ASCE-INDOT
STRUCTURAL SUBCOMMITTEE
MEETING NO. 36 MINUTES
June 7, 2007

The meeting was called to order at 9:05 am by Steve Weintraut. Those in attendance were:

Anne Rearick	INDOT, Structural Services
Tony Uremovich	INDOT, Structural Services
Greg Klevitsky	INDOT, Structural Services
Naveed Burki	INDOT, Structural Services
Ron McCaslin	INDOT, Structural Services
Bill Dittrich	INDOT, Program Development
Keith Hoernschmeyer	Federal Highway Administration
Mike McCool	Beam Longest & Neff, LLC.
Dick O'Connor	RQAW Corporation
Mike Obergfell	USI Consultants, Inc.
Mike Wenning	American Structurepoint, Inc.
Burleigh Law	HNTB Corp.
Steve Weintraut	Butler, Fairman and Seufert, Inc.
Michael Matel	Butler, Fairman and Seufert, Inc.

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

George Snyder	INDOT, Structural Services
Jim Reilman	INDOT, Structural Services
Chris Hill	Prestress Services
Tony Zander	INDOT, Materials and Tests Division
Jason Yeager	Gohman Asphalt Company

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

1. The February 8, 2007 meeting minutes were approved as written.

2. It was confirmed that the meeting minutes are being placed on the INDOT website after they have been reviewed.

3. Tony Uremovich led a discussion with regards to the impacts that the JTRP recommendations on Integral End Bent Structures will have on the current Indiana Design Manual. These recommendations can be referenced from the October 5, 2006 meeting minutes Item No. 3.

   A. Pile embedment increased to 24 inches. Figure 67-1C (Attachment 1A) will be revised. The vertical dimension from the bottom of the end bent to the construction joint will be revised from 700 mm to 925 mm (3'-0"). Revise Section 67-1.01(06) Item No. 2 (Attachment 1B).
   B. Maximum Bridge Lengths for integral end bent structures will be increased. Revise Figure 67-1A (Attachment 2).
   C. The Minimum Pile Length Table 8.1 of the JTRP report shall be incorporated into the Design Manual. Section 66-3.03 Item No. 1 will also be revised (Attachment 3A).

There was some concern regarding the intent of the provided table. It was felt that designers should be allowed to specify shorter pile lengths if justified. After the meeting, Professor Robert Frosch was contacted and he agreed with the above statement. Additional information on this topic is contained in an e-mail from Professor Frosch (Attachment 3B).

D. It was agreed that Section 67-1.03(03) was clear on the point that piles were to be driven in one row and no revisions to this section were necessary.

4. It was reported that the new semi-integral structure details are being delayed in the INDOT Standards Committee. The Standards Committee is requiring an ASTM or AASHTO specification for the adhesive that attaches the material to the back of the end bent. Mike Obergfell will contact some suppliers to find an adhesive that has an ASTM specification, which would apply to this type of usage. Mike will e-mail the group when this item is completed.

5. A question was raised whether anchorage stiffeners should be required with structural steel members at the semi-integral end bent location. The group felt that these stiffeners would only be necessary if they served as a bearing stiffener. It was pointed out that bearing stiffeners are required per AASHTO for plate girder structures. It was felt that if further clarification was needed, then INDOT would issue a design memorandum at that time.

6. Currently, maintenance costs are not being considered for "specialty" type structures when performing preliminary cost estimates to determine the structure type. Special inspections for fatigue details or confined space inspections for concrete box girders are very expensive. Designers at this item are unable to insert a cost for these types of inspections when comparing different structure types. It was asked that Bill Dittrich and Mike Obergfell collect some cost data for various special type of inspections and report their findings to the group.

7. Chapter 59 of the Design Manual addresses structure type selection during the Structure Size and Type phase of plan development. The Design Manual does not explicitly say how many or what types of structures should be evaluated for a specific project setting, but leaves it open to the designer to use their judgment. It was felt that the reviewer and designer should work together if additional structure types are suggested.

8. The subject of including a percentage of the approach slab weight to the design of the end bent piles was brought up. INDOT currently does not require adding any approach slab dead load to the end bents and the group felt that this policy should remain as is.

9. Mike Wenning led a discussion regarding the design of hammerhead piers using the new LRFD code. When using the RC-Pier program (Leap Software), the amount of steel required in the hammerhead portion of the pier has greatly increased due to the code mandated torsional requirements. Members of the group felt that torsion should not be a significant contributor to the required reinforcing steel in a hammerhead pier.

