Transportation Committee Update

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Chief Engineer (Gulf Coast Pre-Stress)

PCI Gulf South
2022 Summer Meeting
Lake Charles
July 16, 2022

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Mission Statement & Collaboration

PCI Gulf South
Transportation Committee

Mission Statement:

To expand our collective knowledge base of precast/prestressed concrete products and be the information resource for precast/prestressed concrete products used throughout the Gulf South Transportation market of LA, MS and AL.

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PCI Gulf South Transportation Committee

- Collaboration
  - Thanks to Tim Colquett (ALDOT), Scott Westerfield (MDOT), and Jenny Fu (LADOTD) for their active participation and involvement in the annual meetings
  - Thanks to the PCI Gulf South **Producer Members** for sharing their knowledge and best practices
  - Appreciate all the input from the **Associate & Professional Members, and Academia**

- Expand the committee to include participation from multi-disciplines and/or other areas of expertise
  - Producer members
  - Associate members
  - Professional Members/Consultants
    - Bridge & Structural Engineers
    - Geotechnical Engineers
  - Academia
  - Construction/Contractors
  - Materials & Testing
  - Specifications
  - Maintenance
  - Preservation
  - Project Managers
  - Inspectors
  - Local Agencies
    - Cities, Counties, Municipalities

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PCI eLearning Courses Related to Bridges

PCI eLearning Courses Related to Bridges

- Refer to article “The Bridge Design Academy at the California Department of Transportation”, ASPIRE Magazine, Summer 2022 by Rizia da Cruz Ferreira, California Department of Transportation.

The PCI courses have clear learning objectives, well-organized outlines, quizzes, lesson summaries, spoken and written narration, and many resources. Each course is followed by an exam that students must pass to receive course credit and a certificate.

PCI eLearning Courses Related to Bridges

The PCI eLearning Center offers courses that help bridge designers become more proficient. There are four series—Precast, Prestressed Bridge Girders; Bridge Geometry; Full-depth Precast Concrete Deck Panels; and Lateral Stability of Precast, Prestressed Concrete Bridge Girders—each with multiple courses.

The courses are based on the content of AASHTO LRFD and PCI publications. Although the courses are designed for an engineer with 5 or more years of experience, a less-experienced engineer will find the content very helpful for understanding concepts and methodologies.

The 10 PCI eLearning courses that engineers in the Caltrans Bridge Design Academy must complete are:

- Preliminary Precast, Prestressed Concrete Design (T110)
- Bridge Geometry—Fundamentals of Roadway Geometry (T505)
- Bridge Geometry—Working with Horizontal Alignments (T510)
- Bridge Geometry—Straight Bridges (T515)
- Basic Prestressed Concrete Design, Parts 1–6 (T100 series)

All courses on the PCI eLearning Center are offered at no cost. Go to https://oasis.pci.org/Public/Catalog/Home.aspx?tab=2.

Plant Tours

plant tours

- Several groups from University of Alabama and ALDOT visited FORTERRA
- At GCP, two groups from LADOTD’s bridge & structural design, MDOT’s bridge design division, and masters' students & Ph.D. candidates from the University of New Orleans

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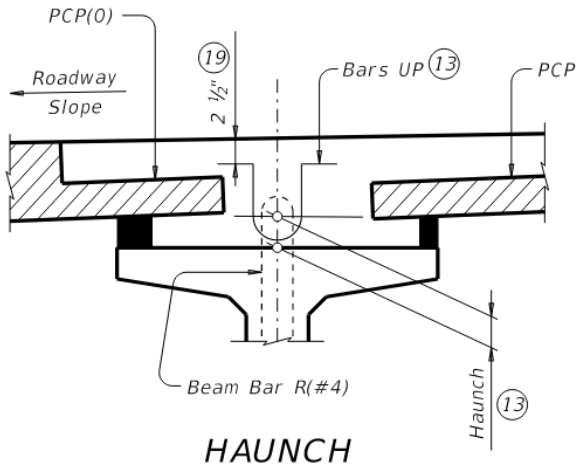
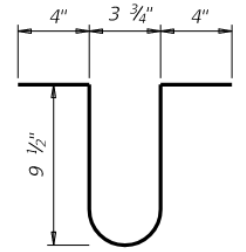
Standardization & WWR

