no. of coaches/cars	Eight/Twelve/Sixteen	Four	Four/Six/Eight	Twelve
2	Service	Designed for suburban traffic. It operates on IR tracks.	Designed for urban traffic commuting within the city. It operates on dedicated tracks and serves specific stations in the metro network.	Designed for urban traffic commuting within the city and adjoining areas of Delhi, NCR. It operates on dedicated tracks and serves specific stations in the metro network.	Designed for suburban traffic to fulfil demand of passengers of nearby towns across cities.
3	Seating Arrangement	Traditional seating arrangements of IR.	Longitudinal seating arrangements, with seats facing each other along the length of the coach.	Longitudinal seating arrangements, with seats facing each other along the length of the coach.	Traditional seating arrangements of IR.
4	Frequency	Running on fixed schedules as per time table.	At shorter intervals.	At shorter intervals.	Running on fixed schedules as per time table
5	Maximum Speed	110 kmph	80 kmph while Round trip schedule speed- 32-35 kmph	80 kmph & 110 kmph on Airport metro line, while Round trip schedule speed- 32-35 kmph & 67 kmph on Airport metro line.	110 kmph

S. No.	Description		MEMU			LMRC			DMRC			nde Metro Iain Line)	
6	Passenger carrying Capacity	Seating	Standing	Total	Seating	Standing	Total	Seating	Standing	Total	Seating	Standing	Total
	Cupucky	614 (8 Cars)	1788 (8 Cars)	2402	186 (4 Cars)	848 (6/m2)	1034	186 (4 Cars)	1320 (4 Cars)	1506	1194 (12 Cars)	1850 (12 Cars) (8pass/	3044
		921 (12Cars)	2682 (12 Cars)	3603	-			286 (6 Cars)	2004 (6 Cars)	2290	-	m2)	
		1288 (16 Cars)	3576 (16 Cars)	4864	186 (4 Cars)	1124 (8/m2)	1310	386 (8 Cars)	2688 (8 Cars)	3074	_		
7	Smart Card Facilities		N.A.			Available		A	Available			N.A.	
8	Fans		Available		N.A. (Due to Airconditioned coaches)		N.A. (Due to Airconditioned coaches)		N.A. (Due to Airconditioned coaches)				
9	CCTV Cameras	N.A.		Available (4 nos. per coach.)		Available (4 nos. per coach.)		Available (4 nos. per coach.)					
10	Talk back facility		N.A.		Available		Available		Available				
11	Lighting		Normal		Diffused LED		Diffused LED		Diffused LED				
12	No. of toilets per coach	ets per N.A.(Mostly) but a few rakes have 02 toilets now.			N.A.			N.A.			02		
13	13 Track Guage 1676 mm (Br		m (Broad (Guage)	1435mm (Standard Guage)		1676mm (Broad Guage) & 1435mm (Standard Guage)		1676mm (Broad Guage)				
14	UTO (Unattended Train Operation)		N.A.			N.A.		1	Available			N.A.	

X. Feedback Survey of MEMU Passengers

During the customer feedback survey, a total of 120 passengers were interacted and their feedback was obtained on all the items of the questionnaire which is attached as **Annexure-I**. The trains taken up for the survey were 04295/04298 between LKO-CNB-LKO, 11807/11808 between VGLJ-AGC-VGLJ and 01812 between VGLJ-GWL MEMU trains.

The commuters were interacted through both formal and informal discussions on the matters of various passenger amenities being provided in the Vande Metro train to know their views and opinion.

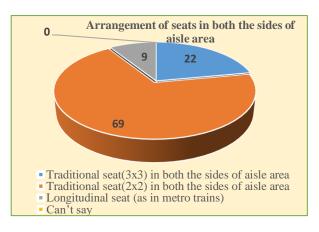
Suggestions of MEMU train passengers based on feedback survey have been summarized as under:

1) Arrangement of seats in both the sides of aisle area:

Total 120 passengers of suburban train (MEMU) passengers were asked about the seating arrangement. Data received in the survey is tabulated below:

Traditional seat (3x3) in both the sides of aisle area		Traditional seat (2x2) in both the sides of aisle area		Longitudinal seat (as in metro trains)		Can't say	
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
26	22	83	69	11	9	1	-

Almost 69% passengers suggested for traditional arrangement of 2x2 seats on both the sides of aisle area whereas 21% passengers suggested for 3x3 seats. This survey shows that majority of the passengers found the arrangement of 2x2 seats



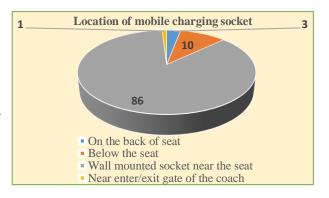
on both the sides of aisle area more convenient.

