CHAPTER 4
FIELD INSPECTION, DATA COLLECTING, REPORT WRITING AND REPORT REVIEW

4.1 INTRODUCTION

In this chapter, MassDOT policies and procedures for performing bridge inspections are presented. This chapter will also discuss conducting the field inspections, data collecting, report writing and report review. In addition, the policy for reporting and addressing "Critical" findings is outlined. As mentioned in Chapter 3, inspections performed in Massachusetts are "hands on", and all inspections are performed by NBIS qualified Team Leaders with the assistance of one or more team members.

Bridge inspections and inspection reports that are developed are essential for protecting lives and for protecting the public's investment in bridge structures. The Bridge Inspection Management System (4D) includes the reports that correctly and efficiently evaluate the condition of a structure. This information is also a valuable aid in establishing maintenance and replacement priorities. Finally, inspection reports are stored in 4D and are also used for determining a structure's load carrying capacity.

The information necessary to make these determinations must come largely from the bridge inspection reporting system. The importance of the reporting system cannot be over emphasized as the success of any bridge inspection program is dependent upon its reporting system. A new inspection report shall be created each time a bridge is inspected. To achieve maximum effectiveness, each report should be supplemented with sketches, photographs, or any other additional explanatory information. Reports and supplemental information must be accurate, and descriptions or explanations shall be clear and concise.

4.2 STANDARD INSPECTION REPORT FORMS

The standardization of the inspection forms is a necessary step for a uniform bridge inspection reporting system. Prior to performing inspections for MassDOT, one should be aware of the standard inspection report forms available in the 4D system. In Chapter 3, the types of inspections commonly performed were briefly explained. Standardized forms have been created to assist in the report preparation and review process. These forms also provide a uniform method for querying information pertaining to the elements and sub-elements of a structure for prioritization of maintenance repairs. The Standard Inspection Forms used are:

- Initial Inspection Report
- Routine Inspection Report
- Routine Arch Inspection Report
- Routine Culvert Inspection Report
- Routine Underwater Inspection Report
- Routine Segmental Box Girder Inspection Report*
- Other Inspection Report
- Routine Movable (Mechanical/Electrical) Inspection Report*
- Routine Closed Inspection Report
- Special Member Inspection Report
- Routine & Special Member Inspection Report

- Fracture Critical Inspection Report
- Damage Inspection Report
- Divers Activity Report
- Underwater Special Member Report
- Underwater Low Clearance Report
- Element Level Inspection Report (AASHTOWare Bridge Management)

* Not available in 4D.

4.3 SI&A SHEET

The Structure Inventory and Appraisal (SI&A) sheet is a tabulation of pertinent elements of information about an individual structure. It includes data that is required by the Federal Highway Administration (FHWA) to effectively monitor and manage the National Bridge Program. Such data is submitted annually to the FHWA and comprises the National Bridge Inventory database. The SI&A sheet also includes information specific to the needs of MassDOT.

There are three formats available on 4D for the SI&A sheet. The three formats are:

1. Inventory
2. For Inspection
3. MA Specific

The first two formats are very similar but have certain unique items. The "For Inspection" format includes accessibility information while the "Inventory" format includes projected future project costs. In most cases the "For Inspection" format should be used, which is the default format within 4D. The "MA Specific" format, as it suggests, is a collection of data utilized by MassDOT.

The SI&A sheet is not an inspection form but it is to be included with each inspection report submission. Bridge inspection personnel shall become familiar with all of the data items appearing on the SI&A sheet. Descriptions and explanations of the FHWA required data are provided in the FHWA's Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. Massachusetts specific items are described in MassDOT's Supplemental Coding Guide included in Chapter 9.

Responsibility for the accuracy of the data appearing on the SI&A sheet is shared between the Boston Bridge Inspection Headquarters and the District Bridge Inspection Units. A clarification of which items are to be confirmed/revised and by who is provided in Chapter 9.

4.4 ELEMENT LEVEL INSPECTIONS

Element Level Bridge Inspection Data (ELBID) (formerly PONTIS Core Element Data) is to be collected and entered into the BIMS (4D) with every Routine Inspection. Also, when requested by the District Bridge Engineer to perform an inspection outside of the established frequency, for the documentation of repairs performed on the structure a revision to the ELBID shall be performed. A hard copy of the Element Level Data is to be attached to the inspection report. Please refer to the AASHTO Guide Manual for Bridge Element Inspection.

Bridge elements to be collected include National Bridge Elements, Bridge Management Elements and Agency Developed Elements as appropriate. Typically, quantities for each bridge element shall be calculated during the Initial Inspection. Ideally the quantities will be calculated from the as-built plans.

At each Routine Inspection, the Team Leader is to identify the quantity of each bridge element that can be categorized as being in each of the four condition states. Guidelines for the assessment of conditions for each condition state can be found in the AASHTO Guide Manual, see Attachment 4-1 for a quick reference guide for the Element Level Condition States.

For bridges that have an underwater inspection, the Team Leader is to also include Element Level Bridge Data collected by the Dive Team. At the time of publication of this Handbook, the underwater inspectors do not have the capability of inputting the Element Level Data into 4D.

It is of the utmost importance that Element Level Inspection Data mirrors the NBI condition ratings for each inspection report submission. The Element Level evaluation is to be reviewed by the DBIE and the ABIE with as much scrutiny that the NBI inspection report receives to assure consistency in the reporting.

The information contained in the Element Level Data is utilized by MassDOT in assessing the placement of structures on the Bridge Prioritization Model.

4.5 FIELD INSPECTIONS

All inspections performed shall be by Teams lead by Team Leaders, where at least two inspectors are on the site at all times, for safety reasons. It is understood that at times additional data or clarification may be required after the bulk of an inspection has been completed, and a team leader may visit the site for clarification as long it is safe do so. The Team Leader (TL) is the principle person in charge of the inspections. Work assigned by the TL during the inspection to the team members is ultimately the responsibility of the Team Leader.

4.5.1 Field Inspection for Initial Inspections

Initial Inspections are to be performed on the following: completed structures after they have undergone rehabilitation; newly constructed structures; or structures being added to the inventory for the first time.

It is understood, that during an Initial Inspection of a structure, the inspection team shall thoroughly examine all elements and state any irregularities observed in the Initial Inspection report. The secondary purpose of this inspection is to document the “as built” condition. Inspectors should also document any details in the main carrying members that differ from the construction drawings.

At a minimum the following shall be evaluated: beams should be evaluated for vertical alignment (plumb) and the presence of camber both positive and negative; if bearings exist they should be evaluated based on the type of bearing system present; guardrail and bridge railing alignment should be checked for both vertical and horizontal alignment; curb reveal measurements and locations where measurements were taken shall be obtained; substructure elements should be checked for vertical alignment. Photos of the elements above shall be stored as part of the history file for reference in the future to evaluate changed conditions when encountered.

For non-dive bridges it will be necessary to take stream bed profiles at both the upstream and downstream fascia to obtain an as built profile. This could be used in the future to determine if a scour is occurring and re-evaluation of Item 113 is required. Above water inspectors are to take the measurements. In some cases the measurements can be taken with drop lines from the bridge deck. If stream flow is too swift for drop lines other methods may be required. The data can be presented in chart form or in graph form or both. Points of measurement and elevation references must be clearly stated. Whatever method is chosen for use, it is important that it be repeatable from cycle to cycle. The value of the information is in the comparison from inspection to inspection to recognize major bed changes.

4.5.2 Field Inspection for Special Member Inspections

Team Leaders shall give Special Member Inspections their highest priority in their monthly scheduling. As such, every attempt shall be undertaken to perform Special Member inspections at the beginning of every month. If a Special Member Inspection is to be done in conjunction with a Routine Inspection, then both the Routine and Special Member Inspections shall be attempted to be completed at the beginning of the month.

The documentation of repairs performed on a structure shall be reported in the Special Member Inspection Report. As previously mentioned, Section 4.4, the ELBID shall also be updated and included in the submission of the inspection report.

Team Leaders shall be cognizant to inspect all structural components of a Special Member Element. For example, if the Special Member on a structure is for Item 59.4; Girders or Beams, and the inspection is to inspect the girder ends of 2 particular girders, then it shall be expected that the Team Leader will not only inspect the 2 particular girder ends, but shall inspect and document the deficiencies on all girders and beams for that particular detail and surrounding environment.

4.5.3 Field Inspection for Damage Inspections

Upon notification of an Incident, the DBIE shall dispatch an Inspection Team to the structure. The DBIE shall then concurrently notify the District Bridge Engineer and the Area Bridge Inspection Engineer. The Area Bridge Inspection Engineer will then notify the Bridge Inspection Engineer, who in turn will notify the State Bridge Engineer. The District Bridge Engineer, DBIE and inspection staff should be aware that a request for incident response may occur at any time of day or night.

Damage Inspection for verification of reported damage does not require extensive in-depth inspection of all members of the structure, but a cursory investigation to observe if the reported damage has affected other components or if damage is hiding or causing other damage or overstress. In addition, inspection should cover areas other than the immediate area of damage impact. This means Inspectors must assess the interconnectivity of the bridge elements to determine the paths that the initial impact force could have taken to inflict damage to other elements. Inspectors shall inspect and identify members or areas where items are disconnected or loose and could vibrate free, and are removed or directed to be removed by appropriate forces.

For example, diaphragms can transmit the initial impact force to other interior beams, causing localized damage around the diaphragm connections. Also, when reporting the information from a damage inspection, the inspector must obtain measurements to a known referenced fixed point on the structure.

When damage is verified and deemed to be a danger to pedestrians and/or vehicles, the site shall not be left unattended until the custodial owners have arrived and are preparing to respond with the necessary safety precautions. The Inspection Team shall document the safety precautions implemented in the Damage Inspection Report.

In situations where a repair cannot be performed immediately, after the appropriate maintenance forces have installed the hazard prevention devices, the District Bridge Inspection Engineer, with the concurrence of the District Bridge Engineer, shall establish a schedule for inspection to monitor and verify that the barricades and hazard prevention devices have not moved and are still effective until the danger has been resolved.

When a damage incident is reported by the District, and the Inspection Team has responded, inspected and written the Damage Inspection Report, the time associated with those activities shall be charged to the Reimbursable Cost Code generated by the District for that particular incident, if one has been generated.

4.5.4 Field Inspection for Scour Critical Structures

For bridges that have been determined to be Scour Critical it will be necessary to take stream bed profiles at both the upstream and downstream fascia to comply with the FHWA mandated Scour Plan of Action (POA). Scour Critical bridges have a numerical coding for Item 113 of 3 or less. For bridges that have underwater inspections, the stream bed profiles will be obtained by the Underwater Inspection Unit as part of their inspection. For non-dive bridges, the above water inspectors are to take the measurements. In some cases the measurements can be taken with drop lines from the bridge deck. If stream flow is too swift for drop lines other methods may be required. The data can be presented in chart form or in graph form or both. Points of measurement and elevation references must be clearly stated. Whatever method is chosen for use, it is important that it be repeatable from cycle to cycle. The value of the information is in the comparison from inspection to inspection to recognize major bed changes.

4.5.5 Plan of Inspection

In order to make the inspection as orderly and systematic as possible, the inspector should plan the inspection in advance. The plan shall include the review of previous inspections; load rating report; fracture critical procedures (if applicable); and SI&A. In addition, a plan includes determining the appropriate inspection sequence, establishing a time schedule, preparing for special inspection requirements (e.g. non-destructive testing and underwater inspection), organizing the field notes, anticipating the effects of traffic control procedures, and facilitating a thorough and complete inspection.

Prior to the actual inspection of a structure, the inspection team leader shall coordinate any and all parties (i.e.; RR flaggers, Police details, traffic set up, etc.) that may be required to accomplish the inspection. It is advisable that the team leader scope the bridge prior to the inspection to evaluate entry points, means of inspection, and any other aspects that may be required to inspect the structure.

The Team Leader shall be aware of the data needed for the particular inspection being performed. At times special requests are made and it is essential that all data is collected during the inspection. Once the Team Leader has reviewed the Load Rating Report, he/she may feel that a new rating may be warranted. In such cases the inspection will require in depth documentation and additional time to complete for the

preparation of a new load rating. Discussions with the District Bridge Inspection Engineer should occur so that other scheduled inspections get reassigned if needed.

4.5.6 Orientation

The orientation and numbering of bridge elements should be as shown on the plans whenever available. When plans are not available the rating report should be used. If no rating report exists, then the numbering of piers, beams, etc. shall be orientated from west to east, or from south to north.

It is important that the orientation of each element be clearly established. Orientation for rivers and streams is looking downstream. That is the left bank is on your left as you face downstream and the right bank is on your right as you face downstream. For tidal rivers, downstream is in the direction of the ebb (outgoing) tide.

