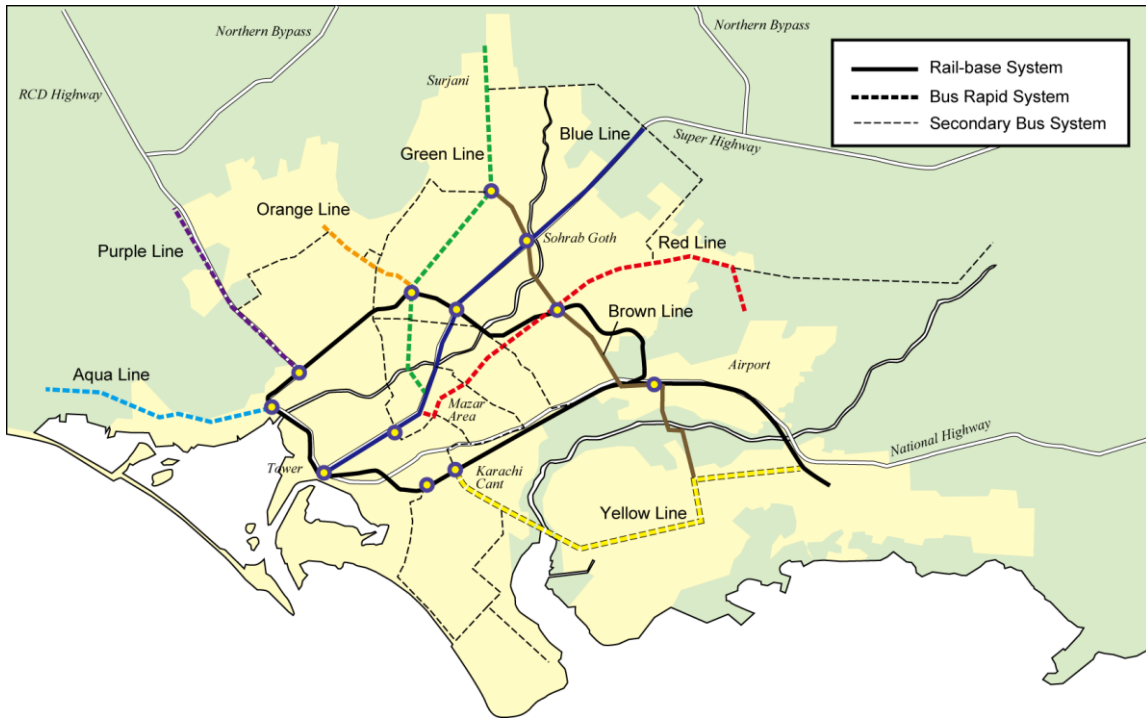


## APPENDIX-1 PRE-FEASIBILITY STUDY OF BLUE LINE

### 1. Outline of Blue Line

#### 1.1 Blue Line in Master Plan Network

The master plan network in KUTMP 2030 is shown in Figure A1-1-1. Blue Line is proposed as Railed-base system.



Source; KTIP

**Figure A1-1-1 Master Plan Network in KUTMP 2030**

#### 1.2 Implementation Plan of Blue Line

Figure A1-1.2 shows the proposed schedule of mass transit lines in KUTMP 2030. It is assumed that a rail-base project takes seven years to be implemented, while BRT project takes five years.



2) A large space is required for the accommodation of LRT facility along the route permanently due to elevated structure or underground structure including station structure.

3) On the other hand, new flyovers would be designed and constructed in the near future as necessary countermeasure against rapid increasing traffic volume in Karachi.

JICA Study Team has carried out the study about necessary space for both transportation systems in different phases so that both systems would be easily introduced without any hindrance in the near future.

Purpose of this study consists of;

- Proposing introducing space, station locations and structures, and countermeasure against obstacles if any, for tentative BRT system of Blue Line as short-time.
- Proposing introducing space as elevated or underground, station locations and structures, transition section plan, terminal tower station, and countermeasure against obstacles if any, for LRT system of Blue Line

### **3. Study of Introducing Space for Blue Line**

#### **3.1 Introducing Space for BRT System during Short-term**

##### **3.1.1 BRT System of Blue Line as Short-Term**

There are two major types of cross section design for BRT. One is to set the station at the center of the road, and another is at curb-side, which would determine the side of the door of BRT bus.

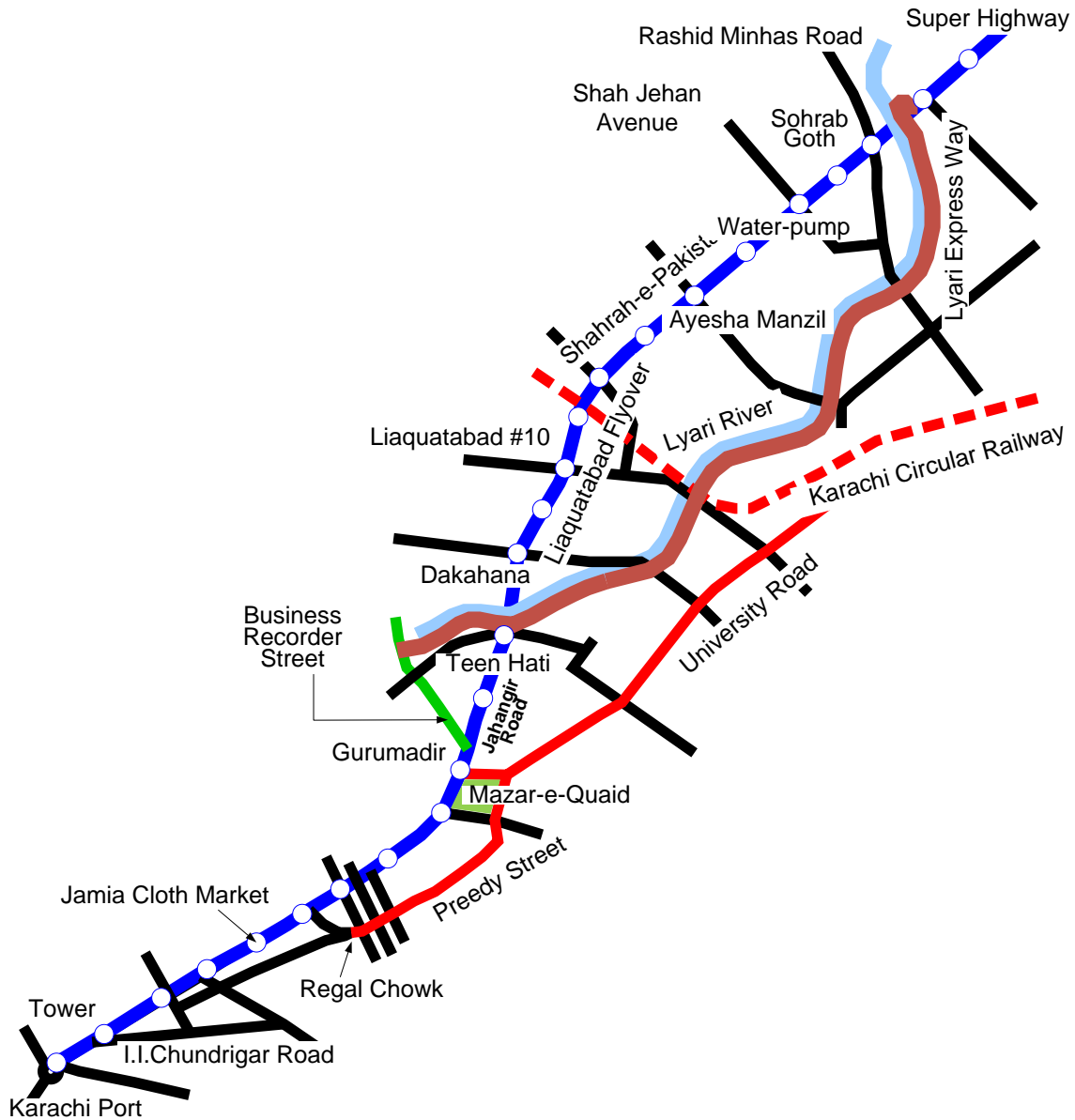
BRT buses of Green Line and Red Line run just through the dedicated lanes except for intersections. And station place is designed at a center of the road for the right door buses, as described in this report Vol. 2.