2) Location of mobile charging socket in each coach:

Four options for location of mobile charging socket were given to the MEMU passengers. In this survey, passengers expressed their opinion as presented in the table below:

On the back of seat		Below the seat		Wall mou	ınted	Near entry/exit gate	
				socket near the seat		of the coach	
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
4	3	12	10	103	- 10		1

As per above data analysis, around 86% of the passengers expressed their opinion that it should be wall-mounted near the seat as per its usability and convenience.

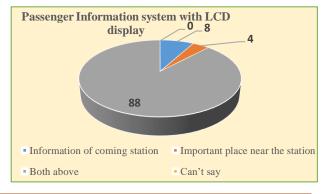


3) Passenger Information System with LCD display:

Third point of the survey was the content of PIS. Presently only information of upcoming station is displayed on PIS. As a customer-friendly approach, additional information regarding nearby important locations around the upcoming station may also be displayed for the convenience of passengers. Opinion of the passengers on this point is summarised below:

	Information of coming station		Important place near the station		Both above		Can't say	
	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
	Number		Number		Number		Number	
ĺ	9	8	5	4	106	88	-	-

Almost 88% of the MEMU passengers suggested that the PIS should display the information regarding upcoming station as well as the important locations around that station.

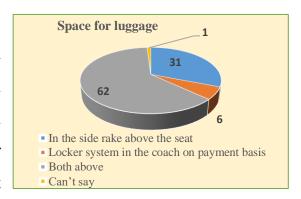


4) Space for luggage:

During the survey, adequacy of luggage space alongwith an additional provision of space for bigger luggage under locking arrangement was also flagged and opinion of passengers was taken on this issue which is presented below:

In the side rack above the seat		Locker system in the coach on payment basis Passenger Percentage		Both the above		Can't say	
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
37	31	8	6	74 62 1		1	

It is clear from above table that 62% passengers of MEMU train suggested for additional luggage space with locking arrangement on digital payment basis. It may be provided near doorways alongwith the present



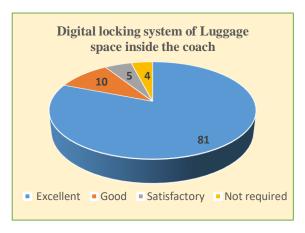
arrangement of side luggage rack above the seat. While 31% passengers suggested that the present system of side rack, above the seat should only be continued as luggage space.

5) Digital locking system of Luggage space inside the coach:

As MEMU or Vande Metro (Main Line) services carry both commuters as well as suburban passengers who carry different size of luggage depending on their travel purpose, it is felt that luggage space of side racks alone cannot serve the purpose of these two types of passengers. Therefore, a space for bigger luggage may also be provided for our customers convenience near doorways. Opinion poll of passengers was taken for this proposed facility.

Excellent		Good		Satisfactory		Not required	
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
97	81	12	10	6	5	5	4

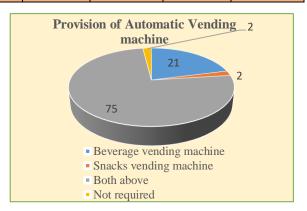
Provision of luggage space inside the coach with digital locking and token system on payment basis was rated excellent by 81% of the passengers. Therefore, this facility may be considered inside the coach for convenience of passengers.



6) Provision of Automatic Vending machine:

Beverage vending		Snacks vending		Both above		Not required	
machine machine							
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
25	21	2	2	91	75	2	2

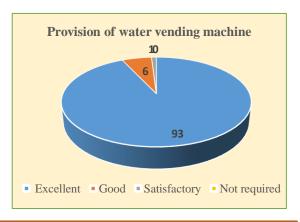
As per the data analysis of above table, 75% passengers of MEMU train suggested for both beverage vending machines and snacks vending machines inside the Vande Metro train.



