Reconstruction of Railroad

Tuncer B. Edil, James Tinjum
Ali Ebrahimi, Research Assistant

THE UNIVERSITY of WISCONSIN MADISON

CFIRE NATIONAL CENTER FOR FREIGHT & INFRASTRUCTURE RESEARCH & EDUCATION

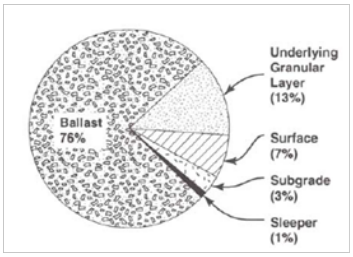
Problem Statement

- **Design and construct railroads to sustain heavier loads:** Upgrade a critical transportation system while conserving energy and raw materials
- **Longer life with lower maintenance cost:** Tracks fail commonly due to ballast breakdown and fouling
- **Minimize green house gas generation in reconstruction:** Use recycled ballast material and Industrial byproducts

Research Background

- **Fouling** is the term used to indicate contamination of ballast (Selig, 1994).

- The main sources of ballast fouling:
    1. Particle attrition
    2. Ballast degradation (breakage)



(After Selig and Waters, 1994)

Research Objective

1. Characterize **the original and recycled ballast** behavior

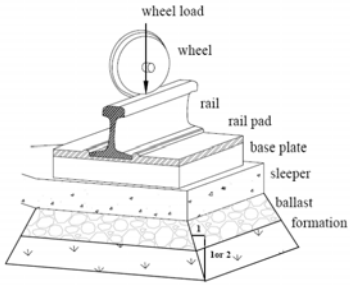
2. Investigate the **effect of fouling** on the railroad performance

3. Evaluate the effect of **rail track substructure stabilization** on the performance of the railroad system

4. Determine the **impact of lateral confinement** on ballast behavior

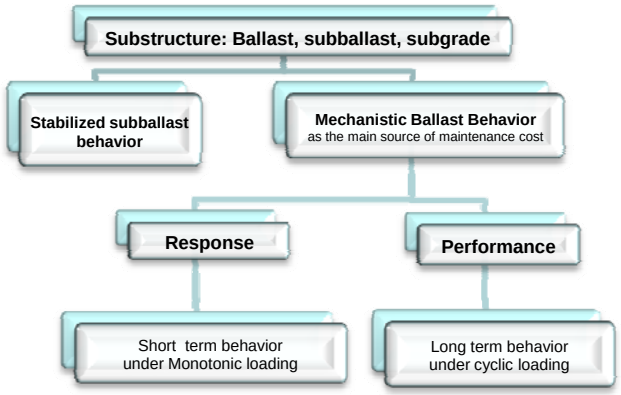
5. **Provide a model** to predict the structural behavior of ballast in railroad structures under a wide range of applied loads

Load Transfer System in RailTrack



High vertical stress versus low confinement
Typical axle load: 25 tons (55,000 lbs)
Max stress on ballast surface: 500 kPa (70 psi)
Typical confining stress: 10-140 kPa (2-20 psi)

Methodology



Future Study

- Develop a **laboratory protocol** for the ballast material.
- Design **testing equipment** to evaluate the factors affecting ballast behavior.
- Establish a **mechanistic behavior** of ballast.
- Justify a **numerical model** to predict the railroad behavior and performance of full scale railroads.