

1. Has your agency observed any wind damage failures of structural supports designed using current specifications?

	Yes	No	Do not know	Respon Coun
Strength	0.0% (0)	100.0% (25)	0.0% (0)	
Fatigue (vortex shedding)	8.0% (2)	88.0% (22)	4.0% (1)	
Fatigue (galloping):	8.0% (2)	92.0% (23)	0.0% (0)	
Truck gusting	0.0% (0)	92.0% (23)	8.0% (2)	
Other	10.5% (2)	78.9% (15)	10.5% (2)	
Comments (optional)				
answered question				
skipped question				

2. Has your agency observed any fatigue-related damage of structural supports designed using 2009 or earlier guidelines? Enter number of structures, if possible. (Or upload data file [here](#) if that is convenient).

Yes/No

	Yes	No	Do not know	Respos Count
Overhead cantilever	46.2% (12)	53.8% (14)	0.0% (0)	2
Overhead bridge	26.9% (7)	73.1% (19)	0.0% (0)	2
Roadside sign	12.0% (3)	76.0% (19)	12.0% (3)	2
Street lighting poles	20.0% (5)	68.0% (17)	12.0% (3)	2
High-level lighting poles	26.9% (7)	57.7% (15)	15.4% (4)	2
Traffic signal poles	12.0% (3)	72.0% (18)	16.0% (4)	2
Span wire supports	0.0% (0)	72.0% (18)	28.0% (7)	2
Other	0.0% (0)	66.7% (8)	33.3% (4)	1

Number (if Yes)

	1-5	5-10	10-20	More than 20	Respos Count
Overhead cantilever	50.0% (5)	40.0% (4)	10.0% (1)	0.0% (0)	1
Overhead bridge	33.3% (2)	16.7% (1)	0.0% (0)	50.0% (3)	
Roadside sign	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	
Street lighting poles	50.0% (2)	50.0% (2)	0.0% (0)	0.0% (0)	
High-level lighting poles	62.5% (5)	0.0% (0)	12.5% (1)	25.0% (2)	
Traffic signal poles	0.0% (0)	33.3% (1)	33.3% (1)	33.3% (1)	
Span wire supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
Other	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	

If yes to any of the previous, what types of structures?

answered question 2

skipped question 1

3. Have any of these structures failed by completely falling to the ground? Enter number of structures is possible. (Or upload data file [here](#) if that is convenient).

Yes/No



	Yes	No	Do not know	Response Count
Overhead cantilever	24.0% (6)	76.0% (19)	0.0% (0)	2
Overhead bridge	4.0% (1)	96.0% (24)	0.0% (0)	2
Roadside sign	16.7% (4)	66.7% (16)	16.7% (4)	2
Street lighting poles	20.8% (5)	58.3% (14)	20.8% (5)	2
High-level lighting poles	16.0% (4)	72.0% (18)	12.0% (3)	2
Traffic signal poles	16.7% (4)	66.7% (16)	16.7% (4)	2
Span wire supports	0.0% (0)	75.0% (18)	25.0% (6)	2
Other	0.0% (0)	77.8% (7)	22.2% (2)	

Number (if Yes)


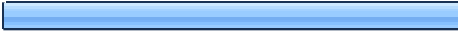
	1-5	5-10	10-20	More than 20	Response Count
Overhead cantilever	100.0% (6)	0.0% (0)	0.0% (0)	0.0% (0)	
Overhead bridge	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	
Roadside sign	75.0% (3)	0.0% (0)	25.0% (1)	0.0% (0)	
Street lighting poles	60.0% (3)	20.0% (1)	0.0% (0)	20.0% (1)	
High-level lighting poles	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	
Traffic signal poles	75.0% (3)	0.0% (0)	25.0% (1)	0.0% (0)	

Span wire supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
Other	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
If yes to any of the previous, what types of structures?				1
answered question				2
skipped question				1

4. Has your agency investigated or used any vibration mitigation measures (devices or practices) for support structures? Please upload information about any devices used [here](#).

		Response Percent	Response Count
Yes		76.0%	19
No		24.0%	6
Comments (optional)			15
answered question			25
skipped question			11

5. Do you have any special details for fatigue resistant designs? If so, please upload detail drawings (PDF is fine) [here](#).

		Response Percent	Response Count
Yes		30.8%	8
No		69.2%	18
Comments (optional)			7
answered question			26
skipped question			10

6. Do you have specifications or practices for connection plate and base plate flatness tolerances? Do different types of structures have specific tolerances?

	Yes	No	Response Count
Overhead cantilever	28.0% (7)	72.0% (18)	25
Overhead bridge	24.0% (6)	76.0% (19)	25
Roadside sign	9.1% (2)	90.9% (20)	22
Street lighting poles	18.2% (4)	81.8% (18)	22
High-level lighting poles	17.4% (4)	82.6% (19)	23
Traffic signal supports	30.4% (7)	69.6% (16)	23
Span wire supports	14.3% (3)	85.7% (18)	21
Other	15.4% (2)	84.6% (11)	13
	If so, please indicate structure types.		9
	answered question		25
	skipped question		11





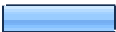
7. For what types of support structures do you use fiber-reinforced composites? Please list:

	Response Count
	24
answered question	24
skipped question	12



8. Do you have FRC performance specifications and/or acceptance testing procedures for them? Do you rely on data provided by the manufacturer? Which manufacturer?

	Yes	No	Response Count
Valmont	0.0% (0)	100.0% (15)	15
Newmark	0.0% (0)	100.0% (15)	15
Whatley	0.0% (0)	100.0% (15)	15
Shakespeare	0.0% (0)	100.0% (15)	15
Other	0.0% (0)	100.0% (11)	11
If so, have the data proven to be reliable?			4
answered question			15
skipped question			21

9. What failures of anchor bolts have you observed?

		Response Percent	Response Count
None		25.0%	6
Anchor Bolts Fatigue		33.3%	8
Anchor Bolts Strength		4.2%	1
Anchor Bolts Corrosion		54.2%	13
Other (please specify)		16.7%	4
Other (please specify)			6
answered question			24
skipped question			12

10. What design criteria and design guidelines for anchor bolts do you use?

		Response Percent	Response Count
AASHTO ACI Appendix D		71.4%	15
Other (please specify)		28.6%	6
	Other (please specify)		9
		answered question	21
		skipped question	15

11. What type of anchor bolts do you use for these respective types of stru

Grade of Steel

	A307	A325
Overhead cantilever	0.0% (0)	9.5% (2)
Overhead bridge	0.0% (0)	10.0% (2)
Roadside sign	6.3% (1)	31.3% (5)
Street lighting poles	6.7% (1)	6.7% (1)
High-level lighting poles	0.0% (0)	12.5% (2)
Traffic signal supports	0.0% (0)	11.8% (2)
Span wire supports	0.0% (0)	0.0% (0)

Bolt Diameter (typical)

	0.5"	0.625"	0.75"	0.875"	1.0"	1.125"	1.25"
Overhead cantilever	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
Overhead bridge	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	6.3% (1)	6.3% (1)
Roadside sign	0.0% (0)	9.1% (1)	27.3% (3)	0.0% (0)	36.4% (4)	0.0% (0)	0.0% (0)
Street lighting poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	70.0% (7)	0.0% (0)	10.0% (1)
High-level lighting poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
Traffic signal supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	7.7% (1)	0.0% (0)	0.0% (0)
Span wire supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	16.7% (1)	0.0% (0)	0.0% (0)

Embedment Length (typical)

	1.0"	1.5"	2.0"	2.5"	3.0"
Overhead cantilever	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	30.0% (3)
Overhead bridge	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	40.0% (4)

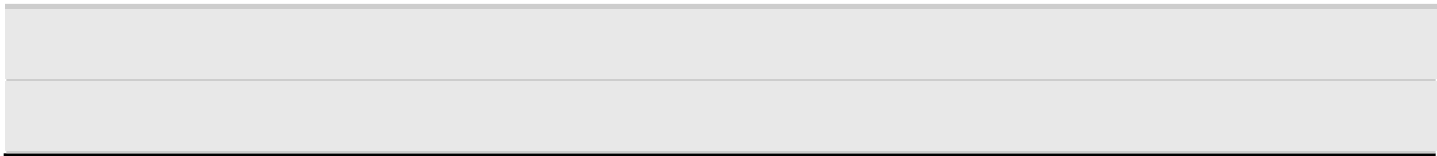
Roadside sign	0.0% (0)	0.0% (0)	0.0% (0)	16.7% (1)	50.0% (3)
Street lighting poles	0.0% (0)	0.0% (0)	12.5% (1)	0.0% (0)	37.5% (3)
High-level lighting poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	12.5% (1)
Traffic signal supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	20.0% (2)
Span wire supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	20.0% (1)

Shape



	Hooked	Straight
Overhead cantilever	27.8% (5)	61.1% (11)
Overhead bridge	29.4% (5)	58.8% (10)
Roadside sign	33.3% (4)	66.7% (8)
Street lighting poles	30.8% (4)	61.5% (8)
High-level lighting poles	30.8% (4)	61.5% (8)
Traffic signal supports	33.3% (5)	46.7% (7)
Span wire supports	12.5% (1)	75.0% (6)

Pretensioned Bolts



	Yes
Overhead cantilever	27.8% (5)
Overhead bridge	29.4% (5)
Roadside sign	23.1% (3)
Street lighting poles	38.5% (5)
High-level lighting poles	38.5% (5)
Traffic signal supports	33.3% (5)
Span wire supports	33.3% (3)








12. Have you observed foundation failures?

		Response Percent	Response Count
Yes		37.5%	9
No		62.5%	15
If you selected 'yes' please state type			10
answered question			24
skipped question			12



13. Does your agency grout under base plates in new designs?

		Response Percent	Response Count
Yes		37.5%	9
No		62.5%	15
Comments (optional)			10
answered question			24
skipped question			12



14. What design criteria and design guidelines for foundations do you use?

		Response Percent	Response Count
AASHTO LRFD		34.8%	8
Broms		52.2%	12
Commercial Software		17.4%	4
FHWA		17.4%	4
Other (please specify)		34.8%	8
		Other (please specify)	11
		answered question	23
		skipped question	13


15. Do you use software to design support structures?

		Response Percent	Response Count
Yes		70.8%	17
No		29.2%	7
		If so, what software?	16
		answered question	24
		skipped question	12


16. Do you perform your own designs? If not please provide additional contact on the next page.

		Response Percent	Response Count
Yes		79.2%	19
No		20.8%	5
answered question			24
skipped question			12



17. Section 1: Introduction

		Response Percent	Response Count
Needs Revision		0.0%	0
Does Not Need Revision		100.0%	21
		Suggestion	2
answered question			21
skipped question			15



18. Section 2: General Features of Design

		Response Percent	Response Count
Needs Revision		0.0%	0
Does Not Need Revision		100.0%	21
		Suggestion	1
		answered question	21
		skipped question	15


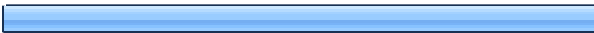
19. Section 3: Loads

		Response Percent	Response Count
Needs Revision		20.0%	4
Does Not Need Revision		80.0%	16
		Suggestion	7
		answered question	20
		skipped question	16

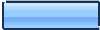

20. Section 4: Analysis and Design - General Considerations

		Response Percent	Response Count
Needs Revision		9.5%	2
Does Not Need Revision		90.5%	19
		Suggestion	4
		answered question	21
		skipped question	15


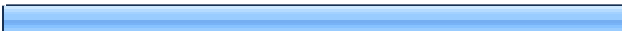
21. Section 5: Steel Design

		Response Percent	Response Count
Needs Revision		10.0%	2
Does Not Need Revision		90.0%	18
		Suggestion	3
		answered question	20
		skipped question	16



22. Section 6: Aluminum Design

		Response Percent	Response Count
Needs Revision		14.3%	3
Does Not Need Revision		85.7%	18
		Suggestion	4
		answered question	21
		skipped question	15


