ASCE-INDOT
STRUCTURAL SUBCOMMITTEE
MEETING NO. 53 MINUTES
November 21, 2011

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

Randy Strain	INDOT, Structural Services
Anne Rearick	INDOT, Structural Services
Tony Uremovich	INDOT, Structural Services
Jim Reilman	INDOT, Construction Management
Mike Wenning	American Structurepoint, Inc.
Burleigh Law	HNTB Corp.
Mike McCool	Beam Longest & Neff, LLC.
Pete White	R. W. Armstrong
Celeste Spaans	Prestress Services, Inc.
Jason Yeager	Gohmann Asphalt Company
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
Tony Zander	INDOT, Materials and Tests Division
Bill Dittrich	INDOT, Program Development
Brian Harvey	INDOT, Program Development
Keith Hoernschmeyer	Federal Highway Administration
Mike Halterman	USI Consultants, Inc.

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

1. The July 7, 2011, meeting minutes were approved as written, and have been placed on the INDOT website.

2. A light weight concrete specification will be addressed by INDOT in 2012. Currently, INDOT has discouraged the use of semi-lightweight concrete but has accepted the use of light weight concrete when required to meet design parameters.

3. The Bridge Conference in July had 102 participants. The overall response was good. The technical topics were covered well. However, it was suggested to get better AV equipment next year. Suggested topics for next year include construction loading examples for steel and concrete beams, seismic design, and residual camber calculations. These and other topics will be discussed by the committee in the next coming months. The tentative date for the conference next year will be the week of July 23. Anne will check on room availability.

4. Mike McCool has developed a research plan to give to Professor Frosch on stirrup reinforcement in prestressed beams.

5. Jim Reilman would like additional information on articulating mats. Currently, there are multiple specifications on these. A standard specification will be developed to

present to the Standards Committee. It was mentioned that the specification needs to be set up to address different grades or thicknesses of mats to fit differing project requirements.

6. Mike Wenning stated that there needs to be clarification in the MSE wall specification. The specification lists H when describing the wall height under all circumstances. However, the old special provision used to list H and H' to describe different design heights. Mike believes that the specification needs to list both H and H'. Randy indicated INDOT would revise specification.

7. Randy passed out a handout (see Attachment 1) covering the use of integral end bents, spiral reinforcement at end bents, tooth joint at the ends of approach slabs and pier keyways. The group will review these attachments and are to provide feedback to Randy before the next meeting.

8. The current detail for drilled shafts shows a different diameter for the shaft and the rock socket. Contractors have expressed concern on the constructability of this detail. Mike Eichenauer and Pete White believe that INDOT has changed this detail in the new Design Manual to show the rock socket and shaft as the same diameter.

9. Mike Wenning brought up spread footing issues that he is having with the new code. The LRFD code is causing sliding to be the controlling factor in the footing design. This is causing the footings to be unreasonably wide even with a key. Mike will send calculations to the group and they will check Mike's design along with other designs to verify.

10. Mike McCool pointed out that the wind loading for the construction loading note should be 25 lb/ft^2 in lieu of 50 lb/ft^2. However, it would be more appropriate to state that the wind load shall be calculated per AASHTO 3.8.1.

11. Steve Weintraut announced that he is stepping down as chairman of this committee effective immediately. Mike Eichenauer will chair the next meeting. It was suggested that the group determine who the next chairman should be and also develop rules on participation in this committee.

The next meeting for the INDOT Structural Subcommittee is scheduled for 9:00 a.m. on February 23, 2012, in a room to be determined.

This meeting was adjourned at 10:45 a.m.

Respectfully submitted,
BUTLER, FAIRMAN and SEUFERT, INC.

