Update on S-5 Reorganization

SCOBS 2015
Organization

• Pool Fund project – KS lead, IA, MI, NJ, OH, UT

• Oversight
  – T-10 (KS, ID, PA, NH, LA, TN, VA, TX, MN, NE, WI, CA, OR, FL, WA)
  – FHWA – Reggie Holt, Dr. Joey Hartman
  – Industry Liaison: PCI, ASBI
  – Others invited as needed

• Contractor: MM with Dr. Mertz
Scope

• Survey Stake Holders
• Critically Review Past Interims
• Develop Annotated Revised TOC
• Develop New Revised and Reorganized Draft Section 5
• Finalize for Consideration by T-10 and SCOBS.
Process

• Survey
• Outline showing broad reorg

So far:
  – 5 Drafts reviewed so far
  – 4 Working meetings with Augmented T-10
  – About a thousand comments received on Drafts.
Getting to the Finish Line

• 2016 agenda item to replace Section 5
  – Final Pooled Fund review – summer ‘15
  – Pooled Fund comments reviewed – September
  – SCOBS Agenda Item out in October
  – SCOBS Comments in mid-Jan
Major Decisions Following Survey

- Evolution, not Revolution
- Keep current units
- Advance Disturbed Regions (Strut & Tie)
- Keep current Bending and Axial Design
- Reduce Shear Options – Drop Vci-Vcw
- Consolidate Reinforcing Details, Prestressing Details, & Seismic in 3 Separate Articles
- Harmonize Shear and Torsion if Possible
The Big Picture

• Largely unchanged:
  – 5.1 Scope (Introduce B-Region/D-Region Concept)
  – 5.2 Definitions
  – 5.3 Notation
  – 5.4 Material Properties (some deletions)
  – 5.5 Limit States and Design Methodologies (More on B-Regions and D-Regions)
The Big Picture

- 5.6 Design for Flex and Axial Force Effects:
  - P/S and R/C
  - (Undisturbed) B-Regions
  - (Disturbed) D-Regions moved to 5.8

- 5.7 Shear and Torsion
  - P/S and R/C
  - Two fewer shear methods in primary section
    - Vci/Vcw removed
    - Segmental moved to 5.12.5

- 5.8 D Regions STM–2015 Item #8
The Big Picture

• 5.9 Prestressing
  – Better separation of pre and post
  – Pieces from 3 sections: 5.9, 5.10, 5.11
    • 5.9.1 General
    • 5.9.2 Stress Limitations (Incl Principal stress)
    • 5.9.3 Prestress Loses
    • 5.9.4 Pretensioning
    • 5.9.5 Post-tensioning
The Big Picture

• 5.10 General Details, Development and Splices of Reinforcement
  – only R/C
  – Pieces from 2 sections: 5.10 and 5.11
  – Cover in 5.10.1, not 5.14

• 5.11 Seismic and Details
  – now includes some provisions for piles
  – Made more prominent in hierarchy
  – Seismic hooks still in 5.10.2.2
The Big Picture

• 5.12 Provisions for Structure Types
  – 5.12.1 Deck Slabs
  – 5.12.2 Slab Superstructures
  – 5.12.3 Beams and Girders
  – 5.12.4 Diaphragms
  – 5.12.5 Segmental Construction
  – 5.12.6 Arches
  – 5.12.7 Culverts
  – 5.12.8 Footings
  – 5.12.9 Concrete Piles
The Big Picture

• 5.13 Concrete Anchors – still working on it
  – Refs ACI 318 Appendix D, NCHRP 757
The Big Picture

• 5.14 Durability – existing, NCHRP, R19B
  – 5.14.1 Design Concepts
  – 5.14.2 Major Chemical and Mechanical Factors Affecting Durability
  • Corrosion Resistance
  • Freeze-Thaw Resistance
  • External Sulfate Attack
  • Delayed Ettringite Formation
  • Alkali-Silica Reactive Aggregates
  • Alkali-Carbonate Reactive Aggregates
The Big Picture

- 5.14.3 Concrete Cover – cross ref to table in 5.10.1
- 5.14.4 Protective Coatings
- 5.14.5 Protection for Prestressing Tendons
- Refs added/updated
- Appendices - current 5 retained – updated for new organization
What to Expect

• Global Reorg as indicated
• Most articles have some wording change that make intent clearer e.g:
  – Conditionals in ~60 locations modified
  – Use of bonded, fully bonded, partially unbonded, debonded, partially debonded, blanketed and shielded replaced with bonded, debonded and unbonded ~ 94 places
  – Consistent definition of f’c  ~ 390 places
What to Expect

• Some articles reorged, streamlined or augmented, e.g. 5.7.4 Interface Shear
• Some individual provisions clarified or moved
• Some corrections –
  – eg combined stress in web service tension should have been in beta-theta strength calc

\[
V_{\text{eff}} = \sqrt{V_u^2 + \left(\frac{0.9 p_h T_u}{2 A_o}\right)^2}
\]

\[
\varepsilon_s = \frac{\left|\frac{M_u}{d_v}\right| + 0.5 N_u + |V_u - V_p| - A_{ps} f_{po}}{E_s A_s + E_p A_{ps}}
\]
What to Expect

• Some corrections – Miss-located info
  – eg Stirrup spacing commentary in article that did not deal with stirrups - relocated
What to Expect

• Some corrections – Some orphans removed
  – e.g. 5.8.4.1 Deep Beams

\[ N_R = \phi f_y A_s \geq 0.12 b_v s \]

This did not make any sense where it was and effectively duplicated the crack control requirements in 5.8.2.6 in strut and tie articles. Replaced with cross ref to STM crack control and better info of requirements for legacy methods for deep beams.
What to Expect

- Some new/modified figures

Prestress duct, tie to outside of curve stirrup leg

Span for analysis of global bending effects on girder

Span for analysis of local bending effects on concrete cover

Centerline of faces consistent with model geometry

Strut-to-Node Interface

Inside of curve

Diagonal tension failure plane

Equilibrium torsion

Compatibility torsion

Statically determinate structures

Impossible
In-Progress WAIs Included in Reorg

- WAI 182 - Strut and Tie Method – 2015 Agenda Item – replaced WAI 153
- WAI 130 – obviated by shear changes
- WAI 169 - 12 updates for corbels, beam ledges and inverted T caps
Summarizing

• Old friends in new places
• Some new information
• With new material, about 17 more pages – still need to add this year’s approved Agenda Items
• Cross-Walk will be provided
Thank You