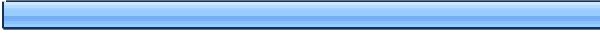
23. Section 7: Prestressed Concrete Design

		Response Percent	Response Count
Needs Revision		5.6%	1
Does Not Need Revision		94.4%	17
		Suggestion	4
		answered question	18
		skipped question	18



24. Section 8: Fiber-Reinforced Composites Design

		Response Percent	Response Count
Needs Revision		5.0%	1
Does Not Need Revision		95.0%	19
		Suggestion	3
		answered question	20
		skipped question	16

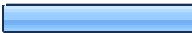
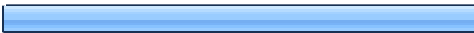
25. Section 9: Wood Design

		Response Percent	Response Count
Needs Revision		9.5%	2
Does Not Need Revision		90.5%	19
		Suggestion	2
		answered question	21
		skipped question	15



26. Section 10: Serviceability Requirements

		Response Percent	Response Count
Needs Revision		14.3%	3
Does Not Need Revision		85.7%	18
		Suggestion	3
		answered question	21
		skipped question	15



27. Section 11: Fatigue Design

		Response Percent	Response Count
Needs Revision		28.6%	6
Does Not Need Revision		71.4%	15
		Suggestion	7
		answered question	21
		skipped question	15

28. Section 12: Breakaway Supports

		Response Percent	Response Count
Needs Revision		4.8%	1
Does Not Need Revision		95.2%	20
		Suggestion	2
		answered question	21
		skipped question	15

29. Section 13: Foundation Design

		Response Percent	Response Count
Needs Revision		13.6%	3
Does Not Need Revision		86.4%	19
		Suggestion	3
		answered question	22
		skipped question	14

30. Does your agency have and use special provisions for the fabrication and/or installation of the following structures. Please provide a web link where a copy can be found or upload the file [here](#).

	Yes	No	Response Count
Overhead Cantilever	66.7% (16)	33.3% (8)	24
Overhead Bridge	66.7% (16)	33.3% (8)	24
Roadside Sign	45.0% (9)	55.0% (11)	20
Street Lighting Pole	47.6% (10)	52.4% (11)	21
High-Level Lighting Poles	57.1% (12)	42.9% (9)	21
Traffic Signal Poles	59.1% (13)	40.9% (9)	22
Span Wire Supports	61.1% (11)	38.9% (7)	18
Other (please explain in comments)	50.0% (2)	50.0% (2)	4
If available, please provide a link to a website where each document can be found.			16
answered question			24
skipped question			12

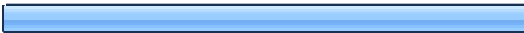
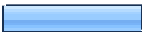
31. Does your agency provide shop inspection for the following structures?

	Yes	No	Response Count
Overhead Cantilever	82.6% (19)	17.4% (4)	23
Overhead Bridge	73.9% (17)	26.1% (6)	23
Roadside Sign	40.0% (8)	60.0% (12)	20
Street Lighting Pole	35.0% (7)	65.0% (13)	20
High-Level Lighting Poles	50.0% (10)	50.0% (10)	20
Traffic Signal Poles	40.0% (8)	60.0% (12)	20
Span Wire Supports	37.5% (6)	62.5% (10)	16
Other (please explain in comments)	40.0% (2)	60.0% (3)	5
	If you selected 'Other' please specify		4
answered question			24
skipped question			12

32. Does your agency perform inspections during installation? If so, how are inspections documented? Please provide a web link where a copy can be found or upload the file [here](#).

	Yes	No	Response Count
Overhead Cantilever	95.7% (22)	4.3% (1)	23
Overhead Bridge	91.3% (21)	8.7% (2)	23
Roadside Sign	85.0% (17)	15.0% (3)	20
Street Lighting Pole	90.0% (18)	10.0% (2)	20
High-Level Lighting Poles	90.0% (18)	10.0% (2)	20
Traffic Signal Poles	95.5% (21)	4.5% (1)	22
Span Wire Supports	93.3% (14)	6.7% (1)	15
Other (please explain in comments)	100.0% (4)	0.0% (0)	4
If you selected 'Other' please specify			11
answered question			24
skipped question			12

33. Have you observed issues with bolt tightness in new construction?

		Response Percent	Response Count
Yes		79.2%	19
No		20.8%	5
Comments (optional)			10
answered question			24
skipped question			12

34. What method is utilized to control anchor rod tightening procedures, i.e., turn of nut method, torque value, etc. Please provide a web link where a copy of the tightening procedure can be found or upload the file [here](#).

	Response Count
	23
answered question	23
skipped question	13

35. What method is utilized to control anchor rod **re**-tightening procedures, i.e., turn of nut method, torque value, etc. Please provide a web link where a copy of the **re**-tightening procedure can be found or upload the file [here](#).

	Response Count
	21
answered question	21
skipped question	15

36. If you have specifications or acceptance testing procedures for fiber-reinforced composite support structures, please provide a web link where a copy of the procedure can be found or upload the file [here](#).

	Response Count
	12
answered question	12
skipped question	24

37. For the typical support structures listed in the table below, please check those that your agency inspects and select the frequency of inspection.

Yes/No				
	Yes	No	Do not know	Respon Coun
Overhead cantilever	77.3% (17)	18.2% (4)	4.5% (1)	
Overhead bridge	77.3% (17)	18.2% (4)	4.5% (1)	
Roadside sign	13.3% (2)	60.0% (9)	26.7% (4)	
Street lighting poles	13.3% (2)	53.3% (8)	33.3% (5)	
High-level lighting poles	77.8% (14)	11.1% (2)	11.1% (2)	
Traffic signal poles	52.6% (10)	36.8% (7)	10.5% (2)	
Span wire supports	25.0% (3)	58.3% (7)	16.7% (2)	
Other	100.0% (1)	0.0% (0)	0.0% (0)	



Frequency							
	6 months	1 year	2 years	3 years	4 years	5+ years	Respon Coun
Overhead cantilever	0.0% (0)	0.0% (0)	11.1% (2)	0.0% (0)	27.8% (5)	61.1% (11)	
Overhead bridge	0.0% (0)	0.0% (0)	11.1% (2)	0.0% (0)	27.8% (5)	61.1% (11)	
Roadside sign	0.0% (0)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	50.0% (1)	
Street lighting poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (2)	
High-level lighting poles	7.7% (1)	0.0% (0)	15.4% (2)	0.0% (0)	23.1% (3)	53.8% (7)	
Traffic signal poles	0.0% (0)	0.0% (0)	10.0% (1)	0.0% (0)	30.0% (3)	60.0% (6)	
Span wire supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (3)	
Other	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	

If you selected 'Other' please specify

answered question

skipped question



38. Does your agency have a reduced inspection frequency for aluminum structures vs. steel structures?

		Response Percent	Response Count
Yes		13.6%	3
No		86.4%	19
	Comments (optional)		6
	answered question		22
	skipped question		14

39. Does your agency have an inspection manual or other guidance regarding the following structure types? Please provide a web link where a copy can be found or upload the file [here](#).

	Yes	No	Response Count
Overhead Cantilever	45.5% (10)	54.5% (12)	22
Overhead Bridge	45.5% (10)	54.5% (12)	22
Roadside Sign	6.7% (1)	93.3% (14)	15
Street Lighting Pole	6.3% (1)	93.8% (15)	16
High-Level Lighting Poles	29.4% (5)	70.6% (12)	17
Traffic Signal Poles	22.2% (4)	77.8% (14)	18
Span Wire Supports	13.3% (2)	86.7% (13)	15
Other (please explain in comments)	33.3% (1)	66.7% (2)	3
If you selected 'Other' please specify. Include web address of any documents related to above selection.			10
answered question			23
skipped question			13

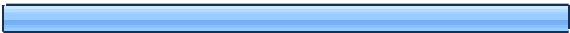

40. If you are an agency that performs regular routine inspections, do you perform element level inspections? If yes, please provide a list of the elements inspected. If no, please describe the type of inspections performed

		Response Percent	Response Count
Yes		42.1%	8
No		57.9%	11
If yes, please provide a list of the elements inspected. If no, please describe the type of inspections performed			14
answered question			19
skipped question			17

41. Please list some common or typical inspection findings.

		Response Count
		19
answered question		19
skipped question		17

42. Have you observed issues with bolt tightness in inspections?

		Response Percent	Response Count
Yes		85.7%	18
No		14.3%	3
	Comments (optional)		10
	answered question		21
	skipped question		15


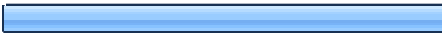
43. For the typical support structures listed in the table below, does your agency perform scheduled maintenance, and if so, at what frequency?

Yes/No							
	Yes	No	Do not know	Response Count			
Overhead cantilever	5.0% (1)	80.0% (16)	15.0% (3)	2			
Overhead bridge	0.0% (0)	85.0% (17)	15.0% (3)	2			
Roadside sign	5.6% (1)	77.8% (14)	16.7% (3)	1			
Street lighting poles	0.0% (0)	77.8% (14)	22.2% (4)	1			
High-level lighting poles	0.0% (0)	82.4% (14)	17.6% (3)	1			
Traffic signal poles	5.3% (1)	84.2% (16)	10.5% (2)	1			
Span wire supports	7.1% (1)	71.4% (10)	21.4% (3)	1			
Other	0.0% (0)	100.0% (1)	0.0% (0)				
Frequency							
	6 months	1 year	2 years	3 years	4 years	5+ years	Response Count
Overhead cantilever	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
Overhead bridge	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
Roadside sign	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
Street lighting poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
High-level lighting poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
Traffic signal poles	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (1)	
Span wire supports	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (1)	
Other	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	



If you selected 'Other' please specify

answered question	2
skipped question	1

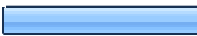

44. Do you repair fatigue-damaged structures? If so, what methods do you typically use?

	Response Percent	Response Count
Yes 	33.3%	8
No 	66.7%	16
Methods		13
answered question		24
skipped question		12

45. Have you developed a maintenance plan, set of procedures, or manual for the retrofit and rehabilitation of fatigue-damaged structures? Please provide a web link where a copy can be found or upload the file [here](#).

	Response Percent	Response Count
Yes 	8.7%	2
No 	91.3%	21
If available, please provide a link to a website where the document can be found.		3
answered question		23
skipped question		13

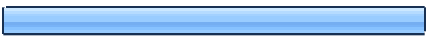

46. If there is someone else in your agency who can provide additional information on retrofit and rehabilitation of fatigue-damaged support structures, select 'yes' and provide their contact information on the next page

		Response Percent	Response Count
Yes		29.2%	7
No		70.8%	17
answered question			24
skipped question			12

47. Does your agency have a centrally maintained file of the following records for the structure types listed?

	Shop Inspection Records	Shop Drawings	Installation Inspection Records	Routine Inspection Records	Other	Response Count
Overhead Cantilever	35.3% (6)	82.4% (14)	11.8% (2)	58.8% (10)	17.6% (3)	17
Overhead Bridge	37.5% (6)	81.3% (13)	12.5% (2)	62.5% (10)	18.8% (3)	16
Roadside Sign	50.0% (3)	66.7% (4)	33.3% (2)	0.0% (0)	0.0% (0)	6
Street Lighting Pole	25.0% (2)	75.0% (6)	37.5% (3)	12.5% (1)	0.0% (0)	8
High-Level Lighting Poles	33.3% (4)	66.7% (8)	16.7% (2)	66.7% (8)	16.7% (2)	12
Traffic Signal Poles	16.7% (2)	75.0% (9)	16.7% (2)	33.3% (4)	8.3% (1)	12
Span Wire Supports	25.0% (2)	62.5% (5)	25.0% (2)	25.0% (2)	12.5% (1)	8
Other, Please Explain	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Other (please specify)						8
answered question						18
skipped question						18






48. Does your agency maintain a database for capturing and retaining inspection data? If yes, specify in the comments whether it was developed in-house or if it is a commercially available program. If you use a commercially available program, what program do you use?

