American Concrete Institute®
Advancing concrete knowledge

Emerging Technologies

ACI Fall 2012 Convention
October 21 – 24, Toronto, ON

ACI
WEB SESSIONS

Pre-Packaged High Performance Concrete

Used for Bridge Replacement

by

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ACI
WEB SESSIONS

KING

Pre-Packaged High Performance Concrete
Used for Bridge Replacement

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October 22, 2012

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Mixing Strength With Satisfaction KING

1.0 BACKGROUND

PRODUCT HISTORY

Ontario MINISTRY OF TRANSPORTATION

- Collaborative effort
- Pre-packaged high performance concrete for bridge replacement
- Meet specific plastic and hardened properties
- 2007-2008
  - Development and Testing
- 2009-2012
  - Field Implementation

1.0 BACKGROUND

REMOTE CONSTRUCTION

- READY-MIX PROXIMITY
- NO NEED FOR RETARDERS

1.0 BACKGROUND

ONLY WATER IS ADDED ON-SITE

- PRE-BLENDED ADMIXTURES
- IMPROVED QUALITY CONTROL
- HIGH PERFORMANCE CONCRETE ON DEMAND

1.0 BACKGROUND

REDUCED CONSTRUCTION SCHEDULE

- PRECAST BRIDGE SECTIONS
- HIGH EARLY STRENGTH

2.0 MIXING ON-SITE

PACKAGING AND YIELD

- 1000 KG (2205 LB) BULK BAGS
- APPROX. 0.45 m^3 (0.58 yd^3) PLASTIC CONCRETE

2.0 MIXING ON-SITE

BATCHING ON-SITE

3.0 PHYSICAL PROPERTIES

PLASTIC REQUIREMENTS

PROPERTY	ACCEPTED RANGE
AIR CONTENT	6 ± 1.5 %
SLUMP	150 – 250 mm (6-10")
TEMPERATURE	10 - 25°C (50-77°F)
CONSISTENCY	FREE OF LUMPS OR SEGREGATION

3.0 PHYSICAL PROPERTIES

HARDENED REQUIREMENTS

PROPERTY	ACCEPTED RANGE
AIR CONTENT	3.0% Minimum
COMPRESSIVE STRENGTH	30 MPa (4300 PSI) – Prior to Traffic
COMPRESSIVE STRENGTH (28 DAY)	50 MPa (7250 PSI) – Minimum
RAPID CHLORIDE PERMEABILITY (28 DAY)	1000 Coulombs – Maximum

4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

- COCHRANE, ON
- CONTRACTOR – TERANORTH CONSTRUCTION AND ENGINEERING
- COMPLETION – MAY 2012
- OWNER – MTO

4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

- PRE-FABRICATED DECK SECTIONS

4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

- SHEAR POCKET KEYS

4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

- IN-FILL STRIPS

4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

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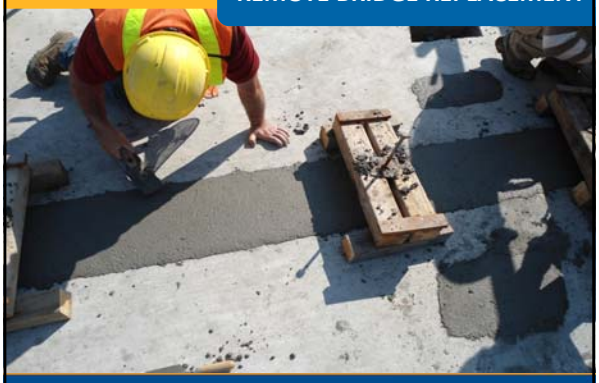
REMOTE BRIDGE REPLACEMENT



4.0 CASE HISTORIES

REMOTE BRIDGE REPLACEMENT

PROJECT FOLLOW-UP	
PROPERTY	RESULT
AIR CONTENT (HARDENED)	7.5%
COMPRESSIVE STRENGTH (48 HOURS)	51.5 MPa (7250 PSI) AVG
COMPRESSIVE STRENGTH (28 DAY)	85 MPa (12300 PSI) AVG
RAPID CHLORIDE PERMEABILITY (28 DAY)	440 Coulombs – AVG

