Bituminous Geomembranes (BGM), over 20 years of presence in the USA in transport applications

Natalie Daly [1], Ted Aguirre [2], Bertrand Breul [3]

1. Business Manager East North America: ndaly@axtercoletanche.com
2. Business Manager West North America: taguirre@axtercoletanche.com
3. Technical Manager, Civil Engineering: bertrand.breul@axter.eu

Bituminous Geomembranes (BGM) have a composite structure that provide advantages, such as a high resistance to puncture by aggregates without any extra protection thanks to its reinforced geotextile. For over 20 years, BGM has been the solution for transportation applications in the USA. Two projects will be detailed demonstrating interest to use BGM for protecting a tarmac and a runway at the St. George Airport in Utah and for stabilization of rail tracks in Nebraska on swelling soils in presence of water.

When the Saint George Regional airport in Utah first opened in 2011, it was said the runway would last 20 years, but it only lasted eight years due to heavy rains. The project needed a watertight barrier that could be driven on and have asphalt applied while maintaining its physical and mechanical properties for a high puncture resistance (Figures 2 & 3). Tolerance to varying high and low temperatures during application was also an important factor in the decision. The consultant wanted the toughest liner on the market for accepting gravel and asphalt at a temperature of 140°C to be applied as the top layers. They opted for a BGM of 4.8mm of thickness following ASTM D 5199. Furthermore, there was corporate support by an in-situ installation training assumed by the manufacturer's monitors, who had experience on similar geotechnical issues.

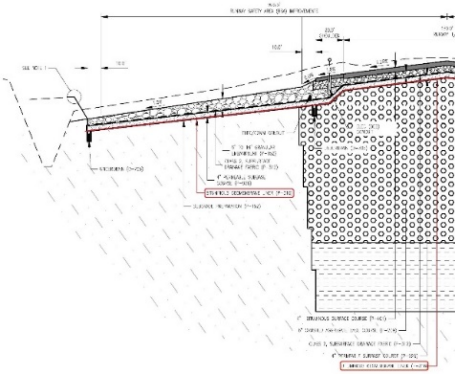

Figure 2. Cross section of the apron

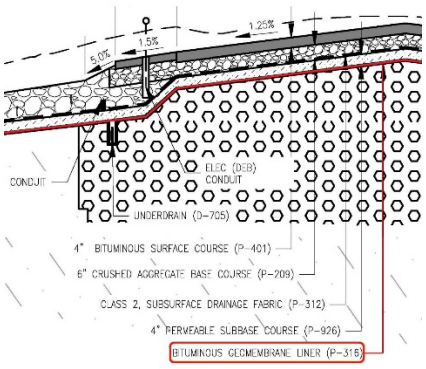

Figure 3. Cross-section under layer of asphalt-concrete

General construction crews started on May 29, 2019, tearing up the old runway, digging up the land and repaving the new runway. The BGM installation started June 3rd for the airport to reopen right on schedule, 4 months later, for August 2019. A team of 6 installed 6,000 m2 per day, with an excavator equipped with a special hydraulic beam working 10-hour days in summer (temperature in the shade up to 40°C), for a total amount of 384,000 m2 of BGM installed (Figure 4).

Figure 4. Installation by local personnel after training by manufacturer monitor

The Burlington Northern and Santa Fe Railway Co. (BNSF) in Nebraska identified several sections of the existing track requiring refurbishment due to swelling soils (clay). Extensive engineering investigations found that the problem was the result of water in contact with the clay soil causing softening of the clay surface, which lubricated the bottom of the sub ballast. Under the repeated loading from train traffic, the sub ballast extruded out the sides of the track bed. The sub ballast layer thinned causing the outer rail to settle. In order to improve track performance in the section of track, the clay subgrade required stabilization and protection from further water contact.

To eliminate the effects of water on lime-treated sulfate-rich soil, and flexural cracks in the subgrade, BNSF chose to use a BGM of 5,60 mm thick following ASTM D 5199 (Figure 5). The water collecting on the geomembrane could drain out of the track completely. The major limitation of this approach was that it required complete removal of the track, sub ballast and ballast (Figure 6 & 7). However, no suitable alternative was defined that did not require track removal.

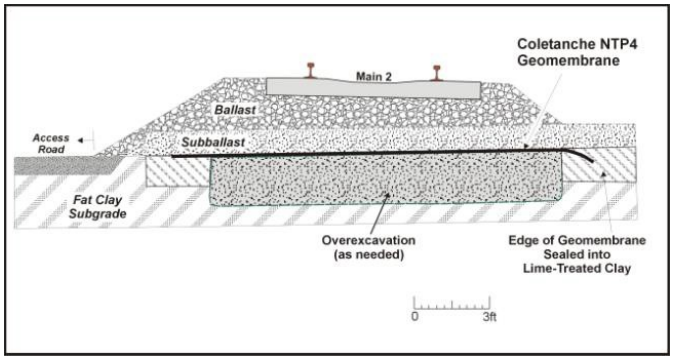

Figure 5. Design Cross Section for BNSF

Figure 6. Placing BGM

Figure 7. Sub-Ballast Placement

CONCLUSIONS

The principle in these applications is to build an umbrella above water-sensitive soils that avoids clay, gypsum, and inflating shales to be in contact with water. The described examples demonstrate the successful use of a BGM by a proven adequate strength, durability and low permeability solution.