		Response Percent	Response Count
Yes		63.6%	14
No		36.4%	8
	Comments (optional)		16
	answered question		22
	skipped question		14

49. Does your agency maintain a designated Program Manager similar to an NBIS Bridge Program Manager but for ancillary structures. If yes, specify in which department within your agency this person is located in the comments box.

	Yes	No	Response Count
Overhead Cantilever	38.1% (8)	61.9% (13)	21
Overhead Bridge	38.1% (8)	61.9% (13)	21
Roadside Sign	0.0% (0)	100.0% (16)	16
Street Lighting Pole	0.0% (0)	100.0% (16)	16
High-Level Lighting Poles	36.8% (7)	63.2% (12)	19
Traffic Signal Poles	16.7% (3)	83.3% (15)	18
Span Wire Supports	7.1% (1)	92.9% (13)	14
Other (please explain in comments)	0.0% (0)	100.0% (3)	3
If you selected 'Other' please specify. Please specify which department from above.			7
answered question			23
skipped question			13

50. Which, if any, of the following non-destructive testing methods does your agency regularly perform during inspections of ancillary structures?

		Response Percent	Response Count
Dye Penetrant		53.3%	8
Magnetic Particle		46.7%	7
Ultrasonic Thickness Testing		60.0%	9
UT of Anchor Rods		60.0%	9
Other, Please Explain		13.3%	2
If you selected 'Other' please specify.			11
answered question			15
skipped question			21

1. Has your agency observed any wind damage failures of structural supports

Comments (optional)		
1	We have observed occasional movement of arms due to galloping. No permanent damage occurred due to galloping. This structure is under observation.	Nov 4, 2010 1:53 PM
2	NO WIND DAMAGE FAILURES HAVE BEEN OBSERVED.	Nov 9, 2010 8:14 PM
3	The connection bolts on some roadside sign supports were not tightened correctly and failed under 50 mph wind loads.	Nov 10, 2010 8:59 PM
4	In the absence of a tornado event, most wind damage failures occur due to fatigue. The current specifications have not been in place long enough to experience a high number of wind load cycles.	Nov 12, 2010 4:13 PM
5	Two overhead sign trusses carrying DMS cabinets developed cracking and welded aluminum tube to tube joints. The cracking may have been due to wind and fabrication inaccuracies.	Nov 15, 2010 7:40 PM
6	We had a failure of a high mast light tower (100') about 4 years ago because of fatigue. We've had 2 failures of mast arms coming off roadway lights due to fatigue as well.	Nov 18, 2010 5:30 PM
7	In the absence of a tornado event, most wind damage failures occur due to fatigue, the current specifications have not been in place long enough to experience a high number of wind load cycles.	Nov 19, 2010 5:24 PM
8	No	Nov 24, 2010 8:29 PM
9	Not sure what is meant by current specifications? But based on question 2, I assume the 2010 specification is "current". PennDOT has not yet adopted the current specification.	Nov 25, 2010 5:44 PM

2. Has your agency observed any fatigue-related damage of structural supports

If yes to any of the previous, what types of structures?		
1	We do not have high-level lighting poles (more than 50 feet high).	Nov 1, 2010 6:16 PM
2	High-level lighting poles and traffic signal mast arms.	Nov 5, 2010 12:30 PM
3	Some redundant member weld cracking on old span and cantilever sign trusses designed in the '60's and '70's.	Nov 5, 2010 6:18 PM
4	Bridge mounted luminaires failure during windstorm. Similar structures were removed after discovery of broken anchor bolts.	Nov 8, 2010 4:14 PM
5	Have some failures - contact us for detail	Nov 8, 2010 8:59 PM
6	Two overhead cantilever structures had fatigue related damages (connection mast to pole) when fatigue was not part of design prior to 2001. Also, the wind speed used for these structure was not in accordance with the latest AASHTO map used for wind speed in that region.	Nov 9, 2010 2:07 PM
7	Cantilever structures were mostly 4-bolt structures. Overhead bridge: (1) - aluminum 4-chord truss, (2) 2-chord structures with clamped connection failure, (5) various multi-chord structures with cracked trussing- chord connections or cracked chord-chord connections.	Nov 9, 2010 7:40 PM
8	WE HAD OBSERVED FAILURES ON STREET LIGHTING ALUMINUM POLES. HENCE WE DO NOT USE THEM ON OUR HIGHWAY SYSTEM	Nov 9, 2010 8:14 PM
9	(1) Cracking induced by fabrication processes (galvanization) at weld toes has been detected near the weld toes of end plates of high-mast poles. The detection was via non-standard ultrasonic evaluation methods. Growth of a few of these cracks have been observed over time. (2) Aluminum luminaire poles attached to a bridge on the coast were subjected to a combination of traffic induced and wind induced vibrations. No dampers had been installed. The poles basically ripped themselves apart. That were replaced with steel poles containing dampers. (3) The most common known wind induced damage to structural supports in Texas is at the toe of the weld of end plates connecting mast arms to traffic signal pole uprights. There have been a number of failures of such connections.	Nov 9, 2010 9:38 PM
10	Tennessee's fatigue related damage has occurred only to cantilever signs. With the exception of the I-65 sign failure near Franklin, it has been the result of anchor bolt failure. Several years ago, we embarked on a program to install four (4) additional anchor bolts to the tension side of all existing four (4) bolt pattern cantilever signs.	Nov 12, 2010 4:13 PM
11	The aluminum tri-chord structures have had fatigue cracks at the diagonal to chord locations. the aluminum weld has cracked. Roadside signs and street lighting poles have fallen, but not sure of the cause. (seen but not recorded)	Nov 12, 2010 8:39 PM
12	A single cantilever overhead structure exhibited fatigue cracking that extended from maintenance damage to the inspection handhole.	Nov 15, 2010 3:13 PM
13	Overhead Cantilever: Aluminum Truss Overhead Bridge: Aluminum Truss Roadside Sign: Steel W-Shape High-Level Lighting Poles: Steel tapered flat-sided tube	Nov 15, 2010 7:40 PM
14	Anchor bolts failed for the cantilever attached to a bridge in 2008. Mast arms are fatiguing off roadway lights from a certain manufacturer. We've had 2 to this date. 1 HMLT fatigued and fell parallel to the road about 4 years ago.	Nov 18, 2010 5:30 PM
15	Overhead sign trusses on bridge spans, fatigue damage to sign truss due to combination of truck gusts and bridge span deflection. We are paying close attention to these in our designs.	Nov 19, 2010 4:09 PM
16	Tennessee's fatigue related damage has occurred only to cantilever signs. With the exception of the I-65 sign failure near Franklin, it has been the result of anchor bolt failure. Several years ago, we embarked on a program to install four additional anchor bolts to the tension side of an existing four (4) bolt pattern cantilever signs.	Nov 19, 2010 5:24 PM

2. Has your agency observed any fatigue-related damage of structural supports

If yes to any of the previous, what types of structures?

17	The Overhead Sign Structures which have this issue are almost exclusively Aluminum sign structures; however, our high mast light poles are weathering steel.	Nov 24, 2010 8:29 PM
18	Overhead bridge - tri chord truss system Light poles - standard designs, not aware of any issues with ornamental light poles High level lighting poles - poles made with weathering steel; note current practice since mid 1990s has been galvanized poles	Nov 25, 2010 5:44 PM

3. Have any of these structures failed by completely falling to the ground?

If yes to any of the previous, what types of structures?

1	Roadside signs on round pipe or w-shape with break away bases. Highmast light tower.	Nov 4, 2010 10:01 PM
2	Traffic signal mast arms.	Nov 5, 2010 12:30 PM
3	Some aluminum light poles mass failed at one location due to a horizontal wind event about 10 years ago. Fatigue cause was uncertain, bad fabrication practices may have been the root cause.	Nov 5, 2010 6:18 PM
4	Bridge mounted luminaire failure during windstorm.	Nov 8, 2010 4:14 PM
5	2-chord cantilever signs with 2 signals for nearby fire department. Probably more of a design issue vs fatigue.	Nov 9, 2010 7:40 PM
6	(1) Aluminum luminaire poles attached to a bridge on the coast were subjected to a combination of traffic induced and wind induced vibrations. No dampers had been installed. The poles basically ripped themselves apart. That were replaced with steel poles containing dampers. (2) Some high mast poles fell to the ground but the failure was due to mismatched nuts and anchor bolts causing the nuts to strip off the bolt threads. (3) Traffic signal pole mast arms have failed fairly regularly over three decades.	Nov 9, 2010 9:38 PM
7	Roadside Sign Supports - loose connections Wood Posts - Under designed Cobra Head Illumination - Corrosion at base	Nov 10, 2010 8:59 PM
8	Tennessee has had 3 structures fail by completely falling to the ground. All were cantilever signs. Two involved failure of the anchor bolts and may have had residual damage from the 1998 East Nashville tornado. One (I-65) was a classic fatigue failure in the pole to base plate weld.	Nov 12, 2010 4:13 PM
9	We had 1 span type overhead sign collapse that caused a fatality. We had at least 1 overhead cantilever fall to the ground. Items marked Do Not Know here are under Highway jurisdiction, not the Office of structures	Nov 12, 2010 8:39 PM
10	High-level lighting: Steel tapered flat-sided tube Roadside Sign: Interstate W-shape steel posts fell - wind may have been the cause.	Nov 15, 2010 7:40 PM
11	The 100' high mast light tower fell parallel to the highway about 4 years ago.	Nov 18, 2010 5:30 PM
12	Tennessee has had 3 structures fail by completely falling to the ground. All were cantilever signs. Two involved failure of the anchor bolts and may have had residual damage from the 1998 East Nashville tornado. One (I-65) was a classic fatigue failure in the pole to base plate weld.	Nov 19, 2010 5:24 PM

1. Has your agency investigated or used any vibration mitigation measures

Comments (optional)		
1	The device proved ineffective and the sign was replaced to my recollection	Nov 4, 2010 8:46 PM
2	Aluminum sign trusses - dog bone dampers traffic signal mast arms - horizontal sign blanks light poles - internal dampers mfg. supplied	Nov 5, 2010 6:22 PM
3	Used vibration damper on sign bridges (span 60' - 150').	Nov 8, 2010 4:14 PM
4	Mitigation devices were used as weights or aluminum plates attached to the masts for manufacturer's warranty. In general, mitigation devices are not considered in the design calculations.	Nov 9, 2010 2:23 PM
5	(1) A damper plate (sign blank) is typically attached to 40-ft and longer mast arms though research has shown that larger sign blanks than are being attached are needed to be effective at preventing galloping. Other research indicates that such damper plates are not effective at mitigating vortex shedding induced vibrations. To date, no standard details of such damper plates have been issued though such a standard is pending. (2) Manufacturers of light poles, especially aluminum poles, typically provide an internal damper device.	Nov 9, 2010 9:38 PM
6	Signal Pole exhibiting small amounts of galloping and a 3'x2.5' sign blank was installed horizontally at the end of the arm.	Nov 10, 2010 8:59 PM
7	Will upload Standard Drawing showing vibration dampener on mast arms >=50' later	Nov 10, 2010 9:50 PM
8	Vibration dampers	Nov 10, 2010 11:57 PM
9	prior to 2002, used by maintenance, not design	Nov 12, 2010 8:41 PM
10	Per Specifications, only allowed for Aluminum Light Poles.	Nov 15, 2010 2:53 PM
11	We have studied but not employed the use of a flat-mounted sign panel for mitigation of galloping behavior, if it should be observed in the future.	Nov 15, 2010 3:43 PM
12	Used ALCOA damper on aluminum trusses. Installed a few dampers on light poles on the US 34 bridge at Burlington and conducted some testing but results were inconclusive http://www.iowadot.gov/bridge/special_projects/Burlington_report_final_rev.pdf	Nov 15, 2010 7:00 PM
13	Do not know	Nov 19, 2010 3:27 AM
14	PennDOT design standards are available on the internet. See Publications 218M, 219M, 148, 149, 647	Nov 25, 2010 5:50 PM
15	Horizontal sign blanks used in a few applications.	Nov 29, 2010 10:30 PM

