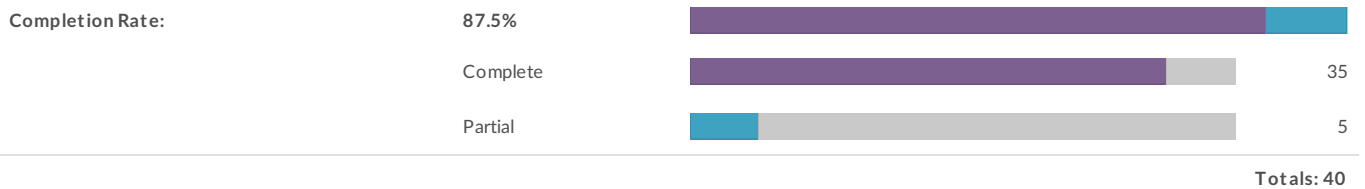


This report is filtered

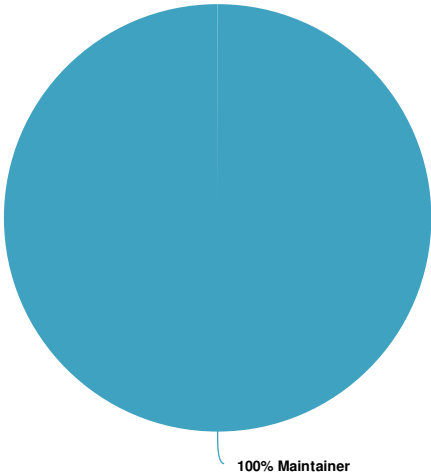
Only show: Question "Based on your most recent experience with bridge corrosion issues, do you consider yourself to be a:" #1 is one of the following answers ("Maintainer")

MAINTAINER Report for NCHRP Synthesis 48-03: Corrosion Protection for Extending Steel Bridge Service Life

Response Counts

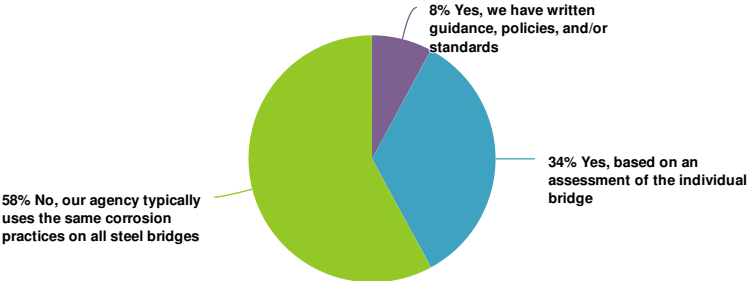


1. Based on your most recent experience with bridge corrosion issues, do you consider yourself to be a:



Value	Percent	Responses
Maintainer	100.0%	40
		Totals: 40

2. Does your agency address corrosion maintenance on steel bridges differently based on criteria such as severity of environmental exposure or operational conditions?

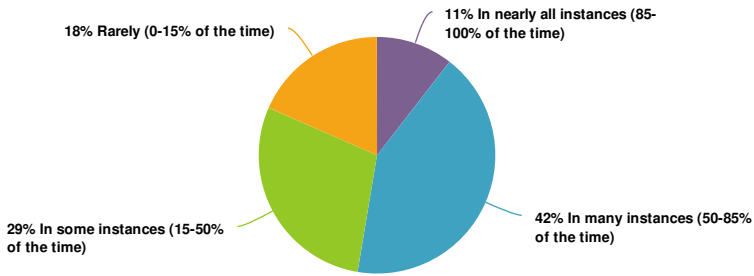


Value	Percent	Responses
Yes, we have written guidance, policies, and/or standards	7.9%	3
Yes, based on an assessment of the individual bridge	34.2%	13
No, our agency typically uses the same corrosion practices on all steel bridges	57.9%	22
		Totals: 38

3. Please briefly describe the criteria used and actions taken.

Count	Response
1	A database of all our steel bridges is maintained with condition information which is used by our program unit to determine what bridges will be painted. Our most critical painted bridges are our coastal bridges, the marine environment is pretty unforgiving to uncoated steel. For these bridges the coating condition is monitored regularly and we use judgment to get coating projects programmed to get the bridges recoated before much section loss can occur.
1	All of our newer steel girder bridges are weathering steel. The environment for each bridge location must be assessed to determine if there are areas that need to be painted to prevent over active patina development. We wash weathering steel bridges at frequencies related to the environment. the range of frequency can be from 1 to 10 years.
1	California has several different types of environmental exposures including desert, coastal, inland and mountainous. In most environments, we use waterborne acrylic latex paints but in coastal environments, we often call for moisture-cured urethane paints.
1	Element Level Inspection Data followed by detailed review of bridge when needed - level of review will depend on type of treatment being considered
1	Low clearance (10' or less) between low steel and ordinary high water for hydraulic structures may exclude use of weathering steel.
1	Most of our steel corrosion occurs in salt water environments. We frequently use cathodic protection to try to slow or stop corrosion.
1	Most steel bridges receive a paint coating to protect them from corrosion. Some steel bridges that cross over heavily congested routes will be galvanized prior to erection or metallized while in service
1	New bridges utilize weathering steel and include painting under joints and areas with traffic below. Repainting of existing bridges may be complete paint or zone painting depending on exposure and current paint condition. We would always address areas near joints on repaint projects.
1	On the standard specifications and when it is a bridge rehabilitation project, 3-coat system is what we've been using (primer - 1 coat of organic zing, Intermediate - 1 coat of epoxy paint, finish - with urethane paint); for bridge maintenance, we've used the one coat system.
1	Painted bridges and bridges with mechanical expansion joints receive special attention and treatment.
1	Percent of coating deterioration.
1	Preventive Maintenance Unit with written guideline/policy for the Major East River Bridges Scheduled cleaning & painting of splash zones and critical members Scheduled cleaning & oiling the bridge cables regular inspection
1	Severity of corrosion is evaluated, and remedial priorities based on numerous factors
1	Type of structural component (rolled section, built up sections), elevation, salt spray severity, splash zone)

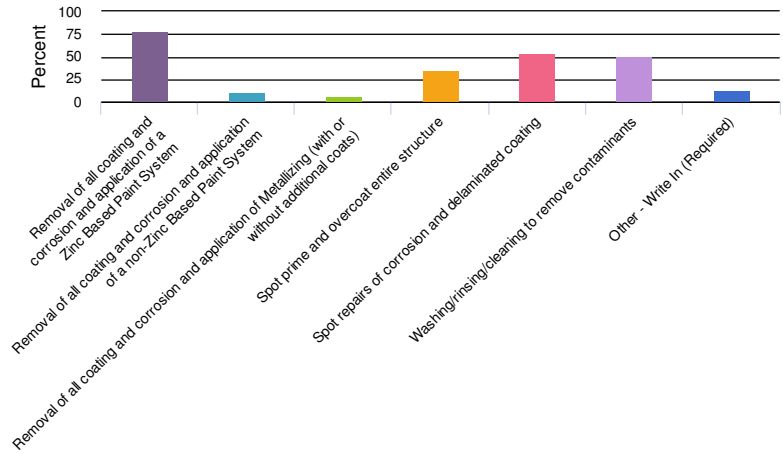
4. How frequently is corrosion the limiting factor for service life of steel bridges?



Value	Percent	Responses
In nearly all instances (85-100% of the time)	10.5%	4
In many instances (50-85% of the time)	42.1%	16
In some instances (15-50% of the time)	28.9%	11
Rarely (0-15% of the time)	18.4%	7

Totals: 38

5. Which of the following corrosion protection technologies do you currently use to maintain coated steel bridges?



Value	Percent	Responses
Removal of all coating and corrosion and application of a Zinc Based Paint System	78.4%	29
Removal of all coating and corrosion and application of a non-Zinc Based Paint System	10.8%	4
Removal of all coating and corrosion and application of Metallizing (with or without additional coats)	5.4%	2
Spot prime and overcoat entire structure	35.1%	13
Spot repairs of corrosion and delaminated coating	54.1%	20
Washing/rinsing/cleaning to remove contaminants	51.4%	19
Other - Write In (Required)	13.5%	5

Other - Write In (Required)	Count
Alkyd Paint System	1
Beam end removal and coat with zinc based system	1
For maintainance, one coat system non-zinc based paint system (High Ratio Calcium Sulfonate Alkyd Technology), surface preparation using water pressure	1
Removal of all coating and corrosion and apply a three coat system consisting of a zinc based primer, epoxy mid-coat, urethane top coat.	1
Seal Joints	1
Totals	5

6. How do you specify and perform bridge maintenance with each of the following technologies?

Selected from: Which of the following corrosion protection technologies do you currently use to maintain coated steel bridges?

