

PROJECT REPORT

PROJECT DETAILS:

Project Name	:	Flood Protection Works on the Downstream of River Ghaghara at Lakhimpur Kheri, Uttar Pradesh
Technology Service Provider	:	Techfab India Industries Limited
Geotextile Material Supplier	:	Techfab India Industries Limited
Project Location	:	Lakhimpur – Kheri, 137 km from Lucknow
Project Coordinates	:	Latitude 27°59'32"N, Longitude 81°00'43"E

1. INTRODUCTION:

Most of the rivers in this region originate from the high mountains, where they have steep gradients giving the flow a massive erosive power. Moreover, intense rainfall and breakout events can accelerate the river flow to such an extent that the water has a significant impact on the watercourses and surrounding areas. During heavy floods water flows through the river channel at a higher velocity, it tends to scour the river bed and bank section during the flood. The scouring lowers the bed level of the river and creates instability in the bank protection system.

2. SITE DETAILS AND PROBLEM DESCRIPTION

The location is Lakhimpur – Kheri 137 km from Lucknow. Every year during monsoon, the difficulties were faced by the local habitants to a large extent by loss/damage to the property, loss of agriculture/farmland, loss of Cattle etc. The site coordinates are Latitude 27°59'32"N and Longitude 81°00'43"E.

The Lakhimpur-Kheri has witnessed several floods in the past due to heavy rainfall. It was observed by the locals that this flood or rise of water levels in the Sharda and Ghaghara Rivers is due to heavy rainfall in this region. Also, tributaries add water into the river from the upstream side of Nepal generally in the month from June to September every year. The lives of the people affected due to flood at the time of monsoon due to the proximity of the people residing on banks or falling under flood influence area of the River Sharda & Ghaghara. Both these rivers have recorded high velocity and frequently changed their course in the past.

The construction challenge was to meet the construction schedule before the monsoon and the mobilization of soil for the construction of Dyke. The earthen dyke is subjected to either loss of fines or breach of the partially constructed bund due to wetting and drying every day.



Figure 1. During flood situation

3. DESIGN OF FLOOD PROTECTION WORKS ON DOWNSTREAM OF RIVER GHAGHARA AT LAKHIMPUR

Generally, as a conventional approach, big boulders are used for river training work. However, mobilizing such a huge quantity of stones in a short span of contract period is difficult and moreover, it is very expensive. Further extraction of stones in huge quantities would affect the environmental balance. Transporting and handling the material to the work site is another issue and needs the involvement of machinery to handle it.

TECHFAB INDIA Industries Ltd designed a flexible solution for river bank protection with woven geotextile bags on the side slope and the bed of the river at the toe of the slope. The woven geotextile bag is very effective when it is exposed to water and sun. The nonwoven geotextile was proposed to be placed on the interface of the geotextile bags and soil, which will act as a filter and a separator. This will prevent the migration of the soil particles from the embankment soil towards the geotextile bag system and vice versa but it allows the flow of water in the direction perpendicular to the direction of the laying. Firstly, it needs to construct a porcupine spur (Transversal Protection Structure) as a temporary structure. Now, Flood

protection work (Spur) can be done with the help of woven Geotextile bags (longitudinal protection structure).

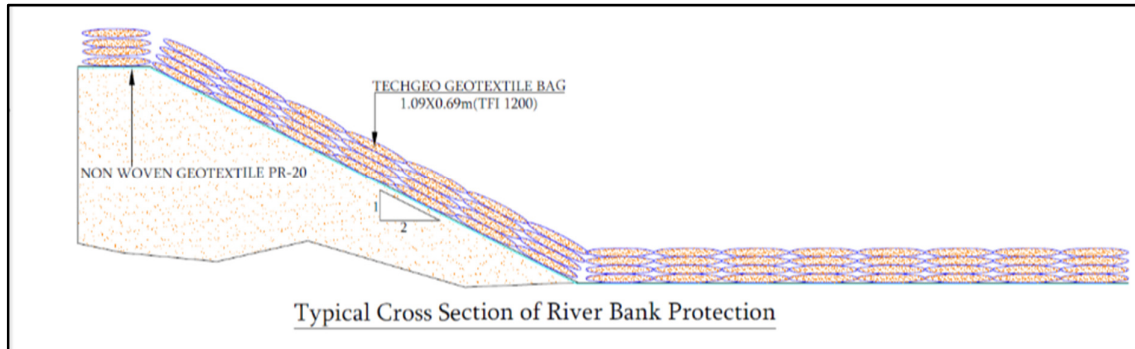


Figure 2. Proposed cross-section of river bank protection on the Right side of Bank

Spurs are constructed transverse to the river flow extending from the bank into the river. This form of river training works performs one or more functions such as training the river along the desired course to reduce the concentration of flow at the point of attack, creating a slack flow for silting up the area in the vicinity and protecting the bank by keeping the flow away from it. Geotextile bags of grade TFI 1200 and size 1.09m(L) x 0.69m(B) have been used. Which has Tensile strength >55/40 kN/m, Tensile elongation <25/25%, Puncture resistance >700N, Trapezoidal Tear strength>850/600N. The total quantity of bags, 1,97,000 was estimated. As a filter and Separator material, nonwoven Geotextile PR-20 was used, which has a Tensile strength of 11/13 kN/m, Tensile elongation of 55/55%, Puncture resistance of 420N, and Trapezoidal Tear strength of 320N.



