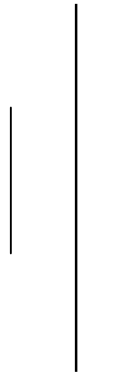


**Government of Nepal
Ministry of Local Infrastructure Development and Agricultural Roads
(DoLIDAR)
District Development Committee/District Technical Office
Kavre Palanchwok**

**Rural Reconstruction and Rehabilitation Sector
Development Program (RRRSDP)**



**Technical Justification for Controlled Blasting
in
10km Road Section of Kamidanda-Taldhunga Road
Sub-Project, Kavre**



**Rural Reconstruction and Rehabilitation Sector Development Program
District Implementation Support Team
Dhulikhel, Kavre**

Technical Justification for Controlled Blasting

Background

Kamidanda-Taldhunga road section of Khopasi-Taldhunga road has been selected for rehabilitation under RRRSDP Project in Kavre district. The proposed alignment of this road section descends with a number of hairpin bends at first and then gradually ascends in mountain covered with dense forest. Around 10km road section of this portion lies in Mahabharat range which constitutes relatively stable hard rock. Slope terrain of this portion varies from moderate to steep. There are also no human settlements across this 10 km road section.

Khopasi-Taldhunga road has been envisaged to connect the south-west part of Kavre district with its district headquarter to provide transportation facilities to local people living in that area, which is considered as remote part of Kavre district. This area is also known as Danda Pari (beyond mountain) area. Though Budget has been allocated for the track opening of this road in the past, the efforts and resources of the DDC have been insufficient to complete this road project. The reason is mainly due to limited budget and rugged topography of the area. Small tracks have been opened in various sections lying between hard rock. Some structures were also constructed along in various parts of the road alignment. All the efforts of LEP approach made for the construction of this road have been inadequate to complete this road project.

Exploration of Possible Routes

All the options for the alternative alignment of this road section were explored during walkover survey of this road sub-project. Since the road must cross the Mahabharat range to connect southern part of district with its northern part and its district headquarters, there are no other possible alternative routes to avoid the Mahabharat range mountain which extends from east to west in southern part of Kavre district. This route has been rather considered as the shortest route to cross this mountainous range.

Designated Road Section for Controlled Blasting

In general, blasting is not allowed during construction. As much as possible, rocky portions need to be avoided by choosing an alternative alignment. But, This alignment was fixed and track opened by earlier ADB supported RIDP project and was one of the PPTA core project also. Evidently, the recent surveys and explorations also indicated that this is suitable alternative alignment to this alignment in this area. Again by the previous project work all the local technology of heating/cooling, chiseling by workers have been tried and removed possible removable bits and pieces of rocks. Given the limited time period of RRRSDP now, the tremendous and voluminous task of this massive hard rock cutting cannot be done by using labor gang. Therefore, there is no other option than to go for controlled blasting. The sections for blasting are limited and scattered in this 10 km stretch.

Other Technical Options

The Labor-Based, Environmentally Friendly, and Participatory Approaches (LEP) construction approach has been considered as appropriate approach for the construction of rural roads in hill and mountain areas of Nepal. The LEP approach has evolved over several years of experience as the technically, environmentally and socially appropriate method for constructing rural roads. This approach implies use of labor, hand tools and small equipments for construction and not large equipment; conservation of the natural environment as much as possible; and incorporation of local interests and opinions into the design and implementation of the schemes. Following methods are mainly included in LEP approach.

Road alignment: As part of the construction process, emphasis to the careful selection of the horizontal and longitudinal alignment prior to the start of the construction phase. As a rule of thumb, the alignment of the road should be chosen such that the centre line is close to the surface of the hill slope resulting in low cut slope.

Balancing cut and fill: This approach will encourage and emphasize planning and design of subprojects aiming to have cut and fill balanced. A complete balance of cut and fill may not always be practical or possible in which case excess spoils will be placed in pre-identified and approved safe tipping sites.

Appropriate structures: Structures will be built on the basis of actual need determined on site, rather than on prepared designs. Standard drawings are used as the basis for choice of structure type, which should always be the lowest cost option that will serve the function required. For example, dry stone walls are favored over gabions, and gabions over concrete masonry; and scuppers are favored over hume pipe culverts.

Bio-engineering: It will also integrate the use of vegetation in combination with simple civil engineering structures such as gabion walls and simple drains to give the best overall slope protection and shallow stabilization.