On the other hand, JICA Study Team proposes that tentative BRT system of Blue Line during short-term run in mixed traffic lanes and station place is set on curb-side for left-door buses. The major reasons for this selection are as follows;

- In case of the center station for the right door buses, pedestrian bridges would be necessary for access between both sidewalk and BRT station. However, pedestrian bridges would become obstructive to the space for LRT structure in the future.
- In additional construction of high height platform would be required at each center station and removal of platform become also necessary before construction of LRT facility.
- Jahangir Road and one-way sections in M.A.Jinnah Road are too narrow to construct the center station of BRT. But construction of the curb-side stations would be possible.
- At the crossing section with KCR, Tentative BRT Blue Line should be designed as elevated structure because KCR is designed at grade. Then tentative BRT lane should be set up in the space of the Liaquatabad Flyover. Although there is no space of the center station, there still would be enough space of curb-side station by constructing elevated platforms at both side of the flyover.
- In case of constructing mixed traffic lane and curb-side stations for tentative BRT, it is possible to make not only initial investment much smaller, but also use of existing buses effective.

**3.1.2 BRT route of Blue Line**

Tentative BRT route and proposed station locations are shown in Figure A1-3-1 Station distance is set on every around 500 m.



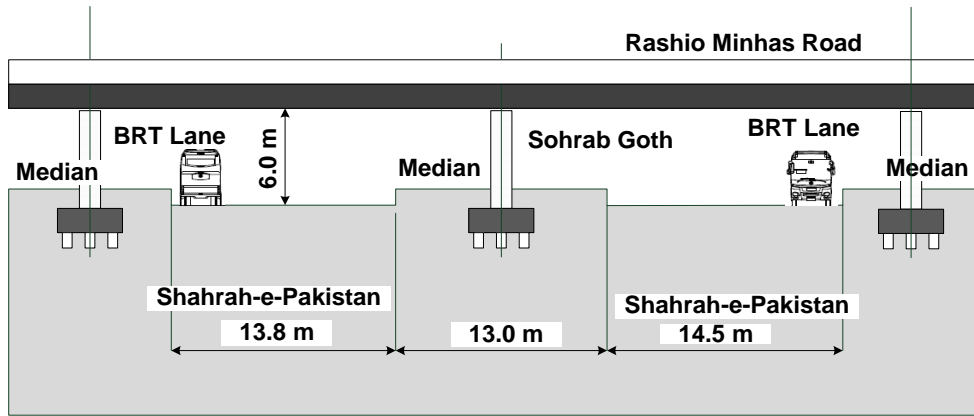
Source: Illustrated by JICA Study Team

**Figure A1-3-1 BRT Route and Station Location**

**3.1.3 Study of Introducing Space for Tentative BRT**

**(1) Sohrab Goth**

BRT lane is designed at both sides in mixed traffic lanes as shown in Figure A1-3-2

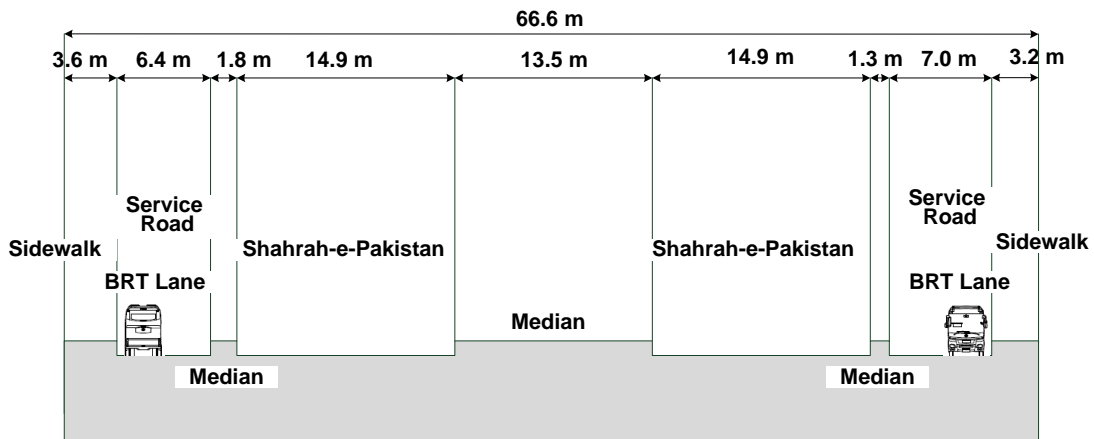


Source: Illustrated by JICA Study Team

**Figure A1-3-2 Cross Section of BRT Blue Line at Sohrab Goth**

**(2) Shahrah-e-Pakistan Road**

BRT lanes are designed to be set at both sides in mixed traffic lanes as shown in Figure A1-3-3

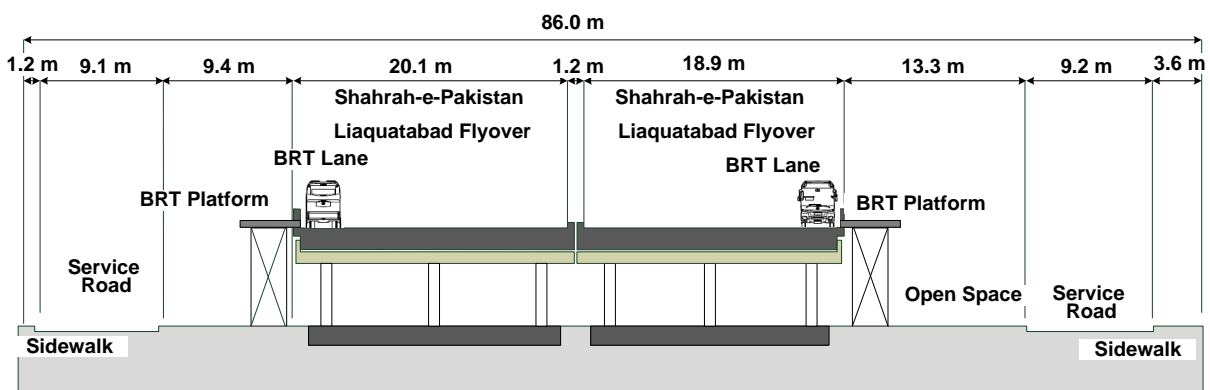


Source: Illustrated by JICA Study Team

**Figure A1-3-3 Cross Section of BRT Blue Line along Shahrah-e-Pakistan Road**

**(3) Cross section with KCR**

BRT lane and stations are designed at both sides in mixed traffic lanes as shown in Figure A1-3-4. Both BRT stations and platforms are designed as elevated structure at both side of flyover.

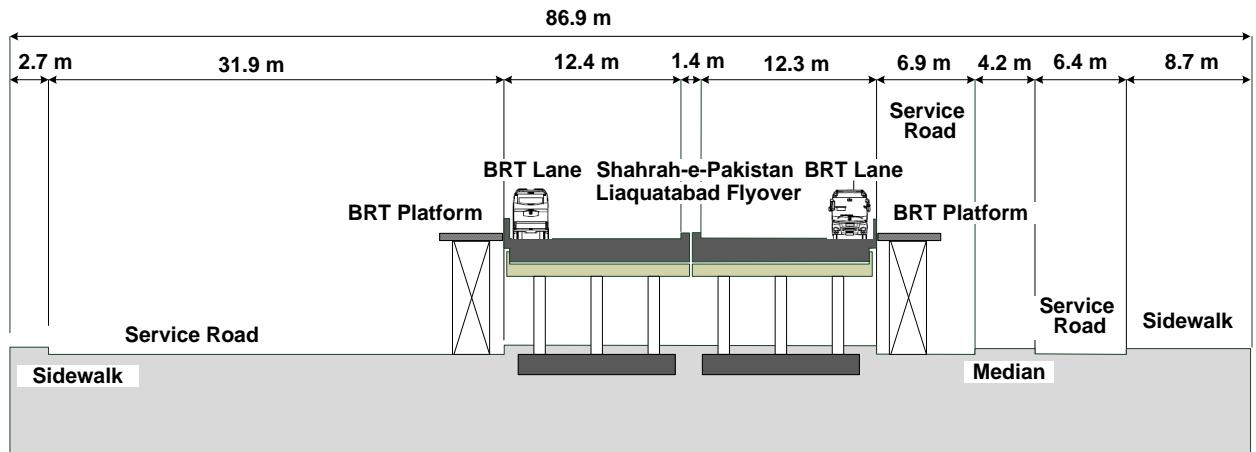


Source: Illustrated by JICA Study Team

**Figure A1-3-4 Cross Section of BRT Blue Line with KCR**

**(4) Section along Liaquatabad Flyover**

BRT lane and stations are designed at both sides in mixed traffic lanes as shown in Figure A1-3-5. Both BRT station and platforms are designed as elevated structure at both side of flyover.