Some examples:

- Identify substructure units (abutments) and sides of floorbeams, such as north/south or east/west designations; alternately, number the substructure units (piers) such Pier #3
- Sides of members can be identified by direction (e.g. "south side of floorbeam #2" or "north side of Pier #4")
- Span numbers and bay numbers should be used to identify general areas on the bridge, as shown on plans or as established otherwise
- Upstream or downstream designations can be assigned to structures over waterways (e.g., "upstream truss", "downstream girder", or "upstream arch")
- For truss elements, identify the member with joint designations

If the orientation used during the inspection differs in any way with that used in existing documents, these differences shall be clearly stated in the inspection report under the general remarks section of the inspection report.

4.5.7 Condition Information

To ensure a comprehensive condition inspection and as a part of the requirements of record keeping and documentation, an inspector shall record the type, size, quantity, severity and location of deterioration and deficiencies for each applicable element in a given component. The Bridge Inspectors Reference Manual (BIRM) and the Manual for Bridge Evaluation (MBE) are the inspectors' guide for identifying the members and the deficiencies on a variety of structure types.

The condition rating guidelines contained in the 1995 Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (or most recent) are to be used in the evaluation of the deck, superstructure, and substructure. During the inspection, the inspector shall be aware of items in the SI&A that must be verified and updated, should it be required.

The outcome of the inspection shall always be to provide a clearly presented narrative description of the conditions. Inspectors shall note the following: all signs of distress, failure, or defects with sufficient accuracy so that another inspector at a future date can make a comparison of condition or rate of deterioration; load, speed, or traffic restrictions on the bridge; information about high water marks and unusual loadings, the presence of any negative camber on any elements, and section losses to beam ends.

All work or repairs to the bridge since the last inspection should be documented. If work is undertaken on a structure that improves the physical condition of a structure and results in the Team Leader increasing the numerical value of an element, the Team Leader must explain what work was undertaken to improve the condition. Verify or obtain new dimensions when maintenance or improvement work has altered the dimensions of the structure.

The end result of the inspection performed is to ensure the public that a safe structure is in place to carry traffic. The data collected on defects found helps with the determination of the safe load carrying capacity of the structure. The documentation will assist the custodian of the structure with important information for the proper maintenance and rehabilitation information. Consistency in coding, data collection and documentation is discussed in subsequent sections.

4.5.8 Critical Inspection Findings

Deficiencies are occasionally discovered during bridge inspections that require immediate action. They can be structural in nature such as a severely undermined girder bearing or they may present a hazardous situation to the travelling public. When such deficiencies are discovered a special procedure of notification is warranted as explained below.

4.5.8.1 Critical Structural (CS/I) Definition and Notification

If a deficiency is discovered that may affect the structural integrity of the bridge, it is considered a Critical Structural Deficiency. A Critical Structural Deficiency is defined as a deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge. Because of the critical nature of the deficiency the urgency code must be Immediate. To assure an immediate response the details of the deficiency must be transmitted quickly. During an inspection, if an inspector discovers a Critical Structural deficiency, the inspector shall immediately notify the DBIE, or in his absence, the DBE. For more information, refer to Section 4.7 of this Handbook regarding CS/I documentation.

4.5.8.2 Critical Hazard (CH/I) Definition and Notification

If a deficiency is discovered that poses an extreme hazard or unsafe condition to the public, it is considered a Critical Hazard. A Critical Hazard condition is defined as a deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Because of the critical nature of the deficiency the urgency code must be Immediate. To assure an immediate response the details of the deficiency must be transmitted quickly. During an inspection, if an inspector discovers a Critical Hazard deficiency, the inspector shall immediately notify the DBIE, or in his absence, the DBE. For more information, refer to Section 4.7 of this Handbook regarding CH/I documentation.

4.5.9 Request for Re-Evaluation of Item 113 - Scour Critical Bridges

The Team Leader must be aware, able to recognize and document changes that are occurring in the stream bed in the vicinity of the structures. These changes, documented by inspections, are to be used to assist the DBIE in determining if the request for a re-evaluation of Item 113 - Scour Critical Bridges is necessary. A re-evaluation does not just apply to structures with Item 113 less than or equal to a

numerical rating of 3. A re-evaluation may be necessary for structures with Item 113 greater than a 3. If a re-evaluation is required, then the Bridge Scour – Item 113 Re-evaluation Form will be filed out and submitted to the Area Bridge Inspection Engineer, see Attachment 4-2.

Some concerns the Team Leader shall be aware of and document are as follows:

- Channel changing course
- Evidence of erosion or scour around footings and embankments
- Large amounts of debris around the substructure
- Evidence of rip rap, bank protection removed or altered
- Stream work performed by others that might change the hydraulic characteristics at the bridge

All of the concerns mentioned above could result in a request for a re-evaluation.

In Summary, a request for an Item 113 re-evaluation shall be submitted for the following cases

- When a structure over water has been replaced
- Substructure scour repairs performed and/or streambed scour countermeasures have been installed on a structure that is scour critical
- Significant changes mentioned above have occurred that alter the stream bed or flow characteristics of the waterway

4.5.9.1 Structure over Water That Has Been Replaced

When a structure over water has been replaced, the DBIE will be required to forward the Initial Inspection to the ABIE who will then submit the report to the Bridge Engineer for an initial coding of Item 113.

4.5.9.2 Substructure Scour Repairs Performed and/or Stream Bed Scour Countermeasures Installed

When a structure is scour critical and has had scour repairs performed on the substructure and/or stream bed scour countermeasures have been installed, the DBIE will be required to forward the Inspection that documents the improvements to the ABIE, who will then submit the report to the Bridge Engineer for re-evaluation of Item 113 coding.

4.5.9.3 Stream Bed or Waterway Changes

The Team Leader shall compare the stream bed profiles being collected and waterway changes to what was documented in past inspections. The loss of the stream bed material, or change in flow characteristics may warrant the re-evaluation of the Item 113 to ensure proper coding and structural stability. The DBIE will submit these Inspection Reports with the documented findings on the streambed changes to the ABIE who will submit the report to the Bridge Engineer for re-evaluation of Item 113 coding.

4.5.10 Reporting of Structurally Deficient Bridges

When a Team Leader inspects a structure and observes a condition that warrants a lowering of the numerical condition coding of a structure to a 4, or from a 4 to a 3, for Item 58, Item 59, Item 60, or Item

62, they shall notify the District Bridge Inspection Engineer. Preferably, this notification shall be done while the Team Leader is still at the structure, so as to allow the DBIE the opportunity to come to the structure to observe and concur with the Team Leader's decision. The intent of notifying the DBIE would be to ensure Items 90 thru Item 92 are coded in a timely manner so that the next inspection is undertaken.

4.5.11 Other Information Gathered at Routine Inspections

4.5.11.1 Request for Rating or Re-rating

The Team Leader shall be responsible for recommending a rating request or a re-rating request for a structure. This recommendation shall be stated in the request for rating or re-rating block located on the 2nd page of the Routine Inspection Report or 1st page of a Special Member Inspection Report. The Team Leader shall evaluate the deficiencies observed on the structure and any alterations made to the structure, in relation to the previous rating report, which would warrant a recommendation to rate or re-rate a structure.

4.5.11.2 Curb Reveal Measurements

The average curb reveal measurement should be used in documenting the curb reveal on the inspection report. The curb reveal measurement is taken primarily to identify if additional pavement material has been added to the structure since the last inspection. The measurement should be made to the nearest 10 mm. If there is no curb, then a measurement should be taken from the parapet, either the top or lowest break line and the point of reference should be clearly defined so that future measurements can be repeated. The reference point shall be stated in the curb comments of the inspection report.

4.5.11.3 Vertical Clearance Measurements & Vertical Clearance Signage Verification

Inspection Teams are required to check the low point vertical height clearances under a bridge, or through a bridge in the case of thru truss bridges, or both. The low point clearance is taken within the traveled way. The travel way is defined as the roadway lane that is allowing travel on a regular basis. Team Leaders should use their judgment when accessing a roadway traveled way. For example, if a roadway has a breakdown lane that travel is permitted on a regular basis, then the clearance will need to be verified at the outer limits of the breakdown lane. Team leaders should not adjust clearance measurements because the travel way is being altered for the convenience of a construction project.

Vertical clearances shall be taken during every routine or damage inspection performed. However, it is understood that it should not be different unless a change condition has occurred to the wearing surface below the structure or on the structure as in the case of a thru truss bridge. This verification frequency will ensure accuracy of the data being recorded at the time of the inspection. The location of the low point(s) should be clearly identified on a framing plan incorporated into the inspection report, see Attachment 4-3. Team Leaders shall place a note in the general remarks when they do not verify the vertical clearance and the reason why.

When the inspection team field verifies the vertical clearance height is less than 14'-6", then the team shall verify the placement of any clearance posting signs in the field during the inspection. Note if any of the "advanced" clearance posting signs or "at bridge" clearance posting signs are missing, then the Team Leader shall notify the DBIE of the missing signs and the location of the missing signs.

In relation to the discussion in this article, it is appropriate to define the "At Bridge" and "Advanced" clearance posting sign terms:

At Bridge Clearance Posting Signs: Signs erected immediately in advance of, or on the bridge being posted.

Advance Clearance Posting Signs: Signs placed at approach road intersections or other points where a vehicle which exceeds the posted limits must detour or turn around.

There are no Massachusetts General Law requirements for installing clearance posting signs, however in order for a bridge to be considered properly clearance posted, an At Bridge Sign must be either within visible distance of the structure or attached to the structure and be erected facing each direction of traffic. If there is an intersecting street between the sign and the bridge, an additional sign must be erected immediately adjacent to the bridge. These additional signs must be in place in order for the bridge to be considered properly posted.

When the inspection team field verifies that the vertical clearance is equal to or exceeds 14'-6", then the team leader shall record the measurement and check off the "not applicable" box in the area of the report dedicated for "Clearance Posting" on the inspection report. Further discussion of clearance posting sign procedure is contained in Section 4.8 of this Handbook.

4.5.11.4 Weight Posting Verification & Weight Posting Signage Verification

The Team Leader shall review the latest rating report of the structure to be inspected, if one exists, so as to obtain any recommended posting for the structure. The Team Leader shall verify the actual weight posting for the structure in the field and compare it to the recommended weight posting contained in the rating report. The actual and recommended weight posting values shall be stated in the "weight posting" area of the inspection report. If a discrepancy exists between the actual and recommended weight posting recommendation, then the Team Leader shall notify the DBIE of his findings.

The Team Leader shall verify the "at bridge" and "advanced" weight posting signs are in place and are accurate for all structure that require posting.

Further discussion of the actions to be taken by the DBIE when discrepancies are encountered shall be contained in Section 6.11 of this Handbook.

4.5.11.5 Average Daily Traffic

At every Routine Inspection the inspector shall refer to the MassDOT website location to obtain traffic data counts for the structure being inspected. The website is at the MassDOT TransNet site. Click on Highway, then Quick Links, then Departments, under Design and Engineering, click Traffic Data Collection. In the first paragraph there is a link to the interactive map. Zoom in to your area of interest. The map shows where the latest traffic counts have been taken and the year.

If there are no traffic counts available on the website, then a manual vehicular and truck traffic count on the structure shall be undertaken. The counts shall be performed and the SI&A shall be marked with the time the counts where taken and number of vehicles observed. The counts can then be calculated using

the formulas and example attached in Attachment 4-4. Other instructions on what will be recorded in Items 29, 30 and 109 of the SI&A are in subsequent sections.

The Team Leader should use his/her judgment as to whether or not the traffic counts at the MassDOT website are still relevant. This could depend on how old the count is, whether traffic patterns have changed for the area, etc. If the TL suspects that the counts may not represent current traffic conditions then the team should obtain a manual count as described above.

4.5.11.6 Inventory Photos

During the Initial Inventory Inspection, a series of photographs shall be taken to document the structure for inventory purposes. At a minimum, the following views shall be taken:

- Two photographs of the roadway on the bridge, one from the approach roadway at each end of the bridge, taken such that the near guardrail-bridge rail transition is clearly visible
- Two elevation photographs, one of each elevation of the bridge
- One photograph of the general underside of the bridge
- If the bridge is over water, two photographs, one looking upstream and the other downstream from the bridge

If the bridge has any unusual features or characteristics, a photograph should be taken of them for inventory purposes as well. If the bridge has a commemorative plaque, or multiple commemorative plaques attached to the structure, a photograph of each plaque shall be taken and included in the inventory photos. The photo shall be taken directly perpendicular to the plaque with a measured scale, such as a tape measure or folding ruler, placed adjacent to the plaque within the photograph so that its true size can be obtained in case it needs to be duplicated in the future.

