Evaluation of Deicer Impacts on Pervious Concrete Specimens

CESTiCC Project Number: 101622
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Background

- Based on a match project for the Ready Mixed Concrete (RMC) Research & Education Foundation (completed)
- Deicing chemicals have deteriorated some pervious concrete placements
- This research focuses on chemical processes of degradation
- Research by others focused more on physical processes such as freeze-thaw, or a combination

Background

- The match project developed a laboratory testing protocol to mimic a severe winter (four months) of application of various deicers.
- Controls were water applications and sodium chloride (rock salt) applications
- Deicers of concern were calcium chloride and magnesium chloride
- The match testing protocol was performed in a room temperature laboratory and a cold laboratory setting.
- Evaluated old and new OPC and 25%FA specimens, with a focus on the new OPC ones as those expected to be least resistant

Background

- Results:
  - The kinetics of change were faster in the room temperature laboratory
  - The calcium chloride specimens showed visible deterioration starting around 2 months
  - The magnesium chloride specimens showed an increase in calcium in the effluent starting around 2 months
  - Abrasion testing was inconclusive for strength as a function of porosity

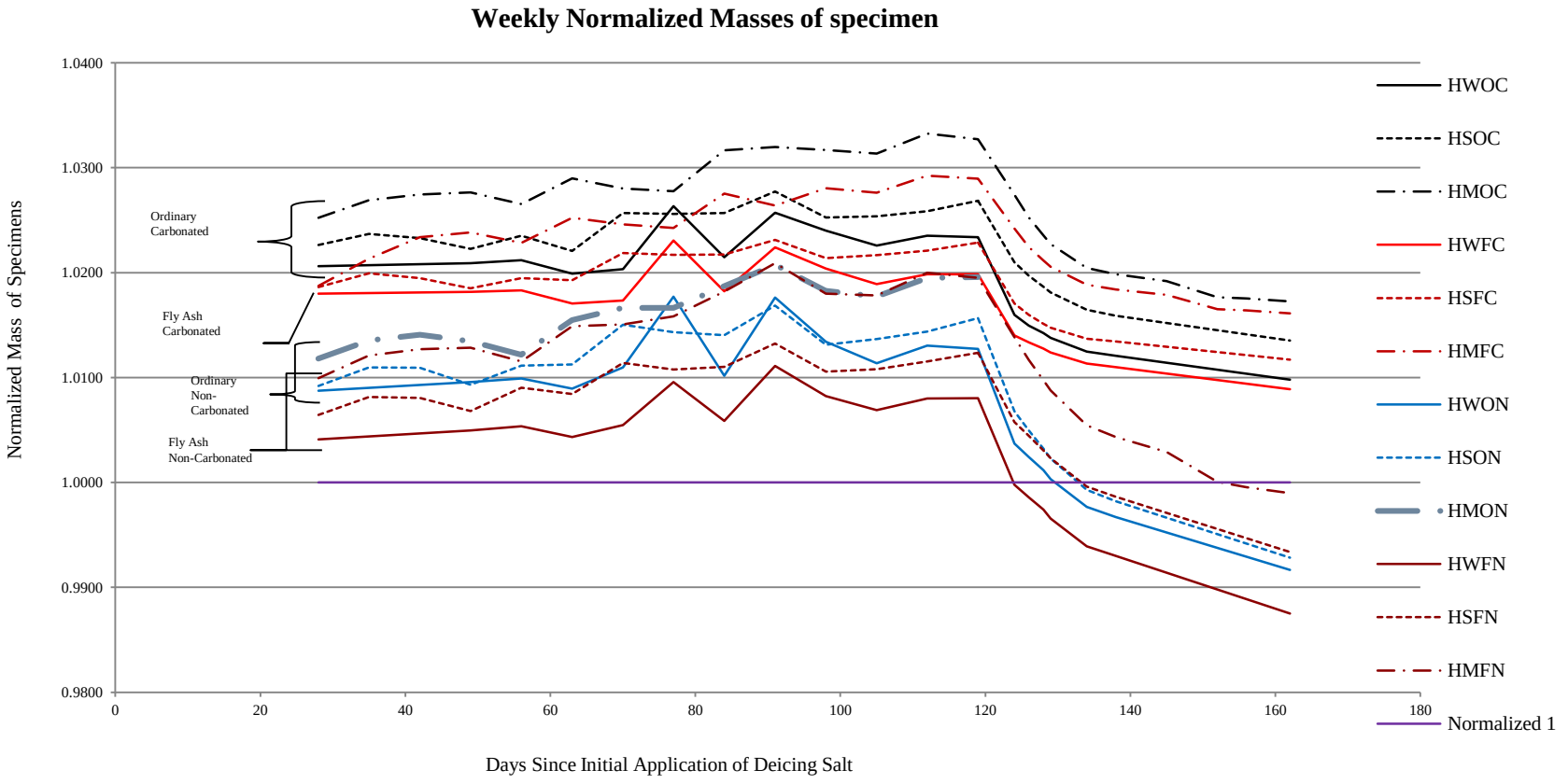
Background

Background

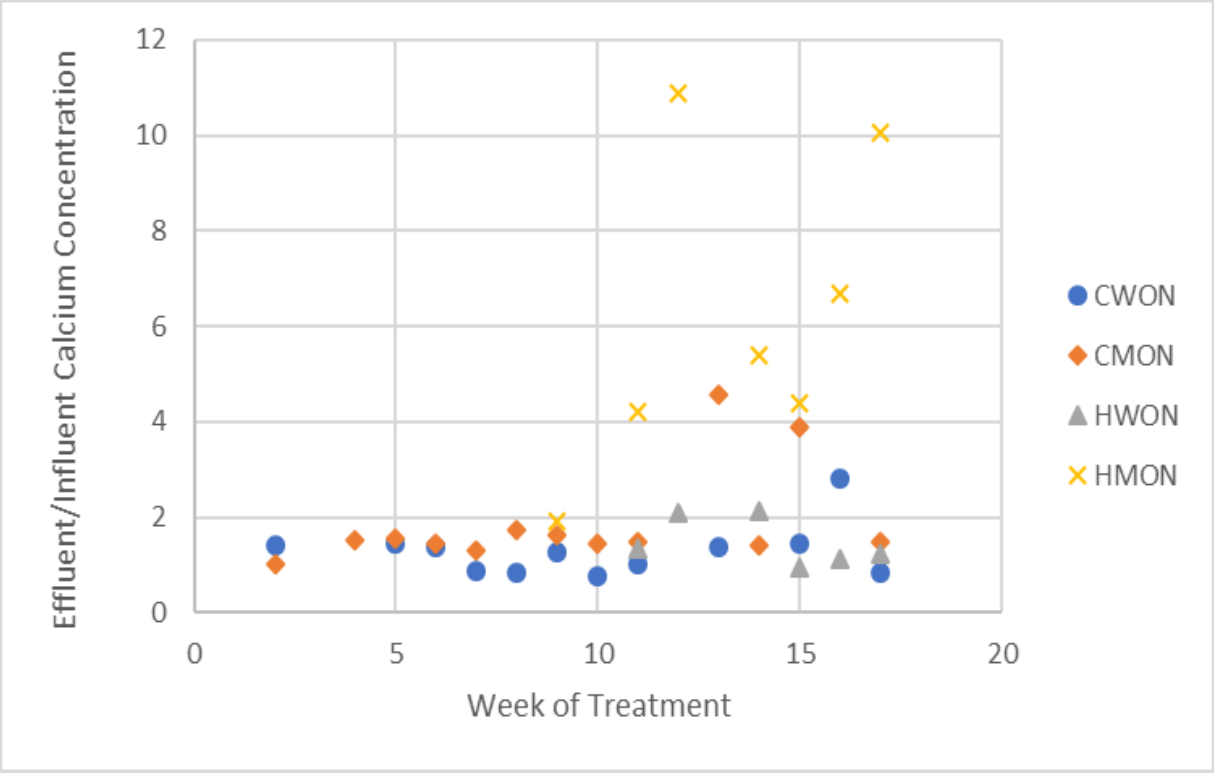
Background: Calcium Chloride

mber of ecimens	Specimen Type	Calcium Chloride	Water	Sodium Chloride	Magnesiu Chloride
4	H_ON				
2	H_OC				
2	H_FN				
2	H_FC				
4	C_ON				
2	C_OC				

