

## KATRA- DHARAM SECTION OF UDHAMPUR – SRINAGAR – BARAMULLA – RAIL LINK PROJECT IN STATE OF JAMMU & KASHMIR

### 1. Overview:

Udhampur - Srinagar - Baramulla Rail Link (USBRL) Project is a National Project to provide rail connectivity from rest of the country to the beautiful valley of Kashmir. A part of this project from Katra - Dharam km 30.00 to km 72.390 & km 91.200 to km 101.635 has been assigned to Konkan Railway Corporation Ltd. for execution. It comprises of 44.59km (85.5%) of route in tunnels, 4.6 km (8.8%) of route on bridges and balance 5.7% of route in cuttings and embankments. Konkan Railway had made 172km of roads including road tunnels and many temporary Bailey bridges.

To expeditiously execute the project Konkan Railway has set up Project Head Office at Jammu. Its project camps are located at Reasi, Kauri and Sangaldhan.

KRCL has mobilized a team of about 310 staff and Engineers for taking this project ahead. The construction machinery, plant, equipments, materials, technicians, skilled and un-skilled manpower is arranged by KRCL's construction Contractors. For design support, various National and International agencies have been engaged.

### 2. Difficult Geology:

- The alignment is passing through three major geological thrust zones namely Reasi, Muree and Panjal thrust.
- The geological strata varies from loose conglomerate, clay, silt stones, crushed and faulted and stones and dolomites.
- Geology changes very frequently along the alignment and it is very difficult to access the complete geology in advance.
- Hence, as the work progresses adjustments in design have to be made.

### 3. Special Bridge -Chenab

Special bridge across the river Chenab is built at height of 359m, from the bed level.(Height of Qutab Minar is 72 m and of Eiffel Tower is 324 m). Chenab Bridge is having the central span of 467 m. This bridge is qualified for **world record for being the highest rail bridge from the river bed**. (Currently the world's tallest rail bridge is located over France's Tarn River with its tallest pillar rising 340m, with the actual height where the train runs on the bridge being 300 m).

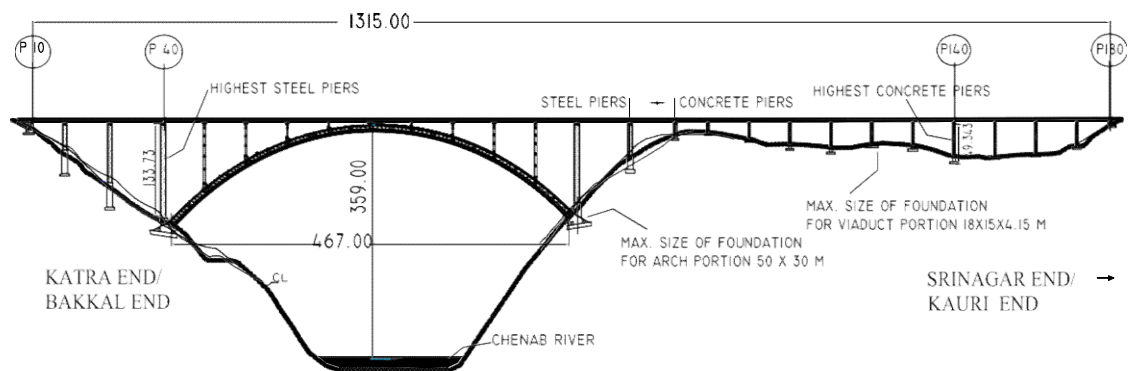


The design of bridge also takes care of “Blast” load, which is internationally an unique feature. For construction of Arch portion of the bridge over the river, a novel method of construction using the cable car is designed and commissioned. This cable car runs on 54mm cables laid across the river valley and connected through 127 m high pylons (towers) on either side of river. The consumption of structural steel for the project is very huge and for Chenab Bridge the quantity is of the magnitude of 29,000 MT.