4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

- BRANTFORD, ON
- CONTRACTOR – DUFFERIN CONSTRUCTION
- COMPLETION – JUNE 2011
- OWNER – MTO

4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

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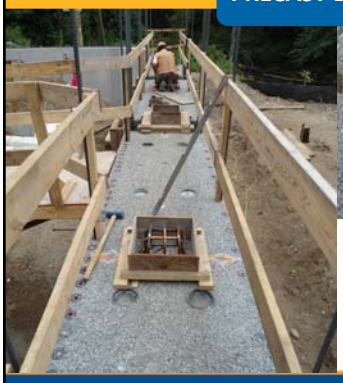

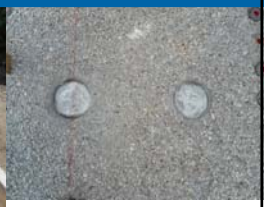

- MICROPILE FOUNDATION
- UHPC – ULTRA HIGH PERFORMACE CONCRETE

4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

- BEARING PLATES

4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

- ABUTMENT CONNECTIONS

4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

- ABUTMENT CONNECTIONS AND BEARING PLATES

4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

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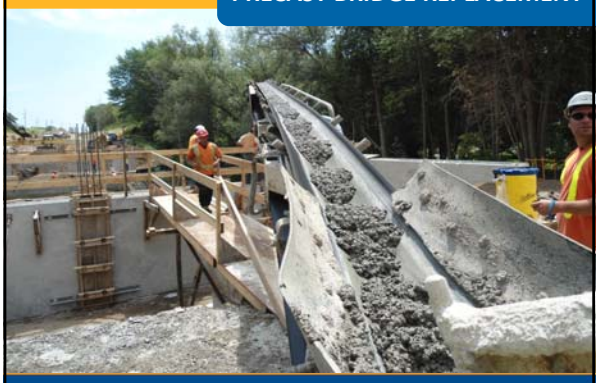
PRECAST BRIDGE REPLACEMENT



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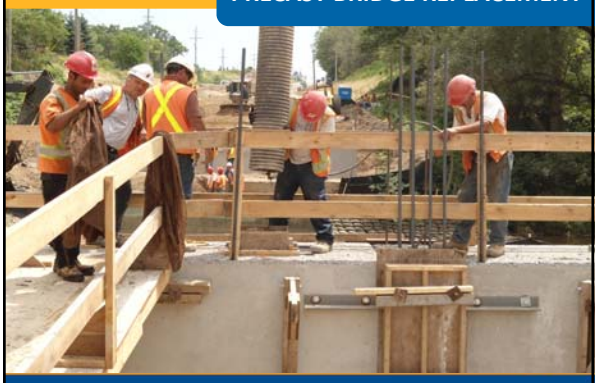
PRECAST BRIDGE REPLACEMENT



4.0 CASE HISTORIES

PRECAST BRIDGE REPLACEMENT

4.0 CASE HISTORIES

RAPID BRIDGE REPLACEMENT

- HAMILTON, ON
- CONTRACTOR – DUFFERIN CONSTRUCTION
- COMPLETION – AUGUST 2010
- OWNER – MTO

4.0 CASE HISTORIES

RAPID BRIDGE REPLACEMENT

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RAPID BRIDGE REPLACEMENT

PROJECT FOLLOW-UP	
PROPERTY	RESULT
AIR CONTENT (HARDENED)	7.0%
COMPRESSIVE STRENGTH (10 HOURS)	31.5 MPa (4500 PSI) AVG
COMPRESSIVE STRENGTH (28 DAY)	95 MPa (13775 PSI) AVG
RAPID CHLORIDE PERMEABILITY (28 DAY)	250 Coulombs – AVG

Thank you for your time!

Questions?

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