7) Provision of water vending machine:

Excellent		Good		Satisfactory		Not required	
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
112	93	7	6	1	1	-	-

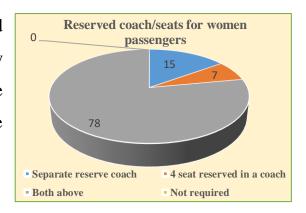
Suggestion for provisioning of water vending machine facility inside the coach was widely appreciated as 99% passengers rated this facility as 'excellent' or 'good' service.



8) Reserved coach/seats for women passengers:

Separate reserve		4 seat reserved in a		Both the above		Not required	
coa	ach	coach					
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
18	15	9	7	93	78	-	-

Separate reserved coach or reserved seats for women passengers in every coach was appreciated by 78% of the passengers during the survey for the Vande Metro train.

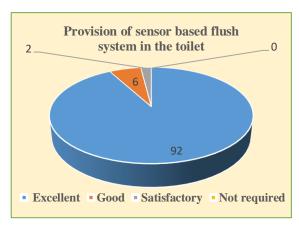


9) Provision of sensor based flush system in the toilet:

Indian Railways face maximum complaints in the area of toilet cleaning. In Vande Metro, bio vacuum toilet with push button flushing has been provided. Experience confirms that passengers don't even operate /use the push button flush for cleaning the toilet after the use. In such condition the only solution for cleanliness of toilet seems to be sensor based automatic flushing system after every use. This issue was flagged and opinion of passengers was taken.

Excellent		Good		Satisfactory		Not required	
Passenger	Percentage	Passenger	Percentage	Passenger	Percentage	Passenger	Percentage
Number		Number		Number		Number	
111	92	7	6	2	2	-	-

As per their rating, almost 99% of the passengers of MEMU train (118 out of 120) rated this provisioning as excellent or good.



Suggestions given by MEMU passengers for adding more facilities, other than the amenities being provided in Vande Metro train:

Suggestions for vending facility: -

- Only authorised vendors should be allowed in the train.
- Fresh items should be sold by the vendors.
- The menu/rate list of items may be displayed in every coach.
- Both cash and digital payment may be made available.

> Facilities required for Senior citizens: -

- Provision of reserved seats in each coach.
- A separate coach for senior citizen with ramp & wheel chair.

> Facilities required for Female staff passengers: -

- Security for female passengers.
- Separate reserved coach for ladies.
- Reserved seats for female passengers in every coach.
- Reserved seats for pregnant ladies.

> Suggestions on provision of mobile holder/pocket:

• Mobile phone stand/pocket holder is required near the charging point.

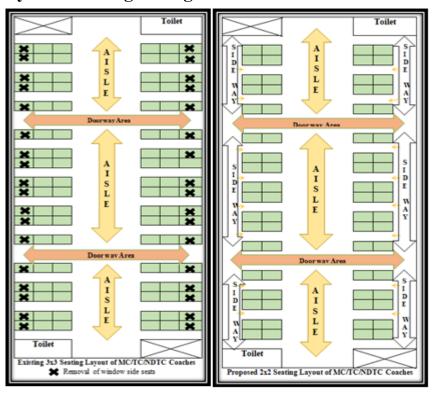
XI. Recommendations

There are several emerging technologies that may be applied in the Vande Metro train to give a feel of world-class passenger amenities to our customers. These technologies aim to enhance the overall travel experience, comfort, convenience and entertainment value. Considering all these factors, following are the recommendations of this study, which will add to a pleasant experience during the journey of the Vande Metro train.

> Modification in seating arrangements-

Area per capita in passenger coaches is a factor that directly affects passenger comfort during the journey, and a large area per capita for passenger means higher comfort during the journey. In the survey conducted by the directorate, approximately 70% of the passengers of MEMU train suggested for 2x2 seating arrangement on both the sides of aisle area. So provision of traditional seating arrangement of 3x3 may be replaced with 2x2 seats after the removal of the window side seat.

