ASCE-INDOT
STRUCTURAL SUBCOMMITTEE
MEETING NO. 47 MINUTES
April 13, 2010

The meeting was called to order at 9:30 am by Steve Weintraut. Those in attendance were:

Anne Rearick	INDOT, Structural Services
Ron McCaslin	INDOT, Structural Services
Mike McCool	Beam Longest & Neff, LLC.
Mike Wenning	American Structurepoint, Inc.
Mike Halterman	USI Consultants, Inc.
Don Bosse	Prestress Services, Inc.
Steve Weintraut	Butler, Fairman and Seufert, Inc.
Michael Eichenauer	Butler, Fairman and Seufert, Inc.

In addition to the attendees, these minutes will be sent to the following:

George Snyder	INDOT, Structural Services
Tony Uremovich	INDOT, Structural Services
Brian Harvey	INDOT, Program Development
Jim Reilman	INDOT, Construction Management
Ron Heustis	INDOT, Construction Management
Bill Dittrich	INDOT, Program Development
Tony Zander	INDOT, Materials and Tests Division
Keith Hoernschmeyer	Federal Highway Administration
Burleigh Law	HNTB Corp.
Jason Yeager	Gohman Asphalt Company
Dick O’Connor	RQAW Corporation
Troy Jessup	R. W. Armstrong

A meeting agenda had previously been distributed and the following items were discussed:

1. The January 12, 2010, meeting minutes were approved as written, and have been placed on the INDOT website.

2. Anne reported that Jim Reilman will be using the new pavement ledge detail on a few projects (see Attachment No. 1). The following were also suggested:
    a. The pavement ledge width be increased from 6” to 9”.
    b. Move the construction joint to the top of the beam.
    c. Make the width of the end bent 3’-0” minimum.

3. Steve passed out a handout on lightweight high performance concrete (see Attachment No. 2). This was used on a project on I-69 over Pigeon Creek. Anne will check with Tony Zander on the beam breaks and additional information and report back at the next meeting.

4. Steve passed out a handout on a new testing method for Self Consolidating Concrete (see Attachment No. 3). This was also forwarded to Tony Zander for his review.

5. Mike McCool will contact Randy Strain to discuss 8” minimum spacing for reinforcing steel in concrete decks.

6. The agenda for the Bridge Design Conference is set. Currently, the group is working on lining up speakers. The conference will be on July 27 from 8:30 – 4:30 at the Indiana Government Center South. Registration will be from 8:00 – 8:30.

7. Anne stated that Design Memo 10-04 addresses the 400k collision load on MSE walls.

8. Mike McCool and Mike Halterman will combine their information and notes on construction loading and pass it on to Ron McCaslin. Ron will forward it to Anne who will pass it on to the appropriate committee.

9. The stirrups in concrete Bulb-T beams was briefly discussed due to time. The 401 bar is typically being shown the full length of the beam which is not necessary. The designer needs to determine how far to extend the 401 bar from the ends of the beam. It was also discussed to eliminate the 302 bar outside of the confinement zone due to fabrication costs. Anne will look into this item.

The next meeting for the INDOT Structural Subcommittee is scheduled for 9:00 am on July 8, 2010, in a room to be determined.

This meeting was adjourned at 11:25 a.m.

