

CONCRETE AGGREGATE UPDATE



2018 AGC-MoDOT Annual Co-op Meeting

Outline

1. Alkali-carbonate reaction (ACR) testing
2. Grade F Aggregate in the D-cracking zone

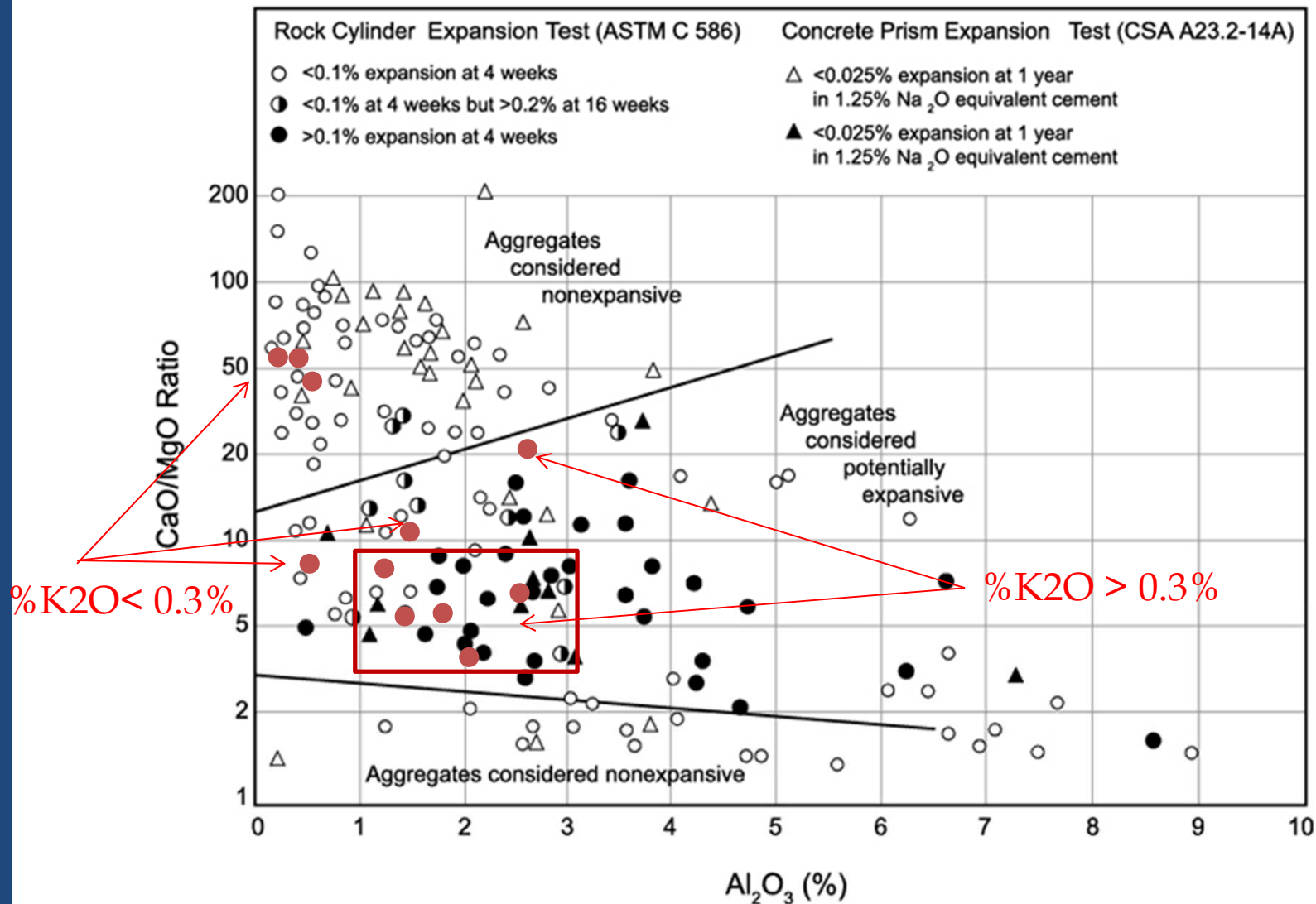
ACR Issues

- ▣ Opened up concrete aggregate specification
- ▣ MoDOT currently allowing new ledges and/or ledge combinations MoDOT previously would not have allowed
- ▣ Potential for alkali aggregate reactivity issues with newer sources

