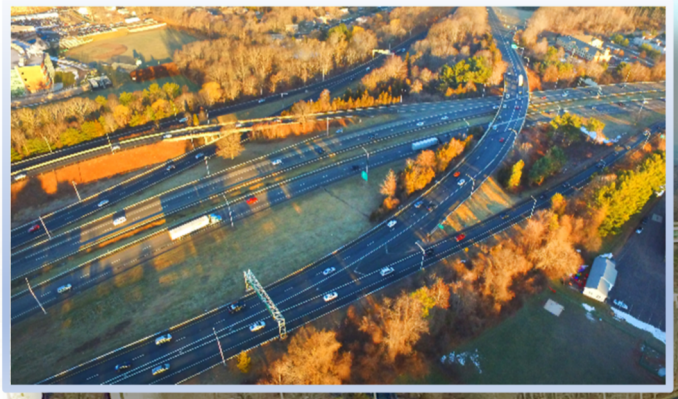

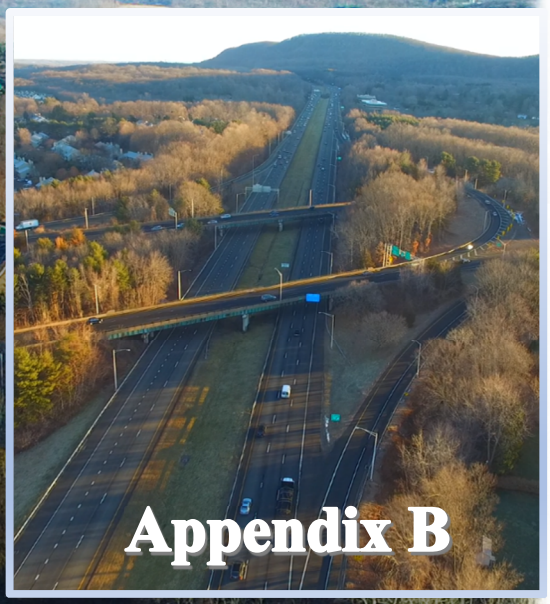

Appendix B

I-91/I-691/Route 15 Interchange Improvements Meriden, CT

Revised Needs & Deficiencies Report

State Project 079-240

July 31, 2018

In association with:

PARSONS

GM2 ASSOCIATES

Terracon

GZA

PARSONS

APPENDIX B

BRIDGE AND CULVERT EVALUATION DATA

Bridge Condition Evaluation: Bridge No. 00799

Description

Bridge No. 00799 carries Baldwin Avenue over State Route 15 north and southbound in Meriden, Connecticut. This two span structure consists of two back-to-back, single span concrete rigid frames supporting a bituminous wearing surface. The frame structures are supported on spread footings. A single spread footing is shared by the interior frame legs. The structure was constructed in 1946 and designed for the H20 live load vehicle model in accordance e with the provisions of the AASHO Standard Specifications for Highway Bridges, 1941 Edition. The bridge has an overall length of 95 feet, a curb-to-curb measurement of 30.0 feet, and a minimum vertical underclearance of 13.75 feet.

The structure services a bi-directional ADT of 3,468 vehicles with 4% truck traffic from 2016 volume data. The most recent load rating analysis for this structure was computed in 1979 using the Allowable Stress Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 26.7 tons for the H20 vehicular model (rating factor = 1.33) and an operating rating of 69.0 tons (rating factor = 3.45). The structure has a sufficiency rating of 70.6 and is currently posted for clearance restrictions.

Table B.01 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.02 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.01: Bridge 00799 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated sidewalk and curbing.	There is a large spall in the sidewalk at the northwest approach with a three-foot-long section of missing approach mountable bituminous curbing which presents tripping hazards to pedestrians.	Medium	6 (Satisfactory)	0-5 Years	Repair approach sidewalks and curbing as required.
2	Deteriorated bride railing system	The bridge railing system consists of a concrete parapet with metal beam rail mounted along the front face of rail and a chain link fence system installed. The metal components of this system exhibit heavy peeling paint with surface rusting. There are rusted through holes to metal beam rail components which could affect the system's vehicular deflection strength.	Medium	5 (Fair)	0-5 Years	Repair deteriorated components. Consideration should be given to replacement of this system with an RB-350 compliant bridge parapet.
3	Collision Damage	Most likely due to the low bridge clearance, there are minor vehicular scrape marks along the underside of frame	Low	7 (good)	10+ Years	Consideration should be given to raising the superstructure during future bridge rehabilitation projects. The structure is currently clearance posted.

Table B.02: Bridge 00799 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach and bridge railing to current RB-350 standards.	The bridge railing, transitions, approach rail, and approach railing end treatments do not meet current design standards. The bridge railing does not meet current standards for a non-NHI bridge, approach rail leading end transitions are not connected to the structure and there is no rub-rail. The approach metal beam rail contains steel blockouts, and the approach rail end treatments terminate within the vehicular clear zone.	Modify the bridge and approach railing system to meet current design standards.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1941 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO ASD methodology in 1979 and found the superstructure system to resist loads beyond statutory load levels for the H20 vehicle but below statutory for the HS20 vehicle at inventory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will identify members with as-built section properties that may require strengthening for code compliance.
3	Minimum vertical underclearance below minimum acceptable design criteria	The minimum vertical underclearance is below minimum acceptable design criteria and requires corrective action	Modifications of the bridge clearance can only be accomplished by profile realignment of the ramp and raising of the superstructure.

Bridge Condition Evaluation: Bridge No. 01818

Description

Bridge No. 01818 carries State Route 15 Northbound over Interstate 91 and Ramp 145 in Meriden, Connecticut. The structure consists of a four span steel multi-girder superstructure system composed of both plate and rolled girders supporting a reinforced concrete deck which is composite within the suspended portion of span 3 only. A single line of retrofitted pin and hanger devices is present in span 3 approximately 32 feet east of pier 2. The superstructure is supported by full height reinforced concrete piers and abutments with spread footings bearing on soil. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1961 Edition. The structure was rehabilitated in 1986 with the installation of catcher's mitt style redundancy retrofit devices for the pin and hanger system and removal of the bridge safety walks. The bridge has an overall length of 377 feet, a curb-to-curb measurement of 39.7 feet, and a minimum vertical underclearance of 15.58 feet.

The structure services a unidirectional ADT of 31,850 vehicles with 6% truck traffic from 2015 volume data. The most recent load rating analysis for this structure was computed in 2002 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 37.5 tons for the HS20 vehicular model (rating factor = 1.04) and an operating rating of 62.4 tons (rating factor = 1.73). The structure has a sufficiency rating of 80.5 and is currently not posted for load or clearance restrictions.

Table B.03 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.04 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.03: Bridge 01818 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deck end spalls with exposed reinforcement.	Spalled away deck ends that are actively deteriorating can compromise the deck joint system and allow water leakage onto superstructure components below.	Medium	6 (Satisfactory)	As soon as possible	Patch all deck ends and concrete joint headers (see item 4 below).
2	Deteriorated expansion joint pourable sealant and spalls within the concrete headers with daylight visible below.	Deteriorated expansion joint sealant can allow active leakage onto superstructure components below. Spalled concrete joint headers provide a hazard to vehicular traffic, most notably motorcycle traffic.	Medium	4 (Poor)	As soon as possible	Repair all leaking and compromised deck joints (strip seal joints at intermediate supports). Patch all spalled away concrete joint headers.
3	Presence of pin and hanger assemblies (redundancy retrofits are in place).	Pin and hanger assemblies, although retrofitted for redundancy and no longer fracture critical details, are present on the structure. These construction details require ongoing advanced inspection and maintenance.	Low	6 (Satisfactory)	10-20 Years	Ongoing maintenance of pin and hanger assemblies will be required including replacement of any deteriorated components, and measures taken to ensure proper functioning.
4	Steel expansion bearing section losses and impact rust present at random locations.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean and paint all active deterioration areas. Grease steel expansion bearings as required or replace bearing devices with elastomeric bearing pads. Source of active deterioration should be identified and corrected (see items 2 and 4 above).
5	Painted over section losses to girders within critical stress regions (flexure, bearing and shear stress regions).	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	5 (Fair)	0-5 Years	Clean, patch and paint compromised structural steel components. Sources of any active deterioration should be identified and corrected (see items 2 and 4 above).
6	Fatigue prone details (category E welds present at lateral bracing member gusset plate to girder web welds within tension stress regions).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	6 (Satisfactory)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
7	Triaxially restrained intersecting welds between vertical and longitudinal web stiffeners.	Triaxial constraint can contribute to fracture of steel components.	Low	6 (Satisfactory)	5-10 Years	The potential to repair fractured steel superstructure components exists.
8	Deteriorated reinforced concrete piers (spalls, hollow areas and wide cracks with and without rust and efflorescence leakage).	Deteriorated concrete can undermine substructure performance and remaining service life.	Medium	5 (Fair)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Source of active deterioration should be identified and corrected (see items 2 and 4 above).

Table B.04: Bridge 01818 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach and bridge railing to current RB-350 standards.	The bridge railing and approach railing transitions to the bridge do not meet current design standards. The bridge railing is less than 42 inches high, and there is greater than 3 inches of blunt end concrete at the approach railing transitions to the bridge.	Modify the bridge railing system (bridge parapet) height and geometry at the approach transitions.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1961 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2002 and found the superstructure system to resist loads beyond statutory load levels however did not consider the most recently noted section losses. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of painted over section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01819

Description

Bridge No. 01819 carries Interstate 91 Ramp 145 over State Route 15 southbound in Meriden, Connecticut. The structure consists of a three span steel multi-girder superstructure system composed of rolled girders with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete piers and abutments with spread footings bearing on soil. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1961 Edition. The bridge has an overall length of 175 feet, a curb-to-curb measurement of 26.0 feet, and a minimum vertical underclearance of 14.4 feet.

The structure services a unidirectional ADT of 3,035 vehicles with 8% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2002 using the Load Factor Design methodology in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges and lists an inventory rating of 43.2 tons for the HS20 vehicular model (rating factor = 1.20) and an operating rating factor of 71.8 tons (rating factor = 1.99). The structure has a sufficiency rating of 90.8 and is currently not posted for load or clearance restrictions.

Table B.05 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.06 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.05: Bridge 01819 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated expansion joint asphaltic plug sealant with active leakage	Deteriorated expansion joint sealant can allow active leakage onto superstructure components below.	Medium	5 (Fair)	0-5 Years	Replace the asphaltic plug joint material to remediate the active leakage during rainy conditions.
2	Steel bearing devices with impact and laminated rust. Locations of frozen expansion bearings.	Impact rust between sliding plates and noted frozen expansion bearing devices can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Medium	5 (Fair)	0-5 Years	Clean and paint all active deterioration areas. Grease steel expansion bearings as required or replace bearing devices with elastomeric bearing pads. Source of active deterioration should be identified and corrected (see item 1 above).
3	Painted over section losses to girders within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Low	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Sources of any active deterioration should be identified and corrected (see item 1 above).
4	Failing paint system	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
5	Fatigue prone details (category E and E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	8 (Very Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.

Table B.06: Bridge 01819 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach and bridge railing to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high, there is greater than 3 inches of blunt end concrete and no rubrail attached at the approach railing transitions to the bridge, and the approach metal beam railing system has steel block-outs.	Modify the bridge railing system (bridge parapet) height and geometry at the approach transitions and replace the safety walk with sloped granite curbing. Replace the steel block-outs with a compliant component at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1961 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2002 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of painted over section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01821

Description

Bridge No. 01821 carries East Main Street over Interstate 91, State Route 15, and State Route 15 Southbound Ramp 147 in Meriden, Connecticut. The structure consists of a four span steel multi-girder superstructure system composed of rolled girders with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete piers and abutments with spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 298 feet, a curb-to-curb measurement of 52.0 feet, and a minimum vertical underclearance of 15.8 feet.

The structure services a bi-directional ADT of 27,468 vehicles with 4% truck traffic from 2016 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 64.1 tons for the HS20 vehicular model (rating factor = 1.78) and an operating rating factor of 106.8 tons (rating factor = 2.97). The structure has a sufficiency rating of 74.7 and is currently not posted for load of clearance restrictions.

