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## PROLOGUE

USBRL Project, as all of us are aware, is a railway line which will link rest of the country to Kashmir Valley – a valley which has been hailed and sung over centuries by poets as ‘Paradise on Earth’. But traditional wisdom also says that path to paradise is not easy to follow, building road for all others to follow is much more difficult. It requires knowledge and skills to build and is full of hardships. This is what officers, engineers, supervisors and staff have silently borne while they have completed 136 km out of 271 km of the entire project. To accomplish this roads have been built and camps have been established. Over years, bridges have been built and tunnels have been bored through mountains to lay a railway line. Each one of them are gems of technical performance.

Those who are involved in this project, have in its course, endured isolation, extreme weather and difficult living conditions. This was possible by sheer grit and determination of a handful of men and women and their families. This technical newsletter aims to give a voice to these engineers and their teams a means to share their experience.

The name of this periodical is ‘*Him Prabhat*’ also has a message. The railway line after it is built will bring with it ideas and will accelerate development. It will light up this area with rays of hope, just like the morning sun. The people in around this area will bloom in this dawn where economy will flourish when this part of the country located high up in the mountains is connected with a fast, eco-friendly and all weather railway line.

**Surinder Kaul**  
**Chief Administrative Officer / USBRL**



## From Editor’s Desk

My association with Himalayas began early my childhood when I frequently travelled with my father through Gharwal and Kumaon Hills (now in the State of Uttarakhand). While he would be discharging his official duties as a revenue officer, my sister and I would spend days in dak bungalows with our mother watching streams flowing by in valleys down below or gazing at a bus or a truck winding around a distant mountain road. Here every bend springs surprise leaving you spell bound by sheer power of nature. Every day you are awestruck by its enormity and complexity. Little could I have guessed that I would be a member of a team entrusted with building a railway line across the same serene but difficult mountain landscape.

This magazine envisages to capture experiences technical and non-technical, challenges of project ranging from scientific to mundane, survival and art of it, and the happenings around the project. In short, it traverses an eco-system which is Udhampur Srinagar Baramulla Rail Link Project or USBRL Project.

This is the inaugural issue and like all beginnings this is a small step. As the time will pass this will become a corner where memories will be kept. Posterity will have a place to check how we did our work – in office and after office hours. How engineers overcame technical challenges deep inside tunnels or while building abutments on steep cliff faces over deep gorges or how did they would control slopes sometimes as crumbly as an apple pie. How their families adapted to life in projects in such hostile environment. How they were blessed with endlessly beautiful sunrises and sunsets over snowy peaks or how they weathered heavy thunderous downpours. How they spent hours in confines of their vehicles caught in middle of nowhere when road was blocked after a landslide. How everyone got cut off in an unprecedented snowfall in Banihal for days without water, electric supply and supplies of food and how they were forced to stay in beds for days just to keep warm. Or that lost snake who chanced in the guest house at Reasi. Just about everything. It will be the endeavour of this magazine to see that every creative spark is nursed. I am sure that we shall be able to tell generation that come how this line was built and how to build more of them with Himalayas protecting our country in a fond embrace.

Experience of building an enormous bridge on river Chenab and accommodating part of a yard of a railway station inside a tunnel are included in this issue. Then a primer on earthquakes is a must for building anything in these mountains. Areas of interest in Laddakh region will excite the travel bug of readers while a short story and poems by members of USBRL team and their family members add colour and variety to otherwise terse technical slant of this magazine. Project news showcases progress being made and life around the project.

We shall look ahead towards a long and wonderful association with the entire USBRL panorama.

**MOHIT SINHA**  
**Editor-in-Chief**

## Udhampur Srinagar Baramull Rail Link Project

### Opening of BanihalQuazigund section.

Hon'ble Prime Minister, Dr. Manmohan Singh and UPA Chairperson Smt. Sonia Gandhi and other Dignitaries, dedicated the newly commissioned Quazigund - Banihal section to Nation and flagged off the first Train on 26.06.2013. The section from Qazigund to Banihal (17.7 Km) involves PirPanjal Tunnel of total 11.215 Km length The block section from Qazigund to Banihal is a part of Katra-Qazigund section of the project, wherein the alignment passes through the world's most difficult terrain, both in terms of logistic and geological strata.

Opening of the section along with Commissioning of PirPanjal Tunnel, the longest transportation tunnel in India and third longest in the world, is a matter of pride for all officers and staff of USBRL project. Many of the technologies and novelties used for construction of this Mega Structure were adopted for the first time in the History of Indian Railways. This, as an asset of Indian Railways, will make every Railway men feel proud.

Completion of this tunnel was made possible with the untiring efforts of many officers and staff of Northern Railway, IRCON & RITES and the employees of consultants and contractors, who had been posted in this project all these years and have worked relentlessly even in the adverse climatic condition and during the time of extreme insurgency.



### # 2

Member Engineering ShSubodh Jain visited the project on 31.08.2013 and reviewed the progress of work. Member Engineering also commissioned the twin cable crane at Chenab Bridge Site. The span of the crane is 915m and the height of the supporting steel pylons are 127m on Kauri end and 105 m on Bakkal end.



### # 3

Sub-Committee-I (Railways) of the Public Accounts Committee(2013-14), Headed by Sh.PrakshJavadekar, visited the project area and discussed the Audit Report No. -19 on USBRL Project on 24<sup>th</sup> and 25<sup>th</sup> Oct. They were appraised about the status of project and difficulties being faced during execution. Key Officers of Northern Railway of concern department and CMD of IRCON and KRCL were also present.



**# 3** Social Gathering of officers and their families at Officers Rest House, Jammu



**# 4** Sh. Kul Bhushan, Member Electrical and Member Engineering (additional Charge) energised 5MVA, 33/11kV Railway Grid at Katra on 08.04.2013.



**# 5** MOU signed between Northern Railway and IRCON for Railway Electrification work of Banihal-Baramulla section of USBRL



**# 7** 67<sup>th</sup> Independence day was celebrated at CAO/USBRL's office at Satyam Complex, Jammu. Flag Hoisting by Sh.R.K.Chaudhary, CEE/USBRL

**# 6** Break through was achieved at Tunnel No. T42 in Sangaldan area on 27.08.2013. This breakthrough was at the junction of 2 track tunnel with single track tunnel. The total length of tunnel is 2732 m. With this, KRCL has achieved breakthrough in 8 nos of tunnels out of 14 nos.



**# 8** Due to excessive squeezing and swelling a portion of the tunnel T1 between Udhampur – Katra collapsed in the year 2006. Rehabilitation of this tunnel by laying a new diversion tunnel of length 1.7 km was a major bottleneck for completion of UHP-Katra section. **Officers and Staff of UdhampurKatra section have successfully completed construction of diversion portion of tunnel T-1 in the month of May, 2013. Laying of BLT in T1 and T3 has also been completed on 30.09.13 and 15.09.2013 respectively.**

**# 9** Lining for tunnel T43 and T46 has been completed by KRCL.



**# 10** Group of the officers comprising CAO/USBRL, CE/S/USBRL, CEE/USBRL, FA & CAO/USBRL, ED/KRCL, Dy.CE/Design/USBRL, Dy.CE/Reasi/USBRL, Dy.CE/Chenab/USBRL, CE/Design /KRCL, CE/KRCL and other officers of NR & KRCL and geologist and DDC of KRCL proceeded to the Anji Bridge Site and trekked around the Bridge Site.(Top Left)

Negotiating the narrow footpath through slided area along the right bank of Anji River (Top Right)



Showing a waterfall in the backdrop over thickly bedded rock and slided scree on the northern slope at the toe of the ridge. (Left)

**# 11**

At Chenab Bridge fabrication work of viaduct girder has commenced. This work was stand still for the last 3-4 years. This is a major achievement and now it appears that construction of bridge will be completed in time.



Workshop at Chenab Bridge site. Site.



**# 12** Rural life of present day India. Going around Anji Bridge location, Dabi Village has to be passed. The village is inhabited by couples of villages. In one of the hut in the village is built this, "Panchakki" (Hydel Floor Mill) run by natural water stream. This masterpiece is equipped with woden penstock to generate the required water head and mechanism to control volume of water to regulate RPM of Grinders. This was a source of attraction for those who had never came across such a device before.

**# 13** Meeting was held with Dr. Branko Damjanac of ITSACA (USA) on the subject of Global Stability of Chenab Bridge and 3DEC dynamic analysis at New Delhi on 05/11/2013.

**# 14** Dr. P. C. Jha, Scientist and Head Engineering Geophysics Dept, National Institute of Rock Mechanics were requested to visit Tunnel No T3 of UdhampurKatra Section.



Banganga Bridge

**# 15** Bridge no 32 over river Banganga is a continuous span bridge comprising of middle span of 90m and end spans of 60 m is nearing completion. The Bridge was constructed by Balanced Cantilever Methodology and last segment is likely to cast during the month.

# T E C H N I C A L

## Power Supply Arrangements in Kashmir Valley

### 1. Introduction:

Quazigund-Baramulla section (120 km) in Kashmir Valley as part of USBRL Project was sanctioned in the year February, 1999. When new alignment was marked on ground, it was passing through orchards, crop fields, etc. There were a large number of Electrical Over Head Crossings of PDD (M&RE), PDD (S&O) and PGCIL infringing the alignment of track. To divert/modify these over head work was a major challenge as earth work had to start immediately for construction of embankment and to clear site of bridges on the alignment. The total numbers of Over Head Crossings were as under:-

a)	400 KV Crossings.	9 No	PGCIL
b)	220 kV Over Head Crossings.	3 Nos	PDD(S&O)
	132 kV Over Head Crossings.	10 Nos	PDD(S&O)
c)	LT to 33 kV Over Head Crossings.	144 Nos	PDD(M&R E)

### 2. Challenges/Constraints:

There were following challenges/constraints for making reliable power supply available:-

i)	Shortage of Power in J&K State (Especially in Valley).
ii)	Severe low voltage problems/Power cut on LT distribution.
iii)	No adequate experienced contractors for execution of work.
iv)	Severe weather conditions, below sub-zero temperature, snow-fall.
v)	Security threats.
vi)	No approach to reach all sites of work.
vii)	Right of way problem and public resistance.

### 3. Approach & Methodology:

Power Development Department and Power Grid of India Limited (PGCIL) were approached to divert/modify electrical over head crossings as a deposit work within a fixed period to clear the Railway Track alignment. PDD (M&RE) did not agree to take-up this huge work as deposit work. Then, it was decided that the work would be done by IRCON/Railway under the supervision of Nodal Officer appointed by PDD (M&RE). The crossings up to 33 kV were modified/diverted by procuring the material and the execution contract was done by IRCON. These were modified by providing double circuit under-ground cables with 4- pole structures on either side of the track alignment.

For diversion/modification of 400 kV/220 kV/132 kV Crossings, Power Grid (PGCIL) and Power Development Department (PDD)/S&O agreed to execute the work as deposit work. Diverted alignment of these Crossings were surveyed and submitted by respective agencies to Northern Railway for approval. While approving the proposed alignments, these were examined to reduce the route lengths in order to save cost of construction of diversions lines.

During the execution of the work, lot of public resistance and right of way problems were faced. To resolve the right of way problems, the alignments of 400 kV Crossings were re-visited and some of the crossings were realigned and few Crossings were raised at existing location by obtaining the dispensation for Regulations of Electrical Crossings-1987.

As a result Rs 2323.23 Lac was saved for 400 kV Crossings.

Similarly, out of 3 nos 220 kV Crossings, alignment of one crossing was revisited and realigned. For modification of 132 kV Crossings by PDD/S&O, right of way issues cropped up which were resolved by negotiating with local public.

It was very difficult to get the shut down for long duration on 400 kV, 220 kV and 132 kV transmission lines for diversion of these Crossings. To resolve these problems, an Emergency Restoration System (ERS) was used during the construction stage to minimize the time of shut down.

15 Railway stations were planned in Quazigund-Baramulla section. For 5 Railway stations, 33 kV Power Supply and for 10 Railway stations, 11 kV Power Supply through independent feeders were taken from PDD (M&RE) to have reliable Power Supply from State Govt. , as against the existing practice of availing connections at LT on way side stations and 11 kV on major stations.

### 4. Integrated Power Supply Scheme:

In January, 2007, electrification of USBRL Project was approved 'in principle' by Railway Board for which tentative Traction Power Supply scheme was finalized with concept of Integrated Sub-stations feeding to requirement of General Services & Tunnel Ventilation systems and feeding to 25 KV AC Traction systems. In this scheme, 2 Traction Sub-stations at Budgam and Baramulla and 3 Integrated Sub-stations at Lower Munda (Quazigund), Sangaldan and Reasi were planned, which have since been changed, to two Integrated Sub-station at Reasi and Sangaldan, since power supply for General Services have been availed in Banihal-Quazigund section.

