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REVIEW OF SOIL STABILIZATION TECHNIQUES

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ABSTRACT

As per civil engineering is concerned it is very important for every planner to plan any city or village so that all the facilities should be provided to public not only with respect to the residence but also transportation, water supply, drainage disposal, public amenities etc.

Keywords: amenities,stability etc.

I. INTRODUCTION

As per civil engineering is concerned it is very important for every planner to plan any city or village so that all the facilities should be provided to public not only with respect to the residence but also transportation, water supply, drainage disposal, public amenities etc. Further it is expected to fulfill the best adaption of comfort, convenience, health and safety while planning any town or village. The stability of the soil mass over which proposed structure is to construct should also be assessed and studied at regular intervals.

II. LITERATURE REVIEW

1. Mangrove restoration technique

Based on site description of "Sedari" village, the mangrove area is almost converted into farm. This persuasive activity is intended that the owner of the property/fishpond can provide a land use permit for planting mangroves and at the same time describing preservation awareness about mangroves. The activities started in 2012, comprising of planting mangroves at Sedari riverbank and the coastal area as a buffer zone (green belt) to prevent abrasion in river side area. Total of planted mangrove is 15,000 seedlings. The planted mangrove was unsuccessful at the river bank. The next restoration was conducted on November 2013 in area of 0.05 hectares. Learning from the previous experience, the restoration activities was used as an experimental material. Based on Working Plan, the next mangrove restoration was on March, 2014. The third mangrove restoration activities were became a form of implementation and the results obtained were so good that abrasion control and soil stability could be increased at a higher extent.

2. Stabilization of expansive soils using fly ash

If it is required to optimize the rainfall infiltration, fly ash content will reduce the moisture content and hence the soil stability will be achieved. As the fly ash content is increased, optimum moisture content will be reduced. For construction of roads, railways it is not possible to get proper soil. In such cases it is required to haul suitable soil from a distance which may be expensive. Hence instead of borrowing a suitable soil from a long distance fly ash can be used in the vicinity of power plants.

3. A dynamic comprehensive method for landslide control:

A dynamic comprehensive control method does not only use pre-phase survey data, but it also uses updated monitoring information. According to this technique, further degradation of the sliding surface is controlled by controlling the surface and underground water drainage, subsections of soil cutting. The expected portion is prevented to slide by increasing the resisting energy i.e. by increasing the weight of sliding soil mass.

4. 4 Constructing the retaining wall

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These retaining walls can be constructed by adding lagging (metal, concrete, or wooden beams) horizontally between the piles. Such walls can be further strengthened by adding tiebacks and buttressing beams. Tiebacks are long rods that attach to the piles and to a competent rock layer below the ground surface. Buttressing beams are placed at an angle downward slope of the piles to prevent the piles from toppling or tilting

III. PROPOSED WORK

a. Objective

- To study different soil stabilization techniques adopted
- To suggest the best suitable method to adopt out of studied methods.

b. Research Methodology

Detailed study of different soil stabilization techniques adopted for soil stabilization purpose

1. Improving surface and subsurface drainage:

Continuous rainfall and water infiltration is a major reason of a landslide. In this case, it is very essential to improve the surface and subsurface drainage so that slope can be stabilized to higher extent. Rainfall water can be diverted from a landslide prone area. So as to achieve this, diversion ditches can be excavated and further such ditches are conversed to keep the landslide prone area dry and free from infiltration chances. In addition to this, it is also essential to drain off the water as early as possible. If the ditches are not properly channelized or diverted water is not allowed to drain off without accumulating on landslide prone area or beside it. The water should be diverted in such a way that it should avoid triggering a landslide adjacent to the site. The accumulated water should be drained off and diverted to a channel. Proper management of slope should be achieved through pipes and earth heap to carry water naturally towards the slope. Existing and expected leakages on the site should be examined and tried to block the seepage.

2. Excavating the Head:

As per the earth head is concerned, it is it is expected to balance driving and resisting pressure. Water infiltration promotes reduction in resisting energy of earth mass. So as to stabilize the earth head it is fundamental norm to remove the soil and rock at the head of the landslide. It will decrease the driving pressure and can slow or stop a landslide. Additional soil and rock above the landslide will need to be removed to prevent a new landslide from forming upslope. Flattening the slope angle at the top of the hill can help stabilize landslide-prone slopes

3. 3 Buttressing the toe:

As we all know that, Malin and Amade both villages are located towards the base of the slope. As Malin had a landslide and Amade is new place of relocation, a planner should keep in mind that Amade is located towards the dam and having more slope than Malin. So Amade is under the risk of earthquake from Dimbhe dam and landslide from earth slope. If the toe of the landslide is at the base of the slope, fill can be placed over the toe and along the base of the slope. The fill increases the resisting forces along the failure surface in the toe area. Due to which filled material can block head from moving toward the toe.