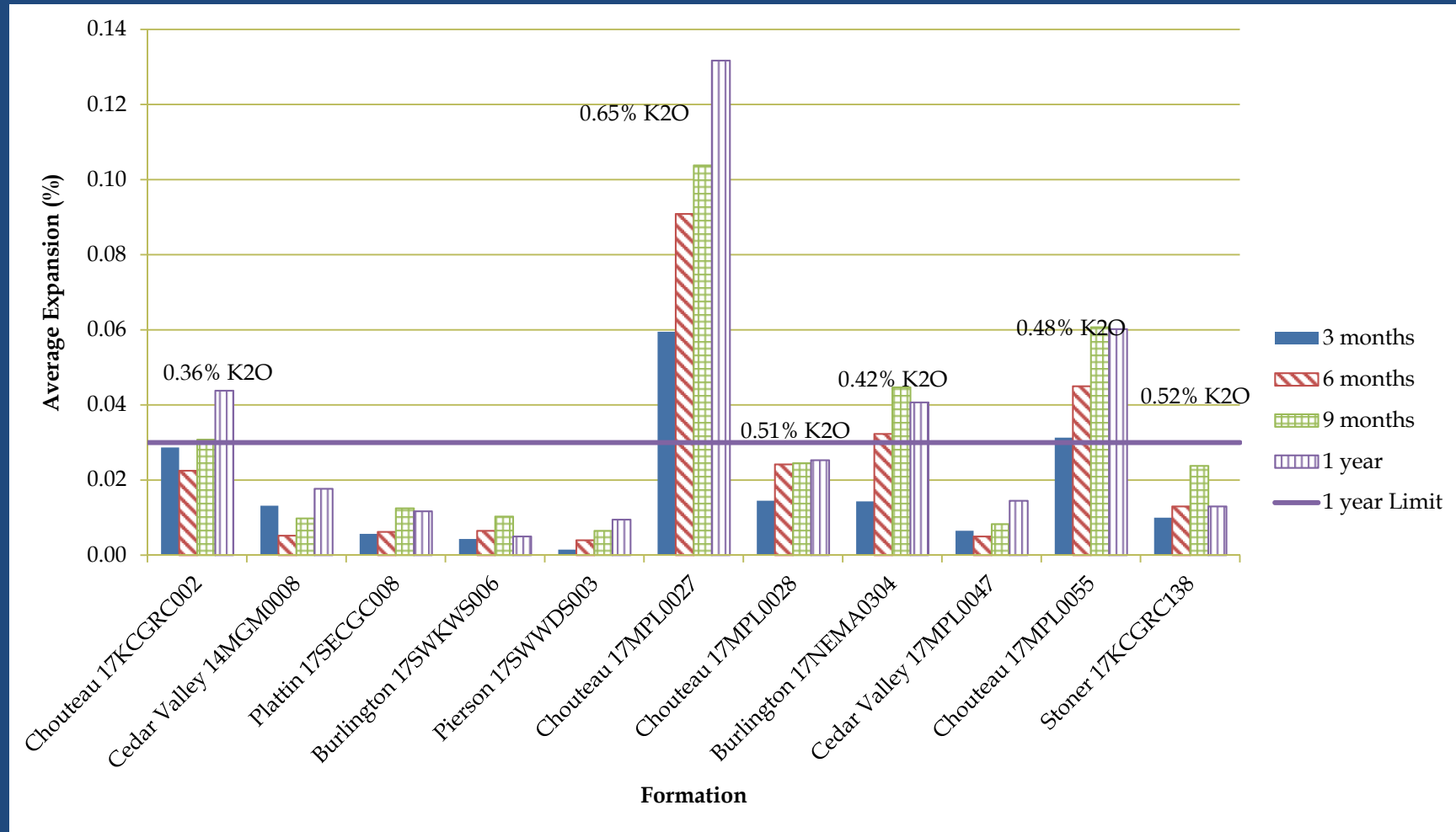
Chemical Testing

- ▣ Based on ratio of calcium oxide (CaO) to magnesium oxide (MgO) and aluminum oxide content (Al_2O_3)
- ▣ Reactive limits given in AASHTO R80 chart
