

Appendix A

Survey

A. Summary of Survey Responses

General Questions

1. Do your State Bridge specifications allow debonding of strands in pretensioned concrete girders?

Yes	No	Neutral
27*	6	2*

* According to Nevada DOT, specifications are silent in regards to the use of debonding; therefore, it would not be precluded from use.

In Georgia, strands are always harped even though strand debonding is permitted because there is a concern about whether the specified level of debonding is actually achieved.

2. If your State bridge specifications do not allow debonding, have your State Specifications ever permitted debonding?

No	Yes*
5	1

3. If your State bridge specifications do not allow debonding but at one time permitted it, why was the practice discontinued (please check all that apply)?

No response	Other*
5	1

* According to Maryland DOT, debonding was done on 2 bridges only 20 years back and there is no available information on why and how it was done.

4. What is the local practice for debonding strands (check all that applies)?

Soft sheathing (such as Teflon wrap)	Split plastic sheathing	Preformed plastic tubes	Debonding agents	Other/not known
5	19	11	0	4

1. According to Delaware DOT, specifications do not state debonding type.
2. Michigan DOT currently specifies two split sheaths with seams 180 degrees apart. The state will change to rigid over-sized tubes to get more effective debonding.
3. Missouri DOT specifies use of polyethylene plastic sleeve.

4. According to New Mexico DOT, soft sheathing, and split plastic sheathing needs to be submitted for approval.
5. North Carolina DOT specifies use of HDPE or polypropylene with wall thickness of 0.025 in.

5. How is the detail of the debonding (strands to be debonded, debonding length, staggering of cut offs, etc.) determined?

By the engineer	By the fabricator	By the fabricator unless specified by the engineer	By specification	Multiple
20	1	4	1	1

1. According to Florida DOT, the details are determined by engineer according to FDOT Structure Design.
2. New Hampshire DOT determines details of both debonding and detensioning sequence using both engineer and NHDOT Standard Specifications for Road and Bridge Construction.

6. How is the detensioning sequence specified?

By the engineer	By the fabricator	By the fabricator unless specified by the engineer	By specification	Multiple
1	16	7	1	2

1. New Hampshire specifies detensioning sequence using NHDOT Standard Specifications for Road and Bridge Construction.
2. According to Pennsylvania DOT, detensioning sequence is specified by fabricator for draped strand, and in other cases by publication 408, section 1107.03.

7. Do your state specifications have a preference of harping (deflecting) strands vs. debonding?

Harping	Debonding	Neutral	Harping is not permitted
10	3	13	1

1. According to Montana DOT, debonding is allowed if possible, but harp only if necessary.
2. Ohio DOT currently specifies the use of draped/harped strands in lieu of debonded strands to simplify fabrication. However, ODOT is going to change this specification to require designers to debond up to the limits.

3. According to Pennsylvania DOT, debonding is preferred when deemed practical by the producer.

8. If no method is specified and both harping and debonding are possible, is the local practice to harp or debond strand?

Harp	Debond	Both harp and debond	No consistent local practice	No response
11	7	1*	5	3

* Although not in Massachusetts DOT specifications, harping for boxes and New England Bulb Tees are shown on drawings. For all other shapes, debonding is shown on drawings.

9. What diameters of strand are permitted in your State with or without special permission (please check all which apply)?

Diameter in.	Permitted	Special Permission only	Not used
0.375	4	2	21
0.5	23	2	2
0.6	25	2	0
0.7	0	3	24

1. According to Michigan DOT, 0.375, 0.5 and 0.7-in. diameter strands are not currently used but can be considered if requested.
2. According to Pennsylvania DOT, 0.5 in. special strands are also permitted. 0.375 in. are used for plank beams only but are considering eliminating 0.375 in. at the producing industry's request. Specifications are currently being revised to permit the use of 0.6 in. strands.

I Girders

10. Does your state use I Girders?

Yes	No	Discontinued	No response
23	3	1*	2

*According to Delaware DOT, bulb-T beams are used now in place of I-girders.

1. According to New Mexico DOT, only harped strands are permitted.
2. According to Washington DOT, debonding is not allowed for I-girders.
3. Nebraska DOT specified use of NU I-girders with 0.6-in. strands with a combination of harping and debonding.

11. What is the MAXIMUM number of strands which may be debonded under your State bridge specifications for ANY case (Fill in Blank, use NA if not applicable)?

	% of all strands in member	% of strands in a given row		No. of debonding locations/increments	
	No. of States		No. of States		No. of States
N/A	7	N/A	8	N/A	17
No response	1	No response	1	No response	9
No value	3	No value	3	No value	1
0%	2	0%	2	4	1
25%	9	25%	1	Not more than 4 strands or 40%, whichever is greater, can be terminated at one point.	
30%	1	40%	10		
33%	2	50%	4		
40%	1				
50%	3				

1. Hawaii DOT does not provide any criteria for maximum percent and locations. Acceptance is on a case-by-case basis.
2. According to Mississippi DOT, no limit is set for debonding. Strands are debonded in pairs to the point that the compression is within 5% of allowable design stresses.
3. New Mexico DOT allows only harped strands.
4. According to Indiana DOT, no more than 4 strands or 40% whichever is greater, should be terminated at one point. Debonding termination point stagger in 3 ft increments. Bonded and debonded strands are alternated vertically and horizontally.
5. Strands are arranged in pairs and staggered per Michigan DOT.
6. In Pennsylvania, design manual part 4, section 5.11.4 is used to determine the number of strands in a row.

