Rutting and Faulting Data for the Interstate Highway System: Equipment Validation

By

Presenter*

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Outline

- Introduction
- Objectives
- Validation Procedure
- Concluding Remarks

Introduction

- FHWA Interstate Sampling Project in 2018
  - Collect sample of ~7500 miles of Interstate Highway System (IHS)
    - International Roughness Index (IRI)
    - Rutting
    - Cracking Percent
    - Faulting
- Project Scopes:
  - Assess the quality of HPMS data
  - Recommend improvements to data collection

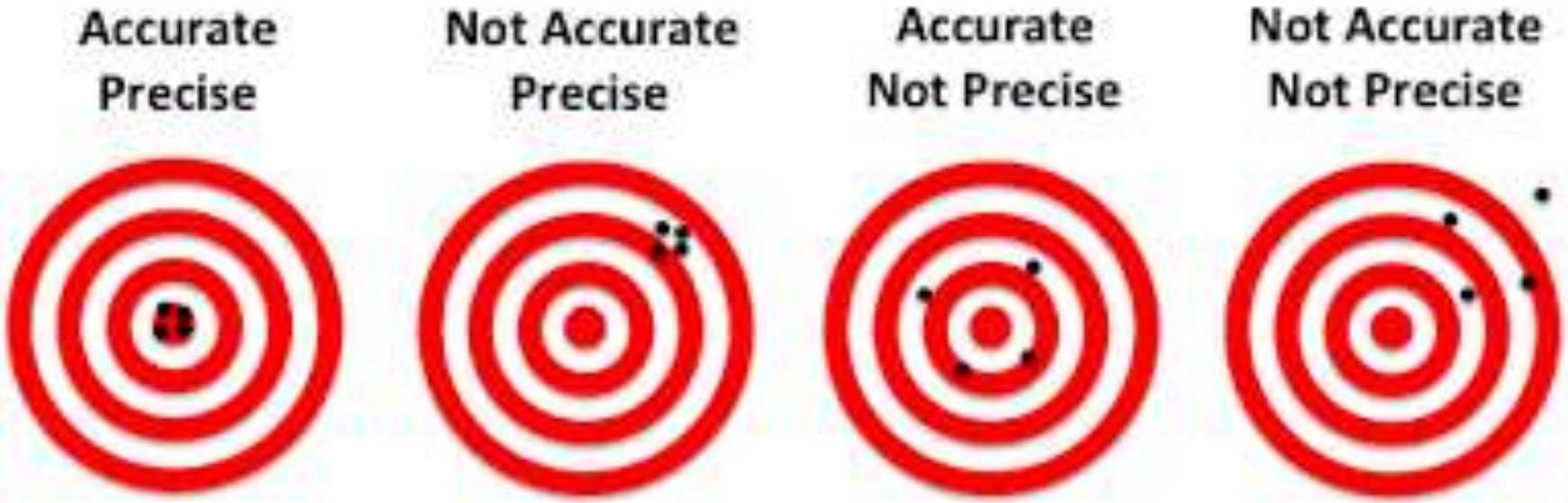
Project Rutting and Faulting Data

➢ Laser Crack Measurement System

- Sampling Rate: 5,600 profile/s
- Transversal field of view: 13.1 ft.
- Transversal resolution: 0.04 inch
- Depth range of operation: 9.8 inches
- Depth resolution: 0.02 inch

Data Quality Management Plan

- Validate data collection equipment by comparison with reference measurements under representative conditions



Objectives

- Validation testing of the LCMS for rutting and faulting measurements
- Field testing at the Minnesota Road Research Facility (MnROAD) facility
- Collecting reference data using the MnROAD Automated Laser Profile System (ALPS) and a faultmeter

