PROJECT STUDY:

Rockfall Protection & Slope Stabilization work in hill cut area between Hazaribagh to Ranchi New B.G Railway Line Section of East-Central Railway

ABSTRACT:

Hazaribagh railway section is falling under the East-Central Railway jurisdictions, which is one of the 17 railway zones in India. The area of the East-Central railway is characterized by dense forest with highly complex terrain. With a view to improve the passenger & goods safety, Indian Railway has decided to protect the cut slopes of new railway line from Hazaribagh to Ranchi.

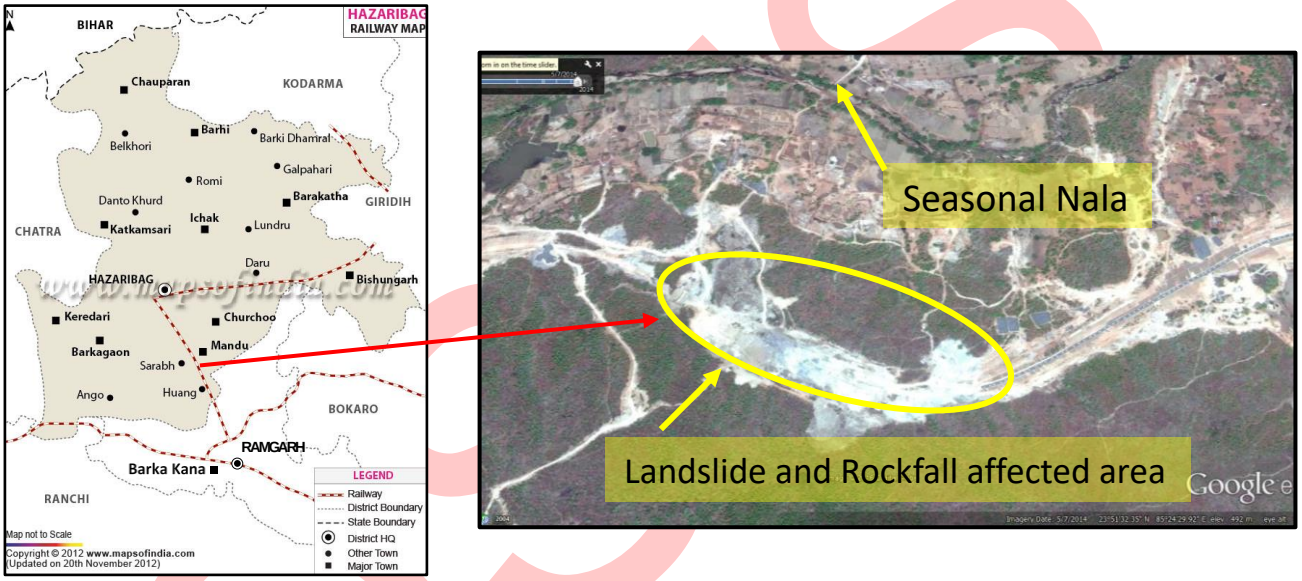

Figure 1 Rockfall affected area along Hazaribagh-Ranchi new railway section

INTRODUCTION:

As the section is passing through very complex geological suppression, protecting the cut slope using a single system may not be suitable considering the high rockfall susceptibility of the slope. Therefore GPS-H7 (Ring Net), GPS-2 (Rhomboidal Cable Net) and PVC coated cable reinforced double twist mesh with suitable anchor has been adopted to protect the slope.

Figure 2 Initial condition of the slope

PROBLEM DEFINITION:

In order to lay the new railway line, cutting has been done along Hazaribagh hill terrain. Since the cut slopes are almost vertical there is enhanced risk of sudden rockfall on the track. During investigation it was found that, danger of shooting stones and large-scale rock block failure was imminent especially during rain. As the cut is artificial, and the rock is of disintegrated type with lot of close fractures, cracks, and discontinuities, it is essential to provide protection works against rockfall which may occur due to detachment of rock blocks from the face of the cut. As the track is present in very close proximity to the base of the slope, it is critical that any event of rockfall can block the railway track by the falling rock mass. Therefore, an appropriate protective measure has to be carried out to stabilize the slope covering 4000 Sqm area.

