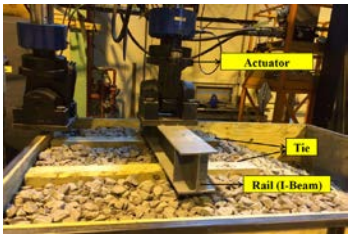
Effect of TriAx geogrid on ballast particle movement– Penn State Univ.



Type of Research:
- Performance Validation through Cyclic Load Testing

Research Organizations
- Pennsylvania State University

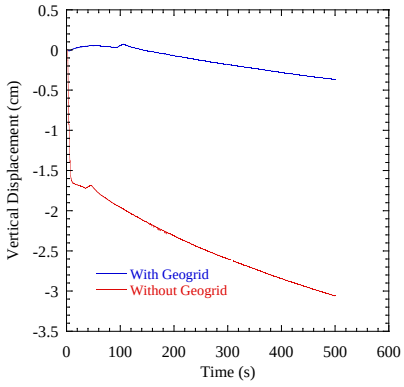
Geosynthetic Product Tested:
- Tensar TriAx TX190L

Test Program
- A wireless device – "SmartRock" was embedded in a ballast box to monitor individual ballast particle movement under cyclic loading conditions.
  - SmartRock is a realistic ballast particle shape wireless device used to investigate individual ballast particle movement.

Experimental Study:
- A half section of a typical railroad track structure that consists of AREMA No. 4 ballast layer, two crossties, and a rail (I-beam) was constructed in the ballast box. TX190L geogrid was installed 10-inch below the top of the ballast.
- A total of 500 load cycles were applied for each test.

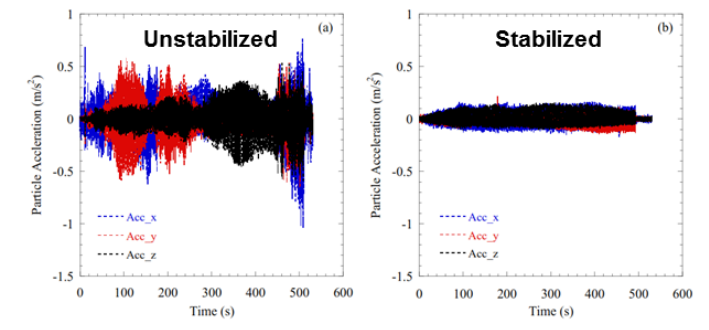
Results:

Vertical displacement at the top of the ballast layer
- The vertical displacement rapidly increased in control section especially in the first 10 load cycles.
- The total vertical displacement at the end of the loading was reduced about 85% in stabilized section.

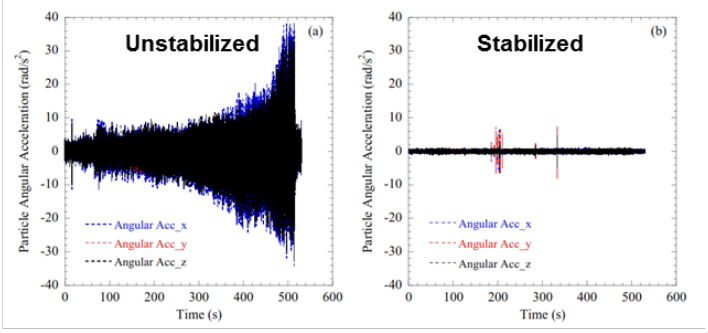


Real-time particle accelerations recorded by the SmartRocks
The results show that the ballast movement is significantly reduced with TX190L geogrid.

Particle Movement



Particle Rotation



Key findings
- SmartRock is capable of recording real-time particle movement including translation and rotation.
- TX190L geogrid restrain the ballast particle movement and rotation under cyclic loading.
- Surface vertical displacement was significantly reduced as a result of confinement.
- This research has demonstrated that the TriAx geogrid can extend the maintenance cycle by reducing the rate of ballast settlement and degradation and provides the long term cost savings benefits.