2. Do you have any special details for fatigue resistant designs? If so, please

Comments (optional)		
1	Working on research project for this	Nov 8, 2010 9:00 PM
2	(1) The MAC standard provides the details of the mast arm to pole connection. Thicker plates were used beginning in 2009 in response to research and the number of failures experienced. (2) To address the need for long (exceeding 44-ft) mast arms TxDOT developed the LMA standard and using the fatigue recommendations of the NCHRP research that was incorporated into the 2001 AASHTO LTS Specifications. The poles were not redesigned to the 2001 Specification but were designed in accordance with the 1994 LTS Specifications and the fatigue design recommendations of NCHRP Report 412.	Nov 9, 2010 9:38 PM
3	On our cantilever shown on TM622 we use a cope under the arm to transition the loads.	Nov 10, 2010 8:59 PM
4	Will upload Rick Crawford's Cantilever Sign Details later	Nov 10, 2010 9:50 PM

2. Do you have any special details for fatigue resistant designs? If so, please

Comments (optional)		
5	All of our Overhead sign structures are now designed for fatigue.	Nov 12, 2010 8:41 PM
6	DMS Roadside Support has special post to cross arm detail http://www.iowadot.gov/bridge/standards/english/DMSRoadsideSupport.pdf Light towers have doubler plate at hand hole http://www.iowadot.gov/design/SRP/IndividualStandards/erm44.pdf	Nov 15, 2010 7:00 PM
7	See question 1	Nov 25, 2010 5:50 PM

3. Do you have specifications or practices for connection plate and base plate

If so, please indicate structure types.		
1	We follow the AISC specification	Nov 4, 2010 1:53 PM
2	General steel specifications have flatness requirements for base plates, ANSI B46.1, Surface Roughness and Lay, Part 1. However, all traffic structure base plates are up off the concrete and connected to anchor bolts using double nuts, so flatness is irrelevant.	Nov 5, 2010 6:22 PM
3	We have notes on our drawings call for the clearance between bottom of the leveling nuts and top of the concrete to be equal or greater than one bolt diameter or the amount specified for that particular design or drawing. Otherwise bending stresses in anchor bolts should be considered in the design. Generally speaking, for adequate stiffness of the base plate thickness is designed to be equal or greater than one bolt diameter.	Nov 9, 2010 2:23 PM
4	MAST ARM SIGNAL POLE FLANGE PLATE SURFACES SHALL BE PLANE WITHIN 1/6" TOLERANCE LIMITS	Nov 9, 2010 8:16 PM
5	(1) 1/8" in 24" off of perpendicular of pole and base plate. Not really a flatness tolerance. (2) 3/16" in 24" for traffic signal pole connection plates.	Nov 9, 2010 9:38 PM
6	High strength bolted connections are required to be tightened until the plate come into complete contact.	Nov 10, 2010 8:59 PM
7	Plates need only comply with dimensional tolerances specified in ASTM A6 (5.14.3)	Nov 10, 2010 9:50 PM
8	We use the AWS D1.1 straightness tolerance of 1/8" per 10 feet for all steel fabrication. Minnesota does not use span wire supports.	Nov 15, 2010 3:43 PM
9	I do not know about the rest	Nov 19, 2010 3:27 AM

1. For what types of support structures do you use fiber-reinforced composites?

Response Text		
1	To my knowledge, we have none.	Nov 1, 2010 6:21 PM
2	None	Nov 4, 2010 1:53 PM
3	None	Nov 4, 2010 8:46 PM
4	None	Nov 4, 2010 10:01 PM
5	N/A	Nov 5, 2010 1:22 PM
6	The material is allowed for standard light poles, but has not been used.	Nov 5, 2010 6:25 PM
7	NONE	Nov 8, 2010 4:15 PM
8	N/A	Nov 9, 2010 2:24 PM

1. For what types of support structures do you use fiber-reinforced composites?

Response Text		
10	NONE	Nov 9, 2010 8:17 PM
11	None	Nov 9, 2010 9:38 PM
12	None	Nov 10, 2010 8:59 PM
13	Tennessee has not used fiber reinforced composites for support structures.	Nov 10, 2010 9:50 PM
14	We do not use FRC	Nov 10, 2010 11:58 PM
15	Currently, we only use FRP for repairs to our overhead sign structures.	Nov 12, 2010 8:43 PM
16	None; An evaluation was done prior to my tenure and the decision at the time was not to implement.	Nov 15, 2010 2:54 PM
17	Some local system owners (county and municipal) use FRC light poles, but Mn/DOT does not.	Nov 15, 2010 4:44 PM
18	None	Nov 15, 2010 7:00 PM
19	We don't use them in Kansas yet.	Nov 18, 2010 5:31 PM
20	none	Nov 19, 2010 3:27 AM
21	None	Nov 19, 2010 4:12 PM
22	None	Nov 24, 2010 8:30 PM
23	None	Nov 25, 2010 5:50 PM
24	Currently not being used. Trial installations of composite lighting poles did not perform well.	Nov 29, 2010 10:31 PM

2. Do you have FRC performance specifications and/or acceptance testing

If so, have the data proven to be reliable?		
1	There are 3 questions up there. To the 1st question, we don't have specifications. To the 2nd, we would depend on whatever manufacturer supplying the material subject to our review of their calculations.	Nov 1, 2010 6:21 PM
2	There is a section in the specification - see Section 1069.05 at link http://www.dot.il.gov/desenv/spec2007/div1000.pdf	Nov 5, 2010 6:25 PM
3	NOT APPLICABLE AS WE DO NOT USE FRC STRUCTURES.	Nov 9, 2010 8:17 PM
4	N/A	Nov 24, 2010 8:30 PM

1. What failures of anchor bolts have you observed?

Other (please specify)		
1	Collision.	Nov 1, 2010 7:07 PM
2	DUE TO IMPROPER INSTALLATION.	Nov 9, 2010 8:31 PM
3	We have had bolts strip out due to overtapped nuts. See answer to "Division I: Design - Damage" question 3.	Nov 9, 2010 10:19 PM
4	Overtightening for ground mounted signs	Nov 11, 2010 12:02 AM
5	Abrasion from shifting structures	Nov 15, 2010 5:24 PM
6	The anchor bolt fatigue has been observed on some light poles and traffic signals. For overhead sign structures, several years ago, PennDOT tested a series of cantilever sign structure anchors bolts using UT in the field. The structures have been in service for at least 15 years. We found no signs of fatigue.	Nov 25, 2010 6:03 PM

2. What design criteria and design guidelines for anchor bolts do you use?

Other (please specify)		
1	AASHTO	Nov 4, 2010 8:50 PM
2	AASHTO Standard Specifications for structural supports for highway signs, luminaires, and traffic signals.	Nov 4, 2010 10:05 PM
3	AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (AASHTO SSSSHSLTS)	Nov 5, 2010 6:29 PM
4	AASHTO sign specifications	Nov 9, 2010 7:45 PM
5	AASHTO 2009 Section 5.17.4.2 and NCHRP 412 examples.	Nov 10, 2010 8:59 PM
6	AASHTO Appendix C, AASHTO Std Spec. for Structural Supports for Highway Signs, Luminaires, and Traffic Signs	Nov 12, 2010 8:49 PM
7	Design performed by fabricator/manufacturer.	Nov 15, 2010 2:59 PM
8	The design standards do not identify the criteria. The designs were completed over 30 years ago.	Nov 15, 2010 5:24 PM
9	NCHRP 469	Nov 15, 2010 7:24 PM

3. What type of anchor bolts do you use for these respective types of

Comments (optional)		
1	For street light poles, our standard plans show stainless steel (ASTM ???). For other structures, our standard plans call our AASHTO M314 (not sure of ASTM equivalent). For sign bridges, shape of anchor bolts noted as hooked, however, our detail actually has welded plates at the ends.	Nov 1, 2010 7:07 PM
2	F1554 GR55	Nov 4, 2010 1:53 PM
3	We use a ASTM 1554, Generally Grade 50. We have a wide variety of anchor bolt diameters	Nov 4, 2010 8:50 PM
4	Overhead Cantilever: AASHTO M314 - Grade 55 - 17d Overhead Bridge: AASHTO M314 - Grade 55 - 17d Roadsign: AASHTO M314 - Grade 55 ---- Bolt Diameter 3/4" to 1 1/2"	Nov 4, 2010 10:05 PM
5	ASTM 1554 - Grade 55	Nov 5, 2010 1:48 PM
6	F1554, Grade 105, diameters, lengths, shapes vary. Either straight or hooked is still used for light poles and traffic signal mast arms. Straight anchor bolts have nuts at embedded end	Nov 5, 2010 6:29 PM
7	Anchor bolts Specification ASTM F1554 Grade 36, 55 & 105 for overhead cantilever, sign bridge, street light pole, High-level lighting, Traffic signal pole & span wire. Transpo breakaway bolts assembly used for roadside signs (Transpo breakaway assembly approved by FHWA and meets requirements of NCHRP Report 350)	Nov 8, 2010 4:16 PM
8	Anchor bolts shall conform to ASTM F1554 Grade 55, hot dip galvanized in accordance to AASHTO M232, ASTM A153	Nov 9, 2010 2:32 PM
9	STRAIGHT ANCHOR BOLTS WITH ANCHOR PLATES AT BOTTOM. ANCHOR BOLTS CONFORM TO F 1554 GRADE 55 S1 WITH MINIMUM 55 KSI YIELD STRESS.	Nov 9, 2010 8:31 PM

3. What type of anchor bolts do you use for these respective types of

Comments (optional)		
10	(1) Overhead cantilever & Overhead bridge Connection bolts between truss members: A 325 and A 490 (5/8" and 3/4") Anchor Bolts = F 1554, Gr 55 (A 193 B7) (1 1/2" thru 3") (2) Street lighting poles (anchor bolts) for 105 ksi: A325, A193-B7 (F 1554, Gr 55), A490 (1 1/4" and 1 1/2") for 55 ksi: F 1554, Gr 55 (A 193 B7) (1 1/4" and 1 1/2") (3) High-level lighting poles for 55 ksi: F 1554, Gr 55 (A 193 B7) (2 1/4") (4) Traffic signal supports and Span wire supports for 55 ksi: F 1554, Gr 55 (A 193 B7) (1 1/2" thru 2 1/4")	Nov 9, 2010 10:19 PM
11	F1554 Gr. 55 for the Cantilevers, bridges, High Level Lighting, some street lighting, Traffic Signals, and Span Wires. A449 for some street lighting and High-Level Lighting Poles. Embedment length is in feet and not inches as shown.	Nov 10, 2010 8:59 PM
12	Embedment lengths of anchor bolts normally vary anywhere from 36" to 84" except for roadside signs. We used max. length of 5" as default but it is not representative of our structures. Bolt diameters represent average values, not minimums or maximums. We normally use ASTM F1554 anchor bolts (Grade 55)	Nov 10, 2010 9:50 PM
13	A-36 for overhead, roadside sign designed by manufacturer.	Nov 11, 2010 12:02 AM
14	F1554 Gr. 50, varies, varies, heavy hex - bolt diameters and embedment vary with span length, height, sign panel area and other design criteria	Nov 12, 2010 8:49 PM
15	AASHTO M314, Grade 36 or 55. Also allow the use of ASTM F-1554.	Nov 15, 2010 2:59 PM
16	OH cantilever - F1554 Gr 36 - 2.5" dia.; OH bridge - F1554 Gr 36 - 2.25" dia.; Roadside breakaway signs use pile post footings, post attached to flange with A325 bolts; Barrier-mounted light poles - F1554 Gr 55 anchor cages; High-level light poles and Traffic signals - F1554 Gr 105.	Nov 15, 2010 5:24 PM
17	Grade of Steel - ASTM F-1554 Overhead Cantilever - Bolt Diameter 2.25 in - Embedment Length 5.75 ft. Overhead bridge - Embedment Length 4.5 ft. High-Level lighting poles - Bolt Diameter 1.75 & 2.25 in. - Embedment Length 7.5 ft.	Nov 15, 2010 7:24 PM
18	Bolts are AASHTO M314 Grade 55. Embedment lengths are 8'-0" for cantilevers and high level lighting poles.	Nov 18, 2010 7:33 PM
19	I don't remember the specifics of overhead cantilever and overhead bridge anchor bolts that we use here in Utah	Nov 19, 2010 3:28 AM
20	Fy = 55 ksi anchor bolts for cantilever and overhead bridge. Roadside signs use a generic slip base design with the bottom portion of the connection embedded in a drilled shaft.	Nov 19, 2010 4:55 PM
21	The embedment length is specified on the standards. PennDOT uses F1554 material for anchor bolts. PennDOT uses an embedded plate for the anchor bolts for overhead and cantilever sign structures.	Nov 25, 2010 6:03 PM
22	Roadside signs - A449 bolts used with safety (breakaway) base. Other structures - M314 of F1554 bolts specified. Don't understand the embedment length options - is this possibly supposed to be in feet?	Nov 29, 2010 10:52 PM