Keeping in view very difficult terrain between Katra-Banihal where 33 kV Power Supply for general services requirement from PDD is not easily accessible, Integrated Sub-stations have been planned for taking 33 kV Power Supply for portal Sub-stations for general services and Tunnel Ventilation . The Power Supply tapped from 132 kV/33 kV Integrated Sub-station will be transmitted by 33 kV cable net-work through the Tunnels and Bridges. This will be further stepped down to 11 kV and used for the various Tunnel Ventilation, E&M and Safety systems and other general services requirements.

### 5. Outcome:

Based on the experience on this project, Railway Board had issued policy guidelines vide Railway Board's letter No 2008/Elect/ (G)/150/22 dt 21.04.2009 for all new projects and for the stations to be upgraded, to obtain 33 kV/11 kV Power Supply from State Electricity Board in place of LT connections and go for Integrated Sub-stations at 132 kV/33 kV with a view to having reliability and eliminating low voltage problems.

### 6. LT Distribution:

No Over Head Distribution lines have been used for Quarters and Service buildings at Railway stations on this project. All 33 kV, 11 kV and LT Net work have been laid through under-ground cables which is reliable as the break-down on account of birdage, kite flying, damage of insulators by stone throwing, breakage under snowfall etc have been eliminated. It has also improved ambience aesthetically. For this initiative also, Railway Board has issued the guidelines, for laying of under-ground cables for new constructions in place of Over Head lines in residential and Service buildings areas.

### 7. Conclusion:

The above initiatives have not only improved the electrical systems on this project but also eliminated many maintenance problems, improved reliability of systems, resolved right of way problem and achieved economy besides having issued policy guidelines by Railway Board.



By  
**R.K. Chaudhary**  
Chief Electrical Engineer/USBRL

The series will continue. In next issue Tunnel Ventilation and E&M System of T-80 will be covered and further issue SCADA system for Tunnel T-80 will be covered.

# DEVELOPMENT AND SELECTION OF TYPE OF BRIDGE

## 1. Introduction

**“This topic covers the selection of type of bridge, introduction of bridge , special design features and the team involved in the construction of Chenab Bridge”**

The Indian Railways has undertaken a mega project of construction of a new Railway line in J&K state from Udhampur to Baramulla. The alignment is a culmination of large number of Tunnels and Bridges in highly rugged and mountainous terrain with most difficult Himalayan Geology. The alignment crosses deep gorges of Chenab River near 11 km upstream of Salal Hydro Power Dam, located in Reasi District of J & K.

Being the alignment near upstream of the Dam and initially lack of accessibility to the bridge site, selection of type of the bridge to be constructed there was a great challenge to this project team; because of too much height of formation level as well as span.

Earlier such a mega bridge on the most typical geology was not constructed in India and therefore, engineers were very cautious about selection of type and shape and span arrangement of the bridge. On this issue, a number of meetings were held to discuss the various alternatives. At the last, a brain storming session comprising of experienced Civil Engineers available in India, including Professors of IITs and Roorkee, was organized on to decide the type, shape and span arrangement of the bridge. Consequently, steel structure in Arch over river Chenab was the most preferred choice of the members owing to steel’s ability to absorb earthquake forces without damage unlike concrete structure. The thrust of the arch also stabilizes the side slopes of the river. It is easier to construct, maintain and rehabilitate the steel structure compared to other structures.

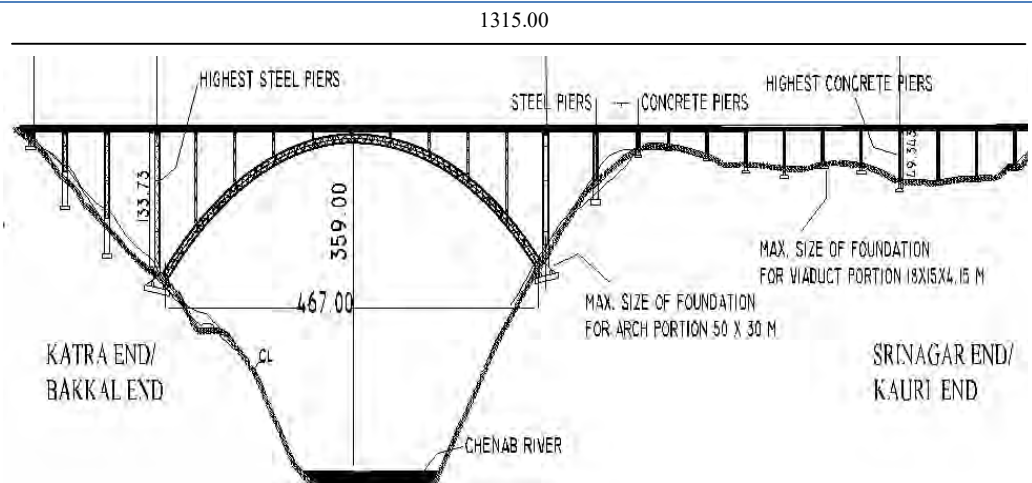


## 2. Longitudinal section of Chenab Bridge and Span Details:

Span arrangement from

**BakkalEnd: 55M + 2 X  
65M + 10 x 48M + 65M  
+55M + 40M + 9X50M +  
40M**

Height of bridge from bed level of Chenab River to Formation level is 359.0 M. It will be the highest Railway Bridge in the world from the river bed once constructed. Span over the river will be steel in Arch having span 467 m between supports P40 (left slope) and P50 (right slope). Foundations of P40 and P50 rest on fractured thinly bedded & jointed Dolomitic Limestone which has been the major concern of stability issues since the inception of the bridge. Keeping this in mind, more detail study like Global stability of left and right slopes is being carried out to know the long term stability of the slopes.



## 3. Salient Features of Chenab Bridge:

1. Total length of the Bridge	:	1315 meters
2. Design Loading	:	MBG loading 1987
3. Design life of the bridge	:	120 years
4. Design speed	:	100 Kmph
5. Height of Bridge (river bed to formation)	:	359 m
6. Main Arch Span	:	467 meters
7. Total steel fabrication	:	25000 MT
8. Design Wind Velocity (at deck level)	:	266 kmph
9. Geology of terrain		
Slope along Katra side bank	:	+35 to 50 degrees
Slope along Kauri side bank	:	vertical to sub-vertical)



By  
**Kamlesh Kumar**  
Deputy Chief Engineer/Chenab Bridge/USBRL

#### 4. Unique Design Features:

- a. **Use of Concrete filled trusses:** A steel arch is comparatively very light and would face stability problems against wind as maximum wind pressure at Deck level recorded was 150 kg/m<sup>2</sup>. Concrete filled trusses will help in improving stability of the arch, and also give benefit of composite action between the steel arch and filled concrete thereby making the design more efficient. This feature is being used for the first time in India. In this regard, a mock up trial of 9.0 m segment of Arch section was conducted at the site in March, 2010 under supervision of Technical Advisory Group (TAG) comprising of eminent Civil Engineers. They suggested to fill high slump concrete in the Arch Box and established the composite action between filled concrete and Arch through studs fixed inside surface in the box.
- b. **Structural Redundancy:** This Bridge is vulnerable from security point of view as any damage to the bridge will not only cut off the link between two regions of Jammu and Kashmir but is also likely to provide wide publicity to the anti-social elements. Hence a provision has been made in the design for the following situations:-



- If an element is removed either from truss of the arches or from steel spandrel columns it would still be possible to run the traffic over the bridge at a restricted speed of 30 kmph.
- If one of the columns/steel Pier collapses, the deck would not collapse. It would be possible to restore the bridge for normal operation after carrying out required repairs.

- c. **Blast load:** The Bridge is designed for the Blast Load also. No standard code for Blast load on steel structure is available in the world. Therefore, design criteria for Blast load was decided after conducting study on the model of M S Plate of different size and thickness supported on two I section with different inter separation distances. The explosive charge was detonated at a distance from I section. The response of the metal plate was determined using Autodene 3D software. Accordingly, parameters for design were decided by the committee set up for the study.

#### 5. Project Team: Agencies involved in the construction of Chenab Bridge are as under:

- Client : Konkan Railway Corporation Limited, Mumbai
- EPC Contractor : AFCONS - ULTRA- VSL JV (M/S CBPU)
- Design Consultant : M/S WSP (Finland) for all work, except Arch and LAP (Germany) for Arch design
- Proof Consultant : M/S URS and Flint & Neill Ltd (United Kingdom) - JV

#### Other agencies engaged by the EPC Contractor are as under:

- ✓ Third Party Inspection : IRS
- ✓ Geotechnical Consultant : IISc Bangalore - NIRM (Kolar), IIT Delhi
- ✓ Welding Consultant : Welding Research Institute, Trichi
- ✓ Wind Tunnel Testing : Force Technology (Denmark)
- ✓ Pylon : Designer - M/S VCE Consultant (Austria)
- ✓ Manufacturing and supplier of Cable crane - M/s SEIK (Italy)
- ✓ Painting Scheme : Central Electro-Chemical Research Institute, Karaikudi, RDSO and IIT Mumbai



# Some of the World's Longest Arch Bridges



## The Chaotianmen Bridge

**Status:** world's longest arch bridge.

**Type :** Road-rail bridge

**Type of Super-structure :** continuous steel truss arch bridge with tie girders

**Span Configuration :**

Main span of 552 meters (1,811 ft) and a total length of 1,741 m (5,712 ft).

**Carriageway/Track :**

Carries 6 lanes in two ways and a pedestrian lane on each side on the upper deck, and dual light rails in the middle and 2 traffic lanes on each side on the lower deck.

**River :** Yangtze River

**City:** Chongqing, China.

**Opened :** 29 April 2009



## The Lupu Bridge

**Status:** World's second longest arch bridge.

**Type :** Road-bridge

**Type of Super-structure:** The Lupu Bridge is a steel through-tied box-girder arch bridge and it is also the only steel arch bridge in the world to be completely welded.

**Span Configuration :**

Main span of 550 meters (1,804 ft) and total length of 3,900-metre (12,795 ft)

**Carriageway/Track :**

The bridge carries 6 lanes of the South-North Elevated Road, 3 lanes in each direction.

**River :** Huangpu River

**City:** Shanghai, China.

**Opened:** June 28, 2003.

**Cost** \$302M, US

## The Bosideng Bridge

**Status :** the third longest arch bridge in the world, after completion

**Type :** Highway bridge

**Span Configuration:** span of 530 m (1,740 ft).

**River :** Yangtze River; **City :** Hejiang County, Sichuan, China

**Opened :** under construction



By  
Hussain Khan  
Executive Engineer/D-II/USBRL/Project



### **New River Gorge Bridge**

**Status:** World's fourth longest arch bridge.

**Type:** Roadway-bridge

**Type of Super-structure:** The Bridge is a steel girder arch bridge and the members are held together with rivets.

**Span Configuration:**

Main span of 518.2 meters (17, 00 ft) and total length of 924-metre (3030 ft)

**Carriageway/Track:**

The bridge carries 4 lanes with central divider.

**River:** New River Gorge

**City:** WestVirgiana, United states.

**Opened:** 22 Oct., 1977.

**Cost** \$37 M, US



### **Bayonne Bridge**

**Status:** World's fifth longest bridge. Longest in the world at the time of its completion.

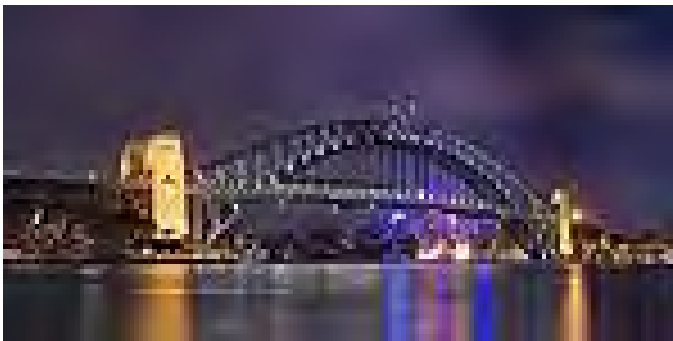
**Type:** Roadway-bridge; **Type of Super-structure:** Two Hinged spandrel-braced trussed arch.

**Span Configuration :**Main span of 510.54 meters (1,675 ft) and total length of 1762-metre (5780 ft)

**Carriageway/Track:** The bridge carries 4 lanes of the NY 440 and NJ 440.

**River:** Kill Van Kull Strait.**City :**New Jersey, USA.

**Opened :**November 15, 1931; **Cost** \$13M,US



### **Sydney Harbor Bridge**

**Status:** world's sixth longest spanning arch Bridge. **Type :** Road-Rail bridge; **Type of Super-structure:** The Bridge is steel through arch bridge and the bridge is held together by rivets.