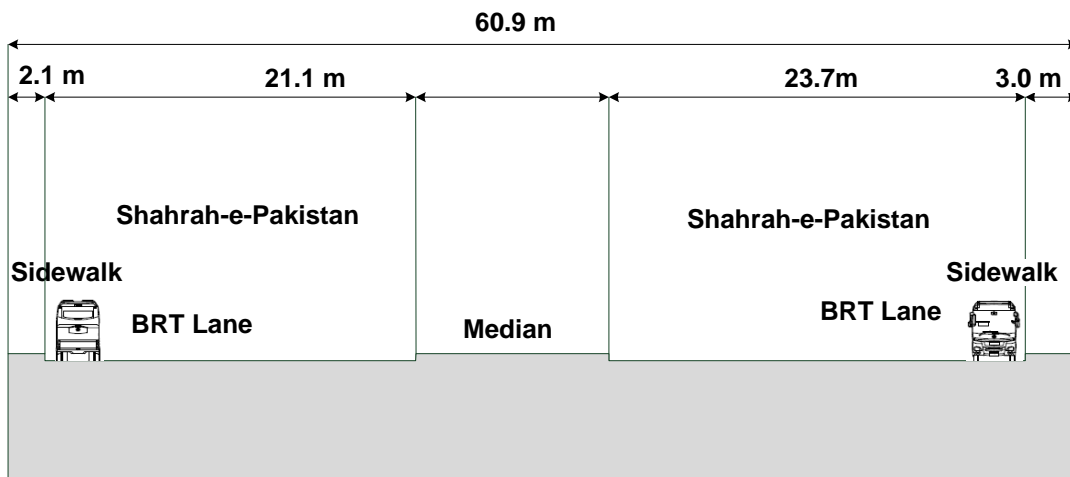


Source: Illustrated by JICA Study Team

**Figure A1-3-5 Cross Section of BRT Blue Line along Liaquatabad Flyover**

**(5) Shahrah-e-Pakistan**

BRT lane is designed at both sides in mixed traffic lanes as shown in Figure A1-3-6

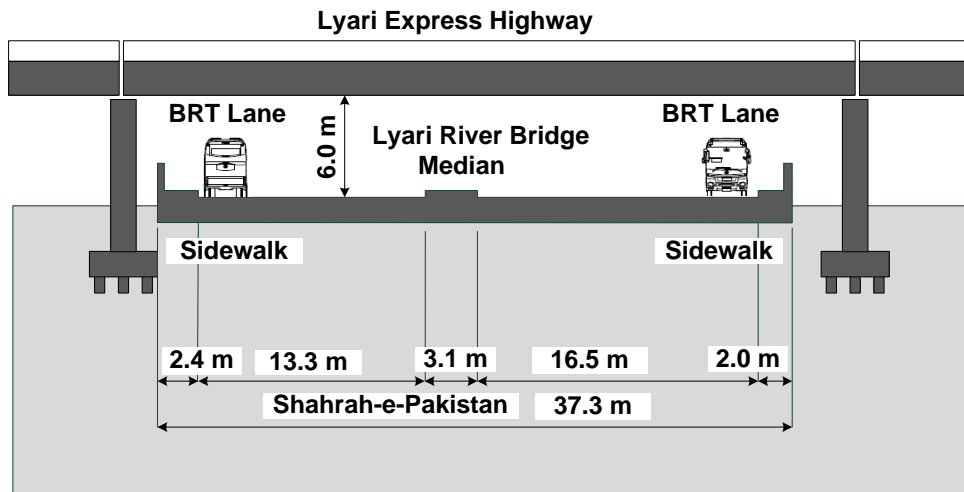


Source: Illustrated by JICA Study Team

**Figure A1-3-6 Cross Section of BRT Blue Line along Shahrah-e-Pakistan**

**(6) Lyari River Bridge**

BRT lane is designed at both sides in mixed traffic lanes as shown in Figure A1-3-7

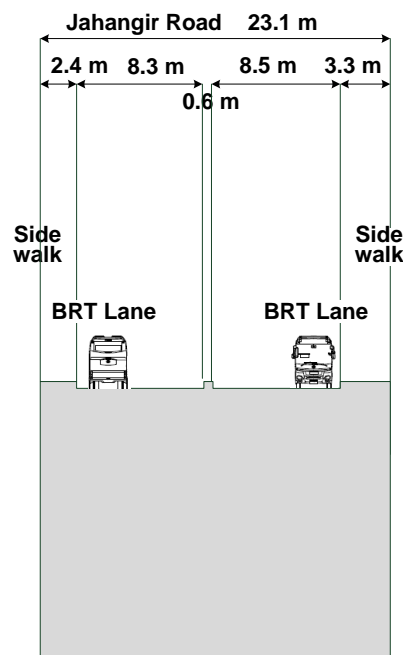


Source: Illustrated by JICA Study Team

**Figure A1-3-7 Cross Section of BRT Blue Line on Lyari River Bridge**

**(7) Cross Section of Jahangir Road**

BRT lane is designed at both sides in mixed traffic lanes as shown in Figure A1-3-8

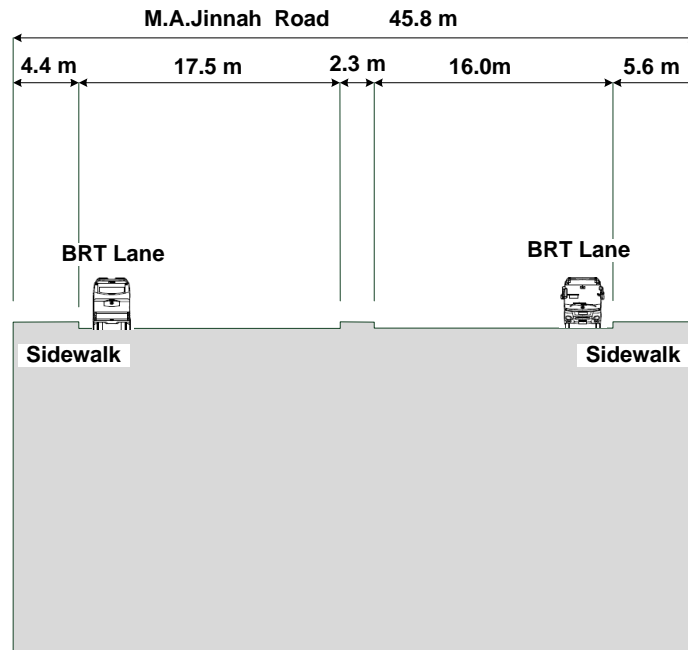


Source: Illustrated by JICA Study Team

**Figure A1-3-8 Cross Section of BRT Blue Line along Jahangir Road**

**(8) Cross section of M.A.Jinnah Road**

BRT lane is designed at both sides in mixed traffic lanes as shown in Figure A1-3-9

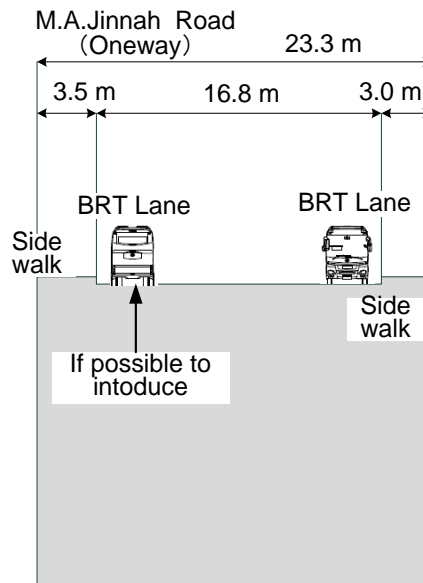


Source: Illustrated by JICA Study Team

**Figure A1-3-9 Cross Section of BRT Blue Line along M.A.Jinnah Road**

**(9) Cross Section of M.A.Jinnah Road (One-way section)**

BRT lane and stations are designed mainly at east side in mixed traffic lanes and west side BRT would possibly be introduced as shown in Figure A1-3-10.



