Carolyn Hansson Ph.D., P.Eng, FACI, FCAE, FRSC started her investigations of the degradation of reinforced concrete at the Danish Corrosion Centre (now Force Technology) and continued at Queen's University Kingston, Ontario, Canada as a colleague of Dr. Brian Hope. She moved to the University of Waterloo in 1996 where she is now is Professor of Materials Engineering in the Mechanical and Mechatronics Engineering Department. She is a member of ACI Committees 222 and 365.

ACI
WEB SESSIONS

A tribute to Brian B. Hope

by: Carolyn M. Hansson
University of Waterloo
Waterloo, Ontario, Canada

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Brian B. Hope, Ph.D., P.Eng.

- Professor Emeritus, Queen's University
- Exceptional Supervisor, Mentor and Teacher
- Collaborator Extraordinaire
- Excellent Engineer and Researcher
- Family Man
- Hobbyist

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As teacher, supervisor and mentor

- The first recipient of Queen's University's "Golden Apple Award" for teaching (in 1971) and received a second "Apple" in 1992.
- Supervised 23 graduate students, 11 on aspects of rebar corrosion.
- Took the trouble to teach the technicians WHY they were doing the testing and treated them as colleagues

5

As a collaborator

How can you argue so loudly and vehemently…

…without getting your feathers so ruffled…

…and yet remain good friends?

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As Engineer and Researcher
Some of the areas of his endeavours:

- Chloride extraction methodology
- Chloride threshold concentrations
- Electrochemical impedance spectroscopy
- Corrosion inhibitors
- Cathodic protection and electrochemical chloride extraction

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Chloride extraction from concrete

- The degree of subdivision strongly influences the results.
- If ground too finely, chlorides are extracted from aggregates which would never be available for corrosion in service
- The Soxhlet method allowed extraction from ½ in chunks of concrete in 24 hrs of all chlorides normally available in the concrete

B.B. Hope, J.A.Page & J.S.Poland, Cement & Concrete Research, 1985 Vol. 15, pp.863-870

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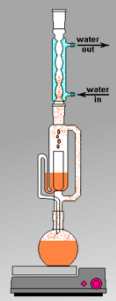
Soxhlet Method of chloride extraction from aggregates



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Chloride threshold concentrations

- Admixed chlorides & Cl-containing aggregates
- Studied:
  - LPR
  - EIS
  - Gravitmetry
  - Visual inspection
- One of first investigations to link corrosion activity with concrete resistivity

B.B.Hope & A.K.C.Ip, ACI Materials Journal, 1987 Vol.84 pp.306-314

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Electrochemical Impedance Spectroscopy

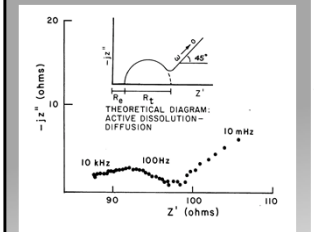

Fig. 4 — Impedance diagram for steel in 2 percent admixed-chloride slab

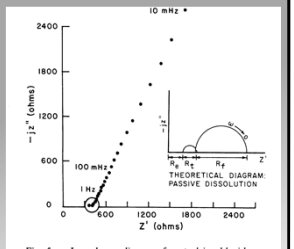

Fig. 5 — Impedance diagram for steel in chloride-aggregate slab

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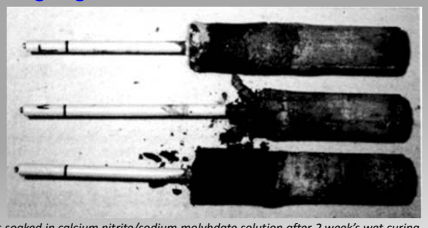
Corrosion Inhibitors

- Possibility of surface application of inhibitor to halt ongoing corrosion



Specimens soaked in calcium nitrite/sodium molybdate solution after 2 week's wet curing

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Corrosion Inhibitors

- Inhibitors found to be effective for delaying the onset of corrosion of steel embedded in concrete
- Same inhibitors found ineffective for steel in synthetic pore solution
- Conclusion: the inhibitors influenced the ingress of chlorides through the concrete

S.M.Trépanier et al., Cement & Concrete Research 2001, Vol. 31, pp.713-718
L.Mammoliti et al., Cement & Concrete Research 1999, Vol. 29, pp.1583-1589

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Cathodic Protection

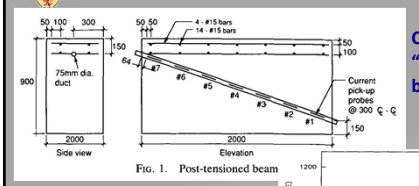

FIG. 1. Post-tensioned beam

CP of deck steel in "Post-tensioned" beam

Instant off potential of deck steel as function of applied current density

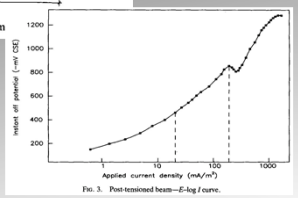

FIG. 3. Post-tensioned beam—E-log I curve.

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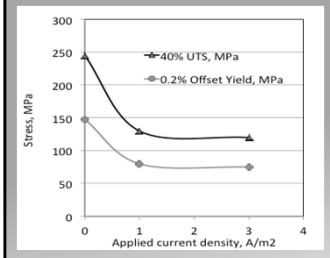
Cathodic Protection



- **Embrittlement of mild steel rebar**

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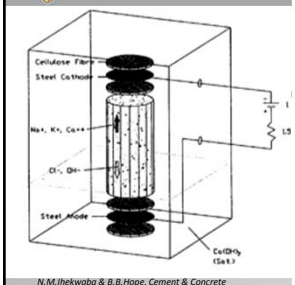
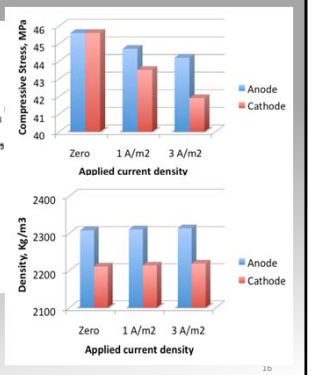
Electrochemical Chloride Extraction



N.M.Ihekwaba & B.B.Hope, Cement & Concrete Research, 1996, Vol 26 (5) 771-780



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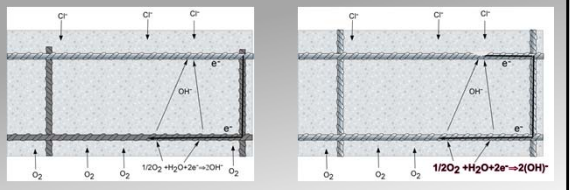
Using stainless steel for critical components and black steel for the less critical

- Any galvanic action between the two?
- Do the two alloys need to be electrically isolated



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The Family Man

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Getting into trouble down under

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Brian's toy

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The Hobbyist (1)

Collector of Depression Era glass

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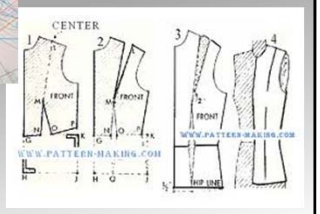
The Hobbyist (2)

Dressmaking



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The Hobbyist (3)

Model Railways

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Thank you, Brian, for all your contributions

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