	Performed using in-house workforce	Contracted using AASHTO standard specifications	Contracted using our agency's standard specifications	Contracted using special specifications
Removal of all coating and corrosion and application of a Zinc Based Paint System:How do you specify and perform bridge maintenance with each of the following technologies? Checks	4	6	45	15
Removal of all coating and corrosion and application of a non-Zinc Based Paint System:How do you specify and perform bridge maintenance with each of the following technologies? Checks	3	0	5	0
Spot prime and overcoat entire structure:How do you specify and perform bridge maintenance with each of the following technologies? Checks	5	2	13	3
Spot repairs of corrosion and delaminated coating:How do you specify and perform bridge maintenance with each of the following technologies? Checks	10	1	16	7
Washing/rinsing/cleaning to remove contaminants:How do you specify and perform bridge maintenance with each of the following technologies? Checks	10	0	7	3
Other - Write In (Required):How do you specify and perform bridge maintenance with each of the following technologies? Checks	1	0	4	1
Removal of all coating and corrosion and application of Metallizing (with or without additional coats):How do you specify and perform bridge maintenance with each of the following technologies? Checks	0	0	1	2

7. What is the life expectancy (in years) associated with each of the following corrosion protection technologies?

Removal of all coating and corrosion and application of a Zinc Based Paint System

Count	Response
9	25
3	30
2	15-20
2	20-25
1	20
1	20 Years
1	25
1	25 years
1	25+
1	30 to 35
1	35 yr
1	40
1	50

Removal of all coating and corrosion and application of a non-Zinc Based Paint System

Count	Response
1	15 Years
1	30
1	35 yr

Removal of all coating and corrosion and application of Metallizing (with or without additional coats)

Count	Response
1	25
1	Not enough experience yet

Spot prime and overcoat entire structure

Count	Response
2	10
2	25
1	15
1	25years+
1	5
1	5--10
1	5-10
1	unknown

Spot repairs of corrosion and delaminated coating

Count	Response
3	5
2	15
2	20
1	10
1	10 Years
1	10 years
1	10-15
1	15 years
1	25 years
1	25 years +
1	7
1	unknown

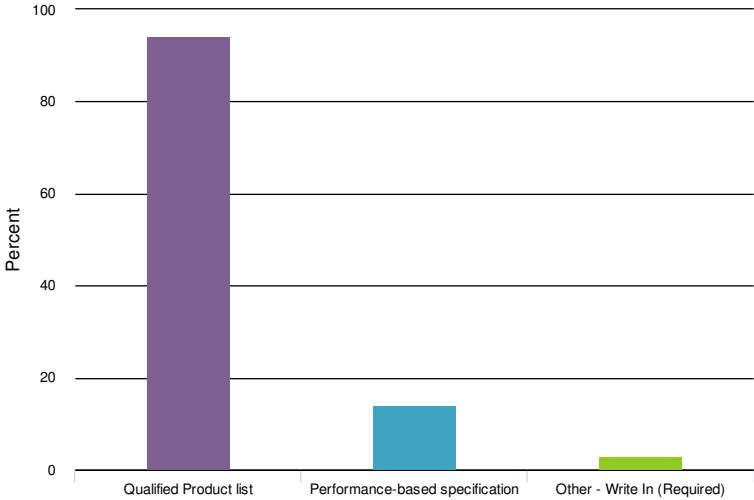
Washing/rinsing/cleaning to remove contaminants

Count	Response
4	2
3	5
2	1
1	10
1	20
1	5 years +
1	Unkown
1	unknown

Other - Write In (Required)

Count	Response
1	25
1	25 years
1	25+
1	5
1	5-8

8. How are protective coatings for maintenance specified/purchased by your agency (select all that apply)?



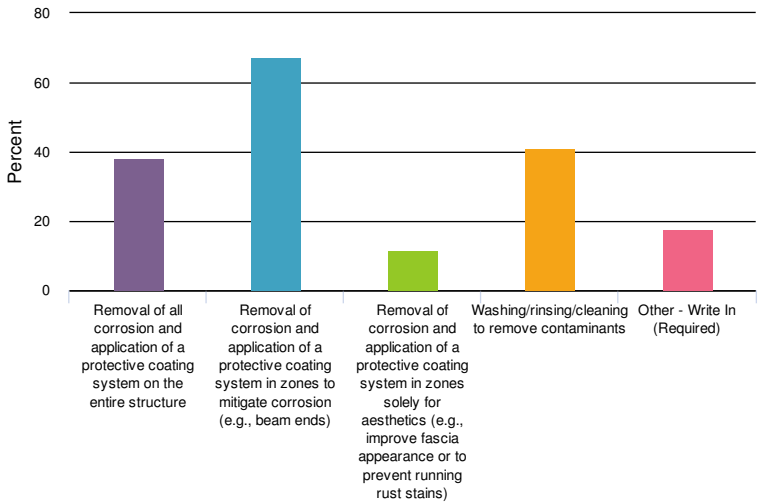
Value	Percent	Responses
Qualified Product list	94.4%	34
Performance-based specification	13.9%	5
Other - Write In (Required)	2.8%	1

Other - Write In (Required)	Count
Negotiated	1
Totals	1

9. Approximately what percentage of the time does each of the following conditions contribute to the need for painting a coated steel bridge?

	In nearly all instances (85-100% of the time)	In many instances (50-85% of the time)	In some instances (15-50% of the time)	Rarely (0-15% of the time)
Repainting due to color and/or gloss changes in the coating Count	0	0	3	28
Repainting based on degree of rust staining Count	5	5	12	9
Time-based maintenance plans Count	0	4	3	25
Inspection Work Recommendation Count	9	13	7	3
Poor Coating Condition Rating Count	13	16	5	2
Observed steel section loss Count	10	10	9	5
Observed steel cracking Count	4	4	4	19
Other structural modifications (e.g., widening) Count	3	10	9	13
Coordination with work that will impact the user (e.g., future work on a parallel roadway or taking advantage of a planned lane closure) Count	1	5	12	14

10. Which of the following corrosion protection technologies does your agency use to maintain uncoated steel bridges?



Value	Percent	Responses
Removal of all corrosion and application of a protective coating system on the entire structure	38.2%	13
Removal of corrosion and application of a protective coating system in zones to mitigate corrosion (e.g., beam ends)	67.6%	23
Removal of corrosion and application of a protective coating system in zones solely for aesthetics (e.g., improve fascia appearance or to prevent running rust stains)	11.8%	4
Washing/rinsing/cleaning to remove contaminants	41.2%	14
Other - Write In (Required)	17.6%	6

Other - Write In (Required)	Count
Bridge Design Manual specifies a site-specific study, painting the end 10' for jointed superstructures and 1' for integral or semi-integral structures.	1
3500psi hot water or 5000psi cold water washing to re-establish patina	1
Do nothing	1
Seal joints	1
This rarely if ever is the case. Our steel members are either (1) weathering steel or (2) coated from day 1.	1
We don't have uncoated steel bridges	1
Totals	6

11. How do you specify/perform uncoated steel bridge

maintenance? **Selected from: Which of the following corrosion protection technologies does your agency use to maintain uncoated steel bridges?**