During the life of the bridge, this series of inventory photographs shall be repeated every ten years unless conditions at the bridge have changed dramatically before the ten year time period is out, rendering the previous set obsolete. These photos shall be saved in the 4D database.

4.5.11.7 Stream Bed Profiles

For all bridges over water that are non-dive bridges, the Team Leader will take stream bed profiles measurements at both the upstream and downstream fascia and record this in the inspection reports. In some cases, the measurements can be taken with drop lines from the bridge deck. If stream flow is too swift for drop lines other methods may be required. The data can be presented in a chart form or in graph form, or both. Points of measurement and elevation references must be clearly stated. Whatever method is chosen for use, it is important that it be repeatable from cycle to cycle. The value of the information is in the comparison from inspection to inspection to recognize major bed changes.

For bridges that have underwater inspections, the stream bed profiles will be obtained by the Underwater Inspection Unit as part of their inspection.

4.6 INSPECTION DOCUMENTATION and REPORT WRITING

4.6.1 Creation of Inspection Report

Team Leaders are responsible for the creation of the inspection report record in the Bridge Inspection Management System (4D). The report record shall be created in the system while the field inspection is occurring. If it is not created while inspection is ongoing it shall be in the system no later than 3 days after the inspection has been completed. It is understood that the creation of this record as a duplicate of the previous inspection is acceptable. In no way will this inspection report be construed as the actual inspection report until the Team Leader has committed the report for review.

4.6.2 Date of Inspection

When inspections are performed over multiple days, the start date of the inspection should always be used for the report and SI&A coding. The start date is the date that elements are actually inspected (a recon of a structure shall not be considered as a start date). This is especially important when inspections are started in one month but completed in the next month.

When inspections are delayed for access issues such as construction operations or right-of-entry permit acquisition, the inspection team should complete as much of the inspection that is physically possible and complete an inspection report depicting the areas and elements inspected. The report should clearly state the limits of the inspection and explain which areas were not inspected and why. When access for the other areas is granted and/or possible, the TL should then return to the bridge to complete an "Other" inspection with its own date of inspection.

4.6.3 Inspection Defects

In the inspection of a structure, a Team Leader may discover faults, flaws and imperfections to the structural elements. These defects should be identified and described by their type, size and location. The Team Leader shall document the defect and describe the seriousness of the defect in the body of the inspection report. If, in the opinion of the Team Leader, an observed defect could receive CORRECTIVE ACTION, then it is to be considered a DEFICIENCY.

4.6.4 Inspection Deficiencies

The Team Leader shall assign a deficiency code to any observed defects that require corrective action. A deficiency code consists of a Deficiency Category and an Urgency Code. The complete Deficiency Code is entered in the column adjacent to the sub-elements condition rating on the Routine Inspection Report. The code is similarly entered on Special Member and Fracture Critical Inspection Reports as needed.

Deficiencies are classified into four categories. The categories are as follows:

M = Minor Deficiency:	Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples may include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion to steel, Minor scouring, Clogged drainage, Minor damage to guard rail, etc.

S = Severe/Major Deficiency: Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples may include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroding rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S = Critical-Structural Deficiency: A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge. All Critical-Structural Deficiencies need Immediate corrective action.

C-H = Critical-Hazard Deficiency: A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples may include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc. All Critical-Hazard Deficiencies need immediate corrective action.

Urgency codes are classified into three categories. The categories are as follows:

P= Prioritize: Shall be prioritized by District Bridge Engineer or the Responsible Party (if not a State bridge) and repairs should be made when funds and/or manpower available.

A= As soon as possible: Action/Repair should be initiated by District Bridge Engineer or the Responsible Party (if not a State bridge) upon receipt of the Inspection Report.

I= Immediate Corrective Action: Immediate means that Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and receive further instruction from him/her. This level of urgency shall only apply to C-S and C-H deficiencies.

4.6.5 Inspection Dimensioning

Sufficient dimensions shall be provided of any deficiencies observed. The dimensioning shall provide actual size measurements and depth measurements to capture the scale of the defect. These measurements shall then be referenced to a fixed and definable reference point on the structure. It is desirable that all reference points refer from the centerline of bearings for the structure. All units of measurement shall be stated in English Units.

Inspectors shall measure and record crack sizes found during inspections. They shall record the lengths and widths and depths were possible and reference to the locations of the cracks to a fixed point on the structure.

When inspectors discover section loss on structural steel elements (i.e.; girders, stringers, truss elements, or reinforcing bars) they shall measure and state the **remaining** structural steel available. The inspector shall **not** assume a section loss percentage, but shall provide measurements of remaining thickness.

4.6.6 Inspection Sketches

When inspecting bridges, it may be necessary to use sketches to clarify locations and/or details of defects. When the sketch format is selected for recording bridge inspection results, the information should be recorded systematically.

In most cases it will be possible to use reproductions of portions of the plans for the sketches. However, in some instances, such as when the "as built" detail is different from what is shown on the construction drawings, an accurate sketch showing the existing detail will have to be drawn.

For examples of typical sketches, see Attachment 4-5: Typical Underside of Deck Condition Sketch, Attachment 4-6: Typical Beam End Elevation Sketch, Attachment 4-7: Typical Beam Elevation Sketch, and Attachment 4-8: Typical Cross Section View of Deteriorated Prestressed Concrete Beam.

4.6.7 Inspection Photos

All photographs shall be taken in color with a digital camera. The camera used shall be capable of taking all required photographs in proper focus and sufficient level of detail, whether overall inventory photographs or close-up detail photographs of deficiencies. The camera must also be capable of operating with an adjustable flash unit in order to properly light up dark areas and fine details. It is preferable that the camera will record a date stamp on every image.

A photograph should be taken to assist either the written description or sketch of a deficiency. If there are several deficiencies of the same type, a photograph would be taken to show a typical deficiency while sketches would be used to show and dimension each deficiency at each location.

When photographing a deficiency, it is usually best to take two photographs, one being a general view of the deficiency which should locate it in relation to the rest of the bridge structure, while a second should be a close up of the deficiency itself, showing its extent and any distinguishing features. This close up view must be in focus, properly lit and should include a ruler to help establish the scale of the deficiency. A pencil, pick or screw driver tip may be used to point to important details that might otherwise be overlooked in the photograph.

If a deficiency is being monitored as part of Special Member Inspection, in lieu of repair, every effort should be made to take a new detail photographs from the same location and at approximately same scale as the ones before so that the progress of the deficiency can be readily established.

4.6.8 Videos of Deficiencies

In some cases, a deficiency is only apparent when under traffic. For example, the longitudinal joint between butted precast beams may have failed so that the beams are deflecting independently of each other. This situation could only be documented during a live action video of a vehicle going over the bridge. In such cases, the video segment should be shot showing the deficiency in action. The video

should be properly focused, well lit and the view should be framed such that the entire action is kept within the view of the camera without having to move the camera to follow the action. If at all possible, a ruler should be used to establish the scale of the view and deficiency. The video will then be forwarded, via email, to the District Bridge Inspection Engineer, District Bridge Engineer, Bridge Inspection Engineer and the Area Bridge Inspection Engineer.

4.6.9 Condition Coding

The numerical condition ratings should characterize the general condition of the entire component being rated. They should not attempt to describe localized or nominally occurring instances of deterioration or disrepair. Correct assignment of a condition rating must, therefore, consider both the severity of the deterioration or disrepair and the extent to which it is widespread throughout the component being rated.

It shall be noted that a bridge's load-carrying capacity is **not** to be used in the condition coding process. The fact that a bridge was designed for less than current legal loads, and may even be posted, should have no influence upon the condition rating.

Narrative descriptions of the conditions should be clearly presented. Note all signs of distress, failure, or defects with sufficient accuracy so that another inspector at a future date can make a comparison of condition or rate of deterioration. When a sub-item is assigned a numerical condition of 6 or less, the inspector will be required to write a narrative description of the defect. Also, if any sub-element is assigned a deficiency coding of S-A, then it will be required that a photo of the sub-element be contained in the inspection report.

In relation to Item 60, 61 and 62, the inspection report will have two columns (Dive & Cur) for each sub-element. If a bridge is a Dive (Underwater Inspection) bridge then the inspectors shall import the condition rating of each sub-element from the latest Underwater Inspection Report and place them in the "Dive" column. The Inspector's own evaluations of these sub-elements are coded in the "Cur" column. Generally, the overall condition of each of the above items is the lower number between Underwater Inspection Report and the Inspector's Report and that would be the number which is entered in the SI&A. The above water inspector needs to review what is contained in the Underwater Inspection Report and make the determination if the item controlling the Underwater Inspection is valid for controlling the overall condition. Two examples and attachments are provided for clarification as follows:

Example #1: The "Abutment" from an Underwater Inspection Report is an "N" and from a Routine Inspection is a "6". The "Pier or Bents" from an Underwater Inspection Report is a "7" and from a Routine Inspection is a "5". The "Pile Bents" from both reports is an "N", then the overall "Abutment" rating is a "6", "Pier or Bents" is a "5" and "Pile Bents" is "N". Overall condition rating of the Item 60 (Superstructure) would be a "5" and this is the number which will be coded in the SI&A. The Routine Inspection condition rating is less than the Underwater Inspection Condition Rating. Refer to Attachment 4-9, Example 1: Condition Coding of Item 60.

Example #2: The "Abutment" from an Underwater Inspection Report is a "6" and from a Routine Inspection is a "7". The "Pier or Bents" from an Underwater Inspection Report is a "5" and from a Routine Inspection is a "7". The "Pile Bents" from both reports is an "N", then the overall "Abutment" rating is a "7", "Pier or Bents" is a "7" and "Pile Bents" is

"N". Overall condition rating of the Item 60 (Superstructure) would be a "7" and this is the number which will be coded in the SI&A. Although, in this example the Underwater Inspection overall condition rating is a "5" the scour that has occurred does not impact the main load carrying member of this rehabilitated structure. The existing arch structure is remaining but the new structure above the arch is supported on piles. Loads are not being transferred to the arch. Refer to Attachment 4-10, Example 2: Condition Coding of Item 60.

4.6.10 Narrative Presentation

The narrative presentation shall be the writing remarks segment of the inspection report summarizing the field inspection findings of the inspection team.

The narrative shall begin with the inspector describing the method of orientation selected to orient the reader. The inspector will then write in the "General Remarks" section any load, speed, or traffic restrictions on the bridge, as well as any special means of access utilized to inspect the structure. Include information about high water marks and unusual loadings. Also, all work or repairs to the bridge since the last inspection should be listed. If work is undertaken on a structure that improves the physical condition of a structure, the Team Leader must explain what work was undertaken to improve the condition. Verify or obtain new dimensions when some maintenance or improvement work has altered the dimensions of the structure.

When numerous defects are to be documented under a sub-element it is encouraged to do so in "bullet" form. The condition narrative should begin with a summary statement which identifies the general condition and/or highlights the controlling deficiencies that are presented in the bullets which are listed below. Refer to Attachment 4-11 for an example of presenting information in an inspection report. The application of this method of presentation will allow the ease of comparison between successive inspection cycles and allow for the visual progression of the deterioration of the sub element.

4.6.11 SI&A Edits

During every inspection cycle, the inspector shall submit a marked up SI&A sheet with every inspection report submission. Team Leaders shall submit a copy of the SI&A sheet with all suggested revisions for the latest inspection marked up in red. At a minimum the latest inspection date should be revised. Other common revisions may include condition ratings for Items 58, 59 and/or 60 as well as ADT dates and values. After the corrections are made to the SI&A sheet electronically (within 4D) by the District Bridge Inspection Engineer or his/her designee a copy of the revised sheet should be printed out and attached to the inspection report. Refer to Attachment 4-12 for an example of a marked up SI&A sheet. It shall be noted on the marked up copy of the SI&A sheet that the ADT was calculated and shown, the changes that were recommended for Item 58, 59, and 60 are shown and any changes recommended on the appraisal section are shown.

4.6.12 Element Level Inspection Report

The Element Level inspection report is produced within the bridge inspection module of 4D under the "Pontis" tab. A separate report is produced and is printed out as an attachment to the inspection report. As mentioned previously, the Element Level report is required with each Routine Inspection and when inspections are performed to document improvements from rehabilitation efforts.

When completing an Element Level inspection report on a bridge that is a dive bridge, the Team Leader must ensure that the Underwater (U/W) Element Level inspection information is incorporated into the above water Element Level report. The U/W Element Level inspection data is a paper report only. The above water Element Level report is where the information is entered into the 4D database. The Team leader should obtain a copy of the latest U/W inspection report and Element Level inspection report prior to the above water inspection and incorporate the U/W information on his/her Element Level inspection report.