**Span Configuration :**Main span of 503 meters (1650 ft) and total length of 1149-metre (3770 ft)

**Carriageway/Track:** The bridge carries 4 lanes of road traffic, 2 Tram tracks and two Railway Tracks.

**River:** SydneyHarbour.;**City:** Sydney, Australia.

**Opened:** 19 march1932.

**Cost** AU£ 6.25M,



### **Chenab Bridge**

**Status :** world's Seventh longest spanning arch bridge (after Completion)

**Type :** Rail bridge

**Type of Super-structure:** Through concrete filled truss steel arch Bridge.

**Span Configuration :**Main span of 467 meters (1532 ft) and total length of 1315 meter (4315 ft)

**Carriageway/Track:** The bridge is 17 meter wide (over arch), carrying single line Railway Track.

**River:** ChenabRiver.**City :**Katra, India.

**Opened :**under construction ; **Cost** :Rs 5120 M,



#### **Wushan Bridge**

**Status:** world's eighth longest spanning arch bridge. (present)

**Type :** Road Bridge

**Type of Super-structure:** Concrete filled steel tube arch Bridge.

**Span Configuration :**

Main span of 460 meters (1510 ft) and total length of 616 meter (2021 ft)

**Carriageway/Track:** The bridge carries 4 lanes of road traffic,

**River:** Yangtze River.

**City** Chongqing, China.

**Opened :** 2005



#### **Miugzhou Bridge**

**Status:** world's ninth longest spanning arch bridge.

**Type :** Road Bridge

**Type of Super-structure:** Double leg half through Steel box arch Bridge

**Span Configuration:** Main span of 450 metres (1476 ft) and total length of 650 metre (2132 ft).

**River :** Yongjiang River.

**Location** Ningbo (Zhejiang) china.

**Opened :** 2011



#### **Zhijinghe River Bridge**

**Status:** world's tenth longest spanning arch bridge (World highest road Arch bridge with 294 m high).

**Type :** Road Bridge

**Type of Super-structure:** Concrete Filled steel tubular arch Bridge.

**Carriageway/Track:** The bridge carries G-50 Shanghai-Chongqing expressway.

**Span Configuration:** Main span of 430 metres (1411 ft).

**River:** Zhijinghe River.

**Location** Hubei Province china.

**Opened :** 2009



#### **Xinguang Bridge**

**Status:** world's eleventh longest spanning arch bridge.

**Type :** Road Bridge

**Type of Super-structure:** steel arch Bridge.

**Span Configuration:** Main span of 428 metres (1404 ft).

**River:** Zhu Jiang River.

**Location:** Guanzhou, Guangdong, china.

**Opened :** 2008

**Cost:** 48 M \$.

# Quake, Tremor or Temblor

## SYNOPSIS

Earthquakes have always been a cause of concern for civil engineers, because of their devastating nature and the challenge they impose on the designer to design a civil structure that is capable of withstanding the energy and forces released during the event. In general, the word earthquake is used to describe any seismic activity – natural or man generated – generating seismic waves. Major cause of earthquake is the fault rupture along the interacting tectonic plates; however a land slide, volcanic eruption, mine blast or a nuclear test can also cause an earthquake. At the earth surface earthquake are noticeable by ground shaking and if the intensity is severe then by ground displacement. When they originate offshore, they manifest themselves in the form of tsunami. Earthquakes are random phenomenon and impose challenge to Engineers. An attempt has been made through this paper to describe most about earthquakes. The paper will be presented in four series each covering following aspects.

Part 1: Causes and origin of earthquake

Part 2: What happens during an earthquake?

Part3: Quantification and simplification of an earthquake event.

Part 4: Concept behind design of structures to resist an earthquake event.



Bhuj, India, earthquake of January 26, 2001. . As many as 15,000 people might have died in the massive quake



The magnitude 6.2 quake hit the island on Sunday (June 2), damaging roads and infrastructure

## PART 1 CAUSES AND ORIGIN OF EARTHQUAKE.

### I. Introduction

This part mainly deals with geodynamics and geology, to understand causes and occurrences of earthquakes a brief review of following three theories/principles is essential.

- Principal of isostasy
- Continental drift theory
- Plate tectonic theory
- Elastic rebound theory.

(This will be covered in part II as this is more related to ....what happens during an earthquake event?)

But before discussing these theories/principles, let's have a quick look on earth's structure or geodynamics.

If the earth is cut into two sections as shown in the figure 1, its inner can be broadly divided into three zones, a) core comprising molten heavy metals, predominantly iron and nickel, b) mantle, earth mantle is 2900Km thick and mainly consists of silicate rocky shell, c) the outer most shell is called crust. There is no clear demarcation between crust and mantle rather there is a gradual transition. The crust and the uppermost mantle, which constitute the hard and rigid outer layer of the Earth is called lithosphere.

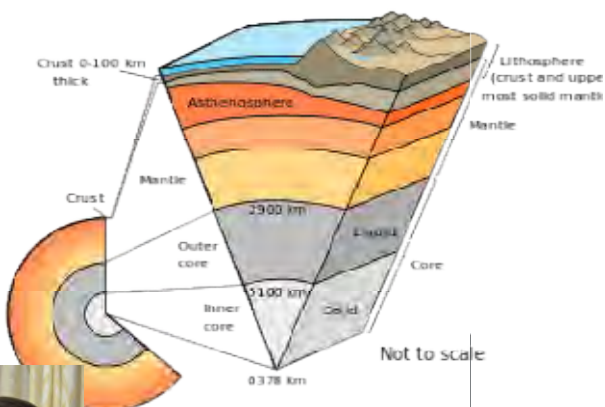
Part of the upper mantle that is hot and weak is called asthenosphere. The only difference between lithosphere and asthenosphere is in the way they behave in response to stress. The lithosphere remains rigid in response to stress, during very long period of geological time it deforms elastically and failure is brittle whereas the asthenosphere deforms viscously and accommodates deformation through plastic strains. The lithosphere is segmented into tectonic plates.

### 2. PRINCIPAL OF ISOSTASY.

(Isos means static; tacy means standstill)

The general term 'isostasy' was coined in 1889 by the American geologist Clarence Dutton. In short it means presence of plastic zone beneath earth crust. It can also be interpreted as Earth crust (i.e. the lithosphere) is floating over the mantle (i.e. the asthenosphere).

(Video on principle of isostasy is available on internet at following hyperlink: <http://bcove.me/cdpcc14v>)



By  
Sangrah Maurya  
Deputy Chief Engineer/Design/USBRL Project

- ✓ The crust and the uppermost mantle, which constitute the hard and rigid outer layer of the Earth is called lithosphere.
- ✓ Part of the upper mantle that is hot and weak is called asthenosphere

### 3. CONTINENTAL DRIFT THEORY

Let's have a look at world's map, shown in Fig 2. Let's separate the three continents North America South America and Africa as shown in fig 3 and let's try to solve a jig saw puzzle. Well the shapes of the continents seemed to fit together, fig 4. Continents of the world have not always been in the same place. The continents have "drifted" to their present locations over millions of years". But what about the other continent that do not fit perfectly. A better fit is found by matching the continental shelves (original shorelines that are now underwater)



Fig 3



Fig 4



Fig 2

Speculation about the drift was first put forth by Abraham Ortelius in 1556. The concept was independently and more fully developed by Alfred Wegener in 1912. This theory is supported by the plate tectonics, which explains how the continents move (explained in the subsequent paragraphs).

- Alfred Wegener proposed the theory of **continental drift** in early 1900's
- Wegener's theorized that all the continents were once a single landmass. He named this single large continent as Pangaea, and published his work in a book, "The origin of Continents and oceans". Unfortunately, Wegener's ideas were sidelined. During that time Austrian Edward Seuss proposed the theory of 'baked apple' earth. He hypothesized that when the Earth cooled down, its surface wrinkled like a baked apple.
- Though Wegener has the right idea but he could not explain the mechanism causing such a massive movement.

Various phases of continental drift are better described in graphical form in Figure 5 to 7 below:

Fig 5a presence of single continent: PanGaea 225 million years ago.

Fig 5b 200 million years ago

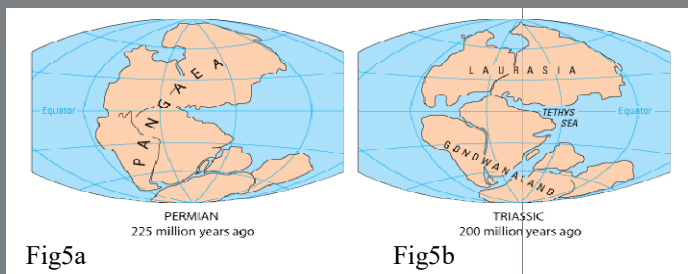


Fig5a

Fig5b

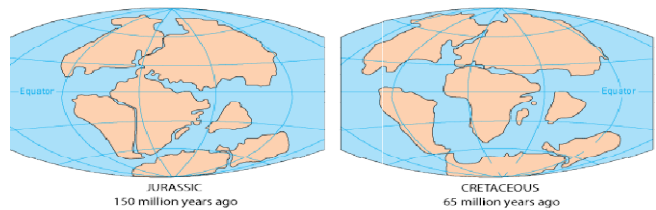


Fig6a

Fig6b

Fig 6a Jurassic era 150 million years ago

Fig 6b Cretaceous 65 million years ago.

Fig 7 Present days

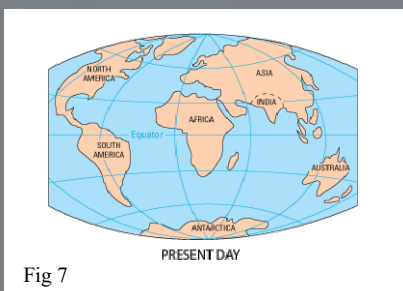


Fig 7

Wegener's theorized that all the continents were once a single landmass. He named this single large continent as Pangaea. (Pan means All, Gaea means Earth)

4. WHAT SUPPORTS THE CONTINENTAL DRIFT THEORY?

**A. EVIDENCE FROM LANDFORMS, FIGURE 8**

- The shapes of the continents seemed to fit together.
- Mountain ranges and other features also lined up
- **Mountain ranges** of one continent, end at coastline begin again at another continent
- Similarities between rocks of adjacent continents are evidence for continental drift.

**B. EVIDENCE FROM FOSSILS, FIGURE 9**

- Fossils from one continent matched fossils from other continents.
- Wegener used both plant and animal fossils.

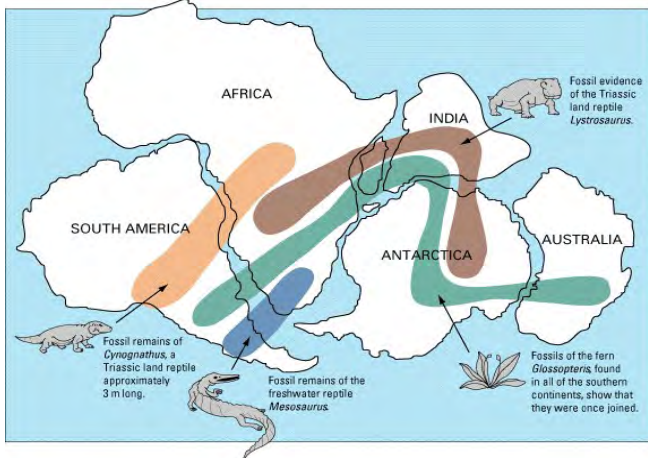


FIG 9

**C. SOURCES OF EARTHQUAKE FIG 11**

Sources of earthquakes if marked on global map are located along the boundaries of these continental plates. Earthquake zones and volcanoes follow a pattern. They occur along the boundaries (edges) of tectonic plates (form an outline).

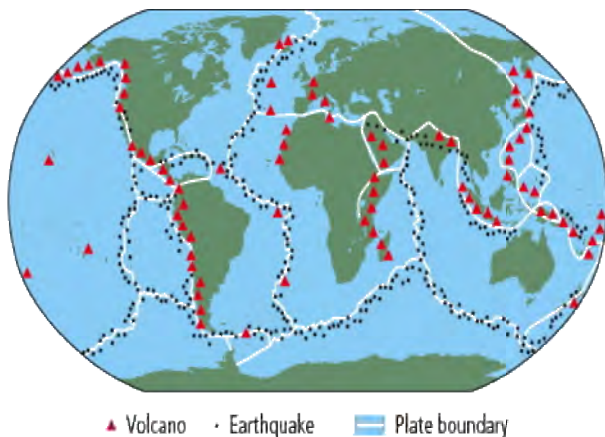


Fig 11



Fig 8

**D. EVIDENCE FROM CLIMATE, FIG 10**

When the glaciers retreat/ advance, they leave behind proof. Deeply scratched rocks (*striations*), U-shaped valleys, patterns of rock formations.