Total length of bridge (m)	1315
Length of Srinagar End viaduct (m)	530
Length of Katra End Viaduct (m)	160
Main Arch Span (m)	467
Height above bed level (m)	359
Total no. of spans ( Nos)	17
Structural Steel (MT) approx.	29000

#### ❖ General Arrangement Drawing



**Fig. 2 – Longitudinal Section of Chenab River Bridge**

<b>Span arrangement from Bakkal End :</b>	<b>55m + 2 X 65 m + 467m + 65 m +55 m + 40 m + 9X50 m + 40 m =1315 m</b>
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❖ **Novel Features of Chenab Bridge:**

- Single Arch Span : **467 m**
- Bridge Deck height above river bed level :**359 m**
- Length of continuous plate girder on approach viaduct :**530 m**
- Span of Continuous plate girder : **64 m**
- Maximum Height of steel pier : **131 m**
- Span of cable crane : **915 m(World's Longest cable span)**
- Maximum designed Wind speed : **266 kmph**
- Total Length of welding: 580 km (Jammu to Delhi Distance)
- Length of longest train on single Arch Span: **18 coaches**
- First time, **End launching** of plate girder **on the transition portion of curve.**
- First time consideration of **Blast Load for bridge design**
- First time use of **Flux Core Arc Welding**
- First time use of **Self compacting concrete for infilling in steel boxes** and ends of plate girders

**4. Special Bridge – Anji**

First cable stayed Railway Bridge in the country (under construction) which has Length 725.5 m. The salient feature of Anji Bridge is as under:

<b>Total Length of Main bridge</b>	473.25 m (1*290.00m+ 1*80.00m + 1* 75.00m+1* 28.25m)
<b>Total Length of Ancillary viaduct Configuration</b>	120.00 m 1*25.00m +2*35.00m + 1*25.00m
Height of Single Pylon	193 m from top of foundation
Cable length	82-295 m
Stay cable composition	31,37 or 43 strands
Total no of stays	2*(24+24) = 96 nos
Total Width of Bridge	15.00 m



## 5. Tunnels:

There are 16 tunnels aggregating length of 44.59 Kms. The longest tunnel is Tunnel No.13 of 9.274 Kms length. Four Tunnels i.e. Tunnel No. 2, 5, 13 & 14 are provided with a separate access to Rescue Tunnel with smaller size of cross – section parallel to main tunnel. The construction of Tunnels was done by New Austrian Tunneling Method (NATM), I-System and conventional method.



## 6. Other Bridges:

There are 22 nos. of bridges other than Chenab & Anji (2 Important bridges, 12 Major Bridges & 8 Minor Bridges). The total length of these bridges is 2.6 Km. These bridges involve about 15 lac cum of earthwork, 1.5 lac cum of concrete, 27000 MT of reinforcement steel and 28000 MT of structural steel.

**Important Bridge 39:** The bridge is an engineering marvel having very high rectangular, tapered hollow piers, spanning about 490 meters with span arrangement of  $1 \times 53.15 + 6 \times 64.0 + 1 \times 53.15$  meters across Sulla Khad nalla. Double line Reasi station yard located on this bridge. The superstructure



of the bridge is continuous composite steel girder. Construction of this bridge involves a mammoth 7.5 lakh cum of earthwork in excavation for construction of its foundations, about 36500 cum of concreting with 7000 MT of reinforcement steel and 7552 MT of structural steel.

Height of piers varies from 35.08 m to 90.53 m. Pier P5 is the tallest pier of height 90.5m.

**Important Bridge 43:** This bridge is 777 m long with span arrangement of  $1 \times 35 + 1 \times 53 + 10 \times 64 + 1 \times 49$ . Double line Salal station yard located on this bridge. The superstructure of the bridge is continuous composite steel girder. The bridge is partly in straight





and partly in curve with straight length of 490 m and curve length of 287 m. Construction of this bridge involves about 4.0 lakh cum of earthwork, 36948 cum of concrete, 5862 MT of reinforcement steel, 7920 MT of structural steel and 15959 m of micropiles. Maximum height of the pier is 50.15m. The major part of the bridge is located in gentle to moderate slope, but initial Four foundations of bridge are located on steep slope & have been stabilized by a special hybrid well foundation of dia14m containing 98 micropiles in Outer surface and 55 micropiles in inner surface of 350 mm dia cast in-situ.