Validation Procedure

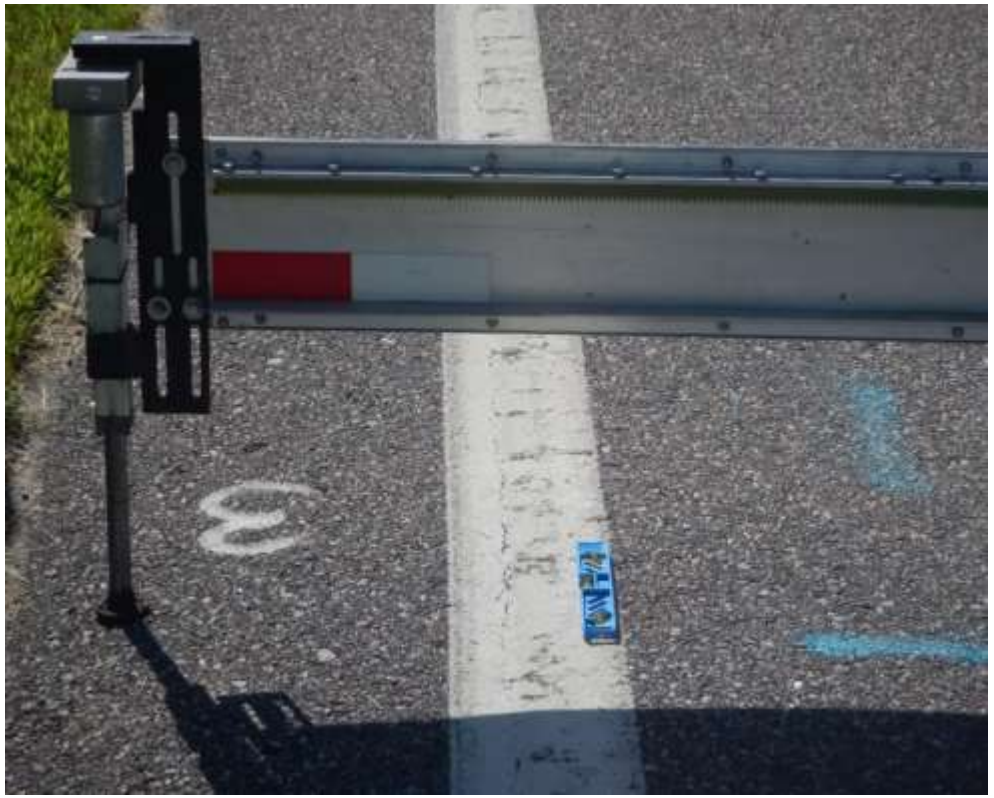
ALPS System

- Components
  1. A laser mounted on a rolling plate
  2. Servomotor
  3. 12.8 ft beam
  4. Leveling system
- Elevation measurements at ~0.25 inch.