Proposed layout of seating arrangement/seats in a coach:



This arrangement will be beneficial from following points of view:

a)- Enhanced space for standing and moving passengers:

Removal of the third seat from window side will free up the space and enhance comfort for standing and moving passengers as compared to 3x3 configuration of seats. It will also make the boarding and deboarding activities of passengers more efficient.

b)- Secured and comfortable space for standing female passengers:

In the Indian scenario, we find the children and lady passengers uncomfortable while standing during the journey. They can also stand comfortably in the freed space by taking back support by the side of the coach wall in a secure manner.

c)- Better mobility inside the coach:

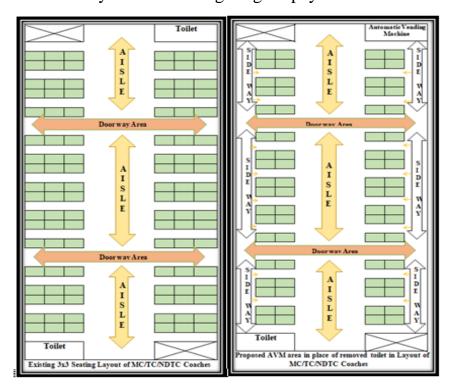
The open layout of seating arrangement allows for better mobility inside the coach and access to seats. This arrangement of seats will drastically reduce the criss-cross movement of passengers by creating space for movement all around the seats.

Reducing the number of toilets-

Two toilets in diagonal directions have been provided in every coach of the Vande Metro train. Since, suburban passengers have fewer toilet requirements due to their short travel time, the number of toilets may be reduced to one per coach. Second toilet may be removed from all the coaches (except DTC). Removal of one toilet from each coach of Vande Metro train will not only reduce maintenance and cleaning costs but will also release the space which may be utilized for further revenue generation.

Provision of Automatic Vending Machines-

The automatic vending machines may be installed in the space vacated by the removal of toilet. These machines may include a variety of items to serve the different catering needs of the passengers; such as, beverage items, like, tea, coffee, juice, tetra pack, and snacks items like, chips, chocolate, namkeen, biscuits, etc. These automatic vending machines may be operated on contractual basis. The menu and rate list of items may be displayed in each coach, and revenue collection may be done through digital payment mode.



> Sensor based automatic flushing arrangement in toilets:

Provision of touch button flushing system in bio-vacuum toilets in the coaches of Vande Metro may be replaced with *sensor based automatic flushing arrangement*. The sensor may be associated with the mandatory activity of the toilet user, like, opening or closing of latches of the toilet door so that when passengers open/close the toilet then the flushing starts automatically. This arrangement will largely contribute to the cleanliness of toilet which is a major concern of complaint on Indian Railways.

Removal of Roller Binds:

The provision of roller blinds on the panoramic sealed windows inside the coaches of Vande Metro train may be dispensed with, since it may create a hindrance to cleanliness as well as the safety of passengers. Roller blinds can accumulate dust and other dirt over a period of time, making it challenging to maintain cleanliness inside the coach. Panoramic sealed windows without roller blinds, on the other hand, are easier to clean and maintain, promoting a hygienic environment for passengers. By eliminating roller blinds from the windows, the overall maintenance costs and efforts can be significantly reduced. Removal of roller blinds will also reduce the threat to safety of passengers in case of fire.

➤ Provision of space for large luggage:

Some suburban passengers carry large luggage and need continuous supervision of their luggage. Therefore, they put their luggage beneath their seats or in aisle area due to non-availability of suitable space which creates inconvenience to others. To cater the need of such passengers, a separate space like locker with token system may be provide to keep their luggage. Individual locking arrangements will also ensure the security of their cargo. This space may be arranged near doorways in every coach. Additional charges for using the facility of locker may be taken through the digital payment.

➤ Additional contents of Passenger Information System:

Presently only information of upcoming station is displayed on PIS. As a customer-friendly approach, additional information regarding nearby important locations around the upcoming station may also be displayed for the convenience of passengers. Almost 88% of the MEMU passengers suggested that the PIS should display the information regarding upcoming station as well as the important locations around that station. Apart from this, history and

demography of the station, nearby important places and their distances from the station, may also be displayed for enhancing the customer satisfaction. Audiovisual display of advertisement may be done in the coach which will give additional earning to the railways.

