Leeds D Silo – Building a cement silo using *Sustainable cements*.

Anna Maria Workshop X – Sustainability of Concrete
November 2009
Holmes Beach, FL

Robert Bachmann
Material Engineer
HTC

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Facts

- Three (3) chamber silo with total of 20,000 MT capacity
- 80 feet diameter, 240 feet tall
- Fully automated truck loading facility
- Construction cost $20.5 million
- 18 months construction time

Situation

- 1157HE cement
- Slag as SCM
- Admixture to control “setting time”
- Contractor experience only with Type I/II
- 28d strength 6000psi

Challenge

- Slip forms require specific properties
- Shortage of time for mix design development
- Contractor concerned about “experimental mix design”
- Lack of ASTM specification
- Lab Data vs. field test (“real world”)

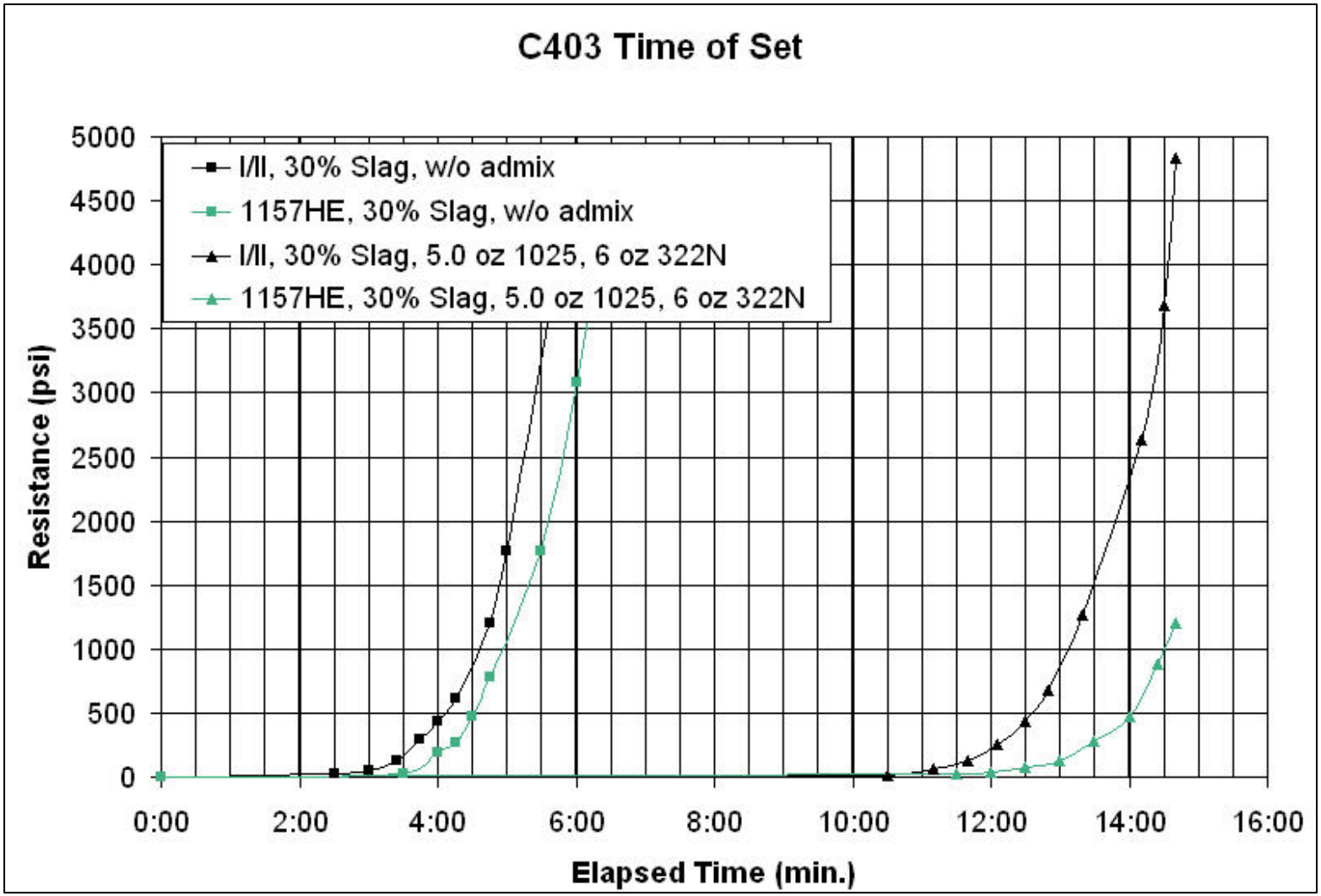
  -> field test “box”

