American Concrete Institute

Experiences Placing and Finishing PLC

Rob Young

Lithko Contracting

In the Beginning

Specifications

1L – Mill Certification

Test Pours

Specifications

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type I, gray.
   2. Fly Ash: ASTM C 618, Class F.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
   4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
   1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330/C 330M, 3/4-inch nominal maximum aggregate size.

1L – Mill Certification

- Issue Date
- Manufactured Date
- Blaine
- Percent Content

Cement Mill Test Report

Month of Issue: May 2023

Plant:	[redacted]
Product:	[redacted] PLC Type IL (10) MS
Silo:	17, 18J, 19, 20
Manufactured:	April 2023

ASTM C595 and AASHTO M 240 Standard Requirements

CHEMICAL ANALYSIS

Item	Spec limit	Test Result
Rapid Method, X-Ray *(C114)*		
SiO_2 (%)	---	18.5
Al_2O_3 (%)	---	4.3
Fe_2O_3 (%)	---	3.1
CaO (%)	---	62.4
MgO (%)	---	2.7
SO_3 (%)	3.0 max *	3.3
Loss on ignition (%)	10.0 max	5.7
Na_2O_{eq} of Base Cement(%)	---	0.42 §
CO_2 (%)	---	4.6
Limestone (%)	5 to 15	9.5
$CaCO_3$ in Limestone (%)	70 min	85
Inorganic Process Addition Baghouse Dust	---	1.2

PHYSICAL ANALYSIS

Item	Spec limit	Test Result
Air content of mortar (%) *(C185)*	12 max	8
Blaine Fineness (m^2/kg) *(C204)*	---	457
Fineness, No. 325 sieve, (% retained) (C430)	---	2.7
Autoclave test (%) *(C151)*	-0.20 to 0.80	0.02
Density of Cement (g/cm^3) (C188)	---	3.09
Compressive strength (MPa, [PSI]) *(C109)*		
1 day	---	14.5 [2100]
3 days	13.0 [1890] min	26.7 [3870]
7 days	20.0 [2900] min	33.2 [4810]
28 days (previous month's data)	25.0 [3620] min	42.5 [6170]
Time of setting (minutes)		
Vicat Initial (C191)	45 - 420	121
3 Days Heat of Hydration (kJ/kg, [cal/g]) (C1702)		282 [67]
Mortar Bar Expansion (%) (C1038) (previous month's data)	0.020 max	0.010

Optional Chemical Information:

Physical Requirements for Blended Cements With Special Properties:

Sulfate Resistance (% Expansion) (C1012)	0.10 max	0.06 *at 180 days*

--- Not applicable

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- Manufactured Date
- Blaine
- Percent Content

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Product:	[redacted] PLC Type II (10) MS
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Manufactured:	April 2023

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Test Pours

- Ratio
- Sub Grade and Sub-base
- Concrete Mix
- Reinforcement
- Placement Method
- Strike to Grade Method
- Finishing
- Densifier
- Curing