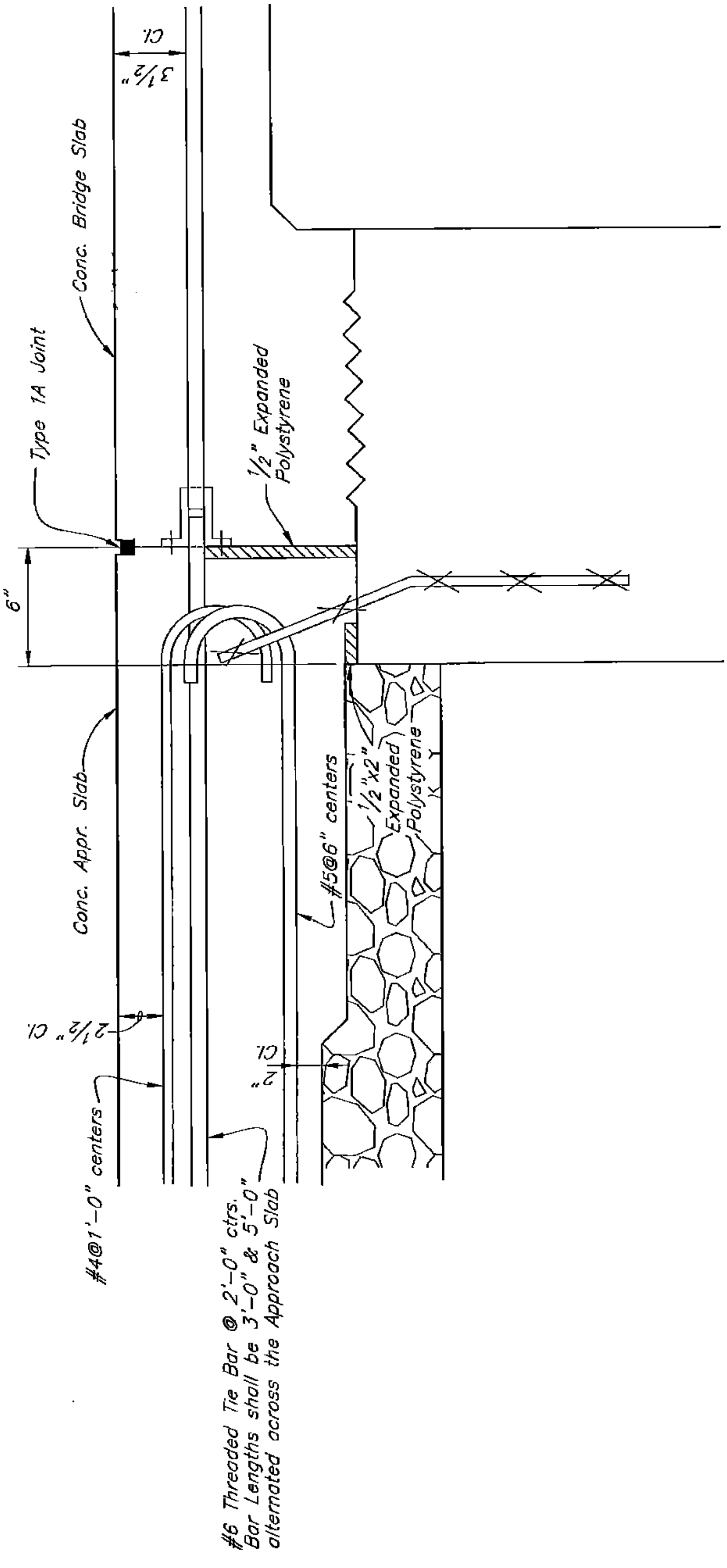
Respectfully submitted,
BUTLER, FAIRMAN and SEUFERT, INC.

Michael Eichenauer, P.E.
meichenauer@bfsengr.com

ME:me

Attachments

ATTACHMENT NO. 1



PAVEMENT LEDGE DETAIL

Not to Scale

ATTACHMENT NO. 2

RSS FEEDS

HPC Bridge Views

PDF Printable Version
of This Issue

Sponsored by

Co-Sponsored by

View directory of all issues

Issue 60
Mar/Apr 2010

HPC Bridge Views is published jointly by the Federal Highway Administration and the National Concrete Bridge Council.

Your opinions and contributions are welcome.
Please contact the Editor:
Henry G. Russell
847.998.9137
847.998.0292 fax
email:

Reinforced concrete beams are being tested to evaluate lap splice lengths.

FHWA Research Program on Lightweight High Performance Concrete

Gary S. Greene, Jr. and Benjamin Graybeal, Federal Highway Administration

The Federal Highway Administration (FHWA) is currently conducting a study on lightweight (specified-density) high performance concrete (LWHPC) at the Turner-Fairbank Highway Research Center (TFHRC). This study includes a comprehensive experimental program to investigate the performance of lightweight concrete (LWC) with a mixture of a lightweight and normal weight coarse aggregates, commonly known as specified-density concrete. The target densities range from 125 to135 lb/ft^3 (2000 to 2160 kg/m^3). The research program is investigating the performance of LWHPC members in terms of their shear strength, short- and long-term prestress losses, transfer and development lengths of prestressing strands, and the bond strength of nonprestressed reinforcement. The intended goal of the study is to identify any necessary changes to the AASHTO LRFD Bridge Design Specifications pertaining to the use of specified-density LWHPC.

Under contract to FHWA, Russell summarized the articles in the AASHTO LRFD Specifications that currently address or should address LWC, synthesized the existing LWC research, and outlined the need for additional research.(1) The FHWA then developed a research program focusing on specified-density LWHPC to address many of these needs.

As part of this research program, 27 full-scale bridge girders and 40 beams with lap splices were fabricated by Standard Concrete Products, a company specializing in precast and prestressed concrete construction, in Mobile, AL. The girders and lap splice beams used three different lightweight aggregates (Haydite, Stalite, and Utelite), from sources geographically distributed across the United States. The Expanded Shale, Clay, and Slate Institute assisted FHWA in identifying existing specified-density concrete mix designs that could be used for the structural components tested in the research program. To date, all 40 splice beams and 9 of 27 bridge girders have been tested. A summary of the research program status is provided below.

Lap Splice Strength of NonPrestressed Reinforcement in LWHPC

Forty reinforced LWHPC splice beams with depths of 18 in. (460 mm) and widths of 6, 9, 12, and 18 in. (150, 230, 305, and 460 mm) were fabricated and tested to evaluate the bond strength of nonprestressed reinforcement in LWHPC. Each beam had three bottom-cast, uncoated, bars lap

henry@hgrconcrete.com

This material is based upon work supported by the Federal Highway Administration under Cooperative Agreement No. "DTFH61-07-H-00041".

spliced at the same location. Eighteen of the beams also had transverse reinforcement as stirrups evenly spaced over the splice length.