PROTECTION MEASURES:

After analysis of the data and investigating the site situation, it was suggested to adopt secure drapery with suitable anchor and high strength ring net & Rhomboidal net to protect the slope. The protective net is not only resistant to high impact of rock but also takes huge load with maximum flexibility.OST suggests to provide a system of GPS-H Ring net (R7 / 3.0 / 300) & GPS-2 Rhomboidal net (DO / 10 / 300) with high strength clip and double twisted hexagonal mesh with top, bottom & surface anchors, vertical & horizontal support rope, lacing wire. The Ring net & Rhomboidal Net is made of up 3 mm diameter and 10 mm diameter respectively of high tensile steel wire. The wire is made up of high carbon steel processed by Galfan anti-corrosion technique and zinc coated respectively. The tensile strength of wire cable is 1770 N/mm².

Figure 3 GPS-H Ring net, Double twisted hexagonal mesh (left to right)

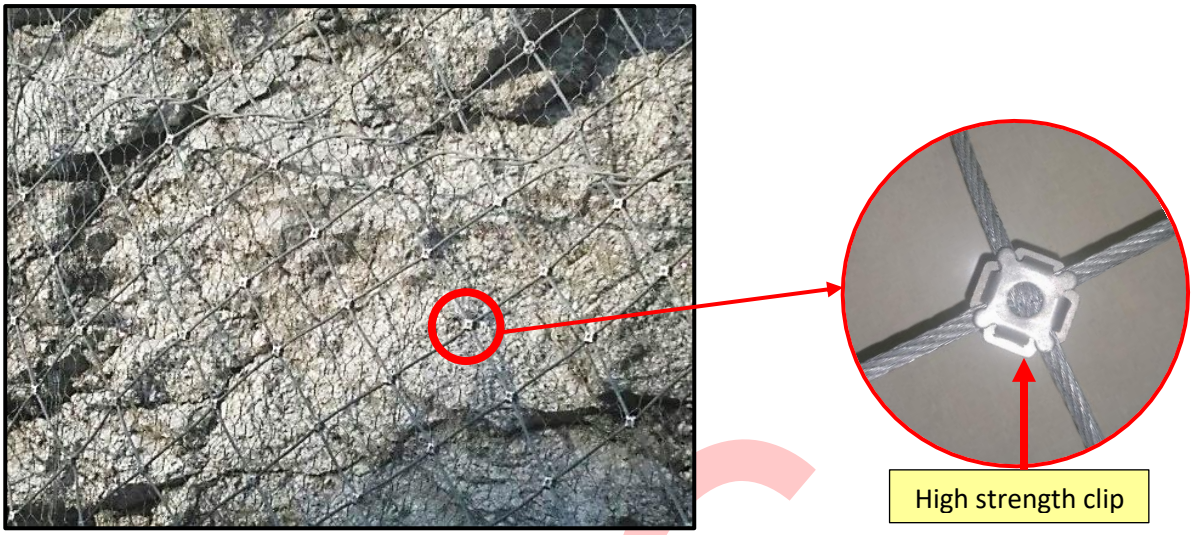

Figure 4 GPS-2 Rhomboidal net highlighting the high strength clips used

INSTALLATION:

Slope surface shall be prepared before the installation of GPS-H & GPS-2 system. Loose and unstable rock particles which could detach easily from the slope surface has been removed. The protective net has been hauled to the top of the slope with the help of an electric winch placed at the top of the slope. The top row of anchors shall be installed initially by following the different phases. After that we spread the nets on to the surface, then starts the surface anchoring. Finally, the bottom anchoring is done to protect the slope.

Figure 5 After installation finished

CONCLUSION:

A combination of GPS-H7 (Ring Net), GPS-2 (Rhomboidal Cable Net) and PVC coated cable reinforced double twist mesh with suitable anchor covering an area of 4000 sqm. has been adopted for the current site.