

6. TRAIN OPERATION PLAN

6.1 PROJECTED RIDERSHIP AND PHPDT DATA

Train operation plan for Virar-Dahanu-Road Corridor has been prepared based on following expected peak hour peak direction traffic (PHPDT) and Ridership data,

Growth of PHPDT in Virar-Dahanu Road Section				
Year →	2012	2021	2031	2041
PHPDT	8800	17600	31700	51900

Table 6.1 Projected PHPDT data

Daily Ridership in lakhs				
Year →	2012	2021	2031	2041
Daily Ridership	2.07	3.97	6.97	11.25

Table 6.2 Ridership Data

6.2 PROPOSED SYSTEM DESIGN

System Design will be as under

- Traction System : 25 kV ac 50 Hz single phase with flexible regulated overhead equipment system similar to the traction system on existing corridor.
- Rolling Stock : Broad Gauge, 3660mm wide having state of the art three phase propulsion system powered with VVVF drive similar to the existing stock in operation in Mumbai Suburban system.
- Signalling System : Automatic signalling system similar to the signalling system in the existing corridor.

6.3 TRAIN OPERATION PHILOSOPHY

The underlying operation philosophy is to provide suburban Services at economical cost with fixed Infrastructure and Rolling Stock Planning.

- Selecting optimum Train frequency to provide sectional capacity commensurate with the peak direction traffic demand during peak hours.

- A minimum frequency of train service during lean period so as to make this service attractive during lean period also in comparison to other options.
- Basic unit will be 3-Coach unit with one motor coach and one trailer coach and one driving coach.
- Running of normal services for 19 hours of the day (5 AM to 12 PM i.e. midnight) with average station dwell time of 30 seconds,
- Make up time of 5-10% (on the tangent track) with 8-12% coasting and scheduled average speed for corridor shall be 45 kmph.
- Suburban train operation in Virar-Dahanu road corridor will an extension of existing suburban train operation of Churchgate-Virar section, therefore in the inception year, some of the existing services terminating at Virar will be extended up to Dahanu Road. PHPDT demand will decide the number of such services.
- Extension of existing services will also avoid transshipment of passengers from one train to another.
- In view of 12-car train operations in adjoining Churchgate-Virar suburban Section; only 12-car service is considered for the proposed section also.

6.4 PASSENGER CARRYING CAPACITY OF TRAIN

Coach wise Passenger Carrying Capacity of existing DC-AC coaches plying in Mumbai suburban section is as under

MC → Motor Coach		DC → Driving Coach		TC → Trailer Coach	
Coach Type	Seating Capacity	Standing Area in SQM	Standing @ 6 per SQM	Total Passengers	
MC	86	21.63	130	216	
TC	114	29.14	175	289	
DC	91	33.02	198	289	

Table 6.3 Passenger Carrying Capacity of Various types of Coaches

Similarly Passenger carrying capacity of train with different configuration is also summarized as under

Number of cars	Passengers in each train			Weight of 9 or 12 car Rake in tonne			
	Passengers Standing per sqm			Empty	With Standing Passengers per sqm		
	6	8	10		6	8	10
9-Car	2881	2884	3387	360	503	533	563
12-Car	3175	3846	4516	480	671	711	751

Table 6.4 : Passenger Carrying Capacity and Weight of train

Average weight of 60 kg per passengers and coach weight Of 40 T have been considered for above calculations

6.5 TRAIN FORMATION

Train composition to be adopted is given as under;

MC → Motor Coach	DC → Driving Coach	TC → Trailer Coach
9-Car Train	DC + MC + TC + TC + MC + TC + TC + MC + DC	
12-Car Train	DC + MC + TC + TC + MC + TC + TC + MC + TC + TC + MC + DC	

Table 6.5

6.6 FREQUENCY OF TRAIN SERVICE TO MEET DEMAND

- **Year 2021**, Based on the projected PHPDT, train operations with 12 car service with a headway of 12 minutes is considered in the inception year; there will be 5 trains per hour during peak period in both directions,

Passenger Carrying capacity Passengers Standing per SQM			
Headway ☐	6	8	10
12 min	15876	19146	22420
15 min	12701	15383	17936
Projected PHPDT 17600			

Table 6.6

- **Year 2031**, train headway is planned at 6 minutes with 12-Car train during peak hours; there will be 10 trains per hour during peak period in both directions.

Passenger Carrying capacity Passengers Standing per SQM			
Headway ☐	6	8	10
8 min	23814	28842	33630
6 min	31753	38457	44840
Projected PHPDT 31700			

Table 6.7

- **Year 2041**, train headway is planned at 4 minutes with 12-Car train during peak hours; there will be 15 trains per hour during peak period in both directions.

