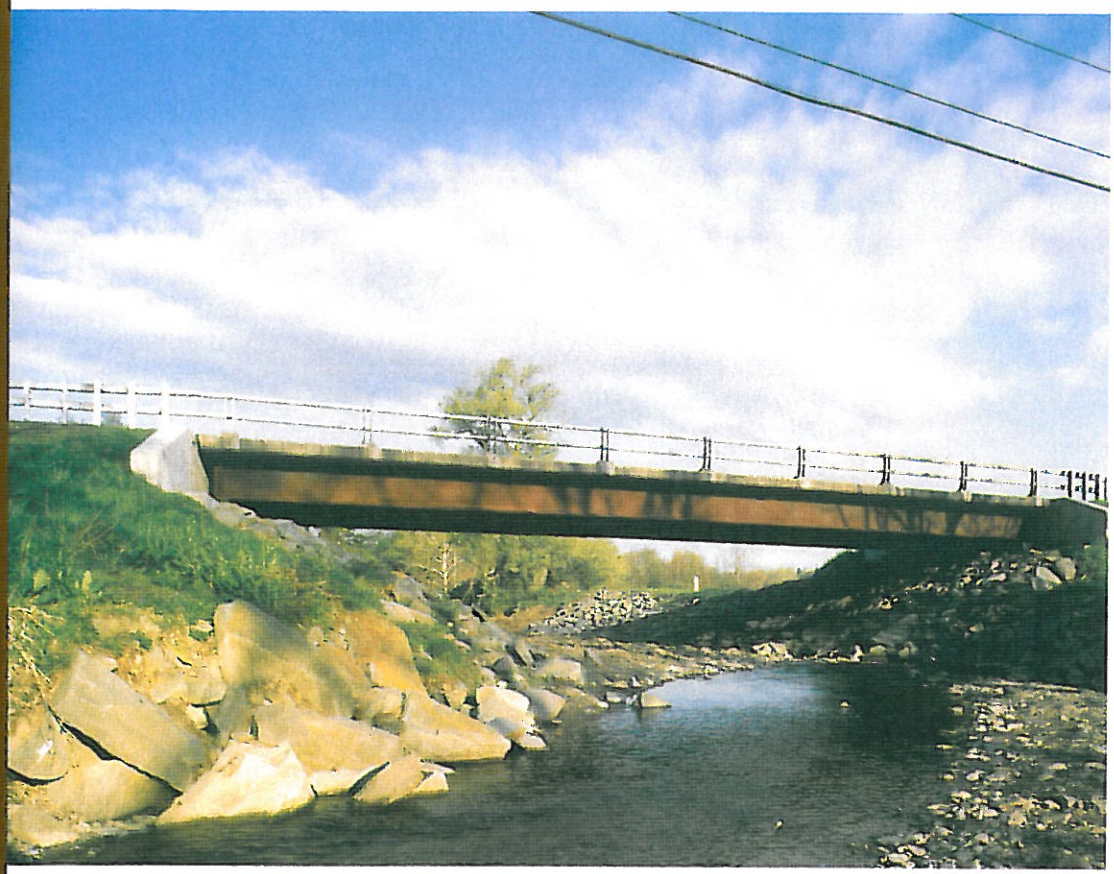
PERFORMANCE OF WEATHERING STEEL IN HIGHWAY BRIDGES

A Third Phase Report



American Iron and Steel Institute

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Cover Picture: The winning steel bid for the County Route 15 Bridge over Beardsley Hollow Creek, New York. Uncoated weathering steel was specified to minimize future maintenance costs. The bridge was more than $130,000 less than the lowest concrete bid. Photo by Peter B. Treiber, 1991

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Weathering steel has been a primary construction material for bridges in the United States since 1964. However, its widespread application has not been without controversy. As such, the American Iron and Steel Institute (AISI) initiated a long-term project to study the performance of weathering steel in different structures and environments. Phase-I was initiated in 1980, and consisted of field inspections of 52 highway bridges. The results of this inspection have been documented in an AISI report, *Performance of Weathering Steel Bridges—A First Phase Report*, August 1982. [1,2]

The second phase of the long-term project focused on maintenance coatings which could be applied to salt-contaminated weathering steel. Phase-II was conducted by the Steel Structures Painting Council (SSPC) working under contract for the Federal Highway Administration (FHWA). Based on this study, the FHWA issued a report RD-92-055 entitled, "Maintenance Coating of Weathering Steel: Field Evaluation and Guidelines," March 1995.

In 1988, the FHWA convened a forum where more than 130 federal and state government and industry representatives met to discuss their experiences with the performance of weathering steel in bridges. The proceedings of this forum are included in the FHWA Report TS-89-016, "Forum on Weathering Steel for Highway Structures: Summary Report," June, 1989. The information presented at the forum was used by the FHWA to develop and issue a Technical Advisory (TA) entitled, *Uncoated Weathering Steel in Structures*, T5140.22, October, 1989 [2] which provides specific guidance and recommendations about the use of weathering steel in highway structures.

In 1993, AISI began Phase-III of this project. This included revisiting the 52 bridges that were initially inspected in 1980 as part of Phase-I, and following 13 more years of exposure.

In addition to the original bridges, eleven others were added for inspection: five in Iowa; one in California; and five in Puerto Rico with two parallel bridges at each site. Exhibit A includes the results of both Phase-I and Phase-III inspections. Fifty-six of the 63 bridges carry highway traffic; three are railroad bridges; one is a combination pedestrian and equestrian bridge and two are part of the West Virginia University Personal Rapid Transit System. Bridges #14 and #21 listed in Exhibit A are located in Michigan and have already been painted. One of the Iowa bridges, Route 28 over the Raccoon River, has also been painted.

What follows are a few historical notes on the use of weathering steel in bridges and a summary of the major findings of the Phase-III inspections.

[1] There were 52 bridges inspected, but because of timing, the results of only 49 inspections were included in the report.

[2] This publication is available from The American Iron and Steel Institute: 1101 17th Street, N.W. Suite 1300, Washington, DC 20036.

HISTORY

Since 1964, bridge engineers have utilized weathering steel because of performance benefits, as well as for economical and environmental reasons. As a result, over 2,300 bridges in the United States have been built with this material over the last 30 years.

Studies show that using weathering steel reduces both initial and life-cycle costs. Current highway legislation in the United States mandates the consideration of life-cycle cost analysis in the highway materials selection process. Grade 50W weathering steel costs approximately 3 cents per pound more than Grade 50 non-weathering steel; however, the initial painting of Grade 50 steel costs more than twice the difference per pound. This makes the selection of weathering steel economically and environmentally more appealing.

One cost estimate, prepared by High Steel Structures, in Lancaster, Pennsylvania, indicates that the cost to paint the non-weathering steel would be 8.5 cents per pound, making the potential initial cost savings more than 5 cents per pound or about $600,000 (Figure 1). Further, using uncoated weathering steel essentially eliminates the need for future maintenance repainting which is significantly more expensive than the cost of the first painting; therefore, the opportunity for substantial LIFE-CYCLE COST SAVINGS exists using weathering steel.

PAINTED VS. UNPAINTED COST

TYPE	Gr. 50	Gr. 50W
STEEL WEIGHT	5151 T	5151 T
MAT., FAB., LABOR & TRANS.	$5.57 M	$5.86 M
ERECTION	$0.47 M	$0.47 M
SHOP PAINT	$0.38 M	$0.03 M
FIELD PAINT	$0.54 M	$0.01 M
TOTAL	$6.96 M	$6.37 M

DIFFERENCE = 9.2%

Figure 1 - Cost Difference; Painted vs. Unpainted Steel

Figure 2 - Moorestown Interchange; New Jersey Turnpike - Built 1964

The availability of 50,000 psi steels for both painted (Grade 50) and unpainted (Grade 50W) bridges provides the engineer with the opportunity to delay the decision to "paint or not to paint" until the final bid documents are prepared. This allows time for an evaluation of environmental concerns, such as the structure's proximity to sea coasts, i.e., exposure to salt water, and to industrial contaminates.