## 7. Approach Road:

Construction of 172 km approach road completed.



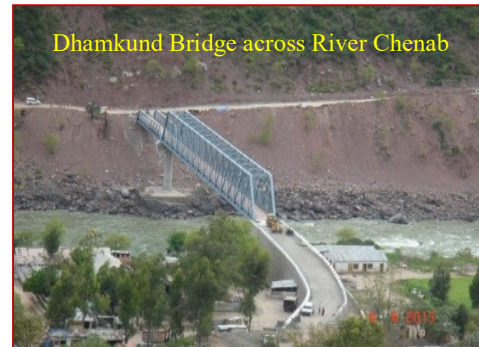
Road at Judda village

Approach Roads are connecting surrounding villages i.e. Guni, Paikhad, Gran, Batal Gala, Bakkal, Kauri, Dugga, Surukot, Morh, Dharam, Sangaldan, Gool, Mahore, Arnas, Kanthan, Reasi etc.in Jammu & Kashmir. Local villages like Bakkal, Kauri, Dugga, Dharam, Barala etc have been utilizing these project roads for

transport. Earlier, the access to these villages was through footpaths or by boat wherever available.

These roads are also facilitating the development works in these areas by other departments of Government. Hence, immediate benefits of project execution are reaching the local population.

To move heavy materials, KRCL had constructed a Road Bridge over river Chenab near Dhamkund on Ramban - Gool State highway and commissioned on 16.06.2013. This road bridge is connecting surrounding villages i.e. Sangaldan, Gool, Mahore, Arnas, Kanthan and Reasi in Jammu & Kashmir.



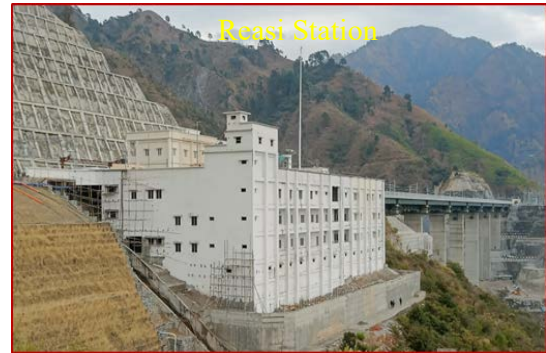
Dhamkund Bridge across River Chenab

To save length of roads and avoid open cuts, and as environmental protection measure, one road tunnel near Batal Gala have also been completed and is already in use.

## 8. Stations:-

The proposed Stations on this section of project are as below:

Sl no.	Name of Station	District
1	Reasi	Reasi
2	Bakkal	Reasi
3	Dugga	Reasi
4	Sawalkote	Reasi
5	Sangaldhan	Ramban



## 9. KRCL has engaged various National & International agencies for execution of USBRL Project.

- M/s WSP (Finland)
- M/s Leonhardt, Andra and Partner (Germany)
- Cowi (UK)
- AECOM (UK)
- M/s ITASCA Consulting Group Inc. (USA)
- Italferr (Italy)
- M/s.Anwikar Consultants, Germany
- WRI-BHEL / Trichy for welding
- SERC / Chennai for fatigue testing & instrumentation
- CECRI / Karaikudi for development of long life paint
- CMRI / Roorkee for tunnel instrumentation
- IISC / Bangalore for slope stabilization
- IIT / Delhi for slope stabilization
- IIT / Roorkee for site specific spectra
- NIRM / Bangalore for geological investigation & rock mass rating
- NGRI / Hyderabad for geophysical investigation
- SJVNL / Shimla for tunnel design
- NHPC for tunnel design

- SAIL for steel for Anji & Chenab bridges
- NEERI / Nagpur for environmental management plan
- CRRI / New Delhi for protection of unstable cut slopes
- CSRMS geo-mechanical & construction materials investigation
- M/s Certification Engineers International Ltd (CEIL)
- M/s URS-Scott Wilson Ltd
- M/s RITES

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