Standardization

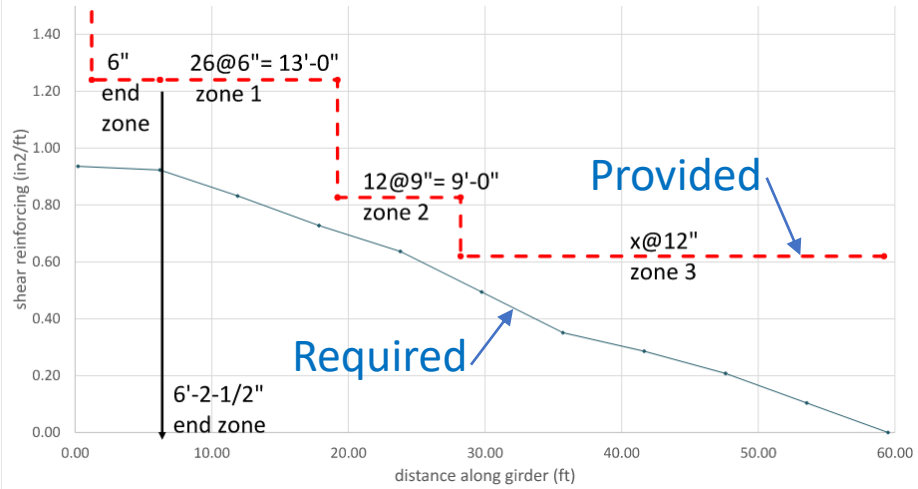
- Same stirrup lengths and projection height
  - TxDOT haunch reinforcing detail for haunch thickness T > 3.5”
  - space #4 bar with stirrups
- Same stirrup spacing for each girder section
- Benefits
  - Facilitate fabrication
  - Improve QA/QC
  - Streamline girder design and review process
  - Reduce costs



HAUNCH REINFORCING DETAIL 4



BARS UP (#4) 13



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Welded Wire Reinforcement

- Refer to article “Welded Wire Reinforcement: A Primer for the Bridge Designer, Part 1 and Part 2”, ASPIRE Magazine, Winter and Spring 2022 by Paul Aubee, Artisan Structural PLLC.
- Part 1 addresses WWR manufacture, material characteristics, benefits, design compatibility, and use in bridge elements.
- The Benefits – For the design professional, there is ease in having design interchangeability between WWR and individual reinforcing bars in the provisions of the AASHTO LRFD specifications and AREMA manual. This opens the door to the most tangible benefits of WWR: the contractor’s ability to greatly reduce installation time and streamline the allocation of labor for reinforcement placing activities, all while installing a structural reinforcement with unparalleled control of fabrication and placement tolerances. These on-site advantages over loose reinforcement have never been more valuable given today’s climate of increasing labor shortages and accelerated construction timelines.
- Part 2 shifts the focus to the implementation of WWR in contract drawings and the critical role played by the manufacturer’s WWR detailing staff in preparing shop and placement submittals for engineer and contractor reviews.

