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A technical paper on RCC blanket wall

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ABSTRACT

In the hilly and mountainous terrain many types of structural methods are used to withstand high earth pressure and also prevent soil erosion and hold the earth surface intact. The generally used techniques include building retaining walls, soil nailing, reinforced earth retaining wall (RERW) etc. These types of construction methods not only consume high quantity of steel and concrete but also increase labour and time of construction. This technical paper on "Blanket wall" for the 'safe Protection' of the cut & exposed/Natural surfaces of the hilly terrains will provide an alternative innovative method of construction which will reduce cost of construction, save time and resources without compromising on the quality, safety and intent of construction. This particular article exemplifies one of NMDC mining projects at Bailadila, Chhattisgarh. In the course of this study a lot of innovative engineering ideas and thoughts have studied before arriving at general layout and its technological requirements. Following factors are considered while planning and designing Blanket Wall: Space constraints, Type of terrain, Soil conditions, Area subjected to heavy rainfall, thick fog considerations, Transportation of heavy machineries & equipment , Time factors with respect to project schedule achieving the cost economy & various related aspects.

Keywords: *Terrain, Protection, Innovative, Quality, Safety & Economy.*

1. INTRODUCTION

The 'RCC Blanket Wall' is required to be constructed for the protection and 'safety' of the adjoining existing structures. This type of structure is mainly constructed for the existing elevated natural terrain conditions or series of mountainous hilly area ranging to a high altitude/ +1800 meters. The blanket wall can be easily constructed without any deep excavation. In case of: conventional construction methods retaining walls are constructed to withstand the earth pressure in the hilly terrain. The foundation part of the retaining wall is deeper & base width as per required design governed by the soil conditions. It would be difficult to design and construct a retaining wall with space constraints specially to accommodate foundation depth due to terrain condition. In the Course of this larger area of space provision to be planned, this may impact on cost & time.
Irrespective of the terrain/profile conditions, the blanket wall can be adopted to safe guard the existing terrain. In case of steep slopes at an angle up to 70 degree the blanket wall shall be adopted after trimming/dressing the profile wherever necessarily called for benches forming to a minimal bare width depending on the profile availability. The Blanket wall is an art of design and the peripheral end need to be provided with key beams (also called as grip/anchor beams.) At the bottom most level of the blanket wall a conventional drainage system is provided. The thickness of RCC blanket wall varies between 50 mm to 100mm with nominal reinforcements. Weep holes are provided depending on the site conditions especially at lower elevations. The weep holes are located at road drainage and formation level to a height of at least 4 meters.

The embedded 'U' shaped reinforcement bars are provided to enable access for maintenance activities during emergency situations. To quote as an example, the blanket wall shown in the pictures has been designed and constructed in a hilly terrain to an altitude of +1120 meters with respect to primary crusher at +1090 meters (30 meters height.)

This blanket wall was constructed 22 years ago and is structurally firm/intact and stable even today. The Blanket Wall has its own merits and advantages compared to vertical walls/retaining walls/reinforced earth retaining wall (RERW)/Soil nailing/other such methods. Most suitably implemented for natural slopped surfaces. It has more advantages than limitation, the cost aspects are also dealt with comparatively very economical to above said methods.

Figure1, 2, 3, 4, 5 & 6 be referred.

Fig. 1: Front view of Blanket wall

Fig. 2: Front view of Blanket wall benches.

Fig. 3: view of Blanket wall at primary crusher entry.

Fig. 4: Side view of Blanket wall

Fig. 5: Side view of blanket wall with key beam & drain

Fig. 6: NMDC Project office, Protection Works.

A. Purpose of Blanket wall

'Blanket Wall' serves as surface protection to the adjoining existing units, keeping in view its vicinity to hill, elevated altitudes, space restrictions to provide retaining wall, cost aspects due to wider spread area with close proximity to varying site profile & other many such related. The blanket wall is generally treated as one of the protections to hilly terrains instead of other methods.

B. Procedure adopted

The 'Blanket Wall' is usually spread at a single stretch of length 50 meters & sloping height of 70 meters.