Reference Rutting Data, ALPS

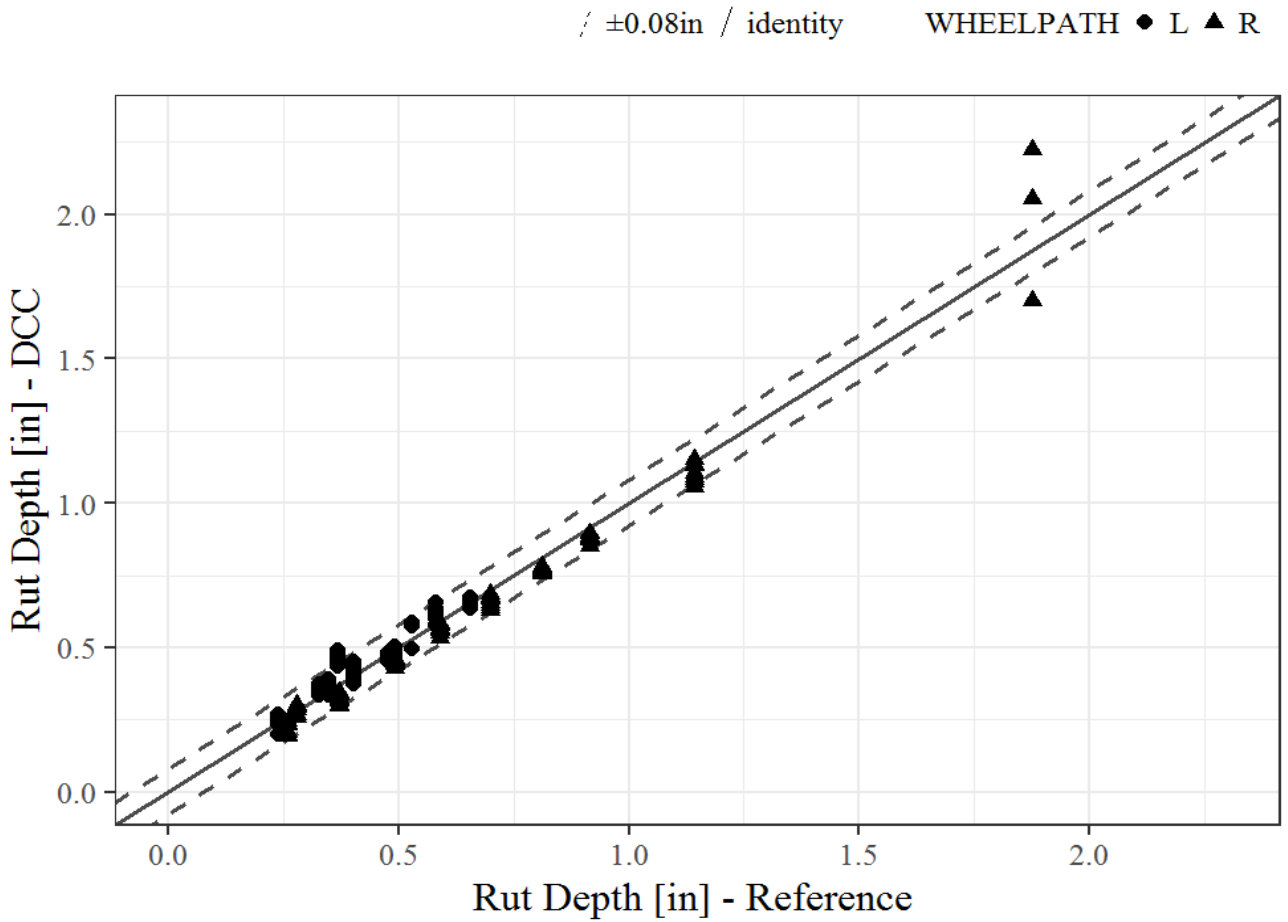
- 10 transverse profiles
- Rut depth from 0.25 to 2 inches

- Markers on the edges of the lane
- Algorithm based on PP69-14



Validation of Rutting Measurements

Acceptance Criteria	
Accuracy	**±0.08** inches
Precision	Values within **±0.08** inches of mean with a 90% CL



