

**FEASIBILITY STUDY
FOR
CONSTRUCTION OF ROAD
FROM
JALORE CITY TO JALORE FORT**

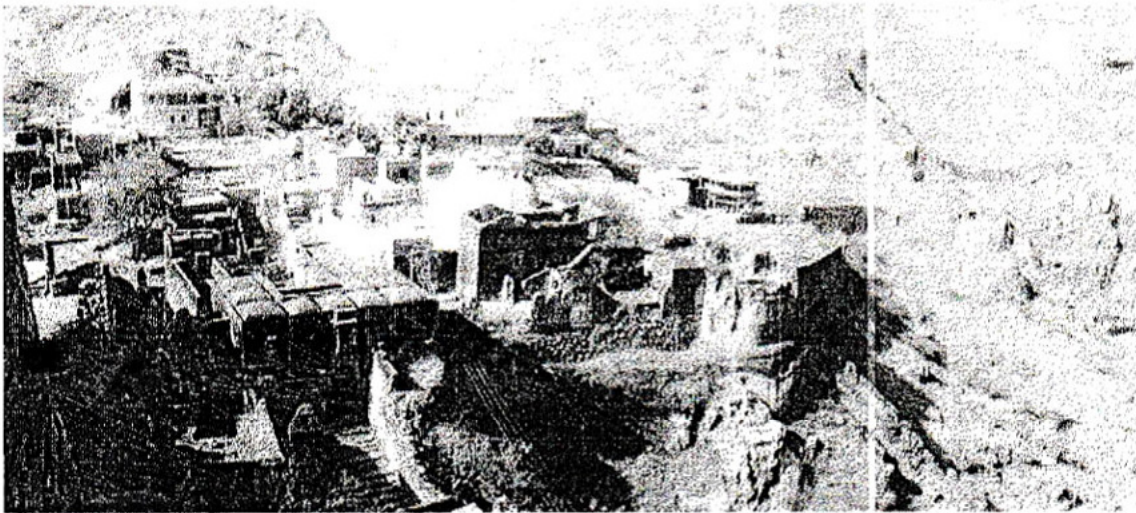


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1.0 INTRODUCTION

M/s Thoughts Consultants Jaipur Pvt. Ltd. was entrusted to carry out the Feasibility Study for Construction of road from Jalore city to Jalore Fort via Jharneshwar temple looking to historical importance of the city and the fort. Presently there is no connectivity of city and the fort through the road. Only 1487 steps are available to connect the city and the fort. The brief description of the city and the fort is as below:-

1.1 ABOUT CITY

History

In South West of Rajasthan Jalore District is located in the peripheries of sky high Swarn giri fort forming fish shape having a vast expanse of 10640 sq.km. According to historical believes it was called as 'Drumkulya' the northern part of southern Ocean. Being frightened from the 'fire bow' of Lord Rama sea accepted to build a bridge on it then he fired this infallible bow here leaving desertous landmass. During Dwapara age this landmass was known as 'Maru Dhanwa' consequently Marudhar and Marwar being the acceptable changes in name.

Jalore's old name was Jabalipur being the sacred glove of Mahirishi Jabali. By the passage of time the name of mountain Kanchangiri & Swarn giri were also frequently used as names of Jalore. It is clear from Kuvalyamana of Udhyanth suri that in 8th Century A.D. it was a prosperous town. At that time Pratihara king Vatsaraja was the ruler. Towards the end of 12th Century A.D. Parmars ruled here. Historians believe that the Jalore fort was built by Parmar rulers. It is known from a stone inscription of 1238 A.D. of fort that Parmar King Biral's-queen Maludevi powered Gold coin on Sindhu King. At that time from Abut to Umarkot all landmass was ruled by Parmar dynasty Chandan, Devraj, Aparajit, Vijjal, Dhasavarsh and Vishal ascended the throne.

After A.D. 1164 Kumarpal rules here. Nadol king Arhan's youngest son kirtipal started chohan tradition in Jalore.

Samarsingh ascended after kirtipal. After him Uday Singh like his father also captured Nadol & Mandore from Mohammedans. Thereafter Chagidev land Samant Singh became rulers upon whose vallant son great poet Padmanabhan had written an epic

named "Kanhad Prabandh". In this epic there is fantastic elaboration of war between Kanhad Dev king Alaudin Khilji.

Fort at mountain Swarnagiri provided name to the lineage of Chouhan's as Songara Chouhan. According to a general belief the place got its name for the heavy presence of Jal tree here.

Rathore king Rao Maldev ruled the fort of Jalore in 15th Century. During Akbar's rule Abdul Rahim Khan Khana took it infinitely from Gazni Khan. King Jehangir built the walls of the fort. After the death of Aurangzeb it permanently became a part of Jodhpur. It is said with relation to Viram & Firoza that the Badshah King invited Viram for a game of "Veniti" with 'Panju Wrestler'. After defeating the wrestler Princess Firoza fell in love with Viram and she sent proposal of marriage, which Viram rejected. Getting angry with this Badshah King surrounded the whole Jalore with his soldiers.

This son Viram Dev of Jalore is its greatest of Heros and left behind sweet memories. Hundreds of Rajput Braves have given life for their country, religion and pride. Brave women have put themselves alive into fire to save their respect.

Demography

The brief detail of the Jalore district is as below:-

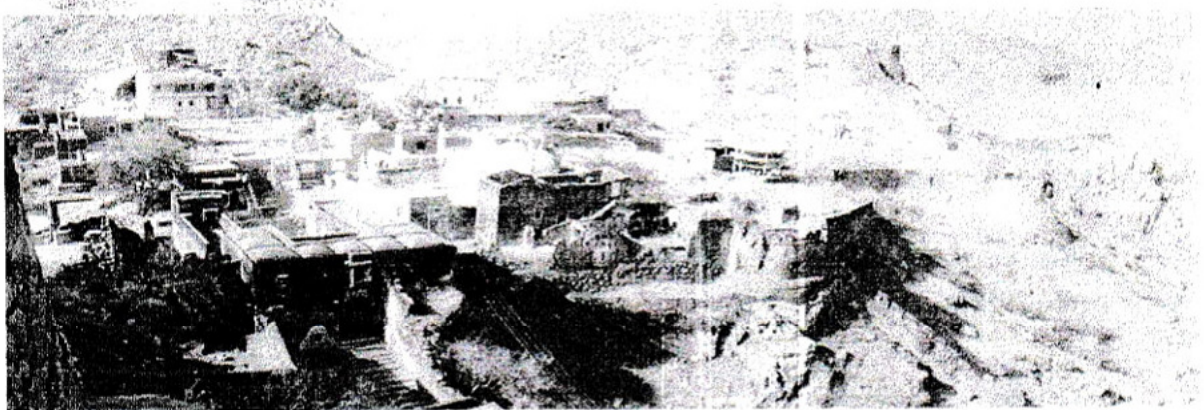
District at a Glance

Area 2001 Census	10564.44 Sq.Km
Population 2001	1448940
Village Population	1338946
Urban Population	109994
Male Population	737880
Female Population	711060
Schedule Caste Population	261315
Schedule Tribe Population	126799
Density of Population	136 Persons per sq. km.
Literacy	46.05%
Male Literacy	64.7%

Female Literacy	27.8%
Sub-Divisions	7
Tehsil	7
Panchayat Samiti	8
Gram Panchayat	264
Municipal Board	3
Villages	802
Towns	3

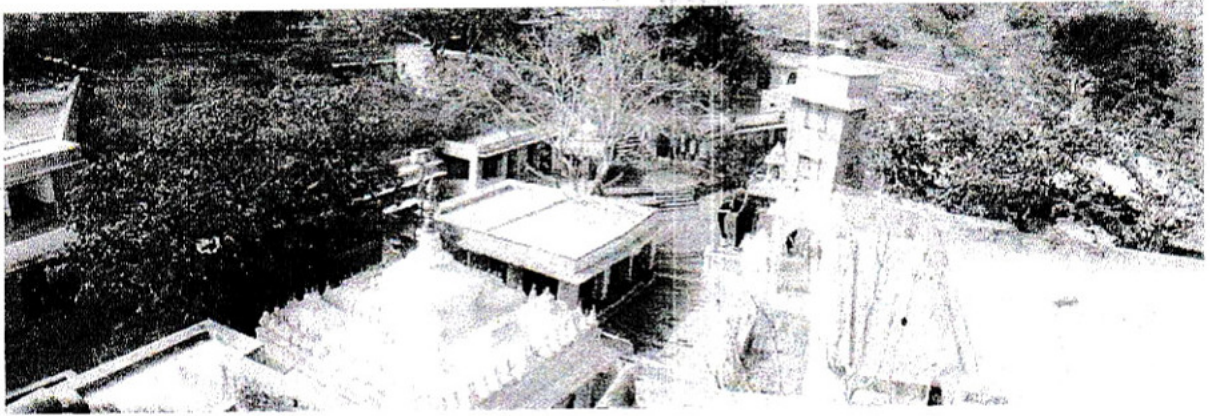
1.2 JALORE FORT

Pride & Prestige of Jalore is its fort that sings its own story of valor & strength. This fort is a property of State Government's archeological department and a protected building since 1956. To go to Jalore fort one has to go through zig-zag roads of mid of town.