Table B.07 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.08 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.07: Bridge 01821 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Hollow concrete along the underside of deck behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes on either sides of the piers.	Medium	6 (Satisfactory)	0-5 Years	Patch all applicable deck ends.
2	Approach sidewalk settlement	Settlement of the approach sidewalk presents a hazard to pedestrian traffic.	High	6 (Satisfactory)	0-2 Years	Remediate all locations of sidewalk settlement by installation of new concrete or bituminous concrete ramp system.
3	Damaged and loose chain link fence system	The chain link fence system attached to the bridge railing is randomly loose, missing lower framing members, and has areas of impact damage with torn fence mesh compromising the performance of the fence. There are two locations of missing fence posts.	Medium	5 (Fair)	0-5 Years	Replace/repair the fence system.
4	PVC deck drains do not extend below the superstructure.	PVC deck weep drains that do not extend below the superstructure can allow runoff to drain directly onto superstructure steel. However at the locations noted in the most recent bridge inspection report, no evidence of leakage onto girders was noted.	Low	5 (Fair)	5-10 Years	Replace all deck weep PVC extension pipes.
5	Adhesion failures within asphaltic plug joint sealant (evidence of deck joint leakage on abutment backwalls).	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below.	Low	6 (Satisfactory)	0-5 Years	Replace the asphaltic plug deck joints.
6	Impact damaged approach metal beam rail system.	Impact damage to approach railing system can compromise the system's operational capacity.	Medium	6 (Satisfactory)	0-5 Years	Replace all sections of damaged rail, reset any tilted posts, and install fasteners at previously detached rail to post connections.
7	Steel bearing devices with impact and surface rust. Locations of both frozen and over-expanded bearings. Heavy section losses to anchor bolt nuts and one location of missing anchor rod.	Impact rust between sliding plates, noted frozen expansion bearing devices, and over-expanded bearings can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	High	4 (Poor)	0-5 Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Replace anchor bolt nuts as required and drill and grout a new anchor rod at the isolated missing location.
8	Superstructure components with active surface rusting, and section losses at support locations within critical bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Sources of any active deterioration should be identified and corrected.
9	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
10	Fatigue prone details (category E' welds present at the ends of cover plates). A single location of cracked diaphragm to diaphragm connection plate weld is present in span 4.	Fatigue prone details increase the potential for localized damage to the superstructure system. Cracked welds can propagate into base metal.	Medium	6 (Satisfactory)	0-5 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk related to the fatigue prone details.

11	Abutment backwall deteriorated concrete around utility block-outs.	The grout around the utility blockouts at both abutments is spalled and hollow with active leakage noted.	Medium	6 (Satisfactory)	0-5 Years	Clean and patch deteriorated concrete.
12	Pier caps and columns with hollow cover concrete, spalls, and random cracks.	Deteriorated concrete can undermine substructure performance and remaining service life.	Medium	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.

Table B.08: Bridge 01821 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach and bridge railing to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high, there is greater than 3 inches of blunt end concrete and no rubrail attached at the approach railing transitions to the bridge, and the approach metal beam railing system has steel block-outs.	Modify the bridge railing system (bridge parapet) height and geometry at the approach transitions. Replace the steel block-outs with a compliant component at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01824

Description

Bridge No. 01824 carries Interstate 91 Ramp 811 over State Route 15 Southbound in Meriden, Connecticut. The structure consists of a three span steel multi-girder superstructure system composed of rolled girders with welded bottom flange cover plates (present in span 2 only) supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete piers and abutments. Abutment 1 and pier 1 are founded on piles while pier 2 and abutment 2 consist of spread footings bearing on soil. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 190 feet, a curb-to-curb measurement of 26.0 feet, and a minimum vertical underclearance of 15.8 feet.

The structure services a unidirectional ADT of 20,340 vehicles with 14% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 36.1 tons (rating factor = 1.00) for the HS20 vehicular model and an operating rating factor of 60.1 tons (rating factor = 1.67). The structure has a sufficiency rating of 84.0 and is currently not posted for load or clearance restrictions.

Table B.09 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.10 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.09: Bridge 01824 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Underside of deck deterioration.	The total underside of deck deterioration is 21.3% with cracks, spalls, and hollow areas.	Medium	6 (Satisfactory)	10+ Years	Remove all loose cover concrete and clean and seal spalls.
2	PVC deck drains do not extend below the superstructure.	PVC deck weep drains that do not extend below the superstructure can allow runoff to drain directly onto superstructure steel. However at the locations noted in the most recent bridge inspection report, no evidence of leakage onto girders was noted.	Low	7 (Good)	5-10 Years	Replace deck week PVC extension pipes as required.
3	Leaking asphaltic plug joints	Active leakage was noted during the most recent bridge inspection at all joint locations.	Medium	6 (Satisfactory)	0-5 Years	Replace the asphaltic plug deck joints.
4	Steel bearing devices with impact and surface rust, locations of frozen bearings, and lateral misalignments between sliding plates. There are two locations of missing anchor rods.	Impact rust between sliding plates, and frozen expansion bearing devices can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	High	5 (Fair)	0-5 Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Drill and grout new anchor rods at the isolated missing locations.
5	Moderate section losses to girder web ends at supports within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	5 (Fair)	0-5 Years	Clean, patch and paint compromised structural steel components. Sources of any active deterioration should be identified and corrected (see item 3 above).
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
7	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	8 (Very Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.

Table B.10: Bridge 01824 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach and bridge railing to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk, no rubrail attached at the approach railing transitions to the bridge, and the approach metal beam railing system has weak posts.	Modify the bridge railing system (bridge parapet) height and replace the safety walk with a sloped granite curb. Replace the weak guide rail posts with a compliant component at the approach guardrail and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHTO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01825

Description

Bridge No. 01825 carries State Route 15 Northbound over Interstate 91 and Ramp 3 in Meriden, Connecticut. The structure consists of a four span steel multi-girder superstructure system composed of both plate and rolled girders supporting a reinforced concrete deck composite in span 3 only. The superstructure is supported by full height reinforced concrete piers and abutments. The abutments are founded on piles with piers consisting of spread footings bearing on soil. The structure was constructed in 1964, rehabilitated in 1988, and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 325 feet, a curb-to-curb measurement of 51.6 feet, and a minimum vertical underclearance of 16.1 feet.

The structure services a unidirectional ADT of 24,950 vehicles with 6% truck traffic from 2014 traffic volume data. The most recent load rating analysis for this structure was computed in 1998 using the Load Factor Design methodology in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges and lists an inventory rating of 41.3 tons (rating factor = 1.15) for the HS20 vehicular model and an operating rating factor of 68.9 tons (rating factor = 1.91). The structure has a sufficiency rating of 80.2 and is currently not posted for load or clearance restrictions.

Table B.11 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.12 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.11: Bridge 01825 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Underside of deck deterioration.	Hollow areas along the deck ends and transverse end diaphragm haunches are present (the locations are not adjacent to active travel lanes).	Low	6 (Satisfactory)	10+ Years	Continued maintenance of underside of deck deterioration is anticipated and has been on-going according to information contained in previous bridge inspection reports.
2	Deteriorated exposed concrete aprons around scupper drain pans. Torn and displaced scupper drain pans.	The concrete aprons around the perimeter of scupper drain pans are deteriorated with spalling and punky concrete. Fiberglass scupper drain pans are pushed up and have small tears and holes.	Medium	5 (Fair)	0-5 Years	Remove deteriorated apron concrete and patch as required, replace damaged and displaced fiberglass hoppers.
3	PVC deck drains do not extend below the superstructure.	PVC deck weep drains that do not extend below the superstructure can allow runoff to drain directly onto superstructure steel. However at the locations noted in the most recent bridge inspection report, no evidence of leakage onto girders was noted.	Low	5 (Fair)	5-10 Years	Replace all deck week PVC extension pipes.
4	Adhesion failures within asphaltic plug joint sealant (no evidence of deck joint leakage explicitly noted however superstructure components below show active deterioration).	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below.	Low	6 (Satisfactory)	5-10 Years	Replace the asphaltic plug deck joints.
5	Steel bearing devices with impact and laminated rust, minor section losses, and anchor bolts with heavy section losses. Sheared off anchor bolts at fixed bearing locations are present.	Impact rust between sliding plates can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random anchor bolt nuts are rusted away up to 100%. Random fixed bearing anchor rods have been sheared off.	Medium	5 (Fair)	0-5 Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Replace anchor bolt nuts as required and drill and grout new anchor rods as required.
6	Presence of pin and hanger assemblies (redundancy retrofits are not in place).	Pin and hanger assemblies are fracture critical (failure of a single pin and hanger assembly can cause catastrophic failure of the span). These construction details require ongoing advanced inspection and maintenance.	High	5 (Fair)	As soon as possible	It is recommended to remove or retrofit these pin and hanger assemblies so that the structure is no longer fracture critical.
7	Superstructure components with active deterioration and section losses within critical shear, bearing and flexural stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	5 (Fair)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions. Sources of any active deterioration should be identified and corrected.
8	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
9	Fatigue prone details (category E welds present at lateral bracing member gusset plate to girder web welds within tension stress regions).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	7 (Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
10	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.

Table B.12: Bridge 01825 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, approach guardrails, and approach guardrail ends to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high, no rubrail attached at the approach railing transitions to the bridge, the approach metal beam railing system has weak posts, and the approach guardrail ends are within the clear zone.	Given that all components do not meet current design standards, the entire approach guard rail should be replaced, compliant posts should be installed, guardrail ends should be properly terminated, and bridge transitions should be RB-350 compliant. The bridge railing (parapet) should be modified to 42 inches high.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 1998 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01826

Description

Bridge No. 01826 carries Interstate 691 Eastbound over State Route 15 in Meriden, Connecticut. The structure consists of a two span steel multi-girder superstructure system composed of plate girders supporting a composite reinforced concrete deck. The superstructure is supported by reinforced concrete piers and stub abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 190 feet, a curb-to-curb measurement of 50.0 feet, and a minimum vertical underclearance of 13.8 feet.

The structure services a unidirectional ADT of 23,150 vehicles with 14% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 1996 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 49.3 tons (rating factor = 1.37) for the HS20 vehicular model and an operating rating factor of 82.1 tons (rating factor = 2.28). The structure has a sufficiency rating of 81.0 and is currently not posted for load but is posted for clearance.

Table B.13 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.14 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.13: Bridge 01826 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Hollow concrete along the transverse concrete end diaphragm haunches and deck ends behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes on either sides of the piers.	Medium	6 (Satisfactory)	0-5 Years	Remove any loose or hollow concrete and patch as required.
2	Steel bearing devices with minor impact and surface rust, and anchor bolt nuts with moderate to heavy section loss.	Although minor as noted in the most recent bridge inspection report, impact rust can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random anchor bolt nuts are rusted away up to 90%.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Replace anchor bolt nuts as required.
3	Superstructure components with active deterioration and isolated minor section losses within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	5 (Fair)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected. The most recent bridge inspection report noted that new asphaltic plug joints have been installed but also that evidence of previous deck joint leakage was noted at girder ends.
4	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
5	Missing and poorly fused diaphragm connection welds	There are random locations of poorly fused frame member connection welds and three locations of missing frame member connection weld returns.	Low	5 (Fair)	5-10 Years	Poorly fused welds may require maintenance in the future.
6	Collision Damage	Most likely due to the low under bridge clearance, there are multiple locations of gouged and/or bent bottom flanges with bent adjacent intermediate stiffeners, a cracked girder web (stop holes drilled), two locations of cracked web to bottom flange longitudinal welds (stop holes drilled), a location of one interior stiffener with three cracks (stop holes drilled), and random locations of completely broken welds connecting the cross frame angles to the intermediate stiffeners.	Medium	5 (Fair)	0-5 Years	Consideration should be given to raising the superstructure during future bridge rehabilitation projects or posting the structure for clearance. Continued monitoring of the cracks related to previous impact damage is required.
7	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.
8	Approach guide rail collision damage	There are two locations of previous impact damage to the approach guide rail system.	Low	6 (Satisfactory)	5-10 Years	Reset and replace damage metal beam rail components as required.

