AGENDA
ACI Committee 345
Bridge Construction, Maintenance, and Repair
Fall 2013 Convention
Phoenix, AZ
C-106 B
Sunday, October 20, 2013, 1:30 pm to 3:30 pm

1. Introduction

2. Approval of Spring 2013 (Minneapolis) minutes

3. Membership status
The committee currently has 2 officers and 13 other voting members, 6 consulting members, and 25 associate members (a total of 46 members as shown in Appendix A)

   Membership changes:
   a. New associate member: Yoon-si Lee
   b. Termination of membership: Reza Akbari, Jeff Bazzo, Gerald Anderson, and Christopher Waldron

4. Technical Sessions/Special Publication:

   "Advanced Materials and Sensors towards Smart Concrete Bridges: Concept, Performance, Evaluation, and Repair" edited by Jimmy Kim (15 papers)

   "Sustainable Performance of Concrete Bridges and Elements Subject to Aggressive Environments: Monitoring, Evaluation, and Rehabilitation" moderated by Jimmy Kim, Baolin Wan, and Isamu Yoshitake (3 sessions for F2014 in Washington, D.C.): sponsored by ACI-201 (durability), 343 (bridge design), and 345 (abstract due by Nov. 30)

5. Liaison reports from other committees (TAC, 342, 343, others)

6. Status of Documents

   a. 345.2R-13 (Guide for Widening Highway Bridges) published in July 2013 (led by Williams and Kim)

   b. 345.1R – Maintenance of Concrete Bridge Elements, published July 2006. Present Document Status – Due for revision/re-approval in 2014.

      a) Ad-hoc committee (Kim, Silfwerbrand, Williams, and St John) reviewed the document and proposed revisions.

      b) A ballot has been issued and details were discussed in Minneapolis

      c) Another ballot has been done in June 2014 (details will be discussed to finalize this document)

   c. 345.XR – Guide for Concrete Bridge Deck Repair and Rehabilitation

Chapter 1 – Introduction (*Brown*)

1.1 Purpose and Scope

Includes activities normally considered as requiring repair and rehabilitation. Excluded are maintenance activities such as deck cleaning and concrete sealer applications.

Includes:

a) crack repair
b) pothole repair
c) restoration of skid resistance
d) overlays
e) demolition and deck removal are beyond scope of document

Chapter 2 – Notations and Definitions (Brown)

Chapter 3 – Condition Evaluation (*Paul St. John & Jeff Smith*)

3.1 Overview

3.1.1 Deterioration Processes and Mechanisms
3.1.2 Repair vs Rehabilitation

3.2 Documentation Review

3.3 Field Survey Techniques

3.3.1 Visual Examination of Bridge Deck
3.3.2 Conventional Delamination Detection
3.3.2.1 Chain Drag
3.3.2.2 Hammer Sounding
3.3.3 Electrochemical Testing
3.3.3.1 Electrical Half-Cell Potential Survey (ASTM C 876)
3.3.3.2 Corrosion Rate Evaluation
3.3.3.2.1 Linear Polarization
a) Unguarded electrode
b) Guarded electrode
3.3.3.2.2 Potentiostatic Electrochemical Impedance Spectroscopy
3.3.4 Resistance and Resistivity
3.3.4.1 2-point Direct-Path Resistance
3.3.4.2 2-point Probe Resistivity
3.3.4.3 4-point Wenner Array
3.3.5 Physical Sampling
3.3.5.1 Coring
3.3.5.1.1 Compressive and Tensile Strength & Modulus
3.3.5.1.2 Petrographic Evaluation
a) Aggregate Type/Condition
b) Cement Paste Quality
c) Air Entrainment
d) Deleterious Reactions (ASR, Carbonation, DEF, Sulfate Attack)
e) Construction quality (freezing/thawing damage, over-finishing, honeycombing, cold joints)
f) Presence of pozzolans or mineral admixtures
g) Presence of surface treatments/penetrating sealers

4.3.2.2 Costs
4.3.2.3 Traffic Conditions
4.3.2.4 Weather Conditions
4.3.3 Specifications and Testing of Systems

Chapter 5 – Removal Methods and Surface Preparation (*Williams*)

5.1 Overview

In addition to project-specific requirements, method selection must also be guided by the following principles of sound practice:

1) The structure to be coated should not be damaged.
2) Reinforcing steel should not be damaged nor its bond with the concrete loosened.
3)Vibration, impact, or thermal loads applied should not weaken the concrete.