1. Have you observed foundation failures?

If you selected 'yes' please state type		
1	Passive failure.	Nov 1, 2010 7:31 PM
2	Anchor Bolt pull-out failure	Nov 4, 2010 1:54 PM
3	tilting of a drilled shaft	Nov 4, 2010 10:45 PM
4	Drilled Shafts: Poor concrete consolidation; Insufficient number of stirrups to resist torsion	Nov 5, 2010 1:58 PM
5	Spalls, Cracks, Sectional loss, Loss/Corrosion of rebars	Nov 9, 2010 3:11 PM
6	Signal pole in poor soil tilted - underdesigned for conditions	Nov 10, 2010 8:59 PM
7	Insufficient depth in fill situation.	Nov 10, 2010 9:50 PM
8	construction problems locating foundation correctly	Nov 12, 2010 8:57 PM
9	Drilled Shaft (Caisson)	Nov 15, 2010 3:30 PM
10	grout is broken up, and concrete foundation cracks	Nov 18, 2010 7:41 PM

2. Does your agency grout under base plates in new designs?

Comments (optional)		
1	Actually yes and no. For overhead sign structures and traffic signal structures, we don't grout. Light poles (under 50 ft.) and other "small" structures are optional.	Nov 1, 2010 7:31 PM
2	Structures installed prior to 2003 were installed with grout under the base plate.	Nov 4, 2010 1:54 PM
3	For roadway signs, grout is placed as stated in NDDOT Spec 754.03 E4.	Nov 4, 2010 10:09 PM
4	Discontinued years ago because it retained moisture and promoted rapid deterioration of steel and concrete.	Nov 5, 2010 6:32 PM
5	Grouting under base plates is allowed when specific conditions warrant. This grout is not considered load carrying for design, and adequate drainage shall be provided in those cases.	Nov 9, 2010 3:11 PM
6	Signal poles and light poles use grout under the base plate with a drain hole.	Nov 10, 2010 8:59 PM
7	Grout retains moisture and contributes to anchor bolt corrosion.	Nov 10, 2010 9:50 PM
8	double nut for leveling under base plate with bird/rodent screen - earlier designs allowed water retention inside posts	Nov 12, 2010 8:57 PM
9	It is still on the standard plans - once the plans are updated we plan to stop grouting in new designs	Nov 18, 2010 7:41 PM
10	Only for cantilever and overhead sign trusses.	Nov 19, 2010 4:56 PM

3. What design criteria and design guidelines for foundations do you use?

Other (please specify)		
1	AASHTO Standard Specification for Structural Supports	Nov 4, 2010 10:09 PM
2	AASHTO SSSSHSLTS	Nov 5, 2010 6:32 PM
3	.	Nov 8, 2010 4:17 PM
4	WE USE AASHTO ASD METHOD	Nov 9, 2010 8:35 PM
5	L Pile	Nov 10, 2010 8:59 PM

3. What design criteria and design guidelines for foundations do you use?

Other (please specify)		
6	<p>2001 and 2009 Signing and Lighting Specifications both refer back to the "Standard Specifications for Highway Bridges" which is an allowable stress design method, not LRFD.</p> <p>Cantilever and overhead bridge signs are designed by the sign fabricator based on site specific soil investigations.</p> <p>Under our current policy, high level lighting pole foundations are designed by the lighting consultant hired by TDOT for the development of the contract plans. They are responsible for performing the soil investigation.</p> <p>We utilize a standard foundation design for light poles 30'-50' (T-L-1)</p> <p>Traffic signal and span wire supports are designed using an in house program developed by Neil-Schaffer specifically for TDOT. The program determines footing depths based on the 4th Edition of the Signing and Lighting Specifications and a side bearing pier foundation formula obtained from a Civil Engineering magazine article historically used by TDOT. Conservative soil parameters are assumed depending on whether the pole is located east or west of the Tennessee River. The program publishes both results and we normally list the larger value on the contract plans.</p>	Nov 10, 2010 9:50 PM
7	Broms for drilled shafts, AASHTO ASD for spread footings, AASHTO Std Spec for OSS - section 13	Nov 12, 2010 8:57 PM
8	No specific method required by Specification, design is per manufacturer/fabricator.	Nov 15, 2010 3:30 PM
9	AASHTO Standard Specifications for Highway Bridges	Nov 15, 2010 7:25 PM
10	The Standard Foundations are designed by AASHTO Std. Spec. (ASD). Our Standards are under revision & they will then be designed in accordance with AASHTO LRFD	Nov 24, 2010 8:38 PM
11	PennDOT developed Sign Program for spread footings. Drilled shafts we use LPILE	Nov 25, 2010 6:05 PM

1. Do you use software to design support structures?

If so, what software?		
1	BRASS-POLE V3.4 and 4.0, STAAD latest version, Excel	Nov 4, 2010 1:54 PM
2	STAAD.Pro 2007 - Overhead Signs	Nov 4, 2010 10:09 PM
3	In-house developed software available off our website	Nov 5, 2010 2:00 PM
4	STAAD for analysis	Nov 5, 2010 6:33 PM
5	Spreadsheets.	Nov 8, 2010 4:17 PM
6	Each consultant /contractor use different commercial or their own software.	Nov 9, 2010 3:18 PM
7	Sabre	Nov 9, 2010 7:48 PM
8	UNIVERSITY OF MARYLAND- SABRE	Nov 9, 2010 8:36 PM
9	TxDOT legacy programs OSB6, COSS1, BMCOL51, etc.	Nov 9, 2010 10:22 PM
10	Pole Analysis Program. Internal spreadsheets and a signal design program written in Visual Basic. Changing to LRFD would require a significant expenditure.	Standard BD sheets also include design tables
11	In house program developed by Neil Schaffer (Traffic signal and span wire structures only)	design tables
12	Excel spreadsheet developed for us by Parsons-Brinckeroff ~ 2001	

Nov 10, 2010 8:59 PM

Nov 10, 2010 9:50 PM Nov 12, 2010 9:04 PM

1. Do you use software to design support structures?

If so, what software?		
13	STAAD	Nov 15, 2010 7:25 PM
14	SABRE and STAAD	Nov 19, 2010 4:57 PM
15	PennDOT Sign Program	Nov 25, 2010 6:06 PM
16	BRASS Pole LPile	Nov 29, 2010 10:55 PM

1. Section 1: Introduction

Suggestion		
1	The only revisions that is warranted is converting to LRFD and having consistency with other AASHTO design specifications (such as design load calculations, design equations, etc.).	Nov 1, 2010 8:26 PM
2	Our department uses the 4th edition of AASHTO.	Nov 4, 2010 1:54 PM

2. Section 2: General Features of Design

Suggestion		
1	2.4.2.4 - We strongly discourage using a planar truss on a cantilevered structure to support a VMS. There are unaccounted loads causing out-of-plane bending stresses.	Nov 12, 2010 10:06 PM

3. Section 3: Loads

Suggestion		
1	Add a verbal description of when tc (transverse component) load is required for each structure type. Currently only the figures give this information.	Nov 5, 2010 2:24 PM
2	OK for ASD, load factor for LRFD.	Nov 8, 2010 4:18 PM
3	New structures designed in and for Tennessee utilize the wind loadings found in Chapter 3. However, we have many older structures that were designed using the alternative method for wind pressures found in Appendix C.	Nov 10, 2010 9:50 PM
4	C3.6 What does the statement "For OSHA-compliant agencies, additional requirements may apply" mean? We found out that our VMS cabinets are being designed for a 5000 lb fall arrest load. If the cabinet must be designed for this then how is it possible that the OSS needn't be designed for this load? The cabinets are required to be designed with this load at each door, so does the structure need to be designed for this load x 2 ? AASHTO should address this issue one head on.	Nov 12, 2010 10:06 PM
5	Remove Alternate Wind Charts.	Nov 15, 2010 3:51 PM
6	Compare wind loads with ASCE 7. Overhead sign loads have larger drag coefficients in ASCE 7.	Nov 15, 2010 7:25 PM
7	Update with ASCE Wind maps and provide examples for special wind region "judgment"	Nov 24, 2010 8:47 PM

4. Section 4: Analysis and Design - General Considerations

Suggestion		
1	Just move to LRFD for ASD design with no major conceptual changes. Same comment for Sections 5 thru 9.	Nov 10, 2010 9:50 PM
2	Keep the code simple. Do not require 3D or EF models.	Nov 12, 2010 10:06 PM
3	For overhead signs structurally attached to bridges and in particular located on long spans, more guidance is needed on design to reflect issues with deflection of the bridge span in combination with truck and wind gusts and the fatigue issues with designing these types of sign structures.	Nov 19, 2010 5:00 PM
4	Brief guidance for wind load mitigation measures and/or damper application	Nov 24, 2010 8:47 PM

5. Section 5: Steel Design

Suggestion		
1	OK for ASD, however changes for LRFD	Nov 8, 2010 4:18 PM
2	1. Section 5.5.2 Width Thickness Ratios - In Table 5-1, the compact limits for the width - thickness ratios seem inconsistent for round tubes vs. other shapes (e.g. E/Fy vs. square root of E/Fy). Also, calculation of "b" seems overly complex. 2. AASHTO Std Spec for OSS Section 5.7.1.2; eqn 5-2 to eqn 5-5: need an equation for allowable bending stress for a double angle.	Nov 12, 2010 10:06 PM
3	see comment 4 above	Nov 19, 2010 5:00 PM

6. Section 6: Aluminum Design

Suggestion		
1	OK for ASD, however changes for LRFD	Nov 8, 2010 4:18 PM
2	NOT APPLICABLE	Nov 9, 2010 8:37 PM
3	see comment no. 4	Nov 19, 2010 5:00 PM
4	Verify aluminum resistance with post-weld heat treatment	Nov 24, 2010 8:47 PM

7. Section 7: Prestressed Concrete Design

Suggestion		
1	OK for ASD, however changes for LRFD	Nov 8, 2010 4:18 PM
2	NOT APPLICABLE	Nov 9, 2010 8:37 PM
3	Iowa does not use.	Nov 15, 2010 7:25 PM
4	see comment no. 4	Nov 19, 2010 5:00 PM

8. Section 8: Fiber-Reinforced Composites Design

Suggestion		
1	NOT APPLICABLE	Nov 9, 2010 8:37 PM
2	Iowa does not use.	Nov 15, 2010 7:25 PM
3	Provide more details for designers	Nov 24, 2010 8:47 PM

9. Section 9: Wood Design

Suggestion		
1	OK for ASD, however changes for LRFD	Nov 8, 2010 4:18 PM
2	Incorporate some of the design values from the National Design Specifications (NDS) from Wood Construction. There is a 1.6 factor that can be used for short term wind and seismic loads instead of using the 1/3 increase.	Nov 10, 2010 9:00 PM