Table B.14: Bridge 01826 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk, no rubrail attached at the approach railing transitions to the bridge, and the approach metal beam rail has steel blockouts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the steel block-outs with a compliant component at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 1996 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.
3	Minimum vertical underclearance below minimum acceptable design criteria	The minimum vertical underclearance is below minimum acceptable design criteria and a requires corrective action.	Modifications of the bridge clearance can only be accomplished by profile realignment of the ramp and raising of the superstructure.

Bridge Condition Evaluation: Bridge No. 01827

Description

Bridge No. 01827 carries Interstate 691 Westbound over State Route 15 in Meriden, Connecticut. The structure consists of a two span steel multi-girder superstructure system composed of plate girders supporting a composite reinforced concrete deck. The superstructure is supported by reinforced concrete piers and stub abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 182 feet, a curb-to-curb measurement of 50.0 feet, and a minimum vertical underclearance of 14.9 feet.

The structure services a unidirectional ADT of 39,050 vehicles with 14% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 1996 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 45.3 tons (rating factor = 1.26) for the HS20 vehicular model and an operating rating factor of 75.5 tons (rating factor = 2.10). The structure has a sufficiency rating of 90.0 and is currently not posted for load or clearance.

Table B.15 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.16 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.15: Bridge 01827 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Hollow and spalled concrete along the deck ends behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes on either sides of the piers.	Medium	6 (Satisfactory)	0-5 Years	Remove any loose or hollow concrete and patch as required.
2	Deteriorated expansion joint asphaltic plug sealant with evidence of leakage	Deteriorated expansion joint sealant can allow active leakage onto superstructure components below.	Medium	6 (Satisfactory)	0-5 Years	Confirm deck joints are leaking and replace the asphaltic plug joint material to remediate the condition.
3	Steel bearing devices with minor laminated and surface rust, and anchor bolt nuts with moderate to heavy section loss.	Although minor as noted in the most recent bridge inspection report, impact rust can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random anchor bolt nuts are rusted away up to 100%.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Replace anchor bolt nuts as required.
4	Superstructure components with active deterioration and isolated minor section losses within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected. Evidence of deck joint leakage was noted in the most recent bridge inspection report.
5	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
6	Missing and poorly fused diaphragm connection welds	There are random locations of poorly fused frame member connection welds and three locations of missing frame member connection weld returns.	Low	6 (Satisfactory)	5-10 Years	Poorly fused welds may require maintenance in the future.
7	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit minor random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.

Table B.16: Bridge 01827 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk, no rubrail attached at the approach railing transitions to the bridge, and the approach metal beam rail has steel blockouts and weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the steel block-outs and weak posts with a compliant components at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 1996 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01828

Description

Bridge No. 01828 carries Interstate 91 Northbound over Bee Street in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 78 feet, a curb-to-curb measurement of 62.0 feet, and a minimum vertical underclearance of 14.1 feet.

The structure services a unidirectional ADT of 46,850 vehicles with 9% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 67.7 tons (rating factor = 1.88) for the HS20 vehicular model and an operating rating factor of 112.9 tons (rating factor = 3.14). The structure has a sufficiency rating of 93.0 and is currently not posted for load or clearance.

Table B.17 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.18 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.17: Bridge 01828 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	The bituminous wearing surface exhibits areas of raveling, breaking up bituminous concrete, and open paving seams.	Low	6 (Satisfactory)	5-10 Years	Mill and repave the bituminous overlay.
2	Steel bearing devices with impact and surface rust. Expansion bearings with minor lateral misalignment.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
3	Superstructure components with active deterioration and isolated minor section losses within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected.
4	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
5	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	6 (Satisfactory)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
6	Collision Damage	There are minor locations of previous collision damage with scrapes and gouges on bottom flanges that have not been completely ground smooth and painted. However, the structure is posted for clearance and the potential for future collision damage exists	Medium	6 (Satisfactory)	0-5 Years	Consideration should be given to raising the superstructure during future bridge rehabilitation projects.
7	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit minor random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.
8	Approach guide rail collision damage	There are two locations of previous impact damage to the approach guide rail system.	Low	6 (Satisfactory)	5-10 Years	Reset and replace damage metal beam rail components as required.

Table B.18: Bridge 01828 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach railing transitions and approach guardrails to current RB-350 standards.	The approach railing transitions to the bridge, and approach guardrails do not meet current design standards. No rubrail attached at the approach railing transitions to the bridge and the approach metal beam rail has steel blockouts and weak posts.	Replace the steel block-outs and weak posts with a compliant components at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01829

Description

Bridge No. 01829 carries Interstate 91 Southbound over Bee Street in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 75 feet, a curb-to-curb measurement of 62.0 feet, and a minimum vertical underclearance of 14.3 feet.

The structure services a unidirectional ADT of 46,850 vehicles with 9% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 68.1 tons (rating factor = 1.89) for the HS20 vehicular model and an operating rating factor of 113.5 tons (rating factor = 3.15). The structure has a sufficiency rating of 93.0 and is currently not posted for load or clearance.

Table B.19 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.20 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.19: Bridge 01829 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	The bituminous wearing surface exhibits areas of raveling, breaking up bituminous concrete, open paving seams, an isolated depressed patch and pothole.	Low	7 (Good)	5-10 Years	Mill and repave the bituminous overlay.
2	Underside of deck deterioration.	The underside of deck exhibits a few spalls with exposed reinforcement.	Low	6 (Satisfactory)	10+ Years	Clean and seal spalls with exposed reinforcement.
3	Adhesion failures within asphaltic plug joint sealant (evidence of deck joint leakage on abutment backwalls).	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below.	Low	6 (Satisfactory)	0-5 Years	Replace the asphaltic plug deck joints.
4	Steel bearing devices with impact and surface rust. Expansion bearings with minor lateral misalignment.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
5	Superstructure components with minor active deterioration.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. As noted in the most recent bridge inspection report, section losses are negligible and found in isolated locations.	Low	6 (Satisfactory)	10+ Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected.
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
7	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	7 (Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
8	Collision Damage	There are minor locations of previous collision damage with scrapes and gouges on bottom flanges. However, the potential for future collision damage exists	Medium	6 (Satisfactory)	0-5 Years	Consideration should be given to raising the superstructure during future bridge rehabilitation projects.
9	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit minor random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.
10	Approach guide rail collision damage	There are three locations of previous impact damage to the approach guide rail system.	Medium	6 (Satisfactory)	0-5 Years	Reset and replace damage metal beam rail components as required.

Table B.20: Bridge 01829 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach railing transitions and approach guardrails to current RB-350 standards.	The approach railing transitions to the bridge, and approach guardrails do not meet current design standards. No rubrail attached at the approach railing transitions to the bridge and the approach metal beam rail has steel blockouts and weak posts.	Replace the steel block-outs and weak posts with a compliant components at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01830

Description

Bridge No. 01830 carries Interstate 691 Eastbound over Interstate 91 in Meriden, Connecticut. The structure consists of a four span steel multi-girder superstructure system composed of plate and rolled girders supporting a reinforced concrete deck composite in spans 2 and 3 only. The superstructure is supported by reinforced concrete stub abutments and piers composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 287 feet, a curb-to-curb measurement of 42.0 feet, and a minimum vertical underclearance of 15.8 feet.

The structure services a unidirectional ADT of 17,300 vehicles with 9% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2000 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 42.5 tons (rating factor = 1.18) for the HS20 vehicular model and an operating rating factor of 70.8 tons (rating factor = 1.96). The structure has a sufficiency rating of 75.9 and is currently not posted for load or clearance.

Table B.21 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.22 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.21: Bridge 01830 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Hollow concrete and spalls along the deck ends behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes on either sides of the piers. Spalls with exposed reinforcement have up to 50% section loss.	Medium	6 (Satisfactory)	0-5 Years	Remove any loose or hollow concrete and patch as required.
2	Missing steel bridge railing pipes	There are two sections of missing steel railing pipe at the south bridge railing in spans 2 and 4.	Low	6 (Satisfactory)	5-10 Years	Remove the bridge railing and install a concrete rail cap to meet current 42 inch height requirements.
3	Steel bearing devices with heavy impact rust, anchor bolt nuts with moderate to heavy section loss, and locations of missing anchor bolt nuts.	Although minor as noted in the most recent bridge inspection report, impact rust can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random anchor bolt nuts are rusted away up to 90%. There are two locations of missing anchor bolt nuts	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Replace anchor bolt nuts as required.
4	Superstructure components with painted over (re-rusting) section losses within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected. Active deck joint leakage was noted in the most recent bridge inspection report.
5	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
6	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit minor random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.

Table B.22: Bridge 01830 Appraisal Items Of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high, has greater than 3 inches of blunt end concrete at the approach railing transitions to the bridge, and contains a monolithic safety walk. The approach metal beam rail, and approach transition rail have steel blockouts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the steel block-outs with a compliant component at the approach guardrail posts and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01831

Description

Bridge No. 01831 carries Interstate 691 Westbound over Interstate 91 in Meriden, Connecticut. The structure consists of a four span steel multi-girder superstructure system composed of plate and rolled girders supporting a reinforced concrete deck composite in spans 2 and 3 only. The superstructure is supported by reinforced concrete stub abutments and piers composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 287 feet, a curb-to-curb measurement of 42.0 feet, and a minimum vertical underclearance of 15.8 feet.

The structure services a unidirectional ADT of 17,050 vehicles with 9% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2000 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 42 tons for the HS20 vehicular model and an operating rating factor of 71 tons. The structure has a sufficiency rating of 75.90 and is currently not posted for load or clearance.

Table B.23 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.24 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.23: Bridge 01831 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Hollow concrete along the transverse concrete end diaphragm haunches and deck ends behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes on either sides of the piers. Spalls with exposed reinforcement have up to 50% section loss.	Medium	6 (Satisfactory)	0-5 Years	Remove any loose or hollow concrete and patch as required.
2	Deteriorated and missing steel bridge railing pipes	There are two sections of missing steel railing pipe at the north railing in span 3 and at the south railing in span 4. There are random perforations and random areas of moderate to heavy laminated rust to railing pipes and clamp assemblies at stanchion connections.	Medium	5 (Fair)	0-5 Years	Remove the bridge railing and install a concrete rail cap to meet current 42 inch height requirements.
3	Adhesion failures within asphaltic plug joint sealant (evidence of deck joint leakage noted).	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below.	Low	6 (Satisfactory)*	0-5 Years	Replace the asphaltic plug deck joints.
4	Cracked weld at bearing device	The north keeper weld is cracked at the girder 2 bearing in span 2 at pier 2.	Low	7 (Good)**	5-10 Years	Grind and re-weld detail as required.
5	Superstructure components with painted over section losses within critical shear and bearing stress regions, and isolated locations within critical flexural stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The section losses have been recently painted over.	Low	6 (Satisfactory)	10+ Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected. Evidence of deck joint leakage was noted in the most recent bridge inspection report.
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Low	5 (Fair)	10+ Years	Abrasive blast clean and paint steel superstructure components.
7	Approach guide rail collision damage	There is an isolated area of collision damage at the northeast guiderail with 3 disconnected posts and damaged spacer blocks.	Low	6 (Satisfactory)	5-10 Years	Reset and replace damaged metal beam rail components as required.

* Note, the most recent bridge inspection report on file at the time of this publication indicated that the joints have been paved over with a ½" thick pavement lift and increased the condition rating from a 6 to an 8. However, previous inspection reports have indicated that the actual joint devices are leaking with adhesion failures as indicated in the above table. Additionally, placing pavement over these deteriorated joint devices will not prevent leakage as the pavement itself is permeable and the condition of the joint devices remain compromised.

** Note, the most recent bridge inspection report on file at the time of this publication increased the condition rating of, "Welds – Cracks" from a 6 to an 8 but indicates the cracked keeper weld is still present and there has been no change in this condition through several inspection cycles. In addition, no details are given in the most recent bridge inspection report as to why this condition rating was increased.

Table B.24: Bridge 01831 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high, has greater than 3 inches of blunt end concrete at the approach railing transitions to the bridge, and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, and the metal beam rail system contains weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail weak posts with a compliant component at the approach guardrail and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01832

Description

Bridge No. 01832 carries Interstate 691 Westbound over future Interstate 691 Ramp 804 in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of plate girders supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 90 feet, and a curb-to-curb measurement of 50.0 feet. No minimum vertical underclearance is required since Ramp 804 is abandoned (inactive).