Field Studies

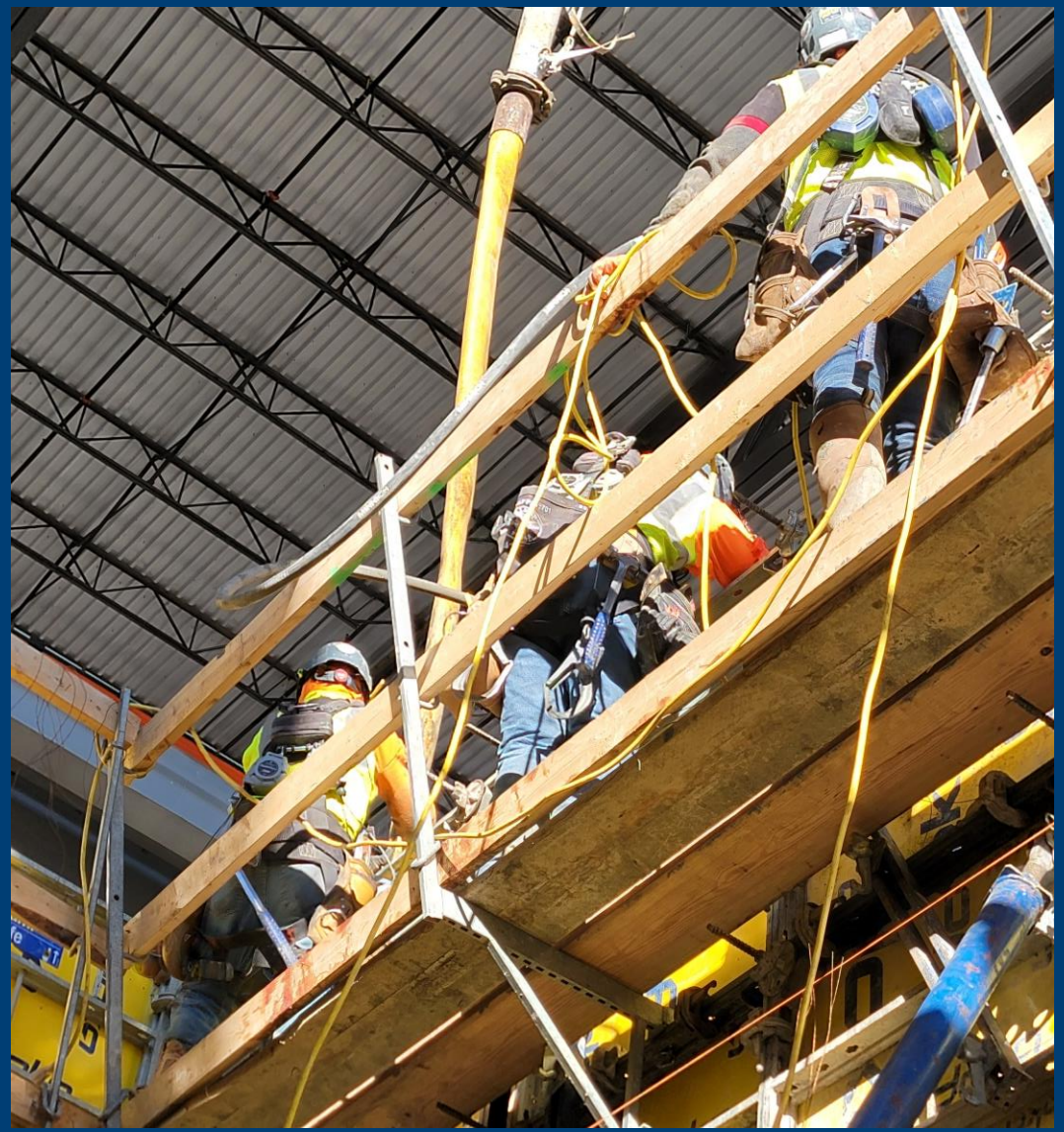
Finishing Horizontal Work

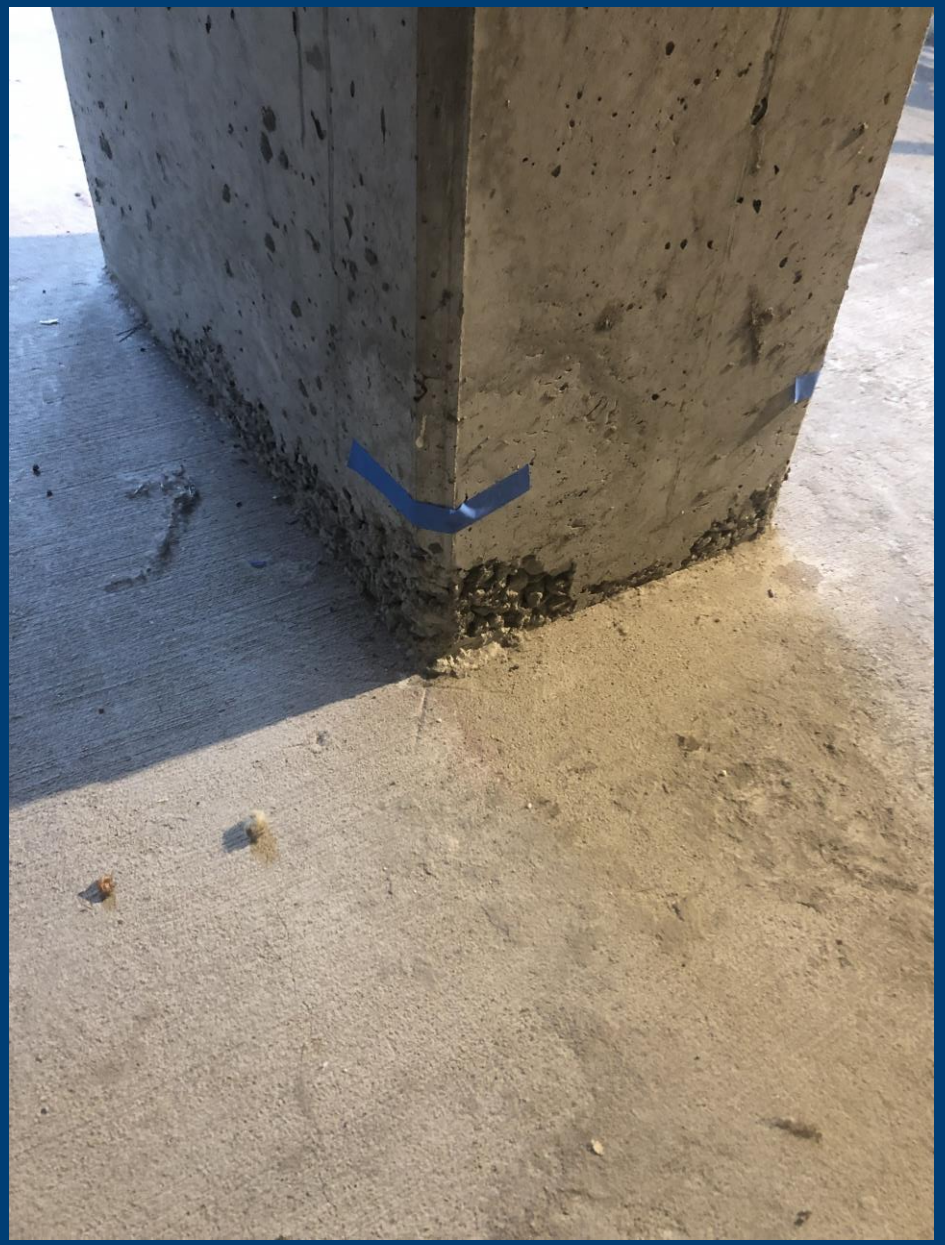
Wall

Elevated Deck

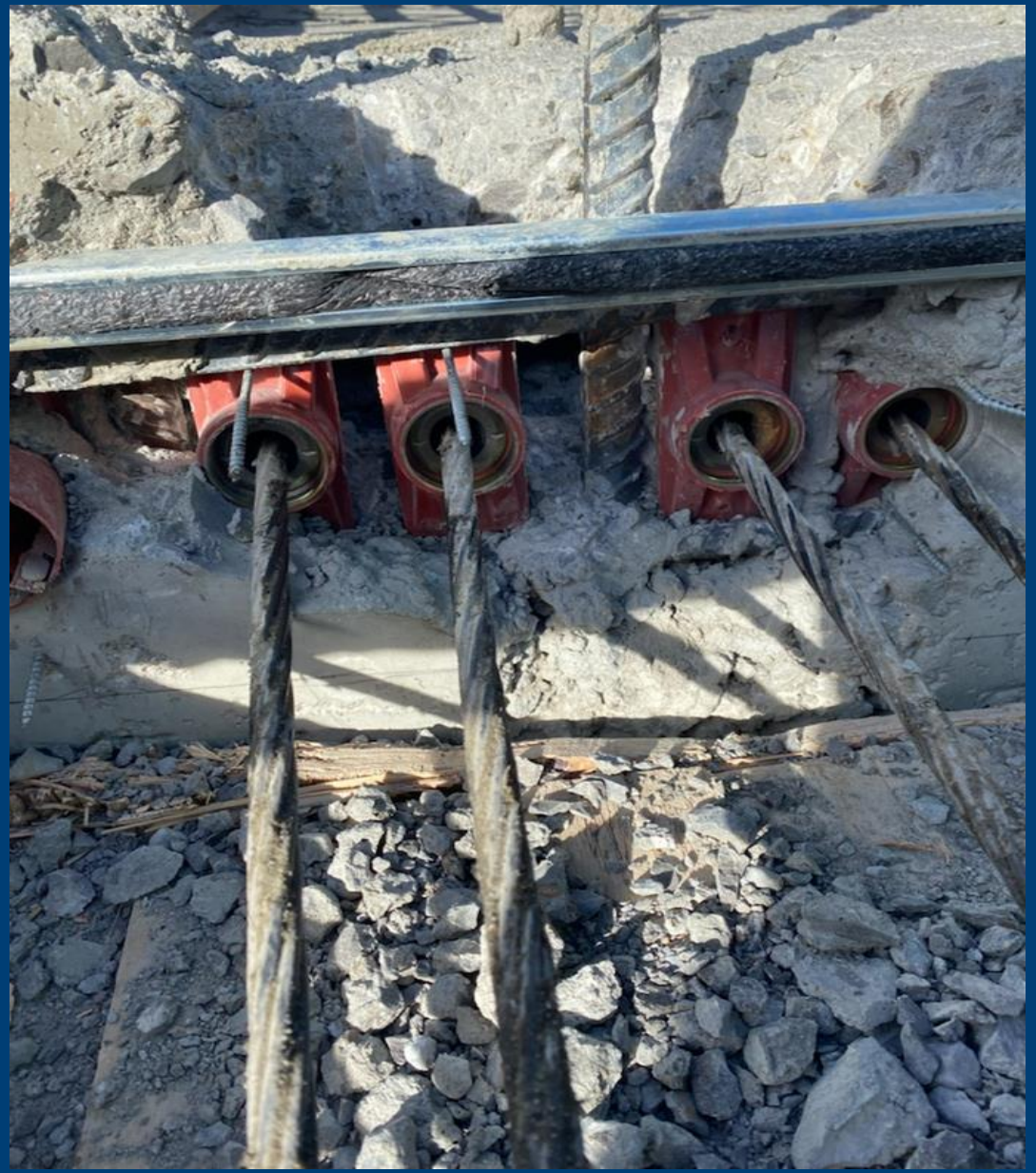
Slow Maturing Surface

Late Appearing Crazing





- Add a VMA
- Insist on a Mid-Range Aggregate
- Use Wall Snake
- About 4’ lifts, the timing of an hour.
- Lower the VBM’s between 6,000-8,000 internal.
- Close all Form holes and Gaps.



Testing

- Field Testing
  - Slump, Air, Unit Weight
  - Consolidation
  - Testing Location
  - Curing
  - Transportation
    - Timing
    - Protection
- Confirm Accuracy with Calculations
- Companion Cylinders

- Maturity Meters
  - Five Tests on Five Mixes
  - Averaged for Curve
- Temperature = Strength
- Placement in Slabs is Critical
  - In Situ
  - Depth
- Variance in Limestone Content

Solution to the Problem

- Confirm proper testing methods
- Point of Placement
- Unit Weights
- Optimize the mix design
- Mid-Range Agg
- Mid-Range WR
- No Retarders
- Consolidation
- Internal
- Low VBM
  - Back Packs
  - Screeds
- Caution to Over Vibrating
- Design
- Allow for Embedment and Coverage