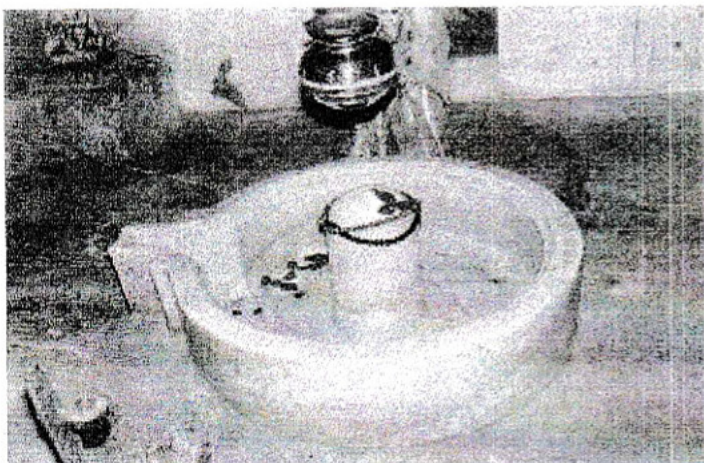
It is situated in south of Jalore 1200 feet over the mountains. A zig zag way leads to the fort upon the mountain where on each step the height goes on increasing. The first gate comes while climbing upward called Suraj Pole. Arch of this gate is of immense beauty. Here there are made small rooms where the security guards used to stay. To refrain from artillery firing a huge wall surrounds the gate from front.

This wall is around 25 feet high and 15 feet in width. After it walking for another half a mile second gate known as Dhruv Pole comes. This obstacle was also peculiar from defense point of view. Without winning this post, entry into the fort was negligible.



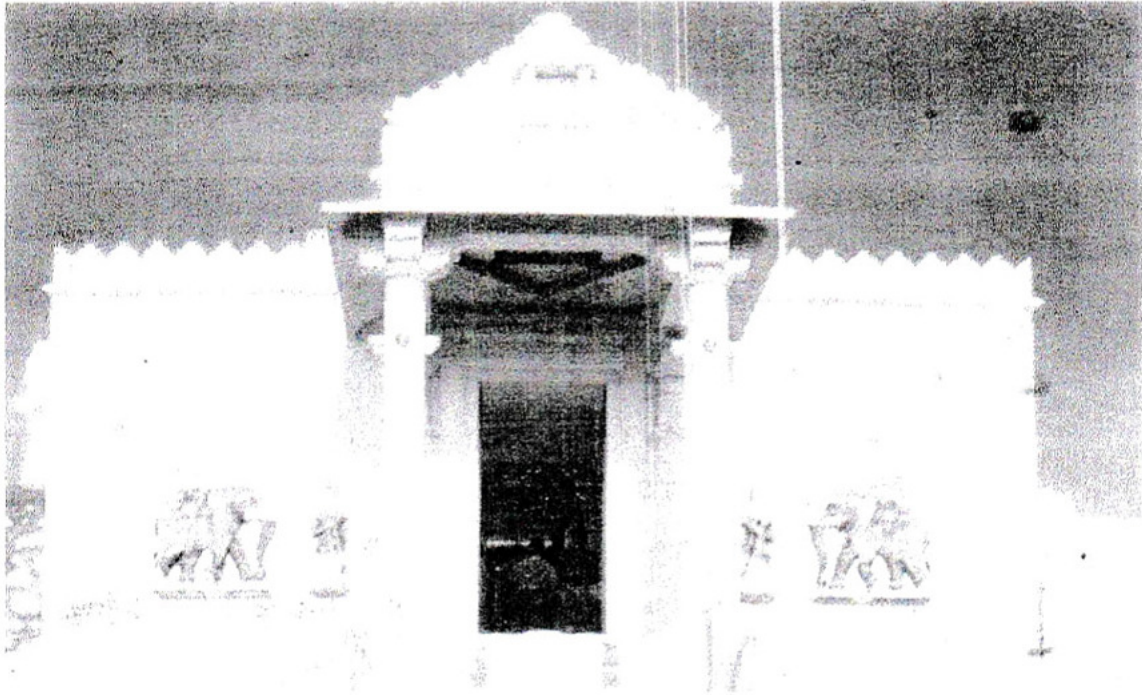
Third gate is called Chand Pole which is more grand, strong and beautiful from others. From here onwards the rampart that runs along the way on both sides is divided into many parts and conceals within it rounded surface of mountain and then expands. The place between third & fourth gates, Fourth gate is called Sire Pole. One part of the rampart before reaching there takes a left turn upwards and touches the highest part of the mountain and the second rampart moves towards right side and while encircling mountain peaks around it meets the first boundary.

The length of the fort is $\frac{3}{4}$ Km and the breadth is half a Km. Presently there is palace of king Mansingh, two water reservoirs, one Shiv Temple, temple of goddesses Jogmaya, station of Viram Dev, three Jain temples shrine of Mallik Shah and One Mosque.

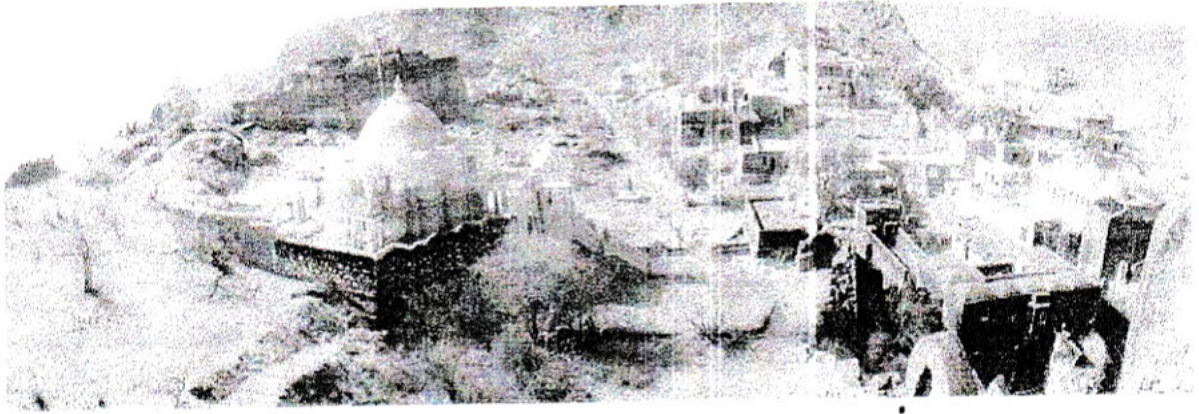


The temple of Parshavnath is the grandest among the temples. The idols sculpted on the walls in the back side of temple attracts visitors the most.

Moving from the four faced Jain Temple to the palace of Mansingh, one pillar of Parmar dynasty stands reserved on a small platform. Probably this is the only memorial of Parmars. The human height red stone's pillar instantly speaks out the beauty of its artistic sculpting. Before many decades this pillar was found while cleaning a water reservoir that was situated here.

