

# A COMPARATIVE STUDY ON GEO COMPOSITE DRAIN AND CONVENTIONAL FILTER USED BEHIND ABUTMENT

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**Abstract:** Drainage is an evitable part for structures such as earth retaining structure, reinforced soil structure, abutments etc. Locking of water inside the structure shall impose extra water pressure and earth pressure that results in reduction in shear strength of soil. This shall reduce the stability of structure and can even lead to catastrophic failure. To prevent this, 600 mm thick filter media (cobble or boulders in railway project/graded aggregate in highway projects) layer is provided behind retaining wall towards the backfill soil face and larger size towards the wall face. This conventional method has a lot of hindrances like: Clogging of filter layer by fine soil particles, difficulty in quality construction (as there is a need to provide proper gradation of aggregate depending upon the fill material and it is difficult to place the handpicked boulders one above the other in case of railways) etc. Considering these aspects, the paper present use of an advanced geo-synthetic material, Geo-composite drain as an alternative to the conventional filter media.

**IndexTerms – Bridges, Retaining wall, Geo-synthetic, Geo-composite, Filter media, Earth Pressure, Drainage & Backfill.**

## I. INTRODUCTION

Due to mining ban by the government in some states and to reduce the adverse effect on environment, some alternative ways for drainage have become necessary now days. One such alternative solution for this problem is drainage composites. It is a geo-synthetics product which is used as an alternate to conventional gravel drainage layer behind earth retaining structures.

The combination of geo-grid and geo-membrane, or geo-textile and geo-grid, or geo-grid, geo-textile, and geo-membrane is a geo-composite material. Such thrilling fabrics pull out the designer, supplier, and contractor 's strongest artistic efforts. The domain areas are various and are increasingly increasing. Geo-composite essentially reduces the hydrostatic burden by storing and moving groundwater for injection through a drain pipe. Drainage composites are derivatives of prefabricated sub-surface drainage that explicitly cover the substrate of granular drainage. Other major geo-composite drainage functions include: separation, liquid barrier, reinforcement, and filtration. Installation the systems are exceptionally fast and highly cost effective. Figure 1 shows a typical geo-composite made of three-dimensional lightweight , high-compressive polymeric core and geo-textile nonwoven, provided on both sides.



Figure -1 Geo-Composite Drain

## II. GEOGRID COMPOSITES

As certain types of geo-membranes and geo-grids can be constructed from the same material ( e.g., high-density polyethylene), they can be connected together (actually welded) to form an impermeable barrier of improved strength and friction power.

## III. APPLICATION OF GEO-COMPOSITE DRAIN

Drainage composite reduces the pore water pressure and thus increases the overall stability of earth retaining structures. It is laid behind the wall facia as shown in Figure 2 & 3. At the bottom end, it is connected to perforated

PVC pipe of suitable diameter to drain the water off. If in case there is the conventional retaining wall system consisting of the weep holes, the geo-composite can be used for the dissipation of the water that may be generated.