10. Section 10: Serviceability Requirements

Suggestion		
1	May want to incorporate recommendation in NCHRP Report 412 that vertical displacements at the tips of cantilevered structures be limited to 8 in. Right now code just references Article 11.8 which stated deflections shall not be so excessive as to result in serviceability problem. All current deflections and cambers appear to be set mainly on aesthetic limits. This section touches on vibration dampeners, maybe the code should provide additional guidance in this area.	Nov 10, 2010 9:50 PM
2	See comment no. 4	Nov 19, 2010 5:00 PM
3	Include information/guidance vibration control (damping)	Nov 24, 2010 8:47 PM

11. Section 11: Fatigue Design

Suggestion		
1	Table 11-2, footnote b criteria affecting branching members (1.5 x main member stress, out of plane) is either too conservative or ambiguous and may lead to grossly excessive designs.	Nov 5, 2010 6:37 PM
2	Expand illustrative examples of fatigue resistant details. Municipalities constantly request longer and longer mast arms (90'). Do we want to establish a maximum limit?	Nov 10, 2010 9:50 PM
3	Need to incorporate current research to help reduce the requirements of this section on structures. May need to clarify the Importance factor section. Currently, this has to be set by each state based on their individual requirements	Nov 15, 2010 3:51 PM
4	Latest research needs to be included.	Nov 15, 2010 7:25 PM
5	see comment no. 4	Nov 19, 2010 5:00 PM
6	Higher (40'-60') aluminum lighting poles need fatigue design or min. thickness requirements. When NCHRP 10-71 is completed, its findings will need to be	evaluated & updates to this guidance will

be necessary

Nov 24, 2010 8:47 PM

11. Section 11: Fatigue Design

Suggestion

- | | | |
|---|---|-----------------------|
| 7 | Basis for fatigue design requirements is sound. However the need for fatigue provisions is a difficult sell to many State and local representatives considering we have not experienced problems. | Nov 29, 2010 10:58 PM |
|---|---|-----------------------|

12. Section 12: Breakaway Supports

Suggestion

- | | | |
|---|---|----------------------|
| 1 | These are certified devices. Manufacturer is responsible for submitting to FHWA for review (NCHRP 350 TL-3) | Nov 10, 2010 9:50 PM |
| 2 | More details on Struct. performance and breakaway dynamic performance | Nov 24, 2010 8:47 PM |

13. Section 13: Foundation Design

Suggestion

- | | | |
|---|---|----------------------|
| 1 | OK for ASD, however changes for LRFD | Nov 8, 2010 4:18 PM |
| 2 | Many designers use LPile and the top deflection is used to design the foundation. The design deflection is typically 1/2", but based on the Broms' design results the allowable deflection looks like it could be more. | Nov 10, 2010 9:00 PM |
| 3 | Needs to be consistent with LRFD | Nov 24, 2010 8:47 PM |

1. Does your agency have and use special provisions for the fabrication and/or

If available, please provide a link to a website where each document can be found.

- | | | |
|---|--|---------------------|
| 1 | http://www.ncdot.org/doh/preconstruct/traffic/ITSS/
Click on PSP - Current Version (V6.7) | Nov 4, 2010 1:54 PM |
| 2 | All fabricators must have a QA/QC program approved by the FDOT. | Nov 5, 2010 4:30 PM |
| 3 | http://www.dot.il.gov/desenv/spec2007/div1000.pdf
Sections 1069, 1070, 1076, 1077, 1093, 1094
http://www.dot.il.gov/desenv/spec2007/div800.pdf
Sections 830, 835, 836, 837, 838, 872, 877, 878
http://www.dot.il.gov/desenv/spec2007/div700.pdf
Sections 727, 733, 734, | Nov 5, 2010 7:04 PM |
| 4 | http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/SS2010.pdf | Nov 8, 2010 4:42 PM |
| 5 | http://www.dot.state.ri.us/documents/engineering/BlueBook/CD-Bluebook.pdf | Nov 9, 2010 3:48 PM |
| 6 | SEE STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS IN SHA WEB SITE | Nov 9, 2010 9:48 PM |

1. Does your agency have and use special provisions for the fabrication and/or

If available, please provide a link to a website where each document can be found.

7	<p>Links to TxDOT Standard Specifications (SS) and Special Provisions (SP) for:</p> <p>(1) OVERHEAD SIGN SUPPORTS SS: ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/specs/2004/standard/s650.pdf SP: http://www.dot.state.tx.us/apps/specs/ShowAll.asp?year=3&type=SP&number=650</p> <p>(2) Street Lighting Pole (ROADWAY ILLUMINATION ASSEMBLIES) SS: ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/specs/2004/standard/s610.pdf SP: http://www.dot.state.tx.us/apps/specs/ShowAll.asp?year=3&type=SP&number=610</p> <p>(3) High-Level Lighting Poles (HIGH MAST ILLUMINATION POLES) SS: ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/specs/2004/standard/s613.pdf SP: http://www.dot.state.tx.us/apps/specs/ShowAll.asp?year=3&type=SP&number=613</p> <p>(4) Traffic Signal Poles (TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)) SS: ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/specs/2004/standard/s686.pdf SP: http://www.dot.state.tx.us/apps/specs/ShowAll.asp?year=3&type=SP&number=686</p> <p>(5) Span Wire Supports (See item 4)</p>	Nov 9, 2010 11:05 PM
8	<p>http://www.tdot.state.tn.us/construction/specbook/2006/spec700.pdf http://www.tdot.state.tn.us/construction/specbook/2006/spec900.pdf</p> <p>see Section 713-Highway Signing Section 714-Roadway and Structure Lighting Section 730-Traffic Signals Section 916-Highway Signing Materials Section 917-Roadway and Structure Lighting Materials</p>	Nov 10, 2010 9:51 PM
9	<p>NYSDOT Standards Specifications - Construction and Materials - Section 644 https://www.nysdot.gov/main/business-center/engineering/specifications/english-spec-repository/section600.pdf</p>	Nov 12, 2010 10:28 PM
10	<p>http://www.virginia-dot.org/business/resources/const/2007SpecBook.pdf; Section 700 and http://www.extranet.vdot.state.va.us/LocDes/Electronic%20Pubs/2008Standards/CSection1300.pdf</p>	Nov 15, 2010 4:22 PM
11	<p>Mn/DOT uses prescriptive standard plans, standard plates, and standard construction specifications for all of the above. I can provide links to our current standards at a later time.</p>	Nov 15, 2010 6:16 PM
12	<p>http://www.iowadot.gov/specifications/provisions/2010/SP-090069.pdf</p>	Nov 15, 2010 7:26 PM
13	<p>I believe i uploaded what i could find. the link to the standard provisions is below. http://www.ksdot.org/burconsmain/specprov/2007/722.pdf http://www.ksdot.org/burconsmain/specprov/2007/812.pdf</p>	Nov 18, 2010 8:11 PM
14	<p>http://www.state.nj.us/transportation/eng/documents/BDC</p>	Nov 24, 2010 8:51 PM
15	<p>See PennDOT Publication 408 for construction requirements for these structures.</p>	Nov 25, 2010 6:09 PM
16	<p>NDOT Standard Specifications can be accessed at http://www.nevadadot.com/business/contractor/Standards/</p>	Nov 29, 2010 11:06 PM

2. Does your agency provide shop inspection for the following structures?

If you selected 'Other' please specify		
1	NCDOT Materials and Test group	Nov 4, 2010 1:54 PM
2	WSDOT shop inspects overhead cantilever and overhead bridge "as needed" to ckeck welds, and assembly of the sign structures.	Nov 8, 2010 4:42 PM
3	Our agency requires certification and inspection of cantilever and overhead sign structures by an approved independent testing agency. Traffic signal, span wire supports and lighting items just require mill test reports and certification of conformance to the specification. (See Chart 1 Section 730.04 of TDOT Standard Specifications linked above.)	Nov 10, 2010 9:51 PM
4	For Roadway signs - the steel posts are inspected. Wood posts are not inspected.	Nov 18, 2010 8:11 PM

3. Does your agency perform inspections during installation? If so, how are

If you selected 'Other' please specify		
1	Inspections are generally documented with field log of inspectors.	Nov 1, 2010 8:39 PM
2	NCDOT Resident Engineer office does the inspection. Traffic signal supports are visually inspected twice a year under a PM and then the state performs a 5-year periodical pole inspection.	Nov 4, 2010 1:54 PM
3	Varies among the 9 District offices, but most likely doesn't occur. With budget and staff shortages, the inspection of new structures probably doesn't get done until they can be included in an inspection contract.	Nov 5, 2010 7:04 PM
4	http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-01/Construction.pdf	Nov 8, 2010 4:42 PM
5	SEE STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS IN SHA WEB SITE	Nov 9, 2010 9:48 PM
6	Resident project engineer oversees installation of signs, traffic signals and lights. He/she generally documents problems in their field notes. If serious problems arise, they will consult with Structures Division for recommendation.	Nov 10, 2010 9:51 PM
7	NMDOT Construction Inspectors	Nov 11, 2010 12:07 AM
8	The structures are inspected by Construction Inspectors while and after the structures are erected.	Nov 12, 2010 10:28 PM
9	Inspection is always specified, but is infrequently performed.	Nov 15, 2010 6:16 PM
10	Inspection field diary.	Nov 25, 2010 6:09 PM
11	NDOT Construction Manual can be accessed at http://www.nevadadot.com/divisions/040/ .	Nov 29, 2010 11:06 PM

4. Have you observed issues with bolt tightness in new construction?

Comments (optional)		
1	There could be some issues but I have not heard of them.	Nov 1, 2010 8:39 PM
2	Our specification includes a nut tightening procedure. Refer to PSP V6.7 (see NCDOT link above).	Nov 4, 2010 1:54 PM
3	Some roadside sign supports have been loose as commented from District. Seldom, but does happen.	Nov 4, 2010 10:13 PM
4	Some issues, not widespread.	Nov 5, 2010 7:04 PM
5	Anchor nuts are frequently not tightened to our specifications.	Nov 8, 2010 4:42 PM

4. Have you observed issues with bolt tightness in new construction?

Comments (optional)		
6	LEVELLING NUTS NOT FULLY TIGHTENED, TOP NUTS NOT TIGHTENED, AND MISSING WASHERS	Nov 9, 2010 9:48 PM
7	(1) We have had trouble with overhead sign bridges loosing nuts due to vibration after construction. It seems that the nuts were never properly tightened in the first place. (2) With double nuts on base plates there has been situations where either top nuts or bottom nuts were found to be loose.	Nov 9, 2010 11:05 PM
8	Also discovered during 1st post construction inspection (4 years later). Issued instructions to Construction Inspectors to check prior to contract acceptance.	Nov 12, 2010 10:28 PM
9	Recent safety inspections of OH signs showed a large percentage had loose anchors. Newer installations were worse than older ones. Evidence from weathering of threads shows that most of the loose anchors were never tightened.	Nov 15, 2010 6:16 PM
10	But our guidance is not real clear, which we are working on	Nov 24, 2010 8:51 PM