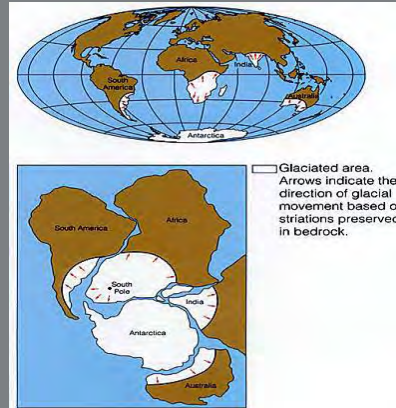
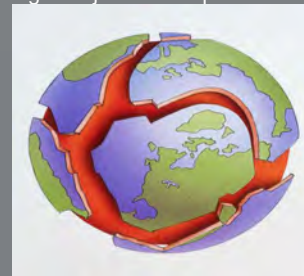


Fig 10

5. PLATE TECTONIC THEORY-HOW THE CONTINENT MOVED

The earth crust or lithosphere is broken into tectonic plates. On earth there are seven to eight major tectonic plates and many minor plates.



These plates are in motion; the *lateral relative motion of the plates* varies from zero to 100 mm annually.

- The current theory is that the continents moved due to the **movement of tectonic plates.**
- **Tectonic plates** = movable slabs of rock that make up the Earth

As already *explained* above lithosphere is cooler and more rigid, while asthenosphere is hotter and flows more easily. The basic principal of plate tectonic is that lithosphere is divided into separate and distinct plates, which rides on fluid like asthenosphere.

Figure12 on next page shows major plates of earth and arrow indicates their relative motion.

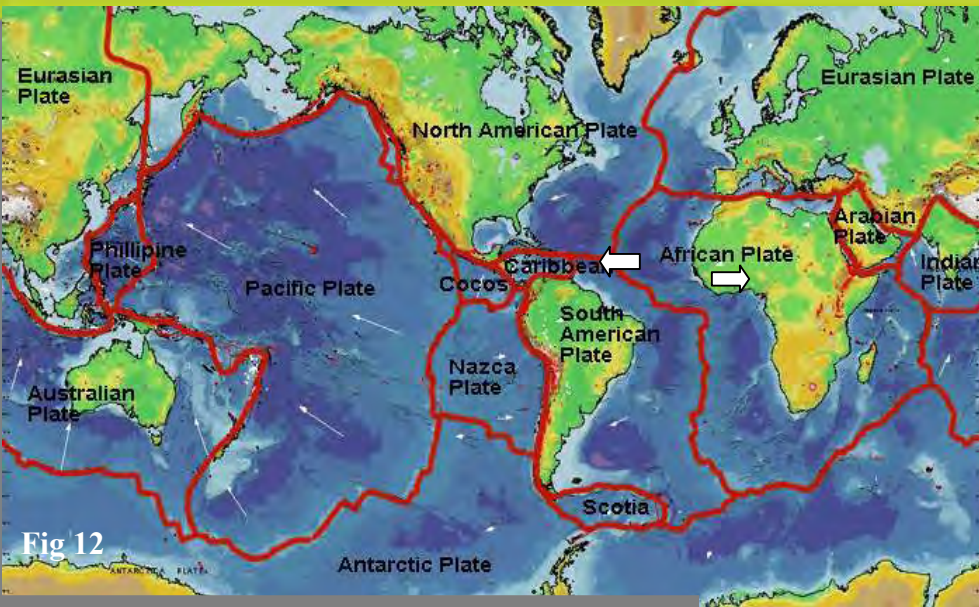


Fig 12

Sub-duction is defined as a process that takes place at convergent boundary, by which one tectonic plate moves under another tectonic plate and sinks into the mantle, point A in figure below

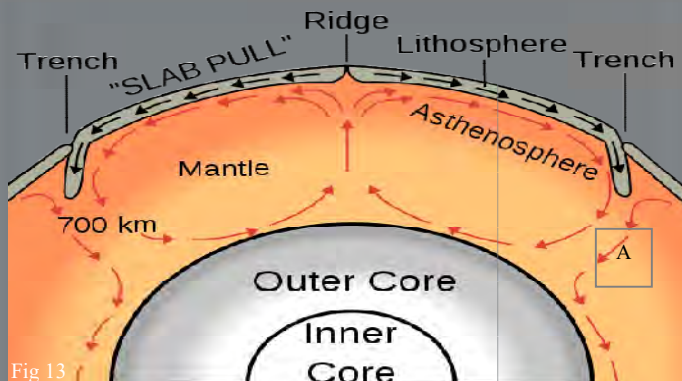


Fig 13

**TRANSFORM FAULTS OR BOUNDARIES:** When plates slides or rub against each other then they are called transform boundaries e.g. San Andreas fault in California. These are also called as conservative fault as they neither create nor destroy Lithosphere. These faults end abruptly and are connected on both ends to other faults, Figure 14.

**DIVERGENT BOUNDARIES: (Constructive as new crust is created):** when plates slides apart from each other e.g. mid ocean ridges. Divergent boundaries within continents produce rift which produces rift valley they also form volcanic island as molten lava rises to fill the gap created as plates move apart.

**CONVERGENT BOUNDARIES (Destroyed as crust is lost):** when two plates slides towards each other forming either a sub-duction zone (if one plate moves underneath the other plate) or continental collision (if the two plates contain continental crust). As a result of pressure, friction and plate material melting in the mantle, earthquake and volcanoes are common near convergent boundaries. (e.g. Himalayas)

**PLATE BOUNDARY ZONES** occur where the effects of the interaction are unclear and the boundaries are not well defined or may show various movements in different events. Figure 14 on next page shows possible location of all such faults

## 6. WHAT DRIVES THE PLATES?

Many theories have been proposed as the driving cause of plate tectonic, like driving force of plate motion, driving force related to mantle dynamics, driving force related to gravity, driving force related to earth rotation. Mantle convection is the leading theory and deliberated in this article, matter on other theories is available on internet.

This theory was proposed by Arthur Holmes in 1930. The temperature of the inner core of earth is about 8000°C, whereas the temperature of outer asthenosphere is about 2000 °C. Temperature difference causes convection currents within the mantle. The lighter and hotter matter of mantle towards the core is carried upwards due to difference in density and buoyancy effects. The matter cool as it rises and the denser and cooler matter sinks causing convection currents. The frictional drag between the convection current in asthenosphere and rigid overlying

lithosphere causes the plate motion Figure 13. Convection currents exert a downward drag force on plates at sub-ductionzone (marked 'A' in fig 13). Temperature as cause of density variation in mantle is one factor in fact 2D and 3D imaging of Earth Interior has shown lateral density variation of mantle, this variation could be due to presence of varying nature of rock, minerals or due to thermal variation.

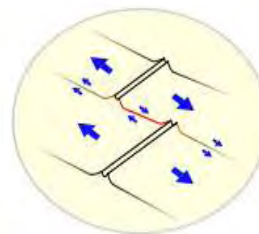
How exactly, mantle convection effects the plate movement is a matter of ongoing study and deliberation in the field of geodynamics. As per the assessment made by scientist as on date there are essentially two type of forces that influence the plate motion.

**BASAL DRAG:** Plates are driven by the friction between the convection current in the asthenosphere and the more rigid overlying floating lithosphere.

**SLAB SUCTION** convection current exerts a downward frictional pull on plates as they are driven into the mantle.

This theory has also been debated recently more information on the subject is available on internet.

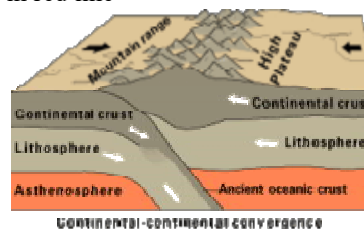
Now we know that there are plates and they are in motion relative to each other. Depending on the motion of these plates relative to each other, boundaries can be classified into following type.



Transform Fault shown in red line



Rift Valley Divergent plate



Convergent boundaries  
Figure 14

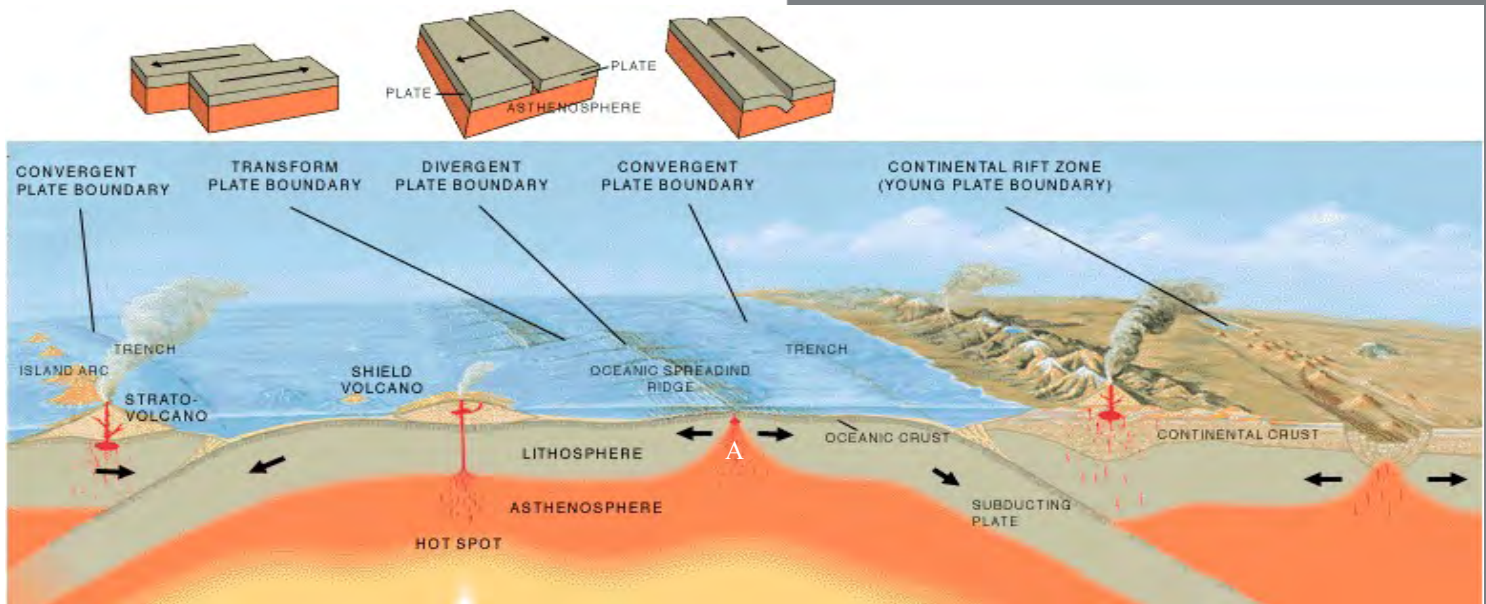


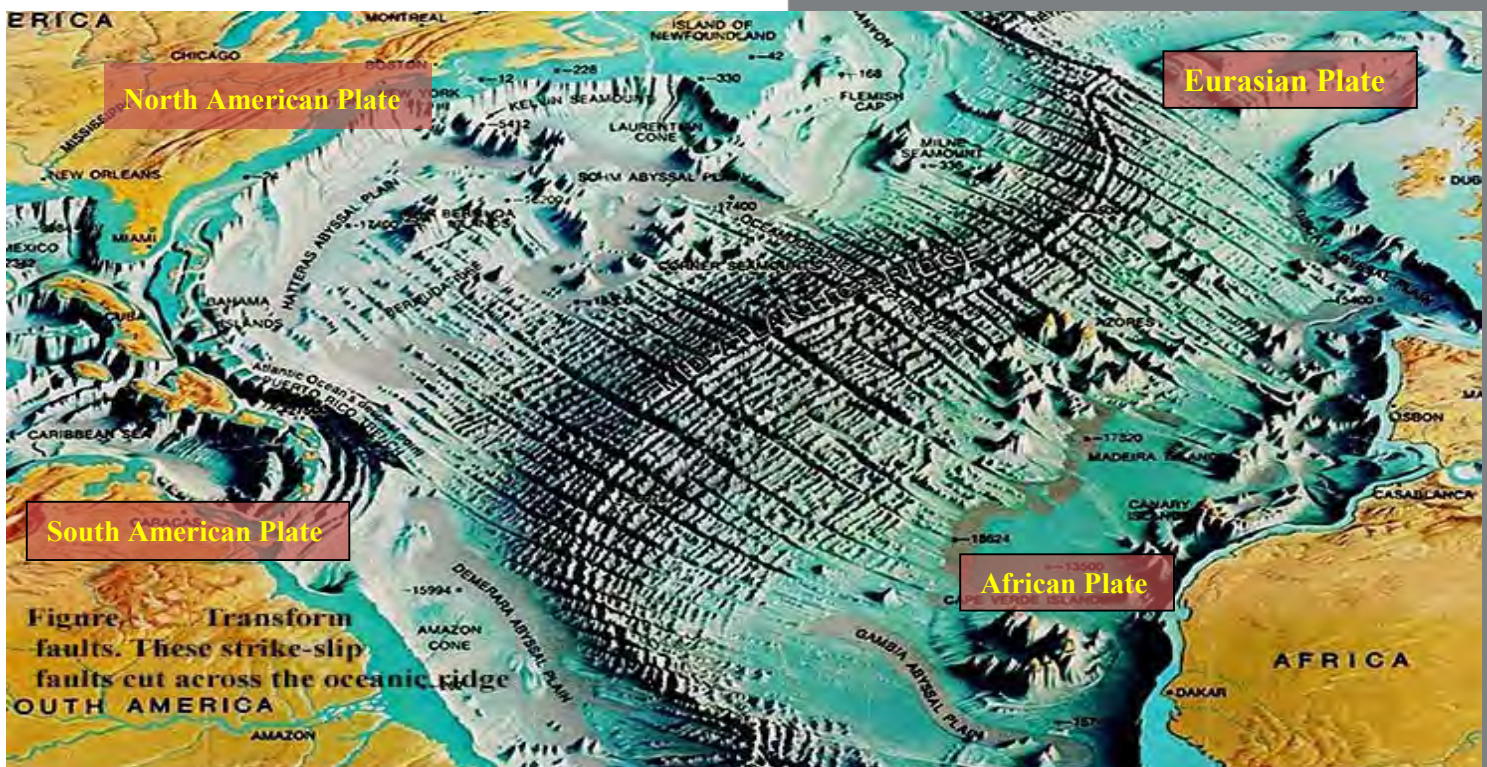
Fig 14

7. EXAMPLE OF DIVERGENT FAULT: MID ATLANTIC RIDGE

- ✓ Figure below shows the boundary between two oceanic plates, the African and South American plate (in the southern Atlantic basin) and the Eurasian and North American plates (in the northern Atlantic basin) kindly also refer to fig no 12 above. The two plates are moving apart, hence constitute the Divergent Boundary. Two plates are

moving apart, this result in thinning of crust at the boundary, the magma from mantle due to convection current results in uplifting of seafloor and also emerges as lava (point A in fig 14 above), creating new crust/Ridge upon cooling.