Location of Mobile Charger and Provision of Mobile holder:

Mobile charging sockets (Type A & Type C) near entry/exit gate of every coach have been provided for passengers of Vande Metro to charge their devices. While in the survey of the directorate, almost 86% passengers of MEMU train suggested that mobile charging sockets should be arranged on the side wall of the coach near the seats. Mobile phone stand/pocket holder may also be provided near the mobile charging point for the convenience of passengers which is not there in Vande Metro train.

> Reserved seats/coach:

Separate coach may be reserved for women passengers in Vande Metro train as provided in MEMU, DMRC etc. Seats may be reserved for disabled passengers and women passengers in every coach. Ergonomically designed seats for pregnant ladies and senior citizens may also be provided in every coach to cater their special need.

XII. Conclusion

The study report on the provision of passenger amenities in Vande Metro train gives deep insight into the various features provided in the train. The comparative analysis of amenities being provided in the Vande Metro train and the amenities of other suburban trains like, MEMU, Lucknow Metro & Delhi Metro has given a wider spectrum to the study. This study has been done with an objective to enrich the travel experience of the Vande Metro commuters. The findings of this study report suggest a few modifications in the amenities being provided in the train for convenient and pleasant journey of suburban passengers.

Indian Railways is continuously trying to assess the expectations and inconveniences of the passengers for delivering world class services to their customers. Continuous focus on passenger comfort and their satisfaction level will make the Vande Metro train an ideal choice for travellers seeking for a superior service and comfortable journey. The amenities provided in this train contribute significantly to the overall travel experience. The recommendations given in the study report offer practical solutions to address the identified shortcomings, emphasizing the need for customer pro planning and its effective implementation. The report brings out the importance of a well-equipped, passenger-friendly service in ensuring customer satisfaction and creating a positive perception of public transportation.

RESEARCH DESIGNS AND STANDARDS ORGANIZATION, LUCKNOW (MINISTRY OF RAILWAYS)

Passenger Feedback Form

अनुसंधान अभिकल्प एवं मानक संगठन, लखनऊ
(रेल मंत्रालय)
यात्री फीडबैक फॉर्म
Train no. (गाड़ी संख्या)Ticket No. (टिकट संख्या)
Station from (स्टेशन से)Station to (स्टेशन तक)
Name of Passenger (यात्री का नाम)
Gender (लिंग) M (पुरुष) Date of Journey (यात्रा की तारीख)
Mob. No. (मोबाइल नंबर)Profession (व्यवसाय)
Following facilities are available in Vande Metro train:
(वंदे मेट्रो ट्रेन में निम्नलिखित सुविधाएं उपलब्ध हैं) –
Fully air conditioned (पूर्णतः वातानुकूलित)
Cushioned seat (गद्देदार सीट)
Automatic door (स्वचालित दरवाजा)
Sealed windows with roller blinds (रोलर ब्लाइंड्स वाली सीलबंद खिड़िकयाँ)
➤ Mobile charging sockets (USB Sockets-Type A&C) (मोबाइल चार्जिंग सॉकेट)
➤ Modular toilet with vacuum evacuation system
(वैक्यूम निकासी प्रणाली के साथ मॉड्यूलर शौचालय)
> Passenger Information system with LCD display
(एलसीडी डिस्प्ले के साथ यात्री सूचना प्रणाली)
 Route indicator display (मार्ग सूचक प्रदर्शन)
Emergency talk back unit (आपातकालीन टॉक बैक यूनिट)
> CCTV cameras (सीसीटीवी कैमरे)

Questionnaires for the amenities in Vande Metro from the passengers of MEMU train-

मेमू ट्रेन के यात्रियों से वंदे मेट्रो में सुविधाओं के लिए प्रश्नावली-

Please put $\sqrt{\text{mark}}$ कृपया सही का निशान ($\sqrt{\ }$) लगाएं

- 1- Requirement of seating arrangement in both the sides of aisle area: (गलियारे के दोनों ओर बैठने की व्यवस्था की आवश्यकता)
- A) Traditional seat(3x3) in both the sides of aisle area. गलियारे क्षेत्र के दोनों किनारों पर पारंपरिक सीट (3x3)
- B) Traditional seat(2x2) in both the sides of aisle area. गलियारे क्षेत्र के दोनों किनारों पर पारंपरिक सीट (2x2)
- C) Longitudinal seat (as in metro trains) (अनुदैर्ध्य सीट-मेट्रो ट्रेनों की तरह)
- D) Can't say (कहा नहीं जा सकता)