4.7 CS/I & CH/I PROCEDURE AND DOCUMENTATION

In the case of Critical-Structural and Critical-Hazard Deficiencies which require **Immediate** corrective action, the Inspection Team Leader (TL) shall immediately verbally notify the District Bridge Inspection Engineer (DBIE), who after verification shall immediately verbally notify the District Bridge Engineer and the Area Engineer (who in return will immediately notify the Bridge Inspection Engineer, who in return will notify the State Bridge Engineer and FHWA officials).

Upon observation of a deficiency, the Inspection Team Leader (TL) shall code all the deficiencies and complete the inspection report and include all sketches and photographs necessary to clearly identify the deficiencies. All reports shall then be given to the DBIE who after review of the report shall forward it to the District Bridge Engineer (DBE) for corrective action. The Team Leader shall indicate in the inspection report the notification of the DBIE.

When the deficiency is verified and deemed to be a danger to pedestrians and/or vehicles, the site shall not be left unattended until the custodial owners have arrived and are preparing to respond with the necessary safety precautions. The Inspection Team shall document the safety precautions implemented in the Inspection Report.

4.7.1 CS/I & CH/I Field Observations at MassDOT Owned Bridges

In the case of a Critical Deficiency, in addition to the prior paragraphs requirement, the DBIE shall prepare a Critical Deficiency Activity Log/Critical Deficiency Verification Form (See Attachment 4-13: Critical Deficiency Activity Log/Critical Deficiency Verification Form) and forward a scanned copy via email to the District Bridge Engineer. The log documents the reporting of the Critical Deficiency and requests that it be returned with documentation of the action taken. Copies shall be forwarded to the Bridge Inspection Engineer who in turn will forward a copy to the FHWA and shall catalog the CS Deficiency in a database.

4.7.2 CS/I & CH/I Field Observations at Municipally Owned Bridges

In the case of Critical-Structural and Critical-Hazard Deficiencies which require Immediate corrective action, the District Bridge Inspection Engineer shall immediately notify the Municipal Officials in Charge.

The DBIE shall prepare the Critical Deficiency Activity Log/Critical Deficiency Verification Form (see Attachment 4-13) with supporting documentation and send a copy to the Municipality with a cover letter signed by the District Highway Director (see Attachment 4-14). Copies shall be forwarded to the District

Bridge Engineer and Bridge Inspection Engineer who in turn will forward a copy to the FHWA and shall log the CS Deficiency in a log book.

4.7.3 Follow-Up Procedures on Critical Deficiency Findings

The Follow-Up Critical Deficiency Inspection process is intended to meet the NBIS requirements for recording the corrective action taken by the Department or Municipality as a result of the Bridge Inspection Unit filing a Critical Deficiency in the Inspection Report found during an inspection. This procedure shall be used for all MassDOT and Municipally-owned bridges as follows. The process should be completed as soon as possible after repair, but no later than one month after the report of Critical Deficiency.

4.7.3.1 Procedures – Follow-Up Procedures for MassDOT Bridges

The District Bridge Inspection Engineer shall verify and document the status of the Critical Deficiency. If the deficiency has been addressed then the DBIE shall ensure that the Verification Form has been signed and forwarded to the appropriate parties. Copies shall be forwarded to the Bridge Inspection Engineer who in turn will forward a copy to the FHWA and shall log the CS Deficiency in a log book.

If the deficiency has not yet been addressed, the DBIE shall notify the ABIE that the status of the CS/I has not changed. The ABIE shall then forward the notification of the un-changed CS/I to the BIE who shall initiate a conversation with the District Bridge Engineer regarding the schedule for such repair. A hard copy of the email string should be retained as documentation of the situation. If the schedule for repairs has not been determined, then a follow up Critical Deficiency memo (Attachments 4-15 or 4-16) shall be sent.

The completed Follow-Up Critical Deficiency Notification Form (See Attachment 4-15 and 4-16) and re-inspection report shall be filed in a separate file in both the District Bridge Inspection Engineer's Office and the Boston Bridge Inspection Engineer's Office. A copy of all correspondence will also be kept in both the District's and Boston's Bridge History File.

4.7.3.2 Procedures – Follow-Up Procedures for Municipally Owned Bridges

The District Bridge Inspection Engineer shall verify and document the status of the Critical Deficiency. The DBIE shall then prepare the Follow-Up Critical Deficiency Notification Form (see Attachment 4-17 and 4-18) and send a copy to the Municipality with supporting documentation with cover letter signed by District Highway Director. Copies shall be forwarded to the Bridge Inspection Engineer who in turn will forward a copy to the FHWA and shall log the CS Deficiency in a log book.

The completed Follow-Up Critical Deficiency Notification Form and re-inspection report shall be filed in a separate file in both the District Bridge Inspection Engineer's Office and the Boston Bridge Inspection Engineer's Office. A copy of all correspondence will also be kept in both the District's and Boston's Bridge History File.

4.7.3.3 Repeat Procedures – Follow-Up Procedures for MassDOT & Municipally Owned Bridges

The procedures outlined in Section 4.7.3.1 and 4.7.3.2 shall be repeated when re-inspection verifies that the Critical Deficiency has not been corrected.

4.8 VERTICAL CLEARANCE SIGNAGE PROCEDURE

MassDOT clearance sign procedure is derived from the latest FHWA Manual for Uniform Traffic Control Devices (MUTCD), in which it states that Low Clearance signage shall be used to warn road users of clearances less than 12 inches above statutory maximum vehicle height. Massachusetts General Laws (M.G.L.) Chapter 90 Section 19 states no vehicle shall exceed a height of 13'-6". Clearance posting of the roadway is the responsibility of the roadway owner, not the owner of the obstruction (bridge, railroad structure, pedestrian structure).

When vertical measurements taken in the travel way are less than 14'-6", then vertical clearance signs will be required. MassDOT's recommended posting values as they relate to the measured field clearance are shown in Chart 4.8-1 below. These recommended posting values are to be used to provide consistency throughout the Commonwealth. Recommended posted clearance values have been derived to be within what is allowable as mentioned in the MUTCD. MUTCD states a reduction not to exceed 3 inches should be used. The reduction reflected in the chart is established to account for the dynamic envelope of the vehicle.

Field Measured Clearance	Recommended Posted Clearance
≥ 14' - 6"	NO POSTING REQUIRED
< 14' - 6" but ≥ 14' - 5"	14' - 3"
< 14' - 5" but ≥ 14' - 4"	14' - 2"
< 14' - 4" but ≥ 14' - 3"	14' - 1"
< 14' - 3" but ≥ 14' - 2"	14' - 0"
< 14' - 2" but ≥ 14' - 1"	13' - 11"
< 14' - 1" but ≥ 14' - 0"	13' - 10"
< 14' - 0" but ≥ 13' - 11"	13' – 9"
< 13' - 11" but ≥ 13' - 10"	13' - 8"
< 13' - 10" but ≥ 13' - 9"	13' – 7"
< 13' - 9" but ≥ 13' - 8"	13' – 6"

Chart 4.8-1

Special consideration shall be given for signing in situations when the clearance varies along the travel way. This situation occurs at times with Arch structures. Attachment 4-19 is an example showing how to post for an arch structure. Truss portals are another situation that may require clarification by signing the low point location to alert the driver of where the clearance is the lowest along the roadway. Attachment 4-20 is an example showing how to post for the low point along the truss portal.

4.8.1 Notification to Post under Clearance - State Owned Roadway

For roadways under the jurisdiction of MassDOT, the DBIE will be responsible for sending out the notification to the responsible party in the District office that will erect the requested clearance posting signs. Attachment 4-21 is an example of what is sent to the District representative that is responsible for the placement of the signs. Exhibits should be attached to the requests for clarification with regards to where the signs are to be located.

4.8.2 Notification to Post under Clearance – Municipally Owned Roadway

For roadways under the jurisdiction of a Municipality, the DBIE will be responsible for sending out the notification to the Municipality requesting that posted clearance signs are required. Attachment 4-22 is an example of what is to be sent to the Municipality. Exhibits should be attached to the requests for clarification with regards to where the signs are to be located.

4.9 COMPLETION and SUBMISSION of INSPECTION REPORTS by TEAM LEADERS

All MassDOT Inspectors and Consultant Inspectors shall follow the procedures established for completing and submitting inspection reports as outlined in Sections 4.9.1 and 4.9.2, respectively. This procedure shall be used for all MassDOT and Municipally-owned bridges under the NBIS program.

A complete inspection report includes a hard copy of the inspection report, Element Level inspection, and a marked up SI&A. Dive reports are not required to be submitted with the inspection report. They are sent to the bridge owner by the Underwater Operations Unit.

4.9.1 MassDOT Inspections

Inspection reports completed by MassDOT teams shall be completed within the MassDOT Bridge Inspection Management System (4D) no later than the 15th day of the month following the inspection.

4.9.2 Consultant Inspections

Inspection reports completed by Consultant teams shall be completed within 4D no later than 21 days following completion of the inspection, or in accordance with specific deadlines contained in their inspection contract.

Upon initial completion of the inspection report and a QC/QA review by the Consultants PM, the Consultant TL should indicate within 4D that the report is ready for review. The Consultant TL should then send an email to the DBIE alerting him/her that the inspection report is ready for review.

4.10 DBIE INSPECTION REPORT REVIEW

The DBIE and the ADBIE shall collectively review 100% of all inspection reports. The DBIE or ADBIE will sign all inspection reports reviewed by him/her. If the ADBIE signs the inspection report that they have reviewed, the ADBIE shall sign his/her name and place the word “for” after their name.

The DBIE will be personally responsible for the review of all inspection reports that have an assigned numerical ratings of 5 or below for Item 58, Item 59, Item 60, or Item 62. The Assistant District Bridge Inspection Engineer may be responsible for the review of all inspection reports that have assigned numerical ratings of 6 or greater for Item 58, Item 59, Item 60, or Item 62 if the DBIE chooses to delegate that task to the ADBIE.

When required based on operational needs, the DBIE may perform an inspection as the Team Leader. In such cases, the DBIE should sign the inspection report as the team leader. The ABIE will then perform the function of the DBIE and shall review and sign the inspection report. This occurrence shall only be done on an intermittent basis when extenuating circumstances arise.

Note: The signatory's signature on the inspection report only signifies that the signatory has reviewed the inspection report in accordance with FHWA and MassDOT standards. The signature does not under any circumstances signify, nor has it ever signified even prior to the formal issuance of this Handbook, the corroboration of the accuracy and thoroughness of either the field inspection itself, the assessment of the structure's condition by the Team Leader, or the description of the structure's condition by the Team Leader on the inspection report.

4.10.1 DBIE Review of MassDOT Inspections

The DBIE shall complete a review of all internally completed inspection reports in a timely manner and in conformance with metrics determined by the District. Approved reports shall be signed and one copy shall be submitted to the Bridge Inspection Engineer.

4.10.2 DBIE Review of Consultant Inspections

The DBIE will complete an expeditious review of the inspection report within 4D in a timely manner and in conformance with metrics determined by the District.

If revisions are requested, the DBIE should either email the Consultant's PM and TL with the requested changes, or indicate within 4D the requested changes. When changes are made, the Consultant PM and TL should again inform the DBIE. When the report is deemed acceptable the DBIE shall check the report approved within 4D.

The consultant shall print out a hard copy, sign the original and submit it with two copies to the Bridge Inspection Engineer. The BIE will then update 4D with the report submission information.

The report will be forwarded to the DBIE through the ABIE with a Bridge Inspection Consultant Performance Evaluation Report form, see Attachment 4-23. The DBIE is to provide an evaluation score, sign the inspection report and copies and return one report to the ABIE along with the evaluation form.

4.10.3 DBIE Review of Inspection Report Content

A review by the DBIE will include the review of all inspection reports for bridges in their district prepared by MassDOT staff and/or Consultants for compliance with FHWA, NBIS and MassDOT requirements before the data is entered in the bridge inventory files.

The DBIE is not responsible for reviewing inspection reports for bridges of other state agencies.

The DBIE's review will consist of the following:

1. Overall review of the Inspection Report to ensure that the correct form has been used, that the correct bridge is identified and that all required information has been entered.

2. Review that all information has been correctly entered in accordance with the FHWA Coding Guide and the MassDOT Bridge Inspection Handbook criteria. This review will include but not be limited to a check that proper coding conventions, format, significant digits and correct units have been used.

3. Check that the Condition Ratings for Items 58 through 62 are consistent with the condition ratings of the individual sub-items.

