

PI: Somayeh Nassiri, Associate Professor of UC Davis

Concrete Construction Recap: Placement, Sampling, and Early Findings

Cells 5, 7, and 9: Construction on September 16, 2025

(CalPortland High-Performance Ternary Blend (IT(L10)(P10)HS) (HPT),
Fortera reactive calcium carbonate (ReAct), KMI natural pozzolan
(Zeolite)

October 2025

Mix Proportions (Batch Size: 6.75 cy)

| Item | Units | CEL 5 TR 1-HPT | CEL 5 TR 2-HPT | CEL 7-ReAct | CEL 9-KMI |
|--|--------------------|-------------------------------------|----------------|----------------------------|--------------------------|
| Batching date-time | - | 9/16-6:38 AM | 9/16-8:52 AM | 9/16-10:57 AM | 9/16-1:20 PM |
| Ambient temperature | °F | 58 | 75 | 79 | 90 |
| Test material | | Blended cement: Type IT(L10)(P10)HS | | Reactive Calcium Carbonate | Zeolite natural pozzolan |
| Cement | lb/batch (lb/cy) | 3982.5 (590) | 3,982.5 (590) | 1,595 (236) | 3180 (472) |
| Slag (50%) | lb/batch (lb/cy) | - | - | 1,994 (295) | - |
| Other SCM | lb/batch | - | - | 399 (10% ReAct) | 795 (20% KMI) |
| Batched Water | gal/batch (gal/cy) | 209.9 (31.1) | 212.8 (31.5) | 209.8 (31.1) | 221.4 (32.8) |
| Added extra water | gal/batch (gal/cy) | 32 (4.74) | 14 (2.1) | 25 (3.7) | 20 (3) |
| Total water | gal/batch (gal/cy) | 241.9 (35.84) | 226.8 (33.6) | 234.8 (34.8) | 241.4 (35.7) |
| Coarse Aggregate | lb/batch | 10,600 | 10,600 | 10,580 | 10,580 |
| Int. Aggregate | lb/batch | 1,920 | 1,920 | 1,920 | 1,940 |
| Fine Aggregate | lb/batch | 8,780 | 8,800 | 9,180 | 8,660 |
| Type A WR, Type B RA, and Type D RA&WR | oz/cwt | 4.6 | 4.8 | 3 | 4.8 |
| Initial PCE Type A WR and Type F HRWR | oz/cwt | 3 | 4 | 3 | 0 |
| Extra PCE Type A WR and Type F HRWR | oz/cwt | 4.5 | 1.5 | 6 | 3 |
| Total PCE Type A WR and Type F HRWR | oz/cwt | 7.5 | 5.5 | 9 | 3 |
| Type S SRA | oz/cwt (gal/cy) | 32.5 (1.5) | 32.5 (1.5) | - | 21.7 (1) |
| Type B RA and Type D RA&WR | oz/cwt | - | - | 1 | 2 |

RA: retarding admixture
 WR: water reducer
 HRWR: high-range water reducer

RA&WR: retarder and water reducer
 SRA: shrinkage-reducing admixture
 PCE: Polycarboxylate Ether-based admixture

CEL 5 TR 1 (HPT)



- Batching started at the plant: 6:40 am
- Truck arrived at the site: 7:12 am
- The ambient temperature at the site was 65°F
- Had difficulty achieving the desired slump at the desired water and HRWR admixture:
 - Added 20 gal of water
 - Initial slump: 1.75 in.
 - Added 4 gal of water + 1.5 oz/cwt of HRWR
 - Slump: 2.5 in.
 - Added 12 gal of water and 3 oz/cwt of HRWR
 - Final slump: 6.5 in.
- Mix **was not used** for the test cell paving

CEL 5 TR 1 (HPT)



The photos show chunks discharged with the mix.

- Possible Causes:
- Residual concrete from the previous batch
- Inadequate drum cleaning
- High clay-type material in the fine portion of the aggregate can affect workability and consistency.