5. What method is utilized to control anchor rod tightening procedures, i.e., turn

Response Text		
1	Our specifications are not clear. Generally turn of nut method.	Nov 1, 2010 8:39 PM
2	Turn of the Nut method verified by torque. Follow up retightening within two weeks after structure is loaded. Refer to PSP V6.7.	Nov 4, 2010 1:54 PM
3	Torque Value - Overhead Signs - Spec Book 754.03 E.5.c.(2)	Nov 4, 2010 10:13 PM
4	Turn of Nut Method	Nov 4, 2010 10:57 PM
5	We use the Turn-Of-Nut method recommended by FHWA in the Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaries, and Traffic Signals.	Nov 5, 2010 4:30 PM
6	A torque value is specified	Nov 5, 2010 7:04 PM
7	WSDOT Standard Specification Section 6-03.3(33) - Minimum bolt Tension or Turn of nut method, http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/Division6.pdf	Nov 8, 2010 4:42 PM
8	Turn of nut method and / or Torque value specified by design	Nov 9, 2010 3:48 PM
9	turn of nut method. Standard Specifications 605.14 http://www.deldot.gov/information/pubs_forms/manuals/standard_specifications/pdf/division_601-605-39.pdf	Nov 9, 2010 7:59 PM
10	TURN OF NUT METHOD	Nov 9, 2010 9:48 PM
11	Per TxDOT Standard Specifications, Item 449, ANCHOR BOLTS SS: ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/specs/2004/standard/s449.pdf	Nov 9, 2010 11:05 PM
12	Turn of the nut is used for the sign bridges, cantilevers, signals, and illumination. The slip base supports used a torquing method.	Nov 10, 2010 9:00 PM
13	Top nut is torqued so as to produce 60% yield stress of anchor bolt. Will upload copy of STD-8-4 later.	Nov 10, 2010 9:51 PM
14	Torque value - standard specs and drawings. Can get them from our website.	Nov 11, 2010 12:07 AM
15	Double nutting and specific torque requirements in section 644-3.06E https://www.nysdot.gov/main/business-center/engineering/specifications/english-spec-repository/section600.pdf	Nov 12, 2010 10:28 PM
16	Turn of nut; Upload link did not work on our system will e-mail file.	Nov 15, 2010 4:22 PM

5. What method is utilized to control anchor rod tightening procedures, i.e., turn

Response Text		
17	Our standard specifications call out a torque value for OH sign anchors. I recently wrote a special provision requiring turn-of-the-nut, adapted from FHWA NHI 05-036, Section 6.9.	Nov 15, 2010 6:16 PM
18	Turn of nut weblink BDM Commentary C10.2.5 http://www.iowadot.gov/bridge/standards/english/OverheadSignTruss.pdf	Nov 15, 2010 7:26 PM
19	We are in the process of writing a new standard provision addressing anchor rod tightening procedures. Turn of the nut, and hydraulic wrenches will be used.	Nov 18, 2010 8:11 PM
20	specs	Nov 19, 2010 3:31 AM
21	turn of nut tension requirement	Nov 24, 2010 8:51 PM
22	Turn of nut. See Publication 408, section 948	Nov 25, 2010 6:09 PM
23	As specified by the pole manufacturer.	Nov 29, 2010 11:06 PM

6. What method is utilized to control anchor rod <font

Response Text		
1	Same comment as above.	Nov 1, 2010 8:39 PM
2	Turn of the Nut method verified by torque. Follow up retightening within two weeks after structure is loaded. Refer to PSP V6.7.	Nov 4, 2010 1:54 PM
3	Torque - Spec Book 754.03 E.5.c(5)	Nov 4, 2010 10:13 PM
4	Turn of Nut	Nov 4, 2010 10:57 PM
5	N/A	Nov 5, 2010 4:30 PM
6	Torque value given on design plans.	Nov 5, 2010 7:04 PM
7	Follow WSDOT Standard Specification Section 6-03.3(33) for re-tightening procedures.	Nov 8, 2010 4:42 PM
8	Construction note provided in all shop drawings that states "Pretensioning of all anchor nuts is required and shall be accomplished by tightening to 1/6 turn beyond the snug tight turn."	Nov 9, 2010 3:48 PM
9	turn of nut method.	Nov 9, 2010 7:59 PM
10	TIRN OF NUT METHOD	Nov 9, 2010 9:48 PM
11	Per TxDOT Standard Specifications, Item 449, ANCHOR BOLTS SS: ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/specs/2004/standard/s449.pdf	Nov 9, 2010 11:05 PM
12	I believe the same method of the original tightening is used. No procedures exist.	Nov 10, 2010 9:00 PM
13	Top nut is torqued so as to produce 60% yield stress of anchor bolt.	Nov 10, 2010 9:51 PM
14	Torque value - standard specs and drawings. Can get them from our website.	Nov 11, 2010 12:07 AM
15	Same as #5 above. Also turn of the nut by Maintenance forces.	Nov 12, 2010 10:28 PM
16	Upload link did not work on our system will e-mail file.	Nov 15, 2010 4:22 PM
17	See answer to question 5 above.	Nov 15, 2010 6:16 PM
18	See #5	Nov 15, 2010 7:26 PM
19	specs	Nov 19, 2010 3:31 AM
20	both	Nov 24, 2010 8:51 PM
21	Procedure not developed.	Nov 29, 2010 11:06 PM

7. If you have specifications or acceptance testing procedures for fiber-

Response Text		
1	None available.	Nov 1, 2010 8:39 PM
2	N/A	Nov 4, 2010 10:13 PM
3	N/A	Nov 5, 2010 4:30 PM
4	see previous link to 1069.05.	Nov 5, 2010 7:04 PM
5	Not applicable - WSDOT does use fiber-reinforced composite sign structures.	Nov 8, 2010 4:42 PM
6	N/A	Nov 9, 2010 3:48 PM
7	NOT APPLICABLE	Nov 9, 2010 9:48 PM
8	No.	Nov 10, 2010 9:51 PM
9	Do not have any	Nov 11, 2010 12:07 AM
10	No	Nov 15, 2010 4:22 PM
11	N/A	Nov 15, 2010 6:16 PM
12	N/A	Nov 24, 2010 8:51 PM

1. For the typical support structures listed in the table below, please check

If you selected 'Other' please specify		
1	Some of our overhead structures have been recently inspected for the first time. We have no plan at this time as to when they will be inspected again.	Nov 1, 2010 11:20 PM
2	A visual inspection is performed twice a year by traffic signal technicians.	Nov 4, 2010 2:15 PM
3	Recommended guidelines are in the Operations Manual. Frequency is 5 years for most, but any found with deficiencies will be inspected more frequently.	Nov 5, 2010 7:23 PM
4	Cantilever with 4 anchor bolts; inspection frequency = 4 years	Nov 8, 2010 4:50 PM
5	N/A	Nov 9, 2010 3:50 PM
6	There is no statewide maintenance inspection program and no statewide inventory database for these structures. Various districts have conducted their own inspections for maintenance and/or inventory. Also, in the case of high mast poles the TxDOT Construction Division has coordinated a one-time statewide inspection of TxDOT owned structures and is monitoring some of the inspected poles.	Nov 9, 2010 11:06 PM
7	There is an inspection program to inspect these structures, but it is in the Bridge Section and Bridges are inspected first. This results in these structures are not inspected as often as they should be. The Electricians typically look at the light and signal poles, but there is no official training for them. The sign maintenance crew looks at the roadside sign support, but there is not official training for them.	Nov 10, 2010 9:00 PM
8	Only a limited 3 of High Mast Lights have been inspected and frequency has not been determined. Only Traffic Signal Poles that cantilever over state highways are inspected by us.	Nov 12, 2010 10:42 PM
9	For 4-bolt overhead cantilevers, require an ultra-sound of anchor bolts every 2 years.	Nov 15, 2010 4:22 PM
10	High-level lighting poles - frequency - 6 months and 4 years.	Nov 15, 2010 7:31 PM

2. Does your agency have a reduced inspection frequency for aluminum

Comments (optional)		
1	N/A	Nov 9, 2010 3:50 PM
2	Every year	Nov 9, 2010 8:04 PM
3	NOT APPLICABLE. NO ALUMINUM STRUCTURES.	Nov 9, 2010 9:48 PM
4	Reduced inspection frequency is determined by condition and can be down to annually.	Nov 12, 2010 10:42 PM
5	Aluminum is used only in street lighting poles. We use steel only for all other traffic structures.	Nov 15, 2010 6:36 PM
6	Unless we uncover issues during our four year inspection cycle, then we would perform inspection more often	Nov 24, 2010 8:59 PM

3. Does your agency have an inspection manual or other guidance regarding the

If you selected 'Other' please specify. Include web address of any documents related to above selection.		
1	Guidance for inspection of overhead structures not available.	Nov 1, 2010 11:20 PM
2	Your upload may not have worked. A file was selected but the uploader said there was none. Try this link: https://insideidot.portal.illinois.gov/sites/bridge/PDF/Sign%20Structure%20Inspection%20Manual%2012-12-03.pdf If this doesn't work, send an email and the file will be sent via email.	Nov 5, 2010 7:23 PM
3	N/A	Nov 9, 2010 3:50 PM
4	High-Level Lighting Poles http://onlinemanuals.txdot.gov/txdotmanuals/hwi/high_mast_lighting_inspection_and_servicing.htm	Nov 9, 2010 11:06 PM
5	Not on external web will e-mail file.	Nov 15, 2010 4:22 PM
6	The sign inspection manual is in development, about 80% complete. The completed sections are shared with the inspectors.	Nov 15, 2010 6:36 PM
7	Manual was prepared by Collins Engineers, Inc. and presented to the office in 2003.	Nov 15, 2010 7:31 PM
8	We've had the same firm from Canada inspect our structures the last two times over 8 years.	Nov 18, 2010 8:16 PM
9	www.state.nj.us/transportation/eng/structeval/downloadads.shtm we also have various non-networked guidance documents	Nov 24, 2010 8:59 PM
10	PennDOT Publication 238 has inspection requirements for overhead and cantilever sign structures.	Nov 25, 2010 6:13 PM

4. If you are an agency that performs regular routine inspections, do you

If yes, please provide a list of the elements inspected. If no, please describe the type of inspections performed		
1	Visual inspection	Nov 5, 2010 7:23 PM
2	Element level inspections are under development.	Nov 8, 2010 4:50 PM
3	N/A	Nov 9, 2010 3:50 PM
4	Visual inspection.	Nov 9, 2010 8:04 PM
5	FOUNDATION, ANCHOR BOLT, BASE PLATE, POST, POST TO CHORD CONNECTION PLATES AND BOLTS, SPAN OR ARM, CHORD SPLICE BOLTS AND PLATES, SIGN ATTACHMENTS, SIGN CLIPS, SIGN CONDITION ,	ELECTRICAL WIRING , TOWER CAP AND CHORD

4. If you are an agency that performs regular routine inspections, do you

If yes, please provide a list of the elements inspected. If no, please describe the type of inspections performed

6	One element in PONTIS is used for Large Traffic Structures. Comments are made about the conditions.	Nov 10, 2010 9:00 PM
7	base of pole including welds anchor bolts	Nov 10, 2010 9:52 PM
8	Visual, fatigue cracking	Nov 11, 2010 12:15 AM
9	Foundation, Base Plate, Anchor Bolts, Guiderail protection, Posts, Connection to Posts, Arm/Truss, Sign Panels, Surface Coating, Attachments. Includes Shake test to see if structure moves beyond expected movement.	Nov 12, 2010 10:42 PM
10	See sample report provided via e-mail	Nov 15, 2010 4:22 PM
11	Recent OH sign inspections were performed at ground-level with the overhead elements visually inspected with binoculars. Elements are: Foundation concrete, anchor rods, base plate, post steel, truss steel. Similar inspections are performed on signal and high-mast light poles.	Nov 15, 2010 6:36 PM
12	It is similar to elements level inspections but it's not similar to Pontis. Burgess engineering has their own system of inspections.	Nov 18, 2010 8:16 PM
13	the elements are listed in the FHWA Guide Manual	Nov 24, 2010 8:59 PM
14	Inspection of our entire overhead sign, (signal?) and high mast lighting inventory performed approximately 2 years ago to assess overall condition and performance. Frequency of reinspections has not been determined.	Nov 29, 2010 11:22 PM