Source: Illustrated by JICA Study Team

**Figure A1-3-10 Cross Section of BRT Blue Line along M.A.Jinnah Road (One-way section)**

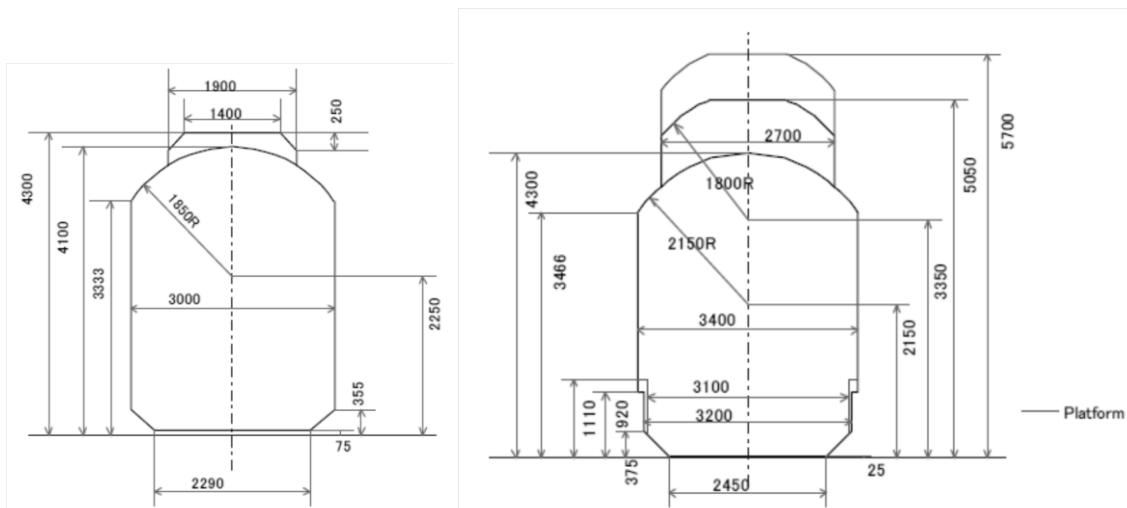


### 3.2 Introducing Space for LRT Blue Line

#### 3.2.1 Structure of Railway

##### (1) Rolling Stock

A car used for the Light Rail Transit (LRT) shall be the typical size of EMU (Electric Multiple Unit), of which length is around 20 meters, and the width is 3 meters. JICA Study Team proposes basic rolling stock gauge and structure gauge of the LRT car as shown in Figure A1-3-11.



Source: Illustrated by JICA Study Team

**Figure A1-3-11 Rolling Stock Gauge and Construction Gauge**

##### (2) Design Criteria

Design criteria concerning decision against the introducing space for LRT is shown in Table A1-3-1

**Table A1-3-1 Alignment Design Criteria**

No.	Items	Technical Features
1	Track Gauge	1,435 mm
2	Design Maximum Speed	90 – 110 km/h
3	Minimum Curve Radius	Main Line: R=160m Platform: R=400m Siding / Depot: R=100m
4	Maximum Gradient	Outside platform: 35 ‰ Platform : 2 ‰ Depot: Level

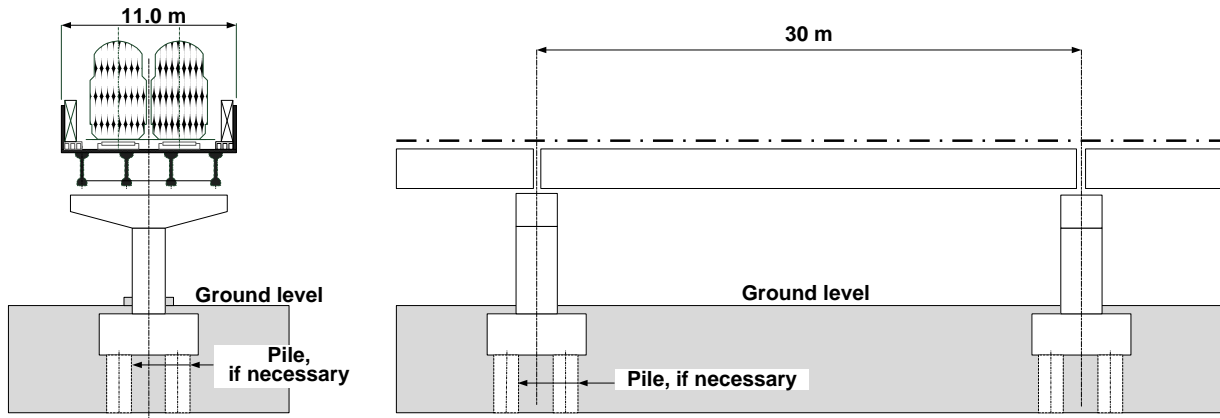
Source: JICA Study Team

JICA Study Team assumed Six-cars train formation in this study. One set of six cars train requires 130m length of platform for both elevated and underground station.

**(3) Elevated Structure**

**1) Elevated structure section between stations**

Elevated LRT structure section between stations is designed as shown in Figure A1-3-12. Minimum width for introducing space of LRT lane would be 11.0m.

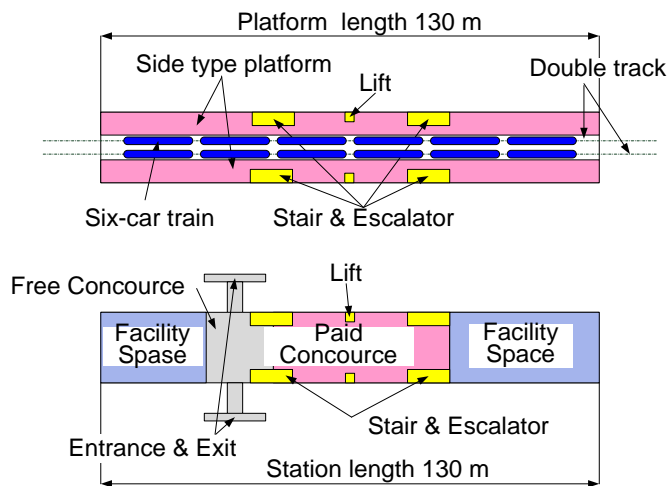


Source: Illustrated by JICA Study Team

**Figure A1-3-12 Elevated Structure of LRT**

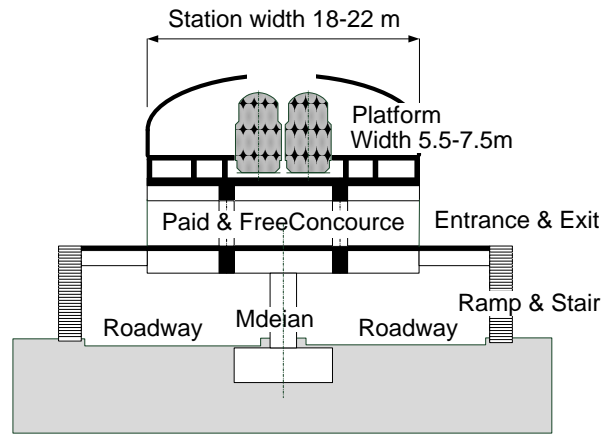
**2) Elevated Station Section**

Necessary facilities for LRT elevated station such as platform, lifts, and station facility space would be designed as shown in Figure A1-3-13. Cross section of elevated station is shown in Figure A1-3-14, A1-3-15. Minimum width of elevated station would be 18-22 m and length of elevated station would be 130m.



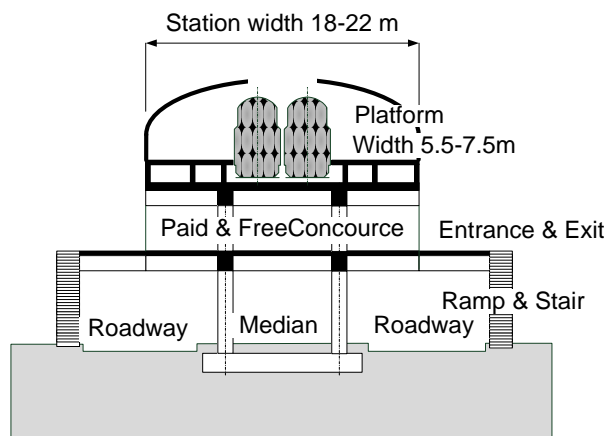
Source: Illustrated by JICA Study Team

**Figure A1-3-13 Elevated Station Plan**



Source: Illustrated by JICA Study Team

**Figure A1-3-14 Elevated Station Supported by the Centre Pier**



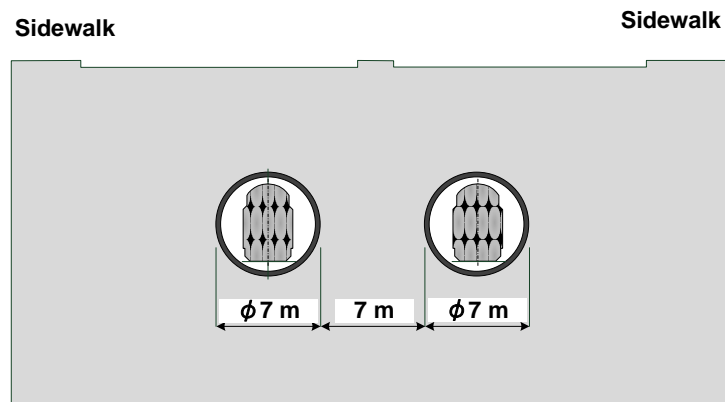
Source: Illustrated by JICA Study Team

**Figure A1-3-15 Elevated Station Supported by the Rigid-frame**

**(4) Underground Structure**

**1) Tunnel between underground stations**

Figure A1-3-16 shows cross section of the tunnel between underground stations.