	Performed using in-house workforce	Contracted using AASHTO standard specifications	Contracted using our agency's standard specifications	Contracted using special specifications
Removal of all corrosion and application of a protective coating system on the entire structure:How do you specify/perform uncoated steel bridge maintenance? Checks	2	2	17	8
Washing/rinsing/cleaning to remove contaminants:How do you specify/perform uncoated steel bridge maintenance? Checks	12	0	5	1
Other - Write In (Required):How do you specify/perform uncoated steel bridge maintenance? Checks	4	0	2	0
Removal of corrosion and application of a protective coating system in zones to mitigate corrosion (e.g., beam ends):How do you specify/perform uncoated steel bridge maintenance? Checks	6	2	25	15
Removal of corrosion and application of a protective coating system in zones solely for aesthetics (e.g., improve fascia appearance or to prevent running rust stains):How do you specify/perform uncoated steel bridge maintenance? Checks	0	0	3	2

12. On average, how frequently do you perform each of the following tasks on a given bridge?

Removal of all corrosion and application of a protective coating system on the entire structure

Count	Response
3	30 years
2	25
2	30
1	0-15%
1	12 years
1	25 years
1	30 yrs
1	35 yr

Removal of corrosion and application of a protective coating system in zones to mitigate corrosion (e.g., beam ends)

Count	Response
2	30
2	as needed
1	0-15%
1	10-15
1	15
1	20 yrs
1	25 years
1	3-5 years
1	35
1	5 years
1	7-10 years
1	As much as possible
1	Case Dependent
1	Initial Construction
1	Rarely
1	Usually done after deck replacement or other rehabilitation work
1	once
1	one time
1	when needed

Removal of corrosion and application of a protective coating system in zones solely for aesthetics (e.g., improve fascia appearance or to prevent running rust stains)

Count	Response
1	10 years
1	25-30 yrs
1	As much as possible

Washing/rinsing/cleaning to remove contaminants

Count	Response
1	1
1	2
1	2 yr cycle
1	5
1	5-10 years
1	No set schedule
1	Rarely
1	Yearly
1	annual
1	bi-annually
1	every other year
1	every two years
1	once every ten years
1	rarely

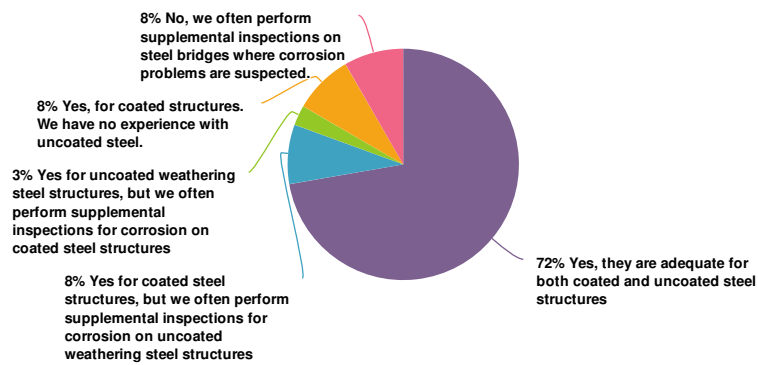
Other - Write In (Required)

Count	Response
1	0
1	Rarely, if ever.
1	as needed
1	as needed; cycle will be specific bridge based
1	new structures only

13. Approximately what percentage of the time does each of the following conditions drive the need for corrosion maintenance on an uncoated steel bridge?

	In nearly all instances (85-100% of the time)	In many instances (50-85% of the time)	In some instances (15-50% of the time)	Rarely (0-15% of the time)
Time-based maintenance plans Count	0	1	4	25
Inspection Work Recommendation Count	11	10	7	4
Poor Coating Condition Rating Count	11	14	2	3
Steel section loss Count	7	12	7	8
Steel cracking Count	4	4	3	18
Other structural modifications (e.g., widening) Count	4	3	5	18
Coordination with work that will impact the user (e.g., future work on a parallel roadway or taking advantage of a planned lane closure) Count	4	1	8	18

14. Do routine inspections adequately identify corrosion maintenance needs?



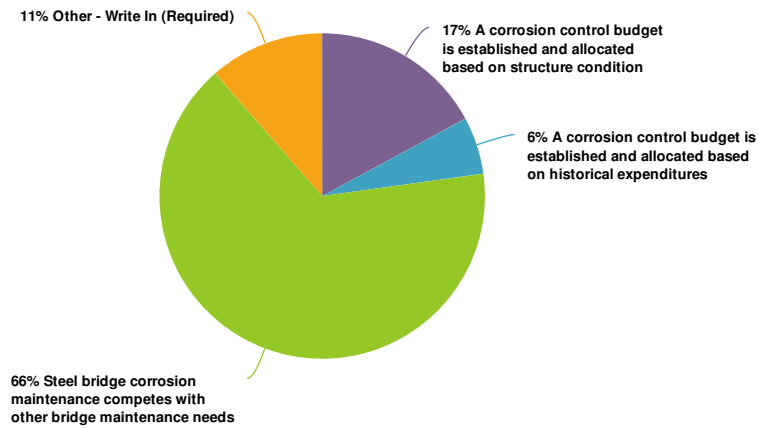
Value	Percent	Responses
Yes, they are adequate for both coated and uncoated steel structures	72.2%	26
Yes for coated steel structures, but we often perform supplemental inspections for corrosion on uncoated weathering steel structures	8.3%	3
Yes for uncoated weathering steel structures, but we often perform supplemental inspections for corrosion on coated steel structures	2.8%	1
Yes, for coated structures. We have no experience with uncoated steel.	8.3%	3
No, we often perform supplemental inspections on steel bridges where corrosion problems are suspected.	8.3%	3

Totals: 36

15. How frequently are corrosion-related maintenance decisions are based on each of the following?

	In nearly all instances (85-100% of the time)	In many instances (50-85% of the time)	In some instances (15-50% of the time)	Rarely (0-15% of the time)
Lowest construction cost Count	5	9	8	10
Least user impact Count	2	9	10	10
Lowest life cycle cost Count	8	7	7	9
Availability of Federal funding Count	7	2	13	10
Other Issues Count	2	1	6	14

16. How does your agency determine budget needs for corrosion maintenance?



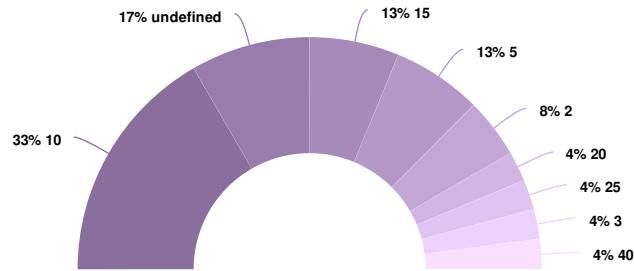
Value	Percent	Responses
A corrosion control budget is established and allocated based on structure condition	17.1%	6
A corrosion control budget is established and allocated based on historical expenditures	5.7%	2
Steel bridge corrosion maintenance competes with other bridge maintenance needs	65.7%	23
Other - Write In (Required)	11.4%	4

Totals: 35

Other - Write In (Required)	Count
A corrosion control budget is established for in-house paint crew projects. For bridge painting by contract forces, steel bridge corrosion maintenance competes with other bridge maintenance needs	1
A yearly defined amount of painting money is allocated.	1
Included with other Bridge Preservation activities	1
only major East River Bridges PM is budgetted	1
Totals	4

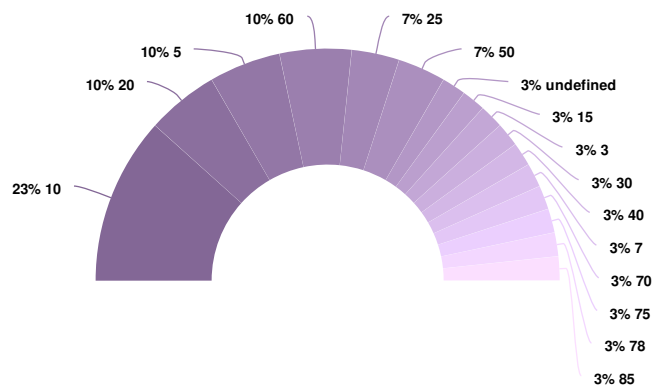
17. What percentage of corrosion maintenance expenditures on steel bridges are in each of the following areas (total should equal 100)?