Michael H. Eichenauer

Michael Eichenauer, P.E.
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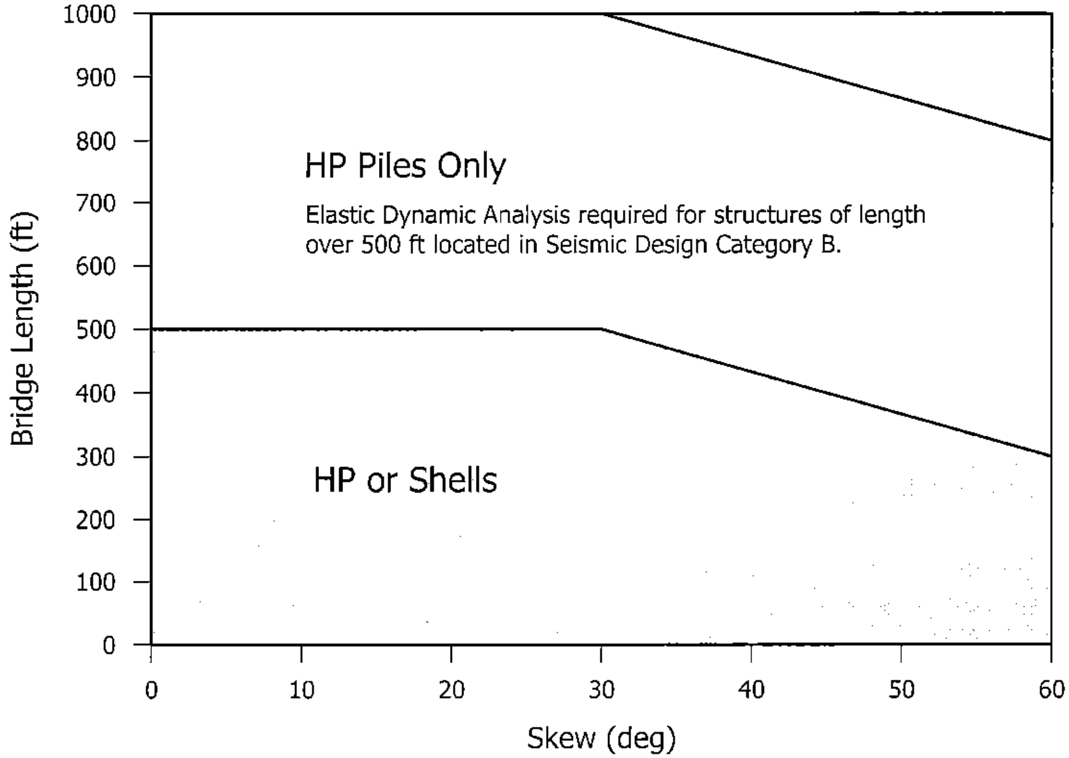
ME:me