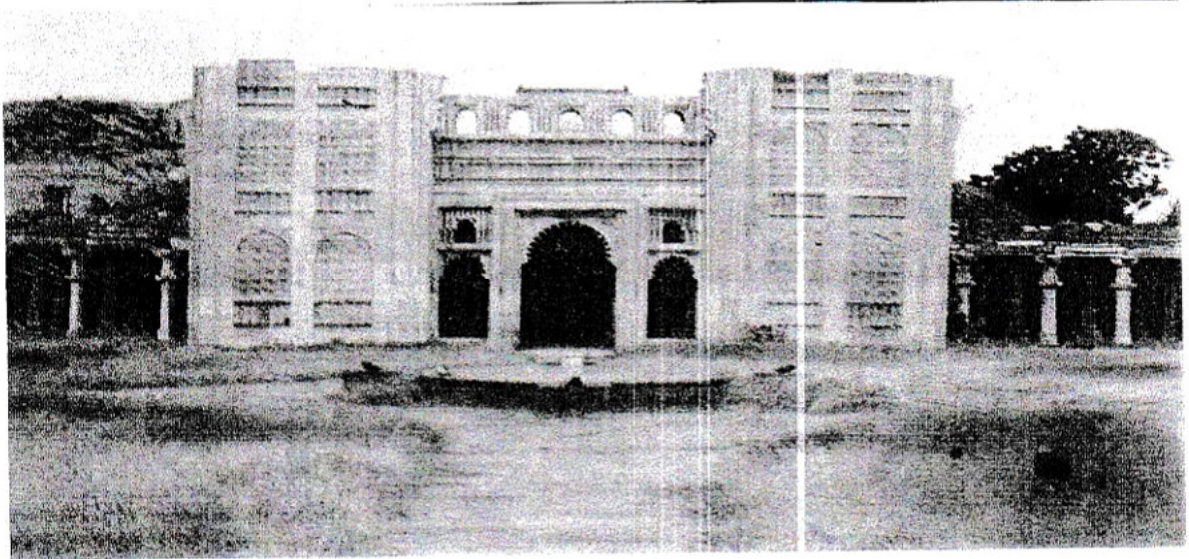


While entering in the palace of Man Singh one big square meeting hall comes, whose right side is a hall. In this hall there is one broken and one big artillery machine is placed. Some artillery could be found here and there in fort's compound. Just down of Mansingh Palace towards general way are casements on height are good example of rock out. Two storied queen palace is also there is this Palace. In its courtyard is one underground reservoir that is now not open for general public. In palace are found big storage houses that were used for storing food grains, Ghee etc. Behind the palace is the read to Shiv Temple. There is located one big ShivLing of white marble. From the backside of the temple the way leads towards water reservoir where there is a temple of goddesses Chamunda built. In this temple is found a inscription on which it is mentioned that war encircled king Kanher Dev was given magical sword by goddesses Bhagwati here.

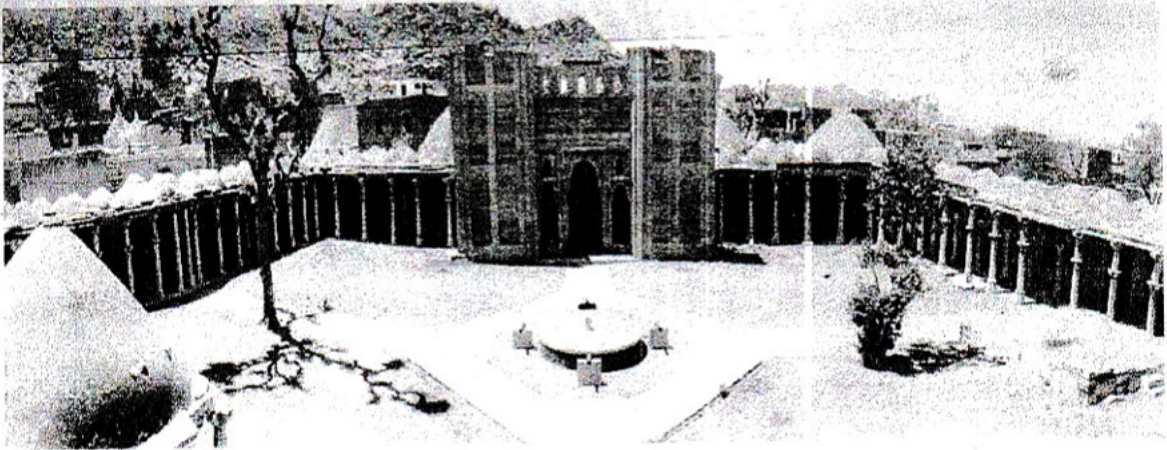


The post of Viram Dev is situated on the highest of the mountain's South East. From here scenes could be seen afar. The flag of Jalore was being flown here. A newly built mosque is nearby this post presently. During Independence struggle freedom fighters like Ganeshlal Vyas, Mathuradas Mathur, Fatehraj Joshi and Tulsidas Rathi were imprisoned here by Britishers.

1.2 (a) Topkhana



In the midst of Jalore town are left remains of a grand Sanskrit school and a temple of king Bhoj times that after passage of several centuries it speaks of its grandeur itself. Bhoj was an intellect of Sanskrit. For the spread of education he built many schools in his capital Dhar, Ajmer and Jalore, all Three are of same structure. Now a days the Sanskrit school of Dhar is known by the name of Mosque of Kamaal Maula, Ajmer School by Adhai Din Ka Jhopda and Jalore school by the name of Topkhana.



Artilleries were kept during tenure of Rathore, consequently the name Topkhana emerged for it. After independence, the supply officers made it place for storage of food grains. It is a protected building under Archaeological department and one security personnel is deputed here.

1.3 Industry

Jalore is also famous for its Granite. Many units are working for procurements of granites in and near Jalore city.

2.0 NECESSITY OF THE PROJECT

The Feasibility Study for Construction of road from Jalore city to Jalore Fort via Jharneshwar temple is necessary looking to historical importance of the city and the fort. Visitors wish to see the fort for its glorious past but presently there is no connectivity between the city and the fort through the road. Only 1487 steps are available to connect the city and the fort. People use feet or palki to reach the fort which is not only cumbersome but also difficult to reach. Therefore necessity of constructing of road is being felt from many years. It is expected that the tourism industry, the granite industry and other industry will boost up after constructing the road.

Many options were discussed to connect the city and fort via different routes, Considering merits and demerits of all routs. Finally it was decided to connect the city to fort via Jharneshwar temple.

Benefits:

- Connectivity of Jharneshwar temple from city
- Availability of Road with proper gradient from City to Fort
- Increase in the numbers of tourists

Salient Features

- 8.0 m wide road with 3.75 m carriageway of Bituminous Pavement and 1.125 wide shoulders on both side of proposed road and rigid pavement i.e Cement Concrete Pavement near entrance at fort
- The total length of road is 5 Km 176m
- The thickness of Granular sub-base, Base and Premix carpet have been adopted as 100mm, 150mm and 20mm respectively for 45-150 CVD as per IRC:SP:48-1998
- The CBR of the sub grade has been taken less than 20
- Gradient of road varies from 1 in 12 to 1 in 20 as per availability at site
- The abstract of cost is as per details given below:

S.No.	Particulars	Amount (Rs in lacs)
1	Road Work	383.07
2	Retaining Wall	745.23
3	Drain Work	133.57
4	Road Furniture	14.63
5	Plantations	9.75
6	Provision for Cross Drainage works (3 Nos.)	75.00
7	Provision for Parking & Land Development in Fort area	50.00
8	Provision for Electrification work High mask lights, External poles etc	25.00
9	Provision for Architectural Entrance Gate at Fort	50.00
	Sub-Total	1486.24
	Add 2.5% (Quality Control +WC establishment)	37.16
	Total	1523.40
	Add 13% Prorata Charges	198.04
	Grand Total	1721.44

3.0 ENGINEERING SURVEY & INVESTIGATION

Technically sound and environment-friendly construction of road from city to fort via Jharneshwar temple has been identified with thorough analyses of vast engineering data collected primarily through field surveys and secondarily through various sources. Topographic Survey was conducted with latest survey equipments around the fort to examine the various options for construction of road through different routes. Finally the road through the Jharneshwar Temple was found the most suitable to satisfy the sound engineering practice. The GAD of proposed road is as per enclosed at Annexure 1. The proposed & existing profile & cross section at 25m is available on Annexure 2 & 3 respectively.

