

Prediction of dowel corrosion and effect on performance of concrete pavements

IRISE ANNUAL MEETING

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Faulting

Dowels reduce the development of faulting in JPCP

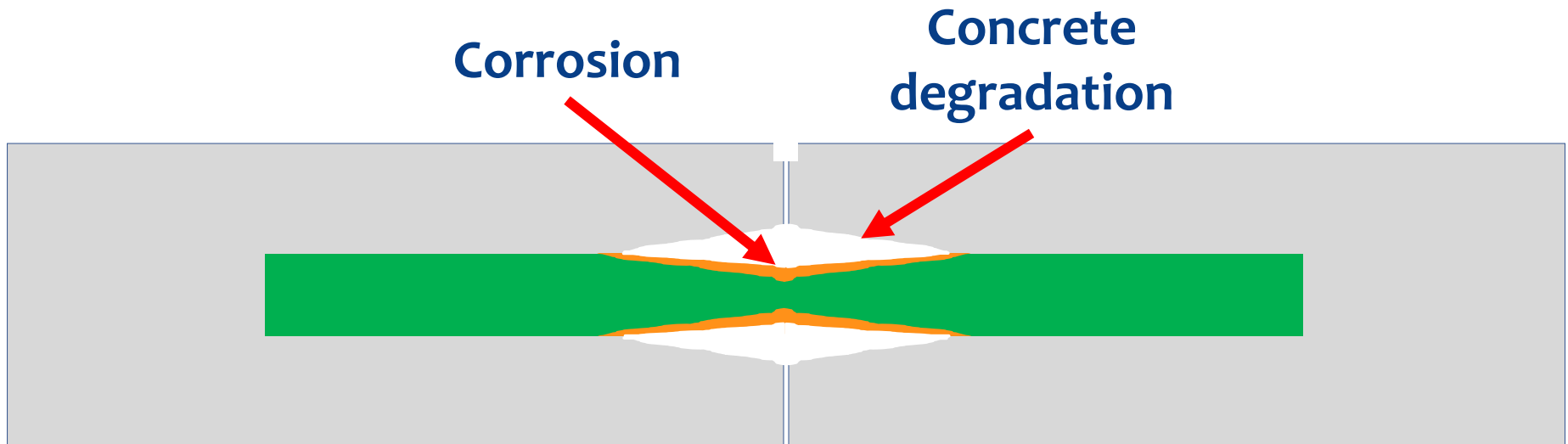


Source: pavementinteractive.org

Joint performance

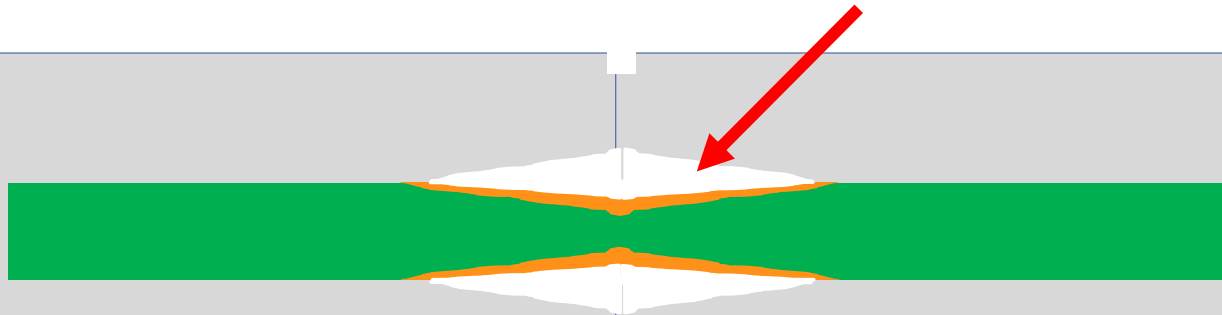
Dowel Looseness