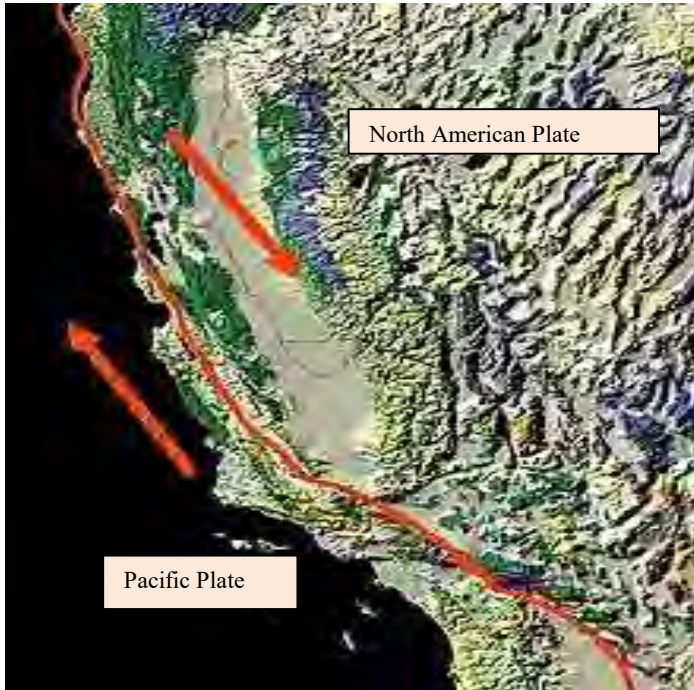
- ✓ The reverse S shape ridge is basically Divergent Boundary and lines perpendicular to the ridge are transform faults.





## 8. EXAMPLE OF TRANSFORM FAULT

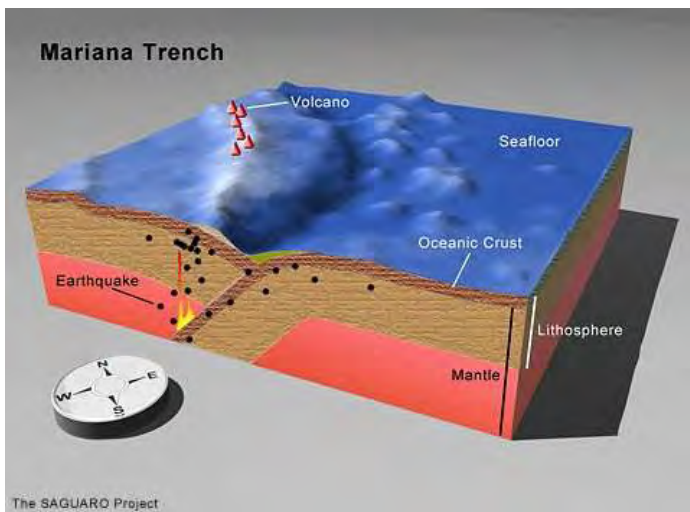
- ✓ San Andreas is a transform fault and extends roughly 1300 Km. it forms a tectonic boundary between North American Plate and Pacific Plate. This fault is responsible for notable earthquake of magnitude up to 7.9 in California (Fig below)



San  
Andreas  
Fault

## 9. EXAMPLES OF CONVERGENT PLATE

The collision between the Eurasian Plate and the Indian Plate that is forming the Himalayas



Mariana trench located in the western Pacific Ocean east of Marian Island forms boundary between the Pacific Plate and the smaller Mariana Plate. This is the deepest part of the world's ocean. The Pacific Plate is the largest of the tectonic plates and also very dense, therefore its great height difference in comparison to the Marina Plate( that is placed higher due to less thickness : principal of isostasy lighter material floats higher and dense material floats submerged)results in sub-duction of Pacific Plate.

## 10. Earthquakes

After having understood geodynamics in brief, let's get back to our main topic i.e. Earthquake.

***“Earthquake or quake or tremor or temblor describes a seismic event either natural or man generated that generates seismic waves. These are caused mainly by rupture of geological faults, but other events like volcano, landslide or nuclear test may also cause earthquake.”***

As seen above the plates move past each other along the fault line. Had the common boundaries of these plates been smooth then the plates could have drifted past against each other without any resistance. Unfortunately most fault surfaces have irregularities or asperities along their surface, which results in high frictional resistance along the fault plane or even locking. If the fault is locked, whereas there is continuous relative motion between the plates, leads to stress accumulation which is stored as strain energy in the volume around the fault plane. As the plates moves the stress accumulates until it touches the threshold value causing breaking of asperity. This breaking of asperity results in sudden sliding along the fault line and release of all accumulated strain energy.

Energy is released in many forms like frictional heat, noise, cracking of rocks and elastic strain seismic waves. It is estimated that only 10 % of an earthquake's total energy is radiated as seismic energy, most of the energy is consumed in initiating the earthquake fracture growth.

In contrast to the common myth that the earthquake is a point mechanism, originating and culminating at the focus/hypocenter, they are actually spread along the fault line. Their occurrence is better described by Stick-slip phenomenon described in part II of the paper. Slip at fault is triggered by a point along the fault line reaching the threshold of stress level first, this act as a catalyst and triggers the slip of adjoining points. In this chain reaction the strain energy stored in the media around the fault plane is released in time frame varying from fraction of seconds to few seconds. Some part of this energy is dissipated in the form of radiating elastic strain seismic waves that are perceived at a distant place as earthquake waves.

.....to be concluded

Myth about causes of earthquake.

- ✓ Earth has been balanced on one of the horns of holy cow. Tired of holding the earth on one horn the cow shifts the earth to her other horn. This is done by bouncing the earth from one horn to other. This bouncing causes earthquake.
- ✓ Poseidon, cause and God of earthquake in Greek mythology, struck the ground with a trident when he is in bad mood. This causes earthquake. He also uses earthquake to punish and inflict fear upon people as revenge
- ✓ In Japanese mythology, Namazu is a giant catfish which causes earthquakes. Namazu lives in the mud beneath the earth, and is guarded by the god Kashima who restrains the fish with a stone. When Kashima lets his guard fall, Namazu thrashes about, causing violent earthquakes.
- ✓ In Norse mythology (North Germany), earthquakes were explained as the violent struggling of the god Loki. When Loki, god of mischief and strife, murdered Baldr, god of beauty and light, he was punished by being bound in a cave with a poisonous serpent placed above his head dripping venom. Loki's wife Sigyn stood by him with a bowl to catch the poison, but whenever she had to empty the bowl the poison dripped on Loki's face, forcing him to jerk his head away and thrash against his bonds, which caused the earth to tremble



## SOME FACTS

### Asperity

Defined as unevenness of surface, roughness, ruggedness

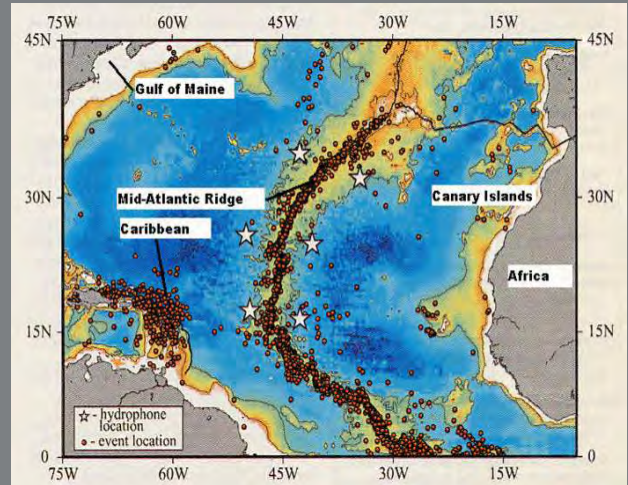


Image of the northern Atlantic Ocean showing the Mid-Atlantic Ridge and recorded seismic (earthquake) event locations. From 1999-2002, approximately 8,000 earthquakes were recorded, mostly along the Mid-Atlantic Ridge

### TNT EQUIVALENT OF EARTHQUAKE MAGNITUDE

Magnitude	TNT equivalent	Example
0.00	15 g	100 firecrackers
0.20	30 g	hand grenade
0.50	85 g	
1.00	480 g	
1.20	1.1 kg	stick of dynamite
1.50	2.2 kg	
2.00	15 kg	
3.00	480 kg	1-ton bomb
3.87	9.5 metric tons	Explosion at Chernobyl in 1986
4.00	15 metric tons	
5.00	480 metric tons	
6.00	15 kilotons	Little Boy Atomic bomb dropped on Hiroshima
7.00	480 kilotons	
7.50	2.7 megatons	Equivalent to all bombs used in WW2
8.00	15 megatons	
8.35	50 megatons	Tsar Bomb Largest thermonuclear weapon ever tested
9.00	480 Megatons	
9.50	2.7 gigatons	Largest earthquake ever recorded - Chile, 1960
10.00	15 gigatons	Thought to be impossible
12.55	100 teratons	Approximate energy of the Yucatan Peninsula Impact killing the dinosaurs 65 million years ago. 31,554 times more powerful than a 9.5 earthquake.

Magnitude is in Richter scale, because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; in terms of energy, each whole number increase corresponds to an increase of about 31.6 times the amount of energy released, and each increase of 0.2 corresponds to a doubling of the energy released.

# Sangaldan Station in Tunnel

## Summary:

The presence of tunnels on either end of Sangaldan yard warranted wider section to accommodate loop lines within the tunnel. At the portal locations the geology is Murree formations with overlying debris 5-10 m high. The work of wider section tunnel was taken up by Conventional Method of tunneling. This is the first time that a two track wide section tunnel has been executed for USBRL Project. The paper explains the design and construction aspects regarding execution of this work.

## 1. Introduction:

The 945m long Sangaldan Station yard of Udhampur-Srinagar-Baramulla Rail Link project is in open cutting and located between chainage 92.370 and chainage 93.315. The maximum depth of cutting at certain locations on uphill side of the yard is ranging up to 55m. The yard including the adjoining tunnels pass through alternative bands of sandstone, siltstone, clay stone of Murree formation with overlying debris about 5-10 m high at the top.

At two ends of the yard, loop lines enter into the tunnels which necessitate wider section of tunnels to accommodate double lines. The 55m long wider tunnel T-40/41 from portal P-2 side has its portal at chainage 92/370m (Katra end). The rock cover above portal is about 16 m and there after it increases to 37 m up at chainage 92/300 m. Similarly the 70 m long wider tunnel T-42/43(Qazigund end) from portal P-1 side has its portal at chainage 93/315m. The rock cover above portal is about 19m and thereafter it increases to 37 m up at chainage 93/360m.

## 2. Design Details:

The design consultant, M/s SJVNL has provided design of supports and construction sequence for wider section tunnels having finished area of 87.96 m<sup>2</sup>. The design is worked out based on the consideration of rock mass of poor to very poor quality. The rock load for the given size of opening and geological conditions is estimated to be about 6.17 kg/cm<sup>2</sup> (i.e. equivalent to 28 m of rock load).