4. Constructing the retaining wall-

Constructing the RCC retaining wall across the slope failure path can also provide safety against the failure of earth mass. A deeply driven RCC wall plays an important role in stability of soil. In some cases, construction of retaining walls at regular interval can also be a good option. These walls should be supported from both the sides. Though series of wall will not be economical, single wall at base of the slope should be supported properly.

These retaining walls can be constructed by adding lagging (metal, concrete, or wooden beams) horizontally between the piles. Such walls can be further strengthened by adding tiebacks and buttressing beams (fig.5.1.4).

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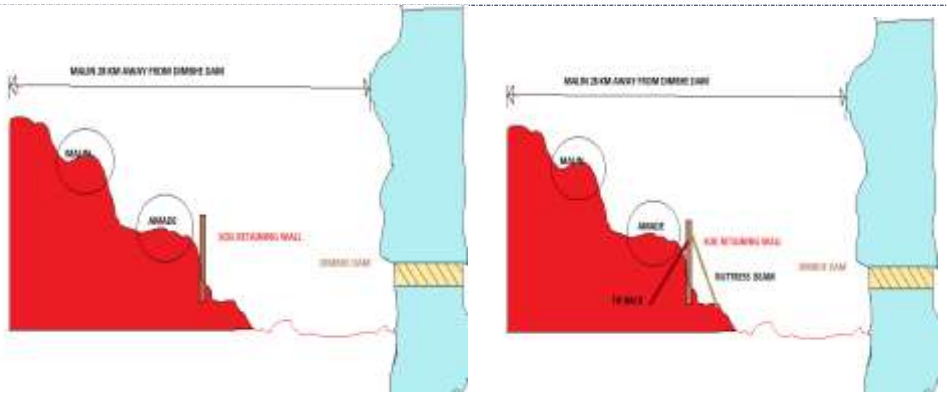

Fig.5.1.4 retaining wall

Tiebacks are long rods that attach to the piles and to a competent rock layer below the ground surface. Buttressing beams are placed at an angle downward slope of the piles to prevent the piles from toppling or tilting. Retaining walls also are constructed of concrete, cinder blocks, rock, railroad ties, or logs, but these may not be strong enough to resist landslide movement and could topple.

5. Removal and replacement:

Landslide-prone soil and rock can be removed and replaced with stronger materials, such as silty or sandy soils. In addition to this lighter materials which can be a good option for increasing the bearing capacity because weathering of shales can form landslide-prone soils. The removal and replacement procedure must include measures to prevent continued weathering of the remaining rock. Landslide material should never be pushed back up the slope.

6. Mangrove restoration technique:

Mangrove restoration technique is advance technique adopted in sedari village of Indonesia. Due to loose soil and concentrated rainfall, stability of soil was awfully affected. In this technique, the land is converted into farm. This technique controls the abrasion of soil and at the same time it controls the slope of a soil mass. It is always important to control the upper layer of land as it contributes in the percolation of rainwater. The main purpose of mangrove restoration technique is to manage the structure, function of ecosystem. Indirectly it affects on the betterment of soil stability. At prior stage it looks mangrove forest will promote only the betterment of soil properties but it also affects the slope as well. Because if the surface drainage is optimized, the rainfall infiltration will be reduced to greater extent and ultimately soil stability will be increased.

7. Stabilization of expansive soils using fly ash:

As the fly ash content is increased, optimum moisture content will be reduced. For construction of roads, railways it is not possible to get proper soil. In such cases it is required to haul suitable soil from a distance which may be expensive. Hence instead of borrowing a suitable soil from a long distance flyash can be used in the vicinity of power plants. For expansive soil, flyash can be used efficiently for all remaining soil types' use of flyash can be done effectively. The areas where landslides are occurred are generally rainfall concentrated or earthquake prone area. In such cases it is required to optimise the rainfall infiltration. If it is required to optimise the rainfall infiltration, flyash content will reduce the moisture content and hence the soil stability will be achieved.