- ▣ Potassium oxide (K_2O) content greater than 0.3% correlates to expansive aggregates
 - Both in current and 1960's MoDOT testing

Chemical Results so Far



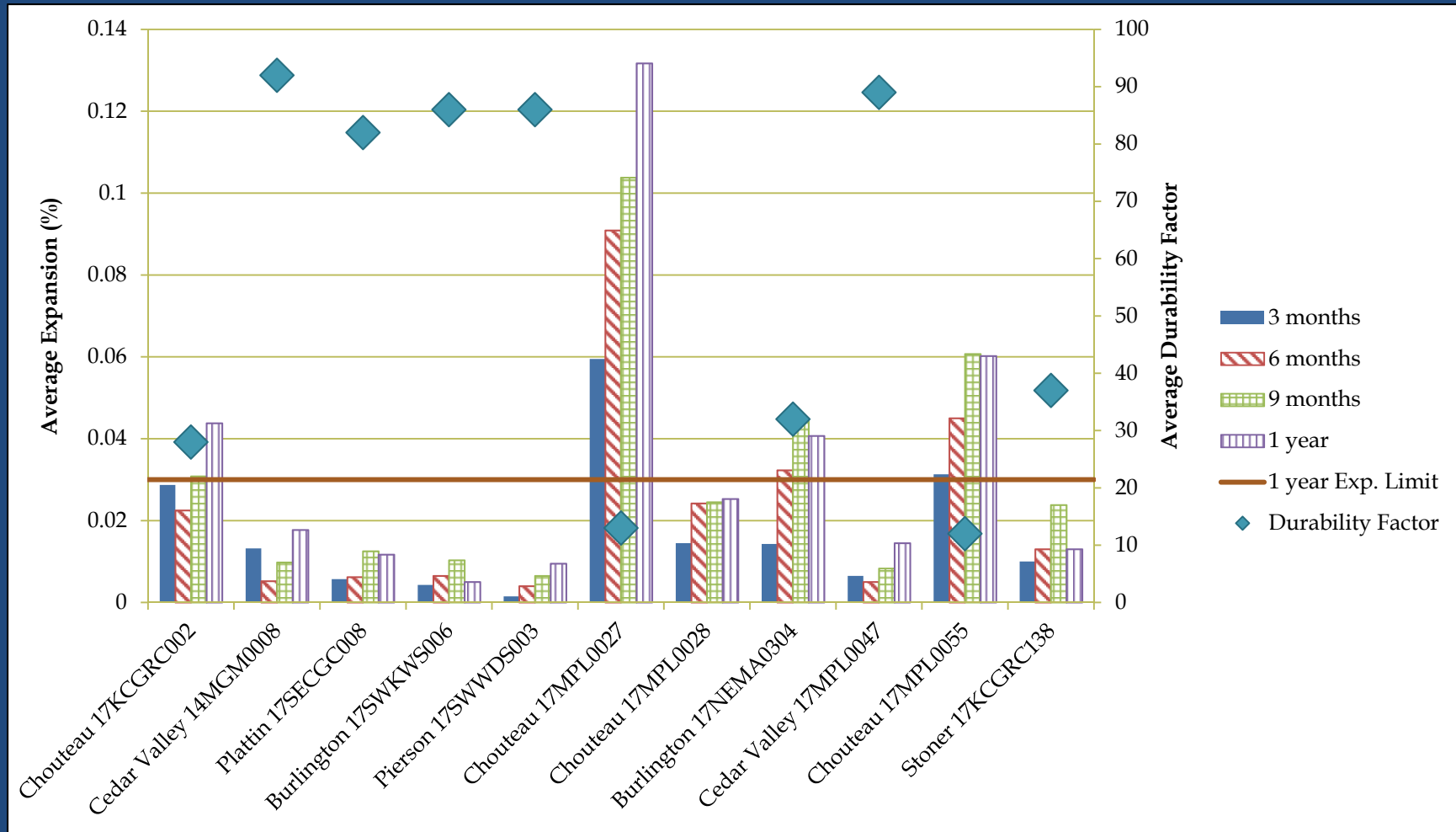
Coarse Aggregate Expansion Results (using Meramec River sand)