10. Section 5.7.3.4. of the AASHTO LRFD Code requires that the tensile stress be checked for crack control. Section 62-1.07 of the Design Manual sets Z values for various components including the footings. The assumption appears to be that crack

control reinforcing steel should be provided in the tops of the footing. This seems to be unnecessary since footings are below ground, are not subject to salt application and if there is no top steel in the footing there should no concerns about cracks occurring. It was asked if this provision could be eliminated.

11. INDOT requires foundations to be designed for LRFD HS-25 loading, while all other components are designed for LRFD PL-93. It was pointed out that in some situations, significant differences are occurring in the values for these cases. As a result, the number of design load cases is being increased and is creating some confusion among designers. It was asked if this topic could be discussed with the Geotechnical group and see if this requirement could be eliminated.

12. Mike McCool discussed the detailing of the mild reinforcing steel around the bottom strands in precast concrete beams. The Design Manual in Section 63-5.01 states that the fabrication process is simplified by using a two piece bar configuration at this location. It appears from the details of the beam manufacturer (Prestress Services), only one stirrup encases the bottom strand. Mike felt that the design manual and accompanying beam details should be revised to direct the designers to use one stirrup bar around the perimeter of the strands and if necessary provide an additional bar on top to encase the strands.

13. The last topic discussed was additional training on LRFD for designers. Mike Wenning mentioned that he had been attending some LRFD training seminars in Ohio, which were provided by the University of Cincinnati. Other organizations that could provide or sponsor training could be LTAP or LEAP software. All the group members felt that the design community still needed additional training.

The next meeting for the INDOT Structural Subcommittee is scheduled for 9:00 am on September 6, 2007, in a room to be determined.

This meeting was adjourned at 11:45 a.m.

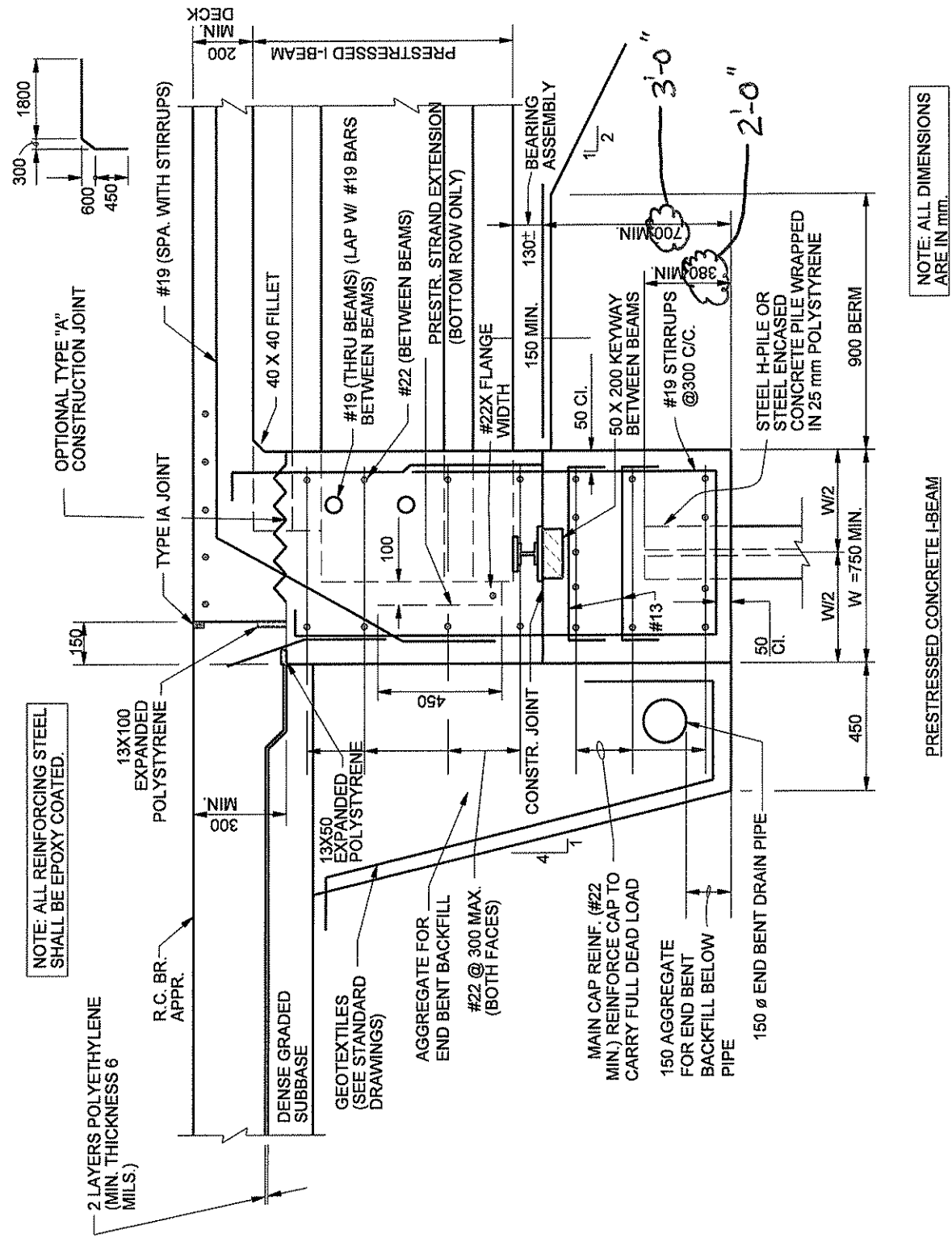
Respectfully submitted,
BUTLER, FAIRMAN and SEUFERT, INC.