4.0 DESIGN STANDARDS

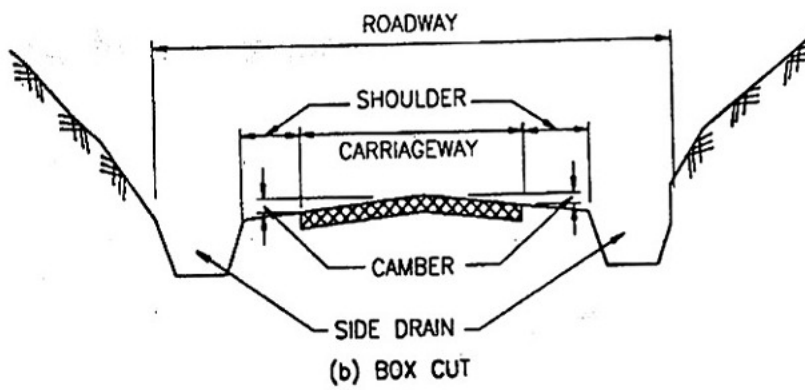
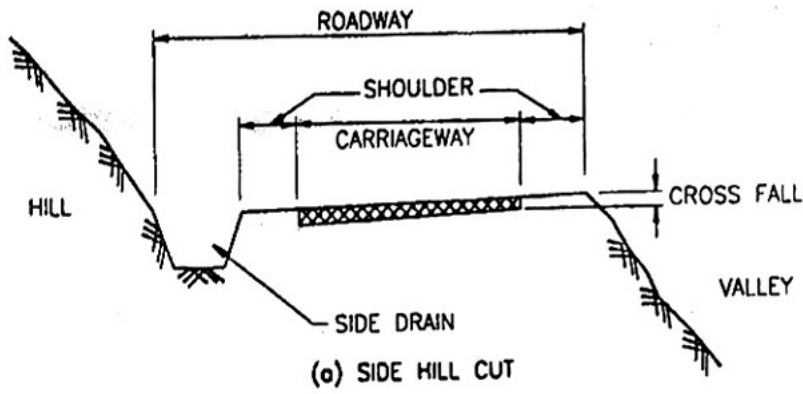
4.1 Introduction

Formulation of series of design standards is required for following them during highway design in order to avoid any inconsistency in design from one section to the other and provide desirable level of service and safety. For this Project it is proposed to follow Design standards given in IRC:SP:48-1998 Hill Road Manual & other IRC codes, guidelines and special publications.

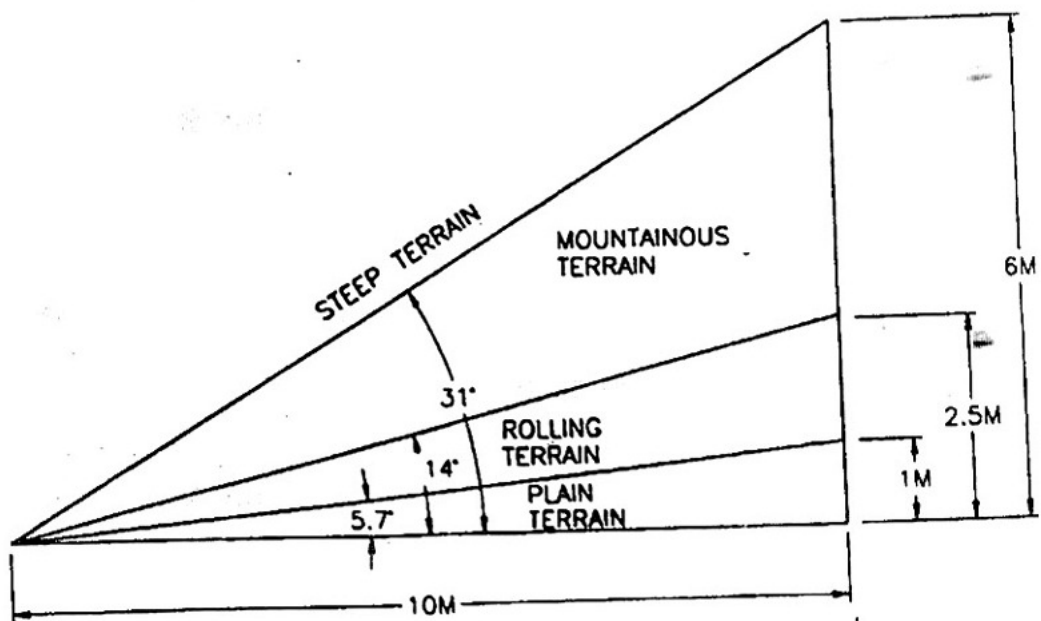
4.2 Geometric Design Standards

Basic Principles of Geometric Design

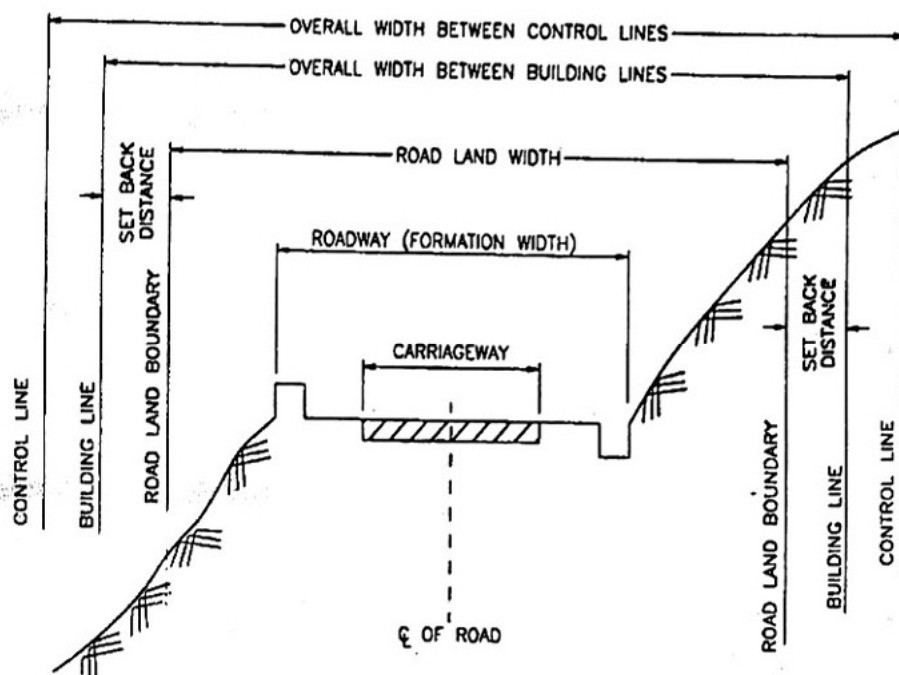
The elements of roadway and the road land & classification of terrain in hill road have been shown in the figure



ELEMENTS OF A ROADWAY



CLASSIFICATION OF TERRAIN



Design Speed

The design speed for various categories of hill roads are given in the table

Table 4.1 Design Speed for diiferent types of road

S.No.	Road Classification	Mountaineous Terrrain		Steep Terrain	
		Ruling	Minimum	Ruling	Minimu m
1	National and State Highways	50	40	40	30
2	Major District Roads	40	30	30	20
3	Other District Roads	30	25	25	20
4	Village Roads	25	20	25	20

Sight Distance

The design value for stopping and intermediate sight distance for various speeds are as below:

Table 4.2 Design values of Stopping and intermediated sight distance for various speeds

Speed (Km/h)	Design Values- meters	
	Stopping Sight Distance	Intermediate sight distance
20	20	40
25	25	50
30	30	60
35	40	80
40	45	90
50	60	120

Table 4.3 Criteria for measuring sight distance

S.No.	Sight Distance	Driver's Eye Height	Height of Object
1	Safe Stopping Distance	1.2m	0.15 m
2	Intermediate sight distance	1.2m	1.2 m

Width of Road Land, Roadway, Carriageway and Shoulders will be as below:

Table 4.4 Width of Road Land (In Meters)

Sl. No.	Road Classification	Open areas		Built up area	
		Normal	Exceptional	Normal	Exceptional
1	National and State Highways	24	18	20	18
2	Major District Roads	18	15	15	12
3	Other District Roads	15	12	12	9