For these reasons, engineers and owners have chosen weathering steel over other materials in highway bridges. The first bridge using weathering steel was built over the New Jersey Turnpike in 1964 (Figure 2). At approximately the same time, the Eight Mile Road Bridge was built in Michigan. While New Jersey was pleased with the performance of its weathering steel bridges, Michigan found the material to be performing poorly, specifically in the Detroit Metropolitan Area (Wayne County). Poor material performance in Detroit led the State of Michigan to issue a moratorium on the use of weathering steel for highway bridges of all types throughout the State. This action led other states to question the suitability of weathering steel in highway bridge construction. These concerns led to the Phase-I investigation spearheaded by the AISI. The Michigan moratorium was lifted in 1990.

PHASE-III: GENERAL FINDINGS

Figure 3 - United States Map with Locations visited highlighted

The primary conclusion of this report confirms that *uncoated weathering steel bridges are all performing well throughout the United States and Puerto Rico*, with the exception of metropolitan Detroit. It is suspected that material problems found in Michigan are caused by the amount and frequency of salts used in inclement weather, the chemical composition of these deicing salts, or a combination of these factors.

The results of this study demonstrated that uncoated weathering steel bridges designed and detailed in accordance with the recommendations outlined in the FHWA Technical Advisory will perform well. The study focused on 63 bridges in 11 states and the Commonwealth of Puerto Rico (Figure 3) that have been in service between 18 and 30 years. The positive performance of these bridges indicates that the original selection of uncoated weathering steel was a cost-effective decision. At a minimum, the decision eliminated the need for initial painting and eliminated at least one additional maintenance painting over the years of operation.

It is important to note that, while weathering steel is performing well overall, there are "micro-environmental" material concerns in many of the bridges inspected. Bridge deck drainage, a common problem, is found to affect structural bridge elements, specifically when salt-laden roadway drainage comes into frequent contact with the uncoated steel. Uncontrolled drainage is also detrimental to the substructure. The effects of uncontrolled bridge deck drainage are usually confined to localized areas in the vicinity of the joint. These effects are mitigated in jointless bridges and bridges with integral abutments. For bridges in areas where roadway salts are not used, the "micro-environmental" concerns include: build-up of debris (pigeon nests, etc.) in very localized spaces and substructure staining. "Micro-environmental" concerns can be avoided by eliminating joints and by using good details.

The Phase-III Report focuses on specific conditions and environments that could affect material performance. These include grade separations, water crossings, marine and industrial environments, weather-related moisture, bridge joints, deck drains, staining of substructure, and fatigue.

Grade separation bridges located over heavily traveled highways in Maryland, Wisconsin, New York, North Carolina and New Jersey sustained minimal, if any, corrosion on either fascia or interior girders as a result of the traffic passing below. Twenty-nine of the 63 bridges inspected were grade separation structures. Figures 4 and 5 show two examples of 18 and 23 year old steel girders, respectively.

Figure 4 - NC Route 231 over US 264; Nash County - Built 1976

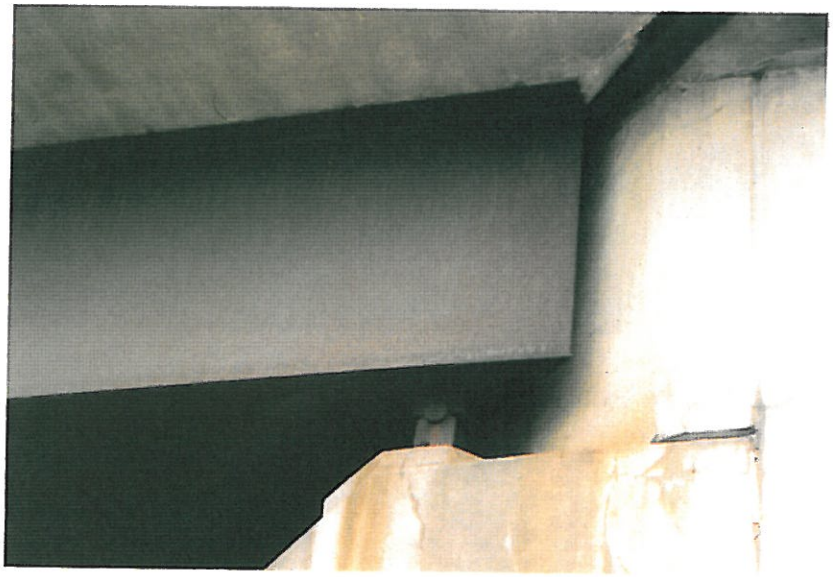

Figure 5 - MD Route I=895 over I-95; End of girder - Built 1970

Most of these bridges, and the roadways below, have been subjected to appreciable amounts of deicing chemicals. Figure 6 shows deicing salts present on the roadway the day after an ice storm on the New Jersey Turnpike. The only exception to this finding is grade separation bridges in the Metropolitan Detroit area where significant corrosion was observed. As stated above, the difference in behavior between weathering steel bridges in the Metropolitan Detroit area versus bridges in other states may be related to the use of higher amounts and more frequent application of salt, the chemical composition of the deicing salt used, or a combination of these factors.

Figure 6 - New Jersey Turnpike; Salt on shoulders

Significant corrosion also occured on bridges #51 and #52 located on the campus of West Virginia University in Morgantown, West Virginia. These bridges have open decks and carry the rail tracks for the University's Personal Rapid Transit (PRT) vehicles. Maintenance personnel at the University use polypropylene glycol (antifreeze) to deice these structures in the winter, causing noticeable corrosion to the steel members of the superstructure. AISI has recommended against the use of antifreeze chemicals for deicing because they can become very corrosive under certain conditions.

LOW-LEVEL WATER CROSSINGS

There was no visible evidence of unexpected corrosion taking place as a result of low-level crossings over either standing or flowing water. Figures 7 and 8 show two bridges constructed about four to nine feet above fresh water; neither one shows evidence of damage to the weathering steel used in their construction. The FHWA TA recommends at least a ten foot clearance for weathering steel structures over still waters and an eight foot clearance over moving waters. The results of this study, support a relaxation in the FHWA TA clearance requirements.

Figure 7 - Green Bay, Wisconsin; Four feet over still water - Built 1971

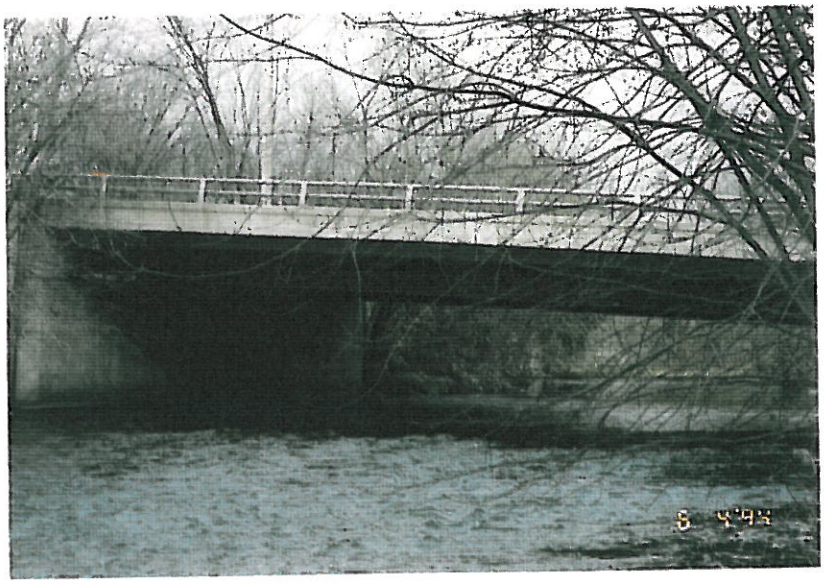

Figure 8 - Waukesha, Wisconsin; 6.5' to 9.5' over flowing water - Built 1972

Weathering steel appears to be performing satisfactorily in marine environments. This finding is based on the study of two bridges included in this survey.