Michael Matel, P.E.
mmatel@bfsengr.com

MM:lm

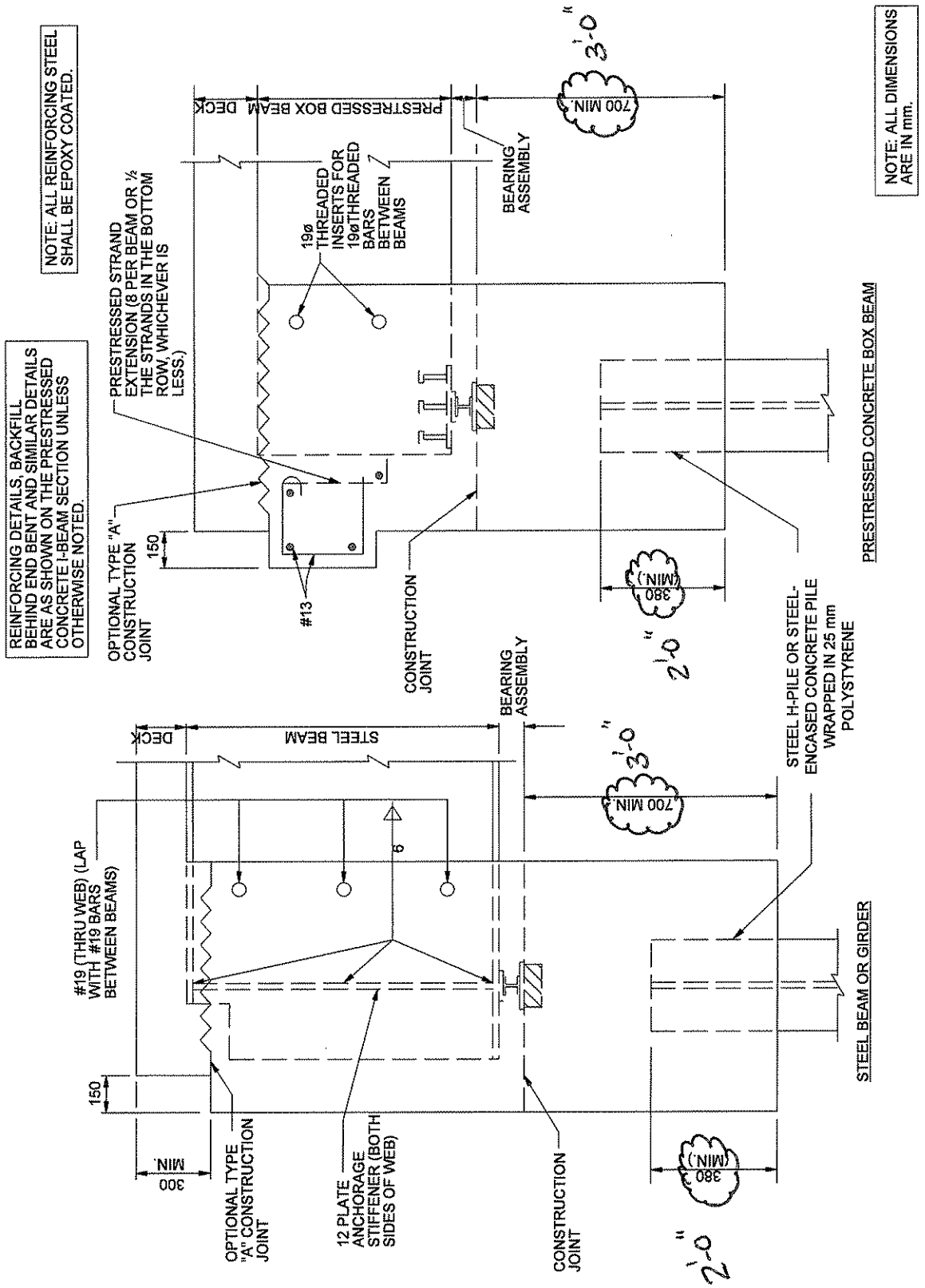
Attachments

ATTACHMENT 1A



SUGGESTED INTEGRAL END BENT DETAILS
(Beams Attached toConcrete Cap, Method B)
Figure 67-1C

ATTACHMENT 1A



SUGGESTED INTEGRAL END BENT DETAILS
(Beams Attached to Concrete Cap, Method B)
Figure 67-1C
(Continued)

67-1.01(06) END BENT DETAILS

ATTACHMENT 1B

(1)

Optional construction joints may be placed in the end bent cap to facilitate construction. The optional joint below the bottom of beam may be used regardless of bridge length. To accommodate the contractor's common practice of pouring the reinforced concrete bridge approach with the bridge deck, a wrap should be provided on the top portion of the pile encased in the concrete cap to counteract any moments that may be prematurely induced at the top of the pile by this practice. The wrap should consist of 25-mm expanded polystyrene. The wrap should not be used with a reinforced concrete slab bridge. The optional construction joint at the pavement ledge elevation shown in Figures 67-1B and 67-1C allows the contractor to pour the reinforced concrete bridge approach with the bridge deck.

Regardless of the method used, the end bent details should be in accordance with the following:

1. Width. The end bent width shall not be less than 750 mm.

2. Cap Embedment. The piling shall extend a minimum of 600 mm into the cap ~~if using Method A, and a minimum of 375 mm if using Method B.~~ (2'-0")

3. Beam Attachment. The beams shall be physically attached to the end bent piling if using Method A and to the cast-in-place cap if using Method B.

4. Beam Extension. The beams shall extend at least 500 mm into the bent measured along the centerline of the beam.