Scheduled Preventative Maintenance



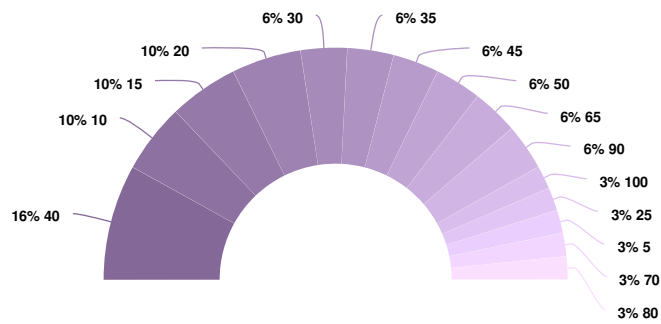
Count	Response
8	10%
4	0%
3	15%
3	5%
2	2%
1	20%
1	25%
1	3%
1	40%

Responsive/Condition Based Preventative Maintenance



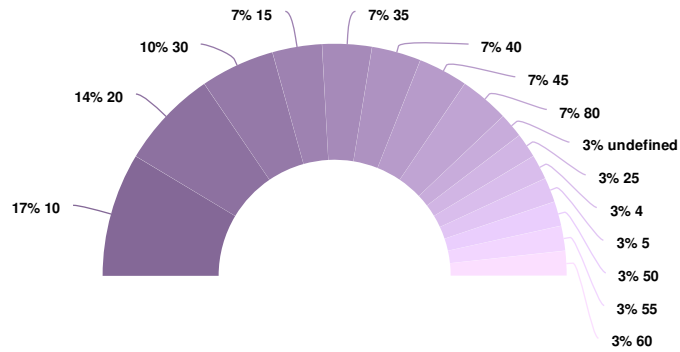
Count	Response
7	10%
3	20%
3	5%
3	60%
2	25%
2	50%
1	0%
1	15%
1	3%
1	30%
1	40%
1	7%
1	70%
1	75%
1	78%
1	85%

Substantial Maintenance (e.g., major re-painting)



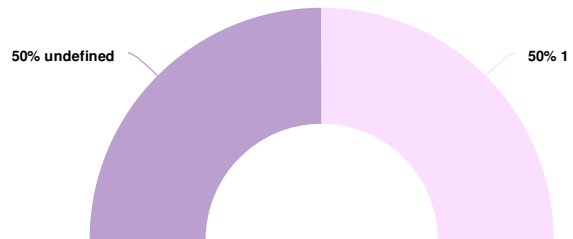
Count	Response
5	40%
3	10%
3	15%
3	20%
2	30%
2	35%
2	45%
2	50%
2	65%
2	90%
1	100%
1	25%
1	5%
1	70%
1	80%

Major Maintenance and Rehabilitation



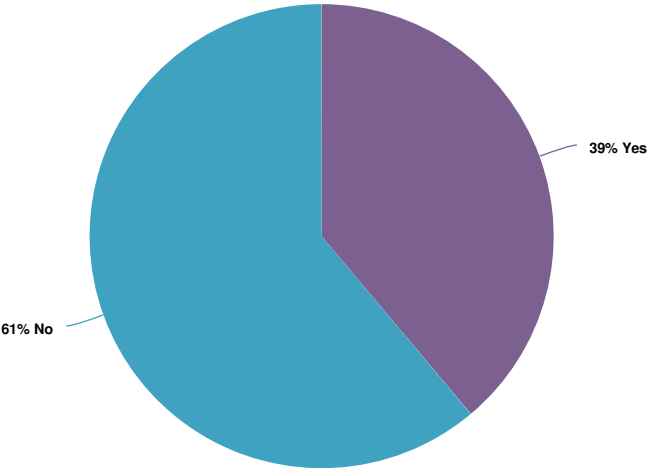
Count	Response
5	10%
4	20%
3	30%
2	15%
2	35%
2	40%
2	45%
2	80%
1	0%
1	25%
1	4%
1	5%
1	50%
1	55%
1	60%

Other



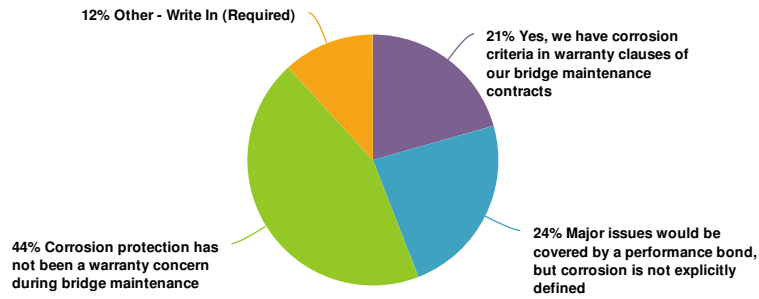
Count	Response
1	0%
1	1%

18. Does your agency have written guidelines or policy for managing and/or repairing steel bridge corrosion?



Value	Percent	Responses
Yes	38.9%	14
No	61.1%	22
		Totals: 36

19. Does your agency include corrosion warranties in steel bridge maintenance contracts?



Value	Percent	Responses
Yes, we have corrosion criteria in warranty clauses of our bridge maintenance contracts	20.6%	7
Major issues would be covered by a performance bond, but corrosion is not explicitly defined	23.5%	8
Corrosion protection has not been a warranty concern during bridge maintenance	44.1%	15
Other - Write In (Required)	11.8%	4
		Totals: 34

Other - Write In (Required)	Count
ODOT does have a warranty specification, but has limited use. Typically contracts are sold without warranties	1
Unknown	1
We are not able to properly enforce warranties, so we do not typically include them in contracts.	1
no, do not use warranties for painting	1
Totals	4

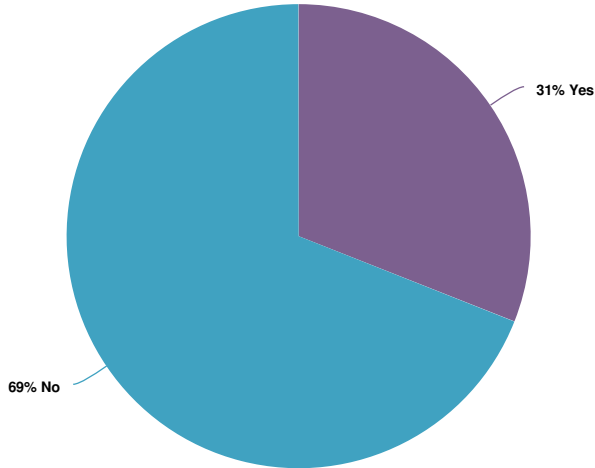
20. What corrosion performance measures are included in your agency's warranties?

Count	Response
4	None
2	NA
1	The occurrence of visible rust or rust breakthrough, coating blistering, peeling, scaling, or unremoved slivers.
1	Allowable Paint Covering Material Paint Coating Thickness
1	Contractor must repair failed coating or loose bond
1	Corrosion, rusting, peeling, delamination.
1	For each Annual Warranty Inspection and the Final Warranty Inspection, the Engineer will inspect the bridge thoroughly for the structural steel paint system defect conditions listed. The inspections will be performed jointly by ODOT personnel and the Contractor.
1	N/A
1	N/A-we don't have warranties for bridge painting
1	NA
1	NA, do not use warranties
1	No Warranties
1	None.
1	The Contractor shall maintain responsibility for the coating system for a 12 month observation period beginning on the date of acceptance of the coating work specified on plans or in the Contract. The Contractor shall guarantee the preparation and installation of the coating system under the payment and performance bond. To successfully complete the observation period, the coating system must meet the following requirements after 12 months in service: (a) No visible rust or rust stains from coated surfaces. (b) No blisters, peeling, cracking or other abnormalities of any coat applied. (c) Have uniform color and gloss and be within the retention values established when tested for acceptance. (d) Have an adhesion rating of at least 80 percent of the initial adhesion when tested for acceptance in accordance with ASTM D4541
1	The work shall be considered defective if visible rust or rust breakthrough, paint blistering, peeling, cracking, chalking, shadow-through, scaling or scaling conditions as noted in the Performance Criteria Table occurs during the warranty period.
1	Unknown
1	Visible rust or rust breakthrough Blistering, cracking, or alligatoring Chalking or fading Loss of adhesion Cohesive failure
1	We do not use a warranty. We have in-house paint inspectors or consultant paint inspectors that monitor all phases of the work.
1	We don't use warranties.
1	We have only had warranties on Desigh Build. Required contractor to repair bubbles in paint on suspender lines
1	information can be found at http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/885_12312012_for_2016.PDF
1	not applicable