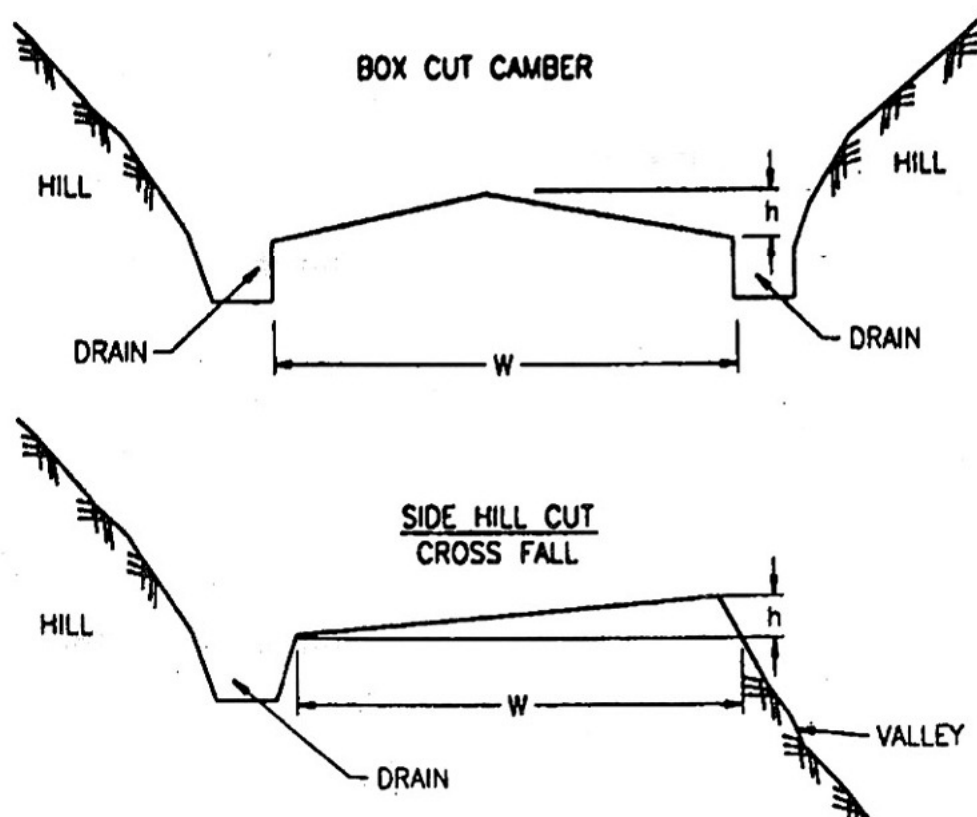
Table 4.5 Width Of Carriageway, Shoulder and Roadway

Highway Classification	Carriageway width (m)	Shoulder width (m)	Roadway width (m)
a National Highways and State Highways			
i. Single lane	3.75	2 x 1.25	6.25
ii. Double lane	7.00	2 x 0.9	8.8
b Major District Roads and other District Roads	3.75	2 x 0.5	4.75
c Village Roads	3.00	2 x 0.5	4.00

1. The roadway widths are exclusive of parapets (usual width 0.6 m) and side drains (usual width 0.6 m)
2. In hard rock stretches or unstable locations where excessive cutting may lead to slope failure, width may be reduced by 0.8 m on two lane and 0.4 m on other roads. Where Such stretches are to be provided continuously for long distances, passing places should be provided.
3. On horizontal curves, roadway width should be increased to provide for extra widening at curve.
4. On roads subject to heavy snow fall, where snow clearance is done over long periods, roadway width may be increased by 1.5 m. However, the requirement of such widening may be examined with reference to ground conditions in each case considering terrain, traffic and other influencing conditions/factors.

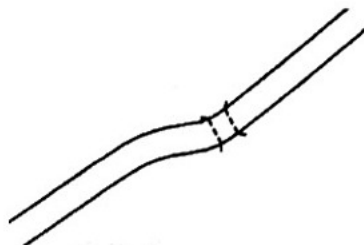
Camber/Cross fall

Camber/Crossfall on straight section should be as below:-

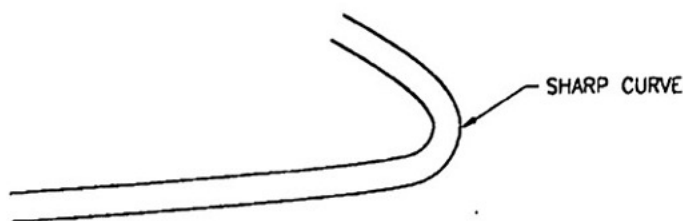


4.3 Horizontal Alignment

The horizontal alignment should be without obstruction and matched with the surrounding topography. The following type of horizontal alignment should be avoided to accident.



(a) BREAK IN HORIZONTAL ALIGNMENT AT CROSS DRAINAGE STRUCTURE



(b) SHARP CURVE AT THE END OF LONG TANGENT

4.3.1 Superelevation

The super elevation should be required to balance the centrifugal force at curves. The following radius is required to avoid the superelevation.

Table 4.6 Radius beyond which Superelevation is not required

Design Speed (Km/H)	Radii (Meters) for Camber of				
	4%	3%	2.5%	2%	1.7%
20	50	60	70	90	100
25	70	90	110	140	150
30	100	130	160	200	240
35	140	180	220	270	320
40	180	240	280	350	420
50	280	370	450	550	650

Transition Curves

IRC Geometric Design Standards for Rural Highways, IRC:73-1980, suggests that the length of the transition curve should be the larger of the two values arrived at on the basis of the following criteria:

- Rate of change of centrifugal acceleration and
- Rate of change of super elevation

The transition lengths obtained for various radii are presented as per Table 4.7

Curve radius (metre)	Design speed (km/h)				
	50	40	30	25	20
15				NA	30
20				35	20
25			NA	25	20
30			30	25	15
40		NA	25	20	15
50		40	20	15	15
55		40	20	15	15
70	NA	30	15	15	15
80	55	25	15	15	NR
90	45	25	15	15	
100	45	20	15	15	
125	35	15	15	NR	
150	30	15	15		
170	25	15	NR		
200	20	15			
300	15	NR			
400	15				
500	NR				

NA - Not applicable
 NR - Transition not required

Set back distances at Horizontal Curves

Required sight distance should be available to see the inside of horizontal curves. The recommended set back distance for single lane carriageway is as per table given below:

Table 4.8 Recommended set back distance for Single Lane carriageway

Radius of Circular Curve in Metres	Set-Back Distance in Metres				
	S=20m (V=20 Km/h)	S=25m (V=25 Km/h)	S=30m (V=30 Km/h)	S=45m (V=40 Km/h)	S=60m (V=60 Km/h)
14	3.4	-	-	-	-
15	3.2	-	-	-	-
20	2.4	3.8-	-	-	-
23	2.1	3.3-	-	-	-
30	1.7	2.6	3.7	-	-
33	1.5	2.3	3.4	-	-
50	1.0	1.6	2.2	5.0	-
60	-	1.3	1.9	4.2	-
80	-	1.0	1.4	3.1	5.6
100	-	0.8	1.1	2.5	4.5
120	-	0.7	0.9	2.1	3.7
150	-	0.5	0.8	1.7	2.3

4.3 Vertical Alignment

The recommended gradients for different terrain conditions and minimum length of vertical curves should be as below:

Table 4.9: Recommended Gradients for Different Terrain Conditions

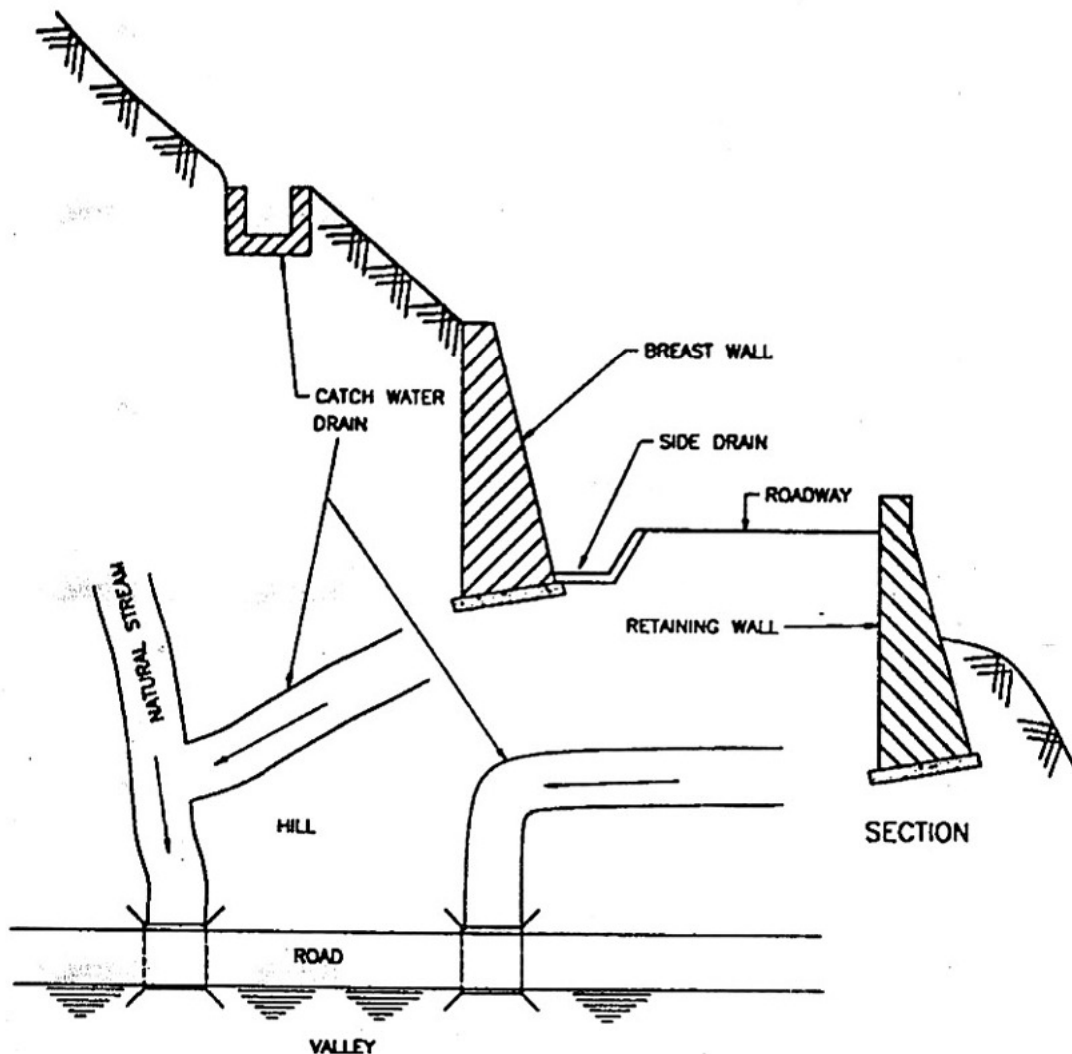
Classification of gradient	Mountainous terrain and steep terrain more than 3000m above MSL	Steep terrain upto 3000m height above MSL
Ruling Gradient	5%	6%
Limiting Gradient	6%	7%
Exceptional Gradient	7%	8%