Figures 9 and 10 are illustrations of Bridge #50, located in the southern portion of Louisiana, immediately adjacent to the Gulf of Mexico. This bridge is partially painted due to an early concern for excessive corrosion; the remaining sections of the bridge are unpainted. Both the painted and unpainted portions of this weathering steel construction appear to be performing well. However, an additional investigation is being initiated at this site to quantify the performance of the unpainted weathering steel, and to compare the performance of the bridge members to test samples at the bridge site. Once completed, this study will provide additional guidance for this type of environmental exposure.

The Antioch River Bridge in California crosses a river that also has a high salt content. Shortly after the 39-span bridge was constructed in 1977, CALTRANS reported "severe" corrosion on some sections of this 8,640 foot long bridge. However, the 1993 inspection did not reveal any evidence of severe corrosion, or any other concerns regarding the performance of weathering steel. It is believed that the corrosion that appeared earlier in several bridge members was a result of direct exposure to sea water spray that occurred during transportation from Japan on the open deck of a cargo ship. No problems have been reported in this structure since the initial concerns emerged.

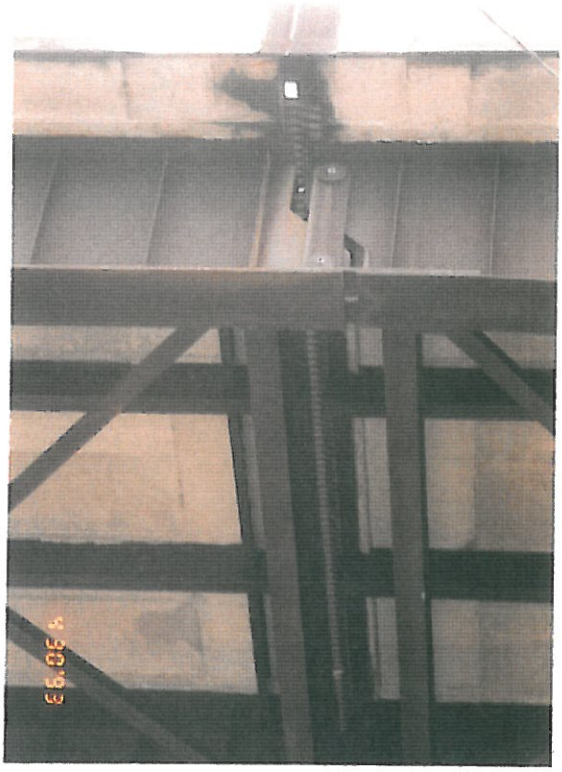

Figure 9 - LA Route 23 over Doullut Canal - Built 1975

The FHWA TA recommends the use of "wet candle" equipment in accordance with ASTM Test Method G 92 "Characterization of Atmospheric Test Sites," Method B, to determine the suitability of the application of weathering steel in marine environments. An upper limit of 0.5 mg chloride/ 100 cm^2/day, average, is recommended for areas where marine salts may be present in the atmosphere. Unfortunately, this test takes many months to complete. A more practical means of assessing site corrosion potentials, appears to be a "corrosion monitor" developed by the ATLSS Center at Lehigh University.

For bridges that are located in an industrial area and subjected to the effects of air borne sulphur trioxides, an upper limit of 2.1 mg/100 cm^2/day (average) is recommended by the FHWA TA for use of weathering steels. None of the bridges inspected as part of this project are in areas with such exposure limits, so an evaluation of this criterion was not possible. However, as a result of the ever-increasing emphasis throughout the United States on clean air standards, it is anticipated that sulphur trioxide levels will rarely, if ever, influence future decisions for using weathering steel in industrial areas.

Figure 10 - LA Route 23 over Doullut Canal - Built 1975

FREQUENT HIGH RAINFALL, HIGH HUMIDITY OR PERSISTENT FOG

Several bridges included in this study have been exposed to these moisture conditions for more than 20 years and display no apparent effect from the high rainfall and ever-present high humidity. In this report, Figure 11 shows the condition of a steel girder of a typical bridge in Puerto Rico exposed to levels of rainfall that approach 70 inches per year as indicated by the U.S. Geological Survey Annual Rainfall map. In addition, two of the Puerto Rico bridges are in a location where there is a warning sign advising drivers of frequent dense fog conditions.

The FHWA TA recommends caution in employing weathering steels in areas where the material could remain wet for extended periods of time due to high levels of rainfall, humidity or fog. The FHWA TA recommends evaluating these conditions using ASTM Test G 84 "Time of Wetness Determination (On Surfaces Exposed to Cyclic Atmospheric Conditions)." If the average time of wetness exceeds 60 percent, use of weathering steel is not recommended. No measurements of the time of wetness were taken at any of the bridge sites visited, so an assessment of the adequacy of the FHWA TA recommendation cannot be made. It has been reported by others that weathering steel in bridges located in the Northwest portion of the United States, west of the Cascade Mountain range, and southeastern Alaska, has not performed satisfactorily and required painting. However, the White Chuck River bridge built in 1982 in the Mount Baker-Snoqualmie National Forest located in the northwest corner of Washington State is performing extremely well.

Figure 11 - PR Route 52; Bridge #2039 - Built 1972

BRIDGE JOINTS

This study confirmed that inadequate control of drainage coming through bridge joints is the major cause of deterioration of steel and concrete bridge components where roadway deicing chemicals are used. Bridge joints inspected during this phase included simple hot-poured asphalt material, single-cell compression seals, strip seals, sliding plates, open finger joints, joints with and without troughs, and numerous other proprietary joint systems. Thirty-four, or 72 percent, of the highway bridges inspected had significant corrosion of the steel occurring under the joints, irrespective of the joint type. Figure 12 is a typical example of the excessive corrosion that has occurred under these leaking joints.

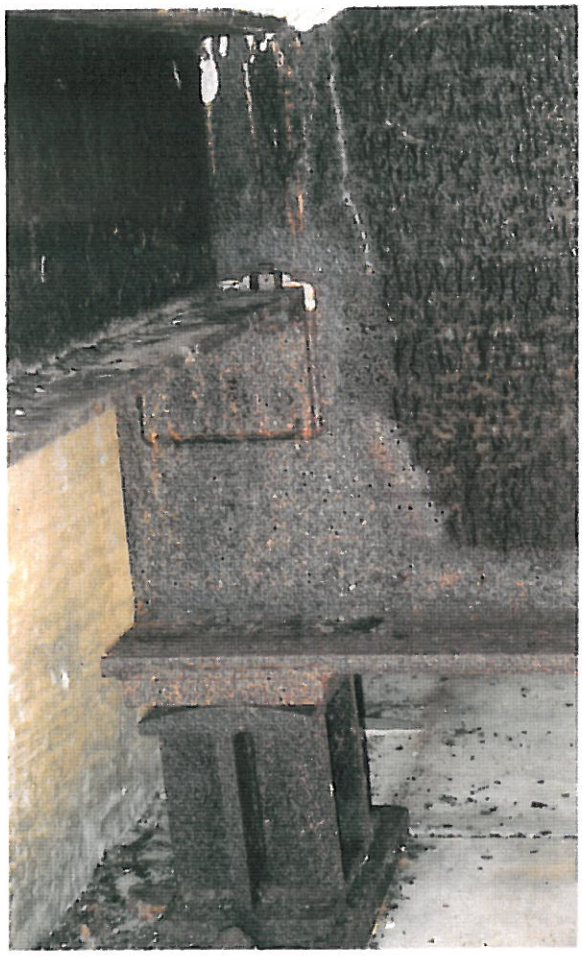

Figure 12 - Illinois Bridge #61-0071 near Centralia; End of girder under joint - Built 1973

In three states, some of the bridges inspected were "jointless" and, therefore, had no problems related to joint leakage. The deck slabs in these bridges were detailed such that there was no need for a traditional joint at the bridge abutments. Figure 13 shows a typical bridge detail, and Figure 14 shows it graphically. The bridges inspected with these "jointless" details were on the order of 200 feet and longer. Figure 15, distribution of bridges by span length and total length in the United States, shows that 80 percent of the nation's 575,000 bridges are only 180 feet long or less.