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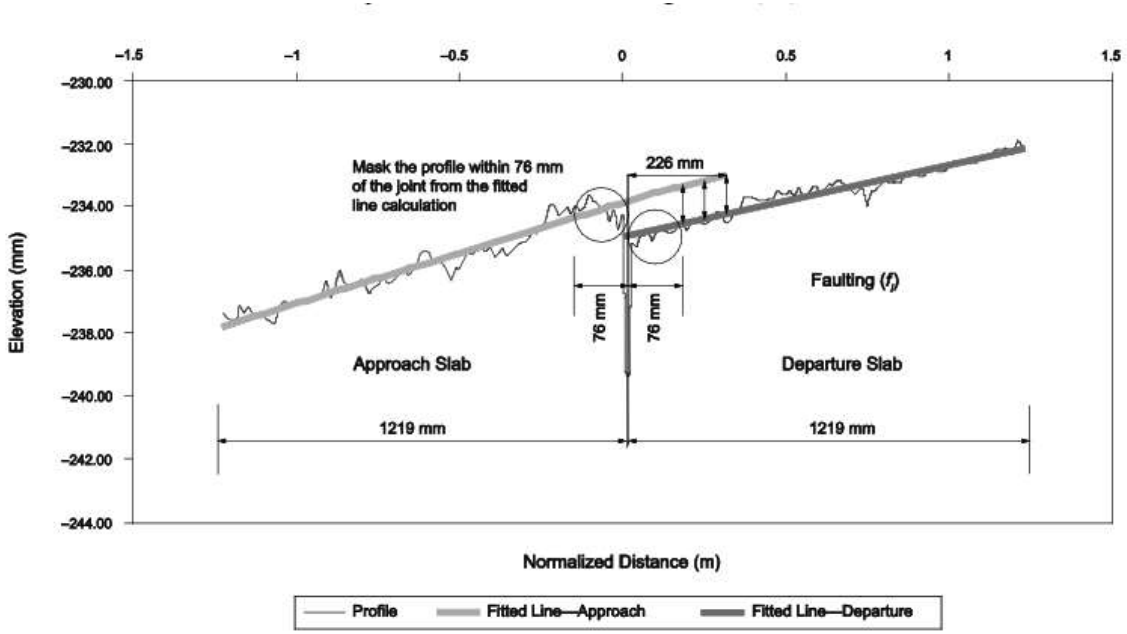
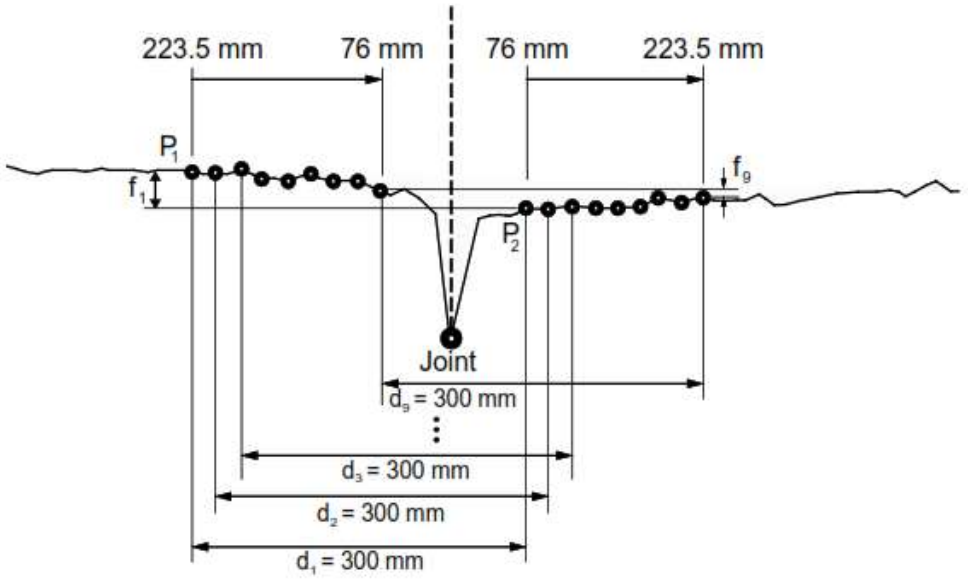
Faulting – AASHTO R36