CEL 5 TR 2 (HPT)



- Batching started at 9 am
- The truck arrived at the site at 9:26 AM
- To achieve the desired 5-6 in. slump:
 - 14 gal of water and 1.5 oz/cwt of HRWR were added
- Workability was verified visually, and discharge started at 9:38 AM

Constructability – CEL 5 TR 2 (HPT)



Constructability – CEL 5 TR 2 (HPT)



9/16/2025 9:42 AM

Constructability – CEL 5 TR 2 (HPT)



Constructability – CEL 5 TR 2 (HPT)



Constructability – CEL 5 TR 2 (HPT)



9/16/2025 9:46 AM

Finishability – CEL 5 TR 2 (HPT)



- Finishing started at 9:48 AM
- Ambient temp: 73°F

Finishability – CEL 5 TR 2 (HPT)



9/16/2025 9:55 AM

Finishability – CEL 5 TR 2 (HPT)



Finishability – CEL 5 TR 2 (HPT)



Finishability – CEL 5 TR 2 (HPT)



Finishability – CEL 5 TR 2 (HPT)



Finishability – CEL 5 TR 2 (HPT)



9/16/2025 10:29 AM

Finishability – CEL 5 TR 2 (HPT)



Finishability – CEL 5 TR 2 (HPT)



10
9/16/2025 10:35 AM

Finishability – CEL 5 TR 2 (HPT)



Finishability – CEL 5 TR 2 (HPT)