5. Concrete Cover. Concrete cover beyond the farthest most edge of the beam at the rear face of the bent shall be at least 100 mm. This minimum cover shall also apply to the pavement ledge area. The top flanges of steel beams and prestressed I-beams may be coped to meet this requirement. Where the 100-mm minimum cover cannot be maintained within a 750-mm cap, the cap shall be widened.

6. Stiffener Plates. Steel beams and girders shall have 15-mm stiffener plates welded to both sides of the web and to the flanges over the supports to anchor the beams into the concrete. In addition, a minimum of three holes shall be provided through the webs of steel beams and girders. Two holes should be provided through prestressed I-beam webs near the front face of the bent, to allow #19 bars to be inserted to further anchor the beam to the cap. Box beams shall have two threaded inserts placed in each side face for anchorage of #22 threaded bars.

7. Reinforcement. The minimum size of stirrups shall be #19 spaced at a maximum of 300 mm. Longitudinal cap reinforcing shall be #22 at 300-mm maximum spacing along both faces of the bent. All reinforcing steel shall be epoxy coated.

Structure Type	Highway Alignment Across Bridge	Maximum Skew	Maximum Bridge Length	Maximum to Zero Point
Reinforced Concrete Slab	No Restrictions	No Restrictions	150 ~~60~~ m*	75 ~~30~~ m*
Structural Steel	Tangent Only**	30 deg***	150 ~~75~~ m*	75 ~~30~~ 5 m
Prestressed Concrete	No Restrictions	30 deg***	150 ~~90~~ m*	75 ~~45~~ 0 m

(500 Feet) (250 Feet)

Notes:

* *The maximum length indicated may be increased, subject to approval by the Design Division Chief, if a rational analysis of induced pile loads indicates that the piles are not overloaded. Two rational analysis methods are described in the Iowa Department of Transportation report,* Pile Design and Tests for Integral Abutment Bridges.