- Major concern: “setting time” control

  -> 1157HE *“spike”*

  Admixture -> Retarder?

Lab Data – I) Time of Set



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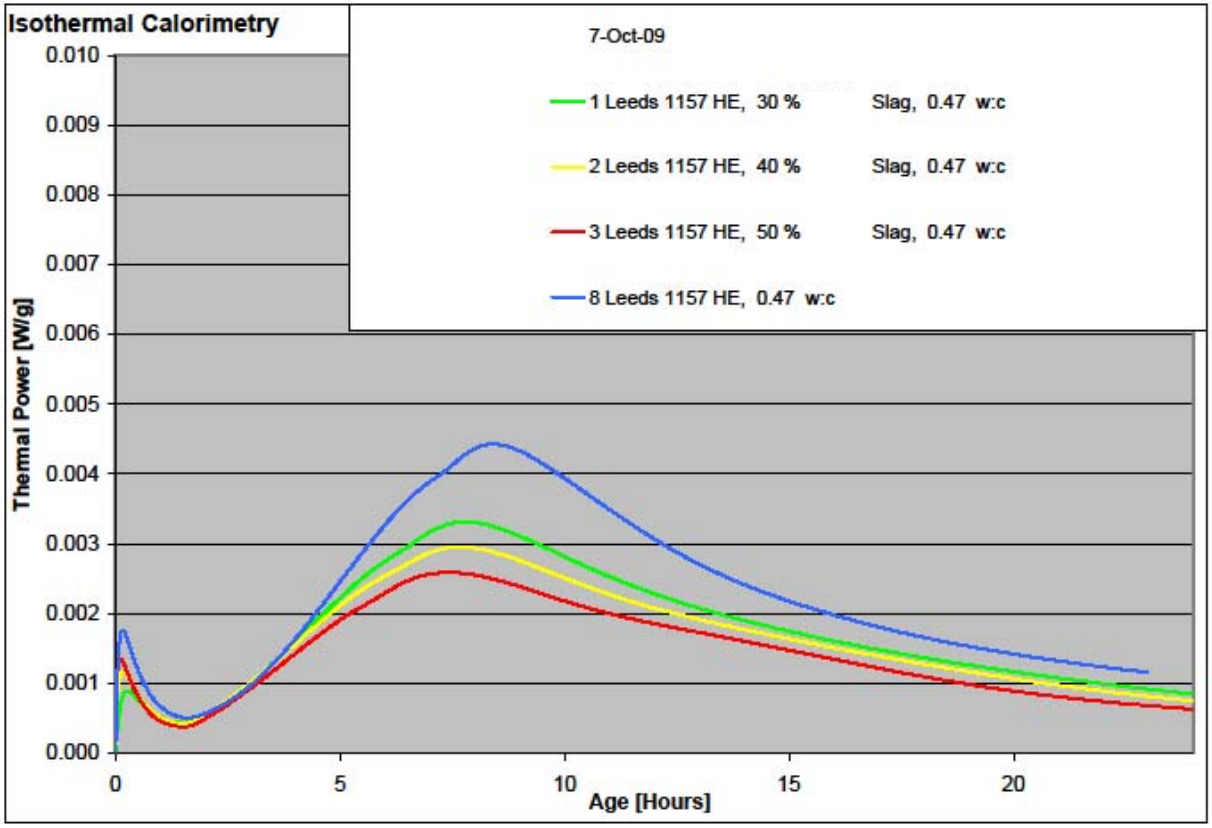
Lab Data – II) Calorimeter