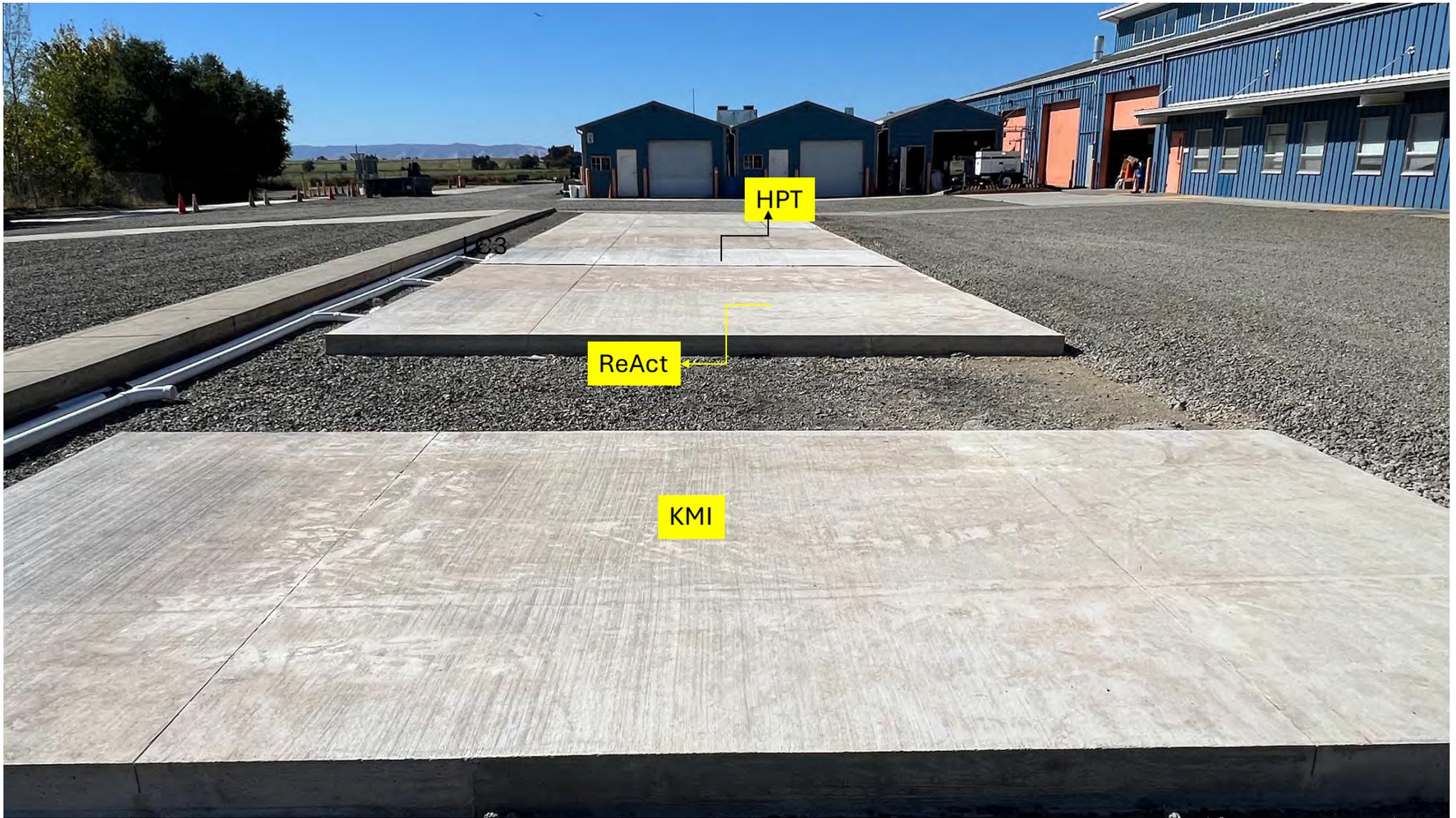


9/16/2025 10:48 AM

Burlap – CEL 5 TR 2 (HPT)



- Slabs were covered with wet burlap cover and then sealed with a plastic sheet at 1:50 PM
- Ambient temp was 88°F
- The slabs were kept sealed and sprayed with water for at least 10 days after paving



CEL 7 (ReAct)



- Batching started at 10:57 AM
- The truck arrived at the site at 11:40 AM
- The ambient temperature at the site was 81°F
- To achieve the desired slump:
 - 25 gal of water and 6 oz/cwt of HRWR were added to the truck
- Initial slump: 5.25in.
- Discharge started at 11:52 AM

Constructability – CEL 7 (ReAct)



Constructability – CEL 7 (ReAct)



Constructability – CEL 7 (ReAct)



Constructability – CEL 7 (ReAct)



9/16/2025 12:00 PM

Finishability – CEL 7 (ReAct)



- Finishing started at 12:01 PM
- Ambient temp was 82°F
- A small amount of water is being sprayed during placement due to significant slump loss at the end of the placement

Finishability – CEL 7 (ReAct)



Finishability – CEL 7 (ReAct)



Finishability – CEL 7 (ReAct)



9/16/2025 12:16 PM

Finishability – CEL 7 (ReAct)



Finishability – CEL 7 (ReAct)



Finishability – CEL 7 (ReAct)



9/16/2025 12:46 PM

Finishability – CEL 7 (ReAct)



- Slabs covered with wet burlap cover and then sealed with a plastic sheet at 3:30 PM

CEL 9 (KMI)



9/16/2025 1:56 PM

- Truck arrival time: 1:52 PM
- Added 20 gal of water and 3 oz/cwt of Glenium
- Initial slump: 8 in.
- Discharge started: 2:01 PM

Constructability – CEL 9 (KMI)



Constructability – CEL 9 (KMI)



9/16/2025 2:03 PM

Constructability – CEL 9 (KMI)



9/16/2025 2:07 PM

Finishability – CEL 9 (KMI)



- Finishing started at 2:09 PM
- Ambient temp: 85°F

Finishability – CEL 9 (KMI)



Finishability – CEL 9 (KMI)



Finishability – CEL 9 (KMI)



9/16/2025 2:26 PM

Finishability – CEL 9 (KMI)



Finishability – CEL 9 (KMI)



Finishability – CEL 9 (KMI)



9/16/2025 2:51 PM

Finishability – CEL 9 (KMI)



Finishability – CEL 9 (KMI)



9/16/2025 3:12 PM

Finishability – CEL 9 (KMI)



Finishability – CEL 9 (KMI)



- Slabs were covered with wet burlap and sealed with plastic sheets at 5:10 PM
- Ambient temp was 76°F

Plastic Concrete Test Results

- Slump: ASTM C143, Air Content: ASTM C231, Unit weight: ASTM C138
- Bleed rate: ASTM C232

| Property | Unit | CEL 5 TR 1 | CEL 5 TR 2 | CEL 7 | CEL 9 |
|--|------------------------|--------------|------------|-------|-------|
| Temperature during slump test | °F | 84.2 | 82.2 | 87.8 | 89.6 |
| Initial slump (before discharge) | inch | 1.75 | None | 5.25 | 8 |
| Final slump (run on sample taken from middle of truck discharge) | inch | 6.5 | 6.25 | 1 | 5.5 |
| Air Content | % | Not measured | 2 | 2 | 1.4 |
| Unit Weight | lb/ft ³ | Not measured | 149.1 | 150.3 | 148.7 |
| Bleed rate | lb/ft ² /hr | Not measured | 0 | 0 | 0 |

