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CONSTRUCTION OF RAILROAD TRACK AND ITS REHABILITATION

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ABSTRACT

Geotextiles are typically used in railroad applications to handle the tasks of separation, filtration, and lateral drainage. Little is known about any strengthening impact geotextiles have on soft subgrades beneath railroads, according to current knowledge. According to test installations, woven geotextiles have a tendency to clog with time and act nearly like a plastic sheet, obstructing the drainage of water from the subgrade. The elevation of the track structure may be such that the geotextile is positioned below the extent of the natural ground in some places. The inflow of water should be stopped where the natural ground surface is higher than the geotextile. A geotextile-lined or fully enclosed French drain built along the edge of the track to filter the water.

Keywords: Rehabilitation, Railroad, Geotextile, Construction, Railway.

1. Introduction

The use of geotextiles during a railroad structure depends upon many factors including the traffic, track structure, subgrade conditions, drainage conditions, and maintenance requirements (Ansari & Daigavane 2020a; Nene & Daigavane 1999). In railroad applications, geotextiles are primarily wont to perform the functions of separation, filtration, and lateral drainage. supported current knowledge, little is understood of any reinforcement effect geotextiles wear soft subgrades under railroad. Therefore, geotextiles shouldn't be wont to reduce the ballast or sub ballast design thickness. Geotextiles have found their greatest railroad use in those areas where an outsized amount of track maintenance has been required on an existing right-of-way as a results of poor drainage conditions, soft conditions, and/or high-impact loadings. Geotextiles are normally placed between the subgrade and ballast layer or between the sub grade and sub ballast layers if one is present. a standard geotextile application is found in what's commonly referred to as “pumping track” and “ballast pocket areas.” Both are related to fine grained sub grade soil and difficult drainage conditions. Under traffic, transient vertical stresses are sufficient to cause the sub grade and ballast or sub ballast materials to intermix if the sub grade is weak. because the intermixing continues, the ballast becomes fouled by excessive fines contamination, and a loss of free drainage through the ballast occurs also as a loss of shear strength. The ballast is pulled down into the subgrade. As this process continues, ballast is forced deeper and deeper into the subgrade, forming a pocket of fouled and ineffective ballast and loss of track grade control.

2. Material Selection

Ballast pockets tend to gather water, further reducing the strength of the roadbed around them and end in continual track maintenance problems. Installation of geotextiles during rehabilitation of those areas provides separation, filtration, and drainage functions and may prevent the reoccurrence of pumping track. Common locations for the installation of a geotextile in railroad are locations of excessive track maintenance resulting from poor subgrade/drainage conditions, highway-railroad level crossing, diamonds (railroad crossings), turnouts, and bridge approaches (Nene & Daigavane, 1994). If a geotextile is installed in track without provisions made for adequate drainage, water are going to be retained within the track structure and therefore the instability of the track are going to

be worsened. In any track construction or rehabilitation project, adequate drainage must be incorporated within the project design.

3. Application of Geotextile for Rehabilitation and Construction of Railroad Track

Geotextiles should be wont to separate the ballast or sub ballast from the sub grade (or ballast from sub ballast) during a railroad in cut sections where the sub grade soil contains quite 25 percent by weight of particles passing the No. 200 sieve. Geotextiles also are utilized in embankment sections consisting of such material where there's but 4 feet from rock bottom of the tie to the ditch invert or original ground surface.

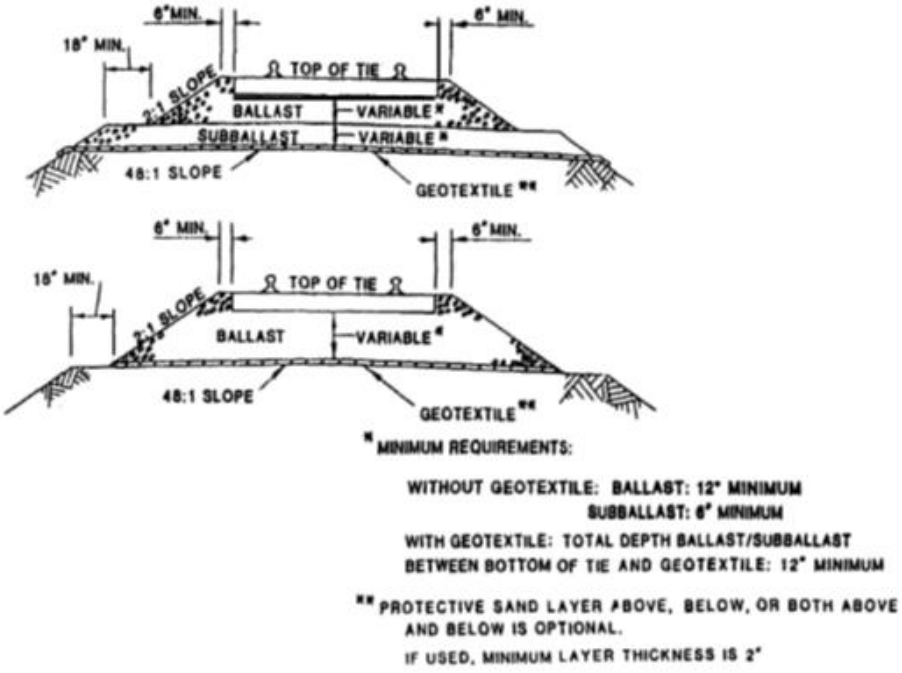

Figure 1. Typical Sections of Railroad Track with Geotextile

3.1 Depth of Placement

Technical Manual TM 5-850- 2/AFM 88-7, chap. 2 specifies a minimum ballast thickness of 12 inches. a further minimum of 6 inches of sub ballast could also be utilized in areas where drainage is difficult. the particular total ballast/ sub ballast thickness required may be a function of the utmost wheel load, rail weight, size, tie spacing, and allowable sub grade bearing pressure.