The structure services a unidirectional ADT of 39,050 vehicles with 14% truck traffic from 2014 traffic volume data. The most recent load rating analysis for this structure was computed in 2000 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 68.3 tons (rating factor = 1.90) for the HS20 vehicular model and an operating rating factor of 113.8 tons (rating factor = 3.16). The structure has a sufficiency rating of 90.00 and is currently not posted for load or clearance.

Table B.25 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.26 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.25: Bridge 01832 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	A new, 1/2 inch thick bituminous concrete wearing surface course has been placed within the mainline travelway only and paved over the asphaltic plug deck joints. This wearing surface is cracked along the deck joints. The original wearing surface, visible within the shoulders, exhibits raveling.	Low	7 (Good)	5-10 Years	Mill and repave the bituminous overlay.
2	Spalled concrete along the transverse concrete end diaphragm haunches and deck ends behind end diaphragms.	There is a deck end spall at the south end of girder 4 at the east abutment that is allowing fill material behind the abutment backwall to spill onto the abutment seat.	Low	7 (Good)	10+ Years	Remove deteriorated concrete and patch spalls as required.
3	Asphaltic plug joint sealant with heaving and adhesion failures up to 1 inch wide. Active leakage noted through the deck joint.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The visible portions of the asphaltic plug joint sealant has random areas of heaving and adhesion failures up to 1 inch wide. Active leakage through the deck joint was noted.	Medium	5 (Fair)	0-5 Years	Replace the asphaltic plug deck joints.
4	Moderate to heavy rust at bearing devices.	Rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
5	Light to moderate active rust of superstructure steel with pockets of laminated rust.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected. Active deck joint leakage noted.
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	High	3 (Serious)	As soon as possible	Abrasive blast clean and paint steel superstructure components.
7	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.
8	Embankment erosion along abutments	Erosion can undermine substructure units over time. There are erosion areas along both abutments and all wingwalls up to 4 feet deep x 8 feet wide.	Medium	6 (Satisfactory)	0-5 Years	Sources of runoff should be investigated and remediated as required. Erosion areas should be backfilled and slopes stabilized.
9	Approach guide rail collision damage	There are three locations of moderate impact damage to the northwest metal beam rail system.	Low	6 (Satisfactory)	5-10 Years	Reset and replace damaged metal beam rail components as required.

Table B.26: Bridge 01832 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high, has greater than 3 inches of blunt end concrete at the approach railing transitions to the bridge, and contains a monolithic safety walk.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01833

Description

Bridge No. 01833 carries Interstate 691 Eastbound over Interstate 691 Ramp 802 in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by reinforced concrete stub abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 90 feet, a curb-to-curb measurement of 41.0 feet, and a minimum vertical underclearance of 16.3 feet.

The structure services a unidirectional ADT of 23,600 vehicles with 9% truck traffic from 2014 traffic volume data. The most recent load rating analysis for this structure was computed in 2000 using the Load Factor Design methodology in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges and lists an inventory rating of 67.2 tons (rating factor = 1.87) for the HS20 vehicular model and an operating rating factor of 112.0 tons (rating factor = 3.11). The structure has a sufficiency rating of 95.00 and is currently not posted for load or clearance.

Table B.27 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.28 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.27: Bridge 01833 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	A new, 1 inch thick bituminous concrete wearing surface course has been placed within the mainline travelway only and paved over the asphaltic plug deck joints. This wearing surface is cracked along the deck joints. The original wearing surface, visible within the shoulders, exhibits raveling and random cracking.	Medium	6 (Satisfactory)	0-5 Years	Mill and repave the bituminous overlay.
2	Underside of deck deterioration.	The average underside of deck deterioration is 9.7% with cracks, spalls, and hollow areas. Spalls and hollow areas are typically located along the deck ends.	Medium	6 (Satisfactory)	10+ Years	Remove all loose cover concrete and clean and seal spalls.
3	Adhesion failures within asphaltic plug joint sealant with active deck joint leakage noted.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The joints are paved over within the mainline travelway only however exposed portions of the joint sealant within the shoulders shows heaving, settlements, and potholes.	Medium	5 (Fair)	0-5 Years	Replace the asphaltic plug deck joints.
4	Moderate to heavy laminated rust at bearing devices.	Rust between plates/components and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean and paint bearing components as needed. In addition, the active deck joint leakage will progress active deterioration of bearing devices if left unaddressed.
5	Moderate to heavy active surface rusting with pockets of laminated rust producing random pitting losses of up to 1/16 inch deep to superstructure components within critical shear, bearing, and flexural stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. Active deck joint leakage onto superstructure components is present.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected. Active deck joint leakage is present.
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	High	3 (Serious)	As soon as possible	Abrasive blast clean and paint steel superstructure components.
7	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	8 (Very Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
8	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.

Table B.28: Bridge 01833 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. There are no approach guardrail systems along the trailing edges (west approaches).	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge N0. 01834

Description

Bridge No. 01834 carries Interstate 691 Westbound over Bee Street in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 58 feet, a curb-to-curb measurement of 48.0 feet, and a minimum vertical underclearance of 13.9 feet.

The structure services a unidirectional ADT of 23,600 vehicles with 8% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 54.0 tons (rating factor = 1.50) for the HS20 vehicular model and an operating rating factor of 90.0 tons (rating factor = 2.50). The structure has a sufficiency rating of 87.6 and is currently not posted for load but is posted for clearance.

Table B.29 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.30 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.29: Bridge 01834 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Asphaltic plug deck joints with random adhesion failures, areas of heaved and depressed sealant, and uneven transition from the approach wearing surface to the bridge wearing surface due to approach roadway settlement.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The uneven riding surface from heaved and depressed sealant and from the approach roadway settlement can pose a hazard to vehicular traffic, most notably motorcycles.	Low	6 (Satisfactory)	5-10 Years	Replace the asphaltic plug deck joints.
2	Steel bearing devices with impact and surface rust. Expansion bearings with minor lateral misalignment.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random expansion bearings have up to 3/16 inch of lateral misalignment between sole and sliding plates.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
3	Moderate to heavy active surface rusting of superstructure steel with negligible section losses.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected.
4	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	Medium	5 (Fair)	0-5 Years	Abrasive blast clean and paint steel superstructure components.
5	Collision Damage	There are partially repaired areas of collision damage to the superstructure related to the low bridge underclearance. There are scrapes and gouges to bottom flanges and cover plates, cracked diaphragm connection welds, bent up bottom flange legs, and isolated locations of slightly bowed webs. Because the bridge is posted for clearance the potential for future collision damage exists.	Medium	6 (Satisfactory)	0-5 Years	Consideration should be given to raising the superstructure during future bridge rehabilitation projects. Continued monitoring of the cracks related to previous impact damage is required.
6	Cracked welds	There is a cracked diaphragm connection weld along girder 8.	Medium	6 (Satisfactory)	0-5 Years	The cracked weld should be ground smooth and re-welded.
7	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	6 (Satisfactory)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
8	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.

Table B.30: Bridge 01834 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. The approach metal beam rail systems contain weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications. Replace weak posts at the approach metal beam rail systems.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.
3	Minimum vertical underclearance below minimum acceptable design criteria	The minimum vertical underclearance for Bee Street is below minimum acceptable design criteria and a requires corrective action.	Modifications of the bridge clearance can only be accomplished by profile realignment of the carried route and raising of the superstructure.

Bridge Condition Evaluation: Bridge No. 01835

Description

Bridge No. 01835 carries Interstate 691 Eastbound over Bee Street in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 58 feet, a curb-to-curb measurement of 38.0 feet, and a minimum vertical underclearance of 14.1 feet.

The structure services a unidirectional ADT of 23,600 vehicles with 8% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2016 using the Load and Resistance Factor (LRFR) methodology in accordance with the provisions of the AASHO LRFD specifications and lists a controlling rating factor of 0.58 under the Fatigue limit state at the bottom flange cover plate fatigue category E' detail. It should be noted that the controlling design vehicle load rating factors are all above statutory load levels. The structure has a sufficiency rating of 91.7 (which does not reflect the above load rating SI&A coding items) and is currently not posted for load but is posted for clearance.

Table B.31 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.32 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.31: Bridge 01835 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Steel bearing devices with impact and laminated rust, and section losses to various components.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
2	Moderate surface rusting of superstructure steel with isolated section losses.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The superstructure has moderate surface rust throughout and an isolated area of web section loss within critical shear region.	Low	6 (Satisfactory)	10+ Years	Clean and paint any deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required.
3	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	High	3 (Serious)	As soon as possible	Abrasive blast clean and paint steel superstructure components.
4	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	7 (Good)	5-10 Years	The potential to repair cracked welds exists.

Table B.32: Bridge 01835 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. The approach metal beam rail systems contain weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications. Replace weak posts at the approach metal beam rail systems.
2	Minimum vertical underclearance below minimum acceptable design criteria	The minimum vertical underclearance for Bee Street is below minimum acceptable design criteria and a requires corrective action.	Modifications of the bridge clearance can only be accomplished by profile realignment of the carried route and raising of the superstructure.

Bridge Condition Evaluation: Bridge No. 01836

Description

Bridge No. 01836 carries Interstate 691 Eastbound over Interstate 91 Ramp 813 in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments founded on piles. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 83 feet, a curb-to-curb measurement of 41.0 feet, and a minimum vertical underclearance of 16.2 feet.

The structure services a unidirectional ADT of 16,750 vehicles with 5% truck traffic from 2013 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 68.0 tons (rating factor = 1.89) for the HS20 vehicular model and an operating rating factor of 113.4 tons (rating factor = 3.15). The structure has a sufficiency rating of 95.00 and is currently not posted for load or clearance.

Table B.33 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.34 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.33: Bridge 01836 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Spalls and hollow concrete along the transverse concrete end diaphragm haunches and deck ends behind end diaphragms.	Spalls along the deck ends can allow water leakage from deck joints above onto components below or retained earth behind the backwall to spill onto the abutment seat.	Low	7 (Good Condition)	10+ Years	Remove any loose or hollow concrete and patch as required.
2	Metal bridge railing deterioration	The metal bridge railing has moderate to heavy surface, laminated and impact rust.. Isolated rail couplers have perforations, and isolated rusted our pipe rails up to 75%.	Medium	4 (Poor)	0-5 Years	See below items. The bridge rail is composed of a reinforced concrete parapet with steel pipe rail mounted on top and monolithic safetywalk. Since this system no longer meets current CTDOT design standards, the entire parapet should be removed and replaced with a compliant system.
3	Approach roadway bituminous concrete wearing surface deterioration.	The approach roadway wearing surface has random potholes up to 2.5 inches deep, cracks, and open paving seams.	Low	6 (Satisfactory)	5-10 Years	Mill and repave the bituminous overlay.
4	Steel bearing devices with impact and laminated rust with section losses to masonry plates.	Impact rust between sliding plates can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
5	Moderate surface rusting of superstructure steel with isolated section losses.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The superstructure has moderate surface rust throughout and an isolated area of web section loss within critical shear region.	Low	6 (Satisfactory)	10+ Years	Clean and paint any deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required.
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses.	High	3 (Serious)	As soon as possible	Abrasive blast clean and paint steel superstructure components.
7	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	8 (Very Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
8	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit minor random spalls, hollow areas, and cracks.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.
9	Approach guide rail collision damage	There is a single location of moderate impact damage along the northwest metal beam rail system.	Low	6 (Satisfactory)	5-10 Years	Reset and replace damaged metal beam rail components as required.

Table B.34: Bridge 01836 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. The approach metal beam rail systems contain weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications. Replace weak posts at the approach metal beam rail systems.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 01837

Description

Bridge No. 01837 carries Interstate 91 Ramp 816 over State Route 66 Westbound in Meriden, Connecticut. The structure consists of a three span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates in span 2 only and supporting a reinforced concrete deck composite in span 2 only. The superstructure is supported by reinforced concrete stub abutments and piers composed of spread footings bearing on soil. The structure was constructed in 1965, rehabilitated at an unknown time with the partial replacement of the original bearing devices, and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 157 feet, a curb-to-curb measurement of 26.0 feet, and a minimum vertical underclearance of 15.9 feet.