These tests are significant because of the paucity of bond strength test data for this type of concrete. Key test parameters include the lightweight aggregate, bar size, splice length, and the presence of transverse reinforcement. The measured 28-day cylinder compressive strengths of the concretes in the beams ranged from 5700 to 10,600 psi (39.3 to 73.1 MPa) with densities ranging from 126 to 138 lb/ft^3 (2018 to 2210 kg/m^3). Applicability of the current AASHTO LRFD and ACI 318 equations for development length of deformed bars in tension to LWHPC was determined from the test results. First, the maximum reinforcement stress in the test specimens was computed from the maximum applied moment based on equilibrium and strain compatibility. This stress was then compared with the stress calculated using the AASHTO LRFD and ACI 318 equations for development lengths.

Both the AASHTO LRFD Specifications and the ACI 318 Building Code specify modification factors for use with LWC. Alternatively, the lightweight modification factor can be calculated using the splitting tensile strength when specified.

The tension development length equation of ACI 318-08 code gave conservative estimates of average bar stress at failure for all 40 splice beam tests i.e. the experimental bar stresses were greater than calculated.

For design purposes, the AASHTO LRFD Specifications multiply the basic tension development length of an individual bar by 1.7 for lap splices where 100% of the bars are spliced and the area of reinforcement provided is less than twice the area required as provided in the test specimens. Incorporating this factor resulted in conservative predictions for all 40 tests.

Development Length of Prestressing Strands in LWHPC Bridge Girders

Twelve AASHTO Type II girders were fabricated with varying aggregate types, prestressing force, strand size, and amount of shear reinforcement. The girders were made with specified-density concrete that had a blend of lightweight and normal weight coarse aggregate and normal weight sand. The average measured 28-day compressive strengths for the three girder mixes ranged between 7400 and 10,500 psi (51.0 and 72.4 MPa). Normal weight concrete decks were cast on the girders after they were delivered to TFHRC. A photograph of a strand development length test setup is shown below.

Development length tests have been completed on 9 of the 12 girders. Preliminary results indicate that the AASHTO LRFD Specifications provide a conservative estimate of the development length for 0.5- and 0.6-in. (12.7- and 15.2-mm) diameter strands in the specified-density LWHPC mixes investigated in this study.

Shear Performance of LWHPC Bridge Girders

An additional nine AASHTO Type II and six BT-54 girders were fabricated alongside the twelve girders discussed above. These girders will be tested to evaluate the shear performance of LWHPC bridge girders. Parameters including quantity of shear reinforcement, prestressing force, strand size, and type of lightweight aggregate will be evaluated. The physical testing will be completed by the end of 2010.

Prestress Losses

Long-term prestress losses are being monitored in the 15 prestressed concrete girders to be used for the shear tests. Internal concrete strains at multiple locations and long-term deflections are being measured.

References

Russell, H. G., “Synthesis of Research and Provisions Regarding the Use of Lightweight Concrete in Highway Bridges,” FHWA U.S. Department of Transportation, Report No. FHWA-HRT-07-053, 114 pp.

Available as PB2007-110768 at www.ntis.gov.

Strand development length test of LWHPC beam.

Editor's Note

The research described in this article complements the research currently being performed in NCHRP Project 18-15, High Performance/High Strength Lightweight Concrete for Bridge Girders and Decks.

RSS FEEDS

HPC Bridge Views

PDF Printable Version
of This Issue

Apparatus used in ASTM C1712.
Photos: BASF

ASTM Test Method for Static Segregation Resistance of Self-Consolidating Concrete

Henry G. Russell, Henry G. Russell, Inc.

Self-consolidating concrete (SCC) must have the ability to flow under its own weight, to pass between reinforcing bars or other obstacles without segregation, and not segregate during or after casting. Three ASTM standard test methods were described in HPC Bridge Views Issue No. 50. In 2009, ASTM International published C1712, Standard Test Method for Rapid Assessment of Static Segregation Resistance of Self-Consolidating Concrete Using Penetration Test. The test method is useful during mixture development and prior to concrete placement in the field. The test does not measure static segregation resistance directly, but provides an assessment of whether static segregation is likely to occur in normal weight concrete.

The test apparatus and protocol were developed based on tests with SCC mixtures containing saturated surface dry coarse aggregates ranging in relative density from 2.67 to 2.79 and in nominal size from 3/8 to 1 in. (9.5 to 25 mm).

The test method uses the penetration apparatus and an inverted slump cone shown in the photographs. After filling the slump cone, the hollow cylinder is aligned in the center of the cone and lowered onto the concrete surface. After 30 seconds, the penetration depth, *Pd*, is measured. Less penetration means a higher degree of static segregation resistance. A non-mandatory appendix provides the following correlation:

Penetration Depth in.	Penetration Depth mm	Degree of Static Segregation Resistance
$Pd \leq 0.4$	$Pd \leq 10$	Resistant
$0.4 < Pd < 1.0$	$10 < Pd < 25$	Moderately resistant
$Pd \geq 1.0$	$Pd \geq 25$	Not resistant