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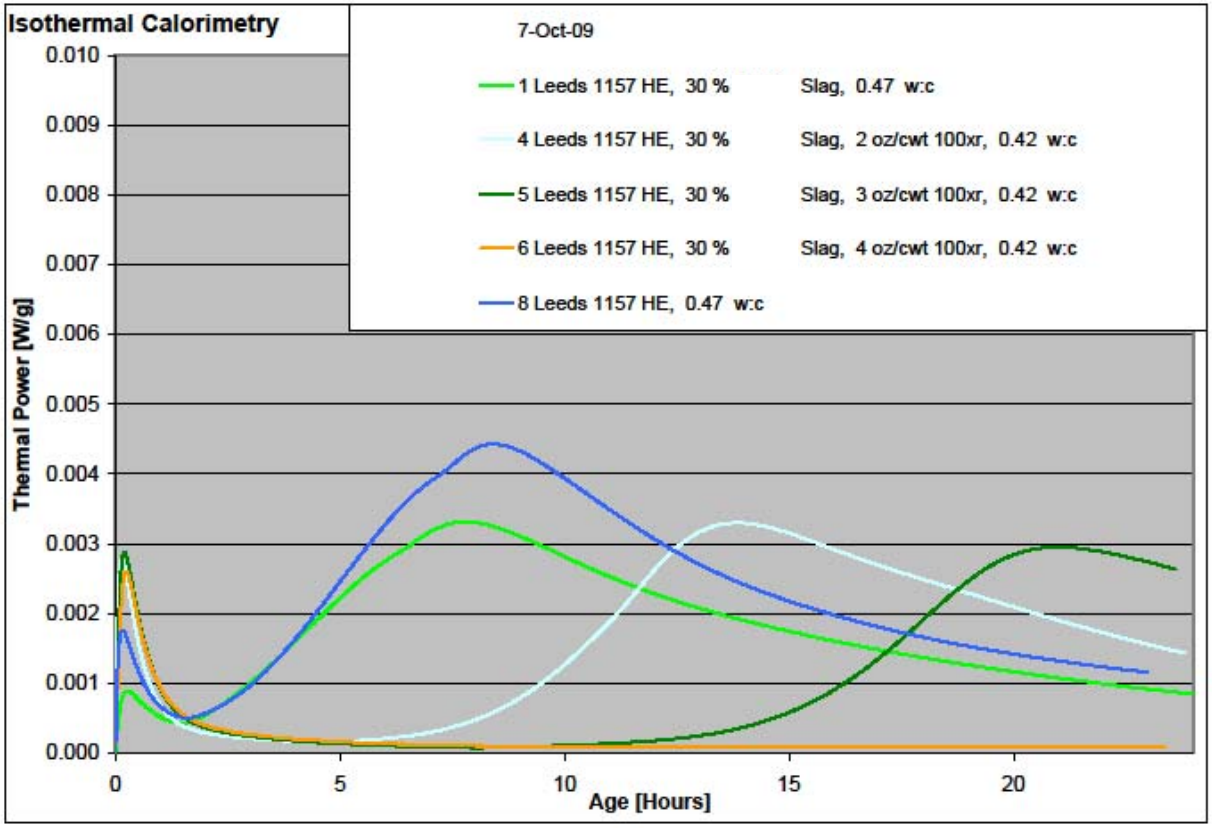

