Mechanization of Construction of Railway Line in Kashmir Valley

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Synopsis

The 21st Century has brought a major revolution in the life-style of the people living in the Kashmir Valley. The impact of introduction of railway line in the Kashmir Valley has significantly influenced the lives of all residents as well as the visitors to the area. The construction of 'Island Railway' in the Kashmir Valley i.e. from Quazigund to Baramulla (119 km), though not having any tunnel, was a daunting task with no availability of any experienced skilled/unskilled local labour for construction of railway line. Majority of the labour force, both skilled and unskilled, have to be imported from far-flung areas. Due to the extreme climatic conditions and security scenario, the working season as well as the working hours got drastically restricted forcing the engineers to think of innovative ways for minimizing the labour components. It was not possible to take heavy track construction machinery to the valley and therefore, certain local innovations by way of modifications, to suit the requirement of the work, were made in the available resources. The entire construction activities, therefore, were completed using these tailor-made small machines and the big machines were brought only to give the final shape to the railway track.

1.0 With a view to provide an alternative and a reliable transportation system to Jammu & Kashmir, Govt. of India planned a 345 km. long Railway Line joining the Kashmir Valley with the Indian Railways network. The Project has been declared as a **Project of National Importance in March 2002**.

1.1 The Jammu-Udhampur-Katra-Quazigund-Baramulla Railway line is the biggest and the toughest project in the construction of a mountain railway since independence. From Jammu to Baramulla, length of the new rail line is 345 km. It passes through the young Himalayas, tectonic thrusts and faults. The work on Jammu-Udhampur section (53 Km) was completed and opened to public by Hon'ble Prime Minister in Apr'05. Similarly, the rail link in Kashmir valley "ISLAND RAILWAY" from Quazigund to Baramulla (119 KM) was commissioned and opened to the public in three phase as under:-

i. **First phase** from Anantnag to Rajwansher (66 Km) by Dr. Manmohan Singh, Hon'ble Prime Minister of India on 18.10.2008.
ii. **Second phase** from Rajwansher to Baramulla (35 Km) by Smt. Sonia Gandhi, Hon'ble Chairperson, United Progressive Alliance (UPA) on 14.02.2009.
iii. **Third and final phase** from Anantnag to Qazigund (18 km) by Dr. Manmohan Singh, Hon'ble Prime Minister of India on 28.10.2009.

1.2 The work is in various stages of progress in the balance length from Udhampur to Quazigund. The detail of the project is as under:-

Item	**Udhampur Katra**	**Katra-Qazigund**	**Qazigund - Baramulla**
Route length (kms)	25	129	119
Bridges (Nos.)	38	62	811
Tunnels (kms)	10.90	103.00	0
Max height of bridge (m)	85	359	22
Longest tunnel (kms)	3.15	11	-
Stations (Nos.)	3	10+1	15

1.3 The railway line in the valley has been constructed at an approximate expenditure of Rs 3250 crores and has 63 major and 748 minor bridges. Fifteen stations fall on this line and passenger amenities have been provided at all of them. The station buildings have been aesthetically designed to gel with the local architecture, which is not only pleasing to the eye, but is also climatically suitable.

2.0 The railway line in the Kashmir Region is being laid for the first time. No experienced labour (skilled/unskilled) is locally available in this area. Majority of the labor had to be imported from far-flung areas like Bihar and Orissa. The climatic conditions are very harsh which restricts the total working hours perday/per year. In order to reduce manual labour components as also to increase the working hours, it was considered prudent to deploy the machines for construction of railway track. However, it was not physically possible to bring all the commonly used track construction machines as the nearest rail head was at Jammu and transporting these machines on the National Highway No. 1-A, was not an easy task. It was considered prudent to use the locally available machines by suitable modifications for construction of railway track. It may be mentioned that many of these tailor-made machines are not in use in Indian Railways anywhere else.

2.1 Another interesting feature of this railway line is that all the construction material as well rolling stock was transported by road from the nearest rail head at Jammu, adding another dimension of challenge in the execution of the project.

3.0 **<u>Mechanisation of Construction Activities:</u>**

3.1 **Welding of Rails:** The temperature in this area goes down to sub-zero. It was considered prudent to minimize the alumino-thermic to the barest minimum. To ensure batter quality of welding in sub-zero temperature, the

Mobile Flash Butt Welding Plant was used. The temporary depots were set up at the yards and at suitable locations in the mid section and the 13 meter long single rails were converted into 10 rail panels by the Mobile Flash Butt Welding Plant. After laying these rails in the track, the Mobile Flash Butt Welding Plant was used for conversion to LWR/CWR in-situ. The AT welding was restricted to the barest minimum and only at the location of SEJ after de-stressing.

Fig 3.1 Mobile Flash Butt Welding Plant at work

3.2 **Carting the welded rails to the formation/mid-section**: The locally available tractors were modified to carry the rails on the formation. A combination of 4 tractors in tandem was used to carry 10 rail panels of 130 meters long rails on the formation and kept alongside.

Fig 3.2 carting of 10 rail welded pane

3.3 **Spreading of Sleepers:** The JCB/Hydra/Crane with the lifting hook attachment, locally fabricated, which could lift 4 sleepers at a time and place on the initial ballast, was used. The attachment was so made that it approximates the required sleeper spacing. The final adjustment of the sleeper spacing was done manually.

Fig 3.3 Locally made arrangement for spreading sleepers on formation

3.4 **Ballast spreading**: The road pavers were used for laying initial layer of ballast i.e. the bottom ballast layer of 150 cum to 200 cum thick to width of 4 meters. The paver was loaded with ballast using track dumper/tipper and spread by the road paver on the finished formation to maintain uniform thickness and width. The light road roller was used for compaction of the initial layer.

