

PROGRESS ENHANCEMENT OF STRATEGIC BORDER ROADS

Border Roads Organisation (BRO), Ministry of defence is laying a network of strategic roads near Indo-China and Indo-Pak Borders. The poor progress of road construction works particularly in hilly terrain is a major concern for the country. This concern has been raised several times in the parliament¹⁻⁵. The hill road pavements can only be laid after the excavation of rock (formation work). Rock blasting is commonly deployed to excavate the rocks. One of the many reasons reported by BRO for slow pace of construction in hilly terrain is the difficulty faced in hard rock excavation¹⁻⁵. The rock mass damage induced during uncontrolled rock blasting further depletes the geological strength of neighbouring rock mass. This weakened rock mass trigger slope failures, rockfall on deployed men and machines during the future operations.

The BRO approached Rock Excavation Engineering research group of Council of Scientific and Industrial Research-Central Institute of Mining and Fuel Research (CSIR-CIMFR) for availing technological know-how of rock blasting. Accordingly, a MoU was signed between BRO and CSIR-CIMFR on 15.11.2018 (Figure 1). The scientists from the research group visited some important under-construction roads to suggest engineering measures for the rock blasting. The names of these roads are deliberately concealed in the correspondence considering the strategic importance.



Figure 1: ADG BRO and Director CSIR-CIMFR showing the signed copy of agreement

Presently, BRO is entrusted with the construction of around 73 Indo-China border (ICBR) roads. The consultation from scientists was sought at 15 roads. Nine were ICBRs and six roads at Indo-Pak borders. Five visited ICBRs are situated in Uttarakhand, three in Arunachal and 1 in Himachal. As per the MoU, the scientists had to visit each road twice for the investigation. In the preliminary visit, scientists investigated the geo-environmental

conditions and suggested drilling-blasting accessories (extension rods, coupling, delay detonators, cord relays, rubber tyre mufflings etc.) to be procured for achieving a good progress and slope stability. Nevertheless, temporary engineering measures (reduction of drill hole depth and utilisation of free-faces) were also demonstrated to the site engineers in the preliminary visit for reducing the drill-blast cycle time and rock mass damage. These temporary engineering measures were practiced during the procurement phase. The site officers of BRO reported an increased progress after the preliminary visits. The scientists from CSIR-CIMFR demonstrated the controlled sequential blasting operation in the subsequent visit after the procurement of accessories.

The reports^{6,7} received from the BRO distinctly recommend the effectiveness of control blasting technique and temporary measures for safe and efficient rock excavation. The average rock excavation from a conventional rock blast of BRO varies between 15 to 30 m³. The BRO site officers reported that blasts yielding a muck of 3000 m³ (at least) can easily be conducted with the sequential blasting technique. The technique also ensured proper fragmentation of muck. Hence, the time was also saved during the mucking operations. Similarly, a site accorded an increased progress of 48 and 40% in rock fragmentation and linear formation works, respectively, using sequential detonation.

As the MoU between the two organisations was for a period of one year, hence, the items for sequential controlled blasting could not be procured at all the visited sites. Nevertheless, two BRO sites reported that the progress in formation cutting increased by 30.86 and 26.64%, consumption of explosives reduced by 29.19 and 38.36%, overbreak reduced by 12.00 and 12.60% using temporary measures suggested during the preliminary visit. They further verified that the drilling efforts have substantially reduced, blasting is more controlled and stable slopes are achieved using CSIR-CIMFR technique.

The progress enhancement due to CIMFR technique has been verified at critical Indo-China Border Roads in Arunachal and Uttarakhand. Similarly, the enhancement in progress has also been verified at important roads in Ladakh. Both the organisations have signed a new agreement on 25.11.2020 to further extend the co-operation in the rock blasting for road works by 5 years.

Additional Director General of Border roads applauded the efforts of team CSIR-CIMFR in his correspondence with DG CSIR. The appreciation letter is appended herewith.

References:

1. Rajya Sabha Unstarred Question no. 1746 answered on 09.12.2014, retrieved from <http://164.100.47.5/qsearch/qsearch.aspx>
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3. Rajya Sabha Unstarred Question no. 1014 answered on 03.05.2016, retrieved from <http://164.100.47.5/qsearch/qsearch.aspx>
4. Lok Sabha Starred Question no. 283 answered on 05.08.2016, retrieved from <http://164.100.47.194/Loksabha/Questions/Qttextsearch.aspx>
5. Lok Sabha Unstarred Question no. 5010 answered on 16.12.2016, retrieved from <http://164.100.47.194/Loksabha/Questions/Qttextsearch.aspx>
6. Field visit report on training to improve drill and blast techniques in BRO by CIMFR scientist under project Vijayak: A letter from HQ CE Vijayak to HQ DGBR, 20001/Gen Corr/17/E2 Wks, 31.01.2020
7. MoU between BRO and CIMFR for engaging CIMFR at BRO project sites to improve drill and blast techniques: A letter from HQ CE HIRAK to HQ DGBR, 20044/R&D/116/E2 Wks, 24.01.2020

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**APPRECIATION LETTER FOR "CSIR CONTROLLED BLASTING TECHNIQUE" TO
ENHANCE THE PROGRESS OF BORDER ROADS**

1. Reference to the MoU between CSIR-CIMFR and BRO dated 16th November 2018 and the field visits conducted by the scientific team to suggest blast designs on various border roads, thereafter.
2. Difficulties faced in rock blasting during formation works of hill roads to develop road formation has been one of the major reasons for slow progress of construction of roads in hilly terrain and High altitude area in Northern and North-East part of the country.
3. Scientific team of CSIR-Central Institute of Mining and Fuel Research spent considerable time at the various sites of Border Roads Organisation for transferring the technology of controlled blasting in road construction in such terrain & remote border area of the country.
4. Field visit reports received from the offices of various Chief Engineer Projects has confirmed that controlled blasting technique of CSIR-CIMFR is quite helpful, effective & safe in enhancing the progress of roads.
5. I convey my appreciation for the dedication, professionalism and skills of Dr. Aditya Rana, Project leader and team of CIMFR. Dr. Rana spent over 125 days with BRO (including festivals of Diwali and Dusshera) in extreme climatic condition in these remote part of the country to train and advise the BRO staff. I believe CSIR system has adequate mechanism to acknowledge the contribution of such young scientists.
6. Furthermore, the guidance rendered by Dr. C. Sawmliana, HoS, REE is admiring. Moreover, the administrative support and scientific advices provided by Dr. Pradeep K.Singh, Director, CSIR-CIMFR (who also happens to be the Head of this Research Group) during the execution of scientific project is thankfully acknowledged.

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7. Nevertheless, the technical services provided by other team members of REE division Sh. Rakesh Singh, Sh. N.K. Bhagat, Sh. Saikat Banarjee and Sh. Gajendra Jadaun are appreciated.

We look forward working with CSIR in future also.

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