21. What is your agency's typical warranty duration?

Count	Response
5	N/A
3	2 years
3	NA
1	0
1	12
1	2
1	3 years
1	5 years
1	One year
1	Unknown
1	Warranties are not typical
1	Warranty is for the whole work as per our standard spec. 2 years
1	We do not use a warranty.
1	do not use warranties
1	n/a
1	not applicable
1	see above
1	three (3) year warranty maintenance bond equal to 60 percent of the total price
1	varies

22. Do you believe that your agency's warranties effectively extend the life of steel bridge corrosion protection?



Value	Percent	Responses
Yes	31.0%	9
No	69.0%	20
		Totals: 29

23. What ideas do you have for steel bridge corrosion research needs?

Count	Response
1	* Scuppers/deck joints * Non-corrosive De-icers (alternative to salt) * Protective coatings, primers in particular.
1	Better color and gloss technology QPL for maintenance coatings Effective de-icers that do not corrode steel
1	Better over coating paint products.
1	Better understanding of the ions that are mechanically created by abrasive blasting, how many are there per square inch and what is the acceptable limit? Could coating life be extended by controlling these ions beyond just blowdown?
1	California has probably the lowest VOC requirements in the Nation. It would be beneficial to have high performance coating system options that meet our stringent VOC requirements.
1	Coating systems with longer life.
1	Common standard for evaluating performance of coating systems. We use one standard and a coating company may use another standard.
1	Duplex Coatings
1	Durability of uncoated steel in certain environments.
1	How best to address pack rust between steel members. We use zinc-rich paint systems for new and repainting. Are there other successful coating systems out there that can be field applied? How successful is metalizing when applied in the field?
1	Is galvanizing cost effective for all new bridge superstructures?
1	Is pressure washing of weather steel effective in reactivating the protect patina
1	Is testing for salts on structural steel worth the time and money,(effort)?
1	It will be good to get more information on the performance of exiting bridges painted using one coat system. In addition, when painting the older bridges with rivets, which paint system works better. How expensive is metallizing and what is the life-cycle cost when compared to the one coat system.
1	Life Span on paint of painted steel girders
1	N/A
1	None
1	T he Kentucky T ransportation Cabinet is with the Kentucky T ransportation Center on a research project to develop painting procedures to provide longer lasting bridge coatings.
1	T here is definitely a need for better more long lasting coatings.
1	We need simple effective products and techniques to apply to steel bridges for enhanced corrosion resistance. Products must be able to be installed by semi-skilled laborers.
1	What is the most effective method to remove chlorides from structural steel?
1	When is the right time to paint?
1	Would like to see more guidance on metalizing
1	two coat systems that are equal or better than 3 coat systems; 90% of problems in coating systems appear to be related to improper preparation of surface and application of paint

24. Please describe any innovative coating practices your agency has employed on steel bridges.

Count	Response
2	N/A
2	NA
1	Combining other maintenance procedures such as joint elimination to limit under-deck corrosion problems.
1	For surface preparation work, some of the paint crews at CADOT are using a vapor blasting system instead of the traditional dry blasting system. The vapor blast system results in significant lower lead exposures for painters compared to dry abrasive blasting. Also, CADOT Chemist are working on developing a high performance waterborne acrylic latex coating using a fluoropolymer resin. This new coating system has a higher abrasion resistance, better gloss retention and a much longer service life than our traditional waterborne acrylic latex system.
1	Looking into metalizing.
1	None
1	On bridge maintenance work, DDOT used the one coat system.
1	Search for advances in protective coating systems. Study/review the new products. Recommended system(s) are applied and inspected for material field performance.
1	Select coating procedure and system that meets the duration of bridge needs.
1	TxDOT recently procured third party coating/painting consultant inspection to ensure that field work, particularly surface prep, meets specification requirements.
1	UHP waterjet pack rust removal - extremely effective but also unpopular with contractors
1	We apply calcium sulfonate based grease on steel bearing devices.
1	We are performing research concerning the use of laser technology for removing existing coatings
1	We have begun to test out metalizing for new bridges as well as existing bridges. We don't have a long enough service life experience to know if this is worthwhile.
1	We have galvanized several bridges in heavily congested areas of the state.
1	We have used Calcium Sulfonate Paint on a couple of bridges.
1	We perform holiday testing on coatings prior to finish coat to reduce the number of pinholes and defects.
1	We will be investigating field metalizing.
1	none

25. Please feel free to comment on corrosion control practices for steel bridges with which your agency has had noteworthy positive or negative experiences.

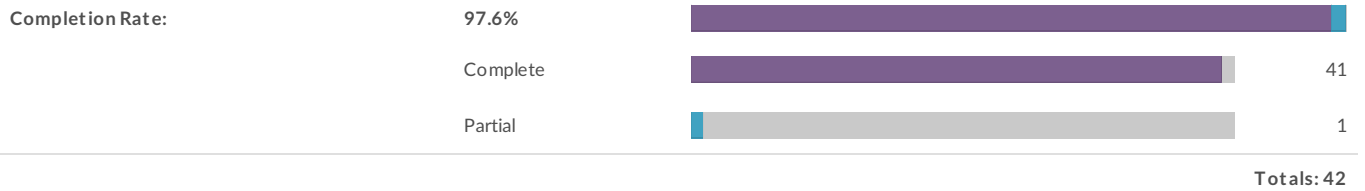
Count	Response
3	N/A
1	CADOT has its own Chemistry Testing Branch which develops waterborne acrylic latex formulations. This Chemlab has developed a new paint using an acrylic latex-fluoropolymer resin blend. This new paint has improved gloss and color retention and has the potential to last significantly longer than our previous formulations. It would be great to share this new formulation with other DOTs as well as learn about coating innovations that other DOT's have to share.
1	Our climate is relatively dry so we are fortunate to not have a lot of corrosion issues on our bridges.
1	Our initial attempts at metalizing existing steel bridges have been largely unsuccessful due to various issues (surface prep, flash rust, knifed edges/90 degree turns).
1	Repainting is always an expensive operation. It would be good to have better enforcement to always have good surface preparation.
1	The best thing that we have done to prevent steel corrosion is to add bridge drain extensions down below the girders. Raise the beam ends above the bearing seat (encased ends above construction joint).
1	We are doing more maintenance painting and bridge washing with positive results.
1	We are finding that the inspection effort required to measure spot work (over and over through prep & coating) is far higher than for full prep & recoat.
1	We try to do a lot of zone painting but sometime we have problems with overcoating old paint. The stresses developed when the new paint dries over the old paint will sometimes debond the old paint at the steel interface. Large sheets of primer, old paint and new paint will then peel off of the steel.
1	Weathering steel must be inspected properly and washed regularly according to exposure to chlorides. Areas of weathering steel exposed to high levels of chlorides should be painted.
1	positive: * Preventive Maintenance, currently for ERBs includes: Scheduled debris removal, washing Br. Members to remove de-icing salt residues, inspection, cleaning & painting of splash zones and critical members and oiling the bridge cables
1	single or two coat system manufacturers are persistent in attempting to get market share but don't have the corrosion data to back up equivalent performance to our 3 coat systems

This report is filtered

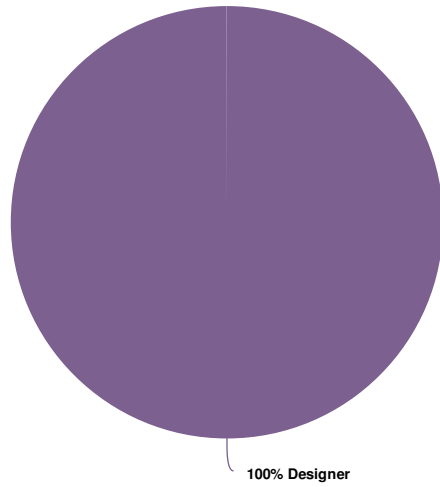
Only show: Question "Based on your most recent experience with bridge corrosion issues, do you consider yourself to be a:" #1 is one of the following answers ("Designer")