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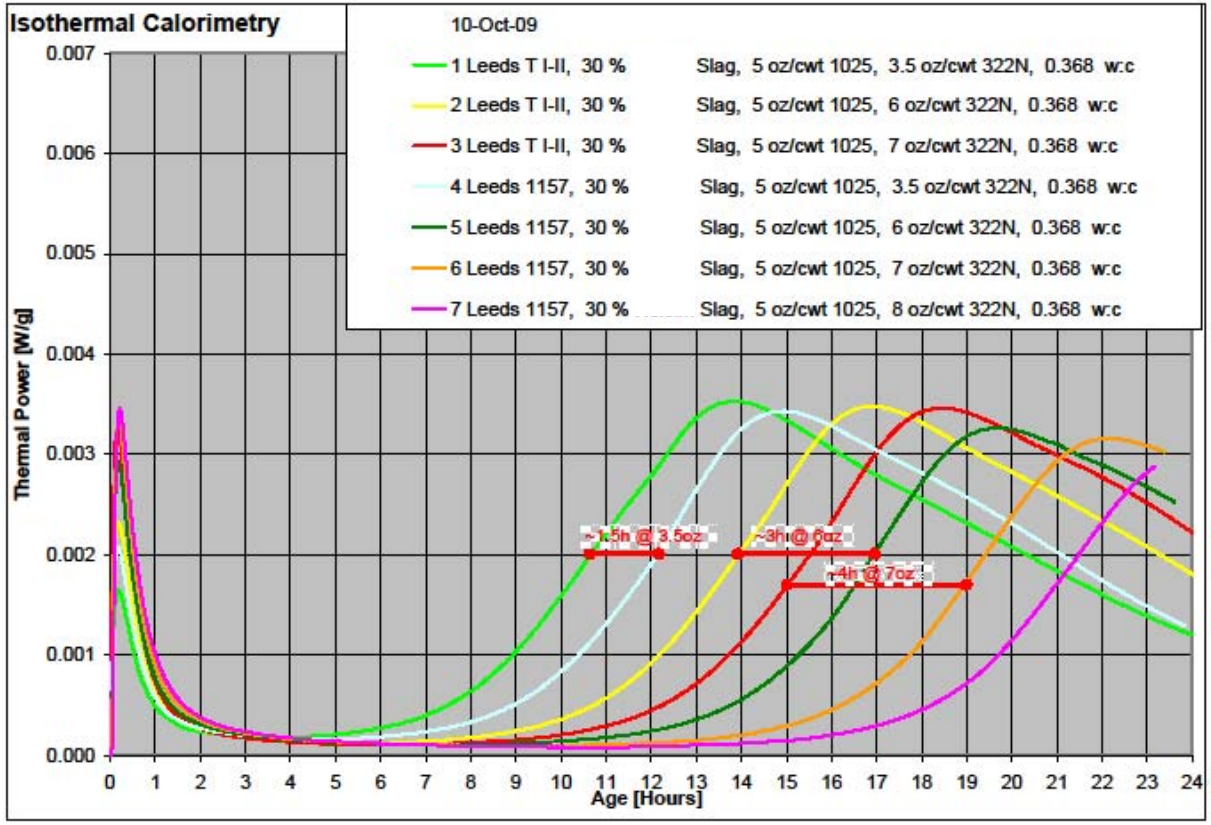
Lab Data – II) Calorimeter



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Lab Data – III) Consistometer