The structure services a bi-directional ADT of 4,160 vehicles with 9% truck traffic from 2014 traffic volume data. The most recent load rating analysis for this structure was computed in 1999 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 40.0 tons (rating factor = 1.11) for the HS20 vehicular model and an operating rating factor of 66.7 tons (rating factor = 1.85). The structure has a sufficiency rating of 89.0 and is currently not posted for load or clearance.

Table B.35 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.36 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.35: Bridge 01837 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Underside of deck deterioration.	The underside of deck exhibits random spalls with and without exposed reinforcement, edge spalls along the transverse concrete end diaphragm haunches, and hollow areas. The average underside of deck deterioration was computed to be 11.6%.	Medium	5 (Fair)	0-5 Years	Clean and seal spalls with exposed reinforcement.
2	Displaced and broken granite curbing blocks	There is a 3 foot long section of broken off and loose granite curbing along the east curb in span 1.	Medium	6 (Satisfactory)	0-5 Years	Remove the granite curb and replace in-kind. Consideration should be given to removal of the full length of all granite curbing and the adjacent safetywalk and replacement with sloped granite curbing.
3	Moderate corrosion of the steel railing system	The railing system exhibits moderate surface rusting throughout, rail couplers have heavy surface rust and impact rust with random small rusted through holes. There are sections of rail ends between expansion joints that were noted to be in contact.	Medium	5 (Fair)	0-5 Years	Remove the deteriorated steel railing components and replace in-kind as required, and clean and paint the system. Consideration should be given to removal of the full length of all railing and replacement with a concrete cap compliant with current bridge railing/parapet height requirements.
4	Adhesion failures along asphaltic joint sealant with active leakage through deck joints	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. Random adhesion failures were noted throughout the joint system open up to 1/8 inches wide with active joint leakage noted through the deck at one location.	Medium	6 (Satisfactory)	0-5 Years	Reseal the asphaltic plug joint material to remediate the active leakage during rainy conditions.
5	Steel bearing devices with painted over impact rust, painted over section losses, and isolated anchor bolt nuts with heavy section loss.	Although minor as noted in the most recent bridge inspection report, impact rust can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random anchor bolt nuts are rusted away up to 100%, random bearing components have pitting and minor painted over section losses.	Low	6 (Satisfactory)	10+ Years	Clean, paint, and grease steel bearing components as needed, or replace steel expansion bearing devices at abutments with elastomeric bearing pads. Replace anchor bolt nuts as required.
6	Superstructure components with painted over and active deterioration and random section losses within critical shear and bearing stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. There are random locations of both active and painted over section losses to girder webs near supports within critical shear and bearing stress regions.	Medium	6 (Satisfactory)	0-5 Years	Clean and paint any active deterioration or rusting of superstructure components. Install patch plates to deteriorated components within critical stress regions as required. Sources of any active deterioration should be identified and corrected.
7	Fatigue prone details (category E' welds present at the ends of cover plates and category E welds present at welded bridge mounted sign baseplates within tension stress regions).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	8 (Very Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.

8	Substructure deterioration	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit minor random spalls, hollow areas, and cracks. Active leakage through deck joints onto abutment backwalls was noted in the most recent bridge inspection report.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required, epoxy inject all applicable cracks. Sources of leakage potentially causing or accelerating this deterioration should be investigated.
9	Approach guide rail deterioration and collision damage	The trailing edge three cable guide rail system has random tilted posts, random disconnected cables, and locations of slack cabling. There are random areas of light to moderate impact damage up to 40 feet long with random tilted posts.	Medium	6 (Satisfactory)	0-5 Years	Reset and replace damaged approach rail components as required.
10	Deteriorated bituminous concrete approach wearing surface.	The approach wearing surfaces have random areas of raveling, open paving seams, and depressed bituminous patches.	Medium	6 (Satisfactory)	0-5 Years	Mill and repave the bituminous overlay.

Table B.36: Bridge 01837 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, approach guardrails, and approach guardrail ends to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, approach guardrails, and approach guardrail ends do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. The approach metal beam rail systems contain weak posts and terminate within the clear zone.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications. Replace weak posts at the approach metal beam rail systems and adjust terminations in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements. Current load rating on file is based on as-built properties and does not include any deterioration to superstructure components.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time. The most current load rating on file does not consider the effects of field measured section losses.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.
3	Approach roadway alignment below minimum acceptable criteria	The functional relation of the approach alignment to the bridge with the general alignment of the highway is below minimum acceptable criteria and requires a substantial reduction in vehicle operating speed.	Modify the horizontal alignment of the highway which may require complete replacement of the structure.

Bridge Condition Evaluation: Bridge No. 03045

Description

Bridge No. 03045 carries Interstate 691 Westbound over Gravel Street in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates and supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 63 feet, a curb-to-curb measurement of 50.0 feet, and a minimum vertical underclearance of 23.6 feet.

The structure services a unidirectional ADT of 39,050 vehicles with 9% truck traffic from 2014 traffic volume data. The most recent load rating analysis for this structure was computed in 2000 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 62.6 tons (rating factor = 1.74) for the HS20 vehicular model and an operating rating factor of 104.3 tons (rating factor = 2.89). The structure has a sufficiency rating of 90.30 and is currently not posted for load or clearance.

Table B.37 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.38 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.37: Bridge 03045 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	A new, 1/2 inch thick bituminous concrete wearing surface course has been placed within the mainline travelway only and paved over the asphaltic plug deck joints. This wearing surface is cracked along the deck joints. The original wearing surface, visible within the shoulders, exhibits raveling and random cracking.	Low	7 (Good Condition)	5-10 Years	Mill and repave the bituminous overlay.
2	Asphaltic plug joints with moderate to heavy wear and isolated adhesion failures.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The joints are paved over within the mainline travelway only however exposed portions of the joint sealant within the shoulders shows moderate to heavy wear and isolated adhesion failures to 1/2 inch wide.	Low	6 (Satisfactory)	5-10 Years	Replace the asphaltic plug deck joints.
3	Steel bearing devices with impact rust between sliding plates and randomly over expanded bearings during mild temperature conditions.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random steel sliding expansion bearings have up to 1/8 inch impact rust between sliding and sole plates, and random bearings are over expanded during mild temperature conditions. Fixed bearings have random areas of moderate to heavy surface and impact rust.	Low	6 (Satisfactory)	10+ Years	Clean, paint, grease, and reset steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
4	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses. The fascia girder bottom flanges have heavy surface rust with negligible section losses within critical flexural stress regions.	High	3 (Serious)	As soon as possible	Abrasive blast clean and paint steel superstructure components.
5	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	7 (Good Condition)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
6	Substructure deterioration and tilted substructure units	Deteriorated concrete can undermine substructure performance and remaining service life. The abutment components have isolated spalls, one location with exposed rebar and up to 50% section loss. The wingwalls and adjacent retaining walls are tilted out of plumb by up to 1.25 inches. These tilting measurements have not changed over previous inspection cycles and appear to be stabilized.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required.
7	Approach guide rail deterioration and collision damage	There are random areas of light to moderate impact damage at the leading approaches and random disconnected posts.	Medium	6 (Satisfactory)	0-5 Years	Reset and replace damaged approach rail components as required.

Table B.38: Bridge 03045 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. The approach metal beam rail systems contain weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications. Replace weak posts at the approach metal beam rail systems.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 03046

Description

Bridge No. 03046 carries Interstate 691 Eastbound over Gravel Street in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates and supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 67 feet, a curb-to-curb measurement of 50.0 feet, and a minimum vertical underclearance of 14.1 feet.

The structure services a unidirectional ADT of 39,050 vehicles with 9% truck traffic from 2014 traffic volume data. The most recent load rating analysis for this structure was computed in 2000 using the Load Factor Design methodology in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges and lists an inventory rating of 66.7 tons (rating factor = 1.85) for the HS20 vehicular model and an operating rating factor of 111.2 tons (rating factor = 3.09). The structure has a sufficiency rating of 88.20 and is currently not posted for load but is posted for clearance.

Table B.39 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.40 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.39: Bridge 03046 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	A new, 1/2 inch thick bituminous concrete wearing surface course has been placed within the mainline travelway only and paved over the asphaltic plug deck joints. This wearing surface is cracked along the deck joints. The original wearing surface, visible within the shoulders, exhibits raveling and random cracking.	Low	7 (Good)	5-10 Years	Mill and repave the bituminous overlay.
2	Spalled and hollow concrete along the transverse concrete end diaphragm haunches and deck ends behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes on either sides of the piers.	Low	7 (Good)	10+ Years	Remove any loose or hollow concrete and patch as required.
3	Outside face of reinforced concrete parapet with random spalling concrete.	The outside faces of the reinforced concrete parapets have random spalls and honeycomb areas.	Low	6 (Satisfactory)	10+ Years	Remove any deteriorated concrete and patch as required.
4	Asphaltic plug joints with moderate to heavy wear, areas of heaving, and isolated adhesion failures. Evidence of previous deck joint leakage has been noted.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The joints are paved over within the mainline travelway only however exposed portions of the joint sealant within the shoulders shows moderate to heavy wear, heaving up to 1 inch high, and isolated adhesion failures to 1/4 inch wide.	Low	6 (Satisfactory)	5-10 Years	Replace the asphaltic plug deck joints.
5	Steel bearing devices with impact rust between sliding plates, randomly over expanded bearings during mild temperature conditions, isolated sheared anchor rod, and random fixed bearing anchor bolt nuts not fully threaded.	Impact rust between sliding plates and section losses to steel bearing components can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system. Random steel sliding expansion bearings have up to 1/16 inch impact rust between sliding and sole plates, and random bearings are over expanded during mild temperature conditions. The girder 2 bearing at the east abutment has one of two anchor rods sheared off. Fixed bearings have random areas of light to moderate surface rust and random anchor bolt nuts not fully threaded.	Low	6 (Satisfactory)	10+ Years	Clean, paint, grease, and reset steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads. Drill and grout new anchor rods as required.
6	Moderate surface rusting of superstructure steel with isolated section losses in non-critical stress regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The superstructure has moderate surface rust throughout and two locations of top and bottom flange section loss within non-critical stress regions due to previous deck joint leakage.	Low	6 (Satisfactory)	5-10 Years	Clean and paint any deterioration or rusting of superstructure components.
7	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses. The fascia girder bottom flanges have heavy surface rust with negligible section losses within critical flexural stress regions.	High	3 (Serious)	As soon as possible	Abrasive blast clean and paint steel superstructure components.
8	Fatigue prone details (category E' welds present at the ends of cover plates).	Fatigue prone details increase the potential for localized damage to the superstructure system.	Low	7 (Good)	5-10 Years	The potential to repair cracked welds exists. An updated LRFR load rating analysis is required to ascertain the severity of risk.
9	Substructure deterioration and tilted substructure units	Deteriorated concrete can undermine substructure performance and remaining service life. The abutment components have random spalls and hollow areas. The wingwalls and adjacent retaining walls are tilted out of plumb by up to 1.5 inches. These tilting measurements have not changed over previous inspection cycles and appear to be stabilized.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required. The previous inspection report noted that the hollow concrete areas have the potential to fall onto the pedestrian sidewalk.
10	Approach guide rail deterioration and collision damage	There are random areas of light to moderate impact damage at the leading approaches with random tilted posts.	Medium	6 (Satisfactory)	0-5 Years	Reset and replace damaged approach rail components as required.

Table B.40: Bridge 03046 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railings, approach railing transitions, and approach guardrails to current RB-350 standards.	The bridge railing, approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The bridge railing is less than 42 inches high and contains a monolithic safety walk. The approach metal beam rail transition rubrail is not attached, contains boxing glove terminations, and the metal beam rail system contains steel blockouts. The approach metal beam rail systems contain weak posts.	Modify the bridge railing system (bridge parapet) height and geometry and replace the safety walk with sloped granite curbing. Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications. Replace weak posts at the approach metal beam rail systems.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2000 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will provide details as to the influence of section losses to primary load carrying members and/or identify members with as-built section properties that may require strengthening for code compliance.
3	Minimum vertical underclearance below minimum acceptable design criteria	The minimum vertical underclearance for Gravel Street is below minimum acceptable design criteria and a requires corrective action.	Modifications of the bridge clearance can only be accomplished by profile realignment of the carried route and raising of the superstructure.