Attachments

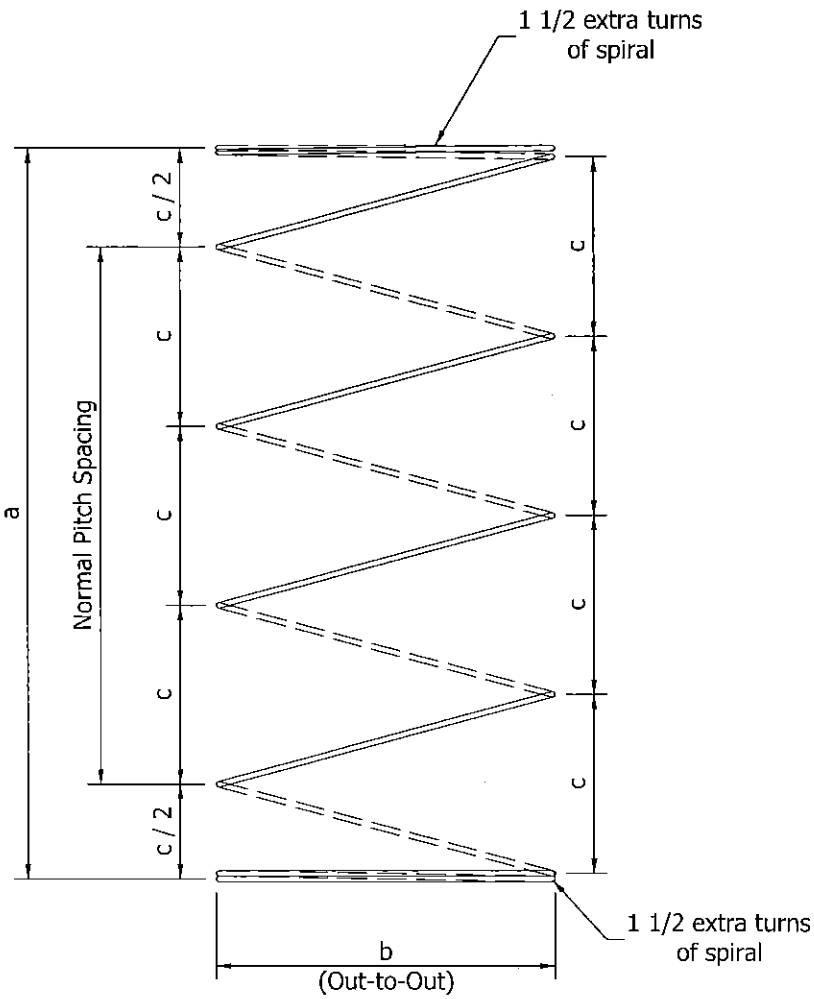


NOTES

1. Integral abutments may be used in a curved-alignment or curved-girder structure with length of 500 feet or less, with a subtended angle in plan not greater than 30°.
2. Pile confinement spiral reinforcement required on all integral abutments.

USE OF INTEGRAL ABUTMENT

Figure 409-2A



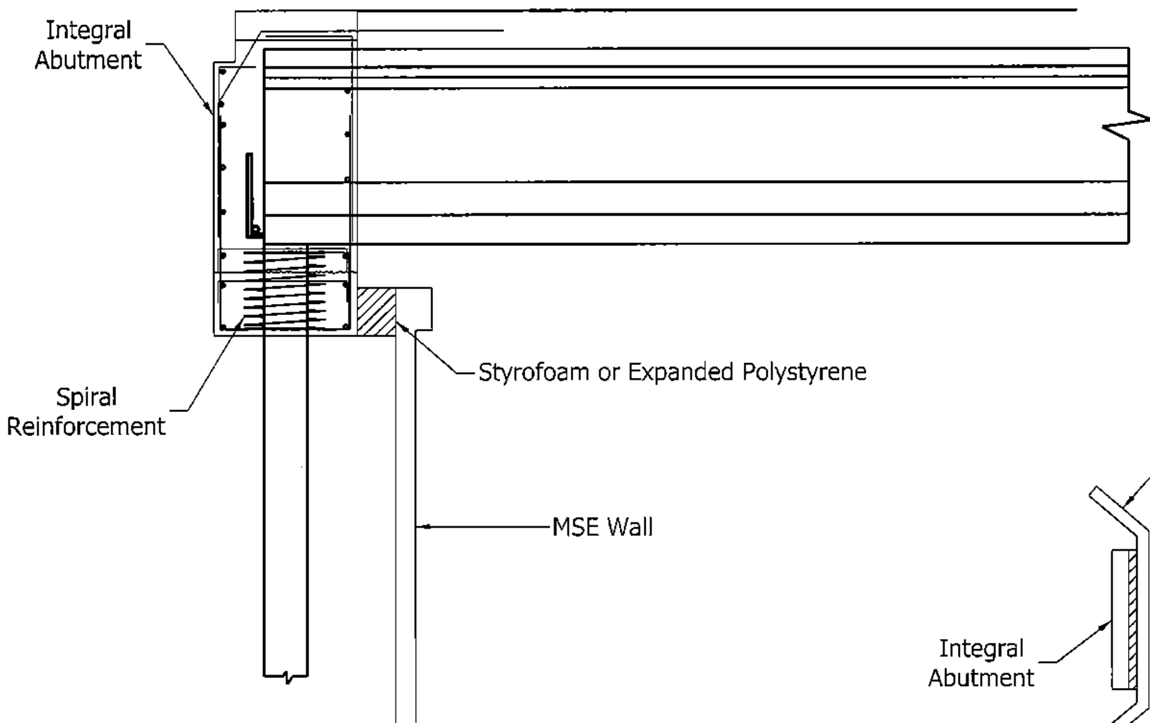
KEY:

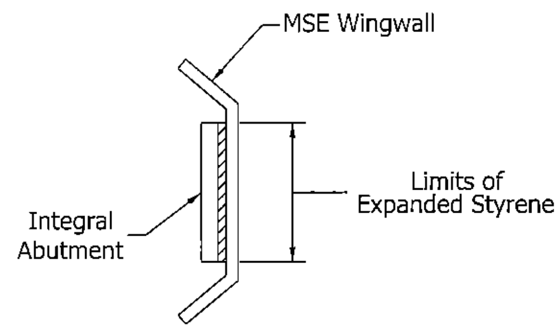
a = Spiral Height
b = Outside Diameter
c = Pitch
d = Bar Diameter
L = Total Length of Spiral Reinforcement

L = [(a / c + 2(1 1/2 turns)] π b

SPIRAL REINFORCEMENT

Figure 409-XX

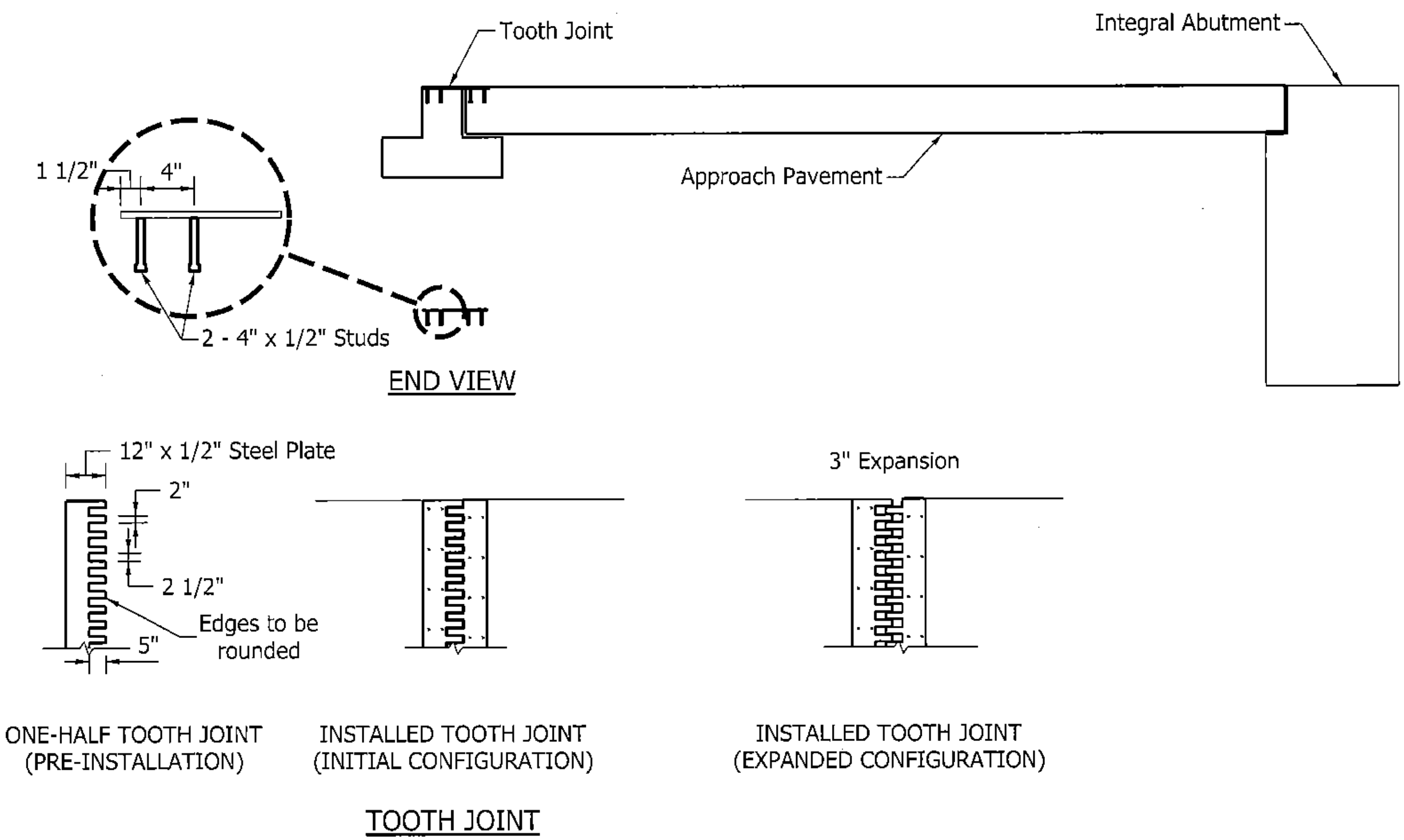




PLAN VIEW

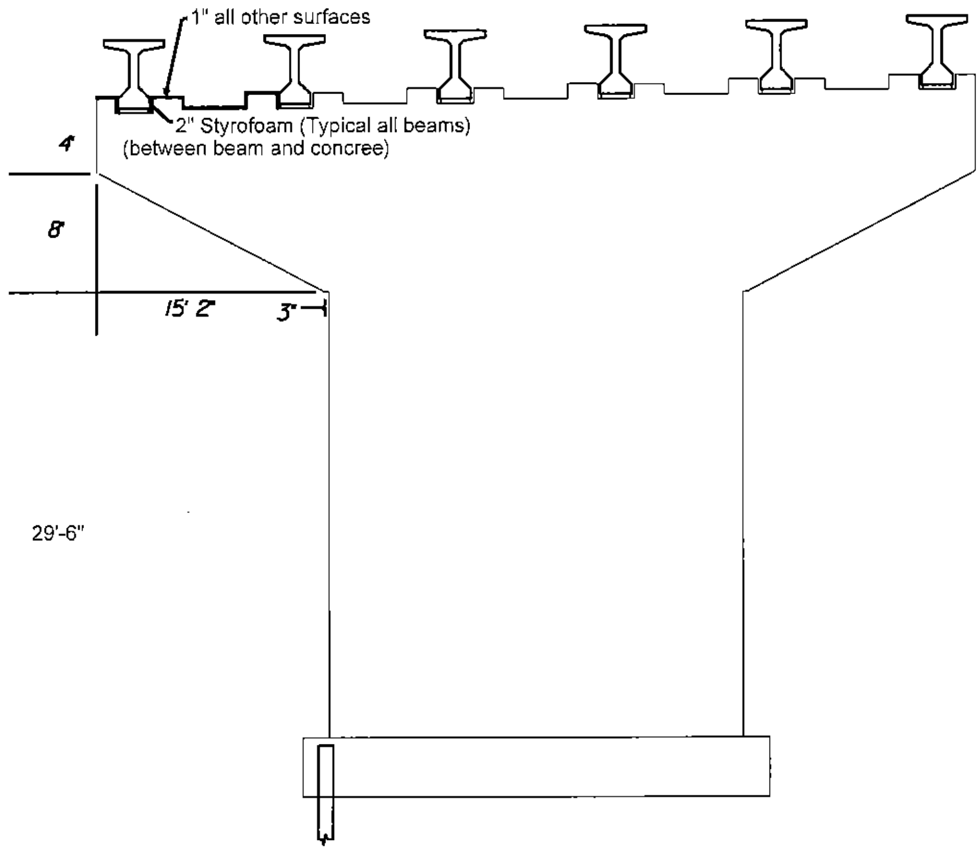
INTEGRAL ABUTMENT PLACED BEHIND MSE WALL

Figure 409-XX



TOOTH JOINT

Figure 409-XX


1" all other surfaces
2" Styrofoam (Typical all beams)
(between beam and concree)
4'
8'
15' 2"
3"
29'-6"

loading combination should be investigated under the Strength II Limit State. Factors for multiple presence and dynamic load allowance should be the same as those used for regular design trucks.