Figure 3 Photograph after Construction

4. MATERIAL SPECIFICATIONS

Geotextile Bag

Geotextile bags are novel, sustainable, and three-dimensional protection system that deals in the field of river and coastal engineering. PPMF Geotextile bags shall be made from UV-resistant woven geotextile fabric and PP Tape woven geotextile fabric which provide high strength and better filtration properties and are usually filled with sand/ dredged material at the site. Geotextile bags are used at sea shores or bunds adjacent to rivers which are to be protected from erosion, especially during emergency situations. Geotextile bags have also been used as revetments, breakwaters etc. to build structural erosion protection.

Geotextile bag material shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids. The specially engineered textile and factory-sewn seams (having a minimum of 50% efficiency i.e., a minimum of 50% of the parent fabric) utilized in the construction of the geotextile bags.

Nonwoven Geotextile

Geotextiles are the technical textiles used for various engineering applications such as reinforcement, containment, filtration, and separation. Geotextiles are commonly either woven or nonwoven and are manufactured using polymer fibres such as polypropylene (PP), polyester (PET), polyamide, polyvinyl chloride etc. However, PP and PET are most used for the manufacturing of geotextiles. Nonwoven geotextiles used in the proposed design solution of the river bank protection are the staple fibre needle-punched nonwoven geotextiles manufactured from 100% PP fibres. The thickness of the Techgeo PR-20 is 1.6mm under standard conditions and is highly resistant to chemical action and ultraviolet degradation.

The placement of the nonwoven geotextile is shown in Figure 4.

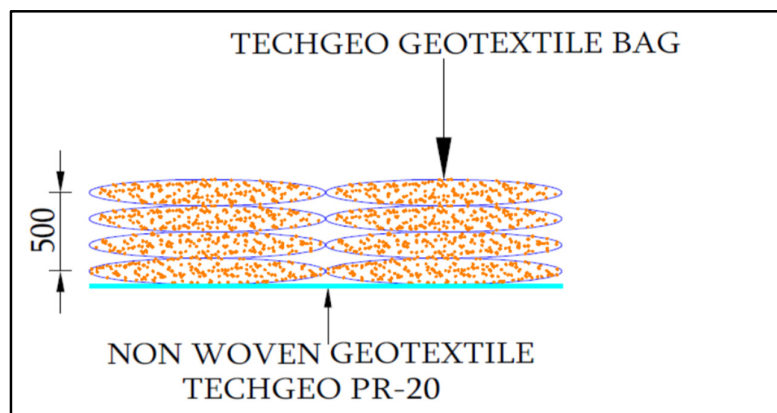


Figure 4 Typical representation of 500mm thick Geotextile bag and nonwoven geotextile at the interface of soil and Geotextile bag

5. SITE EXECUTION STEPS

- Setting out the area as per drawing.
- Mobilisation of Geotextile bags and soil to the project site.
- The excavated soil was disposed of by tippers to a suitable distance from the bank side to reduce the overburden of the bank.
- The slope formation was done with necessary ramming to remove any undulations and corrected to the desired slope before laying nonwoven geotextile.
- The geotextile was laid across the dressed slope over which sand-filled geotextile bags were placed.
- The bags were filled with locally available River Sand; the sand used as filling was as per the technical specification of the project.
- After sand filling was completed, the geotextile bag was weighed to confirm the desired weight as per technical requirements.
- After confirmation of weight, the bag was stitched by a special hand-held stitching machine.
- For convenience, bags were stored in batches or any suitable multiples as per available space at the site.
- The dumping/laying of geotextile bags for launching apron was carried out when the river was dry or with the help of small boats to complete the activity on time.
- Laying of bags was done under the supervision of the site in charge. Laying work was inspected from time to time by authority.
- Laying of porcupine concrete element was carried out as per drawings and installation guidelines for spur construction.

6. CONCLUSION

The proposed design is technically efficient and economical as compared to the conventional approach; big boulders or CC Blocks are used for river training work. It is observed that the Completed Geotextile bag's structure withstood the recent floods for last two years without any major damage to the properties, loss of land or loss of any cattle or people. The protection is serving as desired by the authority. It is also observed that the river has maintained its natural flow profile during the monsoon season.