Bridge Condition Evaluation: Bridge No. 03051

Description

Bridge No. 03051 carries Interstate 91 Northbound over Baldwin Avenue in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates and supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 88 feet, a curb-to-curb measurement of 50.0 feet, and a minimum vertical underclearance of 14.25 feet.

The structure services a unidirectional ADT of 57,350 vehciles with 14% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges and lists an inventory rating of 70 tons (rating factor = 3.50) for the H20 vehicular model and an operating rating of 117 tons (rating factor = 5.85). The structure has a sufficiency rating of 94.0 and is currently posted for low clearance.

Table B.41 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.42 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.41: Bridge 03051 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete wearing surface.	The bituminous concrete wearing surface exhibits random cracks, raveling, and open paving seams. The approach wearing surface exhibits similar deficiencies in addition to random minor potholes up to 1 inch deep and isolated areas of breaking up bituminous concrete.	Low	6 (Satisfactory)	5-10 Years	Mill and repave the bituminous overlay.
2	Asphaltic plug joints with areas of heaving, and isolated adhesion failures. Evidence of previous deck joint leakage has been noted.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The joints show heaving up to 1/2 inch high, and isolated adhesion failures to 1 inch wide.	Low	6 (Satisfactory)	5-10 Years	Replace the asphaltic plug deck joints.
3	Moderate surface rusting of superstructure components within beam end regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The superstructure has moderate surface rust with isolated areas of laminated rust with section losses to bottom flanges and web ends up to 1/16 inch deep most likely due to previous deck joint leakage.	Low	6 (Satisfactory)	5-10 Years	Clean and paint any deterioration or rusting of superstructure components.
4	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses. The paint system has failed over 50% of its total surface area.	Medium	5 (Fair)	0-5 Years	Abrasive blast clean and paint steel superstructure components.
5	Substructure deterioration.	Deteriorated concrete can undermine substructure performance and remaining service life. The abutment components have random spalls, hollow areas, cracks and areas of map-cracking	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required.

Table B.40: Bridge 03051 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach railing transitions, and approach guardrails to current RB-350 standards.	The approach railing transitions to the bridge, and approach guardrails do not meet current design standards. The approach metal beam rail transition rubrail is not attached, and the metal beam rail system contains steel blockouts.	Replace the metal beam rail steel blockouts with a compliant component at the approach guardrail transitions and reset the RB-350 leading edge attachments in accordance with RB-350 specifications.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will identify members with as-built section properties that may require strengthening for code compliance.

Bridge Condition Evaluation: Bridge No. 03052

Description

Bridge No. 03052 carries Interstate 91 Southbound over Baldwin Avenue in Meriden, Connecticut. The structure consists of a single span steel multi-girder superstructure system composed of rolled beams with welded bottom flange cover plates and supporting a composite reinforced concrete deck. The superstructure is supported by full height reinforced concrete abutments composed of spread footings bearing on soil. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The bridge has an overall length of 88 feet, a curb-to-curb measurement of 50.0 feet, and a minimum vertical underclearance of 14.08 feet.

The structure services a unidirectional ADT of 57,350 vehciles with 14% truck traffic from 2015 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges and lists an inventory rating of 70 tons (rating factor = 3.50) for the H20 vehicular model and an operating rating of 117 tons (rating factor = 5.85). The structure has a sufficiency rating of 88.4 and is currently posted for low clearance.

Table B.43 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.44 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.43: Bridge 03052 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Hollow concrete along the underside of the deck behind end diaphragms.	Loose concrete along the underside of deck at these locations has the potential to fall into active travel lanes. The deck ends exhibit isolated areas of spalled concrete with adjacent hollow areas.	Low	6 (Satisfactory)	5-10 Years	Patch all applicable deck ends.
2	PVC deck drains do not extend below the superstructure.	PVC deck weep drains that do not extend below the superstructure can allow runoff to drain directly onto superstructure steel. However, at the locations noted in the most recent bridge inspection report, no evidence of leakage onto girders was noted.	Low	7 (Good)	5-10 Years	Extend all deck weep PVC drains.
3	Asphaltic plug joints with areas of heaving, and random adhesion failures. Evidence of previous deck joint leakage has been noted.	Failure of the asphaltic plug joint sealant to adhere to adjacent wearing surface and concrete deck material can allow leakage through the deck joint system and onto superstructure components below. The joints show random areas of light raveling, and adhesion failures to full width.	Medium	6 (Satisfactory)	0-5 Years	Replace the asphaltic plug deck joints.
4	Steel bearing devices with impact and laminated rust, lateral misalignment between bearing and sliding plates, over-expanded bearing devices, and section losses up to 1/16 inch deep.	Impact rust between sliding plates, and over-expanded bearings can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	5-10 Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
5	Moderate surface rusting of superstructure components within beam end regions.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The superstructure has moderate surface rust with isolated areas of laminated rust with section losses to bottom flanges and web ends up to 1/16 inch deep most likely due to previous deck joint leakage.	Low	6 (Satisfactory)	5-10 Years	Clean and paint any deterioration or rusting of superstructure components.
4	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses. The paint system has failed over 50% of its total surface area.	Medium	5 (Fair)	0-5 Years	Abrasive blast clean and paint steel superstructure components.
5	Substructure deterioration.	Deteriorated concrete can undermine substructure performance and remaining service life. The abutment components have random spalls, hollow areas, cracks and areas of map-cracking	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required.

Table B.44: Bridge 03052 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the approach guardrails to current RB-350 standards.	The approach guardrails do not meet current design standards. The metal beam rail system contains timber blockouts.	Replace the metal beam rail timber blockouts with a compliant component at the approach guardrail.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will identify members with as-built section properties that may require strengthening for code compliance.
3	Minimum vertical underclearance below minimum acceptable design criteria	The minimum vertical underclearance for Baldwin Ave is below minimum acceptable design criteria and a requires corrective action.	Modifications of the bridge clearance can only be accomplished by profile realignment of the carried route and raising of the superstructure.

Bridge Condition Evaluation: Bridge No. 05382

Description

Bridge No. 05382 carries Paddock Avenue over Route 15 in Meriden, Connecticut. The structure consists of a two-span continuous steel multi-girder superstructure system composed of haunched plate girders supporting a composite reinforced concrete deck. The superstructure is supported by full height a concrete abutments and intermediate pier columns composed of spread footings bearing on soil. The structure was constructed in 1946, rehabilitated in 1986, and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The 1986 rehabilitation included the complete replacement of the superstructure, designed for the HS20 live load vehicle in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges, 1983 Edition. The bridge has an overall length of 157 feet, a curb-to-curb measurement of 31.0 feet, and a minimum vertical underclearance of 14.75 feet.

The structure services a unidirectional ADT of 5,550 vehicles with 4% truck traffic from 2016 traffic volume data. The most recent load rating analysis for this structure was computed in 2001 using the Load Factor Design methodology in accordance with the provisions of the AASHTO Standard Specifications for Highway Bridges and lists an inventory rating of 47 tons (rating factor = 1.30) for the HS20 vehicular model and an operating rating of 78.3 tons (rating factor = 2.17). The structure has a sufficiency rating of 77.4 and is currently not posted for low clearance or load restriction.

Table B.45 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.46 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.45: Bridge 05382 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Deteriorated bituminous concrete approach wearing surface.	The approach wearing surface exhibits random cracks with edge spalling up to 1 inch deep, raveling up to ½ inch deep, isolated depressed cold patches, and isolated potholes up to 2 inches deep.	Medium	6 (Satisfactory)	0-5 Years	Mill and repave the bituminous approach overlay.
2	Deteriorated bridge sidewalk.	The sidewalk exhibits light scale, and areas of edge spalling between the curb and sidewalk. The approach sidewalks at all 4 corners exhibit up to 1.75 inches of settlement which present a possible pedestrian tripping hazard.	Low	6 (Satisfactory)	5-10 Years	Repair the deteriorated concrete and approach sidewalk settlement.
3	Impact damage at approach metal beam rail	Impact damage to approach railing system can compromise the system's operational capacity. The approach metal beam rail system has random areas of impact damage with random twisted or town posts, blockouts, and/or rail members, end treatments with moderate impact damage, and disconnected rail members.	Medium	4 (Poor)	0-5 Years	Replace damaged metal beam rail components as required.
4	Steel bearing devices with impact rust, and lateral misalignment between bearing and sliding plates.	Impact rust between sliding plates can impede effective thermal structural movement inducing unintended temperature related stresses into the superstructure system.	Low	6 (Satisfactory)	5-10 Years	Clean, paint, and grease steel bearing components as needed, or replace expansion bearing devices with elastomeric bearing pads.
5	Moderate surface rusting of superstructure components; isolated pockets of laminated rust present.	Loss of section, regardless of active deterioration or if painted over, reduces the serviceability of resistance to load demand. The steel girders exhibit surface rusting over approximately 10% of their surface area. There is an area of minor section loss to the tension flange of girder 1 at pier 1 (critical negative bending stress region)	Low	7 (Good)	5-10 Years	Clean and paint any deterioration or rusting of superstructure components.
6	Failing paint system.	Deterioration of paint system can allow for the presence of active rusting of exposed superstructure steel which can lead to section losses. The paint system has failed on less than 10% of its total surface area.	Low	7 (Good)	5-10 Years	Abrasive blast clean and paint steel superstructure components.
7	Substructure deterioration.	Deteriorated concrete can undermine substructure performance and remaining service life. The substructure components exhibit random cracks, and scaling.	Low	6 (Satisfactory)	10+ Years	Remove all deteriorated concrete and patch as required.

Table B.46: Bridge 05382 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the bridge railing, approach guardrail transitions, approach guardrail, and approach guardrail ends to current RB-350 standards.	The bridge railing, approach guardrail transitions, approach guardrail, and approach guardrail ends do not meet current design standards. The bridge railing height is less than required, the approach guardrail transitions contain steel blockouts but no rub rails, the approach guardrail contains steel block outs, and the approach guardrail ends terminate within the vehicular clear zones.	Replace the metal beam rail timber blockouts with a compliant component at the approach guardrail.
2	Compliance of the superstructure system to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1941 AASHO Standard Specifications for the H20 live load vehicle model. Compliance of the bridge to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	The existing load rating was performed utilizing the AASHTO LFD methodology in 2001 and found the superstructure system to resist loads beyond statutory load levels. Perform an LRFR load rating analysis to ascertain the load carrying resistance of the superstructure system. The load rating analysis will identify members with as-built section properties that may require strengthening for code compliance.

Culvert Condition Evaluation: Culvert No. 01820

Description

Bridge No. 01820 carries Ramps 144 and 147 over Willow Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under three lanes of vehicular traffic. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1961 Edition. The culvert has an overall length of 25.0 feet (as coded per FHWA SI&A Item 49), carries 134.2 feet of Willow Brook, and has two 10 foot wide x 8 foot high clear openings.

The structure services a unidirectional ADT of 8,000 vehicles with 9% truck traffic from 2015 traffic volume data. A load rating analysis of this structure has yet to be completed. The structure has a sufficiency rating of 82.1.

Table B.47 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.48 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.47: Culvert 01820 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Debris obstruction	The previous inspection report indicates the presence of vegetative debris lodged at the nose of the center wall along the inlet (east opening).	Medium	5 (Fair)	0-5 Years	Remove vegetative debris to clear channel.
2	Vegetation growth	There is heavy vegetation growth along the embankments and overhanging into the upstream channel.	Medium	5 (Fair)	0-5 Years	Trim or remove vegetation growth as required.
3	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.

Table B.48: Culvert 01820 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the culvert frame to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1961 AASHO Standard Specifications for the H20 live load vehicle model but has yet to be load rated. Compliance of the culvert to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	Perform an LRFR load rating analysis to ascertain the load carrying resistance of the culvert frame.

Culvert Condition Evaluation: Culvert No. 01822

Description

Bridge No. 01822 carries Interstate 91 and State Route 15 over Willow Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under ten lanes of vehicular traffic. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 27.4 feet (as coded per FHWA SI&A Item 49), carries 375 feet of Willow Brook, and has two 10 foot wide x 8 foot high clear openings.

The structure services a bi-directional ADT of 55,900 vehicles with 14% truck traffic from 2014 traffic volume data. A load rating analysis of this structure has yet to be completed. The structure has a sufficiency rating of 73.6.