Figure 13 - NY Route 117 over US; Underside of deck at abutment - Built 1970

These bridges are perfect candidates for details that will eliminate the leaking joint problem and significantly reduce such deficiencies. The FHWA TA recommends the use of jointless bridges "where possible."

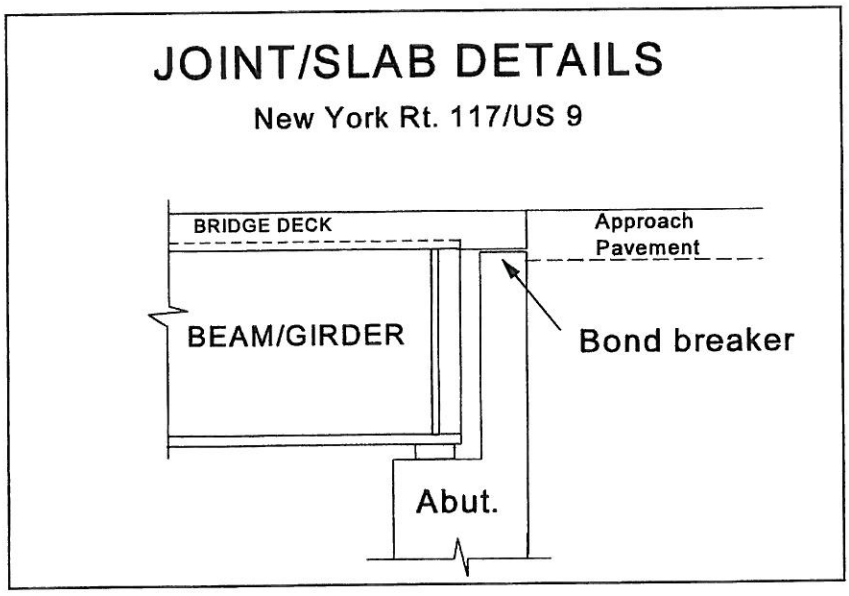

Figure 14 - Graphic of NY 'Jointless' Deck

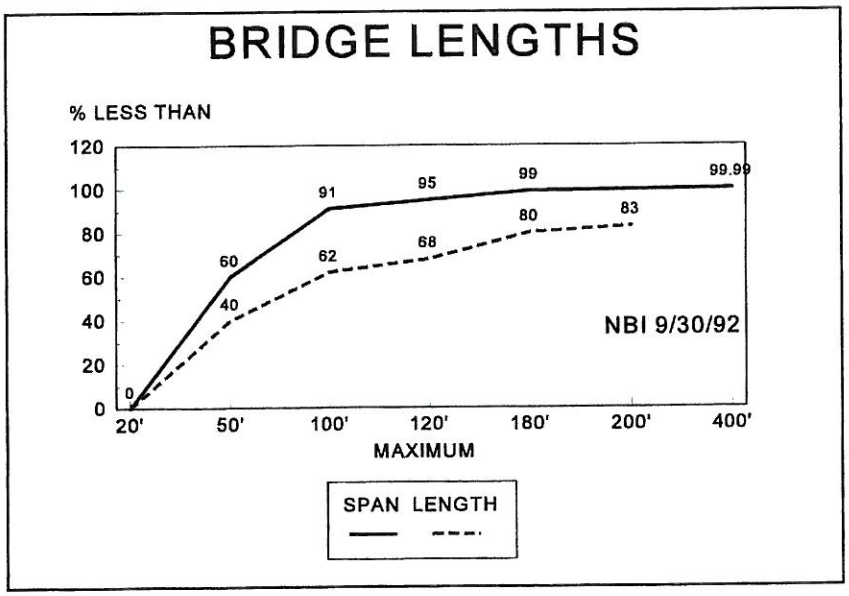

Figure 15 - Span and Length of Bridges in the US (NBI 1992)

Deck drains proved to be the second greatest cause of observed deterioration. Many of the deck drains (scuppers) were clogged, causing the salt-laden drainage to seek another channel, often adversely affecting the bridge components below. Some details allowed drainage to be discharged directly onto the bridge members beneath. Some states, Maryland for example, use very few, if any, deck drains on bridges of nominal lengths; further, they report no problems due to deterioration or hydroplaning. The lesson learned from this experience appears to be: *fewer drains seem to be better*. However, where deck drains are required, proper detailing is critical to prevent the premature deterioration of the building material; improved details are recommended in the TA.

Joints and deck drains were not the only bridge details where damage was observed due to roadway drainage. Construction joints in decks and parapets, electrical junction boxes, and manholes are all channels for deck drainage to seep below the bridge deck and cause deterioration in weathering steel structures. Equal attention must be given to these types of details as well.

STAINING OF SUBSTRUCTURES

There is a great deal of discussion concerning the staining of uncoated weathering steel used in the construction of bridges; it is a very subjective issue. Over the course of this study, some agencies expressed concern about the staining of weathering steel, and included specific control measures in the contract documents. One agency did not seem to consider this issue as a point of concern at all. Where concerns exist, this study showed it is definitely possible to prevent staining with relatively simple and inexpensive techniques.[3]

[3] " Uncoated Weathering Steel Bridges," Highway Structures Design Handbook, Vol. I, Chap. 9, January 1993.

Based on the findings of a Task Force, appointed by the AASHTO Technical Committee for Structural Steel Design, the only concern for fatigue life of weathering steels is for Category A details (AASHTO Table 10.3.1B[4]— Base metal with rolled or cleaned surface). As a result, AASHTO voted to revise the fatigue design criteria for weathering steel by requiring uncoated, Category A "Situations" to be designed for Category B stress ranges. Table 10.3.1A[4], Allowable Fatigue Stress Range, now limits the range accordingly for weathering steel.

A concern expressed by some is the reduced capability to see fatigue cracks in weathering steel, increasing the probability of missing these cracks during inspections. Only one fatigue crack was observed in this study, and as can be seen in Figure 16, the fatigue crack is readily visible. In fact, fatigue cracks in weathering steel tend to bleed an orange dust that is easy to detect. However, as with any bridge inspection, adequate lighting is essential.

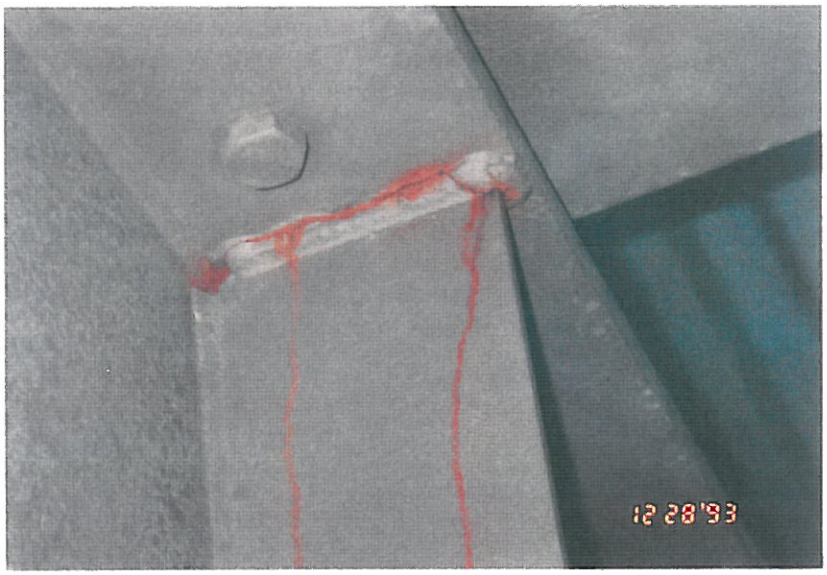

Figure 16 - Fatigue crack in weathering steel

[4] "Standard Specifications for Highway Bridges", American Association of State Highway and Transportation Officials, 15th Ed., 1992.