Fig 3.4 The road paver at work for spreading ballast on the formation

3.5 **Use of Small Track Machines**: To ensure initial better quality of track laying geometry, various small track machines like lifting-cum-lining machine, lifting-cum-tamping machine and hand held tampers etc. were used. Lifting and lining machine of Model RV-100 from M/s Geismar (France) was used for lifting and lining of track for the initial packing. The 60 tonnes lifting capacity machine permits the machine to lift the complete structure upto 60 cms and align upto 15 cms per throw. The RV-100 could be used for rough aligning the track as well.

Fig 3.5 Lifting-cum-Lining machine at work

3.6 **Leading of ballast**: The track ballast is not readily available in any part of Kashmir Valley, since no railway track exists over there. The contractors were not willing to set up the crusher for the specific requirement of the railways. Therefore, it was decided by M/s IRCON to set up their own crusher for production of track ballast. The crusher was installed at Pampore station and the ballast in the entire 119 km length of the track has been taken from this location.

Fig 3.6 Departmental Stone Crusher at Pampore

Various methods have been used for carrying ballast. These are described as under:

3.6.1 **Fabrication of Small Track Hoppers**: The small hoppers (capacity 3 cum) were got fabricated from the local workshops and were mounted on the dip lorries. These hoppers were hauled by the tractor/ Rail-cum-Road vehicle(RRV). The tractor was modified by removing its front wheels and mounting it on dip lorries to guide the gauge. The gauge of the rear wheel was enhanced by using a packing plate to accommodate rear wheels on rails and to use it as traction. The ballast was loaded in these hoppers by the JCB and unloaded manually.

Fig 3.6.1 Locally fabricated small hoppers being pulled by Modified Tractor/RRV

3.6.2 **Small Ballast Hoppers**: Another set of ballast hoppers of 5 cum capacity were procured from M/s Phooltas Tampers and used for carrying the ballast. These hoppers were also hauled by RRV/rail mounted tractors. The ballast was loaded on to the hoppers by the JCB and unloaded manually.

Fig 3.6.2 Small Hoppers of 5 cum capacity in operation

3.6.3 **Modified Tippers**: The road tippers after removing the tyre and mounting it on rails by fixing modified rail wheels were used for carrying ballast on the track and unloaded by tipping. The released rail wheels modified by fixing tippers hub, welded on the rail wheels fitted to the tipper tyre disc was used for its traction. These tippers have been widely used for training out the ballast in the valley.

The above locally modified machines for training out the ballast ensured a uniform spreading of ballast all along the track.

Fig 3.6.3 Modified Tipper at work on Railway Track

3.6.4 **The Normal Ballast Hoppers:** Five normal hoppers (capacity 30 cum) were taken by road from Jammu to the valley after initial laying of the track was over. One WDS-6 engine was also taken from the Shakurbasti Diesel Shed and these hoppers were used training out the ballast for recouping the final deficiency at various locations, hauled by WDS-6 engine.

3.7 **Use of on-Track Machines**: To ensure initial better quality of track geometry fit for 100 kmph sectional speed, the on track machines were brought by road on specifically modified trailers. The following machines were used on this Project :

3.7.1 **Ballast regulating machine** of Kersaw make having capacity of 1 track km per hour was used. This ensured a perfect ballast cross-section uniformly through out and minimized wastage of ballast.

Fig. 3.7.1 Ballast Regulating Machine at work

3.7.2 **Tamping Machines:** A Duometic machine for track tamping on straight track and one Unimat machine (both Plasseur make) were used for final tamping of the track and the turn outs.

⇦ The Tamping Machine in Transit

The Tamping Machine working on Track ⇨

3.7.3 **Initial tamping by Minima-2:** The light tamping machine Model Minima-2 of M/s Plasseur Make was used for initial tamping of the track. This is a small tamping machine with lifting and slewing device. It can give an output of 100 sleepers per hour.

Fig. 3.7.3 Minima at work

3.8 **Inspection vehicles**: Since the skilled track labour is not available in the valley and the climatic conditions are very harsh, the inspection vehicles had also to be designed accordingly instead of normal push trolleys.

3.8.1 **The turn table for motor-trolleys**:
The light weight motor-trolleys were used during the construction period and in order to reverse the direction of the driving, the light weight locally developed turn-tables were used. The motor-trolley can easily be rotated with the help of this turn-table by only two persons.

Fig. 3.8.1 Turn table for Motor Trolley

3.8.2 **Rail-cum-Road Inspection Vehicle**: A Rail-cum-Road Inspection Vehicle on Tata Sumo body suitable for traveling on broad gauge was used for inspection of track during snowfalls and rains. The hydraulic rail system is operated by a 12 volt DC motor powered hydraulic power pack driven from the vehicle battery. For lifting and rotating of vehicle in the block section, locations other than at level crossings, a 50 kg. portable folding jack has been provided for changing the direction of the machine.

Fig. 3.8.2 Rail-cum-Road Inspection vehicle

4.0 Conclusions:

The non-availability of adequate skilled/unskilled track labour locally and limited working hours/days forced the Project authorities to devise innovative methods for completion of the work through use of locally available resources/machines/equipments by making suitable modifications. The final shape to the track was given with the help of track tampers. It has been ensured that at no point of time, the quality of work was compromised. The results were visible in the speed trials which were carried out during the CRS inspection. The train operation is continuing for the last over two years with hardly any deterioration in the track geometry parameters and even under adverse climatic conditions of heavy rain and snowfalls. These modifications were not costly and can certainly be replicated at other places even though the working conditions may be more conducive to use bigger machineries.

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