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A Review on Stabilization of Landslide Using Soil Nail Walls

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ABSTRACT: A landslide (landslip) is a geological marvel that includes a wide variety of ground movements, such as deep failure of slopes, rock falls etc. Landslides can happen in coastal, offshore and onshore environment. It can be controlled by the usage of suitable slope stabilization techniques. A landslide stabilization system using soil nail and a mechanically stabilized earth (MSE) wall was monitored and instrumented to assess total performance and simplify comparisons between design expectations and field annotations. This paper reveals the probability of utilizing soil nail walls for stabilization of active landslides, extending the application of soil nailing beyond its traditional scope of stabilization of cut slopes or for potentially unstable slopes. Axial forces in soil nails conditional from strain gauge measurements prove that design methods built on current recommendations are suitable for design of soil nail walls used for slope stabilization. Design aspects, Site conditions and construction of the soil nail defined. Recommendations for put on soil nail walls to slope stabilization are presented.

KEYWORDS: Landslide, Stabilization on Landslide, Soil Nail Walls

I. INTRODUCTION

Soil stabilization is defined that the changes in natural soil in order to meet the engineering purposes by physical, biological, chemical and combined way of either two of them or all three. The performance of the in-situ soil, sand and Weight bearing capacity can be increased by soil stabilization techniques. The term Soil nailing is an advanced technique of slope stabilization among other techniques. Soil nailing is the method used in slope stabilization and excavation with the use of passive inclusions, usually steel bars, called as soil nail. Soil nailing is used to stabilize prevailing slopes or excavations, where top-to-bottom construction is advantageous compared to other retaining wall systems. Soil nails are structural reinforcing elements installed to stabilize steep slopes and vertical faces created during excavations. Usually, soilnails are made of steel bars covered with cement grout. To protect the steel bars from corrosion and also to transfer the load efficiently to adjacent stable ground, the grout is applied. Some form of support, typically wire mesh-reinforced shotcrete, is providing at the construction face to support the face among the nails and also to serve as a bearing surface for the nail plates

Soil nailing technique is a construction remedial measure to treat the uneven natural soil slopes or to allow a safe over-steepening of new or existing soil slopes. This technique includes the insertion of slender reinforcing elements into the slope (often reinforcing bars (rebar) even though branded solid or hollow-system bars are also available. usually Solid bars are installed into pre-drilled holes and grouted into place by means of a separate grout line, while hollow bars may be drilled and grouted concurrently by the sacrificial drill bit and by pumping grout down the hollow bar as drilling progresses.

II. SOIL NAILING TECHNIQUE PROCESS

In this, the soil is reinforced with the slender elements such as reinforcing bars which are called as nails as illustrated in Figure.2.1. These reinforcing bars are then installed into the pre-drilled holes and then they are grouted. Moreover, these nails are installed at an inclination of 10 to 20 degrees with vertical. As the excavation starts, the materials concrete,

shotcrete or other grouting materials were applied on the excavation face to grout the reinforcing steel or nails. Figure.2.2 to Figure.2.5 shows the soil nailing process.