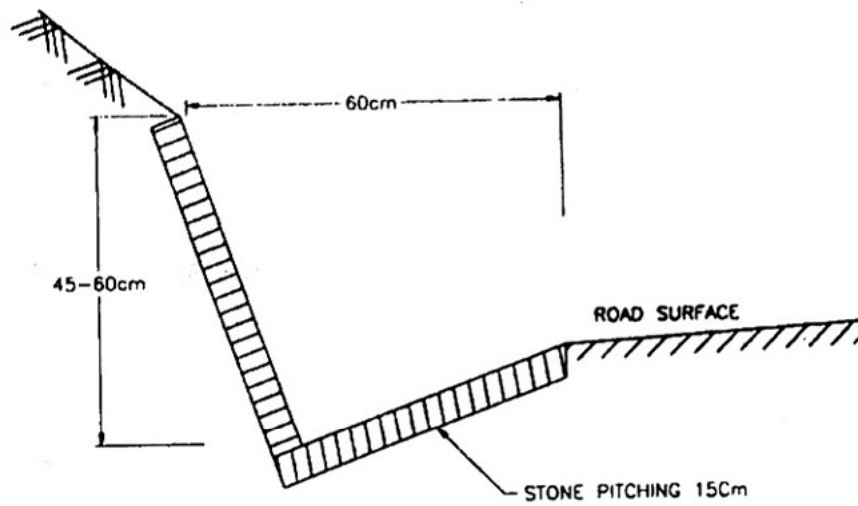
Table 4.10: Minimum Length of Vertical Curves

Design Speed (Km/H)	Maximum Grade Change (percent) not requiring a vertical curve	Minimum Length of vertical curve (m)
Upto 35	1.5	15
40	1.2	20
50	1.0	30

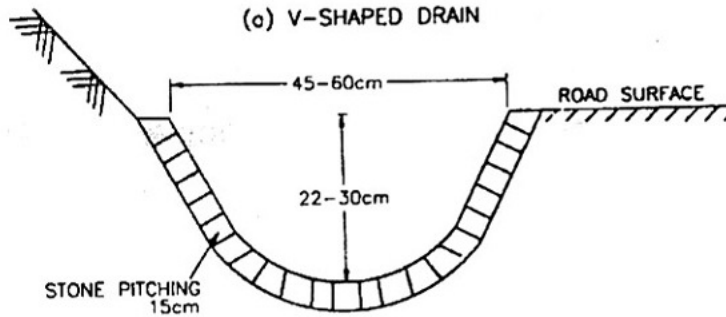
4.4 Drainage and Cross Drainage

Generally the topography of the hill generates many streams and rivers. The gradient of road also adds up the water. Therefore effective drainage of water is required to prevent the damage of the road. The different types of side drains, catch water drain and chute drain are provided as per figure below:

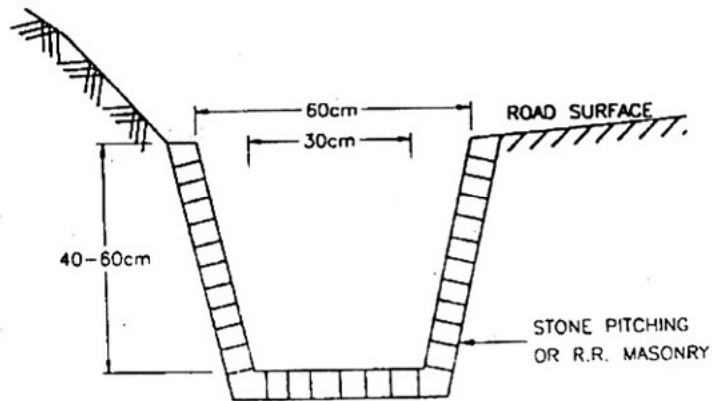




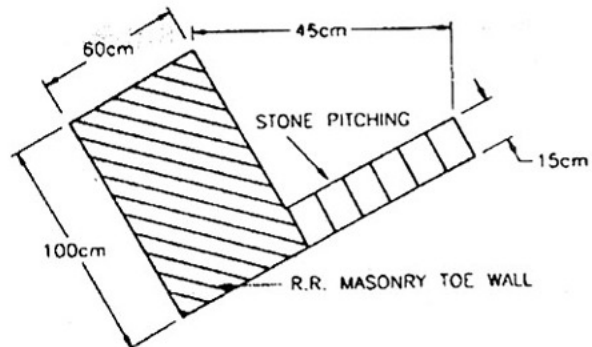
(a) V-SHAPED DRAIN

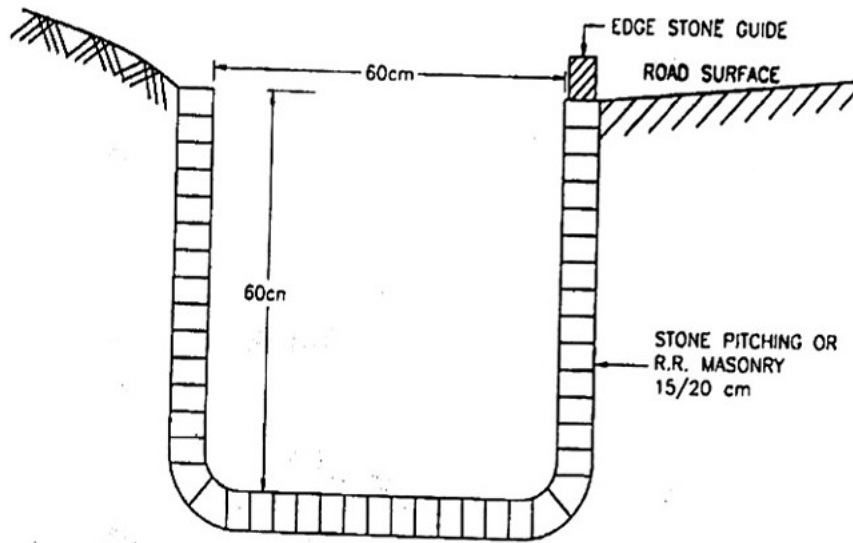


(b) PARABOLIC OR SAUCER TYPE DRAIN

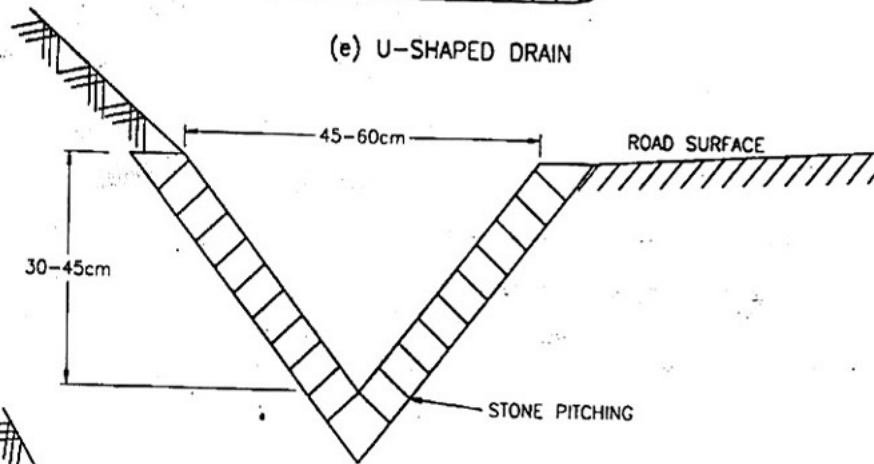


(c) TRAPEZOIDAL DRAIN

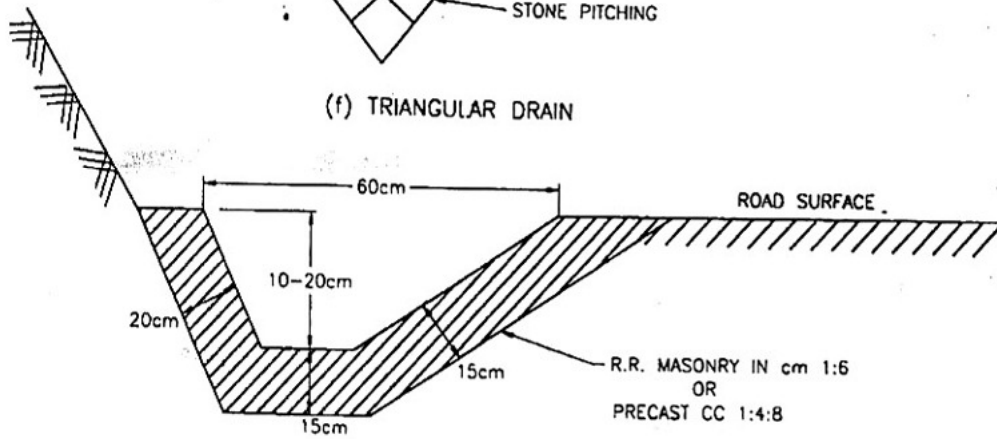




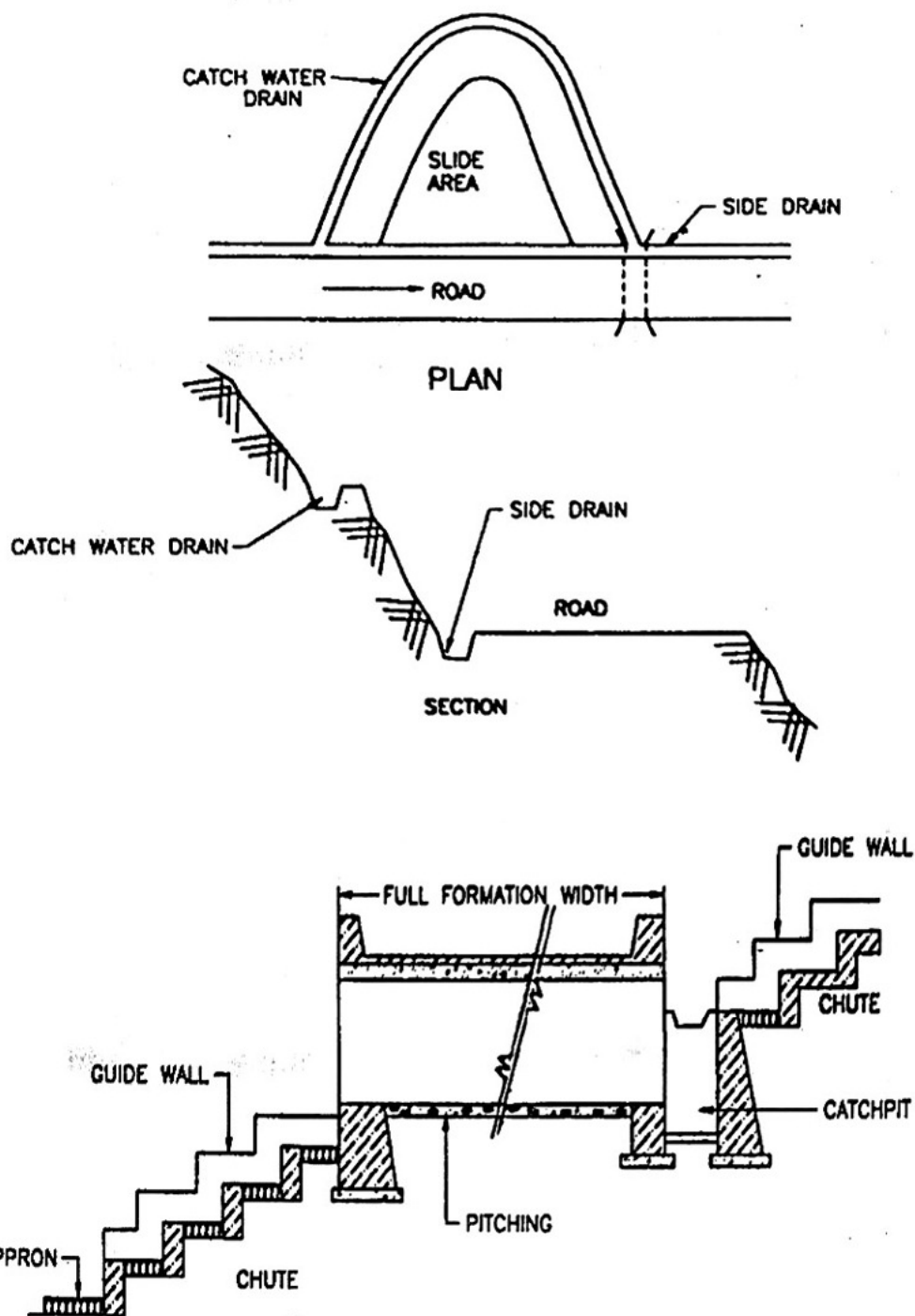
(e) U-SHAPED DRAIN



(f) TRIANGULAR DRAIN



(g) KERB AND CHANNEL DRAIN

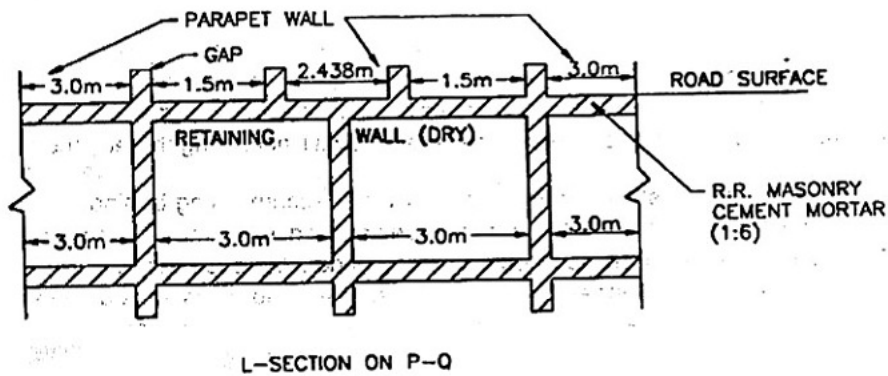
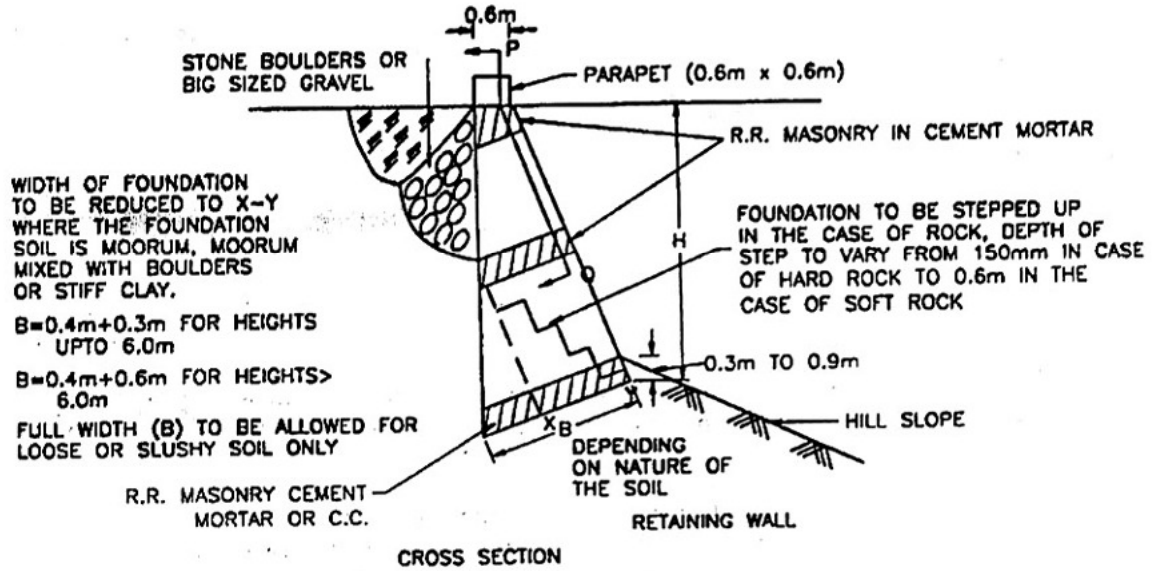