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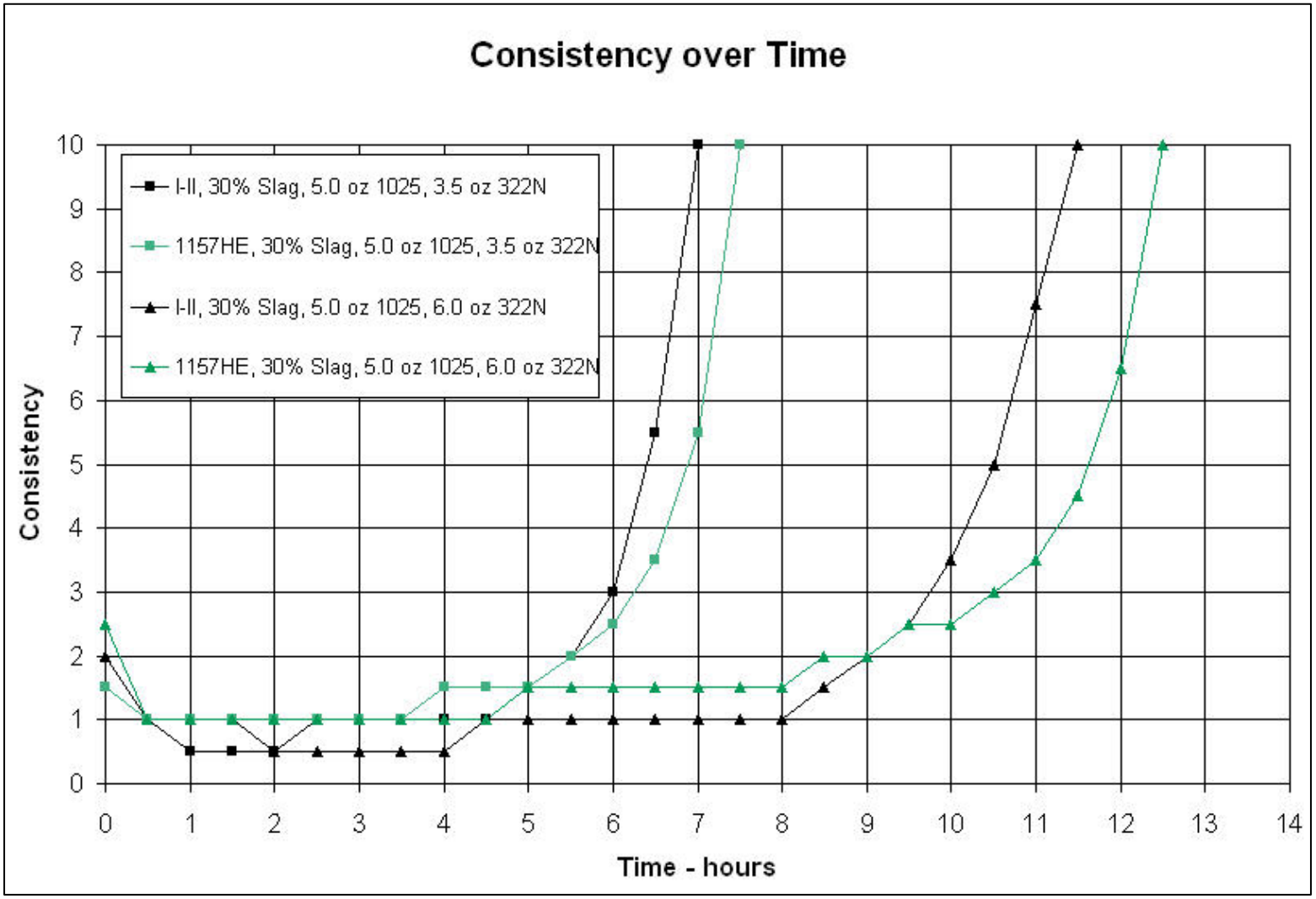