Method A



Method B



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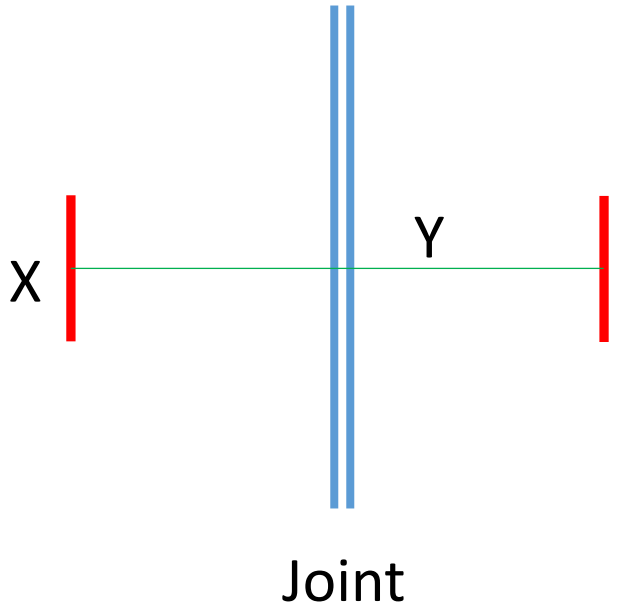
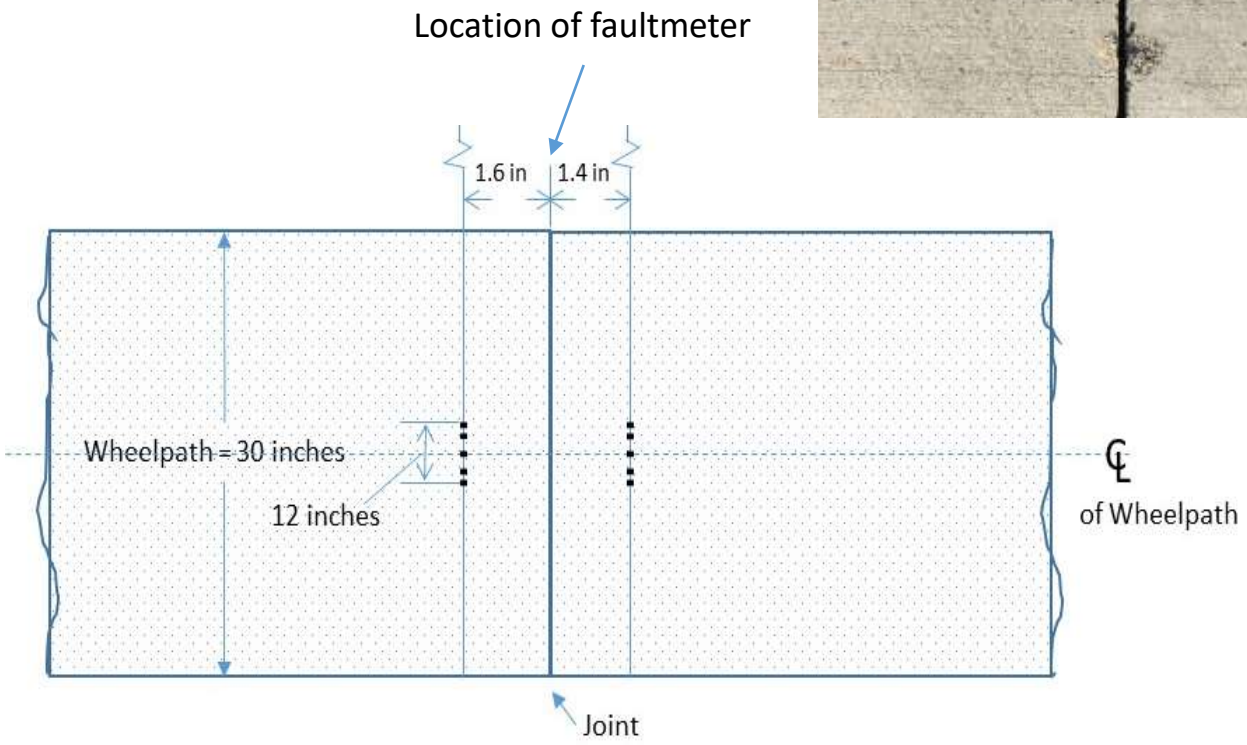
Faulting – LCMS Measurement



X, inches	Y, inches
8	12
8	2
12	12
12	2
0.5	12
0.5	2

Reference Faulting Data, Faultmeter

- 10 joints with average faulting from 0.0 to 0.4 inches
- Measurement locations:
  1. Centerline of the outside wheelpath
  2. 4 in. to either side of the centerline
  3. 6 in. to either side of the centerline