5.2 Method Overview (Present in order from least to most aggressive)

5.2.1 Low-Pressure Water Cleaning (Cleaning Method)
5.2.2 Grinding (Erosion Method)
5.2.3 Abrasive Blasting (Pulverizing Method)
5.2.4 Steel Shotblasting (Pulverizing Method)
5.2.5 Scarifying (Impact Method)
5.2.6 Needle Scaling (Impact Method)
5.2.7 High and Ultra High.Pressure Water Jetting (Erosion Method)
5.2.8 Scabbling (Impact Method) – too much risk of micro-cracking?
5.2.9 Flame Blasting (Expansion Method)
5.2.10 Milling (Impact Method) – too much risk of micro-cracking?
5.2.11 Full Depth Removal – Saw cut, chipping hammers

5.3 Method Selection Process – Reduce risk of micro-cracking

5.4 Summary/Conclusions

Chapter 6 – Repair Methods (*St. John/Kim/Williams)*

6.1 Overview Complete (Williams)

6.2 Standard Repairs

6.2.1 Patching
6.2.2.1 Partial Depth
6.2.2.2 Full-Depth
6.2.2 Crack Repair
6.2.2.1 Gravity Fill Methods
a) Rout and Seal
b) Flood coat
6.2.2.2 Pressure Methods
a) Epoxy Injection

6.3 Repairs with Advanced Composites Complete (Kim)

Chapter 7 – Overlays (*Sprinkel & Silfwerbrand*)

7.1 Scope

7.2 Need for Overlays

7.2.1 Restored or Strengthened Load-Carrying Capacity **Complete (Silfwerbrand)**
7.2.2 Waterproof Barrier
7.2.3 Skid Resistance

8.2 Electrochemical testing for corrosion

8.2.1 Corrosion potential

8.2.1.1 Methods

8.2.1.2 Limitations and constraints

8.2.2 Corrosion rate

8.2.2.1 Methods

a) Linear Polarization

b) Electrochemical Impedance Spectroscopy

8.2.2.2 Limitations and constraints

8.2.3 Resistivity

8.3 Electrochemical Treatment Processes

8.3.1 Impressed Current Applications

8.3.1.1 Cathodic Protection and Prevention (NACE RP0290-2000)

8.3.1.1.1 Methods

a) Overlays containing Strip or Mesh Anodes

b) Conductive Coatings

8.3.1.1.2 Limitations and Constraints

8.3.1.2 Electrochemical Chloride Extraction (NACE 01101)

8.3.1.3 Re-alkalization

8.3.2 Galvanic Applications

8.3.2.1 Cathodic Protection and Prevention

8.3.2.1.1 Methods

a) Galvanic Coatings

b) Bulk Anodes and Distributed Anodes

8.3.2.1.2 Limitations and Constraints

Chapter 9 – Appurtenances, Joints, Parapets and Approach Slabs

9.1 Sidewalks *(Foden)*

9.1.1 Introduction to Concrete Sidewalks

9.1.2 Types of Loads/Stresses Acting on Sidewalks

9.1.3 Possible Damages of Concrete Sidewalks

9.1.3.1 Concrete Problems (Deterioration, Cracking, Abrasion, Corrosion, Water Leakage, Delamination, Surface Smoothing, Freeze-Thaw, Disintegration, etc.)