4. Check that there is adequate documentation for inspection sub-items with condition ratings of 6 or lower.

5. Check that all Photographs and/or Sketches have been properly cross referenced to the Inspection Report.

6. Check that there is consistency of information between the current Inspection Report and previous Inspection Reports, as well as the Dive Report and/or Rating Report, if applicable.

7. Check that proper documentation was incorporated into the inspection report for any changes that may have occurred from the previous SI&A and previous Inspection Report.

8. Review of all Items in the SI&A after data entry to check that they have been properly and correctly entered.

9. For Initial Inventory Inspections, a check of the inventory data on the SI&A against the construction plans to ensure that the data is consistent.

10. For every initial inspection, a set of Inventory Photos has been taken and included in the report.

11. For every routine inspection, an Element Level inspection created with the routine inspection shall be reviewed for accuracy, including elements, quantities and condition states.

4.11 DISTRIBUTION OF COMPLETED INSPECTION REPORTS

Upon approval of the inspection report, the DBIE shall review the marked up SI&A and ensure all changes are made. The DBIE shall print out a new SI&A and attach it to the inspection report.

Completed Inspection reports shall be distributed by the DBIE to the bridge owners as follows:

Boston HQ copy:	Report; SIA; Marked-up SIA; Element Level Inspection Report
District copy:	Report, Element Level Inspection Report
Municipal copy:	Report only. The cover letter* is from the district with a copy to the Bridge Inspection Engineer. See attachment 4-24.

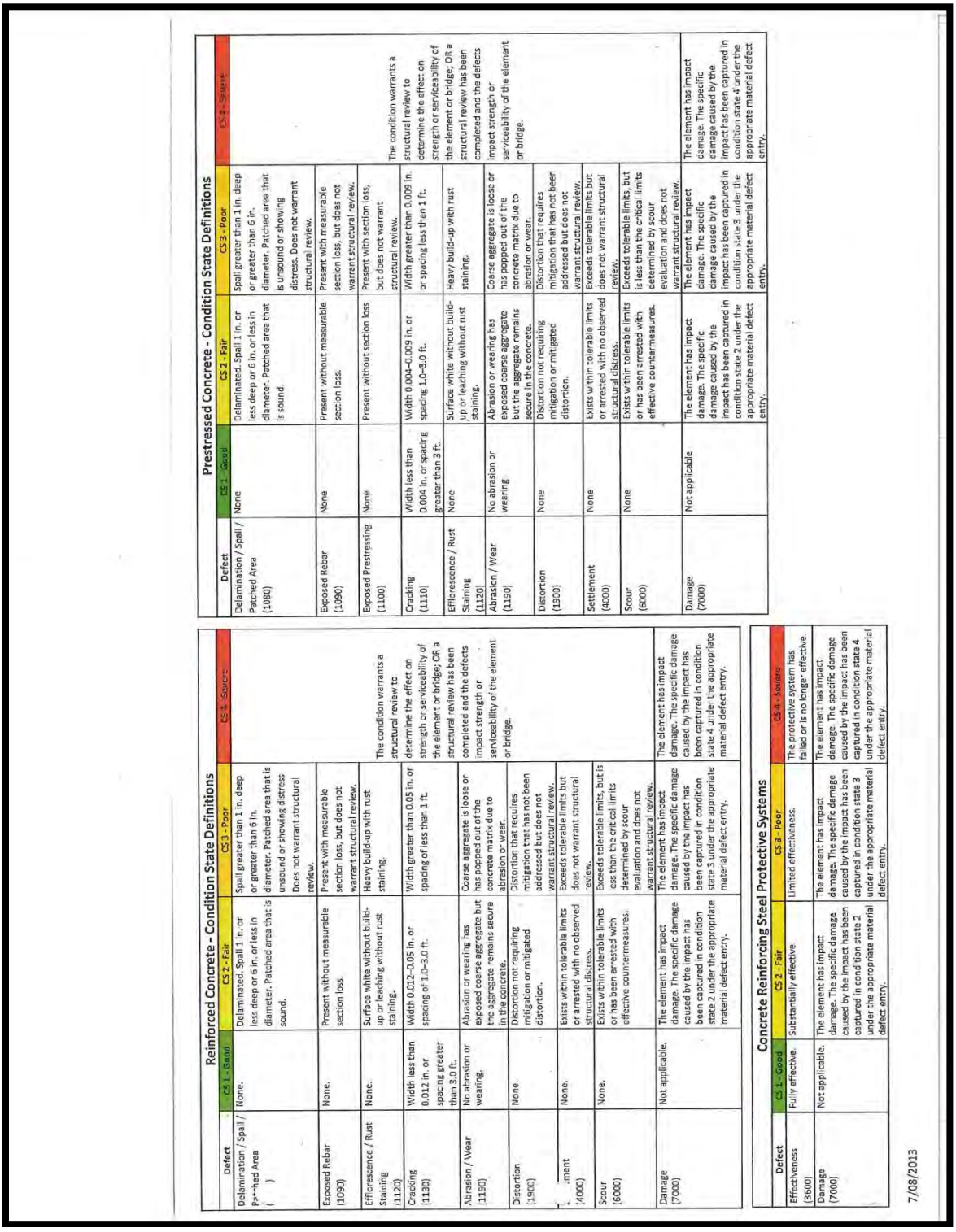
* Cover letter attachments shown being signed by the DHD are intended to have the minimum language required, the District have the right to add additional language as they see fit.

4.12 ABIE REVIEW OF COMPLETED INSPECTION REPORTS

Upon receiving the reviewed inspection reports from the DBIE, the ABIE shall review 100% of the inspection reports with numerical condition ratings of 4 or less on Items 58, 59, 60, or 62. Also the ABIE shall review a minimum of 10% of all reports for completeness. Upon completion of the review by the ABIE, he/she will check off in 4D whether the review was a regular review or an in depth review. Upon completion of the ABIE's review, the ABIE shall place the accepted inspection report into the Boston Bridge history file.

If an inspection report is rejected by the ABIE, the ABIE shall return the inspection report to the DBIE with comments, so that they may forward the rejected inspection report to the Team Leader for revision. When the rejection comments have been addressed, the Team Leader will then resubmit the inspection report to the DBIE for review, who will concur and accept the inspection report in 4D and then resubmit the report to the ABIE.

4.13 CHAPTER 4 ATTACHMENTS



Reinforced Concrete - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area ( )	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None.	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence / Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012–0.05 in. or spacing of 1.0–3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
Abrasion / Wear (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
[illegible]ment (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Prestressed Concrete - Condition State Definitions

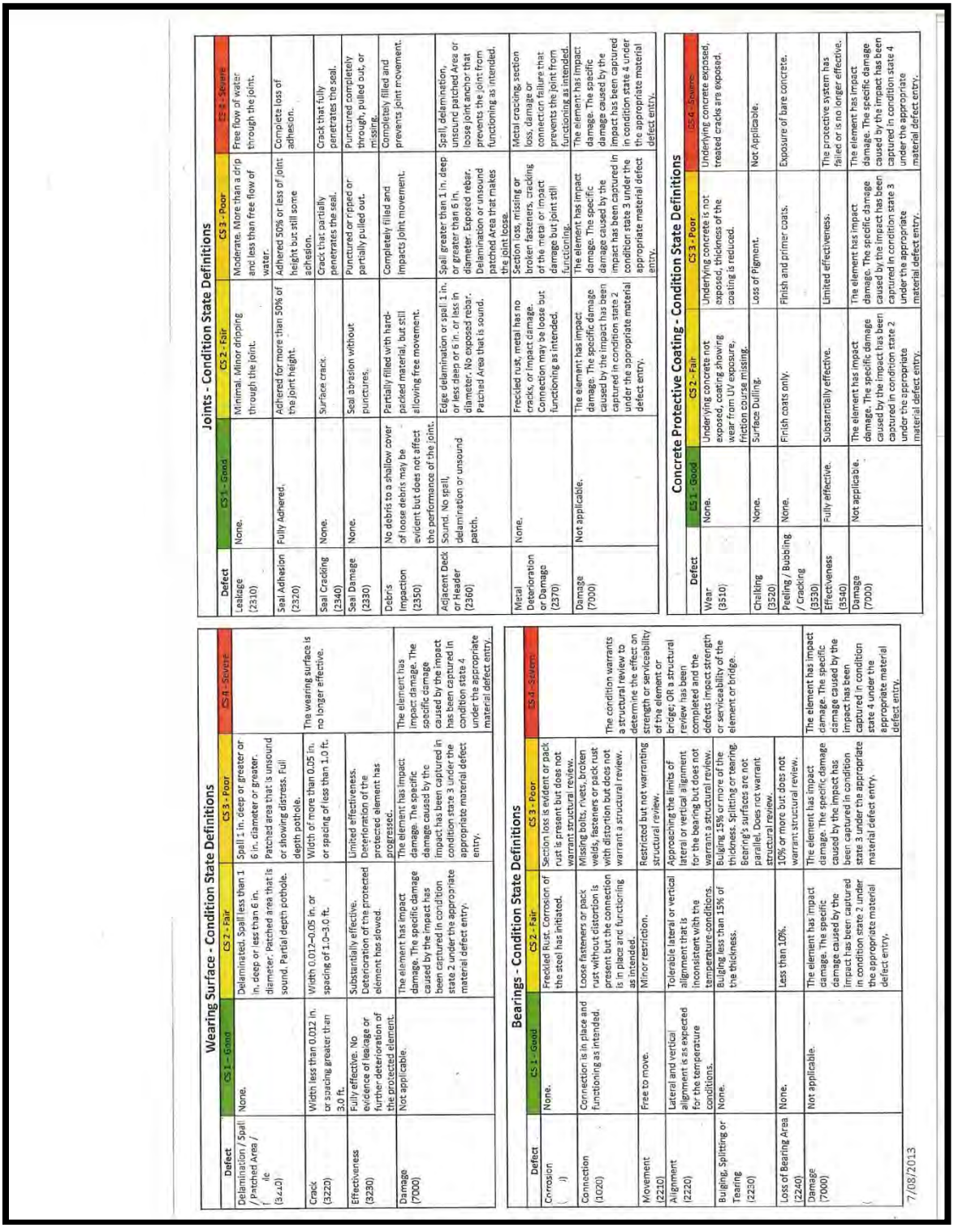
Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss	Present with section loss, but does not warrant structural review.	
Cracking (1110)	Width less than 0.004 in. or spacing greater than 3 ft.	Width 0.004–0.009 in. or spacing 1.0–3.0 ft.	Width greater than 0.009 in. or spacing less than 1 ft.	
Efflorescence / Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion / Wear (1130)	No abrasion or wearing	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Concrete Reinforcing Steel Protective Systems

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 3 - Severe
Effectiveness (3600)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

7/08/2013

Attachment 4-1: Quick Reference Guide for the Element Level Condition States, Page 1 of 5



Wearing Surface - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area / (3220)	None.	Delaminated, Spall less than 1 in. deep or less than 6 in. diameter. Patched area that is sound. Partial depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (3220)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012–0.05 in. or spacing of 1.0–3.0 ft.	Width of more than 0.05 in. or spacing of less than 1.0 ft.	
Effectiveness (3230)	Fully effective. No evidence of leakage or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Bearings - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Corrosion ( )	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connector is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	
Movement (2210)	Free to move.	Minor restriction.	Restricted but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing but does not warrant a structural review.	
Bulging, Splitting or Tearing (2250)	None.	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area (2240)	None.	Less than 10%.	10% or more but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Joints - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered.	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion.	Complete loss of adhesion.
Seal Cracking (2340)	None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Seal Damage (2330)	None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched Area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched Area that makes the joint loose.	Spall, delamination, unsound patched Area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None.	Freckled rust, metal has no cracks, or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning.	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Concrete Protective Coating - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Wear (3510)	None.	Underlying concrete not exposed, coating showing wear from UV exposure, friction course missing.	Underlying concrete is not exposed, thickness of the coating is reduced.	Underlying concrete exposed, treated cracks are exposed.
Chalking (3520)	None.	Surface Dulling.	Loss of Pigment.	Not Applicable.
Peeling / Bubbling / Cracking (3530)	None.	Finish coats only.	Finish and primer coats.	Exposure of bare concrete.
Effectiveness (3540)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