Table B.49 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.50 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.49: Culvert 01822 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Worn bituminous concrete wearing surface and raised median	The bituminous overlay has light wheel rutting and raveling. The west shoulder of Interstate 91 southbound has potholes along the solid white line up to 3 inches deep. There is a raised bituminous concrete median with concrete curbing between Interstate 91 northbound and State Route 15 northbound. The median bituminous concrete is raveled with broken up and missing portions along the curbs. The concrete curbing sections are settled flush with the overlay.	Medium	5 (Fair)	0-5 Years	Mill and repave the bituminous overlay. Repave the raised bituminous median between Interstate 91 northbound and State Route 15 northbound and reset the settled concrete curbing.
2	Collision damage at metal beam railing system	The single or double metal beam railing systems exhibit random areas of moderate impact damage up to 10 feet long with bent and broken posts, and random tears in the railing sections up to 6 inches long.	Low	6 (Satisfactory)	10+ Years	Replace metal beam rail as required or repair impact damage areas.
3	Channel scour	Previous inspection reports have indicated the presence of a 15 foot long x 10 foot wide x 1 foot deep scour hole adjacent to the culvert inlet floor slab for both cells.	Low	6 (Satisfactory)	10+ Years	Continued monitoring of the localized scour hole will be required during future biennial field inspections. However if the scour progresses and begins to undermine the structure, remedial stabilization of the channel bottom will be required.
4	Vegetation growth encroaching the channel	There is heavy vegetation growth along both upstream embankments that is encroaching into the channel.	Low	6 (Satisfactory)	10+ Years	Remove vegetation growth if/when channel encroachment begins effecting channel flow.
5	Aggradation within the culvert cells	There is up to 1 foot of sand, silt, and gravel buildup on the culvert floors for the full length of both cells.	Low	6 (Satisfactory)	10+ Years	Continued monitoring of the aggradation levels will be required during future biennial field inspections. However if the aggradation buildup starts impacting effective channel flow and capacity, removal of the built up material will be necessary.
6	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.
7	Deterioration of concrete culvert structure	The concrete culvert exhibits minor spalling, and cracking with and without efflorescence and dampness. There is a band of scaling along the waterline up to 2 inches deep in isolated locations.	Low	6 (Satisfactory)	10+ Years	Patch scaled and spalled areas as required, and epoxy inject all applicable cracks.

Table B.50: Culvert 01822 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the culvert frame to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model but has yet to be load rated. Compliance of the culvert to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	Perform an LRFR load rating analysis to ascertain the load carrying resistance of the culvert frame.

Culvert Condition Evaluation: Culvert No. 01823

Description

Bridge No. 01823 carries State Route 15 Ramp 148 over Willow Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under two lanes of vehicular traffic. The structure was constructed in 1964 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 43.2 feet (as coded per FHWA SI&A Item 49), carries 120 feet of Willow Brook, and has two 14 foot wide x 8 foot high clear openings.

The structure services a unidirectional ADT of 8,925 vehicles with 5% truck traffic from 2014 traffic volume data. A load rating analysis of this structure has yet to be completed. The structure has a sufficiency rating of 97.0.

Table B.51 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.52 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.51: Culvert 01823 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Collision damage at metal beam railing system	The metal beam rail, along the west shoulder, has a 20 foot long area of minor collision damage. The three cable guide rail, along the east shoulder, has minor slack cabling, moderate to heavy rust, random slightly tilted posts, and two locations of disconnected cable.	Medium	6 (Satisfactory)	0-5 Years	Replace rail system as required or repair impact damage areas.
2	Channel scour	There is a 5 foot diameter x 14 inch deep localized scour hole under a discharge pipe adjacent to the inlet to cell 2 at the northeast wingwall.	Low	5 (Fair)	10+ Years	Continued monitoring of the localized scour hole will be required during future biennial field inspections. However if the scour progresses and begins to undermine the structure, remedial stabilization of the channel bottom will be required.
3	Up and downstream aggradation	There is a 25 foot long x 15 foot wide x up to 3 foot high area of aggradation with heavy vegetation growth in front of, and blocking flow to the inlet to cell 1.	Medium	5 (Fair)	0-5 Years	Remove the built up silt aggradation and restore channel flow to cell 1.
4	Aggradation within the culvert	Cell 1 has approximately 3 feet of aggradation with silt buildup throughout its entire length resulting in a reduced flow capacity. It should be noted that there is a large area of aggradation at the cell 1 inlet which completely blocks flow to the cell itself.	Medium	5 (Fair)	0-5 Years	Remove the built up silt aggradation within the culvert in cell 1.
5	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.
6	Erosion along the approach roadway embankments	There are numerous areas of embankment erosions due to roadway runoff up to 1.5 feet deep, some areas are undermining the edge of pavement with breaking up bituminous concrete present. There is an isolated area of heavy erosion along the back face of the southwest wingwall exposing the back of wall up to 8 feet high. This area of erosion is due to runoff.	Medium	5 (Fair)	0-5 Years	Remediate the source of roadway runoff and stabilize/backfill all embankment erosion areas.

Table B.52: Culvert 01823 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the culvert frame to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model but has yet to be load rated. Compliance of the culvert to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	Perform an LRFR load rating analysis to ascertain the load carrying resistance of the culvert frame.

Culvert Condition Evaluation: Culvert No. 01839

Description

Bridge No. 01839 carries Interstate 91 over Spoon Shop Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under eight lanes of vehicular traffic. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 25 feet (as coded per FHWA SI&A Item 49), carries 300.9 feet of Spoon Shop Brook, and has two 12 foot wide x 8 foot high clear openings.

The structure services a unidirectional ADT of 91,700 vehicles with 9% truck traffic from 2014 traffic volume data. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has a sufficiency rating of 72.6.

Table A.53 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation.

Table A.53: Culvert 01839 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Exposed culvert floor apron at inlet.	There is an area of exposed floor apron along the culvert inlet for cell 1 approximately 15 feet long with 7 inches of exposed apron thickness.	Low	7 (Good)	10+ Years	Continued monitoring of the localized scour will be required during future biennial field inspections. However if the scour progresses and begins to undermine the structure, remedial stabilization of the channel bottom will be required.
2	Debris obstruction	There are two notable areas of debris buildup. There is an area of debris buildup at the culvert inlet in front of the center wall and an area along the northeast embankment which narrows the channel opening.	Low	6 (Satisfactory)	10+ Years	Remove vegetative debris to clear channel.
3	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.

Culvert Condition Evaluation: Culvert No. 01840

Description

Bridge No. 01840 carries Interstate 691 Eastbound over Spoon Shop Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under two lanes of vehicular traffic. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 25 feet (as coded per FHWA SI&A Item 49), carries 172 feet of Spoon Shop Brook, and has two 12 foot wide x 8 foot high clear openings.

The structure services a unidirectional ADT of 17,000 vehicles with 9% truck traffic from 2015 traffic volume data. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has a sufficiency rating of 96.4.

Table B.54 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation.

Table B.54: Culvert 01840 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Collision damage at metal beam railing system	The northwest approach metal beam rail system has an area of impact damage with random tilted posts and one detached post.	Low	6 (Satisfactory)	10+ Years	Replace metal beam rail as required or repair impact damage areas.
2	Exposed culvert floor apron at inlet.	There is an area of exposed floor apron along the culvert inlet approximately 18 feet long with 9 inches of exposed apron thickness.	Low	6 (Satisfactory)	10+ Years	Continued monitoring of the localized scour will be required during future biennial field inspections. However if the scour progresses and begins to undermine the structure, remedial stabilization of the channel bottom will be required.
3	Channel embankment erosion	Both up and downstream embankments have moderate to heavy erosion with exposed tree roots and undercutting up to 1 foot deep.	Low	6 (Satisfactory)	10+ Years	Continue to monitor channel embankment erosion during future field inspections. If erosion begins to affect channel flow characteristics or modifies the channel alignment than consideration should be given to remediation of the embankments and stabilization against erosion.
4	Erosion along the approach roadway embankments	The southeast embankment has an area of erosion along the wingwall up to 10 feet long x 1 foot wide x 6 inches deep.	Low	6 (Satisfactory)	10+ Years	Continue to monitor the roadway embankment erosion. If condition worsens over time, remediate the source of roadway runoff and stabilize/backfill all embankment erosion areas.
5	Debris obstruction/aggradation within the culvert (blocked flow)	There is miscellaneous debris within the channel. There is a build up of sand and gravel debris up to 1 foot high inside of cell 1 which is blocking flow to this cell.	Medium	5 (Fair)	0-5 Years	Remove the built up silt aggradation within the culvert in cell 1 and at both inlet and outlet locations.
6	Vegetation growth with channel constriction	Heavy vegetation is encroaching the channel at the inlet and outlet of cell 1 which is causing a constriction of the channel at these locations. Note, there is no channel flow to cell 1 most likely partly due to the encroachment but also to full length aggradation (see below for additional details). Additionally, there is moderate to heavy vegetation growth along the channel embankments at all four quadrants of the structure site, and along the tops of both headwalls.	Medium	5 (Fair)	0-5 Years	Remove the vegetation as required. Remediation of this item and the previous item should address channel constriction and improve hydraulic performance in order to be considered effective.
7	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.

Culvert Condition Evaluation: Culvert No. 01841

Description

Bridge No. 01841 carries Interstate 691 Westbound over Spoon Shop Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under three lanes of vehicular traffic. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 25.9 feet (as coded per FHWA SI&A Item 49), carries 192.25 feet of Spoon Shop Brook, and has two 12 foot wide x 8 foot high clear openings.

The structure services a unidirectional ADT of 23,600 vehicles with 9% truck traffic from 2015 traffic volume data. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has a sufficiency rating of 80.3.

Table B.55 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation.

Table B.55: Culvert 01841 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Collision damage at metal beam railing system	The northeast approach metal beam rail system has a 65 foot long area of impact damage with random disconnected and twisted posts and rail.	Medium	5 (Fair)	0-5 Years	Replace metal beam rail as required or repair impact damage areas.
2	Channel scour	There is an area of local scour adjacent to the outlet along both cells up to 8 feet long x 28 inches high, exposing the cutoff wall.	Low	6 (Satisfactory)	10+ Years	Continued monitoring of the localized scour hole will be required during future biennial field inspections. However if the scour progresses and begins to undermine the structure, remedial stabilization of the channel bottom will be required.
3	Channel embankment erosion	Both up and downstream embankments have moderate erosion with exposed tree roots and undercutting.	Low	6 (Satisfactory)	10+ Years	Continue to monitor channel embankment erosion during future field inspections. If erosion begins to affect channel flow characteristics or modifies the channel alignment than consideration should be given to remediation of the embankments and stabilization against erosion.
4	Vegetation growth	The up and downstream channel embankments, and areas above the headwalls and wingwalls have an accumulation of moderate to heavy vegetation debris and vegetation growth which overhang into the channel.	Low	6 (Satisfactory)	5-10 Years	Remove vegetative debris and trim vegetation growth back as required.
5	Debris obstruction with channel constriction	There is a heavy accumulation of vegetation debris laying in the channel adjacent to the outlet cutoff wall which has caused localized scour (see above items) and is constricting the channel.	Medium	4 (poor)	0-5 Years	Remove all debris and repair scour hole if required (see above items).
6	Channel alignment	Upstream channel flow approaches the culvert inlet at an eccentric angle thus directing all channel flow through cell 1.	Low	6 (Satisfactory)	5-10 Years	Modify the channel alignment to equalize flow volumes between both culvert cells.
7	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report. There are random hollow corners along the joints.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.
8	Aggradation within the culvert cells	The previous inspection noted up to 12 inches of aggradation in cell 1 and up to 36 inches in cell 2.	Medium	5 (Fair)	0-5 Years	Remove the built up silt/sand/gravel aggradation within the culvert as required.

Culvert Condition Evaluation: Culvert No. 02159

Description

Bridge No. 02159 carries State Route 15 over Willow Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under five lanes of vehicular traffic. The structure was constructed in 1942, extended in 1965, and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges. The culvert has an overall length of 18 feet (as coded per FHWA SI&A Item 49), carries 217.5 feet of Willow Brook, and has two 8 foot wide x 6 foot high clear openings.

The structure services a unidirectional ADT of 28,400 vehicles with 5% truck traffic from 2014 traffic volume data. A load rating analysis of this structure has yet to be completed. The structure has a sufficiency rating of 81.1.