Local labor: Under the LEP approach, unskilled and semi-skilled works such as earthworks, simple retaining structures, minor cross-drainage structures and side drainage will be carried out by local people formed into Building Groups (BGs). Other works, requiring skilled inputs and/or use of specialized equipment, will be carried out by local contractors.

Considering the rugged topography and lithology i.e. details regarding the composition, texture, structure and origin of rocks through which the proposed alignment of the road passes, presence of massive groups of hard rocks requires extensive blasting operations from chainage 23+500 to chainage 32+000 They can not be simply cut out or dug out. Technical team of the sub-project has concluded that controlled blasting is the only way to open the track for road alignment through this rock part. Since the controlled blasting use explosives for track opening, balanced cut and fill method can not be adopted. Similarly, as the road alignment in this area has stable geology, bio-engineering for slope protection and stabilization is not necessary, however, some civil engineering structures

like dry wall, gabion walls, side drains etc. might be necessary to build the road as per design standard.

Arrangement for Controlled Blasting

Following procedures should be followed to carry out the controlled blasting and necessary arrangements should be made accordingly.

Licensing and approval: License should be obtained in accordance with Article 4 of the Explosive Material Act 2018, relating to procurement, storage, application and transportation of explosives. Similarly, Blasting Plan should be prepared containing blasting type, design and method of blasting as per recommendation of manufacturers and government rule and regulations.

Implementation Team: Since certain level of skill and precaution is necessary to execute the controlled blasting, responsibility for this work will not be given to local road building groups. Contractor, who have a separate, skilled team for controlled blasting will carry out the work of controlled blasting.

The activities, among others, should be listed as follows under Controlled Blasting:

- Strictly comply with the relevant GoN legislation and policies (like Explosive Material Act 2018 BS, Forest Act 2049 BS, Environmental Act 1997AD and related guidelines).
- Obtaining official permission from CDO Office and sending official letter from CDO to Army is the first step required to carry out the job.
- The entire workers/labours and supervisors will be properly trained to work in blasting situation (hiding in safe place, going to safer distant place from the blasting site, looking up to sky for falling rock pieces, protecting, whistling, operating, removing of debris, management of spoil, etc).
- No blasting during night shall be done.
- Full information providing using loudspeaker/microphone and siren will be blown before and after blasting.
- Also personal visits to houses/people in the vicinity of the blasting area are required to disseminate the blasting operation and to understand signals given from the blasting operation.
- Blasting materials and detonators shall be kept in the Army's custody.
- Blasting shall be performed under Army's supervision and witness.
- First aid box, safety gear and stretcher will be kept standby at site for unpredictable incidents/ events.
- Safety helmet and safety gear shall be used by the workers.
- Similarly one vehicle will also be kept standby to use for emergency purposes.
- Adequate space or platform for placing and handling operating holes drilling equipment will be made first.
- This work will be done using contractor (not by RBGs).
- The contract clause shall require use of a separate skilled team.
- Least resistance method for locating drill holes (for explosive charges) shall be used.

- The amount of explosives will be used seeing the nature, texture, quality hardness etc of the rock, so that the blasting tremor will not cause future unstable fissures and cracks in the adjoining areas.
- Potentially risked people and their belongings, animals, etc., will be temporarily shifted to safe place though this is not a case for this site.
- If by any reason of this blasting, there causes third party injuries or destroys/damages third party property then this will be covered by insurance which shall be a clause in the bid documents of the contractor.

Environmental considerations: Since the execution of controlled blasting have some implications on natural setting of the environment, safety aspects of workers as well as local people and socio-economic impact on the local surrounding, which are misuse of explosives and its improper handling may cause various type of adverse impacts explosion hazard (loss of private as well as public properties and possible damage to vegetation, crops, and water resources, misfire and fire hazard, geological hazard (cracking of rocks, triggering erosion and landslide etc.), water and noise pollution and occupational health and safety issues. Various mitigation measures should be adopted while carrying out the controlled blasting work. Details about mitigation measures have been given in Environmental Management Plan (EMP) for 10km road section of Kamidanda-Taldhunga Road Sub-Project, Kavre.

Conclusion and Recommendation

The study concluded that controlled blasting can be carried out as per Project Administrative Memorandum (PAM) of ADB for RRRSDP (page 56, No. 72) with incorporation of mitigation measures as given in EMP.