Background: Magnesium Chloride



Background: Magnesium Chloride



Initial Project Scope

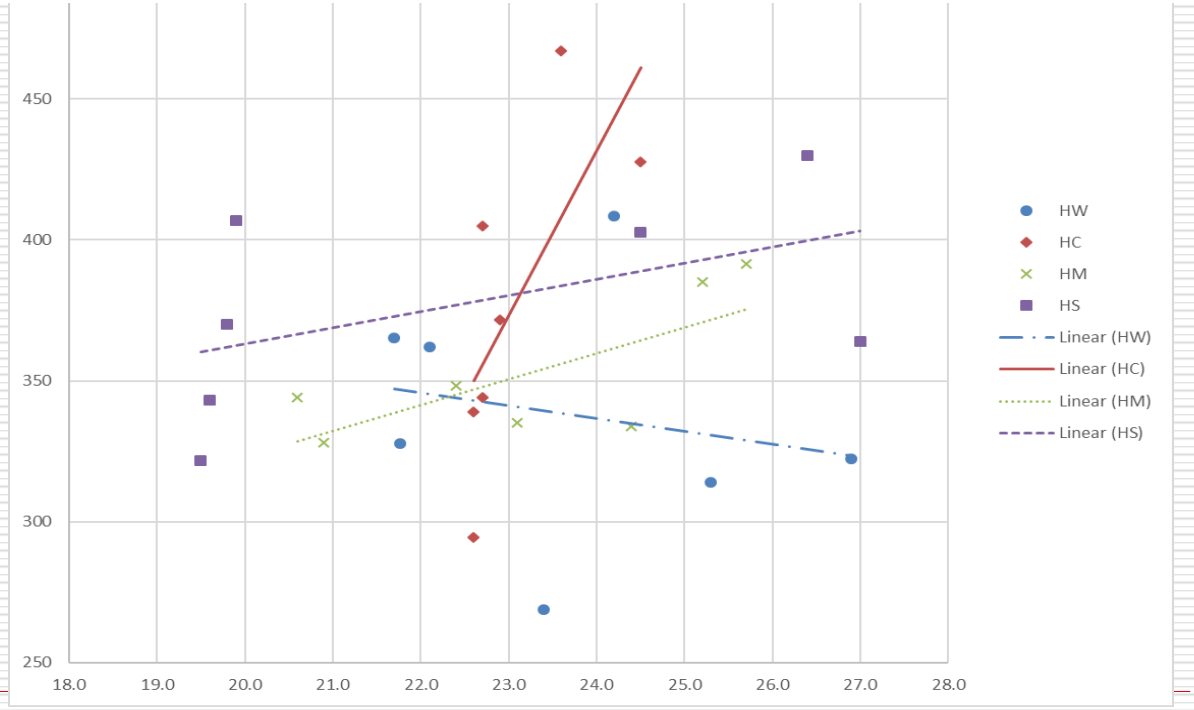
- 1: Further evaluation of Chemical Data from match project
- 2: Enhance the experiments
  - Testing precipitates?
  - Wetted freeze-thaw tests?
  - Split tensile tests

Preliminary Results

- 2: Enhance the experiments
  - Split tensile tests….nearly done.
  - Also taking masses of pieces and debris

Preliminary results

- Split tensile tests….
  - Inconclusive since not enough specimens
  - Not directly a function of porosity



Proposed Modified Project Scope

- 1: Further evaluation of match Chemical Data
- 2: Enhance the experiments
  - *Delete Testing precipitates?*
  - *Delete Wetted freeze-thaw tests?*
  - Continue Split tensile tests
    - On current specimens with mass evaluations
    - Make additional specimens and do four month testing protocol for water, magnesium and calcium chlorides
    - Perform only on ON specimens to increase 'n' for statistical purposes due to porosity variability between **and within** specimens.

Direct Deliverables: Publications

- Sendele, T. *Investigation into possible methods to screen for chemical degradation of pervious concrete due to common deicers*. MS Thesis, Washington State University, May 2017.
- Haselbach, L. *Evaluation of the Effects of Deicer Chemical Methodologies on Pervious Concrete & Development of a Deicer Chemical Testing Method for Pervious Concrete*, Final Report to the RMC Research and Education Foundation, Silver Spring, MD. May 2017.

Planned Deliverables: Presentations

- Poster and presentation to CESTiCC Workshop in Pullman, WA August 2017
- Poster to CeCON, San Marcos Texas, September 2017
- Possibly at the World of Concrete, January 2018
- Planned for the ACI conference March 2018