

Eco Friendly and Cost-Effective Solution for the Construction of Long Compound Wall: A Case Study

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Abstract- Due to rapid increase in the construction sector various building materials are being used universally. Retaining walls play crucial role in Geotechnical Engineering, wherein Gabion retaining walls have come more into limelight. The Gabion retaining walls are very much beneficial when it comes to economy, structural stability and aesthetic look when compared to others. They have multiple functions and are very effective when it comes to water draining properties. The current paper gives an overview about the Methodology of gabion retaining wall and RCC Wall. A Gabion wall is one of a modern kinds of retaining wall, which consists of stone-filled mesh boxes that are tied together to form a shape of retaining wall. A Gabion wall is preferred nowadays due to its simplicity, speedy construction, flexibility, an eco-friendly, and a wide range of applications. This paper describes details of the Gabion wall and details about materials used for manufacturing of mesh box, its specifications, testing methods on Gabion mesh, construction procedure, merits–demerits, and application areas. Total five types of retaining walls, namely stonemasonry, cantilever, counter fort, buttresses, and Gabion has designed for the height of five meters with the same input design parameters. Cost comparison of optimized sections of all walls is also presented. This study provides a base for further research on possible modifications in the Gabion wall system particularly

Indexed Terms- Cost comparison, Gabion retaining wall, Gabion mesh, Construction procedure

I. INTRODUCTION

This paper emphasizes on methodological Comparative analysis of RCC wall and Gabion wall. The primary function of any retaining structure is to provide lateral support to soil or the rock mass behind it. Different flexible and rigid bodies are being used as retaining structures in different parts of the world. Apart from the typical retaining structures, the gabion retaining walls are now gaining attention. The gabions are basically large baskets of galvanized steel which are filled with local stones or concrete rubble. The baskets are 1m high and up to 4m long. The baskets are placed one above another to form a solid structure. The gabion structures are resilient and can resist pressure without deforming, cracking or breaking as in the case of concrete and other materials. Their flexibility takes care of the soil movements and the effect is there is no reduction in the load bearing capacity of the wall. Over years

Vegetation grows over them and they turn out to be the most attractive alternative to concrete retaining walls. They are cost-effective and can be built quickly.

II. OBJECTIVES OF PAPER

- To study the Application of Gabion Wall
- To compare the Construction Process of Gabion wall and RCC wall
- To analyses the cost comparison of both the walls
- To provide cost effective and Ecofriendly solution

III. TYPES OF GABIONS

Depending upon the applications and the site requirements there are different types of Gabions available. Some of them are as follows.

1. Gabion gravity wall:

These are similar to gravity retaining walls which use their own weight to resist lateral pressure.

2. Mechanically stabilized earth:

In order to secure the gabion walls to the backfills welded wire meshes are used.

3. Gabion mattress:

These are commonly used in spillways, channels, banks in order to control erosion.



Image: - SACK Gabion



Image: - Welded Gabion



Image:- Weldmesh Gabion Wall



Image: - Gabion Mattresses



Image: -MSE Wall



Image: -Reinforce Earth Gabion



Image: -Curved gabion walls

4. Types of Gabion wires

Following are the types of Gabion wire

1. Unprotected, Uncoated Wire:

These are 5mm diameter wires which are used for temporary works.

2. Steel wire:

These are high quality low carbon 2mm to 4mm diameter having strength of 38kg/m².

3. Galvanized wire:

Hexagonal woven mesh gabions should be made from galvanized wire (low carbon mild steel wire with a heavy duty coating of zinc or Zinc-Al alloy).

4. PVC coated galvanized steel wire:

The radial coating applied to the galvanized wire core should be a minimum of 0.25 mm. The PVC should be sufficiently bonded to the galvanized wire core to prevent capillary flow of water.

5. Polymer Plastic Rope Mesh:

New materials such as Tenser, a heavy duty polymer plastic material, have been used in some applications in place of wire mesh. Nylon or polypropylene rope gabion baskets are usually used for anti-erosion works.



Image: -Galvanized wire

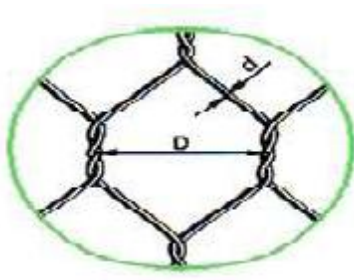


Image: - Gabion Wire mesh

5. Properties of rock fill

The stones should be hard, durable, angular and well graded with a minimum size of 1.5 times the aperture size and maximum size of one half the heights of the gabion baskets. Naturally occurring rounded stone or quarried stones are acceptable. Gabion fill is normally a graded fill of between 100 to 200 mm in diameter. The more angular the fill, the better interlock and the less deformation of the face occurs. Quarried Stone which is normally angular is the preferable fill as the interlock is very good. Construction waste, debris from demolished structures, quarry rejects stones, and Industrial waste has been used as a gabion filler material. However care has to be taken to check the durability, strength and chemical properties of the fill material. Artificial stones made from cement concrete with color pigments to give it the color that would match the natural landscape have been used recently.

6. Construction stages of New RCC Wall

For the Construction of New RCC Wall at the existing site includes the following items:-

1. Excavation Work
2. RCC Foundation Work
3. RCC Column
4. RCC Plinth Beam
5. Cross drainage work (with the help of fabrication) to drain out the water
6. Provision of Precast RCC column for cross drainage work
7. Horizontal prestress panel (thickness 6 to 8 inches) with the help of crane
8. Refilling work
9. Fabrication and fixing MSY pickets (MSY- Mild Steel in Y shape)
10. Supply and fixing MS burbed wire at 4 inches C/C horizontally

- ↓
11. Supply and Fixing Concertina coil
7. Construction stages of Gabion Wall
Steps for providing Gabion Wall includes the following items:-
1. To collect the debris/ Stones
 - ↓
 2. Segregation of stones
 - ↓
 3. Supply and fixing MS wire rope
 - ↓
 4. Need labor for cutting and forming the Gabion bags to lay the stones as per required size and shape
 - ↓
 5. Lifting and filling the stones in to gabion bags to complete gabion wall
 - ↓
 6. Lifting and shifting of gabion bags at required size and shape with the help of crane

CONCLUSION

After the study of step wise process of RCC Compound wall and Gabionwall, the materials specifications, construction procedure, wide range application area, and cost comparison, and for the existing case study high flood waves act horizontally on the perimeter wall. it is found that the Gabion wall construction is easy technique which gives speedy work, cost-effective, and ecofriendly solution. It will also protect the scoring of soil below the gabion wall due to high self-weight of stones inside the gabion bags.

In the current scenario the estimated cost of the new RCC Perimeter wall is 75 % costlier that the Gabion wall, it provide the effective and affordable solution for RCC Compound Wall.

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