8. A dynamic comprehensive method for landslide control:

Dynamic comprehensive method is one of the advance methods of controlling the landslide by the monitoring data. Basically landslide is a dynamic process. Conventional methods are designed or studied which states that landslide is a static process. Landslide as a whole is a downward movement of soil mass. The movement is continuously taken place. This technique promotes monitoring of soil mass regularly. Present data will give exact idea for application of technique to adopt for a landslide. A dynamic comprehensive control method does not only use pre-phase survey data, but it also uses updated monitoring information. Most updated data will clarify the landslide. This technique is very economical. It basically requires small investment. According to this technique, further degradation of the sliding surface is controlled by controlling the surface and underground water drainage, subsections of soil cutting. For controlling the ground drainage dykes along the sliding portion

are essential to provide. Further, underground surface drainage should be controlled by filling the gaps and tampering them so as reduce the sliding time. In this way, the expected portion is prevented to slide by increasing the resisting energy i.e. by increasing the weight of sliding soil mass.

9. Soil stabilisation by using Terrazyme :

Basically the Terrazyme is a liquid in a organic state. It is a liquid ezyme and formulated from the vegetable and fruit extract. Addition of Terrazyme improves quality of the soil and at the same time reduces the optimum moisture content, plasticity index of soil. As the effect of Terrazyme is permanent it can be used at small areas beneficially.

10. Soil stabilization using lime:

Lime plays an important role in the soil stability. Because when lime is added into soil, it will react with the constituents present in soil. Generally, lime reacts with the moisture content in the soil and creates heat. This hydration process enables soil to get dry immediately. As a result, moisture content can be modified easily. Quick drying of soil will reduce the moisture content and soil bearing capacity will also increase to a higher extent.

IV. RESULT AND CONCLUSION

In this paper, about 10 soil resisting techniques are studied. Among them mangrove restoration technique proves more useful as it enhances use of land to reduce the moisture content by treating the land as farm. Planting the tress of mangrove will effect on the stability of soil. Further, using lime is also a best suggestive measure for landslide because lime hydrates quickly when added in moist sand. Moist sand hydrates with the water in soil and the hydration process promotes reduction in the moisture content and ultimately increases strength of soil.

Top most layers of landslide prone area and refilling it with light weightt material can also be a good option. Further, kiln cement (waste by-product from plants) can be spread on the landslide affected area. As the problem deals with the construction of new village, a good planner should deal with best option which can solve the stability problem. In addition to this, use of flyash on land can also be beneficial. Because flyash also enhances the hydration process and reduces the moisture content. Reduction in OMC will increase the stability of soil. As per the construction is concern within landslide prone area, constructing retaining walls along with buttresses can also be constructive option for a planner. But retaining walls only can't control the landslide. One more hopeful method studied in this research work is that dynamic comprehensive landslide control method. According to that method, Landslide is a dynamic action and it can be controlled by continuous monitoring and assessment.

At every essential stage landslide is controlled with different ways. Filling the gaps between soil masses and tampering can also be a good option so as to stabilise the soil. Ditches for drainage water can be initially provided. As a result, soil stability techniques can be applied according to the purpose for which it is stabilized. For construction work, use of lime, flyash, geogrid can be a good option from selection of material point of view. As an on-site application of technique, dynamic comprehensive technique is best.
Use of lime will be the best way of soil stabilization because application is quiet easy and at the same the heat of hydration process will reduce the moisture content from soil

V. REFERENCES

[1] Randya, Hutomob, Purnama(2013)," Collaborative efforts on mangrove restoration in sedari
[2] Benaradj, boucherithafidha(2013),"Rehabilitation of the steppe lygeum in the region of Naama (western Algeria)(vol. no 36, page no. 349)
[3] Bhuvaneshwari, Robinson, Gandhi (2005) "Stabilization of expansive soils using flyash"
[4] Fly ash india 2005, new delhi,Fly ash utilization programme (faup), tifac, dst, new delhi – 110016 (viii 5.1,page no.1)
[5] Zuoan, Shihai, WanLing (2005) "A dynamic comprehensive method for landslide control" a Institute of Mechanics, Chinese Academy of Sciences, Beijing 100080, China, College of Resource and Environmental Sciences, Chongqing University, Chongqing(vol.86, page no. 2-7)
[6] Saini, Vaishnava (2015) "soil stabilization by using terrazyme" International Journal of Advances in Engineering & Technology IJAET ISSN: 22311963 566 (Vol. 8, Issue 4, pp. 566-573,page no.2-3)
[7] Negi, faizan, pandey, rehanjot singh(2013) : "Soil stabilization using lime" Issn: 2319-8753 International journal of innovative research in science, engineering and technology (Vol. 2, issue 2, page no-1,3,4,6)

ISSN: 2277-9655
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[8] Zaliha, Kamarudin, Mustafa,Bakri, Binhussain, Salwa(2013) "Review on Soil Stabilization Techniques"Australian Journal of Basic and Applied Sciences, 7(5): 258-265,(page no.3)

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