SealGuard / Sub-Technical
Case Study – Ground Consolidation using HyperFlex

Challenge Faced

One of our most recent projects was sited at a newly constructed rail tunnel in southern Mississippi that was designed to carry a two lane roadway over it. This tunnel replaced 2 prior bridge structures, which had collapsed. An 800 foot corrugated metal tunnel liner was installed and the small valley back filled using sand and plastic grid material to hold it in place. The roadway was then rebuilt over the tunnel on the compacted fill material. Total depth of the tunnel is 75 feet from the rail bed to the road surface, 20 feet from the top of the tunnel to the road surface. When Hurricane Isaac hit the heavy rain exposed serious problems in the drainage system of the roadway and the design of the road itself. Improperly sealed precast storm drains leaked through the joints and the seals between slabs on the roadway failed. The volume and pressure created by the water scoured large quantities of sand fill from underneath he roadway, causing it to begin to sink. Engineers were concerned that this could lead to a collapse of the road bed with the associated danger to motorists and the tunnel itself.

The Project

The project engineers needed to consolidate the remaining fill from just below the roadway to the top of the tunnel. Other materials considered were cementitious grouts, which were ultimately rejected due to their weight and the resultant stress on the tunnel liner. Our HyperFlex product was selected for its ability to migrate good distances through the substrate and the fact that the reacted material in the consolidated ground would not increase the stress on the tunnel.

Our Solution

Using our air track drill rig, we drilled a grid pattern of 10 and 20 foot deep bore holes. These were placed on 20 foot centers down through the road bed for the length of the tunnel.

This is our air track machine used to drill bore holes.

Compaction Penetrometer used to measure ground compaction after grouting.

We then inserted extensions into the holes and began pumping HyperFlex, moving from hole to hole to allow time for HyperFlex migration. Due to the porosity of the sandy fill, no packers were needed. The pattern was continued until all holes could take no more. Migration was excellent and in fact entered the storm drains through the faulty joints and also up into the road surface through the joints in the road bed.

The above pictures show how well HyperFlex migrated through the porous, sandy soil. On the left is a picture of a storm drain and on the right the road bed itself.

This project took 6 weeks and amounted to 130,000 pounds of HyperFlex (14,300 gallons). Test bores and compaction tests performed upon cure showed the HyperFlex cured into a very dense (40 pcf versus 2 pcf at free rise) material that compacted the ground above and below it. This will enable the ground to carry the roadway safely into the foreseeable future

These pictures offer additional evidence of how HyperFlex seeks out & fills voids.

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