Table B.56 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.49 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.56: Culvert 02159 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Channel scour	There is a 20 foot diameter by up to 4 feet deep scour hole located in the downstream channel with adjacent cuttoff wall exposed up to 26 inches high. In addition, the inlet cuttoff wall is exposed up to 9 inches high. The scour appears to have stabilized over several inspection cycles.	Low	6 (Satisfactory)	10+ Years	Continued monitoring of scour will be required during future inspections. However if the scour progresses and begins to undermine the cuttoff wall, remedial stabilization of the channel bottom will be required.
2	Channel embankment erosion	The downstream embankments are undermined with exposed tree roots.	Low	6 (Satisfactory)	10+ Years	Continue to monitor channel embankment erosion during future field inspections. If erosion begins to affect channel flow characteristics or modifies the channel alignment than consideration should be given to remediation of the embankments and stabilization against erosion.
3	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	6 (Satisfactory)	5-10 Years	Replace preformed joint filler and sealant.
4	Deterioration of concrete culvert structure	The concrete culvert exhibits minor spalling, and cracking with and without efflorescence and dampness. There is a band of scaling along the waterline up to 2 inches deep.	Low	6 (Satisfactory)	10+ Years	Patch scaled and spalled areas as required, and epoxy inject all applicable cracks.

Table B.49: Culvert 02159 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the culvert frame to AASHTO LRFR requirements.	The original structure was designed in accordance with the 1957 AASHO Standard Specifications for the H20 live load vehicle model but has yet to be load rated. Compliance of the culvert to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	Perform an LRFR load rating analysis to ascertain the load carrying resistance of the culvert frame.

Culvert Condition Evaluation: Culvert No. 03049

Description

Bridge No. 03049 carries Interstate 691 Eastbound over Willow Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under two lanes of vehicular traffic. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 22.5 feet (as coded per FHWA SI&A Item 49), carries 184 feet of Willow Brook, and has two 10 foot wide x 7 foot high clear openings.

The structure services a unidirectional ADT of 23,150 vehicles with 9% truck traffic from 2015 traffic volume data. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has a sufficiency rating of 95.8.

Table B.57 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation.

Table B.57: Culvert 03049 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Collision damage at metal beam railing system	There are random areas of collision damage with dents, scrapes, and twisted and tilted posts. There are two detached posts at the south rail system.	Medium	6 (Satisfactory)	0-5 Years	Replace metal beam rail as required or repair impact damage areas.
2	Channel scour	Both cutoff walls at the inlet and outlet are exposed up to full width x 13 inches high.	Low	6 (Satisfactory)	10+ Years	Continued monitoring of scour will be required during future inspections. However if the scour progresses and begins to undermine the cuttoff wall, remedial stabilization of the channel bottom will be required.
3	Channel embankment erosion	Both up and downstream channel embankments have erosion with exposed tree roots.	Medium	5 (Fair)	0-5 Years	Continue to monitor channel embankment erosion during future field inspections. If erosion begins to affect channel flow characteristics or modifies the channel alignment than consideration should be given to remediation of the embankments and stabilization against erosion.
4	Debris obstruction with channel widening	There is a 2-foot diameter dead tree protruding into the channel approximately 20 feet from the culvert outlet.	Low	6 (Satisfactory)	0-5 Years	Remove the dead tree.
5	Vegetation growth	The up and downstream channel embankments have vegetation growth which overhang into the channel.	Medium	5 (Fair)	0-5 Years	Remove vegetative debris and trim vegetation growth back as required.
6	Active leakage through construction joints	Active leakage with efflorescence and rust staining was noted during the most recent bridge inspection report.	Low	7 (good)	5-10 Years	Replace preformed joint filler and sealant.

Culvert Condition Evaluation: Culvert No. 03050

Description

Bridge No. 03050 carries Interstate 691 Westbound and Exit 9 off ramp over Willow Brook in Meriden, Connecticut. The structure consists of a two cell reinforced concrete box culvert with concrete floor buried under three lanes of vehicular traffic and the off ramp gore area. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the ASSHO Standard Specifications for Highway Bridges, 1957 Edition. The culvert has an overall length of 21.9 feet (as coded per FHWA SI&A Item 49), carries 184 feet of Willow Brook, and has two 10 foot wide x 7 foot high clear openings.

The structure services a unidirectional ADT of 23,150 vehicles with 9% truck traffic from 2015 traffic volume data. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has a sufficiency rating of 80.4.

Table B.58 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation.

Table B.58: Culvert 03050 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Collision damage at metal beam railing system	There are random areas of minor impact damage. The southwest and northeast rail systems each have one detached post and several tilted posts.	Low	7 (good)	10+ Years	Replace metal beam rail as required or repair impact damage areas.
2	Channel embankment erosion	Both up and downstream channel embankments have erosion with exposed tree roots.	Low	6 (Satisfactory)	10+ Years	Continue to monitor channel embankment erosion during future field inspections. If erosion begins to affect channel flow characteristics or modifies the channel alignment than consideration should be given to remediation of the embankments and stabilization against erosion.
3	Vegetation growth	The up and downstream channel embankments have vegetation growth which overhang into the channel.	Medium	5 (Fair)	0-5 Years	Remove vegetative debris and trim vegetation growth back as required.
4	Deterioration of concrete culvert structure	There is a large area of spalling/scaling up to 1 inch deep within cell 1, panels 3-7 on the walls and top slab related to a previous fuel spill fire.	Low	6 (Satisfactory)	10+ Years	Patch scaled and spalled areas as required.
5	Aggradation within the culvert cells	There is approximately 18 inches of aggradation within both culvert cells (mainly in cell 2).	Low	6 (Satisfactory)	10+ Years	Continued monitoring of the aggradation levels will be required during future biennial field inspections. However, if the aggradation buildup starts impacting effective channel flow and capacity, removal of the built up material will be necessary.

Culvert Condition Evaluation: Culvert No. 079015

Description

Bridge No. 079015 carries Tumblebrook Road over Spoon Shop Brook in Meriden, Connecticut. This structure is town owned and maintained. Thus, the most recent bridge inspection reports currently on file were conducted in 1991. This condition evaluation is based on the findings of the 1991 inspection report and updated as applicable based on a field inspection conducted by Parsons structural engineers in February of 2018.

Culvert 079015 consists of a two cell corrugated metal pipe culvert and is buried under two lanes of vehicular traffic. According to the only available structure inventory and appraisal data, the culvert was constructed around 1975 however no plan information is currently available. In addition, no load rating information is currently available. The structure has an overall length of 16 feet (as coded per FHWA SI&A Item 49), carries 84.5 feet of Spoon Shop Brook, and has two 87 inch diameter clear openings.

The structure services an unrecorded bi-directional ADT estimated at 100 vehicles during the 1991 inspection with a zero truck traffic percentage. It is reasonable to assume this estimated ADT would not significantly change considering the road essentially services the same residential development as it did in 1991. Load rating analyses of the structures has yet to be completed.

Table B.59 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation. Table B.60 lists substandard structural appraisal items with accompanying recommendations required for compliance to current standards.

Table B.59: Culvert 079015 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Debris obstruction	During Parson's 2018 field inspection, moderate tree debris was noted lodged against the culvert inlet. Little to no reduction of channel flow was noted due to the obstruction	Medium	6 (Satisfactory)	0-5 Years	Remove vegetative debris to clear channel.

Table B.60: Culvert 079015 Appraisal Items of Note

Item No.	Item	Description	Corrective Actions
1	Compliance of the culvert to AASHTO LRFR requirements.	The original structure has yet to be load rated. Compliance of the culvert to current design specifications for load rating, AASHTO LRFR, is unknown at this time.	Perform an LRFR load rating analysis to ascertain the load carrying resistance of the culvert frame.

Culvert Condition Evaluation: Culvert No. 079016

Description

Bridge No. 079016 carries Baldwin Avenue over Willow Brook in Meriden, Connecticut. This structure is town owned and maintained. This, the most recent bridge inspection reports currently on file were conducted in 1991. This condition evaluation is based on the findings of the 1991 inspection report and updated as applicable based on a field inspection conducted by Parsons structural engineering in February of 2018.

Culvert 079016 consists of a two cell reinforced concrete rigid frame and is buried under two lanes of vehicular traffic. The structure was constructed in 1946. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has an overall length of 17 feet (as coded per FHWA SI&A Item 49), carries 112.5 feet of Willow Brook, and has two 8 foot wide x 6 foot high clear openings.

Based on the SI&A data for Bridge 00799, which is immediately to the west of this structure, the travelway services a bi-directional ADT of 3,468 vehicles with 4% truck traffic from 2016 volume data.

Table B.61 lists deficiencies currently affecting the structure with accompanying severity, remaining service life, and maintenance recommendations required for remediation.

Table B.61: Culvert 079016 Condition Deficiencies

Item No.	Item	Description	Severity	NBI Condition Rating	Estimation of Remaining Service Life	Maintenance Repair Type
1	Debris obstruction	During Parson's 2018 field inspection, moderate tree debris was noted lodged against the culvert inlet with minor damming of flow water behind the obstruction and an approximate 25% in flow rate reduction noted.	Medium	6 (Satisfactory)	0-5 Years	Remove vegetative debris to clear channel.
2	Scour	During the Parson's 2018 field inspection, undermining of the concrete apron slab was noted most likely due to localized scour originating from the outlet flow which exits the apron slab as a waterfall. Penetrations of up to 1 foot beyond the face of the apron slab were noted in the field however more detailed documentation of the condition may yield penetrations beyond 1 foot deep. It should be noted that the channel bottom consists predominantly of large stones and stabilizing riprap and because no monitoring information exists over the course of several biennial inspections, the severity of the impact of this noted scouring cannot be fully evaluated at this time.	Medium	5 (Fair)	0-5 Years	Monitor the scour condition over time to ascertain the progression of undermining; revise the condition rating accordingly. If monitoring indicates a time dependent change in undermining, remediation of the outlet flow configuration to remove the waterfall condition and stabilization of the apron slab should be constructed.

PARSONS

Culvert Condition Evaluation: Culvert No. 079017

Description

Bridge No. 079017 carries East Main Street over Willow Brook in Meriden, Connecticut. This structure is town owned and maintained. Thus, the most recent bridge inspection reports currently on file were conducted in 1991. This condition evaluation is based on the findings of the 1991 inspection report and updated as applicable based on a field inspection conducted by Parsons structural engineering in February of 2018.

Culvert 079017 consists of a two cell reinforced concrete box culvert and is directly adjacent to culvert 079018 sharing an integral headwall. The structures in combination are buried under four lanes of vehicular traffic. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has an overall length of 17 feet (as coded per FHWA SI&A Item 49), carries 144 feet of Willow Brook, and has two 8 foot wide x 6 foot high clear openings.

The structure services a bi-directional ADT of 27,468 vehicles with a 4% truck traffic percentage from 2016 traffic volume data.

No significant structural deficiencies or non-compliant appraisal items were noted.

PARSONS

Culvert Condition Evaluation: Culvert No. 079018

Description

Bridge No. 079018 carries East Main Street over Willow Brook in Meriden, Connecticut. This structure is town owned and maintained. Thus, the most recent bridge inspection reports currently on file were conducted in 1991. This condition evaluation is based on the findings of the 1991 inspection report and updated as applicable based on a field inspection conducted by Parsons structural engineering in February of 2018.

Culvert 079018 consists of a single cell reinforced concrete box culvert and is directly adjacent to culvert 079017 sharing an integral headwall. The structures in combination are buried under four lanes of vehicular traffic. The structure was constructed in 1965 and designed for the H20 live load vehicle model in accordance with the provisions of the AASHO Standard Specifications for Highway Bridges, 1957 Edition. A load rating analysis of this structure is not required based on the provisions of the CTDOT Load Rating Manual Section 10.1.4.2.2 since the structure is buried under greater than 10 feet of fill material. The structure has an overall length of 10 feet (as coded per FHWA SI&A Item 49), carries 144 feet of Willow Brook, and has a 10 foot wide x 8 foot high clear opening.

The structure services a bi-directional ADT of 27,468 vehicles with a 4% truck traffic percentage from 2016 traffic volume data.

No significant structural deficiencies or non-compliant appraisal items were noted.