

ROAD GEOMETRIC DESIGN REPORT

Consultant:



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GEOMETRIC DESIGN

1 GENERAL:

The design envisages a four lane dual carriageway with an unpaved median of 3.5m. The approximate length of the project is 21.4 km. Geometric design of the project has been developed for a speed of 100 kph. The design of curves is compatible for the adopted design speeds and Geometric Standards as laid by American Association of State Highway and Transportation Officials (AASHTO) 2004 have been incorporated.

Salient elements of the project are as follows:

- 4 lanes, dual carriageway
- Grade-separated interchange on M-9 at terminal point
- U-Turn for intersecting roads
- Roundabout intersection near M-9
- Toll Plaza near M-9

2 GEOMETRIC DESIGN STANDARDS:

The geometric design of the link road conforms to the following requirements:



GEOMETRIC DESIGN STANDARDS			
Design Elements	Unit	Design Parameters	AASHTO 2004 Reference
Design Speed	Km/hr	100	
Minimum Stopping Sight Distance for Crest & Sag Vertical Curves	m	185	272/274
Cross Section Elements			
Lane Width	m	3.65	311
Outer Shoulder Width	m	3.0	314
Minimum Inner Shoulder Width	m	1.2	315
Minimum Median Width without Barrier	m	3	337
Type of Barrier	-	Curbs	
Cross fall of Shoulder	%	4.0	316
Typical Cross Section Types	As per Drawing # REC/TYP 02,03,04		
Horizontal Alignment			
Minimum Radius for Open Highway	m	437	168
Maximum Super Elevation Rate	%	6.0	168
Minimum Super Elevation Runoff Length	m	As per Equation (3 - 25)	177
Length of Tangent Runout	m	As per Equation (3 - 26)	179
Vertical Alignment			
Maximum Grade	%	5%	233
Minimum Rate of Vertical Curvature, K			
i). Crest Vertical Curve	-	52	272
ii). Sag Vertical Curve	-	185	277
Grade Separations			
Minimum Vertical Clearance	m	5.0	763

REFERENCE: "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, 2004"



3 TYPICAL GEOMETRIC CROSS SECTION DESIGN

The design of the geometric cross section of Link Road is an important element which determines the layouts of roadway structures such as right-of-way requirements, length of culverts, span of overhead bridges, extent of earthwork and maintenance activities etc., and thus the costs of construction.

Typical geometric cross section for the proposed Link Road is described as follows:

3.1 Median

Median width has been designed as 3.5m. The underlying idea of using 3.5 m wide median is to facilitate turning traffic for intersecting roads.

3.2 Traffic Lanes

The standard lane width of 3.65m has been adopted for the project.

3.3 Shoulders

The construction of shoulders on the outer side of each carriageway provides firm edges on which vehicles may pull out. During renewal, repair and re-surfacing operations, the materials and equipment may be stored on the shoulders. It is desirable that width of the shoulders be such that any stationary vehicles do not obtrude into the carriageway. For a majority of the types of vehicles, a width of 2.5 to 3.00 m is sufficient.

Outer shoulder has, therefore, been designed as 3 m. The paved inner shoulder width has been recommended as 1.2m.

3.4 Cross Slopes

In normal tangent sections, carriageways have been designed for a uniform cross slope of 2 percent with the high point at the edge near the median. Outer shoulders have been sloped 4% away from the traveled ways.

3.5 Formation Width

The formation width of the recommended cross section worked out to be 27.5m consisting of 2x7.3m travelled way, 2x3m outer shoulders, 2x1.2m inner shoulders, 3.5m median and 2x0.5m roundings.

3.6 Side Slope

Side slopes of the embankment have been selected as 2:1.



4 HORIZONTAL ALIGNMENT DESIGN

The horizontal alignment of the road consists of tangents and curves designed in accordance with the AASHTO geometric standards matching the existing topography of the land through which the road is passing.

The alignment encounters nine (09) horizontal curves. The horizontal curves vary in radii but can be grouped as under:-

- 400 m 1 curve
- 500 m 2 curves
- 1000 m 6 curves

5 VERTICAL ALIGNMENT DESIGN

The Maximum gradient of profile geometry is about 3.4%. Minimum grades vary to cater for pavement drainage.

The profile has been designed keeping in view the prohibitive cost of cut and fill materials.

6 SIGHT DISTANCES

Stopping sight distances are available over the entire length of the road for a design speed of 100 Kph.

7 INTERCHANGE

Interchange has been designed at the terminal point of the link road on Karachi – Hyderabad Motorway (M-9).

Station	Description	Type of Interchange
20+400	At terminal point of the Link Road	Trumpet Interchange

Adequate acceleration and deceleration lanes have been provided to facilitate entrance and exit movements to and from the motorway (M-9).

8 INTERSECTIONS

A roundabout intersection has been provided to facilitate service road traffic of M-9. There are about 14 intersections where u-turns have been provided to facilitate turning movements. Sufficient acceleration and deceleration lengths have also been designed.



9 TRAFFIC SIGNS AND PAVEMENT MARKINGS

Traffic signs and pavement markings are very essential for the safety of traffic. By means of these, the road users are provided with all the necessary information pertaining to the roadway geometry, traffic control and available roadside services. While travelling at the operating speed of traffic, a driver should be able to perceive, read and understand the signs sufficiently early to take safety measures. The location and type of signs and markings, suggested for the proposed road are discussed briefly as follows:

9.1 Traffic Signs

There are three types of traffic signs which can be classified as follows:

i) Informatory Signs:

These signs guide the road users in advance and provide them information.

The following are a few examples:

- Approach to a road junction
- Entry signs at an interchange/roundabout , etc.

ii) Warning Signs:

These signs warn the driver advance about any possible danger and enable him to ensure his safety. Some of these are listed below:

- Right curves
- Left curves
- Bridge ahead, etc.

iii) Other Signs:

These signs are installed where a prohibition is imposed on the road user.

The following are a few examples of such signs:

- Speed Limit
- No parking, etc.



9.2 Installation of Signs

Signs have been proposed at such locations that the information supplied to the driver is well in advance to enable him to act accordingly.

9.3 Pavement Markings

Pavement markings have been provided as under:

- i) Both edges of pavements would be marked with continuous yellow lines of 0.20 meter width.
- ii) The centre of the pavement would be marked with broken white line with 2m solid and 7m gap. The line would be 0.15 meter wide.

Pavement marking shall be carried out with thermoplastic reflective paint.