CONCLUSION

The results of AISI's Phase-III study confirm that uncoated weathering steel bridges are all performing well throughout the United States and in Puerto Rico with the possible exception of the Metropolitan Detroit area. Further, weathering steel has proven to be a cost-effective material that performs well in virtually all environments.

The results of this study also confirm that bridges designed and detailed in accordance with recommendations in the FHWA Technical Advisory will perform very well. The inspections performed during Phase-III were done on structures built years before the Technical Advisory was published. Both the "macro-environmental" and "micro-environmental" concerns discovered during the bridge inspections are adequately covered by the FHWA TA. However, the TA requirements for low-level crossings over standing or flowing water appear to be too conservative.

The bridges inspected in Phase-III have been in service between 18 and 30 years, and, based on the performance of these structures to-date, the original selection of uncoated weathering steel has to be considered a cost-effective decision. At a minimum, that decision resulted in eliminating the need for an initial coating, and in most cases studied, at least one additional maintenance painting. Also, most of these bridges should not require painting except under leaking joints. This has resulted in savings for the owners of the structures, while conforming to existing highway legislation mandating the consideration of life-cycle costs for bridges throughout the country.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
1.Twin Bridge 061-0070 and 061-0071 East of Centralia, IL (2-14 ft. above water and grade) Built 1973	Rural	21	Heavy	NA	Heavy	NA	Leaking

Results of Inspections:
10/8/80 - Excellent conditions except for a little flaky or laminar rust (.028" to .0287" thick) below leaky sections of expansion dams. There was little apparent loss of cross section. The corrosion rate is estimated as less than 1 mpy.

3/14/94 - All areas of both of these bridges are weathering as would be expected in this rural environment, except for corrosion that is occurring under the leaking expansion joints at all four abutments. The ends of the girders and the bearings are experiencing laminar type rusting. All other steel is in excellent condition.

2. SN037-0124 Genesco, IL Built 1973	Rural	21	Light	NA	Heavy	NA	Leaking

Results of Inspections:
10/1/80 - Good condition-no significant corrosion anywhere except in small localized areas under leaking joints. In these areas flaky or laminar rust (.030") was observed on beams and diaphragms with beam lower flanges being affected the most. The greatest section loss observed was about 5 mils which equates to an average local corrosion rate of about .71 mpy.

3/15/94 - The steel beams are weathering as would be expected in this rural environment, except for areas directly under the leaking expansion joints. The ends of the beams show some laminar rusting caused by the leakage. All other steel is in excellent condition.

3. SN081-6050 Moline, IL Built 1968	Urban	26	Heavy	Light	Heavy	Light	Leaking

Results of Inspections:
!0/1/80 - Good condition-no significant corrosion anywhere except in small localized areas under leaking joints. In these areas flaky or laminar rust (.80") was observed mainly on diaphragms with upper flanges being affected the most. The greatest section loss observed was about 20 mils which equates to an average local corrosion rate of about 1.67 mpy.

3/15/94 - The overall condition of this 25 year old bridge is very good. The beams have weathered nicely on both interior and exterior faces. The expansion joints are open sliding plate type. Areas beneath the joints on the abutment seats are very wet, due to weep holes in the backwall, and appear to stay wet all the time. As a result, the masonry plates and anchor bolts are corroded. The ends of the beams are only slightly affected, with the fascia beam being the worst.

4. SN050-0033 Ottawa, IL Built 1975	Urban	19	Heavy	NA	Heavy	NA	Leaking

Results of Inspections:
9/30/80 - Good condition-no significant corrosion anywhere except in localized areas under leaking joints., including a median joint. In these areas flaky or laminar rust (.075") was observed on beams and diaphragms with beam lower flanges being affected the most. The greatest section loss observed was about 10 mils which equates to an average local corrosion rate of about 2 mpy.

3/16/94 - This bridge is located on one of the main streets of Ottawa. The heavy traffic has destroyed the "sealed" type of expansion joints, with many sections actually missing. This provides a direct channel for the salt-laden deck drainage to get onto the beams below. The result is severe corrosion occurring at those locations. However, a very short distance (5' +/-) away, the steel is in excellent condition

5. SN001-0024 Quincy, IL Built 1975	Rural	19	Light	NA	Light	NA	Leaking

Results of Inspections:
10/2/80 - Good condition-no significant corrosion anywhere except in small localized areas under leaking joints. In these areas flaky or laminar rust (.065") were observed on beams, stiffeners and diaphragms with beam lower flanges being affected the most. The greatest section loss observed was about 10 mils which equated to an average corrosion rate of about 2 mpy.

3/14/94 - Except for the ends of the beams immediately under the leaking expansion joints, the steel is weathering in essentially a "textbook" fashion. Fine rust particles could be rubbed off surfaces, but there is no evidence of section loss. The areas around the ends of the beams need to be cleaned and painted for a distance of about 4' to 5'

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
6. SN050-8000 Streator, IL Built 1972	Urban	22	Light	NA	Light	NA	Leaking

Results of Inspections:
9/30/80 - Good condition - no significant corrosion anywhere except in small localized areas under leaking joints. In these areas flaky or laminar rust (.035") were observed on beams, stiffeners and diaphragms with beam lower flanges being affected the most. The greatest section loss observed was about 10 mils which equates to an average local corrosion rate of about 1.25 mpy.

3/16/94 - Again, except for areas directly under the leaking expansion joints, the steel is in excellent condition. One of the sealed" expansion joints is in very poor condition with about one-half of the sections missing. The steel below is being adversely affected as a result. The designer controlled abutment staining by providing a small "lip" around the periphery of the abutment seat, and channeling the water through chamfer strips.

7. BC-4104 East Baltimore, MD, Exit Ramp Built - 1970	Rural (Note: previously classified as industrial)	23	Very Heavy	Very Heavy	Heavy	Heavy	Slight Leakage

Results of Inspections:
10/21/80 - Excellent condition. There were some cracks in the concrete deck with white deposits, presumably deicing salts. These cracks did not affect the corrosion performance of the substructure. Some slight granular or flaky rust occurred at three of the four corners of the bridge beneath leaky expansion dams.

12/20/93- The box girders for this bridge were only inspected from the ground. Due to the extensive OSHA safety requirements for entering enclosed spaces, no internal inspection was attempted. Overall, the bridge remains in excellent condition with no decipherable change from that reported in 1980. A very small rust lamination was observed at the southeast corner of the bridge. Corrosion from the reported leaky joints, is at worst, minimal. The "white deposits" previously identified as deicing salts on the bottom of the deck, are more likely calcite deposits.

8. 3201 South of Baltimore, MD, Exit Ramp (I-95 SB to I-695 EB) Built - 1969	Urban (Note: previously classified as industrial)	24	Heavy	Very Heavy	Heavy	Heavy	Joints leaking badly

Results of Inspections:
10/22/80 - Good condition except for some moderate flaky rust (0.25" to 0.63" thick) at a few sections of the bridge where some joints are leaking. There was little apparent cross sectional loss of steel.

12/20/93 - The condition of the structure is excellent in all areas, including fascia beams over traffic that are exposed to salt spray from trucks passing below, EXCEPT under the abutment joints. Leakage of salt-laden water is causing severe corrosion, with section loss at the ends of the beams, and the bearings. The beam ends are not painted as would be required for new structures. There is a trough under the joints, but it is not effective! Bridge #3199, which is adjacent to Bridge #3201, is in the same condition.

9. 7031 Charlestown, MD, Built - 1974	Rural	19	Light	Railroad	Heavy	NA	Pier joint leaking

Results of Inspections:
10/21/80 - Good condition except for some granular or flaky rust (.037" to .052" thick) at leaky sections of expansion dams. There was little apparent loss of section.