3.2 Protective Sand Layer

- In track rehabilitation where undercutting of ballast removal operation is employed, there could also be many large aggregate pieces remaining on the surface of the sub grade before the location of the geotextile. A 2-inch-thick layer of sand placed on the sub grade provides a smooth surface for the location of the geotextile and protects the geotextile from punctures and abrasion thanks to the massive aggregate pieces that are on the sub grade.
- While the utilization of protective clean sand (less than 5 percent passing the No. 200 sieve) extends service lifetime of a geotextile, there also are several disadvantages. These disadvantages include the additional cost of the sand, the rise in rail height (which results

from the additional thickness within the track structure), and therefore the difficulty and price of placing the sand layer during construction or rehabilitation.

3.3 Drainage

Adequate drainage is that the key to a stable railroad structure. During the planning of a replacement track or a track rehabilitation project, provisions for improving both internal and external track drainage should be included. Drainage provisions that ought to be considered include adequate (deep) side ditches to handle surface runoff, sufficient crown in both the sub grade and sub ballast layers to stop water from ponding on the highest of the sub ballast or sub grade, installation of perpendicular drains to stop water accumulation within the track, and French drains where required to help within the removal of water from the track structure. During track rehabilitation, the creation of bath or canal effects should be avoided by having the shoulders of the track below the extent of the ballast/geotextile/subgrade interface(Daigavane & Ansari, 2021).Geotextiles shouldn't be placed during a railroad structure until existing drainage problems are corrected. Proper maintenance of railroad drainage facilities is described in TM 5-627.

4. Special Applications

Installation of Geotextiles Below Natural Ground Level:

In some locations, the elevation of the track structure could also be such the geotextile is placed below the extent of the natural ground. Where the natural ground surface is elevated above the geotextile, steps should be taken to stop the inflow of water. A French drain installed along the sting of the track and lined or completely encapsulated during a geotextile to filter the inflow of surface water could also be wont to direct water faraway from the track structure. In extremely flat areas it's going to be necessary to construct perpendicular side ditches and soak-away pits from the track structure to permit the water to empty out of the French drains. Slotted drainpipes are often placed within the trenches to facilitate movement of the water from the track.

Highway Grade Crossings:

- Drainage during a level crossing is usually parallel to the rails until the pavement and roadshoulder are cleared. Once beyond the crossing itself, the drainage should be turned perpendicular to the track and discharged faraway from the track structure. A perforated drain pipe either wrapped with a geotextile during installation or prewrapped, could also be placed within the trench to help the flow of water from within the crossing to the ditches outside of the crossing area. Such drainpipes should be placed within the trench with the road of perforations facing downward (Ansari & Daigavane, 2020; Ansari et al. 2021).
- The ends of the perforated drainpipes and therefore the geotextile under the crossing should be laid with sufficient fall toward the side ditches to stop water from ponding within the crossing area. Whether perforated pipes are used or not, the shoulders at the corner of the crossing should be removed, and therefore the ends of the geotextile turned down in order that the geotextile facilitates drainage under gravity toward the side ditches.
- In cold climates it's common to salt and sand highways, including grade crossings, which may cause ballast fouling within the level crossing. One method of preventing or minimizing this ballast fouling is to encapsulate the ballast during a geotextile. the supply for drainage during this sort of installation would be an equivalent as discussed above.

Turnout Applications:

- The installation of a geotextile under a turnout is essentially an equivalent as installation in the other segment of track. within the vicinity of a switch, drainage of ballast or subballast to ditches is harder to realize because horizontal distances for subsurface flow are about doubled and gradients are about halved. Thus, there are reasons for using geotextiles to market lateral drainage under a turnout where none is employed in adjacent straight sections(Daigavane & Ansari, 2021a). If this is often done, it should extend a minimum of 25 feet far away from the turnout itself to supply a transition section. like road crossings, particular attention should tend to the removal of surface water from the turnout area.
- Many geotextile manufacturers produce specially packaged units ready-made for quick

5. Conclusion

The use of geotextiles during a railroad structure depends upon many factors including the traffic, track structure, subgrade conditions, drainage conditions, and maintenance requirements. If a geotextile is installed in track without provisions made for adequate drainage, water are going to be retained within the track structure and therefore the instability of the track are going to be worsened. In any track construction or rehabilitation project, adequate drainage must be incorporated within the project design. Adequate drainage is that the key to a stable railroad structure. During the planning of a replacement track or a track rehabilitation project, provisions for improving both internal and external track drainage should be included. Drainage provisions that ought to be considered include adequate (deep) side ditches to handle surface runoff, sufficient crown in both the sub grade and sub ballast layers to stop water from ponding on the highest of the sub ballast or sub grade, installation of perpendicular drains to stop water accumulation within the track, and French drains where required to help within the removal of water from the track structure. the utilization of a geotextile within the track under a rail crossing is extremely almost like the road crossing application. the planning and installation process must provide adequate drainage.

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