Plastic Concrete Test Results

| Property | Unit | CEL 5 TR 2 | CEL 7 | CEL 9 |
|---|--|------------|------------|------------|
| Initial Set Time of the sample | h:m (min) since batching time at the plant | 4:22 (262) | 2:50 (170) | 3:17 (197) |
| Final Set Time of the sample | h:m (min) | 5:26 (326) | 4:12 (252) | 4:21 (261) |
| Initial Set Maturity | °F-min | 13,424 | 9271 | 11,798 |
| Final Set Maturity | °F-min | 17,273 | 14,202 | 17,053 |
| Initial Set Time of the slab | h:m (min) | 3:59 (239) | 2:47 (167) | 3:11 (191) |
| Final Set Time of the slab | h:m (min) | 4:57 (297) | 4:01 (241) | 4:30 (270) |
| Start of Saw Cutting Window: =1.3 x final set time at target maturity + 30 min | h:m (since final set time) | 7:05 | 5:52 | 6:30 |
| Saw Cutting Time | h:m | 7:00 AM* | 7:20 AM* | 7:40 AM* |

*following day

Why Trial Batching Matters: Moisture & w/c Ratio Verification are Needed

- Allows finalizing the mixing procedure, including water and admixtures
- Verify sand moisture content with the burn method; not relying solely on the sensor
- Observation (supersack discharge method):
 - Higher w/c (furnace-measured) → higher slump and better workability
- Verifying w/c ensures enough water for uniform mixing throughout the load

| Cell / Truck | Measured w/c (furnace test) | Calculated w/c (batch records) |
|---------------------------------------|--------------------------------|-----------------------------------|
| Cell 5 (slump=6.5in.) | 0.52 | 0.50 |
| Cell 7 (slump= 3 in.) | 0.53 | 0.51 |
| Cell 9-Truck 1 (dry mi: Slump= 2 in.) | 0.50 | 0.50 |
| Cell 9 -Truck 2 (slump = 5in.) | 0.57 | 0.51 |

■ = Lower measured w/c than calculated (low water / poor workability)

■ = Higher measured w/c than calculated (more water / better workability)



w/c Verification Results: What They Reveal About Mixing & Workability

| Cell / Truck | Measured w/c (furnace test) | Calculated w/c (batch records) | Comments/ Observations |
|-------------------------------|-----------------------------|--------------------------------|---|
| Cell 5 Truck 1 (End-Sample 1) | 0.54 | 0.54 | • Lower w/c than calculated → poor mixing / drum residue |
| Cell 5 Truck 1 (End-Sample 2) | 0.53 | 0.54 | |
| Cell 5 TR 2 (Start) | 0.55 | 0.50 | • Higher measured w/c → uniform mixing + water availability |
| Cell 5 TR 2 (Middle) | 0.58 | 0.50 | |
| Cell 7 (Start) | 0.47 | 0.50 | Slump loss tied to lower available water across the batch |
| Cell 7 (Middle) | 0.50 | 0.50 | |
| Cell 7 (End-Sample 1) | 0.55 | 0.50 | |
| Cell 7 (End-Sample 2) | 0.50 | 0.50 | |
| Cell 9 (Start) | 0.55 | 0.53 | • Higher measured w/c → uniform mixing + water availability |
| Cell 9 (Middle) | 0.59 | 0.53 | |
| Cell 9 (End-Sample 1) | 0.55 | 0.53 | |
| Cell 9 (End-Sample 2) | 0.58 | 0.53 | |

- = Lower measured w/c than calculated (low water / poor workability)
- = Higher measured w/c than calculated (more water / better workability)

