Mechanical Stabilization of Foundation Soils for Airfield Pavements in the Mid-Atlantic Coastal Region

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A critical aspect of the design and construction of airfield pavements for maximum service life is ensuring the structure is built on a solid foundation. This can be challenging in coastal areas, where subgrade soils are often weak and saturated, providing poor support.

On four separate aviation projects along the Mid-Atlantic coast, mechanical stabilization was used to address unsuitable subgrade soil conditions and provide a firm foundation for the construction of runways, taxiways, and tarmacs. The facilities include two military airfields, a general aviation airport, and a commercial airport. The conditions and solutions in each case varied, but in each case a mechanically stabilized layer using multi-axial geogrid was used to create a stable surface with the required structural capacity and durability.

In the case of the commercial airport, a taxiway and tarmac areas were to be expanded to accommodate larger aircraft than the facility was previously handling. During design, the subgrade soil was found to be unsuitable for construction. Due to the constraints of the time of year for construction operations and constraints in tight quarters, with working on an active commercial facility serving more than 2 million passengers per year, many conventional solutions were not viable for the site. A mechanically stabilized layer using a multi-axial geogrid and select fill was designed to meet the structural requirements. In some areas with extremely poor conditions, a double layer system was required.

Photo 1: Geogrid Installation at Commercial Airport

At the general aviation airport, taxiways were being reconstructed when the milling machine for the asphalt pavement sank through the existing pavement due to the weak subgrade. A mechanically stabilized layer using multiaxial geogrid and processed Recycled Asphalt Pavement (RAP) as granular fill was used to address the subgrade conditions and provide a structural base for the reconstructed taxiways.

Photo 2: Processed R.A.P. Used for Granular Layer at General Aviation Airport

At a major Naval facility in Virginia, a concrete rotary tarmac immediately adjacent to water was to be replaced. The subgrade soils were extremely soft and pumping. A multilayer design including multiaxial geogrid and nonwoven geotextile was used beneath the new pavement, with well-graded stone immediately beneath the pavement and open-graded stone layers designed to provide drainage and a capillary break.

At another military airfield in Eastern North Carolina, another concrete tarmac used for rotary aircraft was constructed with an optimized design that used a multiaxial geogrid to provide increased stability in the aggregate layer while reducing the required thickness of aggregate base course. These pavements are used by standard rotary aircraft, tiltrotor aircraft, and large transport aircraft.

CONCLUSION

Aviation authorities, including the Federal Aviation Administration (FAA), are focused on extending the service life of airfield pavements. In the four cases discussed here, mechanically stabilized layers for subgrade stabilization provided a cost-efficient, effective solution to address soft soils in Mid-Atlantic coastal areas. The designs successfully addressed bearing capacity, drainage, material availability, and constructability issues to deliver successful installations of airfield pavements.