ASCE-INDOT
STRUCTURAL SUBCOMMITTEE
MEETING NO. 50 MINUTES
January 18, 2011

The meeting was called to order at 9:10 am by Steve Weintraut. Those in attendance were:

Randy Strain	INDOT, Structural Services
Anne Rearick	INDOT, Structural Services
Jim Reilman	INDOT, Construction Management
Tony Uremovich	INDOT, Structural Services
Tony Zander	INDOT, Materials and Tests Division
Bill Dittrich	INDOT, Program Development
Mike Wenning	American Structurepoint, Inc.
Burleigh Law	HNTB Corp.
Mike McCool	Beam Longest & Neff, LLC.
Celeste Spaans	Prestress Services, Inc.
Jason Yeager	Gohman Asphalt Company
Mike Halterman	USI Consultants, 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:

Ron McCaslin	INDOT, Structural Services
Brian Harvey	INDOT, Program Development
Keith Hoernschmeyer	Federal Highway Administration
Troy Jessup	R. W. Armstrong

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

1. The October 6, 2010, meeting minutes were approved as written, and have been placed on the INDOT website.

2. INDOT prefers to not use semi lightweight concrete unless design dictates its use. This should be shown as a savings in the SST and economical analysis. INDOT is seeing problems with delayed ettringite when using semi lightweight concrete that causes cracking in the beams. INDOT is working on a specification to address the concerns.

3. Self consolidating concrete was discussed. Due to testing requirements which are different than normal concrete, it was determined that its use will probably be driven by the precast industry.

4. Bridge Design Conference will be on July 26 and July 27. Subcommittee will form to develop topics.

5. Mike McCool sent reinforcing details to Prestress Services. His findings were that the 3D bar costs approx. $5.75/lft more than the U bar and a welded stud bar would cost approx. $1.25/lft more than the 3D bar. It was suggested that Mike develop a proposal for a research project at Purdue.

6. The group would like INDOT to issue a memo to allow welded wire reinforcement in precast beams. Steve will send a proposal to Randy to run through the Standards Committee.

7. Randy Strain and Jim Reilman are working on learning the process of post tensioning. They may be developing a construction manual on post tensioning.

8. INDOT is looking at developing a recurring special provision on high strength concrete. Currently waiting on research to be completed and then develop an implementation plan.

9. Professor Frosch is performing a study on skewed reinforced concrete approach slabs and will present results to Randy soon.

10. Burleigh passed out a handout on MSE wall clearances at abutments. Tony Uremovich will deliver it to the wall committee to incorporate into the Design Manual. Designers need to be aware of the clear distances that are required between MSE walls and piles.

11. Randy and Jim stated that construction loads on rehabilitations need to be checked especially when the deck is being replaced or when the structure is being widened and new beams are being added.

12. Long term deflections on concrete beams is not being considered in design. There have been instances during construction where the residual camber was less than calculated causing additional fillet over the beams. This appears to be more common with longer bulb-T beams (>100'). It is recommended that the designers check their designs for an additional 2" fillet on top of their normal fillet to address the construction camber issues. It was suggested to investigate the short term and long term camber factors in PCI for bulb-Ts since these factors were developed in 1977.

13. Some designers are calling out #5 stirrup bars in the hybrid bulb-T beams and there are issues with the bar bends of $4d_b$. Celeste will investigate.

The next meeting for the INDOT Structural Subcommittee is scheduled for 9:00 am on April 7, 2011, in a room to be determined.

This meeting was adjourned at 11:30 a.m.

Respectfully submitted,
BUTLER, FAIRMAN and SEUFERT, INC.