Expansion vs. Durability Factor

- ▣ Tested all but 1 sample for freeze-thaw resistance
- ▣ Is there a correlation between ASTM C1105 expansion and T161 results?

ASTM C1105 Expansion vs. AASHTO T161 Durability Factor



Expansion vs. Durability Factor

- ▣ High (>80) Durability Factor
 - ASTM C1105 results acceptable

- ▣ Low (<80) Durability Factor
 - ASTM C1105 results fail or have noticeable expansion

- ▣ Potential to accept/reject samples based on combination of chemical results and failing T161 results

Measurement Issues



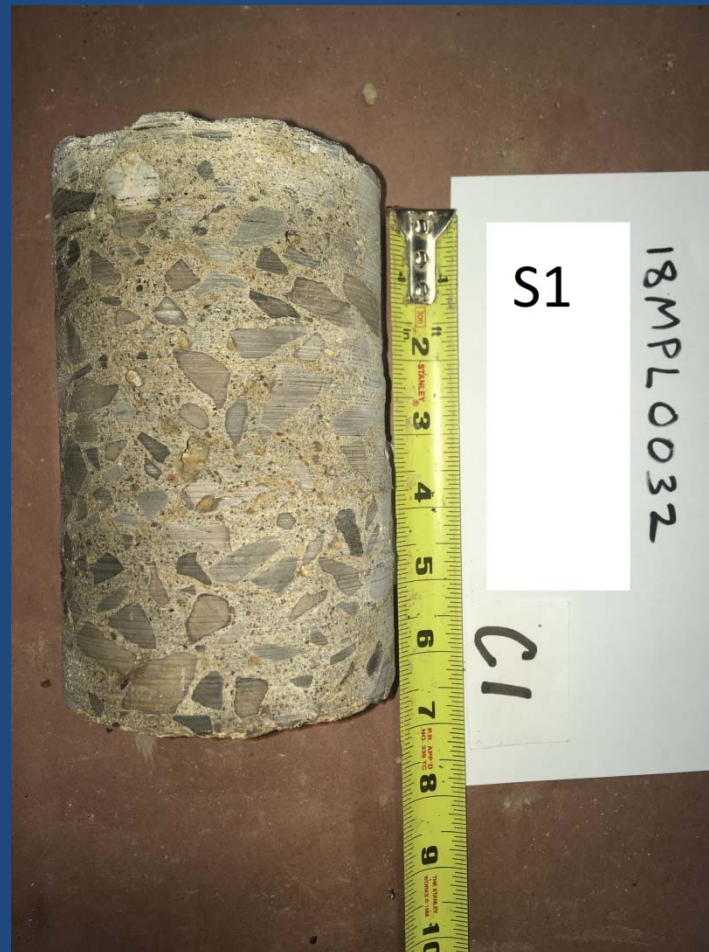
Field Performance Issues

- ▣ Somewhere in Missouri...
- ▣ Concrete pavement showing severe deterioration
 - Possible combination of D-cracking and map cracking
- ▣ Cores taken, tested by Chemical lab
 - Tested by Sam Marshall

Street 1 Core 1



Street 1 Core 1



0.69 % Al_2O_3

0.14 % K_2O

Street 1 Cores 2 & 3