These design trucks should not be considered for fatigue considerations, but they may be used for centrifugal and braking forces.

403-3.02 Centrifugal and Braking Forces, and Wind Pressure on Vehicle

Centrifugal forces, braking forces, and wind pressure on a vehicle should be applied at 6 ft above the profile grade at the centerline of the pier or bent.

403-3.03 Stream Pressure

A drag coefficient, C_D, should be used as described in *LRFD* 3.7.3.1.

403-3.04 Forces Due to Friction

Chapter 409 discusses friction forces within the context of bearings.

403-3.05 Earthquake Effects

Earthquake Effects, *EQ*, should be determined in accordance with AASHTO *Guide Specifications for LRFD Seismic Bridge Design* and current interims. All structures with spans greater than 500 feet located in a seismic design category greater than category A will be analyzed using elastic dynamic analysis. *Standard Drawings*

403-3.06 Ice Forces on Pier

The following describes criteria for determining ice forces on a pier.

1. Effective ice crushing strength, p = 165 psi.
2. Ice thickness, t = 1 ft.
3. The horizontal force should be applied midway between the Q_{100} elevation, i.e., the water elevation at the 100-year frequency flood event, and the low-water elevatio

Substructure elements for seismic loading should be designed in accordance with AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.. For all other extreme events, substructure elements should be designed in accordance with AASHTO *LRFD Bridge Design Specifications*.

409-1.02 Resistance Factors

For abutments, bents, and piers, see *LRFD* 11.5.6. The resistance factor for bearings should be taken as 1.0.

409-1.03 Load Combinations and Load Factors

See *LRFD* 3.4.1 and 11.5.5.

409-2.0 INTEGRAL END BENT

409-2.01 General

An integral end bent eliminates the expansion joint in the bridge deck, which reduces both the initial construction costs and subsequent maintenance costs.

Integral end bents should be used for a new structure in accordance with the geometric limitations provided in Figure 409-2A. Minimum support-length requirements need not to be investigated for an integral-end-bent bridge. Integral structures 500 feet in length or less will not require seismic analysis. Integral structures larger than 500 feet in length and located in a seismic design category B will be analyzed using elastic dynamic analysis.

~~For an existing bridge without integral end bents, the design criteria shown in Figure 409-2A should be used in evaluating the conversion to an integral-end-bent structure. For additional information, see Chapter 4~~12.

409-2.02 Materials

Class C concrete and epoxy-coated reinforcing steel are required.

The wingwalls concrete should be Class C.

409-2.03 Design Criteria

Although each end of the superstructure is monolithically attached to an integral end bent, the rotation permitted by the piles is sufficiently high, and the attendant end moment is sufficiently low, to justify the assumption of a pinned-end condition for design. The following design assumptions should be considered.

409-2.03(01) Ends

The ends of the superstructure are free to rotate and translate longitudinally.

409-2.03(02) Passive Earth Pressure

The restraining effect of passive earth pressure behind the end bents may be neglected in considering superstructure longitudinal force distribution to the interior piers. Alternatively, the effect of passive earth pressure behind the end bents may be considered by distributing the longitudinal forces between the interior supports, end bent supports, and the soil behind the end bents. ~~The resultant soil resistance should also be checked against the available passive earth pressure. The effect of passive earth pressure behind the end bent should be considered in evaluating thermal-force effects and seismic forces.~~ (recommend delete)

409-2.03(03) Interior Pile Bent

All longitudinal forces from the superstructure should be distributed among the interior supports, end bents, and soil behind the end bents based on relative stiffness in designing an interior pile bent or a thin-wall pier on a single row of piles.

409-2.03(04) Shear and Moment

Force effects in the cap beam may be determined on the basis of a linear distribution of vertical pile reactions. For minimum reinforcement, the cap should be treated as a structural beam.