Michael H. Eichenauer

Michael Eichenauer, P.E.
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ME:me

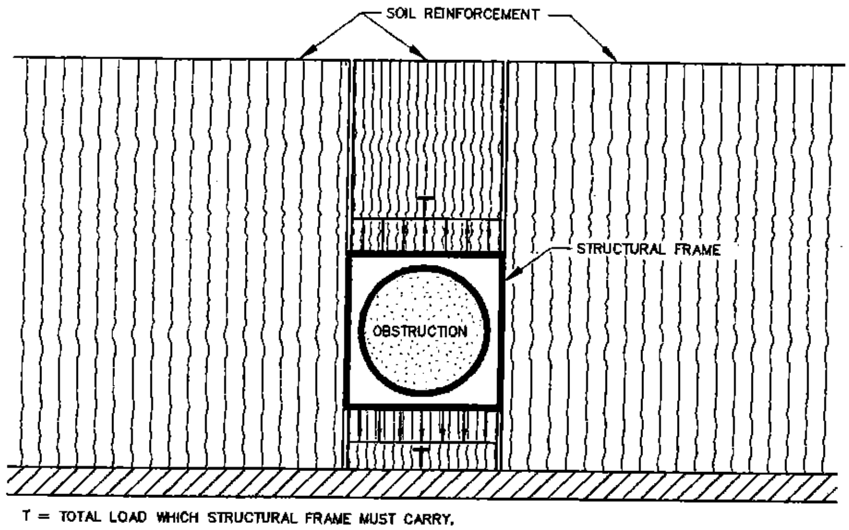


Figure 11.10.10.4-1 Structural Connection of Soil Reinforcement Around Backfill Obstructions.

11.10.11 MSE Abutments

Abutments on MSE walls shall be proportioned to meet the criteria specified in Article 11.6.2 through 11.6.6.

The MSE wall below the abutment footing shall be designed for the additional loads imposed by the footing pressure and supplemental earth pressures resulting from horizontal loads applied at the bridge seat and from the backwall. The footing load may be distributed as described in Article 11.10.10.1.

The factored horizontal force acting on the reinforcement at any reinforcement level, T_{max}, shall be taken as:

$$T_{max} = \sigma_{Hmax} S_v \qquad (11.10.11\text{-}1)$$

where:

σ_{Hmax} = factored horizontal stress at layer i, as defined by Eq. 2 (ksf)

S_v = vertical spacing of reinforcement (ft.)

Horizontal stresses in abutment reinforced zones shall be determined by superposition as follows, and as specified in Article 11.10.10.1:

$$\sigma_{Hmax} = \gamma_p(\sigma_v k_r + \Delta\sigma_v k_r + \Delta\sigma_H) \qquad (11.10.11\text{-}2)$$

where:

γ_p = load factor for vertical earth pressure in Table 3.4.1-2

C11.10.11

$\Delta\sigma_H$ = magnitude of lateral pressure due to surcharge (ksf)

σ_v = vertical soil stress over effective base width $(B-2e)$ (ksf)

$\Delta\sigma_v$ = vertical soil stress due to footing load (ksf)

k_r = earth pressure coefficient varying as a function of k_a as specified in Article 11.10.6.2.1

k_a = active earth pressure coefficient specified in Article 3.11.5.8

The effective length used for calculations of internal stability under the abutment footing shall be as described in Article 11.10.10.1 and Figure 11.10.10.1-2.

The minimum distance from the centerline of the bearing on the abutment to the outer edge of the facing shall be 3.5 ft. The minimum distance between the back face of the panel and the footing shall be 6.0 in.

Where significant frost penetration is anticipated, the abutment footing shall be placed on a bed of compacted coarse aggregate 3.0 ft. thick as described in Article 11.10.2.2.

The density, length, and cross-section of the soil reinforcements designed for support of the abutment shall be carried on the wingwalls for a minimum horizontal distance equal to 50 percent of the height of the abutment.

In pile or drilled shaft supported abutments, the horizontal forces transmitted to the deep foundation elements shall be resisted by the lateral capacity of the deep foundation elements by provision of additional reinforcements to tie the drilled shaft or pile cap into the soil mass, or by batter piles. Lateral loads transmitted from the deep foundation elements to the reinforced backfill may be determined using a P-Y lateral load analysis technique. The facing shall be isolated from horizontal loads associated with lateral pile or drilled shaft deflections. A minimum clear distance of 1.5 ft. shall be provided between the facing and deep foundation elements. Piles or drilled shafts shall be specified to be placed prior to wall construction and cased through the fill if necessary.