Considering the existing/prevailing site conditions in a hilly terrain area, where crushing plant was built to a height of 30 meters with respect to the start of downhill conveyor. The Dumper Platform (DPF) is at an elevation of +1120 meters. The mountainous terrain in between dumper platform and start off downhill conveyor; was retained/undisturbed (For which the blanket wall protection was adopted.)

The existing contours of the hill have been physically surveyed and plotted on the drawing in Figure.7 as shown below.

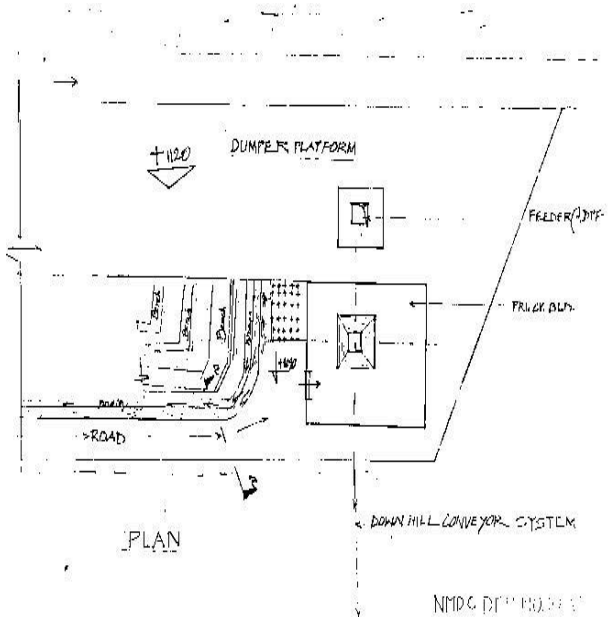

Fig. 7: Plan of blanket wall

Based on the contours the location of the dumper Platform, primary crusher, secondary crusher, transfer houses, downhill

conveyors, silos, screening plant (wet circuit system),loading plant, road/approaches and all the concerned units connectivity requirements have been marked; to accommodate the required size of the plant buildings based on technology of the mining process right up to loading plant.

The level from DPF (Dumper platform) at +1120 meters to loading plant at +550 meters being RHT (Rail Head Top.) that is units are housed to a height of 570 meters in mountainous strata.

Keeping in view the 'safety' of all technological units; a decision has been taken to protect the road leading to entry at primary crusher/start of downhill conveyor system.

The base for blanket wall is designed along with the road drain to induce gravity by weight in the form of a beam, to enable blanket wall spring from the beam top. The cross section of the blanket wall shown in figure.8

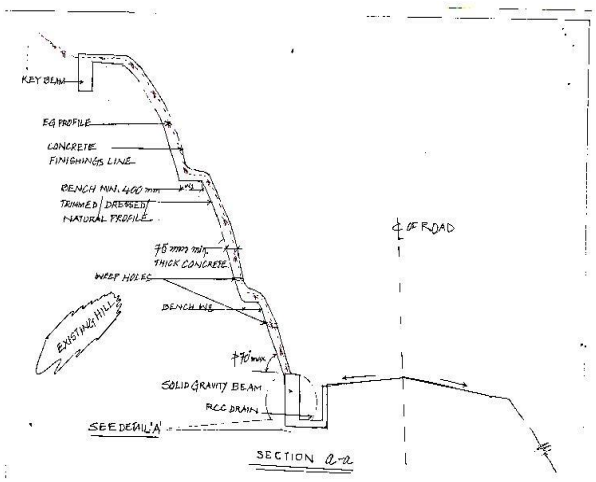

Fig. 8: Cross section of blanket wall

The design of creating gravity beam is to serve the following multiple purposes:

- As a structural member & a part of drain.
- Solid coverage & protection between road & hill part.
- To enable safe movement of heavy moving trolleys/ equipment / machinery/ other such.
- Envisage Kerb on the outer drain wall supplementing mines safety.
- Also to cater branch to blanket wall.

Key/edge beams: This shall be provided all along the periphery of the blanket wall. The size of key beams generally ranges with width between 200mm to 250 mm and depth around 400mm. Refer Figure.9 for further details.

