INTRODUCTION
It has been desirable for years to develop a reasonably simple, accurate, and reliable method to directly measure the average vertical pressure magnitudes and distributions at the crosstie/ballast interface for railroad trackbeds. Quantifying the magnitudes and relative distributions of pressures at the crosstie/ballast interface are important inputs for trackbed engineering design and analysis aspects. The pressures produced by millions of load applications ultimately affect the long-term performance of the track by reducing the service lives of the component materials and layers. Many of the assumptions used today in trackbed design were based on analytical methods, which have never been verified by direct measurement. This research looks to perform that task.

RESEARCH OBJECTIVES
- Determine the Applicability of Granular Material pressure cells to measure vertical pressures at the crosstie/ballast interface for typical revenue traffic
- Evaluate the effect of recessing the pressure cells within the bottom of timber crossties
- Develop a procedure to subsequently install the pressure cells for accurate measurements
- Determine the effect of tamping and relative ballast consolidation on pressure magnitudes
- Determine the effect of accumulated tonnage over time (18-month period)
- Compare the pressure magnitudes recorded with wheel/rail forces (from WILD)
- Determine the effect of the vertical and horizontal loads produced by the loaded train
- Determine the relative distribution of pressure along the footprint of a crosstie

NEW METHODOLOGY
Routing Copper Naphthenate Timber Crossties

LABORATORY CALIBRATION
- Created a simulated trackbed designed to minimally resist lateral movement
- Vertical deflections were in the range of 1/3-inch
- Near-perfect correlation between measured and applied stress

LABORATORY EXPERIMENTS

IN-TRACK INSTALLATION
Norfolk Southern – Mascot, TN

DATA ACQUISITION
PRESSURE MEASUREMENTS
Typical Series of Locomotives
Typical Series of Intermodal Cars
Typical Series of Empty Cars
Typical Series of Loaded Cars

WILD COMPARISONS

REFERENCES