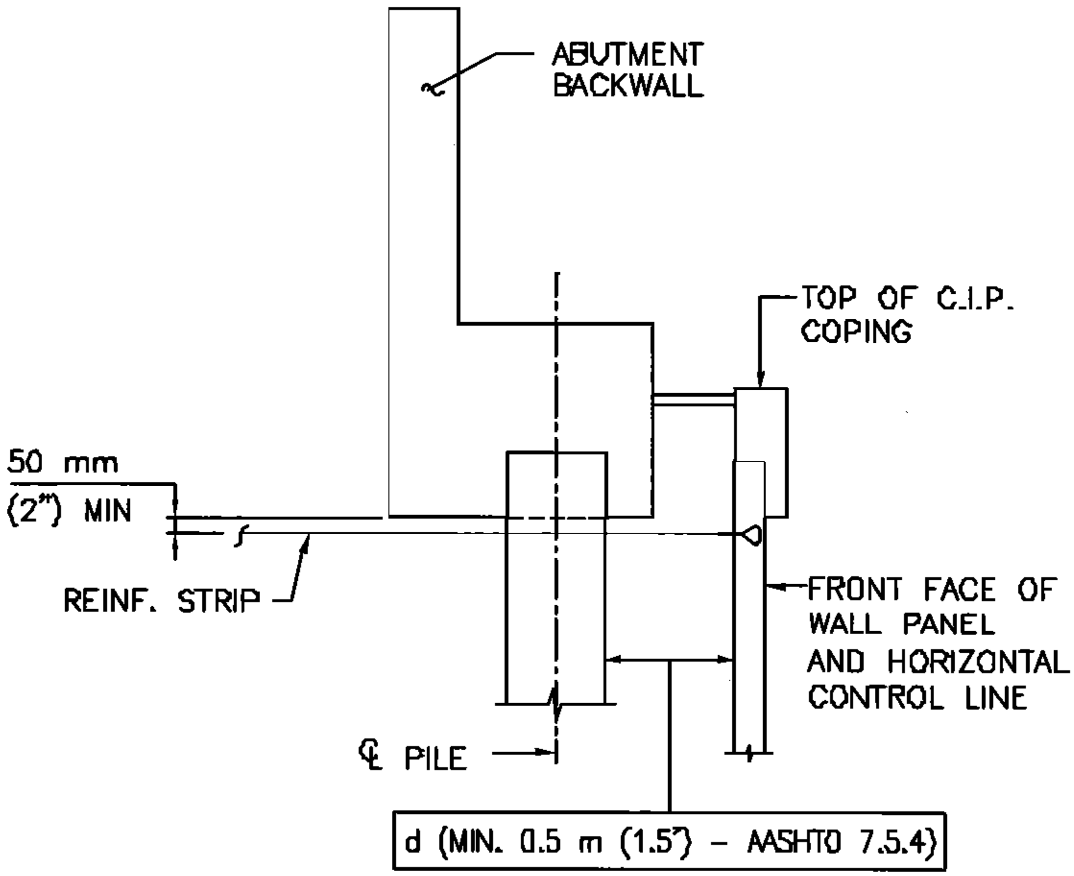
The equilibrium of the system should be checked at each level of reinforcement below the bridge seat.

Due to the relatively high bearing pressures near the panel connections, the adequacy and ultimate capacity of panel connections should be determined by conducting pullout and flexural tests on full-sized panels.

The minimum length of reinforcement, based on experience, has been the greater of 22.0 ft. or $0.6\,(H + d) + 6.5$ ft. The length of reinforcement should be constant throughout the height to limit differential settlements across the reinforced zone. Differential settlements could overstress the reinforcements.

The permissible level of differential settlement at abutment structures should preclude damage to superstructure units. This subject is discussed in Article 10.6.2.2. In general, abutments should not be constructed on mechanically stabilized embankments if anticipated differential settlements between abutments or between piers and abutments are greater than one-half the limiting differential settlements described in Article C10.5.2.2.