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PCI MNL-137 Manual for the Evaluation and Repair of Precast, Prestressed Concrete Bridge Products re-write status

MNL-137 re-write

- First Edition 2006
- Committee members as of 7-8-2022
- Major Additions
  - Camber variability
  - Sweep
    - 3 part article series published in ASPIRE by Dr. Bruce Russell (Oklahoma State University) covering sweep in the plant, during transportation, and at the project site
  - Prestressed Piles
- Task group review comments to revised Chapters 1 (Introduction) & 2 (Troubleshooting) are nearing completion, Chapter 3 on standard repairs will be reviewed next
- Remaining chapters include, 4-Methods of Patching, 5-Epoxy Injection, and 6-References
- Re-write currently scheduled to be completed Q2/2023

David Tomley	Gulf Coast Pre-Stress/Texas Concrete Partners
Lee Wegner	Forterra Structural Precast
Brent Koch	Con-Fab California
Fletcher Smith	Standard Concrete
Alex Trammel	Standard Concrete
Austin Maue	Concrete Tech
Dr. Bruce Russell	Oklahoma State University
Joe Roche	TxDOT
Vince Dorzweiler	NMDOT
Kris Brown	Technical Editor
Trina Brown	PCI
Troy Jenkins	Northeast Prestressed Products, LLC
Ed Wasserman	Modjeski & Masters

PCI BDM Chapter 20-Precast Prestressed Concrete Piles

20.8.8 Pile Damage
- 20.8.8.1 Damage During Driving
  - 20.8.8.1.1 Compression Damage at Head
  - 20.8.8.1.2 Compression Damage at Tip
  - 20.8.8.1.3 Transverse Cracking
  - 20.8.8.1.4 Torsional Cracking
  - 20.8.8.1.5 Reflective/Bending Stress Combination Cracking
  - 20.8.8.1.6 Splitting in Hollow Piles
- 20.8.8.2 Repair of Damaged Piles
  - 20.8.8.2.1 Concrete Spalling at Head
  - 20.8.8.2.2 Cracking

MNL 137 rewrite

- TxDOT has their own Concrete Repair Manual
- FLDOT has additional information on definitive definitions and thresholds for noncomplying prestressed product requirements part of their Standard Specifications
- WSDOT has producer members submit typical repairs annually to streamline and obtain pre-approval for repairs

- NCDOT recently published standard repairs for the following:

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MNL 137 rewrite

- MNL-137 Chapter 3 – Standard Repair Procedures

INTRODUCTION TO STANDARD REPAIRS

States and public agencies continue to develop formal quality control-quality assurance (QC-QA) relationships with fabricators. These programs carefully define the responsibilities of the plant for product quality control including the evaluation of some defects and the implementation of repairs.

Many of the standard repairs described in this chapter require the development of a "repair plan" that must be submitted to the owner/engineer for approval. Most require the repair be made "in the presence of the owner's inspector." Some repairs require the "prior approval of the owner/engineer."

Practices and procedures vary throughout the United States. As stated, some owner agencies place the responsibility on the manufacturer for detection, reporting, and disposition of non-conforming products.

Under the QC-QA agreements, these agencies require the submission and approval of a project quality manual or a comprehensive plant quality manual that is submitted and approved annually. Part of the manual defines the responsibility of the manufacturer, pre-qualifies the repairs that may be made, states the exact repair methodology including approved materials and qualified personnel. During the normal course of the work, the manufacturer may make the specified repairs and submit documentation to the satisfaction of the owner. This manual may be put to use as a starting point for the repair section of the plant quality manual.

Owner agencies are urged to adopt such procedures. The most common damage or defects are described in Chapter 1 and many may be repaired routinely.

The precast industry is keyed to a 24-hour production cycle. Timely decisions about transfer of prestress, moving products to either storage or to repair and finishing locations are necessary to maintain efficiency and even profitability. Routine practice often has plants starting operations prior to sunrise and finishing production at night. It is important to have flexibility to schedule facilities and personnel for repairs.