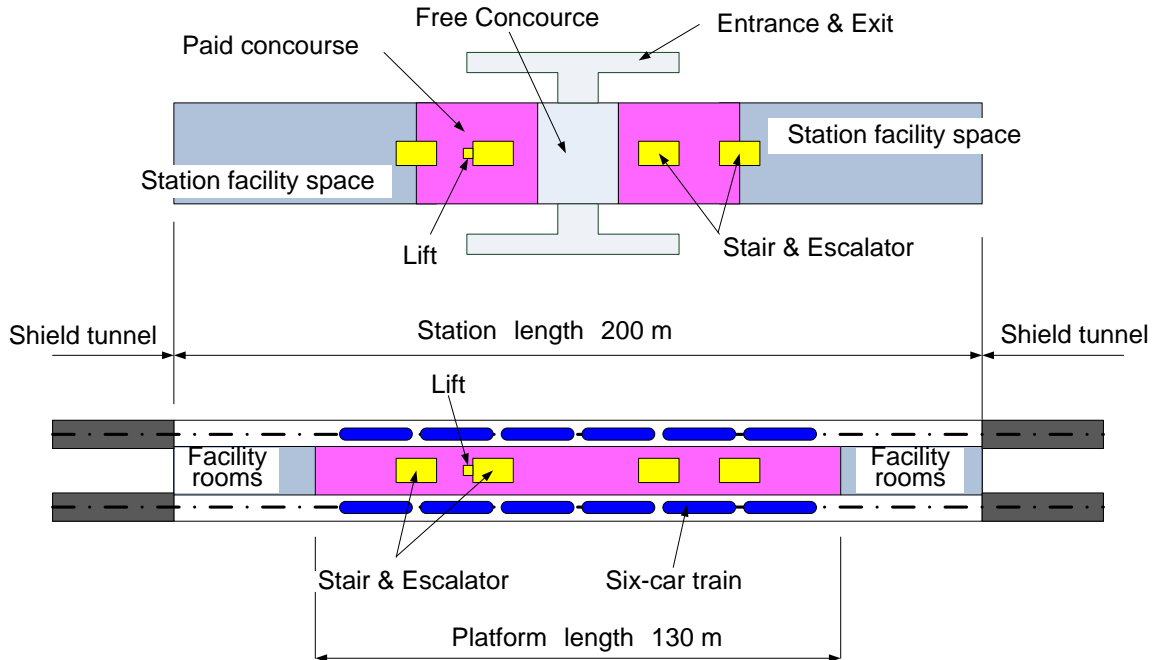


Source: Illustrated by JICA Study Team

**Figure A1-3-16 Cross Section of Shield Tunnel**

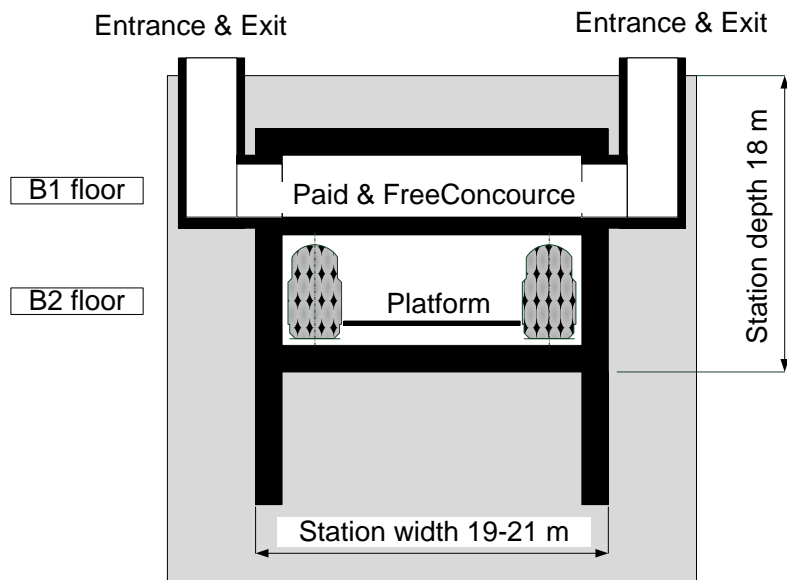
**2) Standard Underground Station**

LRT facilities for underground station such as platform, lifts and other station facility would generally be designed as shown in Figure A1-3-17. Cross section of an underground station is shown in Figure A1-3-18. Minimum width of the underground station section would become 19-21m, and length would become 200m.



Source: Illustrated by JICA Study Team

**Figure A1-3-17 Underground Station Plan**

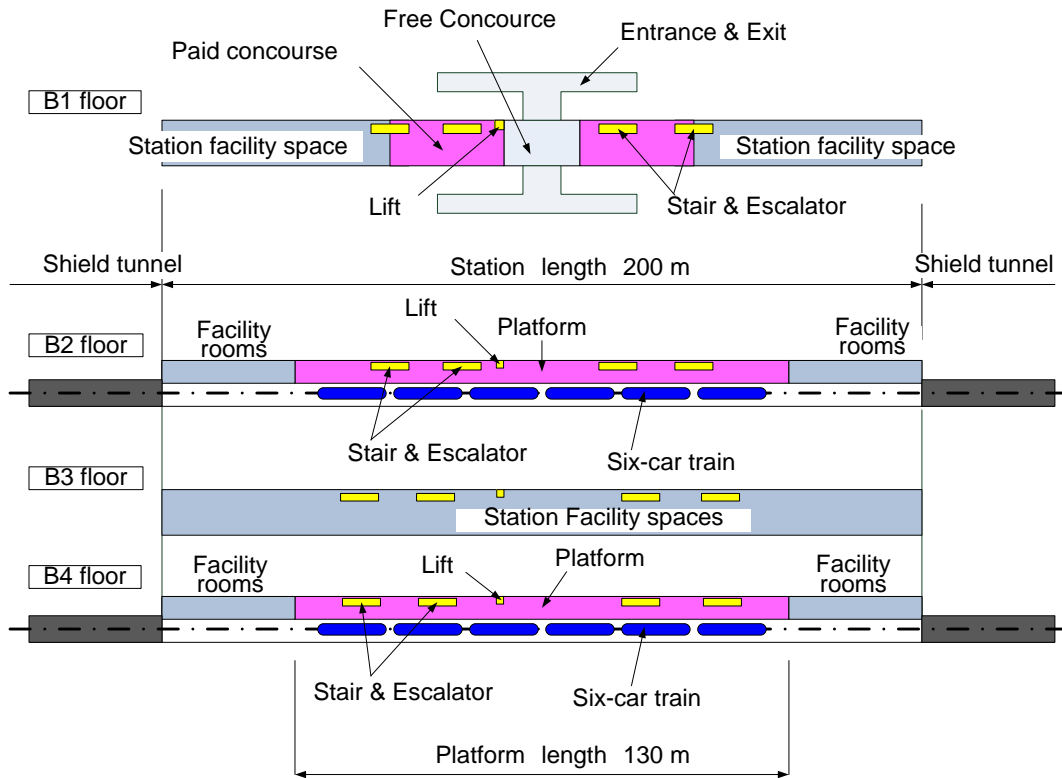


Source: Illustrated by JICA Study Team

**Figure A1-3-18 Cross section of Underground Station**

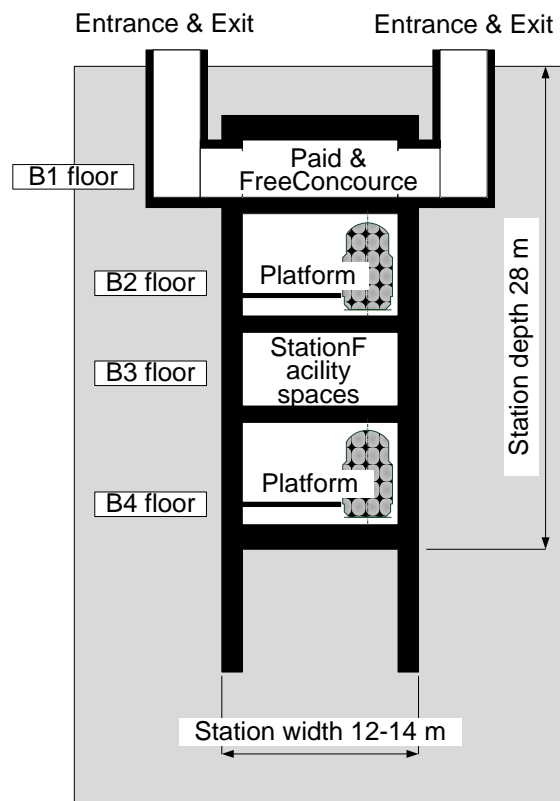
**3) Underground Station in case of narrow road**

In case of planning underground station under narrow road, two-stories platform type is recommended as shown in Figure A1-3-19. That cross section is shown in Figure A1-3-20. Minimum width of the station would become 12-14m, and length would become 200m.