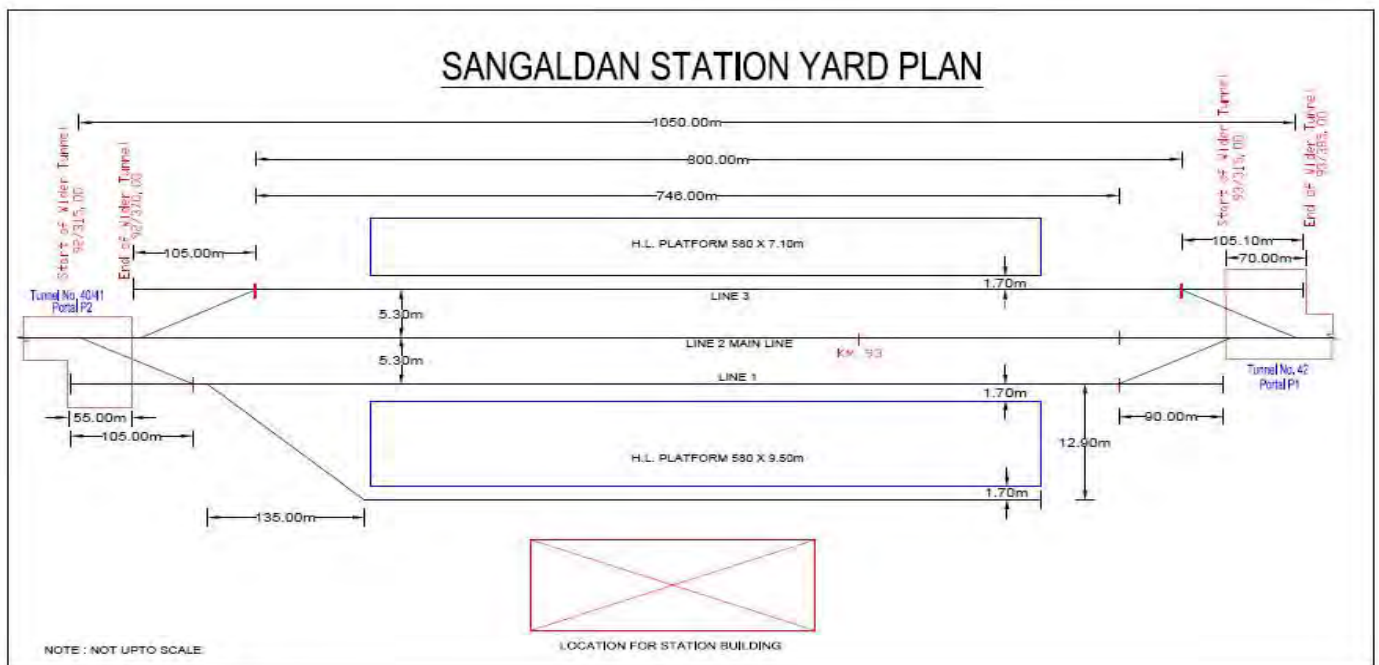
The support elements are described as below:

### 2.1 Collapse Prevention:

114.33 mm diameter steel pipes, 12 m long for support in advance are advised so that the collapse of rock and over break is prevented. Pipe fore poling umbrella at crown was proposed for the distribution of loads in the longitudinal direction. Ground improvement was suggested ahead of the tunnel face by pressure grouting.

### 2.2 Initial supports:

150mm thick plain shotcrete (M-25) with 2 layers of wire mesh or 150 mm thick SFRS immediately after excavation was proposed as initial support. 50mm thick shotcrete was advised to support face along with fiber rock bolts as per requirement.



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 DyChief Engineer  
 Konkan Railway Corporation Limited



**Rajesh Agarwal**  
 Executive Director/Projects  
 Konkan Railway Corporation Limited



### 2.3 Rock bolts:

Pattern rock bolts 32 mm dia., 8-10 m long were proposed at overt.

### 2.4 Steel Ribs:

Steel ribs ISHB 300 X 250 built up with additional flange plates (10mm thick and 300 mm wide) were proposed. The space between the ribs was required to be filled with backfill concrete or shotcrete using RCC lagging.

### 2.5 Temporary Concrete Invert:

Temporary concrete invert 30 cm thick was to be provided in the heading to close the supporting ring in 1<sup>st</sup> and 2<sup>nd</sup> stage of excavation. This was to be removed/sacrificed at the time of benching.

### 2.6 Final Support:

This was to be provided after the rock movements have stabilized. Reinforced Concrete lining 530mm thick is proposed for final lining.

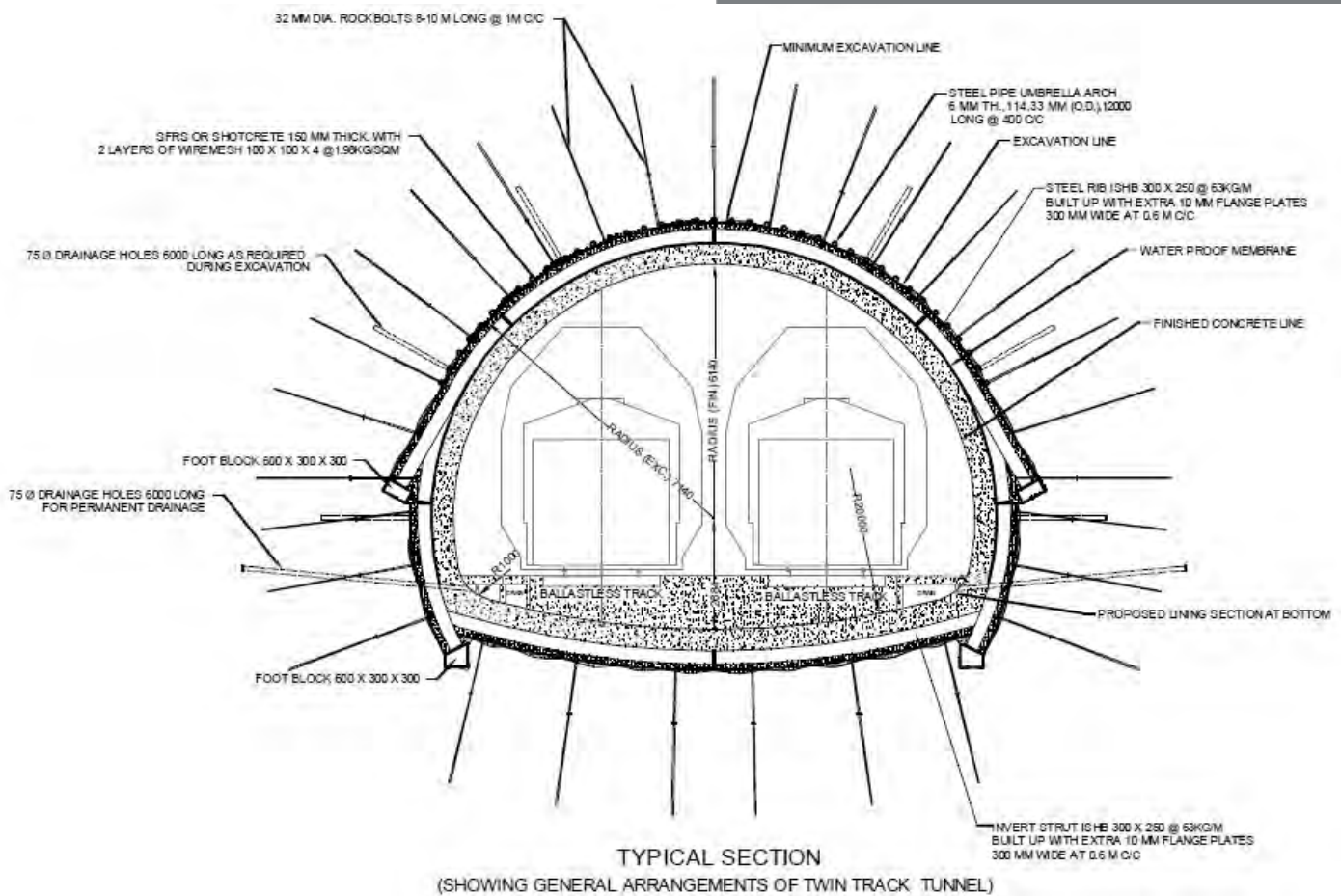
## 2.7 Drainage holes :

Being in Murrey formation comprising of Sandstone/Silt stone and Clay stones, significant seepage water was not expected in these tunnels. Drainage holes were to be provided as per requirement during construction stage. For the final stage, drainage holes are to be provided, near the base, for the release of sub-surface water.

The sequence of construction selected was such that over breaks and cavity formation is avoided by advance application of fore poles and immediate application of shotcrete and rock bolts so as to make a self supporting rock arch. The support system was to be further strengthened in stages by installation of steel supports. The space inside the steel ribs is to be backfilled with concrete. At the heading level, haunch support (elephant foot) and horizontal anchors were provided for the steel ribs so that these load bearing supports are not disturbed during benching. Invert steel struts were to be provided to close the supporting ring.

As the proposed steel ribs ISHB 300 X 250 were not available in the market, a built up section with ISHB 200 X 200 with 10 mm thick plate welded on both flanges was used. These sections were brought to required profile by cold bending method so that the steel property does not change. The sections became heavier for erection as compared to the sections used for single line tunnel with smaller ISHB, thus it warranted use of heavier crane for erection. The curvature of steel rib was maintained by measuring versine on inner surface with a 2 m overlapping chord along the profile at regular interval. After placing of concrete lagging between ribs and completing backfill concrete, next cycle was taken up.

The above advance was continued for 37m. Now the tunnel face was reaching the fragmented strata with overlying loose overburden material. Due to very poor strata a cavity was formed at this location which was subsequently grouted and filled from the top. Further excavation was carried out from outside i.e., P2 portal side, in heading and the break through of tunnel was achieved on 07<sup>th</sup> Mar 2013.



## 3. Challenges faced during Execution:

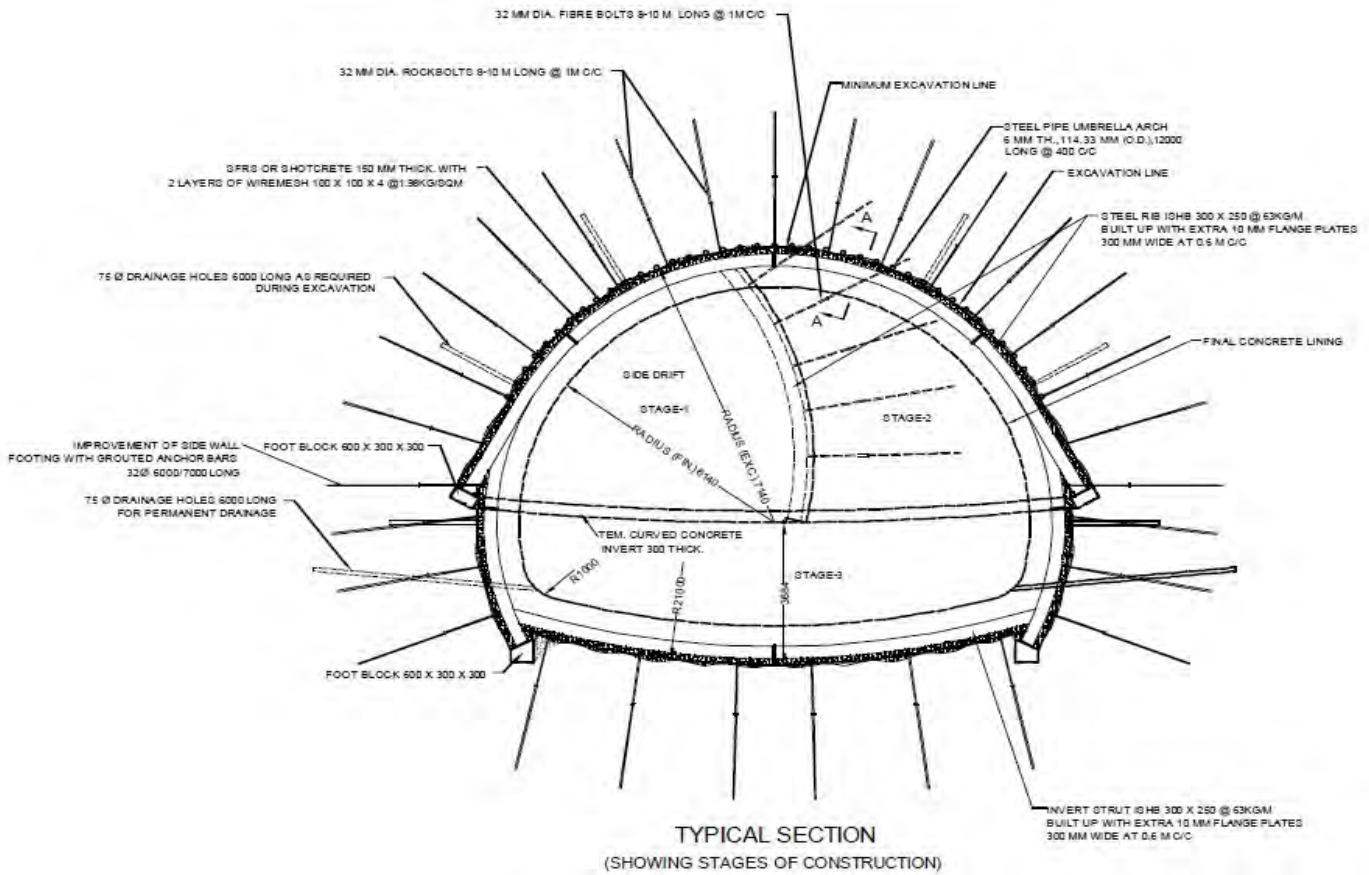
The main challenge was to execute the planned design for this wider section tunnels in very poor and unstable strata.