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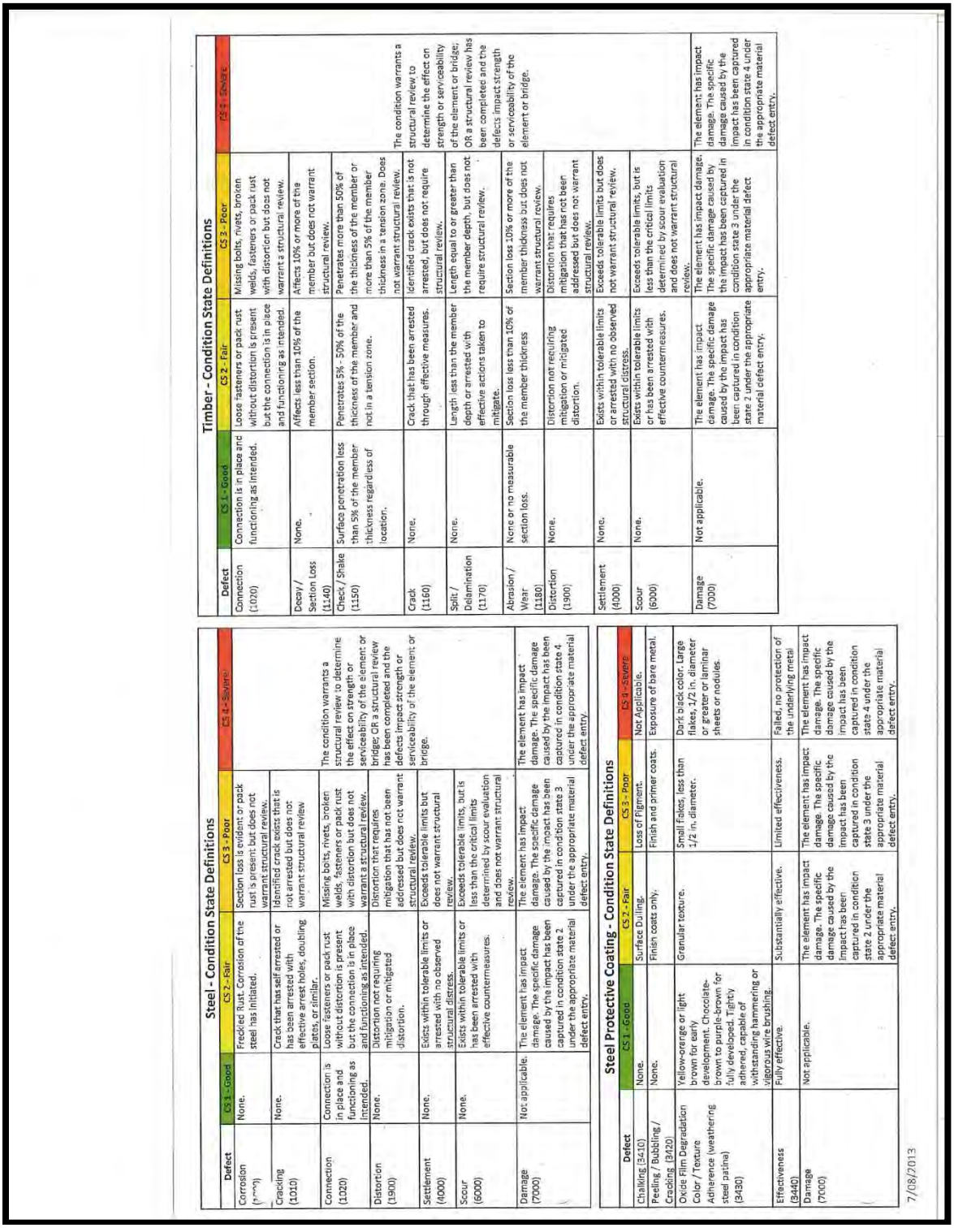
Attachment 4-1: Quick Reference Guide for the Element Level Condition States, Page 2 of 5



Steel - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Corrosion (1000)	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Cracking (1010)	None.	Crack that has self arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Steel Protective Coating - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Chalking (3410)	None.	Surface Dulling.	Loss of Pigment.	Not Applicable.
Peeling / Bubbling / Cracking (3420)	None.	Finish coats only.	Finish and primer coats.	Exposure of bare metal.
Oxide Film Degradation Color / Texture Adherence (weathering steel patina) (3430)	Yellow-orange or light brown for early development. Chocolate-brown to purple-brown for fully developed. Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture.	Small flakes, less than 1/2 in. diameter.	Dark black color. Large flakes, 1/2 in. diameter or greater or laminar sheets or nodules.
Effectiveness (3440)	Fully effective.	Substantially effective.	Limited effectiveness.	Failed, no protection of the underlying metal
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Timber - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay / Section Loss (1140)	None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check / Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review.	
Split / Delamination (1170)	None.	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion / Wear (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness	Section loss 10% or more of the member thickness but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

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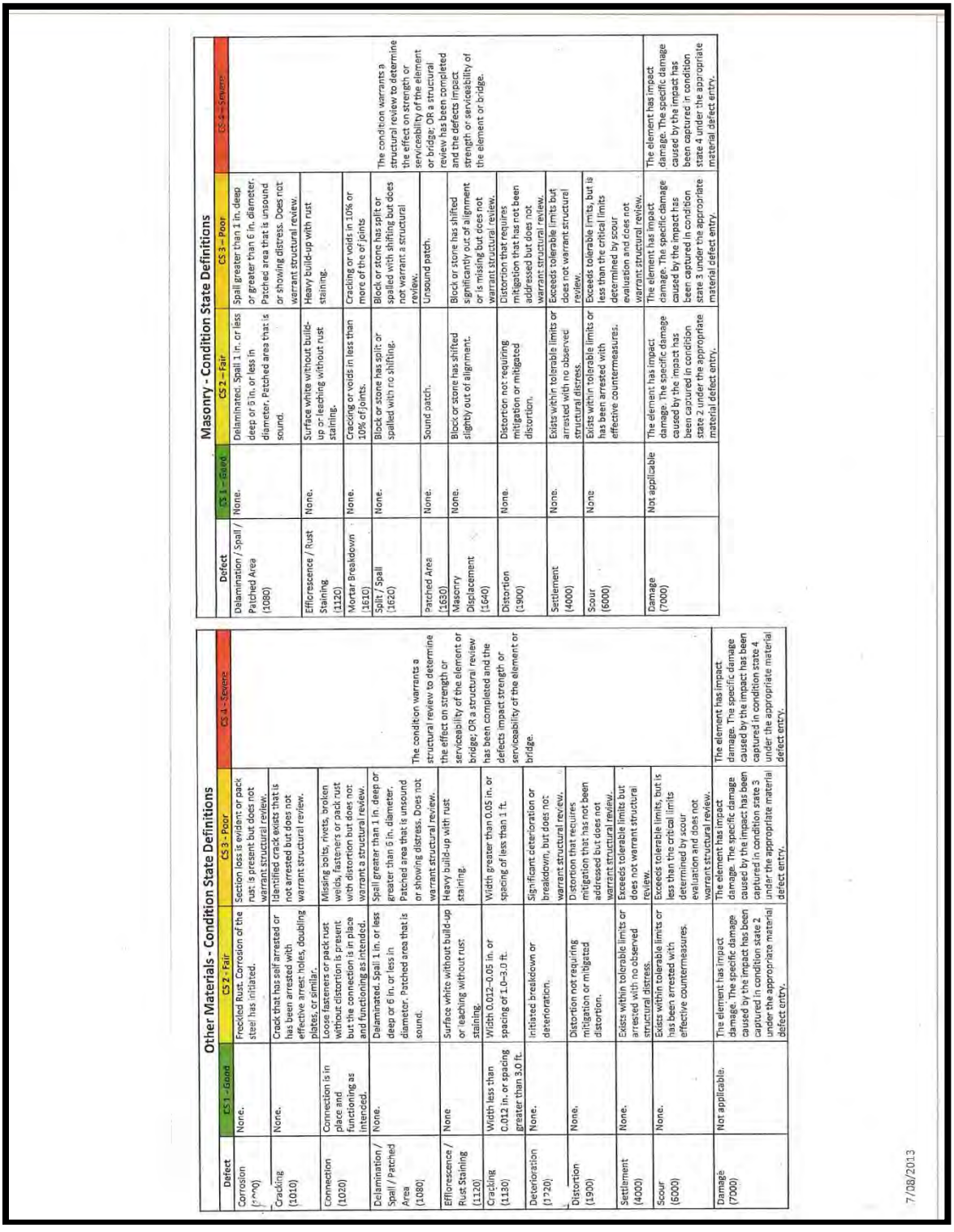

Other Materials - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Corrosion (1000)	None.	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Cracking (1010)	None.	Crack that has self arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	
Delamination / Spall / Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence / Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (1130)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012–0.05 in. or spacing of 1.0–3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
Deterioration (1720)	None.	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limit but does not warrant structural review.	
Scour (6000)	None.	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

Masonry - Condition State Definitions

Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Delamination / Spall / Patched Area (1080)	None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Efflorescence / Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Mortar Breakdown (1610)	None.	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split / Spall (1620)	None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (1630)	None.	Sound patch.	Unsound patch.	
Masonry Displacement (1640)	None.	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Distortion (1900)	None.	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in condition state 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in condition state 4 under the appropriate material defect entry.

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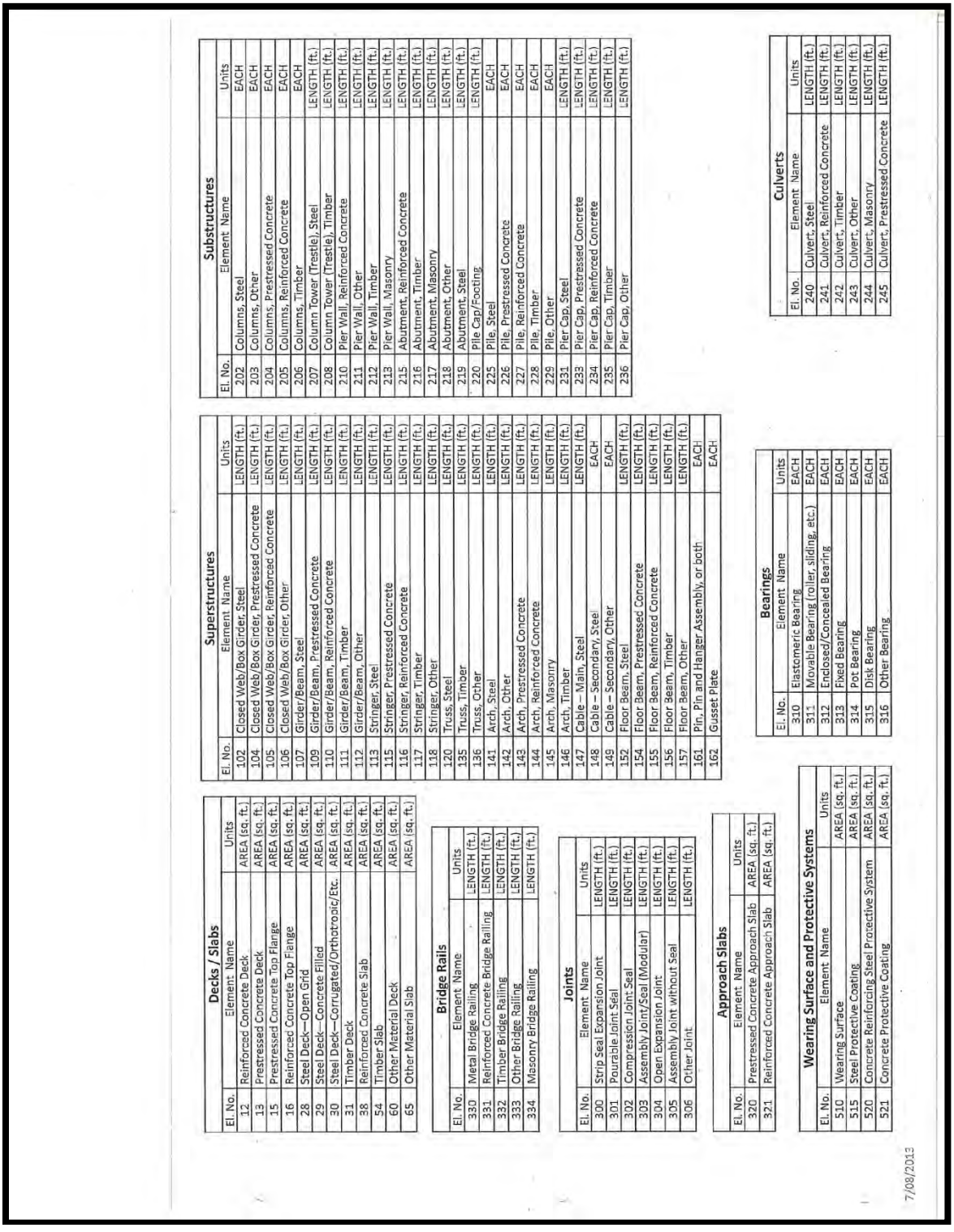
Attachment 4-1: Quick Reference Guide for the Element Level Condition States, Page 4 of 5



Decks / Slabs

El. No.	Element Name	Units
12	Reinforced Concrete Deck	AREA (sq. ft.)
13	Prestressed Concrete Deck	AREA (sq. ft.)
15	Prestressed Concrete Top Flange	AREA (sq. ft.)
16	Reinforced Concrete Top Flange	AREA (sq. ft.)
28	Steel Deck—Open Grid	AREA (sq. ft.)
29	Steel Deck—Concrete Filled	AREA (sq. ft.)
30	Steel Deck—Corrugated/Orthotropic/Etc.	AREA (sq. ft.)
31	Timber Deck	AREA (sq. ft.)
38	Reinforced Concrete Slab	AREA (sq. ft.)
54	Timber Slab	AREA (sq. ft.)
60	Other Material Deck	AREA (sq. ft.)
65	Other Material Slab	AREA (sq. ft.)