9.1.3.2 Damage Due to Moving/Static Loads of Heavy Vehicles

9.1.3.3 Fracture or Settlements in Sidewalks with Hollow Like Section

9.1.3.4 Load Effects to Cantilevered Sidewalks

9.1.3.5 Other Damages

9.1.4 Repair, Rehabilitation or Strengthening Techniques

9.1.5 Stress Reduction Techniques

9.1.6 Reinforcement Requirements

9.1.7 Surface Preparation

9.1.8 Overlays and Coatings

9.1.9 Placements Methods

9.2 Parapets *(Foden)*

9.2.1 Introduction to Concrete/Steel Parapets

9.2.2 Types of Loads/Stresses Acting on Parapets

9.2.3 Possible Damages of Parapets

9.2.3.1 Concrete Problems (Deterioration, Cracking, Corrosion, Water Leakage, Delamination, Freeze-Thaw, Disintegration, etc.)
9.2.3.2 Damage Due to Impact Effects of Moving Vehicles
9.2.3.3 Steel.Concrete Connections
9.2.3.4 Other Damages
9.2.4 Reinforcement Requirements
9.2.5 Repair, Rehabilitation or Strengthening Techniques

9.3 Joints

9.3.1 Bridge Deck Joints Classification **Complete (Carroll)**
9.3.2 Expansion/Non-Expansion Joint Functions **Complete (Carroll)**
9.3.3 Traffic Bearing Expansion Joints **Complete (Carroll)**
9.3.4 Other Types and Features (Carroll: may be deleted?)
9.3.5 Review of Current Practice **Complete (Carroll)**
9.3.5.1 Design Procedures **Complete (Carroll)**
9.3.5.2 Construction Practice **Complete (Carroll)**
9.3.5.3 Selection Guidelines **Complete (Carroll)**
9.3.6 Possible Problems with Bridge Deck Joints
9.3.7 Deck Joints Maintenance, Repair and Rehabilitation Practice (address below)
6.1.2.c
6.2.3 Joint Repairs
6.2.3.1 Joint Types
6.2.3.2 Surface Preparation
6.2.3.3 Joint anchorage repair or replacement

9.3.8 Deck Joints Waterproofing and Sealing
9.3.9 Lessons for Maximizing Joint Service Life

9.4 Approach Slabs *(Williams/Harris)*

9.4.1 Introduction to Approach Slabs
9.4.2 Types and Features
9.4.3 Reinforcement Requirements
9.4.4 Seismic Effects to Approach Slabs
9.4.5 Possible Damages for Approach Slabs
9.4.6 Settlement in Approach Slabs and Abutment Backfill
9.4.7 Repair and Rehabilitation of Approach Slabs

7. Other Business

Appendix A

Membership as of Oct. 2013: **46 members**

Officers: 2
Kim, Yail Jimmy (Chair); Carroll, Chris (Secretary)

TAC Contact
Sprinkel, Michael M

Voting members: 13
Beaver, Jesse; Brown, Michael C; Foden, Andrew J; Gepraegs, Oliver K; Matejowsky, Alan B; Oglesby, Rita K; Sandberg, Harold R; Silfwerbrand, Johan L; Sprinkel, Michael M; St John, Paul J; Vaughn, Ronald E; Weyers, Richard E; Williams, Mark Erik

Consulting members: 6
Anderson, James C; Danley, Byron; Fouad, Fouad H; Harwood, Allan; Virmani,Yash; Wouters, Jeffrey

Associate members: 25

Al Wakeel Shahlaa A; Bartlett, F Michael; Branson, Tobias J W; Carrato, John L; Carter, Paul D; Castrodale, Reid W; Cumming, Neil A; Estenssoro, Luis F; Guth, Dena L; Haque, Mohammed E; Harris, Devin K; Hughees, Mark E; Huza, Richard; Klein, Gary J; Lee, Yoon-si; Morcous, George; Nash, William R; Pulido, Claudia P; Simpson, John M; Smith, Jeffrey L; Soubra, Khaled S; Suh, Kwangsuk; Takhtovich, Eugene; Watts, Ralph D; Zhu, Zhenyu