12/20/93 - Overall the condition of the structure is excellent. Leakage through the pier expansion joint is causing some laminar corrosion of the bottom of the bottom flange of only the southernmost fascia beam because of roadway superelevation. Inspection was conducted from ground level with binoculars due to electrified railway.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
10.10161South Bridge near Mt. Airy, MD Built - 1975	Rural	19	Heavy	Medium	Heavy	Heavy	Abutment Joints leaking

Results of Inspections:
10/23/80 - Excellent condition. There is some granular or light flaky rust in two of the four corners, but it is of little consequence.

12/21/93 - This single span overpass structure is in excellent condition. The single cell compression seal joints at the abutments are leaking with only minor affect on the steel beams. However, painting of the ends of the beams is recommended for long term protection.

11. 13018 Sykesville, MD, Built - 1975	Rural	19	Medium	NA	Heavy	NA	Abutment Joints leaking

Results of Inspections:
10/23/80 - Good condition except along the entire bottom of flange and the ends of one exterior beam (fascia surface painted) where water flows over the bridge deck onto beam (no curb, only guardrail). Flaky and laminar rust (0.26" to 0.55" thick) was evident at these areas. However, substantial steel remains (.865" to .887") and attack was minimal on the basis of thickness measurements. There was no significant pitting corrosion on any sections of the bridge.

12/21/93 - The adverse effects of roadway drainage coming into contact with the structural steel is most evident on this bridge. The abutment joints are leaking badly, causing corrosion of the ends of the beams. In addition, because the deck slab on the downstream side does not extend beyond the fascia beam, the roadway drainage pours down over the steel beam. The web is painted, and shows no corrosion. However, the bottom of the bottom flange is corroding, and should also be painted. These portions of the bridge should be painted to insure long term protection. All other parts of the structure are in excellent condition.

12. 13031 North Bridge near West Friendship, MD Built - 1974	Rural	20	Heavy	Medium	Heavy	Heavy	Abutment Joints leaking

Results of Inspections:
10/22/80 - Excellent condition. There is some granular or very light flaky rust on sections below some leaks in the expansion dams at the ends, but little apparent loss in thickness of steel.
12/21/93 - This structure is in excellent condition, with the exception of the ends of the girders under the leaking expansion joints. Minimal corrosion is occurring at these locations due to the leakage, and painting of the ends of the girders is recommended.

13. RO1-18024, US 10 over Ann Arbor Railroad, near Farwell, MI Built 1973	Rural	21	Light	NA	Heavy	NA	Leaking

Results of Inspections:
5/20/81 - Bare steel in excellent condition, except that light rust flaking has developed below a leaking joint. Mill scale with moderate pitting was present on much of the interior members' surfaces.

3/19/94 - Severe corrosion is occurring under the leaking joints which is over the pin/link hangers at both the fixed and expansion ends of the suspended spans. Salt-laden water is running down the flanges for a considerable distance, causing additional corrosion

14. RO1-82123, I-96 over C&O Railroad and Fullerton Ave., Detroit Built 1975	Urban	19	Heavy	Light	Heavy	Heavy	Leaking

Results of Inspections:
5/19/81 - Bare steel in excellent condition, except that rust scale has developed on bridge members below leaking expansion joints and on bridge members to which the leaked roadway water has spread.

3/18/94- Due to severe corrosion that was occurring under leaking joints and over traffic lanes, this bridge was painted in 1993 after 18 years of service. Time of Exposure Amount of Traffic Amount of Deicing Salts Joint Bridge Environment (years) On Bridge Below Bridge On Bridge Below Bridge Conditions

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
15. S34-82123, Maplewood Ave. over I-96, Detroit, MI Built 1972	Urban	22	Heavy	Heavy	Heavy	Heavy	Leaking

Results of Inspection:
5/19/81 - The lower sheltered surface of this bridge shows flaky or laminar rust. Section loss due to corrosion has not occurred beneath this rust. Corrosion has occurred on a flange subject to runoff from a leaking joint.

3/18/94 - This bridge is undergoing severe corrosion over essentially the entire length of the bridge. It should be painted as soon as funding permits.

16. S35-82123, Pacific Ave., over I-96, Detroit, MI Built 1972	Urban	22	Heavy	Heavy	Heavy	Heavy	Leaking

Results of Inspections:
5/19/81 - Most of this bridge members are covered with flaky rust; this has resulted in no significant section loss. Aside from appearance this bridge is in fair condition.

3/18/94 - This bridge is undergoing severe corrosion over essentially the entire length of the bridge. It should be painted as soon as funding permits.

17. S03-70024 (88th Ave.) East of Holland, MI (16 ft. above concrete highway) Built 1972	Rural	22	Medium	Heavy	Medium	Heavy	Leaking

Results of Inspections:
6/23/81 - Excellent condition.

3/19/94 - This structure is in generally good condition, but severe corrosion is occurring under the leaking expansion joints. There is corrosion visible over the traffic lanes as well. At the South Abutment, there is a heavy flaky surface on the steel.

18. S01-70024 (Adams Road) East of Holland, MI (17 ft. above concrete highway) Built 1972	Rural	22	Medium	Heavy	Medium	Heavy	Leaking

Results of Inspections:
6/23/81 - Excellent condition.

3/19/94 - Severe corrosion is occurring under the leaking expansion joints. Slight corrosion is visible over the traffic lanes. However, overall the bridge is in good condition.

19. B03-82293, North Bound I-275 over Rouge River, Livonia, MI Built 1972	Urban	22	Heavy	NA	Heavy	NA	Leaking

Results of Inspections:
5/18/81 - Bare steel in excellent condition, except that corrosion has occurred on bridge below leaking joints.

3/18/94 - Except for the effect of leaking joints, the steel is weathering as expected. Under the joints, corrosion is severe. There is some evidence of corrosion on the fascia girders, possibly due to salts being blown over the edge of the bridge. As is standard with Michigan bridges, there is only a 13" overhang on the deck slab.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
20. B03-70024 (Black River) East of Zeeland, MI (15 ft. above water) Built 1972	Rural	22	Heavy	NA	Heavy	NA	Leaking

Results of Inspections:
6/24/81 - Fair to excellent condition. There is heavy, flaky or laminar rust on some hanger areas (less than 5% of bridge structure) below leaky joints.)

3/19/94 - Severe corrosion is occurring under the leaking joints. Corrosion is also occurring on the fascia girders, possibly due to the short (13") slab overhang. The rest of the bridge is in good condition.

21. SO5-82123, SO6-82123, East Bound I-96 over M-39,Detroit Built 1970	Urban	24	Heavy	Heavy	Heavy	Heavy	Leaking

Results of Inspections:
5/18/81 - Bare steel in good condition, except that heavy rust scaling with no observable section loss has occurred on bridge members over the roadway.

3/18/94 - These two structure numbers represent many bridges that are a part of a very large urban interchange. All of these bridges were painted between 1988 and 1991 due to severe corrosion that was occurring. The bridges had been exposed in an uncoated condition for 18 to 21 years.

22. S11-18024, US 10 over US 27, near Clare, MI Built 1973	Rural	21	Medium	Medium	Heavy	Heavy	Leaking

Results of Inspections:
5/20/80 - Bare steel in excellent condition except that rust flaking has developed on bridge members below leaking joints.

3/19/94 - Except for the corrosion that is occurring under the leaking joints, this bridge is in excellent condition.

23. NJTP over Berry's Creek Canal, MP 112.67 Built - 1970	Industrial	23	Very heavy	None	Heavy	None	Leaking

Results of Inspections:
9/24/80 - Bare Steel in excellent condition, except that corrosion has occurred on bare steel bearings below leaking expansion joints.

12/28/93 - Heavy corrosion is occurring under the leaking joints. The trough under the joint is not functioning as intended. All steel away from the joint areas is in excellent condition.

24. Edgebrook Road over NJTP, MP 60.33 Built - 1973	Rural	20	Light	Very heavy	Heavy	Heavy	Leaking

Results of Inspections:
9/23/80 - Bare steel in excellent condition, except that rust scale has formed on bridge members above the roadway.