Moments should be taken at each level under consideration about the centerline of the reinforced mass to determine the eccentricity of load at each level. A uniform vertical stress is then calculated using a fictitious width taken as $(B-2e)$, and the corresponding horizontal stress should be computed by multiplying by the appropriate coefficient of lateral earth pressure.



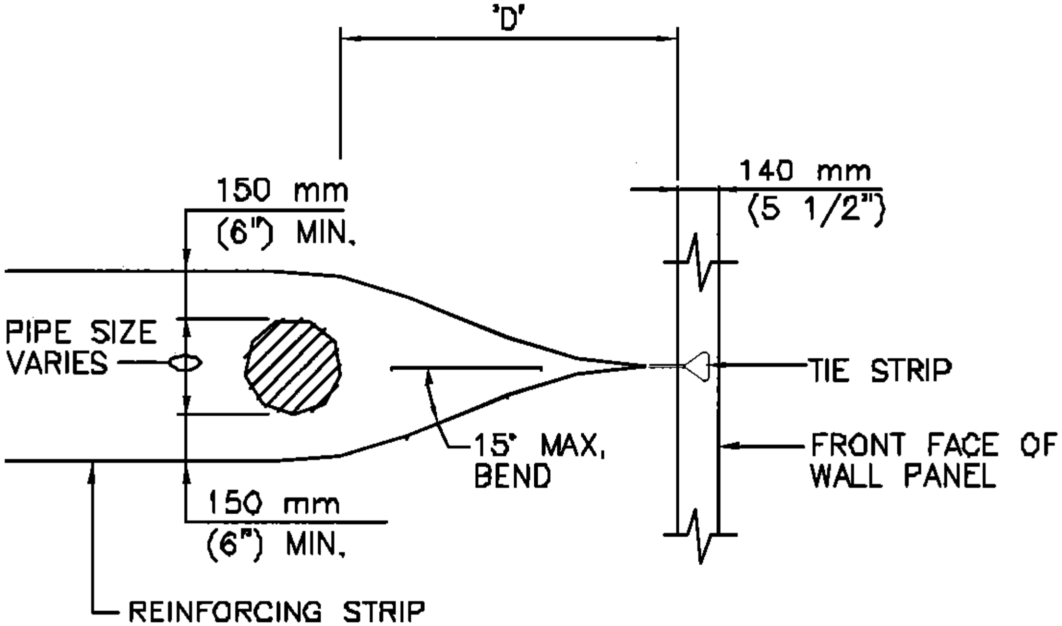
NOTE:
DISTANCE "d" DEPENDS ON PILE TYPE AND SIZE. CONSULT REINFORCED EARTH COMPANY DESIGNER FOR PROJECT-SPECIFIC INFORMATION

IMPORTANT NOTE ABOUT DIMENSIONS

Dimensions used in this document are for illustrative purposes only and may vary slightly from precise design or fabrication dimensions due to English/Metric conversion or due to simplification appropriate to the guideline character of this manual. When required for design, precise dimensions (each project uses either English or Metric) should be obtained from contract plans or directly from The Reinforced Earth Company. RECo reserves the right to change the dimensions of fabricated materials as needed.

CLEARANCE OF PILES FROM WALL PANELS FOR PILE-SUPPORTED ABUTMENT IN R.E.WALL

TYPICAL STRIP BENDING DETAIL AT PIPES



NOTE:
BEND TO BE AS GRADUAL AS POSSIBLE.

Reinforced Concrete Pipe Size O.D. (In)	Dim 'D' Edge of Pipe to B.F. Panel
10 1/2"	1.5'
13"	1.8'
16"	2.1'
19 1/2"	2.5'
23"	2.9'
26 1/2"	3.3'
30"	3.7'
33 1/2"	4.1'
37"	4.5'
40 1/2"	5.3'
44"	5.7'
51"	6.1'
58"	6.9'
67"	7.8'
74"	8.7'
81"	9.5'
88"	10.3'
95"	11.1'

This table is based on the assumption that the center of the pipe is aligned with the center of the tie strip.

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