12. Does this maximum apply in all cases or just in special cases?

	Applies in all cases	Applies only in special cases
	17	
N/A	4	1
No response	1	

13. If the maximum debonding applies only in special cases, what limits apply to typical cases?

In Missouri, the strands are not generally bent in typical bridges. To control excessive stresses due to the prestressing force for some cases, bend strand(s) in accordance with AASHTO LRFD specifications but have not used AASHTO specified maximum debonding limit

14. Have there been inspection reports indicating girder cracking during fabrication that the inspector attributed to debonding?

No	Yes, but the instances are rare (5% of girders or fewer per year)	N/A
17	4	2

15. Have there been inspection reports indicating girder cracking while the girder is in service that the inspector attributed to debonding?

No	Yes, but the instances are rare (5% of girders or fewer per year)	N/A
21*	1	1

*Missouri: To optimize the usage of the bed, fabricator's option is to use same number of strands for same size section (long and short span) and debond unnecessary strand(s) full length. Less than 5% of the time, cracking and significant damage were observed as a result of fabricator's debonding operations.

Bulb T Girders

16. Does your State use Bulb T Girders?

Yes	No	No response
25	3	1

17. Are your answers for Bulb T Girders the same as for I Girders?

Yes	No	No response	N/A
17	8	1	3

18. What is the MAXIMUM number of strands which may be debonded under your State bridge specifications for ANY case (Fill in Blank, use NA if not applicable)?

% of all strands in member	% of strands in a given row
25%	40% 7
8	50% 1

19. Does this maximum apply in all cases or just in special cases?

Applies in all cases	No response
7	1*

* According to Tennessee DOT, 50% bond breaks plus raised (“harped”) strands may be used if shear in bond break zone is designed as reinforced concrete. The vertical component of raised (“harped”) strands can be used.

20. If the maximum debonding applies only in special cases, what limits apply to typical cases?

N/A
8

21. Have there been inspection reports indicating girder cracking during fabrication that the inspector attributed to debonding?

No	Yes, but the instances are rare (5% of girders or fewer per year)
6	1 (Nebraska)

22. Have there been inspection reports indicating girder cracking while the girder is in service that the inspector attributed to debonding?

No	Yes, but the instances are rare (5% of girders or fewer per year)	No response
22	1 (New Hampshire)	1

U (or trapezoidal) Girders

23. Does your State use U (or trapezoidal tub) Girders?

Yes	No	No response
7	20	2

24. Are your answers for U (or trapezoidal tub) Girders the same as for I Girders?

Yes	No	No response	N/A
4	3	2	20

25. What is the MAXIMUM number of strands which may be debonded under your State bridge specifications for ANY case (Fill in Blank, use NA if not applicable)?

% of all strands in member		% of strands in a given row	
25%*	2	40%	2
75%	1	75%	1

* New Mexico: These values are the department’s design requirements but they are not in the specifications.

26. Does this maximum apply in all cases or just in special cases?

Applies in all cases

3

27. If the maximum debonding applies only in special cases, what limits apply to typical cases?

N/A

3

28. Have there been inspection reports indicating girder cracking during fabrication that the inspector attributed to debonding?

No Yes, but the instances are rare (5% of girders or fewer per year)

2

1

29. Have there been inspection reports indicating girder cracking while the girder is in service that the inspector attributed to debonding?

No Yes, but the instances are rare
(5% of girders or fewer per year)

1

1

Box Girders/Voided Slabs

30. Does your State use Box Girders/Voided Slabs Girders?

Yes No No response

22

5

2

31. Are your answers for Box Girders/Voided Slabs Girders the same as for I Girders?

Yes No No response N/A

15

7

2

5

32. What is the MAXIMUM number of strands which may be debonded under your State bridge specifications for ANY case (Fill in Blank, use NA if not applicable)?

% of all strands in member		% of strands in a given row	
25%	6	40%	6
75%	1	75%	1

33. Does this maximum apply in all cases or just in special cases?

Applies in all cases

7

34. *If the maximum debonding applies only in special cases, what limits apply to typical cases?*

N/A

7

35. *Have there been inspection reports indicating girder cracking during fabrication that the inspector attributed to debonding?*

No Yes, but the instances are rare (5% of girders or fewer per year)

36. *Have there been inspection reports indicating girder cracking while the girder is in service that the inspector attributed to debonding?*

No	Yes, but the instances are rare (5% of girders or fewer per year)
6	1

Tee Girders (includes single or double tee, deck bulb tee, or tri beams)

37. *Does your State use Box Girders/Voided Slabs Girders?*

Yes	No	No response
10	18	1

38. *Are your answers for Box Girders/Voided Slabs Girders the same as for I Girders?*

Yes	No	No response	N/A
7	2	2	18

39. *What is the MAXIMUM number of strands which may be debonded under your State bridge specifications for ANY case (Fill in Blank, use NA if not applicable)?*

% of all strands in member	% of strands in a given row
25%	40%
2	2

40. *Does this maximum apply in all cases or just in special cases?*

Applies in all cases
2

41. *If the maximum debonding applies only in special cases, what limits apply to typical cases?*

N/A

2

42. Have there been inspection reports indicating girder cracking during fabrication that the inspector attributed to debonding?

No
2

43. Have there been inspection reports indicating girder cracking while the girder is in service that the inspector attributed to debonding?

No
2