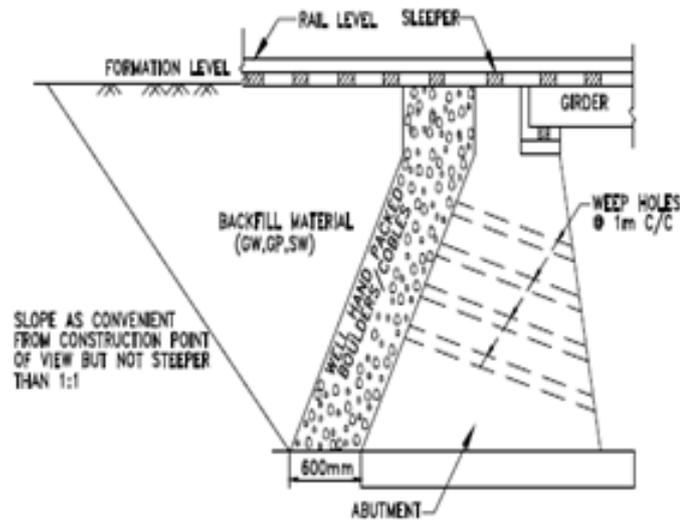


Figure-2 Retaining wall with geo-composite

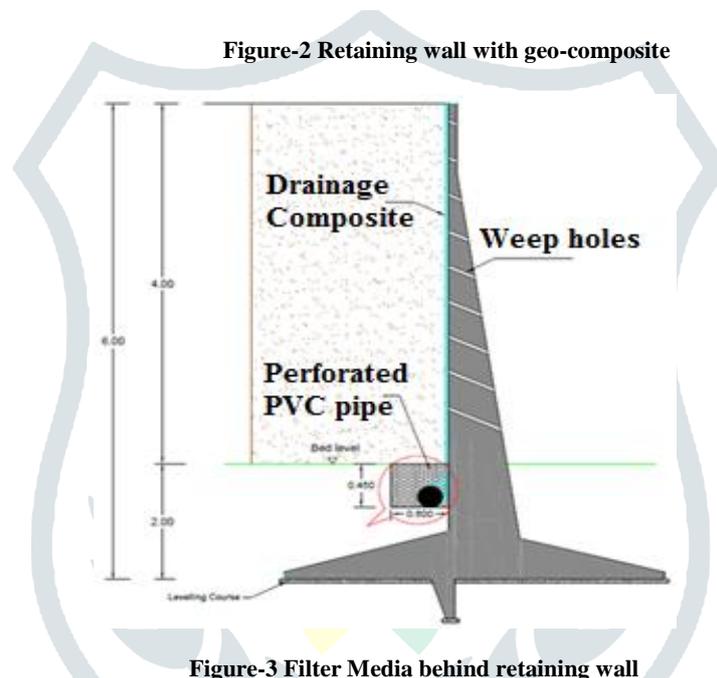


Figure-3 Filter Media behind retaining wall

Some field testing is required to be carried out for interpreting the functions. The basic objectives of conducting the field test were;

- To establish installation procedure, get the project team familiarized with the installation procedure.
- Review the effectiveness of installation procedure.
- Water may be poured on the backfill area till it reaches to submerged condition.
- To check, if water gets drained out from the weep holes and / or PVC pipe.
- To check the functionality or working mechanism of the drainage composite.

#### IV. ADVANTAGES OF GEO-COMPOSITE DRAIN OVER CONVENTIONAL FILTER MEDIA

Geo-composites provide effective solution over conventional drainage layer. Some of the inherent advantages of geo-composite are:

- a) Extremely effective solution compared to traditional stone drainage layer.
- b) Being light in weight, it is easy to handle and install them quickly.
- c) Made of PP and PE, so they are durable and chemical resistant.
- d) High flow capacity as compared to conventional gravel drain.
- e) Acts as drainage as well as protection layer due to its high puncture resistance.
- f) Filtration properties are suitable for most soil types.
- g) Highly compressive strength core.
- h) Geo-composite drain, being factory manufactured product, it is very easy to install and suitable for wide range of soil gradation.
- i) Geo-composites have a filter geo-textile layer attached to its drainage core which shall not allow the clogging of drainage core and thus ensures requires in-plane flow capacity and proper functioning.

- j) Robustness prevents puncturing and tearing during installation.
- k) Since these are factory manufactured products, high quality can be assured.
- l) The burden on natural resources for gravel/aggregate is also reduced.

## V. CONCLUSION

The process of installation of Geo-composite drain is very simple, fast and economical. The core component of the drainage composite made up of polymer core networks with high compressive strength acts as a water carrier and the geo-textile portion prevents the passage of fine soil particles into drainage and thus prevents the clogging of drainage composite and thus ensures the necessary level flow capacity and proper operation.

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