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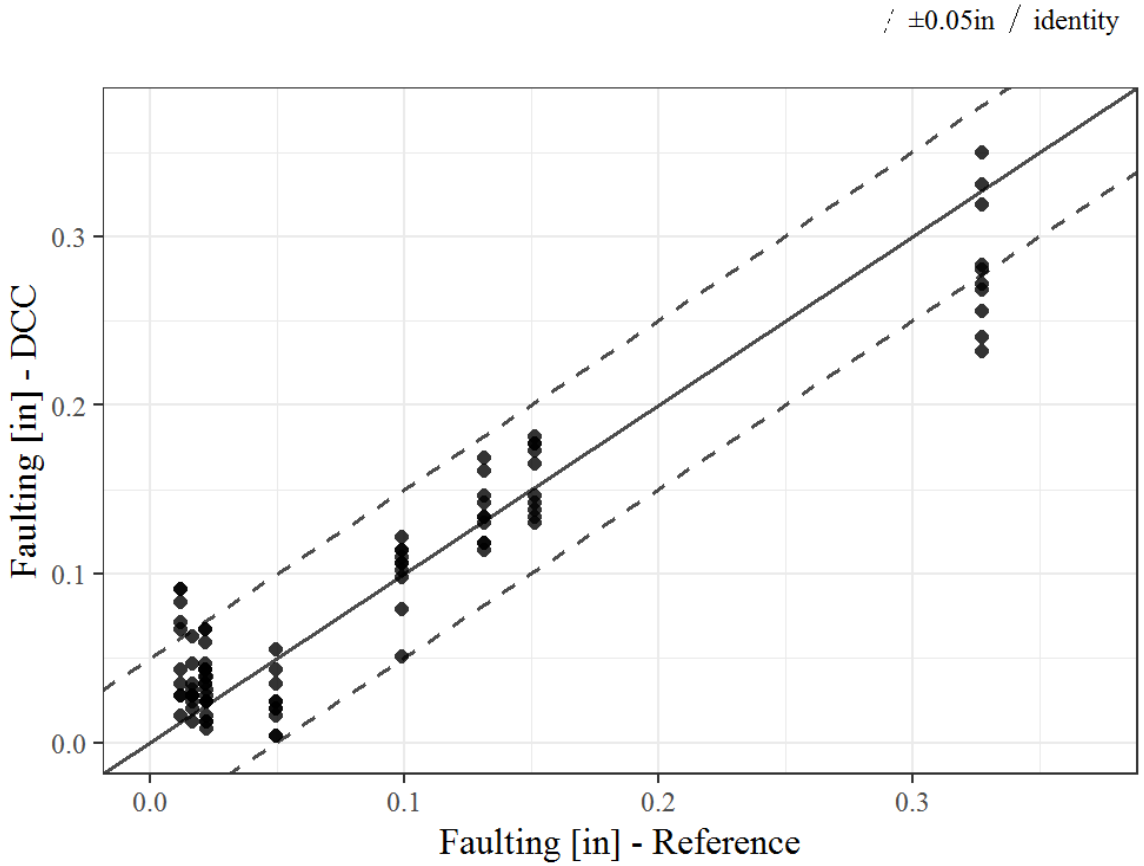
Validation of Faulting Measurements

- 10 repeat measurements at each joint using the data collector's LCMS

Acceptance Criteria	
Accuracy	**±0.05** inches
Precision	• Standard deviation of values not to exceed **15%** of mean value if the mean is greater than 0.1 inches • Not to exceed **0.03** inches if the mean is lower than 0.1 inches



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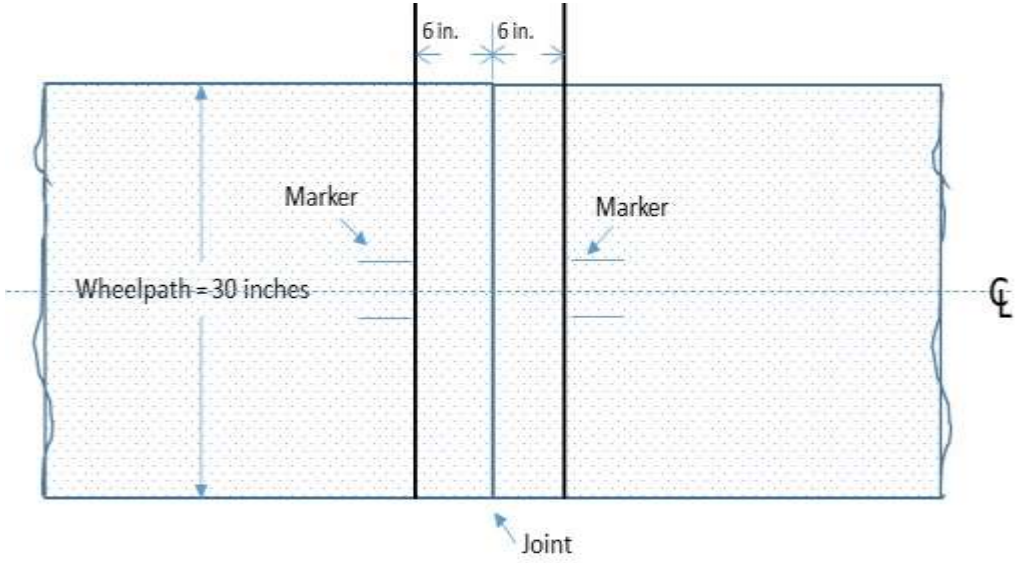
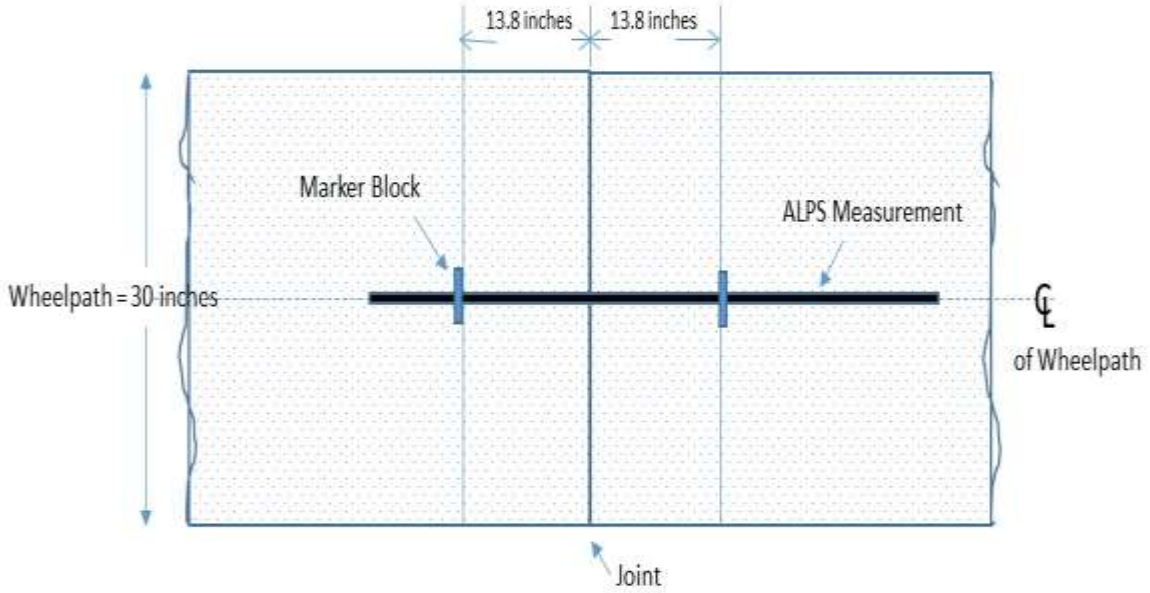
Reference Faulting Data, ALPS