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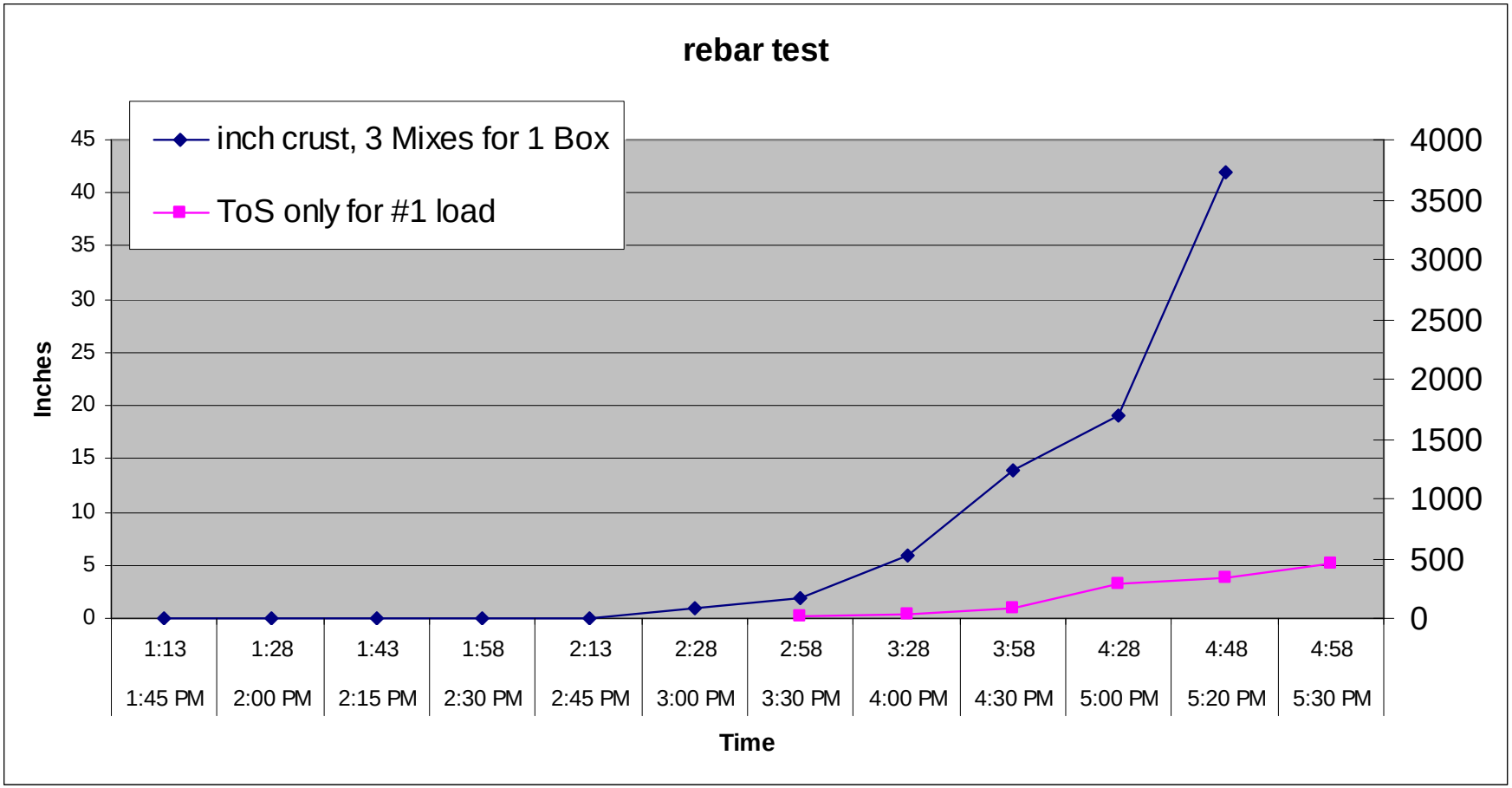
Field Trial – “Box” test

- 3 layer of concrete
- 1ft each layer
- 30min between each filling
- Rebar test as measurement