To start with, the work of tunnel no T40/41 continued through single track section from Katra end towards Qazigund direction, up to its interface with proposed wider section tunnel. Once this location was reached, the excavation for wider section was started in Heading for a length of 1.2 m to erect two ribs. After the fore poling, the excavation was carried out from left to right to achieve full width of tunnel. The excavated surface was shotcreted with steel fiber reinforced shotcrete (SFRS) to provide initial support. Subsequently, pattern rock bolts of 32 mm diameter of 8-10 m long were provided.

Having gained this experience, similar work was carried out from Portal P1 for tunnel T42/43. The strata here too were covered with slope debris. The excavation started in heading from outside at chainage 93/315m towards Qazigund side and first rib was erected on 6<sup>th</sup> March 2013

When the excavation reached chainage 93/322m, a huge cavity was formed leading to skylight on 20<sup>th</sup> of March 2013. This cavity was tackled from inside the tunnel as well as from the top by grouting and filling with concrete. The work proceeded in heading up to tochainage 93/385m which was interface of single-line and double-line section. The breakthrough in heading of tunnel T-42/43 is achieved on 27<sup>th</sup> August 2013. Further, the benching excavation of this tunnel was carried out from 4<sup>th</sup> September 2013 and completed on 5<sup>th</sup> October 2013.

The above works were completed under difficult conditions where in field engineers had to carry out certain modifications to the excavation scheme proposed by Design Consultants.



The gantry for RCC Lining of wider section tunnel is now mobilized and erected at site. The thickness of lining to be provided shall be 530 mm with double layer of steel reinforcement.

4. Conclusion:

In a totally loose material like slope debris probably the conventional method of tunneling using steel ribs and laggings is the solution for the execution of wider section tunnels. This method permits erection of passive supports under the loose material. Though its time consuming, but it is successful. This is the first time a twin track section tunnel has been successfully executed for USBRL Project.



Figure 3: Cavity being tackled at tunnel T-42/43



Figure 2: Gantry for Concrete lining of Wider Section Tunnel

# S O C I A L

## Every individual is Unique

The age-old Indian scriptures have in them the highest wisdom on human characteristics. Right at the time of conception, certain endowments (called genetics) become part of a person through the channel of transmission provided by parents. After the child comes out of the womb and enters the bigger world to the role of genetics is added, the role of nature (including environment in various aspects) directly on a continuous basis and they together produce "GUNAS" that in turn make one's nature or trait.

According to Gita, three types of Gunas viz Sattava, Rajas and Tamas are present in all human beings in varying degrees. The mixture of three Gunas is peculiar and unique to each person. One is born with it. The "Gita" calls it as praradhha is perhaps the genes in the body system.

Thus Gunas in their unique proportion and combination in a person becomes the author of one's action. Individual behaves and acts according to Gunas that dominates. Thus every individual has unique personality/value system and behaviors and each individual needs a different treatment/approach so that one unleashes his/her value to optimum performance.

By  
SunainaWalia  
D/o ShParamjit Singh  
AXEN/C/Reasi



### Mickey Mouse Cake,

Buy cake mix of your choice. You can buy chocolate cake mix. Then follow the instructions given on the box of cake mix, to bake the cake. You have to make two cakes one for the head and one for the ears. For the head, use a round cake pan. For ears, use a separate pan big enough to cut out the ears. After the cakes are ready take a knife, and carefully trim the top of both cakes. For the head, you don't have to do anything, so just put it on a clean surface. For the ears take a knife and make the round ears. Now take a toothpick and insert one on the side of one ear. Now insert the toothpicks into the side of the head. Repeat this for the other ear. Now get some ready-made icing. Take a Ziploc bag and cut a hole in the corner. Line the ears and head with the icing. Make eyes and the nose with the same icing. After this is done put inside a fridge to let icing set and then cake is ready to be cut !!

By  
Tapashyu Shree Student-II,  
DPS/JAMMU  
D/o ShKamlesh Kumar,  
Dy/CE/Chenab



### धरती के हेमानव

धरती के हेमानव धरती की रातिको देखो।  
प्रतिपल चलती ही रहती, इससे चलना तुम सीखो।  
सरिता बहती ही रहती, पथ स्वयं बनाती रहती।  
पथ में चटान भले ही, परगति उसकी क्या रुकती ?  
दिन-रात सदा होता है, व्यावधान न इसमें हो।  
ऋतु-चक्र चलाकरता है, पतझड़ बसन्त फिर होता।  
सुख-दुःख का आना-जाना, जगती कारोना-गाना।  
हर क्षण चलता ही रहता, यह है इतिहास पुराना।  
फिर सुख में क्या इतराना, दुःख पाकर क्या मुरझाना ?  
क्षण भंगुर मानव-जीवन, फिर क्या रोना, क्या गाना ?  
जो आये हैं, जायेंगे, संदेह नहीं कुछ इसमें।  
जो समय सुलभ हमको है, उसको कृतार्थ हम कर लें।  
जगता है जगदीश्वर के, हाथों का एक खिलौना।  
निर्माण-ध्वंस वे करते, हमको इसमें क्या करना ?  
जो भार हमारे सिर पर, उसको हम सदानि भायें।  
पीछे न कभी हम देखें, आगे ही बढ़ते जायें।



के 0 के 0 मिश्रा  
सा 0 अभि 0 / निर्माण  
सुरकोट, कौड़ी,

### बढ़ते चलो

करने हैं, कुछ काम तो बढ़ते चलो,  
देश की माटी को सलाम करते चलो।  
एक उद्देश्य, एक लक्ष्य की ओर बढ़ते चलो,  
देखकर अपने लहका एक-एक करता,  
इस पावन माटी को सिंचते चलो।  
करना है, बुराई का खातमा तो बढ़ते चलो।  
देश की खतिरमर-मिटने का दावा तो हर कोई करता है।  
हो खून में जिसके मर-मिटने का दम, उस वीर को सलाम करते चलो।  
दिखाओं अपने बाजुओं की ताकत को,  
बनाओ ऐसा देश अपने पसीने से,  
जोड़कर हर एक पत्थर को बनाओं,  
एक ऐसी सुंदर दुनिया, जिससे रोशन हो, हर इन्सान की मुस्कान,  
ऐसा काम करते चलो।  
करने हैं, कुछ काम तो बढ़ते चलो,  
देश की माटी को सलाम करते चलो।  
जून-ए-आजादी सबके खून में नहीं होती।  
यूं शहादत पाने की आरजू सब के खून में नहीं होती।  
गरम खून का दावा तो हर जवान करता है।  
बालालास के जो लाखों में, वो गर्मी सबके खून में नहीं होती।  
जय हिन्द।



संधीर कुमार  
(कनि 0 अभि 0)  
उपमुख्य अभियन्ता / निर्माण

# The Elephant and The Ant



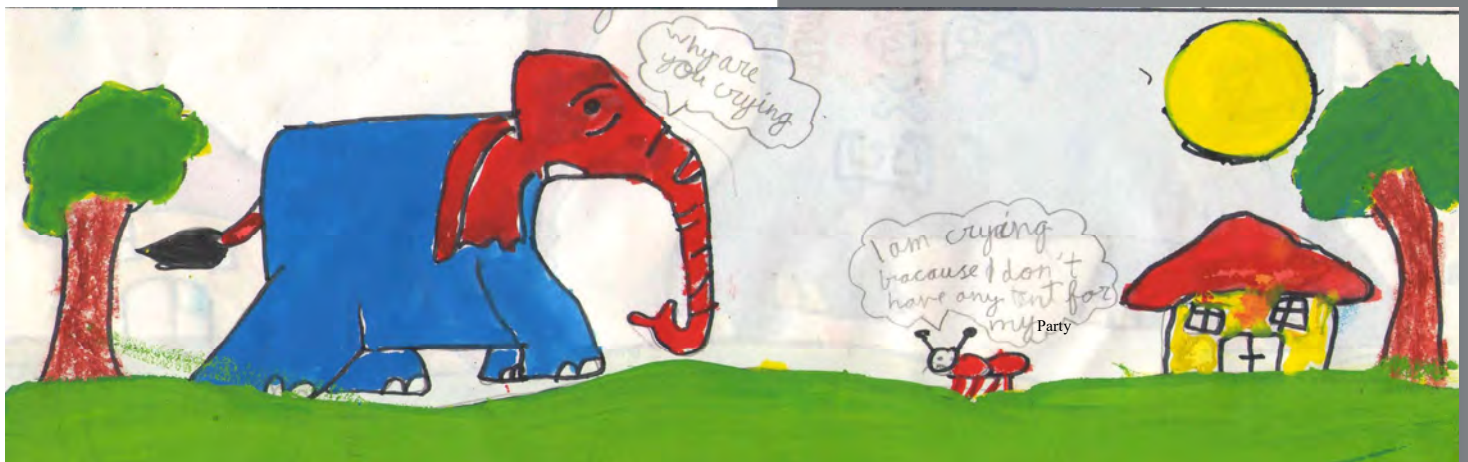
Once upon a time, there lived a family of ants and a family of elephant. Both the families were good friends. They always helped each other. One day, the head of elephants was passing by the head ant's home. They were very, very, very good friends. But when he saw the ant, she was crying. The elephant asked her, "My dear friend why are you crying". So ant said, "I am organizing a party tonight, but the bad thing is, I do not have any tent for my party" and I have told about the party to everyone and they will all come to my house at 5:30 pm and my house is not that big' so everyone can't come in my house. The elephant thought for a while and said, "You can take my old clothes. They are very colorful and big. They will make a nice tent for you. So ant said, "Then go fast and bring them for me". The elephant ran very fast and an earthquake thing happened! When the elephant came back

there and when the ant saw the clothes she said, "these clothes are very big for me to stitch, can you stitch these for me?" The elephant stitched them in 15 min. Then elephant said, "to make it stand we have to bring some strong logs of wood from the main forest. I will go and bring them here, and then we will together make the tent stand. Till the time you clean and decorate your house". "OK" said the ant and then the elephant left for the main forest. In the meantime the ant decorated and cleaned the house, placed the table and chair and cooked the food for the party.

When the elephant came they both together made the tent stand and then the ant placed the tables and chairs in the tent for sitting and also decorated with yellow rose, white and blue silk cloth. Almost everything was ready and there were only fifteen minutes left for the party and for the guests to come.

Then the ant in the house and elephant in the big tent, they both checked that everything is done and everything was all right or not and everything was all right. Just then the guests started coming.

The party went on and on and do you know the party continued till what time. Party went on till 11:50 pm, means only 10 min left for 12:00 am. As it was too late the entire guest started going home. Then suddenly all the lights of the tent were switched off and when they were switched on, everybody was in with a beautiful cake. Oh! It was elephant's Birthday. All the guest gave their best wishes to the elephant. The elephant thought, "I am very foolish, I forgot my own Birthday". They all sang Birthday song for him and enjoyed very much.



Story and Graphics by  
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## Friends are Forever

"Friendship is the hardest thing in the world to explain. It's not something you learn in school.

But if you haven't learned the meaning of friendship, you really haven't learned anything"

"Mohammad Ali"

# Tourism in Ladakh (J&K)



## Introduction.

Opened for tourism in 1974, with a tourist arrival of 527 the first year, **Ladakh** has witnessed a steady growth in tourist arrival. Its geo-climatic conditions, stark barren mountains, landscape, culture, tradition, and environment have been a great source of attraction for the tourists. Tourist arrival to Ladakh has increased many folds since then. Tourist arrival has been recorded 11, 05,547 by August 2013 end. The tourism industry is now an important and major socio-economic sector for Ladakh. Tourism is generating handsome revenue and enormous employment opportunities both skilled and un-skilled, especially in the sectors such as hotels, guest houses, restaurants, catering services, transport, porters, ponies, souvenir shops, handicrafts etc. Ladakh endowed with unique geo-climatic and topographical conditions have made it a paradise for the adventure lovers. Ladakh is a paradise for the trekkers, mountaineers, bikers, river runners and motor safari. Ladakh is a complete tourist destination with choice of Cultural, Spiritual, Adventure, Wild life and Health tourism. Some of the world record attractions such as the highest motor able road of the world, the largest brackish lake in Asia, the longest glacier outside pole, the world highest observatory are great attraction and inspiration for the visitors. Some of the rarest species of wild-life viz black necked crane, snow leopard, Himalayan Lynx etc. are confined to Ladakh.