1) Transverse profiles from 6 inches before joint to 6 inches after joint



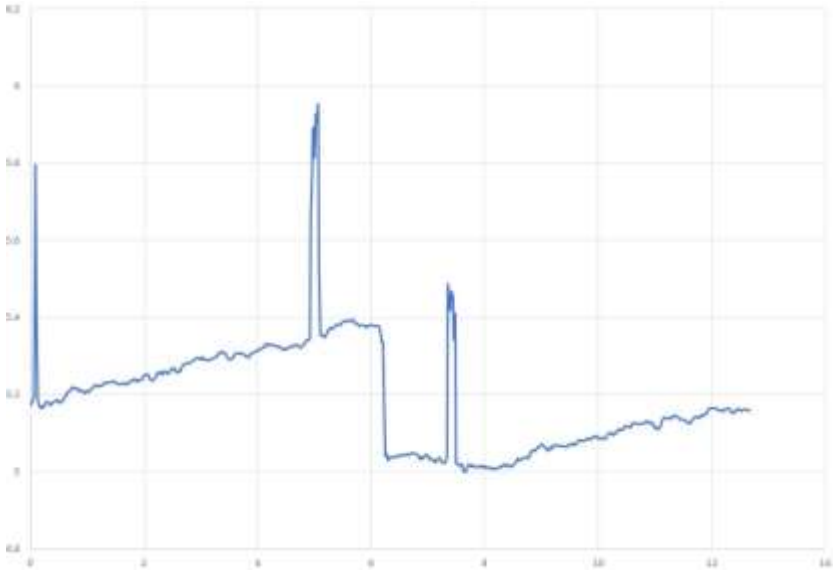
2) Longitudinal profile across a joint



Faulting Measurement – ALPS Transverse

ALPS – LCMS comparison

- ALPS measurement across the joint
  - Method A – 0.31 inch
  - Method B – 0.34 inch
- LCMS measurement (12 x 12) – 0.35 inch
- Transverse comparison
  - No elevation reference



Concluding Remarks

- Needed means to validate precision and accuracy of data collection equipment
- ALPS provided a means for evaluating transverse profile
- MN Faultmeter used for validation of faulting
- ALPS provided another means for reviewing faulting