12/27/93 - Heavy corrosion is occurring under the leaking joints. Steel flanges and cross-frame members over the gore area show presence of salts and slight corrosion. Fascia beams over roadway appear to be in excellent condition in spite of obvious presence of roadway salts deposited from below.

25. Fulton Street over NJTP, MP 92.08 Built - 1970	Industrial	23	Heavy	Very Heavy	Heavy	Heavy	Leaking

Results of Inspections:
9/24/80 - Bare steel in excellent condition, except that light to heavy rust scale has formed on bridge members over the roadway

12/28/93 - Only one span remains of the bridge inspected in 1980. The steel on this span is in excellent condition even though the joints had obviously been leaking. Interior and fascia surfaces have formed a dense patina.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
26. NJTP Interchange No. 11 ramp, MP 90.21 Built - 1970	Urban	23	Heavy	Very heavy	Heavy	Heavy	Leaking

Results of Inspections:
9/24/80 - Bare steel in excellent condition, except that rust scale has formed on bridge members over the roadway.

12/28/93 - This bridge is the closest example to the "Tunnel Effect" of all bridges inspected on the Turnpike. Salt deposits were evident on the fascia girder flanges and on the bottom flange. However, no evidence of serious corrosion was observed except under the leaking expansion joints.

27.NJTP Harry Ladderman Memorial Bridge, MP 107.87 Built - 1970	Industrial	23	Very heavy	None	Heavy	None	Leaking

Results of Inspections:
9/25/80 - Bare steel in excellent condition, except that corrosion has occurred on bridge members below leaking joints and a bare steel hinge below a leaking joint has become "frozen".

12/28/93 - This is a very long bridge, and the vast majority of the steel is weathering in a "textbook" fashion. However, there are numerous expansion joints, inspection access manholes in the deck, and deficient scuppers that are causing roadway drainage, contaminated with roadway salts to come into contact with the steel. The steel hinge (pin/link hanger) noted as "frozen" in 1980 has been replaced with stainless steel pins and links. In addition, a very efficient trough was installed under the finger joint which is above the hanger.

28. NJTP Mile 92 U-Turn,
MP 92.11 This bridge has been removed due to widening of the Turnpike
Built - 1970

Results of Inspections:
9/24/80 - Bare steel in excellent condition, except that light rust scale has formed on bridge members over the roadway.

29. Moorestown Maintenance Drive, over NJTP, MP 37.02 Built - 1964	Rural	29	Moderate	Very heavy	Heavy	Heavy	Leaking

Results of Inspections:
9/23/80 - Bare steel in excellent condition, except that corrosion has occurred in bridge members beneath leaking joints and light to moderate rust scale has formed on bridge members above the roadway.

12/27/93 - It is believed that this bridge is the first weathering steel bridges built by the NJTpk, and is one of the oldest in the United States. In spite of the very heavy traffic and salting that takes place below the structure, the steel over the roadways is still in excellent condition. Heavy corrosion is taking place under the leaking expansion joints from the salts placed on the roadway above.

30. Pedestrian bridge over NJTP, MP 86.58 Built - 1973	Urban	20	Light	Very heavy	Light	Heavy	Leaking

Results of Inspections:
9/24/80 - Bare steel in excellent condition, except that rust scale has formed on bridge members over the roadway.

12/27/93 - Except for the steel immediately under the leaking joints above, all steel on this bridge, including the fascia beams over traffic is in excellent condition. Minor corrosion is occurring under the leaking joints. Evidently, this pedestrian bridge is not used very much, and therefore, receives less salt.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
31. NJTP over Railroad Avenue, MP 98.76 Built - 1970	Industrial	23	Very heavy	Moderate	Heavy	Light	Leaking

Results of Inspections:
9/25/80 - Bare steel in excellent condition, except that corrosion has occurred onbridge members below leaking joints and one small area has developed flaky rust.

2/28/93 - This is a very long structure that has the Turnpike on one side and an EXXON refinery on the other The refinery may be asource of corrosion causing industrial pollutants, but no corrosion is evident on the steelbeams. Except for under the leaking joints, all steel exhibits a dense protective oxide coating.

32. NJTP over Rancocas Creek, MP 40.96 Built - 1971	Rural	22	Very heavy	None	Heavy	None	Leaking

Results of Inspections:
9/23/80 - Bare steel in excellent condition, except that corrosion has occurred onbridge members beneath leaking joints.

12/27/93 - Heavy corrosion is occurring under the leaking expansion joints onthis bridge. In addition, the salt-contaminated roadway drainage is running down the girder flange, causing corrosion away from the joint area. Allother steel on this bridge is in excellent condition.

33. 1-0694-1,2, I-481 over Conrail, NY Built - 1978	Rural	26	Very heavy	None	Heavy	None	Leaking

Results of Inspections:
10/16/80 - All bare steel in excellent condition.

2/8/94 - There is heavy corrosion under the leaking expansion joints at theabutments. There is also relatively coarse rust scales on the southern fascia girder at the east abutment. Other than this, the steel is in excellentcondition.

34. 3-09330-0, NY 8 Nine Mile Creek, near Syracuse, NY Built - 1974	Industrial	20	Light	None	Heavy	None	No leaking Joints

Results of Inspections:
10/16/80 - All the sheltered bare steel on this bridge close over a pollutedwaterway is covered with flaky or laminar rust. However, corrosion of the steel is not excessive.

2/8/94 - The fascia girders are being adversely effected by salt-laden deck drainage because a drip groove was not installed on thebottom of the deck overhanging slab. Leakage at the expansion end of this single span bridgeis causing corrosion of the beam ends. At the other end, a very effective detail was used by carrying the slab over the top of the backwall. All theother steel in this bridge is in excellent condition, even though it is a "low" water crossing.

35. 220222, Broadway over Conrail, Rensselaer, NY Built - 1975	Urban	19	Heavy	None	Heavy	None	Leaking Joints

Results of Inspections:
10/15/80 - Bare steel in excellent condition, except at both ends of the bridgewhere corrosion has occurred below leaking joints.

2/7/94 - The deck was overlaid in 1992 with microsilica concrete. At that time,new joints were placed at the abutments. However, deck drainage is pouring over the ends of the joints and effecting the fascia girders. The rest of the steel is in excellent condition.

36. 1-09133-1, NY 117 over US 9, Westchester County, NY Built - 1970	Suburban	24	Light	Heavy	Heavy	Heavy	No leaking Joints

Results of Inspections:
10/14/80- All bare steel in excellent condition.

4/11/94 - The steel on this bridge is in excellent condition throughout, primarilybecause of an effective and inexpensive detail used at the abutments - no joint!

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
37. 2-09104-1 Pocantico Hills bridle path over NY117, Westchester County, NY Built - 1970	Rural	24	None	Light	None	Heavy	No leaking Joints

Results of Inspections:
10/14/80 - All bare steel in excellent condition.

4/11/94 - The steel on this bridge is still in excellent condition. The timber pedestrian walkway is allowing debris to accumulate, which remains wet, and could cause excessive corrosion. The timber should be removed since it is also rotted in some areas.

38. Foote Mineral Co. Bridge over I-85 Cleveland County, NC Built - 1972	Rural	22	Light	Heavy	None	Light	No leaking Joints

Results of Inspections:
9/16/80 - All bare steel in excellent condition.

2/1/94 - All steel in this bridge remains in excellent condition after 22 years of service. Very little, if any, salt is applied to the deck. there is no apparent effect on the steel from the traffic below.

39. 26-95-20, I-26 over Green River, near Henderson, NC deck Built - 1968	Rural	26	Heavy	None	Light	None	Leaking Expansion & constr. joints

Results of Inspections:
9/18/80 - Bare steel in excellent condition, except where ponding of roadway water (from leaking joints) has caused rust flaking and corrosion.

2/1/94 - Other than the effects of salt-laden water that penetrates through the deck joints, the steel is in excellent condition. Some section loss is apparent where the steel shell penetrates the groundline, but it appears to be within the "extra" design thickness.