Bridge Rails

El. No.	Element Name	Units
330	Metal Bridge Railing	LENGTH (ft.)
331	Reinforced Concrete Bridge Railing	LENGTH (ft.)
332	Timber Bridge Railing	LENGTH (ft.)
333	Other Bridge Railing	LENGTH (ft.)
334	Masonry Bridge Railing	LENGTH (ft.)

Joints

El. No.	Element Name	Units
300	Strip Seal Expansion Joint	LENGTH (ft.)
301	Pourable Joint Seal	LENGTH (ft.)
302	Compression Joint Seal	LENGTH (ft.)
303	Assembly Joint/Seal (Modular)	LENGTH (ft.)
304	Open Expansion Joint	LENGTH (ft.)
305	Assembly Joint without Seal	LENGTH (ft.)
306	Other Joint	LENGTH (ft.)

Approach Slabs

El. No.	Element Name	Units
320	Prestressed Concrete Approach Slab	AREA (sq. ft.)
321	Reinforced Concrete Approach Slab	AREA (sq. ft.)

Wearing Surface and Protective Systems

El. No.	Element Name	Units
510	Wearing Surface	AREA (sq. ft.)
515	Steel Protective Coating	AREA (sq. ft.)
520	Concrete Reinforcing Steel Protective System	AREA (sq. ft.)
521	Concrete Protective Coating	AREA (sq. ft.)

Superstructures

El. No.	Element Name	Units
102	Closed Web/Box Girder, Steel	LENGTH (ft.)
104	Closed Web/Box Girder, Prestressed Concrete	LENGTH (ft.)
105	Closed Web/Box Girder, Reinforced Concrete	LENGTH (ft.)
106	Closed Web/Box Girder, Other	LENGTH (ft.)
107	Girder/Beam, Steel	LENGTH (ft.)
109	Girder/Beam, Prestressed Concrete	LENGTH (ft.)
110	Girder/Beam, Reinforced Concrete	LENGTH (ft.)
111	Girder/Beam, Timber	LENGTH (ft.)
112	Girder/Beam, Other	LENGTH (ft.)
113	Stringer, Steel	LENGTH (ft.)
115	Stringer, Prestressed Concrete	LENGTH (ft.)
116	Stringer, Reinforced Concrete	LENGTH (ft.)
117	Stringer, Timber	LENGTH (ft.)
118	Stringer, Other	LENGTH (ft.)
120	Truss, Steel	LENGTH (ft.)
135	Truss, Timber	LENGTH (ft.)
136	Truss, Other	LENGTH (ft.)
141	Arch, Steel	LENGTH (ft.)
142	Arch, Other	LENGTH (ft.)
143	Arch, Prestressed Concrete	LENGTH (ft.)
144	Arch, Reinforced Concrete	LENGTH (ft.)
145	Arch, Masonry	LENGTH (ft.)
146	Arch, Timber	LENGTH (ft.)
147	Cable – Main, Steel	LENGTH (ft.)
148	Cable – Secondary, Steel	EACH
149	Cable – Secondary, Other	EACH
152	Floor Beam, Steel	LENGTH (ft.)
154	Floor Beam, Prestressed Concrete	LENGTH (ft.)
155	Floor Beam, Reinforced Concrete	LENGTH (ft.)
156	Floor Beam, Timber	LENGTH (ft.)
157	Floor Beam, Other	LENGTH (ft.)
161	Pin, Pin and Hanger Assembly, or both	EACH
162	Gusset Plate	EACH

Bearings

El. No.	Element Name	Units
310	Elastomeric Bearing	EACH
311	Movable Bearing (roller, sliding, etc.)	EACH
312	Enclosed/Concealed Bearing	EACH
313	Fixed Bearing	EACH
314	Pot Bearing	EACH
315	Disk Bearing	EACH
316	Other Bearing	EACH

Substructures

El. No.	Element Name	Units
202	Columns, Steel	EACH
203	Columns, Other	EACH
204	Columns, Prestressed Concrete	EACH
205	Columns, Reinforced Concrete	EACH
206	Columns, Timber	EACH
207	Column Tower (Trestle), Steel	LENGTH (ft.)
208	Column Tower (Trestle), Timber	LENGTH (ft.)
210	Pier Wall, Reinforced Concrete	LENGTH (ft.)
211	Pier Wall, Other	LENGTH (ft.)
212	Pier Wall, Timber	LENGTH (ft.)
213	Pier Wall, Masonry	LENGTH (ft.)
215	Abutment, Reinforced Concrete	LENGTH (ft.)
216	Abutment, Timber	LENGTH (ft.)
217	Abutment, Masonry	LENGTH (ft.)
218	Abutment, Other	LENGTH (ft.)
219	Abutment, Steel	LENGTH (ft.)
220	Pile Cap/Footing	LENGTH (ft.)
225	Pile, Steel	EACH
226	Pile, Prestressed Concrete	EACH
227	Pile, Reinforced Concrete	EACH
228	Pile, Timber	EACH
229	Pile, Other	EACH
231	Pier Cap, Steel	LENGTH (ft.)
233	Pier Cap, Prestressed Concrete	LENGTH (ft.)
234	Pier Cap, Reinforced Concrete	LENGTH (ft.)
235	Pier Cap, Timber	LENGTH (ft.)
236	Pier Cap, Other	LENGTH (ft.)

Culverts

El. No.	Element Name	Units
240	Culvert, Steel	LENGTH (ft.)
241	Culvert, Reinforced Concrete	LENGTH (ft.)
242	Culvert, Timber	LENGTH (ft.)
243	Culvert, Other	LENGTH (ft.)
244	Culvert, Masonry	LENGTH (ft.)
245	Culvert, Prestressed Concrete	LENGTH (ft.)

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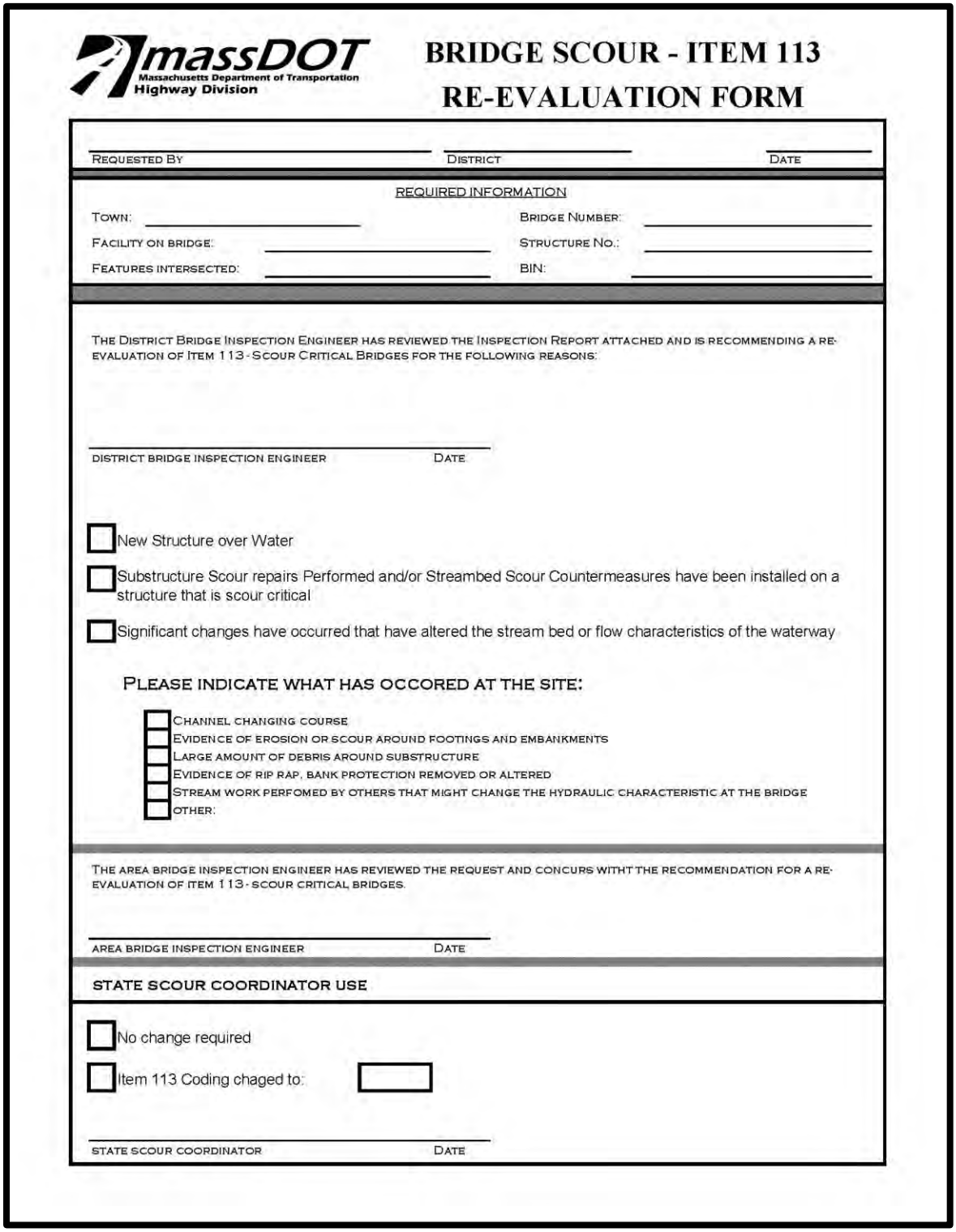
Attachment 4-1: Quick Reference Guide for the Element Level Condition States, Page 5 of 5



massDOT
Massachusetts Department of Transportation
Highway Division

BRIDGE SCOUR - ITEM 113
RE-EVALUATION FORM

REQUESTED BY _____ DISTRICT _____ DATE _____

REQUIRED INFORMATION

TOWN: _____ BRIDGE NUMBER: _____

FACILITY ON BRIDGE: _____ STRUCTURE No.: _____

FEATURES INTERSECTED: _____ BIN: _____

THE DISTRICT BRIDGE INSPECTION ENGINEER HAS REVIEWED THE INSPECTION REPORT ATTACHED AND IS RECOMMENDING A RE-EVALUATION OF ITEM 113 - SCOUR CRITICAL BRIDGES FOR THE FOLLOWING REASONS:

_____
DISTRICT BRIDGE INSPECTION ENGINEER DATE

☐ New Structure over Water

☐ Substructure Scour repairs Performed and/or Streambed Scour Countermeasures have been installed on a structure that is scour critical

☐ Significant changes have occurred that have altered the stream bed or flow characteristics of the waterway

PLEASE INDICATE WHAT HAS OCCORED AT THE SITE:

- ☐ CHANNEL CHANGING COURSE
- ☐ EVIDENCE OF EROSION OR SCOUR AROUND FOOTINGS AND EMBANKMENTS
- ☐ LARGE AMOUNT OF DEBRIS AROUND SUBSTRUCTURE
- ☐ EVIDENCE OF RIP RAP, BANK PROTECTION REMOVED OR ALTERED
- ☐ STREAM WORK PERFOMED BY OTHERS THAT MIGHT CHANGE THE HYDRAULIC CHARACTERISTIC AT THE BRIDGE
- ☐ OTHER:

THE AREA BRIDGE INSPECTION ENGINEER HAS REVIEWED THE REQUEST AND CONCURS WITHT THE RECOMMENDATION FOR A RE-EVALUATION OF ITEM 113 - SCOUR CRITICAL BRIDGES.