DESIGNER Report for NCHRP Synthesis 48-03: Corrosion Protection for Extending Steel Bridge Service Life

Response Counts

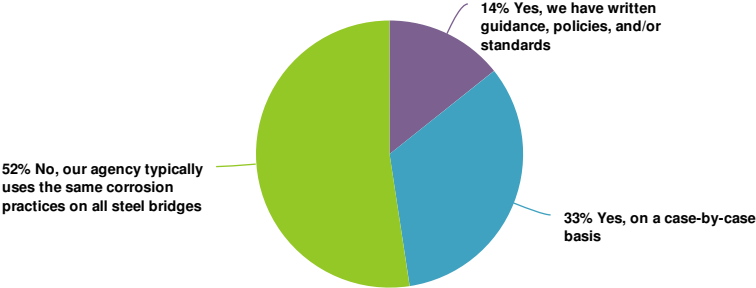


1. Based on your most recent experience with bridge corrosion issues, do you consider yourself to be a:



Value	Percent	Responses
Designer	100.0%	42
		Totals: 42

2. Does your agency address corrosion of steel bridges differently based on criteria such as severity of environmental exposure or operational conditions?



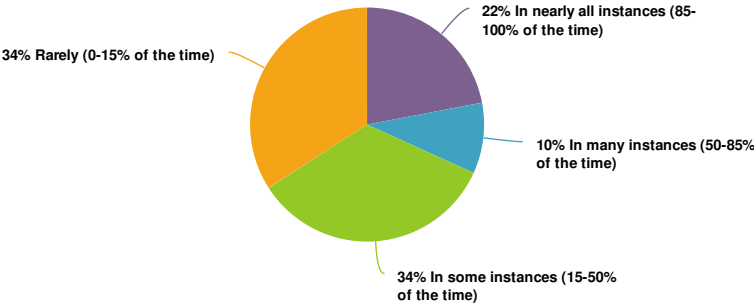
Value	Percent	Responses
Yes, we have written guidance, policies, and/or standards	14.3%	6
Yes, on a case-by-case basis	33.3%	14
No, our agency typically uses the same corrosion practices on all steel bridges	52.4%	22

Totals: 42

3. Please briefly describe the criteria used.

Count	Response
1	Bridges that are over heavy ADT routes or over areas that are difficult to access are sometimes galvanized or metalized.
1	Depending on arid vs. humid environment and also based on the use of de-icing salts.
1	FDOT Structures Design Guidelines has criteria including proximity to the coast, environmental classification, etc. (FDOT SDG 1.32 and 5.12).
1	For bridges that are not deemed not to be in severe exposure locations we typically use weathering steel with painted beam ends. For severe exposure locations such as costal locations, overpasses, or bridges close to freshwater we consider using metalized or galvanized steel beams or using concrete.
1	Formal: Don't use uncoated steel in locations not recommended by FHWA weathering steel memo. Paint beam ends under joints and fascia beams Paint straddle bents Informal: When in doubt, consider concrete, if not concrete then galvanize, if not galvanize then metalize or paint.
1	In Non-Corrosive sites, the use of steel girders is acceptable. AASHTO M270 Grade 50W or 70W weathering steel shall typically be used for steel girders and is preferred over painted steel. However, do not use weathering steel in "low-level" or "tunnel like" bridges. Stream crossings in which the bottom of the girders are less than 10 feet above the normal water surface shall be considered "low-level". Grade separations in which a depressed roadway is bounded by abutments or retaining walls, typically found in urban areas, shall be considered "tunnel like". AASHTO M270 Gr. 50 or 70 fully-painted steel girders shall be used instead of weathering steel girders for "low-level" and "tunnel-like" bridges. In Corrosive and Highly Corrosive sites, do not use steel girders unless otherwise approved. If steel girders are approved for use, application of a thermal sprayed coating and a seal coating to the girders will be required regardless of the location of the girders with respect to th
1	Metalizing and galvanizing have been considered on a case-by-case basis for large structures or structures of difficult/costly access.
1	Minimum distance requirement from pacific ocean.
1	NYSDOT Bridge Manual and NYSDOT Standard Specifications address when certain corrosion protections are appropriate, such as weathering steel, paint, metalizing, etc.
1	Primarily we use weathering steel with the exception of harsh environments or low clearance to waterways.
1	Type of Water : Salt or Fresh Height above water. Priority Road, evacuation route etc.. Average daily traffic
1	We use higher levels of care in our design of State owned bridges as opposed to city and county bridges.
1	Weathering steel is used in accordance with FHWA Guidelines
1	Zone 1 - Rural or industrial, mild exposure. Where severe corrosion is not a problem. Zone 2 - Industrial, severe exposure. Area where corrosion is a serious problem. Progressively aggressive industrial locations. Zone 3A - Marine, mild exposure. Structural steel more than 15 feet above mean high water. Structure located in less severe coastal salt intrusion zone. Zone 3B - Marine, severe exposure. Structural steel less than 15 feet above mean high water. Structure located in severe coastal salt intrusion zone.
1	based on location of the bridge in the state
1	coastal and tunnel affect for the interstate
1	http://epg.modot.org/index.php?title=Image:751.1.2.7_weathering_steel_Nov_2010.jpg
1	joints, splash zone, proximity of water body and over railroads

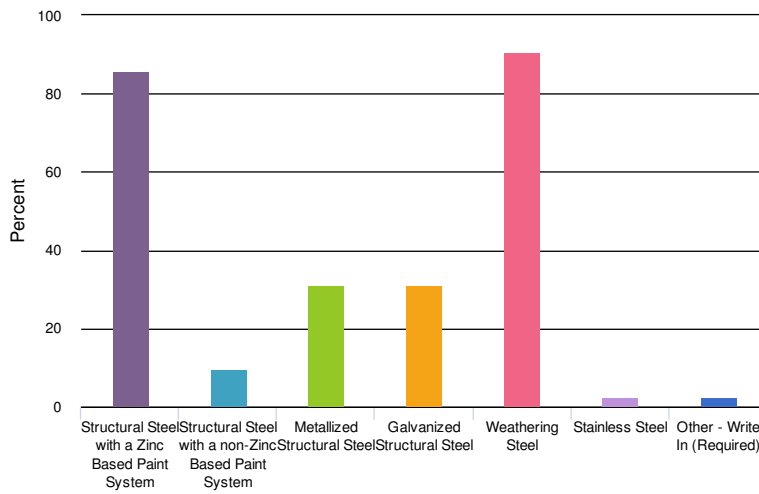
4. How frequently is corrosion the limiting factor for design service life of steel bridges?



Value	Percent	Responses
In nearly all instances (85-100% of the time)	22.0%	9
In many instances (50-85% of the time)	9.8%	4
In some instances (15-50% of the time)	34.1%	14
Rarely (0-15% of the time)	34.1%	14

Totals: 41

5. For current steel bridge designs, which of the following corrosion protection technologies does your Agency use?:



Value	Percent	Responses
Structural Steel with a Zinc Based Paint System	85.7%	36
Structural Steel with a non-Zinc Based Paint System	9.5%	4
Metallized Structural Steel	31.0%	13
Galvanized Structural Steel	31.0%	13
Weathering Steel	90.5%	38
Stainless Steel	2.4%	1
Other - Write In (Required)	2.4%	1

Other - Write In (Required)	Count
A1010 and Hot Dipped Galvanized A709 Gr50W have also been used. VDOT painting systems are listed in Section 411.04 in the State Road and Bridge Specifications.	1
Totals	1

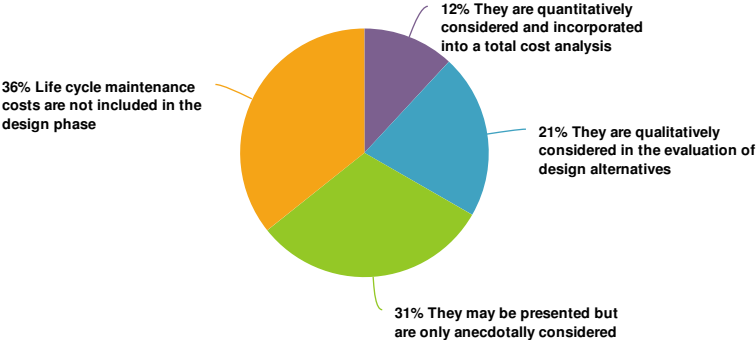
6. How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: **Selected from: For current steel bridge designs, which of the following corrosion protection technologies does your Agency use?:**