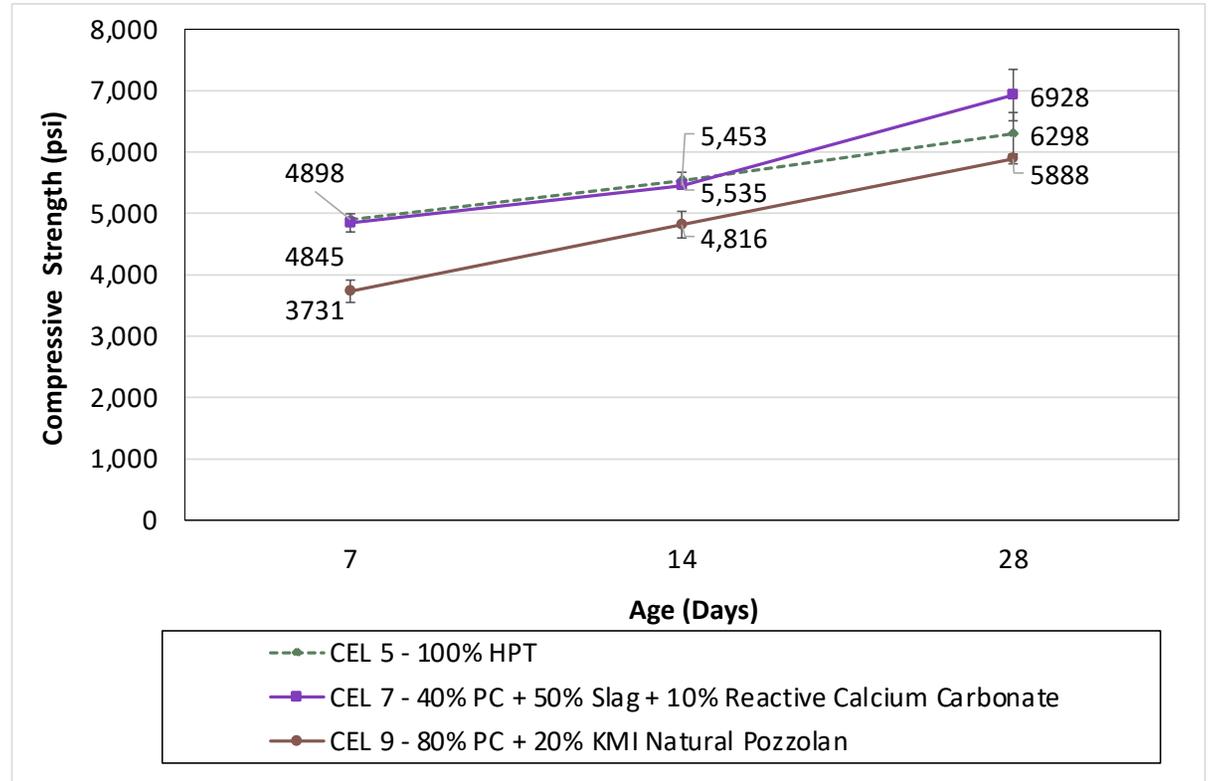
w/c Ratio Verification Insights-Trial batch day (Sep 15)

| Cell / Truck | w/c based on mass loss in furnace at 600 °C | Calculated w/c based on recorded water and admix |
|---------------------------------------|---|--|
| HPT-Truck 1 (slump=6.5in.) | 0.52 | 0.50 |
| ReAct Fortera (good-slump= 2.75in.) | 0.53 | 0.51 |
| KMI-Truck 1 (dry mix-Slump= 2 in.) | 0.50 | 0.50 |
| KMI-Truck 2 (good batch=slump = 5in.) | 0.57 | 0.51 |

- A similar trend is observed in the results of the trial batch day:
 - Mixes with higher measured w/c ratios (determined by the furnace method) produced more workable mixes with higher slump.
- Verifying w/c ratios is important to ensure adequate upfront water and uniform mixing throughout the batch.

