NEWCRETE PRECAST SOLUTIONS

NEWCRETE PRODUCTS DIVISION
A DIVISION OF:
NEW ENTERPRISE STONE & LIME CO., INC.

RELIABILITY * RESOURCES * RESULTS

SELF CONSOLIDATING CONCRETE

FROM A FABRICATORS PERSPECTIVE

PREPARED BY:
NEWCRETE QUALITY CONTROL / ENGINEERING DEPARTMENTS
PRESENTED BY:
DAVID STULTZ (QUALITY CONTROL MANAGER)
R. ALLAN DERR, P.E. (ENGINEERING MANAGER)

Newcrete Experience with SCC

- Commercial Applications
  - Parking Garages (40 Projects)
    - Double tees / Inverted tees / Columns
  - Prison Cells (3 Projects)
- Typical Strength Requirements
  - F'ci = 3,000 psi
  - F'c = 5,000 psi

Newcrete Experience with SCC

- PADOT Applications
  - Bellwood Pedestrian Bridge
    - Double Tees (2)
- Strength Requirements
  - F'ci = 4,000 psi
  - F'c = 5,000 psi

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Newcrete Experience with SCC

- PADOT Applications Cont…
  - 4 Bridge Projects Involving Six Structures
    - Largest Beam - 28/96 AASHTO I-Beam
    - Smallest Beam - 28/66 AASHTO I-Beam
- Strength Requirements
  - F'ci = 6,800 psi
  - F'c = 8,000 psi

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Why Develop SCC

- Advantages
  - More Efficient Placement
    - (Dependent on Product Geometry)
  - Crew Requirements for Placement
  - Consistency
  - Finish
- Disadvantages
  - Increased Cost
  - Increased Hydraulic Forces

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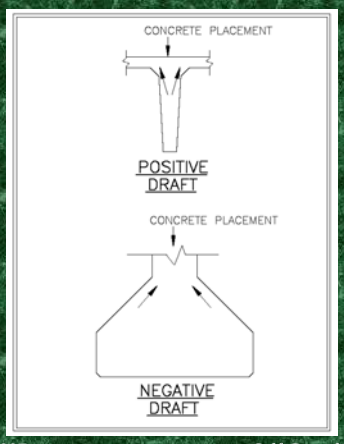
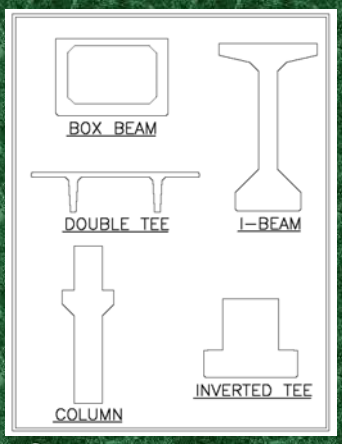
Effects of Product Geometry

- Positive Verses Negative Draft





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Developing SCC for PADOT

- SCC Mix Design Criteria Established 11/21/05 Letter to Fabricator
- Overview of Requirements
  - Modified Quality Control Plan
  - Nine Qualification Tests
  - Full Size Mock-Ups Demonstrating Placement Technique / Techniques

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Qualification Tests

1. Compression Strength Testing
2. Air Content – Pressure Method (Modified)
3. Slump Flow (w/VSI) and J-Ring
4. Concrete Temperatures
5. Static Column Segregation Testing
6. Freeze Thaw Resistance
7. Hardened Air Analysis
8. Rapid Chloride Permeability
9. Strand Bond Qualification

(First 4 Required During Production)

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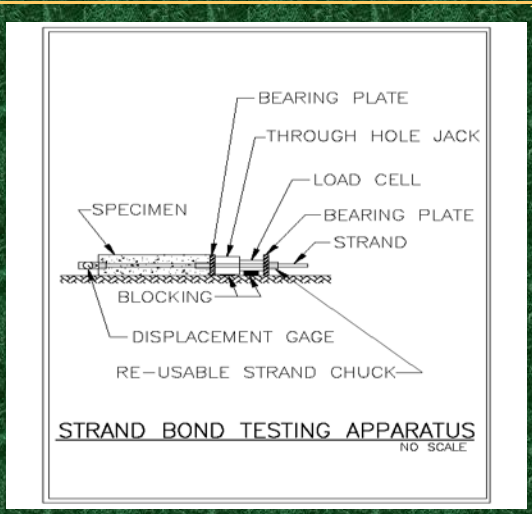
Strand Bond Test Set-up



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Strand Bond Test

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Strand Bond Test

Strand Bond Test

BOND QUALITY SUMMARY
STRAND BOND TEST
(STANDARD AND SCC (P-61) MIX DESIGN)

Prepared by: RAD
Checked by: LRV

	*Standard Mix					Average	SCC Mix (P-61)			Average
	Test#1	Test#2	Test#3	Test#4	Test#5		Test#1	Test#2	Test#3	
Fi (kips)	31.25	32.00	34.25	31.00	33.75	32.45	38.50	36.00	39.00	37.83
Fu (kips)	31.25	32.50	34.75	31.00	34.25	32.75	39.20	38.50	39.00	38.90
f'c (psi)	7,058	7,058	7,058	7,058	7,058	7,058.00	7,148	7,148	7,148	7,148.00
eq.1 (Lti)	36.99	36.12	33.75	37.29	34.25	35.68	30.03	32.11	29.64	30.59
eq.2 (Lult)	48.07	46.22	43.23	48.46	43.86	45.97	38.39	39.09	38.59	38.69
eq.3 (Lti-norm)	0.44	0.43	0.40	0.44	0.41	0.42	0.36	0.38	0.35	0.36
eq.4 (Ltu-norm)	0.57	0.55	0.51	0.58	0.52	0.55	0.45	0.46	0.46	0.46

* Standard Mix Strand Bond Data included with SCC (P-60) Mix Design Submission

Fi = Measured force corresponding to 0.01" slip at dead end of specimen (kips)
Fu = Measured force corresponding to 0.1" slip at dead end of specimen (kips)
f'c = Concrete compressive strength measured at time of pullout test (psi)
Lti = Lower bound transfer length (in)
Lult = Lower bound bond length required to fracture strand (in)
Lti-norm = Normalized lower bound transfer length (Adjusted for f'c) (in)
Lult-norm = Normalized lower bound bond length required to fracture strand (Adjusted for f'c) (in)

Full Size Mock-Up

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Full Size Mock-Up

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SCC In I-Beams / Box Beams

- SCC Utilized in I-Beam Production
  - Challenges:
    - Tightly Spaced Reinforcing
    - High Prestress Forces
    - High Early Strength Requirements
    - High 28 Day Strength Requirements

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Vibration Requirements

- Commercial Experience
  - Required at Areas of Congested Reinforcing
- PADOT Experience
  - External and Internal Vibration Required due to Reinforcing Spacing

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Beam Finish
First SCC P/S I-Beam In PA

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Beam Finish
(Bug Holes)

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Beam Finish (Negative Draft Effect)

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Canyon Tone Stain (Fascia Beams)

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Conclusions

- Mix Designs Satisfy Qualification Tests…
- Satisfactory Finish (Continuing to Improve)…
- Improved Workability…
- Improved Strand Bond…
- SCC Requires Additional Measures Be Taken To Secure Reinforcing, Jigs, Voids, Forms…
- Slight Adjustments Required for SCC Cure Characteristics (Initial Set Time)…