All manufacturers certified through the PCI Plant Certification Program, are required to develop and maintain a plant Quality System Manual (QSM). The requirements for and the content of a QSM are defined in the PCI *Manual for Production and Quality Control of Structural Precast Concrete* (MNL–116). Sections of MNL–116 relevant to inspection and repair follow:

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PCI partial list of manuals

- Quality Manual (MNL-116)
- Bridge Design Manual (MNL-133)
  - Chapter 20-Precast Prestressed Concrete Piles (Publication Number BM-20-04)
- Tolerance Manual (MNL-135)
- Repair Manual (MNL-137)

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PCI Prestressed Pile Design Spreadsheet (revised v.1.2.16) to be balloted

PCI Prestressed Pile Design Spreadsheet (revised v. 1.2.16) to be balloted/revised by Aug. 5

- Changes performed by Eriksson Technologies include:

1. Updated references to LRFD 9th Edition throughout spreadsheet (multiple tabs)
2. Updated spiral tab (Tim Mays)
    a. Updated to new PCI recommendations on spiral reinforcement
        i. Based on Page 43-44 of Chapter 20 document
    b. Updated AASHTO spiral calculations as well (with updated LRFD references)
    c. Updated documentation in “Instructions” Tab
3. Added shear design (Tim Mays)
    a. Add new section (input/output and code module)
    b. Used simplified design procedure as shown in Chapter 2
    c. Added documentation in “Instructions” Tab
4. Added support for 300 ksi strand (Catrina Walter)
    a. Converted current stress-strain curve to power curve from Tadros (1992)
    b. Calculated new constants for this curve based on 300 ksi strand
    c. May be other items not currently known that effect 300 ksi strand
5. Reviewed and updated QC manual
    a. Updated all LRFD references to the 9th Edition
    b. Updated both QC manual and spreadsheet to use the latest LRFD P/S loss equations (were not in sync)
    c. Added new calculations and checks to reflect changes in the spreadsheet
6. During the QC process we found (and fixed) latent bugs in spreadsheet
    a. Custom strand pattern did not function
    b. Problems with printing

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City of Pass Christian
Harrison County, MS
E. North St. bridge replacement

Pass Christian E. North St. Bridge replacement

Description of Structure:
One span precast concrete channel beam structure.
1@19' span
23' clear roadway (curb to curb).
No skew.
7 precast concrete deck panels.
Timber caps.
Timber piles.
Timber headwalls and wing walls.
Structure does not meet NBIS length requirement and is not inspected in the NBI program.

Deficiencies:
Channel beam stems have areas of heavy spalling and delamination with primary rebar and diaphragm rebar being exposed.
The exposed rebar is showing heavy to severe corrosion with section loss.

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Pass Christian E. North St. Bridge replacement

- GCP & Gill's Crane met with City to discuss plan to design, fabricate, and construct a replacement as soon as possible
- The new bridge to include:
  - Prestressed 18" quad beams
  - Precast bent caps
  - Prestressed 14" piles (at abutments and wingwalls)
  - Precast lagging
  - Precast guardrail posts (post-installed)
  - Asphalt topping

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Prestressed Concrete Seminars

Prestressed Concrete Seminars

- MDOT Jan/Feb 2021
- LADOTD Oct/2021
- ALDOT Oct/2022

PDH's provided

- List of speakers have included:
  - Primary-Reid Castrodale (design, products, design code requirements, lateral stability, repairs, etc.)
  - Ben Spruill (virtual plant tour, fabrication, transportation, and storage)
  - Tony Chiappetti (contractor perspectives)
  - David Tomley (MDOT camber research)
  - Dan Eckenrode (PCI body of knowledge & resources)
  - Q/A panel

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Past and Future Topics

Past & Potential Future Topics

- Durability
- Precast Barriers for use on National Highway System (TL-4 crash testing level)
- UHPC
- BrIM
- Spliced-girders
- Spun-Cast Cylinder Piles
- Camber
- Tolerances
- Standard repairs & procedures
- Trucking/Transportation Logistics
- Research

- Internal Curing
- Prestressed Pile Design & Construction
- Spun-Cast Cylinder Piles
- Connections (prestressed pile to bent cap)
- Prestressed Deck Panels
- Strand Bond
- Scheduling & Material Lead-Times emphasize importance to coordination between:
  1) contractor and producer member,
  2) producer member and material suppliers

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