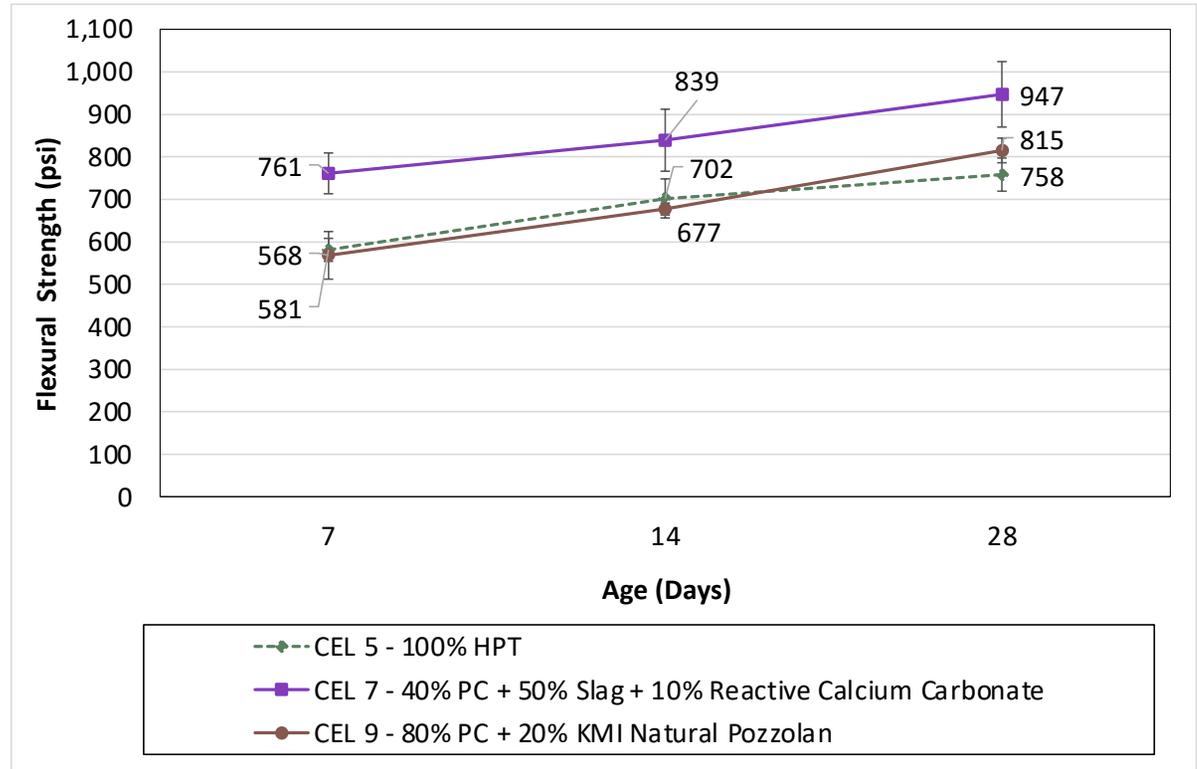
Compressive Strength Test Results

- Compressive strength increased across all mixes from 7 to 28 days, more rapid strength development for KMI.
- By 28 days, all three mixes had a strength of nearly 6,000 psi or greater.