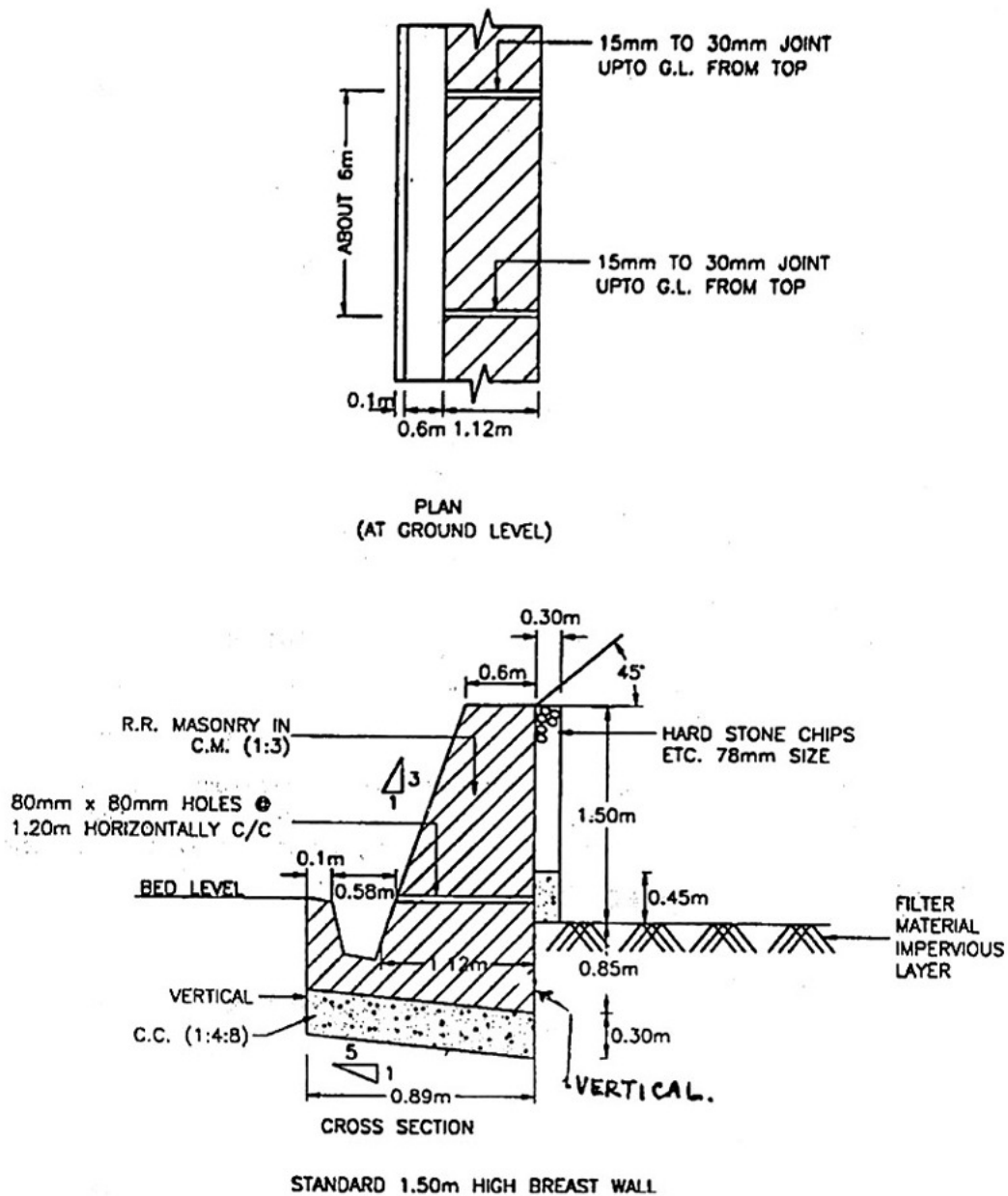
4.5 Structures and Protective Works

4.5.1 General

Generally the Hill Road is formed by cutting and filling or by only cutting therefore different structures are required to protect the slope and to maintain

natural slope therefore retaining wall, breast wall and other type of structures are required. The cross section and other details are shown as per figures.

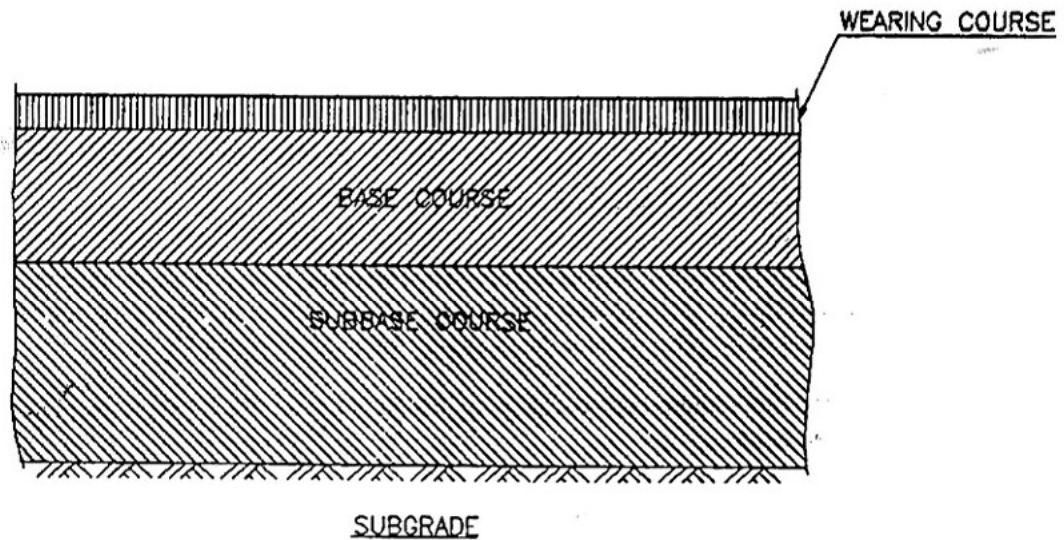




5.0 PAVEMENT DESIGN

Designs for new pavement will be carried out in accordance with Indian and International practice. Generally the paved shoulder is structurally designed to carry 10 to 20% of the traffic load the design lane is expected to carry. However the structural drainage system of the paved shoulder is required to be integrated with that of the carriageway pavement. Presently there is no connectivity of road from city to fort therefore it is difficult to assess the traffic demand ,however the thickness of Granular sub-base, Base and Premix carpet

have been adopted as 100mm, 150mm and 20mm respectively for 45-150 CVD as per IRC:SP:48-1998 considering CBR of the sub-grade as less than 20 for the estimate.



6.0 PROJECT COST

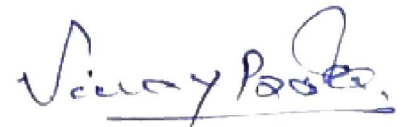
The project cost of the road comes to Rs 17.21 Crores as per enclosed estimate in Annexure '4'.

7.0 CONCLUSION

The construction of the road from Jalore city to Jalore fort will mark a remarkable sign in the history of the Jalore. It will boost not only the tourism but also the other industries and a new position of Jalore in the state of Rajasthan.

REFERENCES:-

- IRC:5-1998 Standard Specifications & Code of Practice for Road Bridges, Section I - General Features of Design (Seventh Revision)
- IRC:6-2010 Standard Specifications & Code of Practice for Road Bridges, Section II - Loads and Stresses (Third Revision)
- IRC:37-2001 Guidelines for the Design of Flexible Pavement (Second Revision)
- IRC:78-2000 Standard Specifications and code of Practice for Road Bridges, Section VII-Foundations & Substructure (First Revision)
- IRC:SP:48-1998 Hill Road Manual



(विनय बोडा)
अतिरिक्त अभियंता
नगरास्पष्ट, जालोर