	In nearly all instances (85-100% of the time)	In many instances (50-85% of the time)	In some instances (15-50% of the time)	Rarely (0-15% of the time)
Structural Steel with a Zinc Based Paint System:How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	12	11	7	5
Structural Steel with a non-Zinc Based Paint System:How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	0	1	2	1
Metallized Structural Steel:How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	0	2	2	9
Galvanized Structural Steel:How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	0	1	4	7
Weathering Steel:How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	12	9	11	6
Stainless Steel:How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	1	0	0	0
Other - Write In (Required):How frequently are each of the following corrosion protection technologies currently used in new steel bridge design?: Count	0	0	0	1

7. What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: **Selected from: For current steel bridge designs, which of the following corrosion protection technologies does your Agency use?:**

	AASHTO standard specifications	Our agencies standard specifications	Special specifications/designs	Qualified Product Lists	Performance-based requirements
Structural Steel with a Zinc Based Paint System:What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	18	44	16	19	5
Structural Steel with a non-Zinc Based Paint System:What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	0	1	0	4	0
Metallized Structural Steel:What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	1	4	11	1	1
Galvanized Structural Steel:What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	4	8	5	3	0
Weathering Steel:What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	25	21	3	1	3
Stainless Steel:What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	1	0	0	0	0
Other - Write In (Required):What specifications does your agency use for each of the following corrosion protection technologies (check more than one if appropriate)?: Checks	0	0	1	0	0

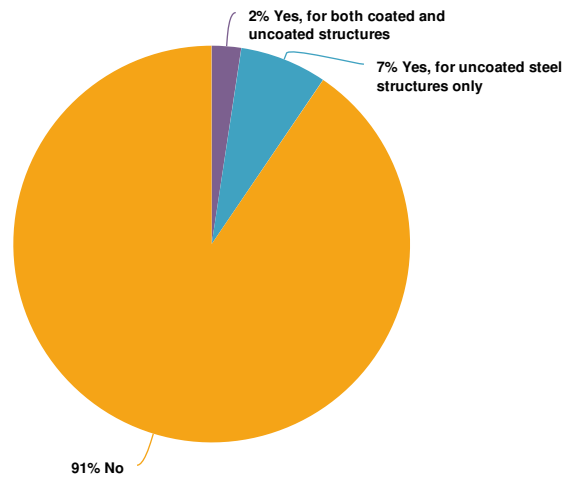
8. In new structure design, are life cycle maintenance costs formally considered when selecting a corrosion protection scheme?



Value	Percent	Responses
They are quantitatively considered and incorporated into a total cost analysis	11.9%	5
They are qualitatively considered in the evaluation of design alternatives	21.4%	9
They may be presented but are only anecdotally considered	31.0%	13
Life cycle maintenance costs are not included in the design phase	35.7%	15

Totals: 42

9. Are specific corrosion allowances used in new steel bridge design calculations?



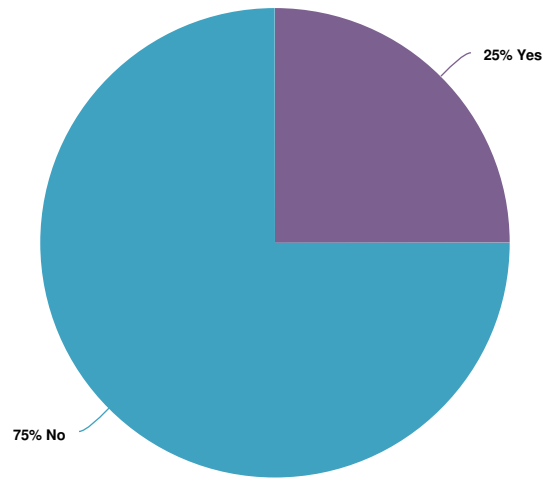
Value	Percent	Responses
Yes, for both coated and uncoated structures	2.4%	1
Yes, for uncoated steel structures only	7.1%	3
No	90.5%	38

Totals: 42

10. What are the corrosion allowances used in new steel bridge design calculations ?

Count	Response
1	Add 1/16" to webs on exterior girders when drainage is allowed over the edge.
1	For weather steel structures we include an additional 1/8" sacrificial thickness.
1	Increasing flange thickness

11. Are the corrosion allowances used to determine the design service life of the steel bridge?



Value	Percent	Responses
Yes	25.0%	1
No	75.0%	3
		Totals: 4

12. Feel free to elaborate on the use of corrosion allowances in this area (e.g., special circumstances, design life criteria, etc).

No data: No responses found for this question.

Count	Response
1	n/a

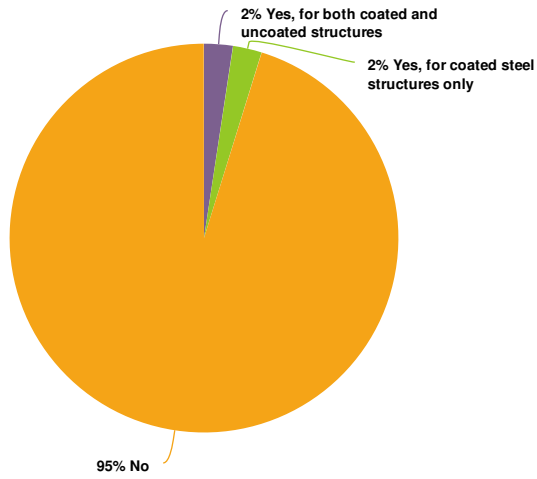
13. Does your agency employ the following design strategies to mitigate steel bridge corrosion?

	Generally Required	Preferred or Encouraged	Not Considered	Don't Know/Not Applicable
Minimize bridge joints Count	24	13	1	0
Direct drainage away from the structure (e.g., downspouts) Count	21	15	2	0
Coat weathering steel beam ends Count	24	8	5	1
Specify galvanized fasteners for painted steel structures Count	23	2	11	2
Detailing to eliminate water/debris collection points Count	22	12	3	1

14. Feel free to comment on these or other design strategies to mitigate steel bridge corrosion.

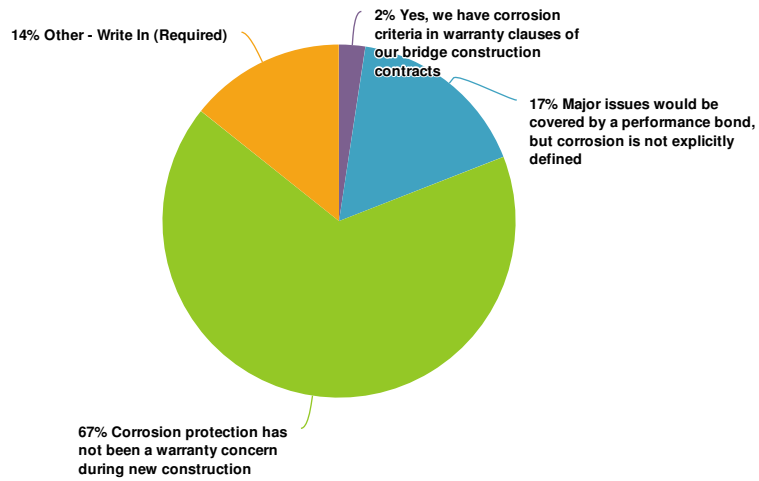
Count	Response
1	If deck drains are employed, they are extended one foot below the bottom of the steel girder. Also, expansion joints are extended one foot beyond edge of deck.
1	MDOT no longer uses uncoated weathering steel and typically coats any in services bridges with weathering steel when maintenance is required.
1	N/A
1	VDOT requires a waiver for new structures which do not meet our Jointless philosophy. This philosophy has led us to develop structural elements which we refer to as the Virginia Abutment and Virginia pier which include concrete drainage trough and semi-integral beam ends on either side of the joints separating superstructure units. Use of this approach has reduced the number of structures being partially painted.
1	We use common practice.
1	n/a