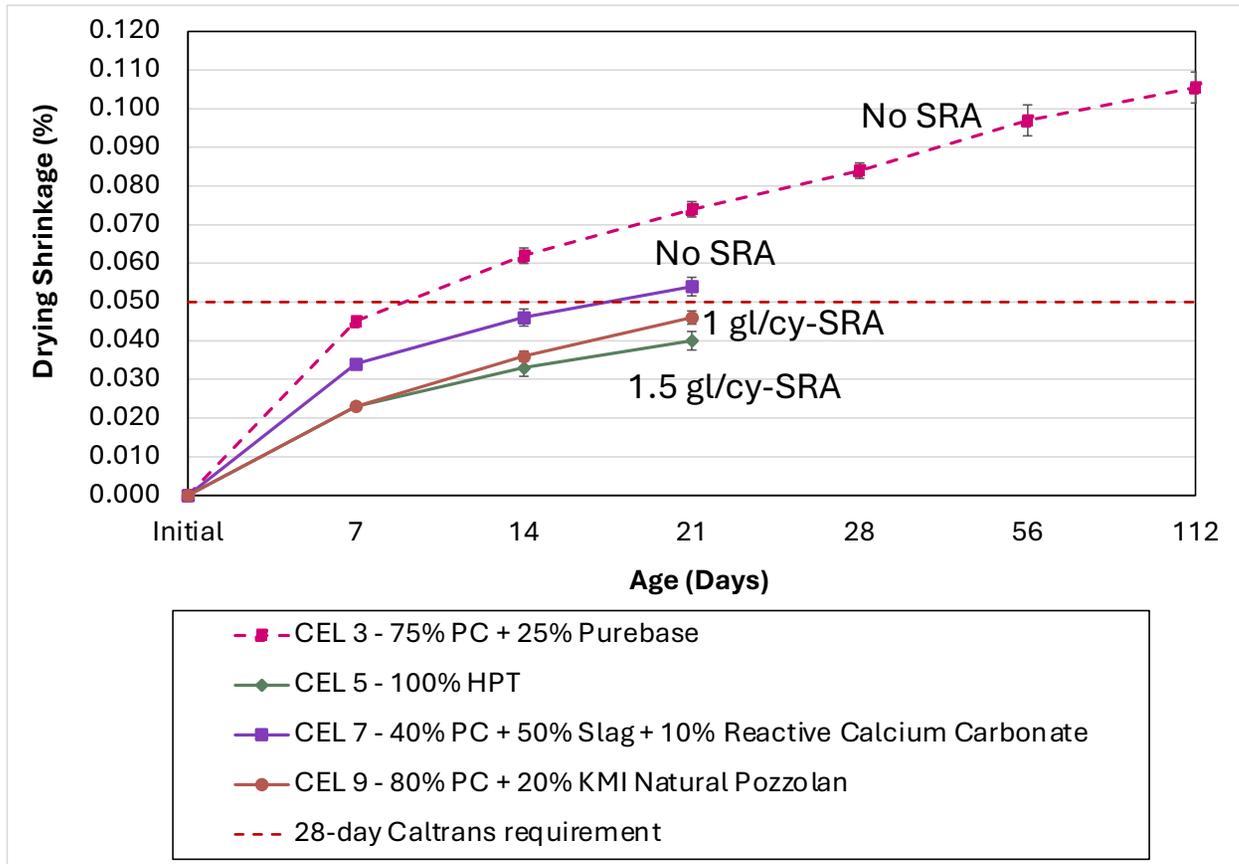
Flexural Strength Test Results

- All three mixes easily meet the 42-day 650 psi Caltrans requirement and produced exceptionally high flexural strength by 28 days



Drying Shrinkage Test Results

- KMI mix had 1 gal of SRA per CY, and HPT mix had 1.5 gal of SRA per CY and met Caltrans's 28-day 0.05% requirement
- C-FA (25% coal fly ash) and Purebase had no SRA and showed high drying shrinkage. These mixes need SRA to meet the requirement
- ReAct/slag mix had a slightly higher drying shrinkage than KMI and HPT, but still much lower than C-FA and Purebase. A dose of SRA is required to meet the spec



What's Next?

- **Share Construction Recap Materials**
 - Post the recap presentation on the Lab2Slab website and email the link to all attendees.
- **Continue Data Analysis**
 - Review and analyze instrumentation data along with other field and laboratory results.
- **Plan the Next Meeting**
 - Schedule a mid-year or annual meeting to discuss findings and next steps.
- **Publish Annual Updates**
 - Post summarized field and lab data on the Lab2Slab website for member access.
- **Present findings** — CalCIMA and ACI Spring Convention.
- **Prepare next test cells** — Planning and design for the upcoming construction are underway.

Thank you!!

- Reports will be posted at:
- <https://mdsc.ucdavis.edu/lab2slab/>
- <https://ucprc.ucdavis.edu/publications>



[News](#) [Events](#) [Lab2Slab Initiative](#) [Research & Publications](#) [People](#) [Affiliates](#) [Get Involved](#)

Join Our Mailing List

As an academic research center, we respect your privacy. You will not receive frequent emails from us, and your data will only be used if it pertains to the specific research conducted here.

Name

Email *

Learn About Lab2Slab

- ▶ [Lab2Slab Home](#)
- ▶ [Research & Testing](#)
- ▶ [Publications & Data](#)
- ▶ [Projects](#)
- ▶ [People](#)
- ▶ [Industry Engagement](#)
- ▶ [Affiliates](#)