409-2.04 Design Requirements

409-2.04(01) General Requirements

The following requirements must be satisfied.

1. Backfill. Each integral end bent for a beam- or girder-type superstructure should be backfilled with aggregate for end-bent backfill. Each reinforced-concrete-slab bridge end bent should be backfilled with flowable-backfill material. The INDOT *Standard Drawings* provide backfill details for both concrete-slab and beam- or girder-type structures.

2. Bridge Approach. A reinforced-concrete bridge approach, anchored to the end bent with #5 bars, epoxy coated, and spaced at 1'-0" centers, should be used at each integral end bent regardless of the traffic volume. The bars should extend out of the pavement ledge as shown in Figures 409-2B and 409-2C. Two layers of polyethylene sheeting should be placed between the reinforced-concrete bridge approach and the subgrade. A rigid reinforced-concrete bridge approach is necessary to prevent compaction of the backfill behind the end bent.

3. ~~Bridge Approach Joint. A terminal joint of 2 ft width, as shown on the INDOT *Standard Drawings*, or a pavement relief joint, should be used at the roadway end of the reinforced concrete bridge approach if a portion of the adjacent pavement section is concrete. A joint is not required if the entire adjacent pavement section is asphalt.~~

   Bridge-Approach Joint. For structures less than 300 feet, a terminal joint 2 feet in width, as shown on the INDOT *Standard Drawings*, or a pavement relief joint should be placed at the end of the reinforce concrete bridge approach. An expansion joint should be considered for integral structures greater than 300 feet. An expansion joint is required for integral structures greater than 500 feet.

4. Wingwalls Configuration. Wingwalls should extend parallel to the centerline of roadway. This configuration reduces the loads imposed upon the bridge structure due to passive earth pressure from the end-bent backfill. See Figure 409-5A for suggested wingwall dimensioning details. The minimum thickness of a wingwall used with an integral end bent should be 1 ft. The wingwall length should not be greater than 10 ft. A longer wingwall will require additional analysis.

5. Wingwall Connection. Force effects in the connection between the wingwall and cap, and in the wingwall itself, should be investigated, and adequate reinforcing steel should be provided.

6. Interior Diaphragms for Steel Structure. Where steel beams or girders are used, an interior diaphragm should be placed within 10 ft of the end support to provide beam stability prior to and during the deck pour.

7. Intermediate Pier Details for Integral Structures Located in Seismic Areas Greater Than SDC A. Intermediate piers should include concrete restrainers as shown in figure 409-XX

409-2.04(02) Pile Connection and Plans Details

An integral end bent may be constructed using either of the methods as follows (See Figures 409-2B and 409-2C).

1. Method A. The superstructure beams are placed on and attached directly to the end-bent piling. The entire end bent is then poured at the same time as the superstructure deck. This is the preferred method.

2. Method B. The superstructure beams are set in place and anchored to the previously cast-in-place end-bent cap. The concrete above the previously cast-in-place cap should be poured at the same time as the superstructure deck.

Optional construction joints may be placed in the end bent cap to facilitate construction. An optional joint below the bottom of the beam may be used regardless of bridge length. The optional construction joint at the pavement-ledge elevation shown in Figures 409-2B and 409-2C allows the contractor to pour the reinforced-concrete bridge approach with the bridge deck.

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

1. Width. The width should not be less than 2.5 ft.

2. Cap Embedment. The embedment of the piles into the cap should be 2 ft. The embedded portion ~~should not be wrapped with polystyrene~~ of the pile should be confined with spiral reinforcement as shown in figure 409-XX.

3. Beam Attachment. The beams should be physically attached to the piling if using Method A, or to the cast-in-place cap if using Method B.

4. Beam Extension. The beams should extend at least 1.75 ft into the bent, as 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 should be at least 4 in. This minimum cover should also apply to the pavement-ledge area. The top flanges of structural-steel or prestressed-concrete I-beams may be coped to satisfy this requirement. Where the 4-in. minimum cover cannot be maintained within a 2.5-ft cap, the cap should be widened.