2- Location of mobile charging socket in each coach: (मोबाइल चार्जिंग सॉकेट का स्थान)

A) On the back of seat (सीट के पीछे)

B) Below the seat

(सीट के नीचे) Wall mounted socket near

C) Wall mounted socket near the seat (सीट के पास दीवार पर लगा सॉकेट)

D) Near entry/exit gate of the coach (कोच के प्रवेश/निकास द्वार के पास)

3- Passenger Information system with LCD display:

(एलसीडी डिस्प्ले के साथ यात्री सूचना प्रणाली) A) Information of coming station.

(आने वाले स्टेशन की जानकारी)
B) Important place near the station.

(स्टेशन के निकट महत्वपूर्ण स्थान)

C) Both above.

(उपरोक्त दोनों)

D) Can't say (कहा नहीं जा सकता)

4- Space for luggage: (सामान रखने की जगह)

A) In the side rack above the seat (सीट के ऊपर साइड रेक में)

B) Locker arrangement in the coach through token and digital payment (टोकन एवं डिजिटल भुगतान के आधार पर कोच में लॉकर व्यवस्था)

C) Both above. (उपरोक्त दोनों)

D) Can't say (कहा नहीं जा सकता)

5- Digital locking system of luggage space inside the coach (कोच के अंदर सामान रखने की जगह का डिजिटल लॉकिंग सिस्टम)

A) Excellent (বকুষ্ট)

B) Good (अच्छा)

C) Satisfactory (संतोषजनक)

D) Not required (आवश्यक नहीं)

6- Provision of Automatic Vending machine (स्वचालित वेंडिंग मशीन का प्रावधान)

A) Beverage vending machine (पेय पदार्थ वेंडिंग मशीन)

B) Snacks vending machine (स्नैक्स वेंडिंग मशीन)

C) Both above (उपरोक्त दोनों)

D) Not required (आवश्यक नहीं)

- 7- Provision of water vending machine facility inside the coach-(कोच के अंदर वाटर वेंडिंग मशीन की सुविधा का प्रावधान)
- A) Excellent (বক্ছ)
- B) Good (अच्छा)
- C) Satisfactory (संतोषजनक)
- D) Not required (आवश्यक नहीं)
- 8- Reserved coach/seats for women passengers: (महिला यात्रियों के लिए आरक्षित कोच/ सीट)
- A) Separate reserve coach (अलग रिजर्व कोच)
- B) 4 seat reserved in a coach (एक कोच में 4 सीट आरक्षित)
- C) Both the above (उपरोक्त दोनों)
- D) Not required (आवश्यक नहीं)
- 9- Provision of sensor based flush system in the toilet (शौचालय में सेंसर आधारित फ्लश सिस्टम का प्रावधान)
- A) Excellent (বকুষ্ট)
- B) Good (अच्छा)
- C) Satisfactory (संतोषजनक)
- D) Not required (आवश्यक नहीं)

Suggestions given by MEMU passengers for adding more amenities, other than the amenities being provided in Vande Metro train:

वंदे मेट्रो ट्रेन में उपलब्ध सुविधाओं को छोड़कर, अधिक सुविधाओं को जोड़ने के लिए मेमू ट्रैन के यात्रियों द्वारा दिए गए सुझाव

>	Suggestions for vending facility (ट्रेन में वेंडिंग सुविधा के लिए सुझाव)
>	Facilities Required for Senior citizens- (विरष्ठ नागरिकों के लिए आवश्यक सुविधाएं))
>	Facilities Required for Female staff passengers- (महिला यात्रियों के लिए आवश्यक सुविधाएं)
	Suggestion on provision of mobile holder/pocket - (मोबाइल होल्डर/पॉकेट की व्यवस्था पर सुझाव)
	Signature (हस्ताक्षर) Date (दिनांक)