Source: Illustrated by JICA Study Team

**Figure A1-3-19 Two-stories Platform Type of Underground Station**

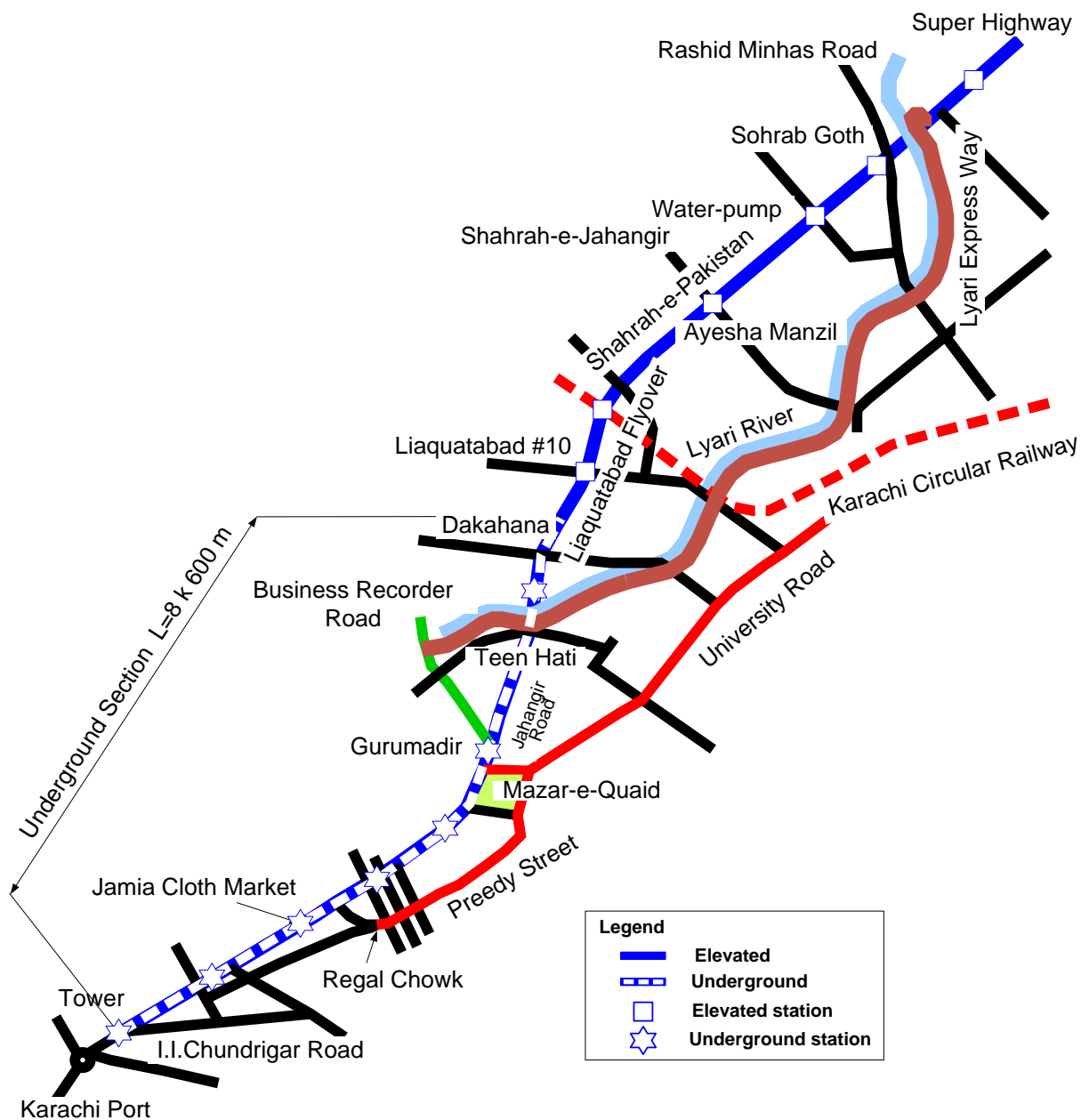


Source: Illustrated by JICA Study Team

**Figure A1-3-20 Cross section of Two-stories Platform Type of Underground Station**

### 3.2.2 LRT Blue Line Route

LRT route and proposed station locations are shown in Figure A1-3-21. Distance between stations is designed every about 1000 m.



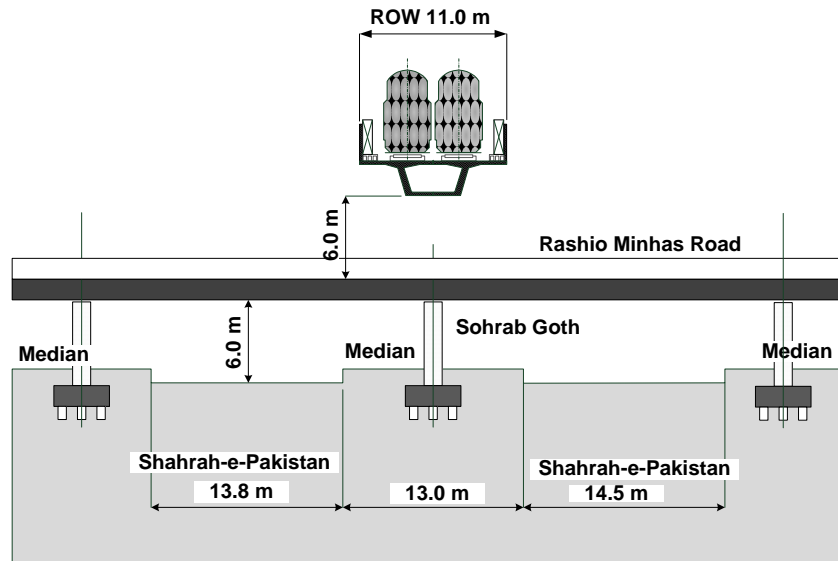
Source: Illustrated by JICA Study Team

**Figure A1-3-21 LRT Route and Proposed Station Location**

### 3.2.3 Introducing Space for LRT

#### (1) Sohrab Goth

Elevated LRT structure is designed over Sohrab Goth Flyover and height of platform near Sohrab Goth Intersection would be as high as 16.5m from the ground as shown in Figure A1-3-22. Station location would be designed at one side of Flyover.

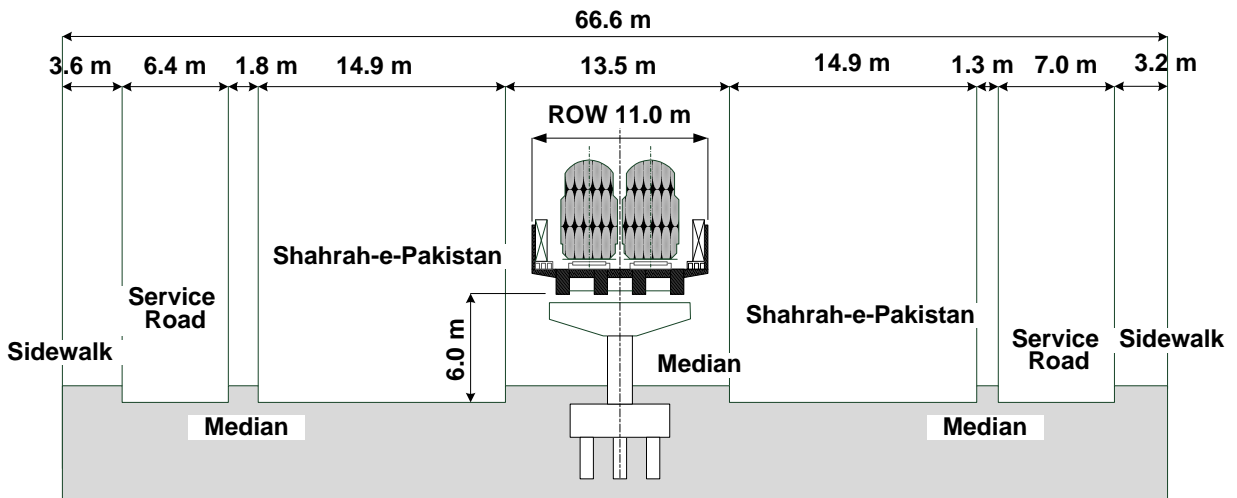


Source: Illustrated by JICA Study Team

**Figure A1-3-22 Cross Section of LRT Blue Line at Sohrab Goth**

**(2) Shahrah-e-Pakistan (from Sohrab Goth to Karimabad colony old)**

This section of Shahrah-e-Pakistan Road is very wide with service roads on both side and median strip. Median strip is enough wide to introduce LRT structure as shown in Figure A1-3-23.