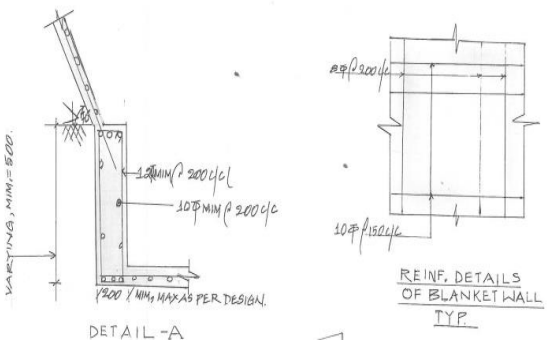

Fig. 9: Reinforcement details of gravity beam & Blanket wall.

At the exterior end of the key beam; fill the extreme cut portion, adjacent to key beam with available boulders & interstices with good earth/morrum. At the meeting point of two different stretches of the blanket walls an expansion joint of width 30mm to be provided. This gap of 30mm is filled with twisted jute impregnated in hot bitumen.

While making blanket wall the trees of any girth can be retained. The required space around the tree is provided with key beams. Before laying the blanket wall the 'construction paper /polythene sheet' is provided on the hill profile surfaces before placing the reinforcement. The uniform top surface to the extent possible need to be maintained while laying the concrete.

The thickness of blanket wall concrete due to the existing hill profile varies. Maintain minimum of 50mm thick at any given cross sectional point.

Provide 10mm diameter or 12mm diameter reinforcements in the blanket wall including the key beams to enable flexibility while matching existing terrain/profile conditions. U-shaped bars with 10mm diameter are reinforced as steps which will be used for maintenance activities or at emergency situations.

C. Quality & Safety aspects

Quality: Best efforts required to be exercised in all respects to quality aspects, strength of concrete, grade of cement, grade of steel all such related as per IS.

Safety: All precautionary and care need to be implemented as the hilly terrain contours may abruptly vary during construction activities. Prolific experience & expertise will be an added advantage in handling such challenging works.

D. Cost aspects

In General with all aspects & considerations no comparison for a blanket wall is drawn with respect to retaining wall/Soil nailing/reinforced earth retaining wall (RERW)/other such. All the said methods are heavily reinforced. However on a broad concept considering the use of nominal reinforcement (excepting the gravity beam), the blanket wall is around 25 percent of other said methods.

E. Benefits & Limitations of Blanket Wall

Benefits: It has many advantages in comparison with other types of protection works. The listed below are the advantages.

- Faster commencement of work.
- Less involvement of materials, labourers and earth equipment.
- Minimum involvement of the vegetation removal, bigger girth of trees can be retained; unless otherwise demanded by safety considerations.
- Helps in retaining trees and thus partly contribute towards environmental protection.
- Protection to natural drain in valley spots.
- Envisage easy making of benches suiting to site conditions.
- The gravity beam is clubbed along with drainage part.
- Less utilization of steel & minimum grade of concrete.
- Retention of natural terrains without much disturbance.
- 'U' shape rings/steps provided for safety towards the maintenance to reach at top point of elevations, also; it will be further useful for works continuity.
- Less maintenance.

Limitations: The listed below are the limitations.

- The Protection is extended for slopes less than/within 70 degree angle of inclination to natural hill.

- This can be adopted as protection to valleys portion where natural water stream flow all time.
- Protection to downstream check dams.
- Effectively made use for caping methods.

2. ACKNOWLEDGMENT

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(i) "MECON Limited & NMDC Limited". The Blanket Wall was designed at project Deposit No.10 & 11A, Bailadila Chhattisgarh, Suiting to Project requirement, client NMDC got this executed by renowned executing agencies under the challenging situations; keeping in view the safety of all adjacent existing structures/units during the year 1992 to 2001.

(ii) M/s Bhamys Construction Pvt. Limited., Dr. M. D. Raghavendra Prasad, Managing Director & Mr. D.S. Mallikarjuna, Chief executive officer.

3. REFERENCES

[1] IS: 14243-2 (1995); Selection & Development of site in Hill areas

[2] IS: 456 (2000); Plain & Reinforced Concrete-Code of Practice IIT, Kanpur.

[3] SP:34-1987 ; Hand Book on Concrete reinforcement detailing

[4] IS: 1786-2008; Steel bars for concrete reinforcement specification for high strength deformed steel bars & wires for concrete reinforcement.

[5] IS: 383 ; Specification for fine & coarse aggregate for concrete