Passenger Carrying capacity Passengers Standing per SQM			
Headway ☐	6	8	10
5 min	38103	46148	53808
4 min	47628	57684	67260

Projected PHPDT **51900**

Table 6.8

6.7 DESIGNED CAPACITY OF SYSTEM

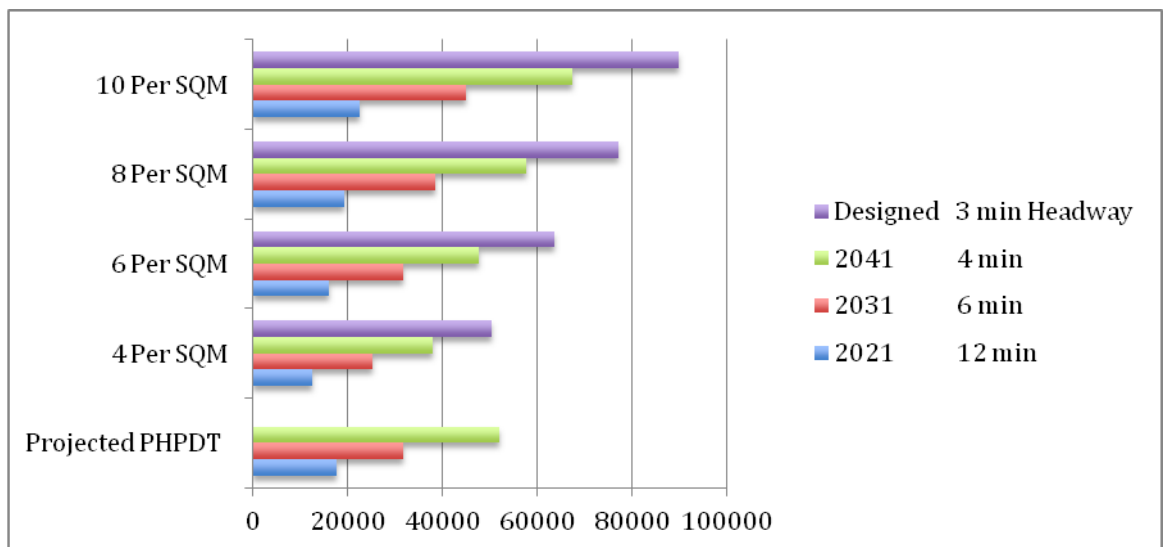
Year wise Projected Peak hour peak direction traffic demand and non peak hour traffic for the corridor is as below.

No of Car per Train	Train-Headway	Passengers Standing per SQM	PHPDT
12-Car	3 min	10	89680

Table 6.9

6.8 HEADWAY/TRAIN FREQUENCY

Year wise growth of Passenger Carrying Capacity available and Projected PHPDT is shown below



6.9 HOURLY TRAIN OPERATION PLAN

The number of train trips proposed to be operated daily during different hours in each direction for the period 2021-2041 is given below.

Year	2021	2031	2041
Headway Time (Hours)	12 min	6 min	4 min
5 to 6	3	5	6
6 to 7	4	6	10

7 to 8	4	8	12
8 to 9	5	10	15
9 to 10	5	10	15
10 to 11	5	8	12
11 to 12	4	6	10
12 to 13	3	5	6
13 to 14	3	5	6
14 to 15	3	5	6

Year	2021	2031	2041
Headway Time (Hours)	12 min	6 min	4 min
15 to 16	4	6	10
16 to 17	4	8	12
17 to 18	4	10	15
18 to 19	4	10	15
19 to 20	4	6	12
20 to 21	4	6	10
21 to 22	3	6	6
22 to 23	3	5	6
23 to 24	3	5	6
Trains / day / Direction	72	130	190

Table 6.10

6.10 ROLLING STOCK REQUIREMENT

Based on Train formation and headway as decided above to meet Peak Hour Peak Direction Traffic Demand in different years, Rake requirement has been calculated. The Requirements of coaches has been calculated as per following assumptions-

- i) Coach requirement has been calculated based on headway during peak hours.
- ii) Traffic/Operational spares have been considered @5% of bare requirement to cater to operational exigencies on the corridor.
- iii) Repair and maintenance has been estimated as 8% of total coach requirement (Bare + Traffic Reserve) based on Intermediate overhaul and periodic overhaul interval.
- iv) The calculated number of rakes in fraction is rounded off to next higher number.
- v) Journey time for end to end will be around 85 minutes ie Schedule speed is 45 Kmph.

Based on Train length and headway as decided above to meet Peak Hour Peak Direction Traffic Demand in different years, Rake requirement has been worked out in as under;

Year	2021	2031	2041	Designed
No. of Cars / Train	12	12	12	12
Headway in min	12	6	4	3
Bare Rake Requirement	19	33	48	62
Traffic Spare @5%	1	2	2	3
Maint. Spare @8%	2	3	4	5
Total Rakes	22	38	54	70
Total Coaches	264	456	660	840
Motor Coach	88	152	220	280
Driving Coach	44	76	110	140
Trailer Coach	132	228	330	420

Table 6.11

6.11 PROVISION FOR STABLING LINES AND MAINTENANCE FACILITY

During discussion with western railway official it is understood that maintenance facilities required for this section can be developed in the existing car shed at Virar. Detailed designing of the same can be done later at appropriate stage keeping in mind the level of activities due to existing operations and growth of activities due to operations in the proposed corridor.

6.12 REQUIREMENT OF THE STABLING LINES

Requirement of stabling line for efficient train operation has been assessed as under in table 7.5

Table 6.12: Stabling Line Requirements

Year	2021	2031	2041	Designed
Stabling Requirements	22	38	54	70
Inside Depot for Maintenance +POH	8	8	10	10
Stabling Lines in Depot	2	2	2	2
Stabling Lines in the section ie at Dahanu Rd (4) and Virar (4), and Boisar(2)	10	To be decided at appropriate stage		

6.13 OTHER MAINTENANCE FACILITY

Maintenance facility for traction, general services, Signal & Telecom and Pway & Works shall be developed at appropriate stage based on standard practice recommended by OEM's and other Railways standard.