## LOK-TEST & CAPO-TEST for in-situ strength

Section 3 Hardware Testing Procedures Instruments

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## In-Situ Strength, why?

- Control of effects of transportation and compaction
- Effects of curing, quality of the cover layer protecting the reinforcement against chloride ingress
- Eliminate shortcomings of cylinders and cubes
- Low strength of laboratory specimens
- Changed mixes, intentionally / not intentional
- Strength of existing structures for load carrying capacity calculations
- Timing of safe and early loading operations



#### The two in place test systems presented





#### LOK-TEST

#### CAPO-TEST

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LOK-TEST



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## LOK-TEST for new structures

- Install inserts
- Ready the testing
- Perform the LOK-TEST either to a required strength or to top-peak loading, with or without pull-out
- Transform the kN pullforce to compressive strength of lab cubes (or cores) or lab cylinders by general correlation



## LOK-TEST





## LOK-TEST



## Clearance Requirements ASTM C900



#### Reinforcement clearance

Edge distance



#### LOK-TEST Inserts, <60 MPa cyl, strength

Attached to formwork cutouts

## Nailed to<br/>formworkOr through aFloated<br/>into surface

Max pullforce 55 kN, equiv. to 60 MPa cylinder strength or 80 MPa cube strength



#### LOK-TEST inserts >60 MPa cyl. strength

Attached to formwork cutouts

0

Nailed to<br/>formworkOr through aFloated<br/>into surface

Max pullforce 90 kN, equiv. to 105 MPa cylinder strength or 140 MPa cube strength Note: Both sets of inserts <60 MPa and >60 MPa follow the general correlations(s)





## LOK-TEST Inserts

Attached to formwork cutouts

0

REAL PROPERTY

Nailed toOr through aFloatedformwork7 mm hole in the forminto surface





## L-40 insert for nailing to wooden formwork



## LOK-TEST'ing



"H" is the peakload, saved in the memory with time and date of testing for documentation

Duration of one tests including preparation is 3-5 minutes



## Correlating the kN to MPa using the generel cylinder correlation



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## L-42 Insert for safe and early formstripping

Attached to formwork cutouts

Nailed to<br/>formworkOr through aFloated7 mm hole in the forminto surface



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## Strength for Formwork Removal



Vice-President Mr. Sal Fasullo, C.E.T., Davroc & Associates Ltd., Canada

Mr. Sal Fasullo has during the years been in charge of and responsible for testing of +200,000 LOKETEST Suild right



Remove backing plate
timed by maturity
Attach loading system
Apply load

Measure pullout strength



#### LOK-TEST Pull Machine

## Peak Load, example H = 29.5 kN

- At peak load, ≈ 0.2 mm surface displacement
- Gradual decrease in load with continued displacement



#### Correlating the kN to MPa using the generel cylinder correlation



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## **Floating Inserts**





## Placement of L-49 inserts





#### Testing of L-49 inserts floated in the top surface for QC



COMA-Meter for maturity



#### Testing of L-49 inserts floated in the top surface, tunnel slab







# Deeper testing than at the surface 25 mm



Deeper embedment of the LOK-TEST insert can be made using e.g. the L-49 insert as illustrated adjacent.

Using this insert the testing surface will be lowered 20 mm from the surface.



## CAPO-TEST Cut And PullOut Test

## Instruction video on Google "CAPO-TEST ASTM-C900"



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## LOK-TEST to CAPO-TEST









## **CAPO-TEST** Failure



"Leaves" from the 2nd crack pattern with the concrete in compression STRUT being intersected in the softening regime



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## CAPO-TEST Procedure

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## Prepare Concrete



## Core Hole



Shown here using the vacuum plate, otherwise perform the coring handheld, stepping on the flange



## Plane surface





Use governing tap for centering if performed handheld



= Test smart – Build right

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## Planed surface









## Insert Expansion Cone with Coiled Split-Ring







## Expand Ring

Hold base/cone pullbolt in the same position and turn nut







## Expand Ring

Hold base/cone pullbolt in the same position and turn nut with the 45 mm wrench 9 rotations clockwise. Back off slightly



Couple instrument Apply Pullout Force, slowly to failure



#### Pullout the Expanded Ring against the 55 mm counterpressure





## Acceptable Test

Sharp 55 mm diameter edge from counterpressure

> Crushed material



## Criteria for correct CAPO testing





## Max strength for CAPO-TEST and duration of test

- Max pullforce for the CAPO-TEST is 90 kN, equiv. to 105 MPa cylinder strength or 140 MPa cube strength
- Total duration of one test 15-20 minutes



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## LOK-TEST and CAPO-TEST Instruments



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## LOK-TEST Instrument in a suitcase





## CAPO-TEST Lite Instrument in a suitcase

For handheld use without the suction plate



Extra, C-112 Expandable inserts



The pull machine is the same as for LOK-TEST Can also be used for BOND-TEST



## CAPO Equipment, complete set



Prep. Kit

DSV Kit with Surface Planner and Suction Plate





Pullmachine