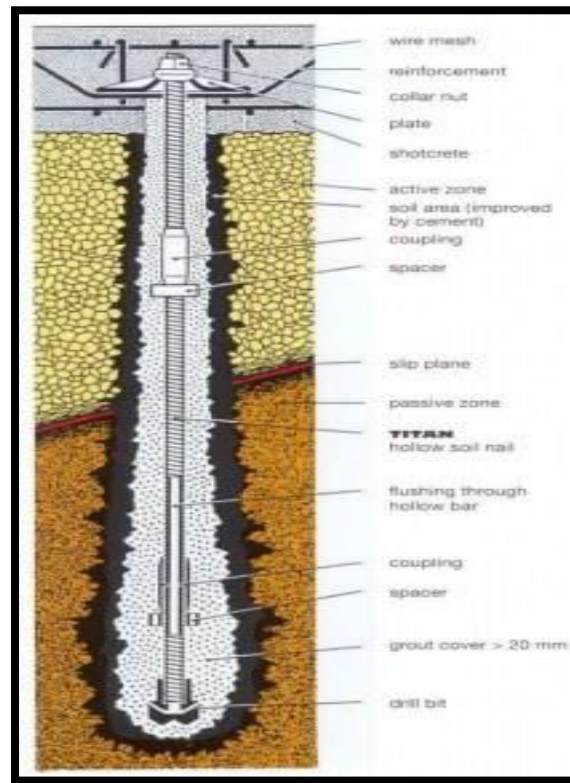


Fig 2.1: Details of soil nailing



Fig2.2: Drilling holes



Fig 2.3: Nail inserting and grouting



Fig 2.4: Applying plates



Fig 2.5: Spraying shotcrete

III. TYPES OF SOIL NAILING TECHNIQUES

3.1.1 Drilled and grouted Soil Nailing method

- In this method, in walls or slope face, the holes are drilled
- Then, in the pre-drilled holes, nails are inserted.
- Then using grouting materials such as concrete, shotcrete, the hole is filled
- Finally, the nails diameter ranges from 100-200mm with spacing of 1.5m.



3.1.2. Driven soil nailing method

- This is used for the temporary stabilization of soil slopes and it is considerably fast.
- However, it will not offer corrosion protection to the reinforcement steel or nails.
- In view of this method, the nails are driven in the slope face during excavation.
- Diameter of the nail is about 19 to 25mm which is moderately small.
- Nail spacing is 1 to 1.2m.



3.1.3 Self drilling Soil Nailing method

- In self driven soil nailing method, the Hollow bars are used.
- Hollow Bars are drilled into the slope surface. Grout injected simultaneously throughout the drilling process.
- This is faster than drilled grouted nailing.
- This method provides more corrosion resistance to the nails than the driven nails.



3.1.4 Jet Grouted Soil Nailing method

- In this method, jets are used for eroding the soil to create holes in the slope surface.
- Next, steel bars are installed in this hole and they are grouted with concrete.
- Finally, these techniques provide good corrosion protection for the steel bars (nails).



3.1.5 Launched Soil Nail method

- In this method, steel bars are forced into soil with single shot by using the compressed air mechanism.
- The soil nails installation is fast, but controls over length of bar penetrating the ground is difficult.
- Used to reinforce an unstable or potentially unstable soil mass.
- Lastly, diameter of nail is 38mm and its length was around 6m.



IV. APPLICATIONS OF SOIL NAILING

- Landslide Remediation
- Roadway widening under existing bridges
- Highway embankments and cuttings
- Railway embankments
- Stabilizing of existing retaining walls

V. MACHINERIES USED FOR SOIL NAILING

- Drilling Equipment's
- Compressor
- Grout Mixing Equipment's
- Shotcreting / Guniting Equipments

VI. ADVANTAGES

- By the right soil and site conditions, a quick and economical means of constructing the earthretaining support systems and retaining walls.
- Generates less noise and less traffic obstructions.
- Fewer impact on neighbouring properties
- Allow in-situ strengthening on existing slope surface with minimum excavation and backfilling, particularly very suitable for uphill widening, thus environmentally friendly.
- Permit excellent working space in front of the excavation face, it Can be used for strengthening of any natural slope or manmade cut slopes

VII. DISADVANTAGES

- Nail infringement to retained ground rendering unusable underground space
- Usually, larger lateral soil strain during ground surface cracking and removal of lateral support may appear
- due to drilling technique, Tendency of high ground loss, mostly at course grained soil,
- Fewer suitable for soft clayey soil and course grained soil, which consume short self-support time, and soils susceptible totocrawling
- Suitable only for the excavation above the groundwater

REFERENCES

- [1]. <https://www.slideshare.net/asertseminar/soil-nailing>
- [2]. <https://ascelibrary.org/doi/full/10.1061/%28ASCE%291090-0241%282005%29131%3A2%28141%29#:~:text=A%20landslide%20stabilization%20system%20using,design%20assumptions%20and%20field%20observations.>
- [3]. <https://www.onlinecivilforum.com/site/soil-nailing-technique/>
- [4]. Goldstein, Natalie (Sep–Oct 2001). "Soil Nailing". Erosion Control. Forester Media. 8(6). Archived from the original on 2011-07-10.
- [5]. "Construction d'un mur de soutènement entre Versailles-Chantiers et Versailles-Matelots", S. Rabejac and P. Toudic, General review of the railways, 93rd edition, pp 232-237.
- [6]. https://en.wikipedia.org/wiki/Soil_nailing



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