Field Trial – “Box” test

Field Trial – “Box” test



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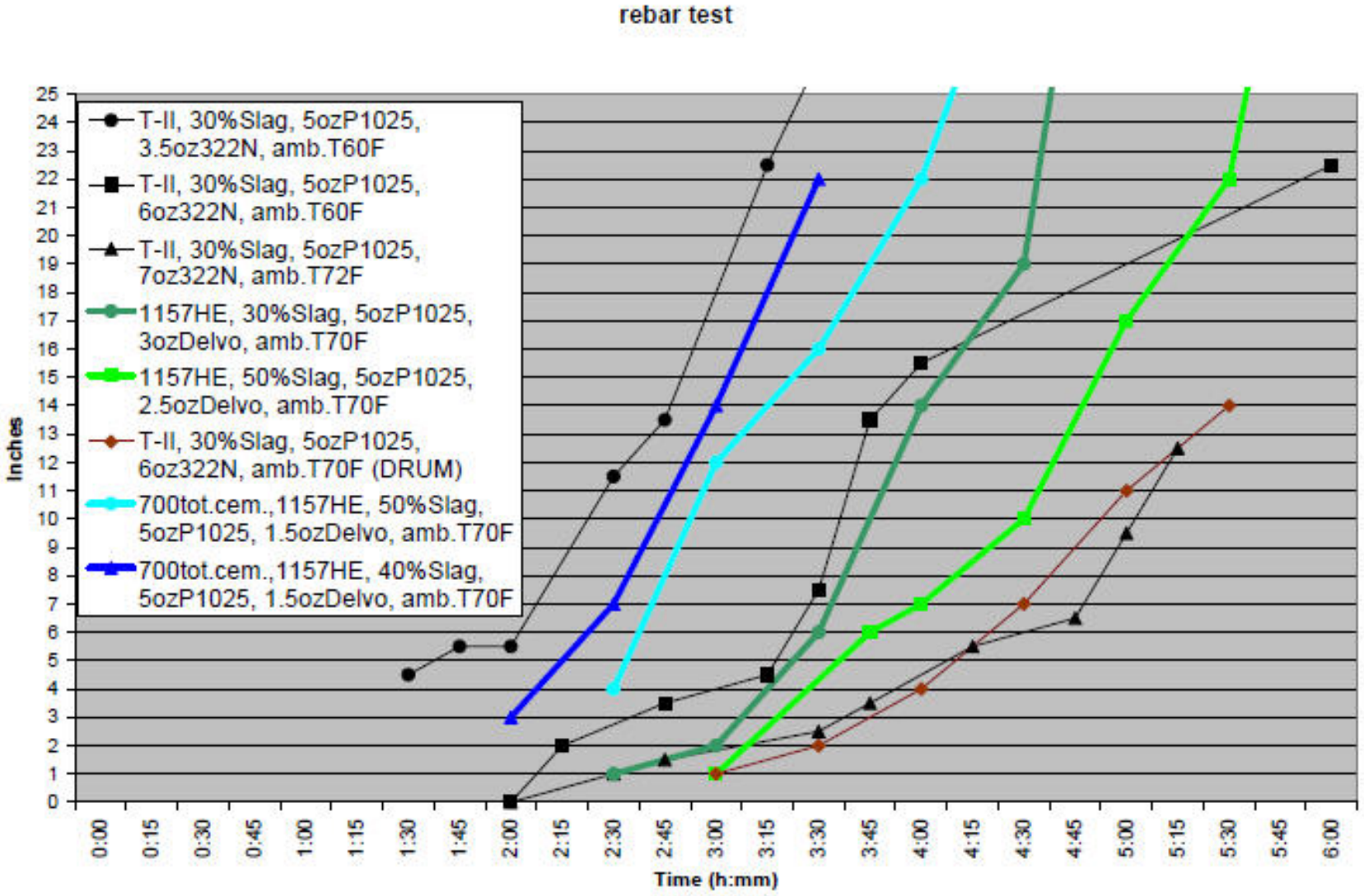
Field Trial – “Box” test