15. Are required corrosion maintenance procedures developed as part of the design process?



Value	Percent	Responses
Yes, for both coated and uncoated structures	2.4%	1
Yes, for coated steel structures only	2.4%	1
No	95.2%	40
		Totals: 42

16. Does your agency include corrosion warranties in new construction contracts?



Value	Percent	Responses
Yes, we have corrosion criteria in warranty clauses of our bridge construction contracts	2.4%	1
Major issues would be covered by a performance bond, but corrosion is not explicitly defined	16.7%	7
Corrosion protection has not been a warranty concern during new construction	66.7%	28
Other - Write In (Required)	14.3%	6

Totals: 42

Other - Write In (Required)	Count
1 YEAR GENERAL WARRANTY ON ALL CONSTRUCTION	1
NO	1
NYS does not allow warranties for construction projects.	1
No.	1
Warranties were included on some bridge coating projects. Few were successful but not all.	1
no	1
Totals	6

17. What corrosion performance measures are included in warranties?

Count	Response
5	N/A
1	Percent rust along with color and gloss retention.
1	The work shall be considered defective if visible rust or rust breakthrough, paint blistering, peeling, cracking, chalking, shadow-through, scaling or scaling conditions as noted in the Performance Criteria Table occurs during the warranty period.

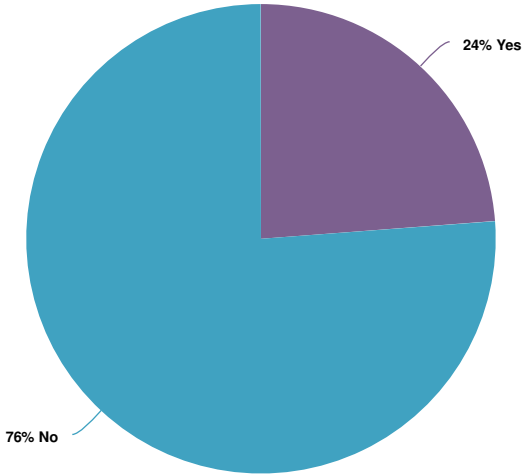
18. What is the typical warranty duration?

Count	Response
4	N/A
1	1 YEAR GENERAL WARRANTY FOR AFTER CONSTRUCTION ACCEPTANCE
1	2 years
1	FDOT used 10 years, but 3-5 years is more common.

19. Feel Free to provide any thoughts you have regarding corrosion warranties in the following space.

Count	Response
4	N/A
1	Corrosion warranty need to be increased and should be supported with bond.
1	MS constructs only a small amount of steel bridges and weathering steel works well. We only paint in urban areas for looks.
1	PERFORMANCE CRITERIA TABLE THRESHOLD LEVEL REMEDIAL ACTION Less Than 1 Square Foot Failure of a Bridge Element No action required 1 Square Foot to Less Than 20 Square Feet Failure of a Bridge Element Remove defective paint, rust, etc., and repaint defective area of Bridge Element. 20 Square Feet or More Failure of a Bridge Element Totally reclean and repaint entire Bridge Element.
1	The main concern expressed by our general contracting industry is the warranty coverage affects their bonding capacity and thus are not in favor of warranties.
1	Warranties must include labor, be backed by a bond, and the agency must have the manpower to keep up with the warranties for this type of program to be successful.
1	timelines are to long for an appropriate warranty

20. Do you believe that warranties effectively extend the life of steel bridge corrosion protection?



Value	Percent	Responses
Yes	23.8%	10
No	76.2%	32

Totals: 42

21. What ideas do you have for steel bridge corrosion research needs?

Count	Response
1	A1010 has been a successful although expensive solution for a steel bridge. it is highly corrosion resistant, tough and, unfortunately expensive. targeting use of A1010 to critical locations makes sense. we used A304 bolts, using a cheaper option for bolts would help. welding A1010 to A709 weathering grades to eliminate painting needs under joints. evaluate corrosion of A325 Grade 3 bolts with A1010 evaluate galvanized A325 with A1010 Evaluate bolts made from MMFX (ASTM 1035 steel material)
1	Are there coatings that can be applied over corrosion to arrest the corrosion process? Cost effective methods for existing lead-based paint removal.
1	At what point is best to replace paint system before corrosion takes hold.
1	Design procedure for life expectancy of uncoated steel in different environment. Also, for coated steel bridges.
1	Duplex Coating - Painting Applied over Galvanized Coating
1	Guidelines for evaluating existing coatings to determine best maintenance solution.
1	How to cost effectively rehabilitate the coating of existing steel bridges
1	Is it beneficial to seal metalizing?
1	Look for resin-based, UV ray protection products such as Blue-Seal rather than paint and metalizing.
1	N/A
1	Service life is more dependent on surface preparation (sp) than the coating chemistry. Research should be conducted utilizing new sp technologies like lasers.
1	Steel bridge corrosion repairs and strength estimation of corroded sections.
1	The effects of new modern de-icing chemicals on steel beam bridges, since there is anecdotal evidence that where these are used, accelerated corrosion is encountered. Likewise, research into new types of roadway de-icing strategies, including new families of chemicals, that are not so corrosive to steel beams.
1	Weathering steel was first used in Arkansas in the early 1970's. Weathering steel has been used extensively since the mid 1980's. Updated research on its use and how it is doing would be beneficial. Also, I see some fabricators selling overhead trusses using weathering steel to LPA's. Should this practice be discouraged?
1	What are the effects of different deicing methods on the corrosion yet of steel bridges (coated and uncoated)
1	When is repainting needed? TxDOT has thousands of steel bridges and many the coating has failed or nearly failed, it would be useful to know if we are unconcern about the looks, can we leave the steel as is with little risk? Also, some of the steel bridges spans get protected by widenings on each side, thus reducing exposure conditions, should this effect our decision process? Investigate what metalizing is best after moving a previously applied liquid coating.
1	n/a
1	rust inhibitors/preventors that can be applied to problem areas such as gusset plates, field splices, etc.

22. Please describe any innovative coating practices your agency has employed on steel bridges.

Count	Response
1	3 coat inorganic zinc primer and paint system.
1	FDOT utilized top shelf coatings such as fluorourethanes and clear coatings to extend color, gloss retention and service life.
1	Metalizing has been used on a limited basis for pot bearings.
1	N/A
1	NYSDOT has recently increased of metalizing of steel bridges.
1	None
1	Used Metalized steel coating on integral post tensioned pier cap. In areas where steel is encased in concrete.
1	We have galvanized structural steel girders on a couple of projects to try it out.
1	Zinc primer.
1	hot dip galvanized weathering steel girders. at this location, the FHWA memo did not recommend an uncoated structure, so we tried an HDG coating.
1	n/a
1	piloting use of metalizing. Using 2 coat polyaspartic paint system to reduce time in the field.

23. Please feel free to comment on corrosion control practices for steel bridges with which your agency has had noteworthy positive or negative experiences.

Count	Response
2	None
1	N/A
1	Previously, we used weathering steel for practically all of our steel bridges. However, we have found that even where weathering steel was used appropriately and roadway joints were eliminated, corrosion was still occurring at a higher rate than expected. This was attributed to the use of salt for roadway de-icing, which contaminated the steel. As a result, we have adopted galvanizing and metalizing as the preferred corrosion protection, however weathering steel is still allowed in non-road over road locations (such as over railroads or bodies of water provided that there is adequate ventilation).
1	Some negative results from the use of uncoated weathering steel where the patine does not form correctly, due to environmental conditions and bridge locations/characteristics.
1	We are trying to limit joints. Research on integral or semi integral abutments would be nice.
1	We have tried single coat and two coat field painting applications with limited success.
1	We recently metalized many larger structures, there was some concern on the initial appearance after they were metalized, they were blotchy in appearance, however if did appear that over time the it became an more even appearance.
1	We use common recommended practice.
1	n/a
1	using concrete beam end encasement has been highly successful (see details related to Virginia Abutment and Virginia Piers.
1	we have gotten away from overcoating and went to complete sandblast and recoat, which has given us better and longer lasting coatings.