See Section 67-1.03(03) for an alternative analysis in lieu of the above criteria.

** *The horizontal alignment may be curved as long as curved beams are not used.*

*** *A skew of greater than 30 deg but equal to or less than 45 deg will be permitted if the maximum bridge length does not exceed ~~45 m~~.*

75 m

(250 Feet)

USE OF INTEGRAL END BENTS

Figure 67-1A

ATTACHMENT 2

ATTACHMENT 3A

(3)

elevation. The epoxy coating is vulnerable to handling and driving. Because of the vulnerability of the epoxy coating near the flowline, reinforcing steel is included in the top part of the pile. See the INDOT *Standard Drawings*.

7. Construction. The designer should consider the driveability of steel-encased piles.

66-3.02(02) Steel H-Piles

The following will apply to steel H-piles.

1. Usage. These are generally used either where the pile obtains most of its bearing capacity from end bearing on rock or as recommended in the Geotechnical Report.

2. Size. Pile size designations may be HP250, HP310, or HP360. HP310 is used most often.

3. Protection for Exposed Piles. Only reinforced concrete encasement shall be used. The concrete encasement shall be extended a minimum of 600 mm below the flow line elevation or as specified in the Geotechnical Report.

4. Steel Strength. The yield strength, f_y, should be a minimum of 345 MPa.

5. Bearing Capacity. The maximum bearing capacity for a steel H-pile should be based on a maximum allowable stress of $0.25F_y$. For a Grade 345 pile, this is 0.25 x 345 MPa = 86 MPa.

66-3.03 Pile Length

The following will apply to the length of piles.

1. Minimum Length. The minimum pile length ~~is 3.0 m into hard cohesive or dense granular material, and not less than 6.0 m for friction piles into soft cohesive or loose granular material.~~ should be that shown in Figure 66-3A(1). If the depth to suitable rock strata is less than 3.0 m (10 ft), the piles should be seated in holes cored into the rock and backfilled with concrete. A minimum core depth of 900 mm (3 ft) into scour resistant rock should be used. Pedestals should not be used.

2. Tip Elevation for Friction Piles. Show the minimum pile tip elevation on the elevation view of the General Plan sheet based on the scour requirements or the minimum pile tip elevation requirements specified in Figure 66-3B.

ATTACHMENT 3A

(3)

Pile Size	Minimum Length, ft (m)	
	Clay	Sand
HP 10	30 (9)	25 (8)
HP 12	35 (11)	25 (8)
HP 14	40 (12)	30 (9)
CFT 14	50 (15)	35 (11)

MINUMUM PILE LENGTH

Figure 66-3A(1)

PROPOSED NEW FIGURE

From: Robert J Frosch [mailto:frosch@purdue.edu]
Sent: Thursday, June 21, 2007 9:45 AM
To: Stephen Weintraut
Subject: RE: Attached Image

ATTACHMENT 3B

Steve:

The reason for the lengths provided in the table was to prevent displacement at the pile base. In the research, we performed a parametric study for both weak and strong axis bending of the family of piles in both clay(soft, stiff, very stiff) and sand(loose, medium, dense). We subjected the pile to a tip displacement of 1 in., 2 in., and 4 in. Based on this analysis, we determined the depth required such that the base did not significantly laterally translate. From this analysis, we found that the tip displacement does increase the depth required. These results are summarized for each pile in Figure 4.35-4.42 of the report. For the table, the lengths were based on weak axis bending, and considering soft clay and weak sand. A tip displacement of 4 in. was also considered. It may be useful to refer to these tables if designers want to consider a variety of tip displacements and soil conditions.

I agree that we should allow designers to have shorter pile lengths if it is justified. The table was meant to be a simple guide. If below the lengths provided by the table, the designer should evaluate if the pile length is adequate.

Regarding the torsion issue, I am not familiar with the requirements of the new LRFD code. I assume it is based on the MCFT much like shear but would have to look into. I do know that there has been a lot of concern by PCI with the new torsion requirements of the ACI code for spandrel beams. They are conducting a series of tests since the new method has been requiring significantly more steel. Gut feel is that a the piers would be torsionally strong on their own. Is AASHTO neglecting the concrete contribution to strength?

- Robert