By  
**Hussain Khan**  
Executive Engineer/D-II/USBRL/Project

## Tourist Places in Ladakh

Government of India, Ministry of home Affairs has declared some areas of Ladakh opened for International Tourism. These areas are among the outstanding feature of Himalayan Panorama. It could be yet another destination for the tourists. These areas are relatively more distinct for cultural and adventure tourism.

- Khaltse Sub-Division (Drokhpa Area).
- Nyoma Division (Changthang).
- Nubra Division.

### Khaltse Sub-Division (Drokhpa Area):

Along one of the route one can visit the areas **Khaltsi-Dumkhar-Skurbuchan-Hanudo-Bima-Dha-Garkon-Batalik-Silmo-Kargil** and vice versa.

Along another route areas **Khalsi-Dumkhar-Dah-Sanjak-Chiktan-Khangral-Kargil** and vice versa can be visited.

### DROGPAS

The greatest attractions in the above areas are the villages of DhaBiamo, Darchigs, Garkon, Batalik which are entirely populated by last remaining remnants of the Dards in the District. Dards are considered as last race of



Aryans confined to Indus Valley. These villages have considerable anthropological and ethnographic importance. ChhaposRubla, the harvest festivals is the most popular festival in this area. These are considered rare and eventful the year of Drogpa in which all the people of these villages come out in their colorful traditional dress and festival moods to celebrate the festivals. Preceding to the Drogpas villages the village which fall enroute are the villages of DomkharSkurbuchan, Achinathang which are also important and which tourists can also easily visit. There is a very good road leading right up to Drogpa villages and tourist can stay overnight in some private guest houses and or at some identified camping site at Khaltsi, Dhomkhar, Skurbuchan, Achinathang, Hanu Do, Biama and Dha village.

### CHANGTHANG (NYOMA DIVISION)

Over this region the tourist can travel on the following identified tour circuits.

1. Leh-Upshi-Depring-Puga-Tsomoriri Lake-Korzok
2. Leh-Upshi-Mahey bridge-Puga-Tsomoriri Lake-Korzok.
3. Leh-Karu-Changla-Durbuk-Tangtse-Lukhung-Spangmik-Maan-Merak.
4. Leh-Upshi-Mahey-Nyoma-Loma bends.



The upland plateaus of Changthang in Nyoma Sub-Division are possibly the most attractive areas in the District as far as scenic beauty, brackish lakes and Wild Life are concerned. The vast pastures with their gently flowing streams and the lakes amidst the spectacularly colored mountains are quite unlike anything a tourist see anywhere in India.

#### **THE PANGONG LAKE**

This lake is situated at an altitude of 14,100ft. in the Eastern sector of Ladakh, at a distance of 150 km from Leh across Changla pass (17,000ft.). This lake is one of the largest and most beautiful natural brackish lakes in the country



#### **THE TSOMO RIRI LAKE**

This lake is situated at an elevation of 15,000 ft. above the sea level, at a distance of 240 km from Leh in the South-eastern sector of Ladakh. It is like a pearl shaped and contains large mineral deposits. Korzok village is situated on the South-west bank of this lake. Korzok Gonpa and its inhabitant's nomads by tradition are most outstanding features of this area.



#### **NUBRA DIVISION**

This valley is popularly known as Ldumra or the valley of orchard/flowers. It is situated in the North of Ladakh, between Karakoram and Ladakh ranges of Himalayas. Nubra lies at average altitude about 10,000 feet above sea level. The climate, of the areas being soft, soil is much fertile and the vegetation of the area is comparatively thicker than those of the other areas of Ladakh. Shrubs, bushes and trees grow in abundance wherever there is any source of water. Due to this reason Nubra has acquired its right name- Ldumra. Shayok and Siachan rivers forms fairly large drain in Nubra. Nubra is a broad valley with lofty mountains on its all sides. Valley assumes greater attractions at the site where both the rivers meet. The formation of Central part of Nubra also takes place there. Diskit is the Sub-Division Headquarter. Of Nubra, Diskit Gonpa is also situated at a height of about 200 mtrs. Above the village, on the spur of rocky mountain and at the most commanding point having clear view of the entire central part of

Nubra. Samstanling Gonpa is situated on the North, facing Diskit Gonpa. This Gonpa is equally important and recreationally it assumes greater importance for being situated at a commanding scenic view point at the foot hills of Karakoram ranges up above Tegar and Sumoor villages, amidst plenty of water and high vegetation. Major village via Kardong, Khalsar, Tirit, Sumoor, Tegar Pinchemik, Tirisha and Panamik all fall along the traditional silk route. The caravans travelling Central Asia and Kashmir through Nubra valley used to stay at those villages. Panamik was the most important place for halting of Caravan. It served as last major village where the Caravans landed the facility of feeding, before they negotiate Saseer and Karakoram passes towards Central Asia. The famous hot spring of Panamik also served them as a source for bath, drinking water and therapeutic purpose. Panamik has still got charms and potentiality to serve as a host to travelers. All areas around it including Iantsa Gonpa and Murgi waterfall across it combined with scenic view strengthen its beauty and hospitality. Major attraction of Nubra is the highest motor able road Khardongla pass (18,380ft.) majestic peaks and glaciers enchanting valleys and villages. Diskit and Samstanling Gonpa, Panamik hot spring, double humped camel safari, river rafting, trekking and Sunbath in the sand dunes at Hunder are also a great attraction for the tourists.



# Cold weather precaution

## INTRODUCTION

Cold environment forces the body to work harder to maintain its core temperatures. The body's energy is used to keep the internal temperature warm. Thus blood will shift from extremities such as hands, feet, legs & arms to the core of the body like chest & abdomen. Thus allowing the exposed areas to cool rapidly & increases risk of frostbite & hypothermia.

A significant amount of body heat can be lost through the exposed head & neck area, especially in children.

Normal body temperature is around 98.6° F (37°C). Hypothermia happens when a person's body temperature drops below 95° F (35°C).

When your body gets cold it will try to prevent losing more heat by: Shivering, restricting blood flow to skin & releasing hormones to generate heat. However, these responses use up energy and may not be enough to maintain body temperature if you are exposed to cold for long time. When the body runs out of energy, it gradually begins to shut down. Shivering stops and heart beat starts to slow down leading to reduced blood supply to vital organs.

### SIGNS OF HYPOTHERMIA:

Mild symptoms include shivering, tiredness and confusion. But as temperature drops, shivering becomes more violent and a person is likely to become delirious, struggle to breathe and may end up unconscious.

### FIRST AID IN HYPOTHERMIA:

Move the person indoors or somewhere warm as soon as possible. Once the person is in a warm environment, carefully remove any wet clothing and dry the person.

Wrap them in blankets/ towels/coats, protecting their head and torso first.

- ◆ Your own body heat can help someone with hypothermia. Hugging them can help to warm them.
- ◆ Encourage the person to shiver if they are capable of doing so.
- ◆ If the person is conscious and able to swallow give the person warm drinks or high energy foods, such as chocolate, to help warm them up.
- ◆ Avoid alcoholic drinks and also do not put the cold person into a hot bath to warm them up, because it will cause the blood vessels in the arms, legs and throughout the surface of the skin to dilate too quickly and cause fall in blood flow to vital organs like brain, heart, lungs & kidney, possibly leading to cardiac arrest, coma and death.
- ◆ Once the person's body temperature has increased, keep them warm and dry.
- ◆ If they become unconscious, not breathing and you can't detect a pulse after feeling for 60 seconds at the carotid pulse in the neck, then Cardio Pulmonary Resuscitation (CPR) should be given.
- ◆ **Prevention is always better:**
- ◆ Keep as active as possible to beat the cold.
- ◆ Warm up if you need to go outside on cold days.
- ◆ Exercising generates heat to keep you warm. Make sure you dry off and put on warm clothes immediately, because wet clothes lose around 90% of their insulating power.
- ◆ Keep curtains drawn and doors closed to block out draught.
- ◆ Have regular hot drinks and hot meal.
- ◆ Wear at least three layers of clothes with an outer wind and rain protecting layer. Layers of clothing trap air, which helps to keep you warm, hence layers of cloth is better than one thick coat.
- ◆ Do not forget to cover head and neck area.
- ◆ Plan your travel judiciously, always carry extra clothes and food supply.

## TIPS FOR HEALTHY LIFE

- Early to bed early to rise.
- Breakfast of a King, Lunch of a Queen, Dinner of a Beggar.
- EXERCISE regularly at least 45 minutes per day.
- Consume at least 3 to 4ltrs of water per day.
- Brush your teeth twice daily. Never forget to brush before going to bed.



By  
Dr.Steven George  
Dy.CMO/KRCL/Reasi

## TIPS FOR HEALTHY LIFE

- Eat to live and not live to eat.
- Vegetable and fruits are good for health, say no to junk food.
- Know your BMI and manage your waist line.
- Say no to smoking, moderate alcohol consumption.
- Know and manage stress and have regular health checkup.

# Salient Features of the Project

Item	Udhampur -Katra	Katra- Qazigund	Qazigund -Baramulla	Total
Route length	25	128*	118	271
( km)				
Ruling gradient	1 in 100 ©	1 in80©	1 in 100 ©	
Max Curvature	5 o	2.75 o	2.75 o	
Bridges	38	62	811	911
Max. height of Bridge	85 m	359 m	22 m	
Length of Bridges(m)	1488	7310	4210	13008
Longest span	154m Steel Girder over river Jhajjar	467 m Steel Arch over river Chenab	45 m	
Tunnels Length	10.9	105	0	115.9
( km)				
Tunnels (No)	9	29	0	38
% Tunnels Length	43.6	79.84	0	
Longest tunnel	3.15 km.	11.27 km	-	
Max Depth of Cutting	20 m	40 m	12 m	

The Jammu Udhampur Srinagar Baramulla Rail Link Project was envisioned with a view to provide a reliable and alternate transportation system in the state of Jammu and Kashmir and to connect the state and the Kashmir valley with rest of the Indian Railway Network. With the above vision, Government of India planned a 326 km. long Railway Line. The Project was declared as a “National Project “ in year 2008.

Some of the special features of the project are as under:-

- ❖ The Jammu-Udhampur-Katra-Quazigund-Baramulla Railway line is the biggest project in the construction of a mountain railway since independence. From Jammu to Baramulla, length of the new rail line is 326 km. and it passes through the young Himalayas, one of the most geologically complicated and challenging terrains in the world. The Geology, tectonic thrusts and faults, drainage and ground water of the region have great bearing on the construction of this project.

Sites are remotely located, inaccessible and therefore difficult from logistic and topographic consideration.

- ❖ Providing access to the work sites involves construction of large network of Access Roads, the most challenging job for completion of this project. In particular the stretch between river Chenab and Banihal is passing through a virgin territory and require construct of about 200 km of access road.
- ❖ The alignment crosses deep gorges of Chenab River near Salal Hydro Power Dam, which necessitates construction of long span bridges. The Chenab Bridge, 359 m above river bed, will be the highest bridge in the world, and longest span for BG Rail line with arch span of 467 m.
- ❖ The project also involved construction of Pir-Panjal tunnel, the longest transportation tunnel of Indian Railways across PirPanjal range connecting Jammu & Kashmir provinces of J&K State. The tunnel is located between the Banihal railway stations in South and Qazigund in North. Total length of the tunnel is 11.2 km with overburden of 1100 m. ***This tunnel had been completed and Section from Banihal to Quazigund opened to public by Hon'ble Prime Minister on 26.6.2013.***
- ❖ The stretch between Katra to Qazigund representing 128 km length is the most difficult part of this project. Almost 80% of length of this stretch is in tunnel and 10% on bridges and rest on embankment.
- ❖ Some of the special features of this stretch are:-
  - ◆ Alignment in this stretch passes through the world's one of the most difficult terrain, both in terms of logistics and geological strata.
  - ◆ Terrain characterizes sedimentary/metamorphic rocks which are yet to be stabilized.
  - ◆ Various type of geological formation are met with in this stretch having altogether different characteristic / properties.
  - ◆ Alignment running across major tectonic features such as Reasi Thrust, Murree Thrust, Panjal Thrust & Local faults
  - ◆ The structural discontinuities occurring in the form of faults, thrusts, shears and joints are likely to pose problems in the construction activities along the rail alignment
  - ◆ Adverse climatic condition due to heavy snowfall in winter resulting in sub-zero temperature and reduced working period.
  - ◆ Many of station on this project are located on tunnel/ bridges.
  - ◆ World most advance and modern technology is being used for construction.
  - ◆ ***When completed this will be a marvel of engineering with unparalleled benchmark.***

# Project Alignment



## Disclaimer

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