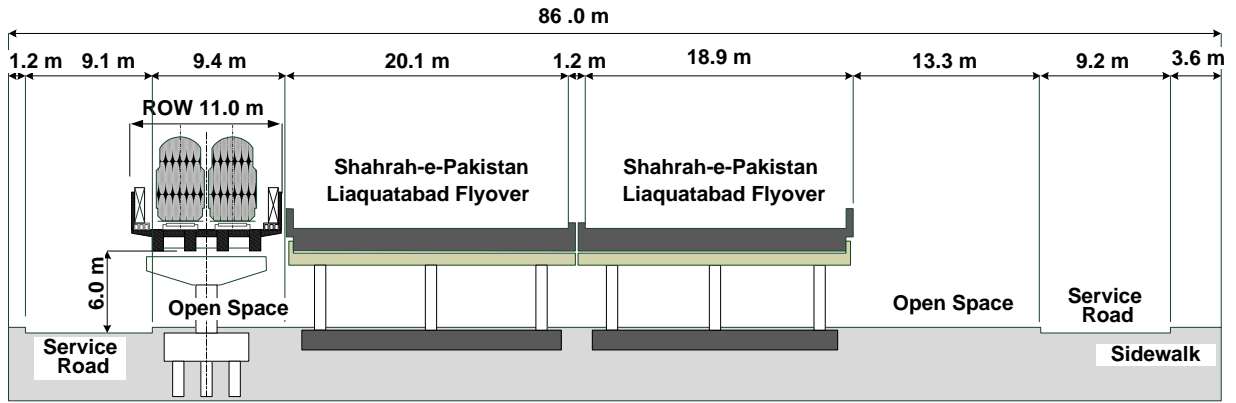


Source: Illustrated by JICA Study Team

**Figure A1-3-23 Cross Section of LRT Blue Line of Shahrah-e-Pakistan**

**(3) Cross section with KCR**

Open space is enough wide for elevated structure in KCR cross section as shown in Figure A1-3-24. However, Electric Pylon of KESC would become an obstacle against LRT route. This electric pylon should be relocated before construction of LRT.

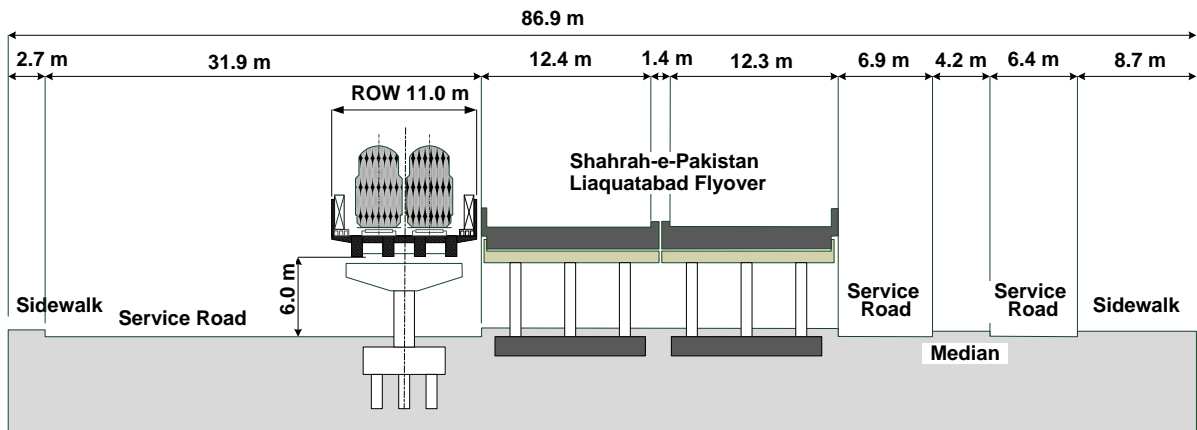


Source: Illustrated by JICA Study Team

**Figure A1-3-24 Cross Section of LRT Blue Line with KCR**

**(4) Section along Liaquatabad Flyover**

Service road and median strip is enough wide to introduce LRT structure as shown in Figure A1-3-25.

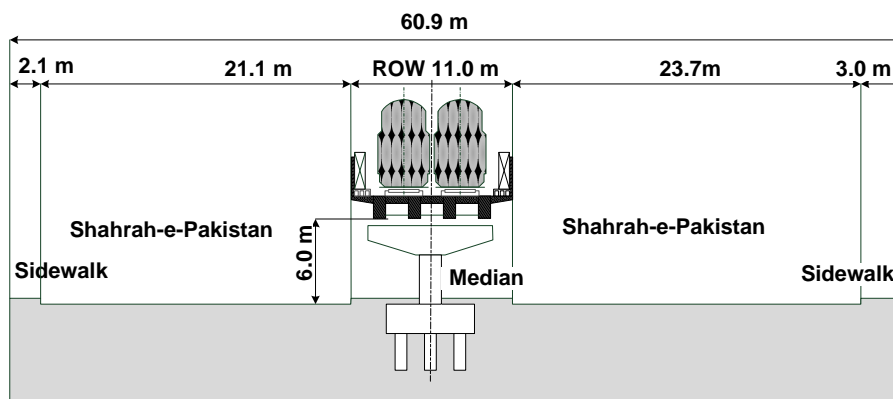


Source: Illustrated by JICA Study Team

**Figure A1-3-25 Cross Section of LRT Blue Line along Liaquatabad Flyover**

**(5) Shahrah-e-Pakistan (from Liaquatabad#10 to Lyari River)**

Width of median strip is sufficiently enough for elevated LRT structure as shown in Figure A1-3-26.



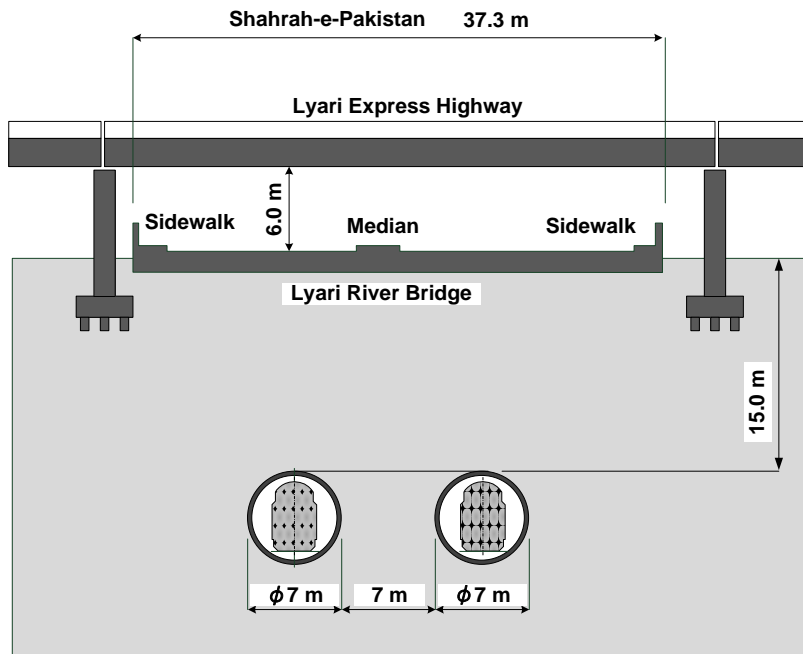
Source: Illustrated by JICA Study Team

**Figure A1-3-26 Cross Section of LRT Blue Line along Shahrah-e-Pakistan**



**(6) Cross Section at Lyari River**

There is no space for elevated or underground station at Teen Hati due to narrow Jahangir Road. Transition section from elevated to underground would be located at the section between Dakahana Intersection and Lyari River as described in 3.2.4 in Appendix-2. As a result, underground structure would be adopted under Lyari River as shown in Figure A1-3-27.

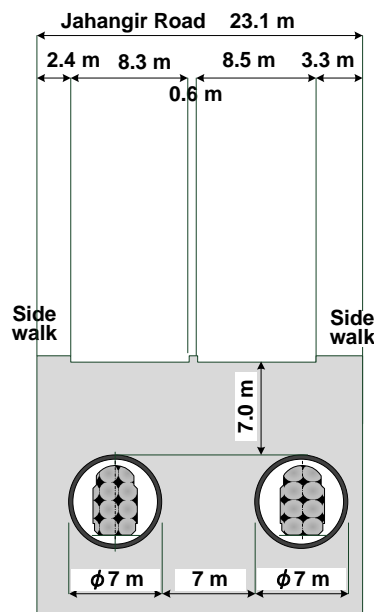


Source: Illustrated by JICA Study Team

**Figure A1-3-27 Cross Section of LRT Blue Line at Lyari River**

**(7) Jahangir Road**

Road width is narrow for Right of Way width, 130 ft (39.6 m). Cross section of underground tunnel is shown in Figure A1-3-28.