- ❑ Concrete degradation
- ❑ Corrosion



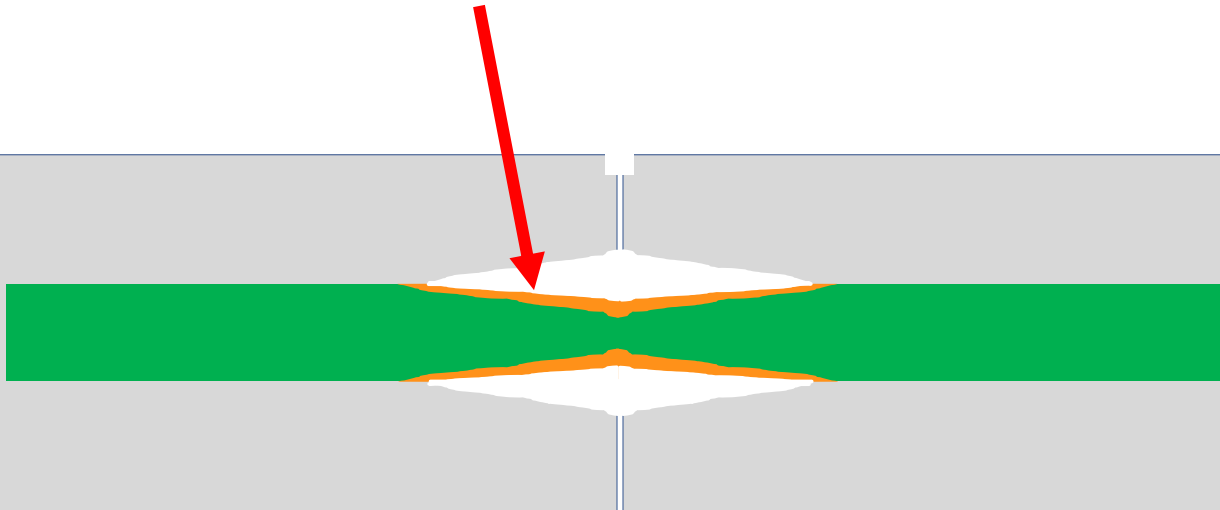
Joint performance

Degradation of PCC accounted for in AASHTO Pavement ME Design



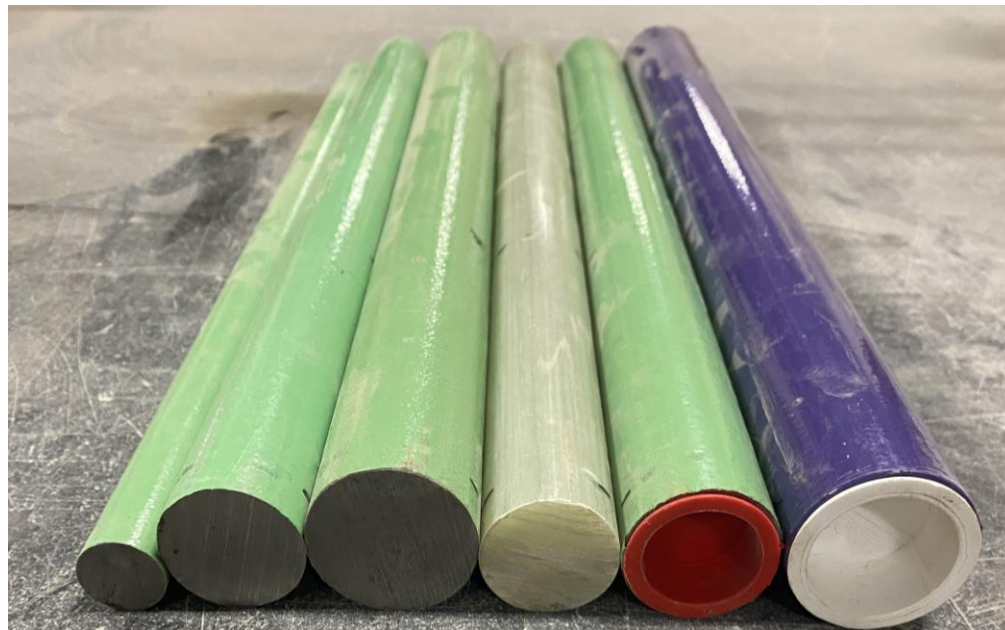
Impetus

Effect of corrosion not accounted for in design



Impetus

Need to predict dowel performance to justify long-life paving costs



Problem



Key Parameters:

- Exposure conditions
- Loss of joint performance
- Effect of:
 - Dowel diameter
 - Material
 - Coating
 - Chloride exposure



Source: PennDOT Winter Maintenance website

Schedule/Status

- Task A: Literature (due April 1, 2023)
- Task B: Material corrosion database (due July 1, 2023)
- Task C: Accelerated dowel corrosion laboratory study (due July 1, 2024)
- Task D: Dowel corrosion predictive model (due September 1, 2024)
- Task E: Final report (due January 1, 2025)

Task A: Exposure conditions

- ❑ PennDOT salt application logs reviewed from 2020 and 2021
- ❑ Application rates in PA within typ. nationwide ranges
- ❑ Exposure to be used in modeling and laboratory

Measure	2020 Winter Season	2021 Winter Season
Avg. application rate (lb/lane mile)	232	265
Salt per joint per application (lb)	0.66	0.75
Number of applications	220	131
Total salt per mile (lbs)	51,075	34,742
Total salt per joint (lbs)	145	99
Total salt per joint (cf)	1.8	1.2

Task B: Review of corrosion models

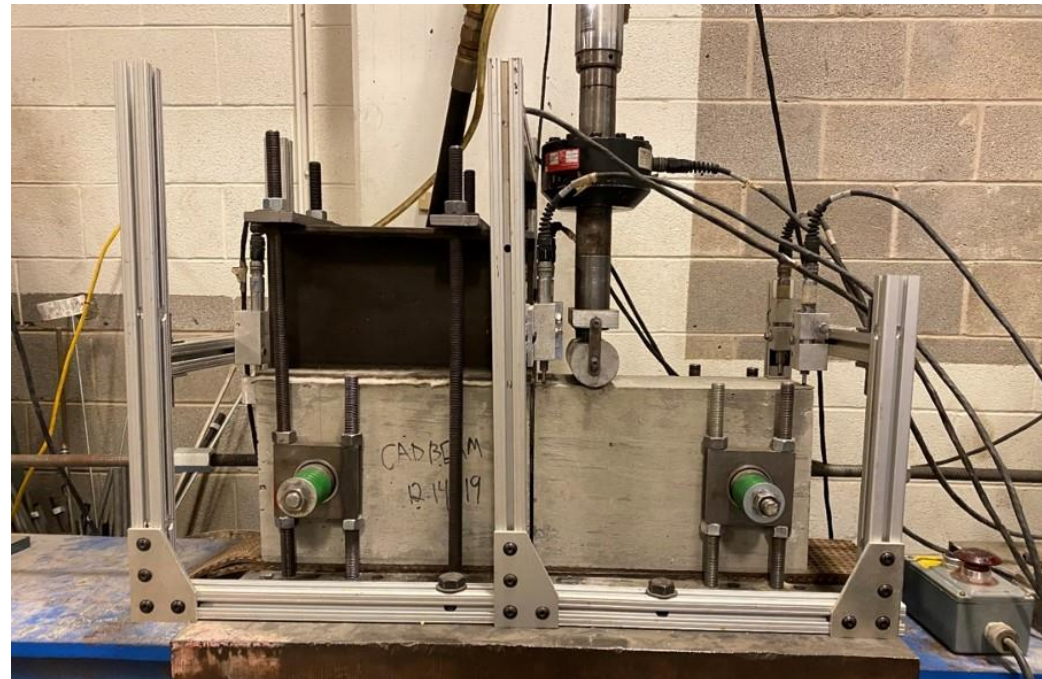
- ❑ Review available corrosion models to identify key corrosion mechanisms
- ❑ Select model that best captures critical mechanisms for dowel bars
- ❑ Available material corrosion databases compiled to identify key parameters
- ❑ Validate dowel corrosion model using available corrosion databases

Task C: Laboratory investigation

Accelerated corrosion and load testing

Parameters:

- Corrosion exposure
- Pavement features
- Dowel material
- Dowel coating
- Dowel diameter



Acknowledgements

Project Panel

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Questions?