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Trey,

The following is a draft outline for the Task Group on losses for distribution to the committee. I have suggested some members for the task group; however, this should be confirmed at the Chicago meeting. At the Chicago meeting the committee needs to come to an initial consensus on the outline, the complexity of loss calculations, and the limitations of the document. Do we do bars or just strand? Most of these items are outlined below. In addition to agreeing on the outline, we should discuss the schedule for drafts.

Charlie Dolan 2/25/2010

ACI 423 TASK GROUP ON LOSSES

DRAFT OUTLINE

Editorial Review Group (Zia, Bondy, Walker, Hamilton)

Chapter 1 – Introduction (Dolan)

- Objective
- Need for document
  - Audience – Design engineer not completely familiar with the details of prestressing losses and newest material factors affecting the design. Assumptions, prestressing plants and commercial post-tensioning firms have a good handle on the loss calculations.
- Overall outline
  - General approach to prestress losses
  - Considerations for pretensioning applications
  - Considerations for post-tensioning applications
- Code requirements
- Limits of the document
  - Low-lax steel
  - Seven wire strand
  - Extrapolation to high strength bars and special PS
- How to use – including clarifying how large variation in loss calculations affect strength (not much) and service (potentially a lot)
- Separation of pretensioned and post-tensioned structures and needed – hopefully this section is not needed.

Chapter 2 – Lump sum Prestress loss Estimate ()

- This is the preliminary way to get losses. If this is sufficient, stop. By sufficient, the actual losses are computed by a specialty consultant. Otherwise go on the chapter 3. In either event, the ACI Code requires calculation of detailed losses.

Chapter 3 – Detailed Prestress loss Estimate

This chapter will present the general methodology and equations for computing losses. It will point to the following chapters for details to refine predictions. This chapter generally follows either the Zia paper or the PCI Handbook

- Sectional properties and dimensions – When to use gross or transformed section (Ahlborn)
- Critical sections – where do we have to compute losses and for what purpose (Ahlborn)
- Anchor seating
    - pretensioning i.e., longline operations, and
    - post-tensioned applications
- Relaxation – Follow PCI Handbook (
    - Effect of curing temperature in prestress operation
    - Is it possible to define a percent of relaxation occurring after longline stressing?
    - Special considerations for post-tensioning
    - Larger and high strength strands (Ma)
- Elastic Shortening
    - Pretensioning (Barnes and Dolan)
    - Post-tensioning – including effects of sequential PT (Gupta, Baxi,)
- Shrinkage
- Creep
- Friction and wobble – update the table currently in the code, especially for encapsulated strand and newer multi-strand systems (Gupta, Baxi)
- Combined effects – this section presents a methodology to address the combined effects of prestress loss and increasing modulus of elasticity. (to be assigned)
- Curing Temperature – high heat curing pretensioning applications (Roberts-Wollmann)
- Treatment of topping – based on the committee comments, this topic may not belong in the document or as an afterword for those needing specialized guidance

Chapter 4 – Elastic Shortening (Barnes, Dolan)

- Pretensioning
- Post-tensioning

Chapter 5 – Creep and Shrinkage (Barnes, Dolan)

- Pretensioning
- Post-tensioning

Chapter 6 – Friction and Seating (Pawan, Baxi, Vejvoda, Xia)

Chapter 7 – Relaxation and Temperature (Roberts-Wollmann)

Chapter 8 – Properties of Concrete Affecting Modulus of Concrete (Dolan)

This chapter will organize a discussion of how concrete properties affect loss calculations. In the quest for a simple approach for design, we are examining the variation in aggregate type, especially if this is picked up in the $w^{1.5}$ factor and aggregate volume fraction as a key element in variation of E_c, shrinkage and creep. The intent is to provide a basis for the Chapter 4 and 5 material.

Tentative sub sections are:

- Comparison of Equations for Modulus
- Role of Aggregates and mix design on modulus
- Normal concrete
- SCC
- High performance concrete
- Variation in creep
- Variation in shrinkage