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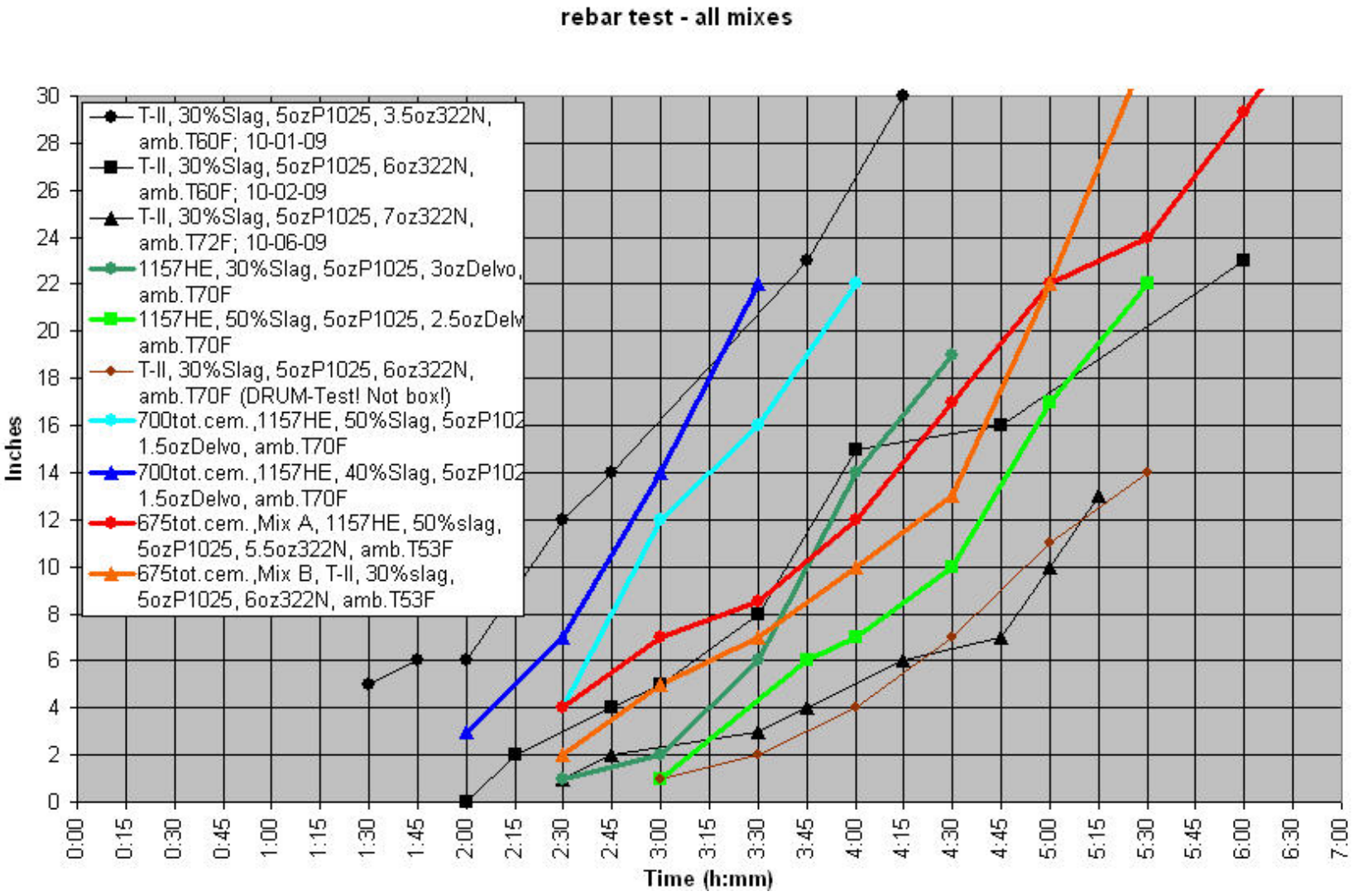
Field Trial – “Box” test



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Day 1 – Tuesday: 0–20ft, 10.8in/h

Day 2 – Wednesday: 20–40ft, 10.3in/h

Day 3 – Thursday: 40–57ft, 9.8in/h

Day 4 – Friday: 57–84ft, 10.8in/h

Questions?

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