40. 321-79-05, Future US321 over Henry River Hickory, NC Built - 1975	Rural	19	Light	None	Light	None	No leaking joints

Results of Inspections:
9/17/80 - Bare steel in excellent condition, except where ponding of roadway water (from leaking joints) has caused rust flaking and corrosion.

1/31/94 - The steel in this bridge is in excellent condition, even under expansion joints.

41. 29-49-60, West Green Street over Temp. I-85 High Point, NC Built - 1975	Urban	19	Light	Heavy	Light	Light	No leaking Joints

Results of Inspections:
9/15/80 - Approximately 20% of the exposed steel shows flaky or laminar rust with no measurable loss of the steel underneath the rust.

1/31/94 - The steel is in excellent condition in all parts of this structure.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
42. 231-32-04, NC231 over US 264, Nash Co., NC Built - 1976	Rural	18	Light	Heavy	Light	Light	Leaking

Results of Inspections:
9/15/80 - All bare steel in excellent condition.

1/31/94 - The steel in this bridge remains in excellent condition except for minor corrosion under the leaking expansion joints.

43. B-5-141 Green Bay, WI (4 ft. above water) Built - 1971	Urban	23	Heavy	(over water)	Heavy	(over water)	Leaking

Results of Inspections:
9/8/80 - Excellent condition

4/5/94 - This low level water crossing is in excellent condition after 23 years of service, except at the ends of the beams, where joint leakage is causing corrosion.

44. B-67-170 (E) Hartland, WI (15 ft. above concrete highway) Built - 1976	Rural	18	Heavy	Heavy	Heavy	Light	Leaking

Results of Inspections:
9/17/80 -Excellent condition. Only some thin (.023") flaky rust and soil below a few sections of leaky joints.

4/5/94 - Although joints at both ends of this single span bridge are leaking, corrosion is limited to only 6" to 12" at the ends, since the beams are haunched for aesthetic reasons. The remaining portions of the bridge are in excellent condition.

45. B-27-68 Hatfield, WI (50 ft. above water) Built - 1972	Rural	22	Light	(over water)	Light	(over water)	Leaking

Results of Inspections:
9/9/80 - Excellent condition

4/6/94 - This bridge is in an ideal environment for use of uncoated weathering steel. Except for very minor corrosion under the leaking joints, the steel is in excellent condition.

46. B-40-405 Oak Creek County, suburb of Milwaukee, WI Riveted railroad bridge (15 ft. above concrete highway) Built - 1972	Rural	22	(RR bridge)	Heavy	(RR bridge)	Heavy	No leaking but tunnel like conditions

Results of inspections:
9/17/80 - Good condition. Some flaky and laminar rust (.042" to occasional .100" thick) occurred on a few areas of center beam and of cross braces (lowest sections of the massive bridge structure), probably due to road spray. The condition of the steel remaining was good and there appeared little loss of cross section.

4/5/94 - This railroad bridge is weathering well as would be expected in this rural environment. There is no evidence of excessive corrosion over the roadways. The diagonal bracing does have a "scaly" appearance, most likely due to roadway salt spray, but no section loss is apparent.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
47. B-62-34 Rockton, WI (53 ft. above water and grade) Built - 1975	Rural	19	Light	(Over water and extended grade)	Light	(Over water and extended grade) some leakage of joints on ends	Leaking

Results of Inspections:
9/9-10/80 - Good condition except for some flaky or laminar rust (.027" to ,045" thick) below open or leaky sections of expansion

4/6/94 - The steel on this bridge is in excellent condition except under the leaking joints. Due to the rural nature of this site, corrosion under the joints is minimal when compared to more urbanized areas where more salt is used.

48. B-67-177 Waukesha, WI (10 ft. above water) Built - 1972	Industrial	20	Heavy	(Over water)	Light	(Over water)	No joints

Results of Inspections:
9/17-18/80 - Excellent condition. There were some cracks through the concrete deck which had white deposits, presumably salt, but they did not cause any problems.

4/5/94 - This bridge is only 6.5 to 9.5 feet above the Fox River, yet there is no evidence of any corrosion on the beams. There are no joints at the ends of the bridge, and, therefore, no corrosion!

49. B-56-56 Wisconsin Dells, WI (38 ft. above water) Built - 1976	Urban	18	Heavy	(Over water)	Heavy	(Over Water)	Leaking

Results of Inspections:
9/10/80 - Good condition, however, there are cracks through the concrete deck with white deposits (probably salt). Flaky and laminar rust (.040" to .113" thick) occurred beneath some of these cracks and below leaky sections of expansion dams. There was little apparent cross sectional loss of steel. The corrosion rate was estimated as less than 1 mpy.

4/6/94 - The ends of the beams were painted in 1989 due to corrosion from leaking joints. However, the salt-laden deck drainage is running down the flange for a distance of 20' in some cases. The bridge joints are in very poor condition. There is also evidence of salt-laden water coming through an electrical junction box, and having a minor effect on the steel. The majority of the steel on this bridge is in excellent condition.

50. Empire Bridge over Doullut Canal Built 1975	Marine	19	Medium	NA	None	NA	Open

Results of Inspections:
1982- Most of the bridge surface exhibited flaking rust due to location-related salt contamination, frequent fog, and high humidity. Localized areas where rust flakes have accumulated can be cleaned and painted to prevent corrosion due to retention of moisture in the rust-flake poltices. The corrosion performance of the bridge and weathering steel samples exposed on the bridge should continue to be monitored.

1/26/94 - Since the 1982 inspection, the LaDOTD had a Contractor paint a portion of the bridge. There are localized failures of the painted portions. However, the remaining surfaces of the bridge steel appears to be weathering in a "normal" fashion, in spite of the marine environment, except for the same localized areas noted in 1982, where accumulated debris has remained moist due to the high humidity. At these locations corrosion is still occurring, and again, cleaning of these areas is recommended. Continued monitoring of the performance of this structure is recommended, because of the results of the small sample tests that were recently completed.

Bridge	Environment	Time of Exposure (years)	Amount of Traffic On Bridge	Amount of Traffic Below Bridge	Amount of Deicing Salts On Bridge	Amount of Deicing Salts Below Bridge	Joint Conditions
WEST VIRGINIA UNIVERSITY PRT							

Note: These bridges are a part of the University of West Virginia's "Personal Rapid Transit" (PRT) system. Much of the system is on elevated structure. The descriptions used in the August, 1980 inspections were vague. It is assumed this inspection is of the same portions of the system as was inspected previously.

51. Beechmont Avenue Station; PRT over Route 19; Sta. 88+48-	Urban	22	PRT	Heavy	??	Heavy	NA*

*There is no deck on this structure. Guideway North It is a rail type bridge with open deck.
Built 1972

Results of Inspections:
8/15/80 - Area free of debris and salt appeared to be in good condition. Salt contamination due to accidental spills.

3/24/94 - There is a considerable amount of corrosion on this structure, even though it is not subjected to roadway deicing salts. Crash barrels were originally filled with a mixture of sand and salt. These leaked, and caused significant corrosion of members below, some of which had to be replaced. Other parts of the structure are being adversely affected because of the corrosive nature of the rail "anti-freeze" mixtures being applied in freezing weather.

52. 'B' Ramp; Sta. 0+97; Engineering Station where rails meet grade.	Urban	22	PRT	Heavy	??	Heavy	NA*

*There is no deck on this structure. It is a rail type bridge with open deck.
Built 1972

Results of Inspections:
8/15/80 - Area free of debris and salt appeared to be in good condition. Salt contamination due to accidental spills.

3/24/94 - There is a considerable amount of corrosion on this structure, even though it is not subjected to roadway deicing salts. Crash barrels were originally filled with a mixture of sand and salt. These leaked, and caused significant corrosion of members below, some of which had to be replaced. Other parts of the structure are being adversely affected because of the corrosive nature of the rail "anti-freeze" mixtures being applied in freezing weather. There is a curved fascia for decorative purposes on each side of the structure. At the bottom of this fascia, it has a plate that catches all dirt and debris from above. This debris is retaining moisture and causing corrosion of this non-structural member.