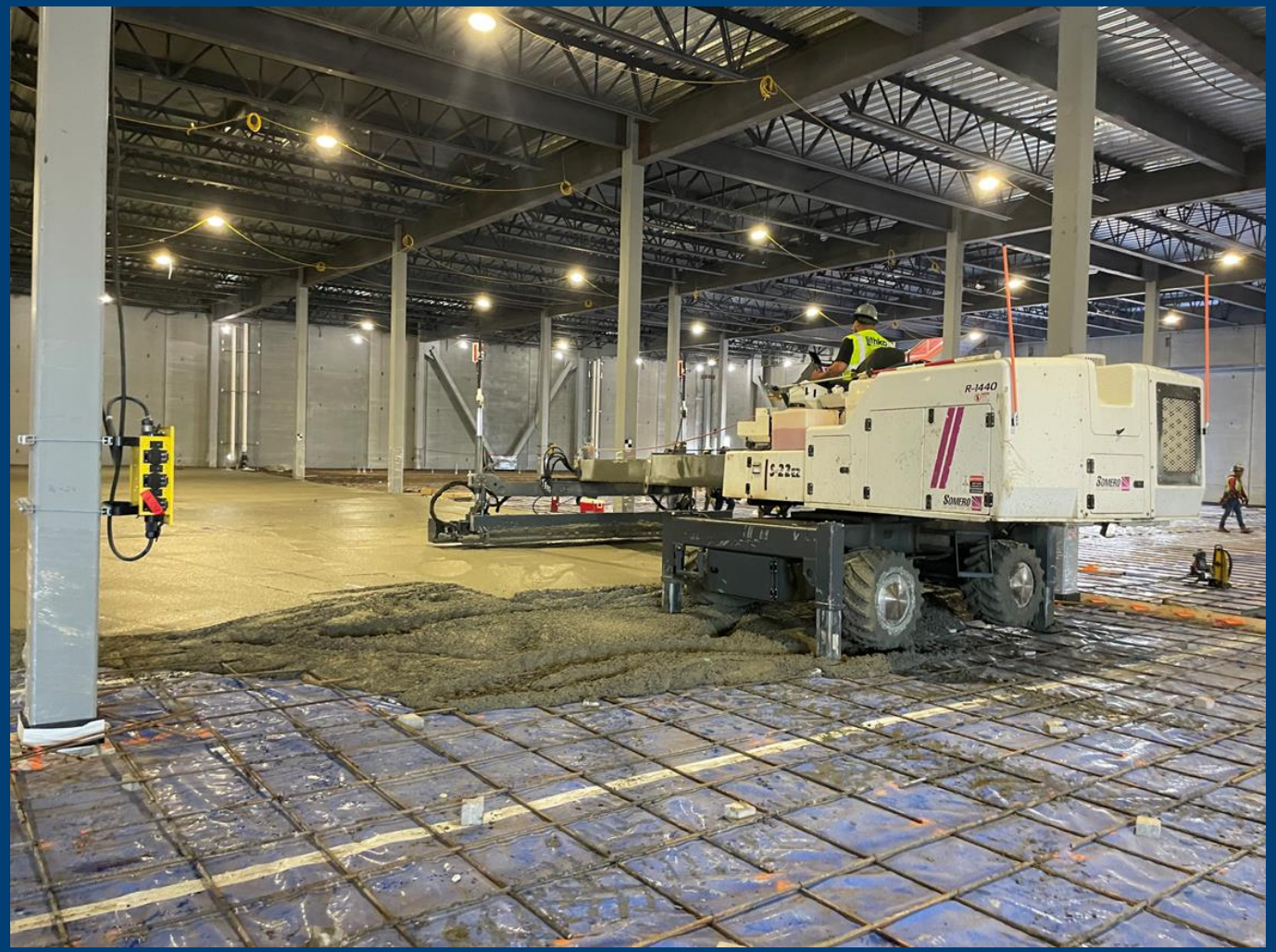
Placement and Finishing Tips

Pump Locations
Evaporative Retarder
Panning
Surface Treatments
Saw Cutting

Pump Location

- +/- 5 “ at POP
- 100 yards per Hour
- Strike to Grade
- Float

Apply Evaporative Retarder ASAP



Delay Panning

Cure than Saw Cut

Surface Treatments

Things to Remember

- We are in this together.
- Do Test Pours.
- Get the word out.
- Evaluate your individual craft for practice.
- Specifications –
  - Blaine and % Limestone
  - Optimized Mix Design
  - Finishing Techniques
- Installers
  - Hydration Rate
  - Consolidation of Equipment
  - Timeline Lengthened
  - Additional Products
  - Densifiers
  - Expansive Cements

Rob Young

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Thank you

For the most up-to-date information please visit the American Concrete Institute at:
www.concrete.org