5. Please list some common or typical inspection findings.

Response Text		
1	We have performed only one inspection so it is not unusual that corrossions was the biggest issue especially at the base plates. As expected lead paint an issue. Also because of the age of most of our sign structures, capacity to withstand the current design loads an issue.	Nov 1, 2010 11:20 PM
2	Corrosion issues loose bolts Impact damage	Nov 4, 2010 11:00 PM
3	Poor grout pad installation Stand-off distance greater than one bplt diameter Leveling nuts not engaged Rusted anchor bolts	Nov 5, 2010 4:50 PM
4	Corroded steel supports on 3 to 40 year old structures. Some weld cracks on redundant members of old aluminum sign trusses, although most have been replaced due to age and deterioration, so this is not seen as much. Some loose connection bolts are reported.	Nov 5, 2010 7:23 PM
5	Improperly tightened anchor nuts, anchor bolt corrosion, weld shrinkage cracks at tubular truss connections, freeze burst aluminum truss members.	Nov 8, 2010 4:50 PM
6	N/A	Nov 9, 2010 3:50 PM
7	Corrosion of anchor bolts and pole bases. Loose bolts. Crack and/or spalled grout pads. Cracked and/or spalled foundation pedestals.	Nov 9, 2010 8:04 PM
8	EROSION AROUND FOUNDATIONS, CRACKS IN FOUNDATION, RUSTING OF ANCHOR BOLTS AND MISSING SIGN CLIPS	Nov 9, 2010 9:48 PM
9	Loose or corroded bolts. Foundations that are covered by soil and debris.	Nov 10, 2010 9:00 PM

5. Please list some common or typical inspection findings.

Response Text		
10	corroded anchor bolts loose nuts	Nov 10, 2010 9:52 PM
11	minor corrosion	Nov 11, 2010 12:15 AM
12	Entire sign structure is inspected, all elements. Typical findings are loose anchor bolts, debris in posts, corrosion at post base (measurements taken).	Nov 12, 2010 10:42 PM
13	loose anchor bolts; missing washers	Nov 15, 2010 4:22 PM
14	Loose anchors, grouted base plates, corroded anchors and nuts, partially buried footing and base plate, missing or loose connection bolts (truss-to-post). Uncommon findings include fully buried footings, post and/or truss impact damage, coating failure of post and/or truss.	Nov 15, 2010 6:36 PM
15	Cracked welds at aluminum tube to tube connections	Nov 15, 2010 7:31 PM
16	loose anchor bolts in the high mast light towers, loose bolts on the overhead trusses, some collision damages, some missing or broken truss members in the overhead trusses, cracks in the splice for the remaining weather steel high mast light towers.	Nov 18, 2010 8:16 PM
17	fatigue cracks in welds, loose bolts, impact damaged sign panels. missing shims	Nov 24, 2010 8:59 PM
18	During the initial inspection of sign structures which occurred in the mid 1990s, We found many cracked bolts that connected the aluminum sign to the galvanized metal support beam. The bolts were made of aluminum. Lehigh University did an investigation on the dissimilar material issue.	Nov 25, 2010 6:13 PM
19	Missing or loose hardware.	Nov 29, 2010 11:22 PM

6. Have you observed issues with bolt tightness in inspections?

Comments (optional)		
1	Loose leveling nuts	Nov 4, 2010 2:15 PM
2	Some, but not widespread.	Nov 5, 2010 7:23 PM
3	Anchor nuts not tightened to our specification during construction is our single largest finding; this occurs on 90% of our cantilevers and sign bridges.	Nov 8, 2010 4:50 PM
4	N/A	Nov 9, 2010 3:50 PM
5	Frequently.	Nov 9, 2010 8:04 PM
6	See comments for "Division II: Construction" question 4.	Nov 9, 2010 11:06 PM
7	Some of the anchor rod nuts are loose. They are typically inspected with tapping a hammer on them to hear a "ting" for tight or a "Thud" for loose sound.	Nov 10, 2010 9:00 PM
8	loose nuts	Nov 10, 2010 9:52 PM
9	See comments to #4 and #5 above.	Nov 12, 2010 10:42 PM
10	truss chord flange bolts have occasionally been found to be loose	Nov 24, 2010 8:59 PM

7. For the typical support structures listed in the table below, does your agency

If you selected 'Other' please specify		
1	Maintenance as necessary	Nov 4, 2010 11:00 PM
2	Maintenance may occur after inspections find poor conditions, but not regularly scheduled.	Nov 5, 2010 7:23 PM
3	N/A	Nov 9, 2010 3:50 PM

7. For the typical support structures listed in the table below, does your agency

If you selected 'Other' please specify		
4	No scheduled maintenance but if something is found to be defective during inspection, it will be corrected.	Nov 10, 2010 9:52 PM
5	Not aware of any scheduled maintenance	Nov 11, 2010 12:15 AM
6	Maintenance is done as needed, no specific frequency is known at this time.	Nov 12, 2010 10:42 PM
7	We are moving towards a set-aside program for ancillary structures. We are trying to get one established.	Nov 18, 2010 8:16 PM
8	Maintenance is performed based on inspection findings.	Nov 25, 2010 6:13 PM

1. Do you repair fatigue-damaged structures? If so, what methods do you

Methods		
1	We would repair them if known to exist.	Nov 1, 2010 11:22 PM
2	Signal on State Street replaced bolts that were fatigued.	Nov 4, 2010 10:18 PM
3	Mostly not, they are usually old enough to be ready for replacement. Some re-welding of aluminum was attempted in the past, but outdoor conditions were not conducive to quality welding.	Nov 5, 2010 7:25 PM
4	Fatigue-damaged structures/anchor bolts being replaced with new structures/anchor bolts.	Nov 8, 2010 4:51 PM
5	Total replacement.	Nov 9, 2010 8:05 PM
6	(1) In the case of traffic signal mast arms we replace the arm, but other owners in Texas have repaired the arms by lifting and welding without consulting with TxDOT. (2) In the case of high mast poles we are in the process of developing procedures for repairing in service poles that exhibit galvanizing induced cracking.	Nov 9, 2010 11:11 PM
7	Fatigue damaged structures are typically replaced. If we can change from cantilever to overhead sign structure, we will.	Nov 10, 2010 9:52 PM
8	The internal truss members of span type aluminum overhead sign structures are repaired using one of two approved Fiber Reinforced Polymer (FRP) systems.	Nov 12, 2010 10:45 PM
9	Typically remove from service.	Nov 15, 2010 4:23 PM
10	None noted. The OH sign with the handhole crack was removed and replaced.	Nov 15, 2010 6:38 PM
11	Replacement or, for high-level lighting poles, reinforcing	Nov 15, 2010 7:32 PM
12	Typically replace structure or repair welds.	Nov 19, 2010 5:06 PM
13	Temporary repairs such as carbon fiber wraps and diwidag bars	Nov 24, 2010 9:00 PM

2. Have you developed a maintenance plan, set of procedures, or manual for the

If available, please provide a link to a website where the document can be found.		
1	This is on an as-needed basis.	Nov 9, 2010 8:05 PM
2	Procedures under development but not yet formalized.	Nov 9, 2010 11:11 PM
3	Engineering Instruction 07-015 https://www.nysdot.gov/portal/pls/portal/mexis_app.pa_ei_eb_admin_app.show_pdf?id=6767	Nov 12, 2010 10:45 PM

1. Does your agency have a centrally maintained file of the following records for

Other (please specify)		
1	None of those records are centrally located and maintained.	Nov 1, 2010 11:25 PM
2	We are developing centrally maintained records for overhead and cantilever sign structures -shop drwgs and routine inspection records	Nov 4, 2010 11:04 PM
3	Official records are kept at each of the 9 District offices. Central office has a limited inventory of overhead sign structure plans and shop drawings.	Nov 5, 2010 7:27 PM
4	NDT reports.	Nov 9, 2010 8:08 PM
5	Project Inspection reports are with the construction documents and the shop drawings stay with the Engineer of Records Files. We are investigating having the final shop drawings sent in to a central location for archiving.	Nov 10, 2010 9:00 PM
6	Only maintain shop drawings on street lighting for poles 30'-50' in height.	Nov 10, 2010 9:52 PM
7	As-builts	Nov 24, 2010 9:05 PM
8	Construction records for each installation filed with contract documents, no special file maintained. Inspection records for individual structures haven't been developed.	Nov 29, 2010 11:26 PM

2. Does your agency maintain a database for capturing and retaining inspection

Comments (optional)		
1	In-house	Nov 4, 2010 2:19 PM
2	modified Sign-View by Cartograph	Nov 4, 2010 11:04 PM
3	Some Districts may have developed their own database in Microsoft Access.	Nov 5, 2010 7:27 PM
4	Developed in-house	Nov 8, 2010 4:52 PM
5	Developed by our inspection consultant. It is an access database format.	Nov 9, 2010 8:08 PM
6	DATA BASE DEVELOPED IN-HOUSE	Nov 9, 2010 9:48 PM
7	ODOT uses PONTIS and one cell is used for the large support structures.	Nov 10, 2010 9:00 PM
8	In house database (TRIMS) Contains general comments regarding highway feature, this is not a core element database	Nov 10, 2010 9:52 PM
9	In house	Nov 11, 2010 12:18 AM
10	Recently developed by Consultant. It is being updated and completed by OSS inspectors each year. This is the first of a four year cycle of inspections to completely update.	Nov 12, 2010 10:56 PM
11	Developed by a Consultant.	Nov 15, 2010 4:24 PM
12	In development	Nov 15, 2010 6:40 PM
13	Developed by Collins Engineers, Inc. in spreadsheet format it will be in SIIMS (InspecTech) soon.	Nov 15, 2010 7:34 PM
14	The database was developed by the consultants who inspected our ancillary structures. The arc-editor in ARC-GIS is used.	Nov 18, 2010 8:22 PM
15	In-house developed	Nov 24, 2010 9:05 PM
16	Overhead and cantilever sign structures are recorded and data stored in the bridge management system	Nov 25, 2010 6:16 PM

3. Does your agency maintain a designated Program Manager similar to an NBIS

If you selected 'Other' please specify. Please specify which department from above.

1	The Bridge Preservation Engineer - within the Bridge & Structures Office.	Nov 8, 2010 4:52 PM
2	DelDOT bridge inspection program manager also oversees the overhead sign structure inspection program.	Nov 9, 2010 8:08 PM
3	OFFICE OF TRAFFIC AND SAFETY, TRAFFIC ENGINEERING DESIGN DIVISION	Nov 9, 2010 9:48 PM
4	Overhead Sign Structure Inspections (and the database) fall under the supervision of the Bridge Inspection Unit Supervisor (my former position) currently James Flynn (jhflynn@dot.state.ny.us)	Nov 12, 2010 10:56 PM
5	Bridges and Structures	Nov 15, 2010 7:34 PM
6	We do not have a designated program manager per say, however I am in charge of designing all overhead cantilever, overhead bridge, and butterfly sign structures. I do the foundations for the light towers.	Nov 18, 2010 8:22 PM
7	NBIS & Ancillary Structures inspections are managed by the same staff	Nov 24, 2010 9:05 PM

1. Which, if any, of the following non-destructive testing methods does your

If you selected 'Other' please specify.

1	None of the above are a regular part of inspections.	Nov 1, 2010 11:26 PM
2	if cracks are present	Nov 4, 2010 11:05 PM
3	Some of the above NDT performed by the fabricator's QC is required in the shop, but in-use inspections are mostly visual.	Nov 5, 2010 7:29 PM
4	We also perform dye penetrant testing, only when cracking is suspected via visual observation or evidence of vehicle damage.	Nov 8, 2010 4:52 PM
5	N/A	Nov 9, 2010 3:54 PM
6	Non-destructive testing is limited to traffic weld toes of signal mast arms high mast pole end plates and has not be performed on a "regular basis" except during fabrication of the high mast poles.	Nov 9, 2010 11:18 PM
7	We have only done a small amount of ultrasonic testing of anchor rods	Nov 10, 2010 9:52 PM
8	When cracks or section loss is observed	Nov 12, 2010 10:57 PM
9	All methods may be used depending on what is seen via a visual inspection. For example, Dye penetrant would be used to determine the extent of a crack.	Nov 15, 2010 4:25 PM
10	Visual	Nov 15, 2010 6:42 PM
11	If we observe visually a potential defect, then we use ndt methods.	Nov 25, 2010 6:17 PM