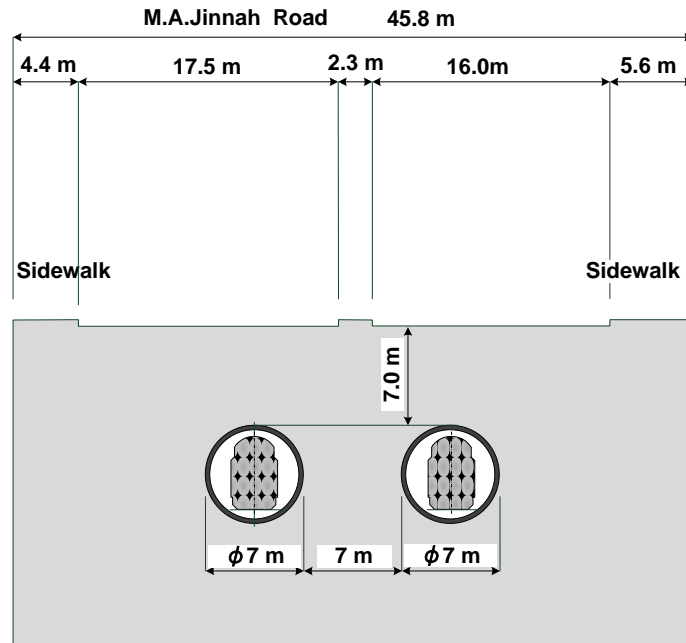


Source: Illustrated by JICA Study Team

**Figure A1-3-28 Cross Section of LRT Blue Line under Jahangir Road**

**(8) M.A.Jinnah Road**

Cross section under M.A.Jinnah road is shown in Figure A1-3-29.

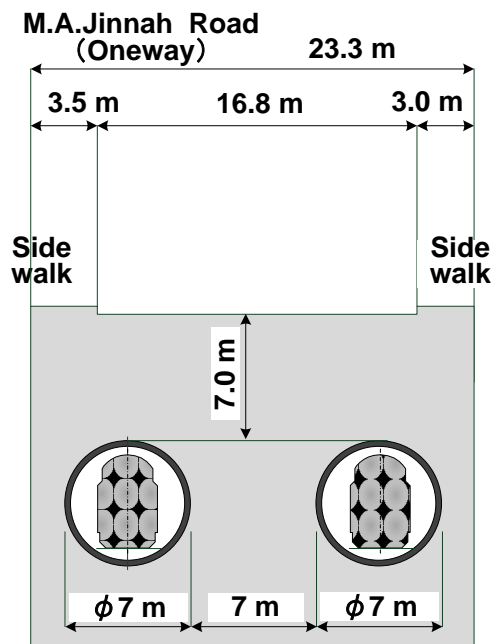


Source: Illustrated by JICA Study Team

**Figure A1-3-29 Cross Section of LRT Blue Line under M.A.Jinnah Road**

**(9) One way section in M.A.Jinnah Road**

Cross section in one way section in M.A. Jinnah Road is shown in Figure A1-3-30.



Source: Illustrated by JICA Study Team

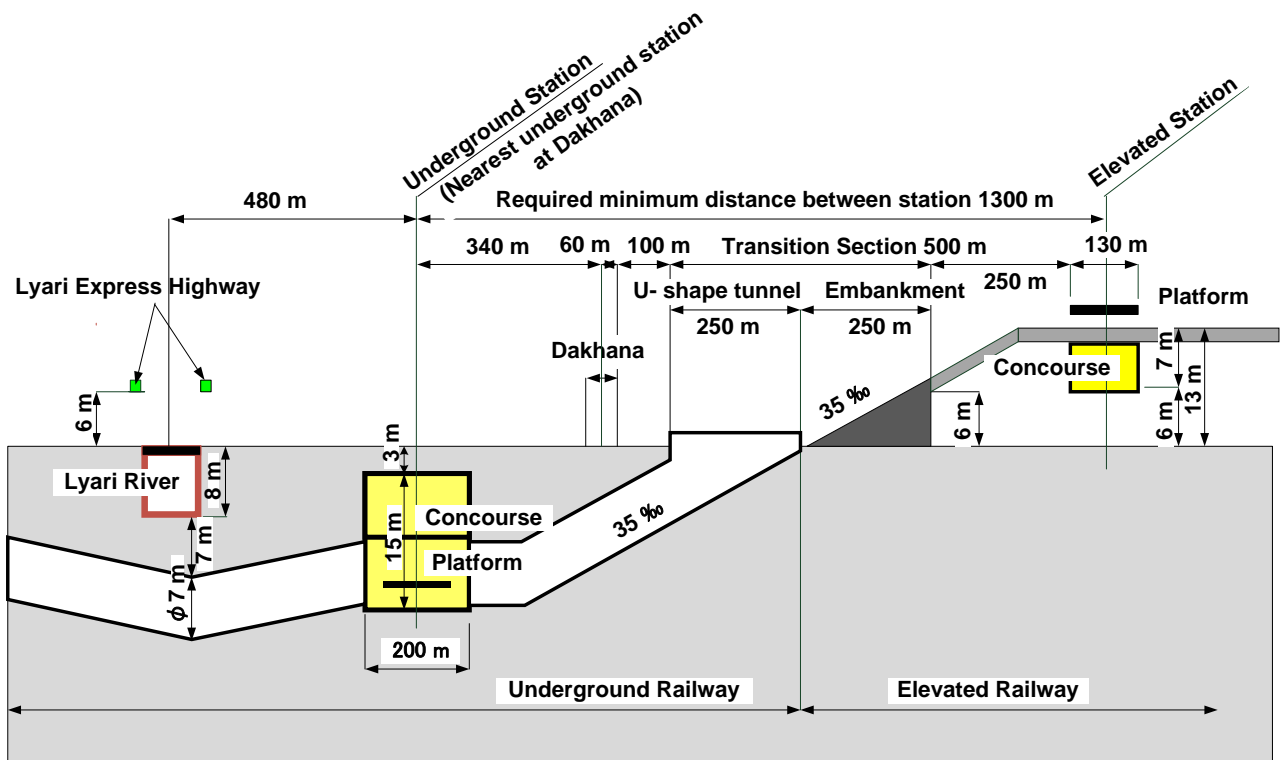
**Figure A1-3-30 Cross Section of LRT Blue Line under one way section**

3.2.4 Transition Section between Elevated and Underground



Source: JICA Study Team

Figure A1-3-31 Transition Section of LRT Blue Line



Source: Illustrated by JICA Study Team

Figure A1-3-32 Longitudinal Transition Section of LRT Blue Line

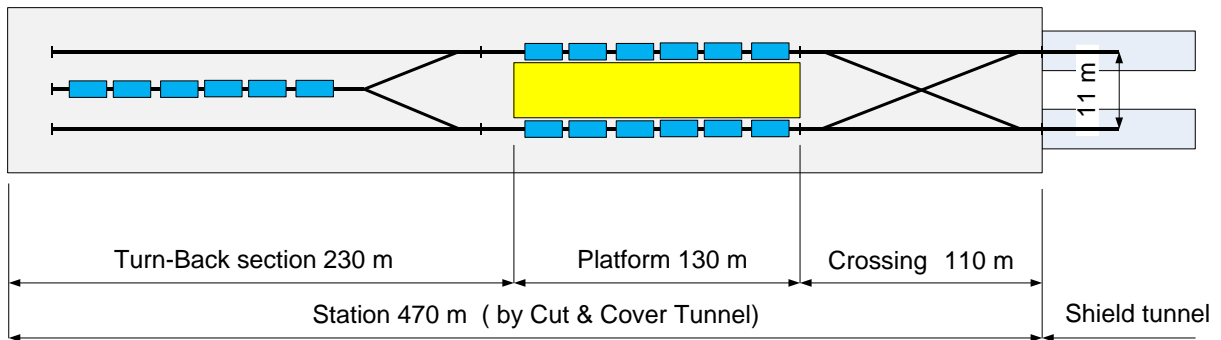
3.2.5 Terminal of LRT (Tower Station)



Source: JICA Study Team

**Figure A1-3-33 Terminal Station Plan (Tower Station)**

Layout of track



Source: Illustrated by JICA Study Team

**Figure A1-3-34 Layout plan of Track Alignment at Terminal Station (Tower station)**