_____
AREA BRIDGE INSPECTION ENGINEER DATE

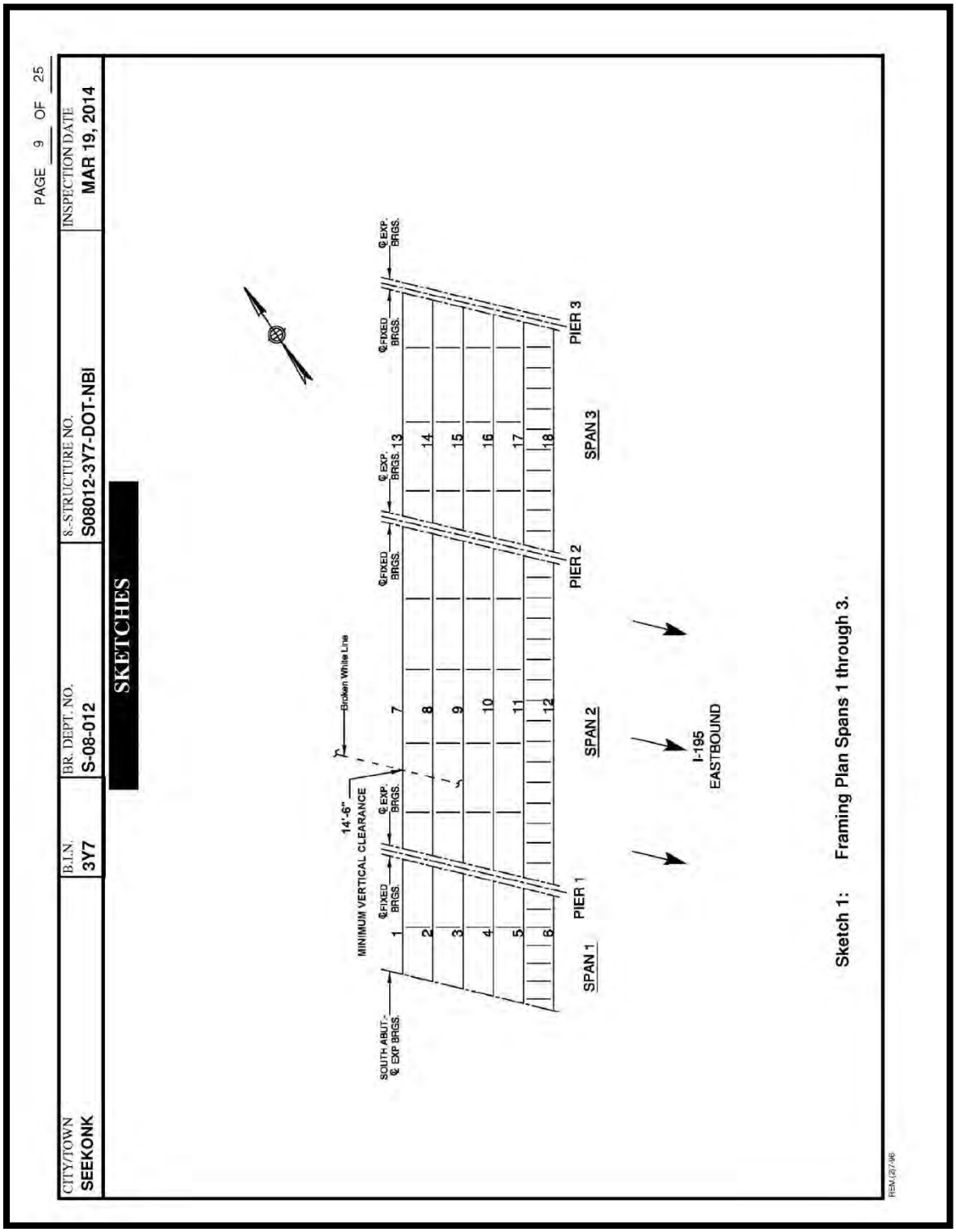
STATE SCOUR COORDINATOR USE

☐ No change required

☐ Item 113 Coding chaged to: ☐

_____
STATE SCOUR COORDINATOR DATE

Attachment 4-2: Bridge Scour – Item 113 Re-evaluation Form



Attachment 4-3: Vertical Clearance Location Placed on a Framing Plan

Traffic Count Formula for use when MassDOT Traffic Volumes are not provided.

Definitions:

Rush Hour = 3hrs A.M. + 3hrs. P.M. = 6 hrs (7 AM – 10 AM & 3 PM – 6 PM)
Off-Peak = Early AM = 3 hrs (4 AM – 7 AM)
Remaining = = 15 hrs (10 AM – 3 PM & 6 PM – 4 AM)
= 24 hrs

Off - Peak carries no traffic

Rush hour (6)hrs = 42% ADT
Remaining (15)hrs = 58% ADT

Instructions :

Take twelve minute counts and extrapolate according to the above. Document and note actual time count was made. If 12 minute counts are used then a factor of **5** will be used to make the counts per hour i.e. 5X12 = 60 min = 1 hour

Example #1

Counts where taken at 11:00 AM for 12 minutes the total vehicles counted was 50. Find the ADT.

50 cars X 5(factor to convert to per hour) X 15(counts taken at outside rush hour) = 3750 cars/hr

Therefore, 3750/.58 = 6466 ADT Round up to 6500 ADT

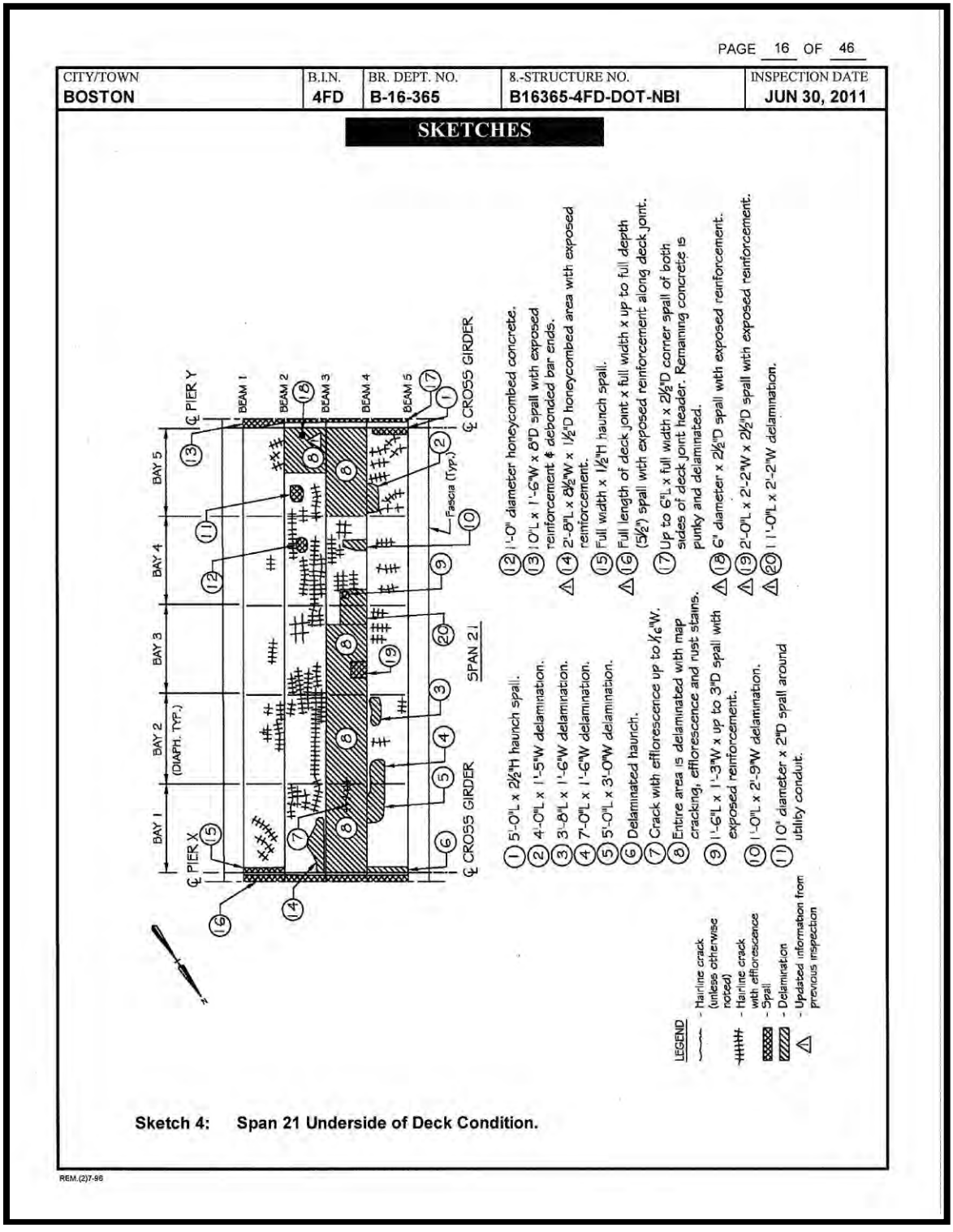
Example #2

Counts where taken at 9:00 AM for 12 minutes the total vehicles counted was 75. Find the ADT.

75 X 5 = 375 cars/ hr
375 X 6 = 2250 cars

Therefore, 2250/ .42 = 5357 ADT Round up to 5400 ADT

Attachment 4-4: Average Daily Traffic Count Formulas & Example Calculations



Attachment 4-5: Typical Underside of Deck Condition Sketch

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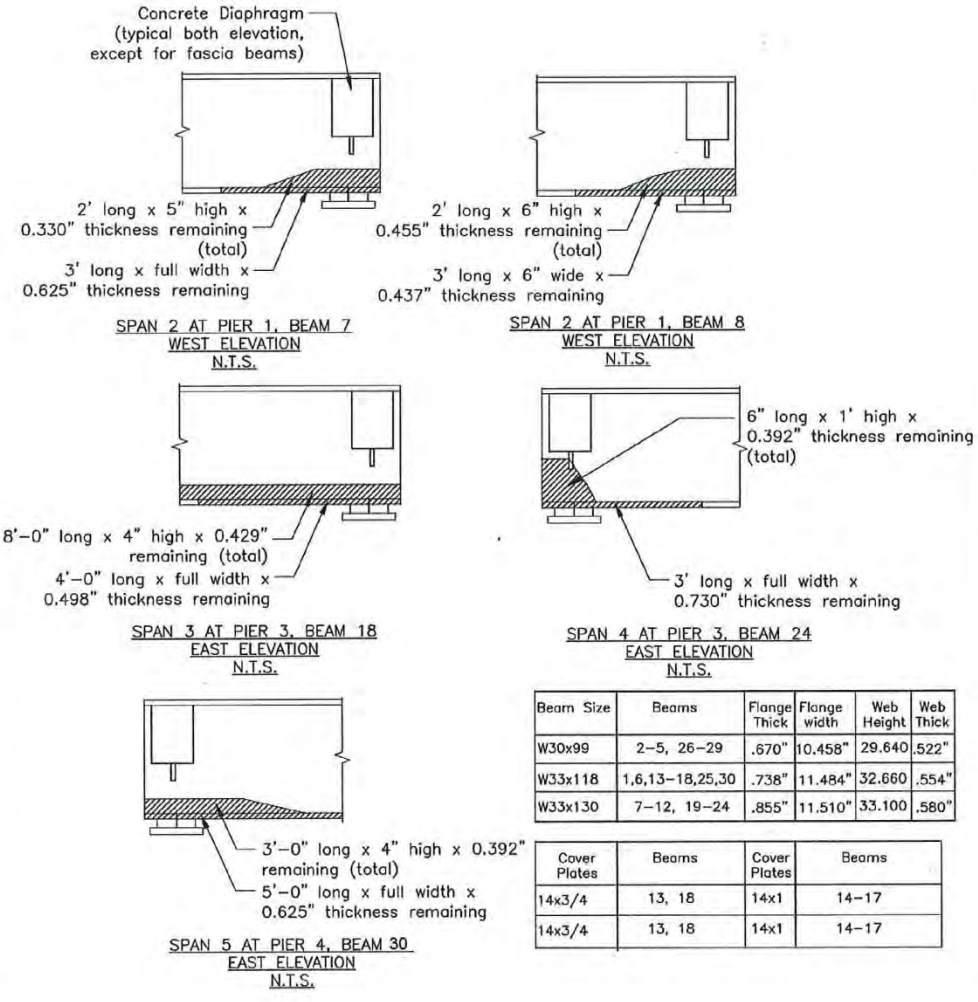
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
NORTH ATTLEBORO	3Y5	N-16-052	N16052-3Y5-DOT-NBI	DEC 31, 2013

SKETCHES



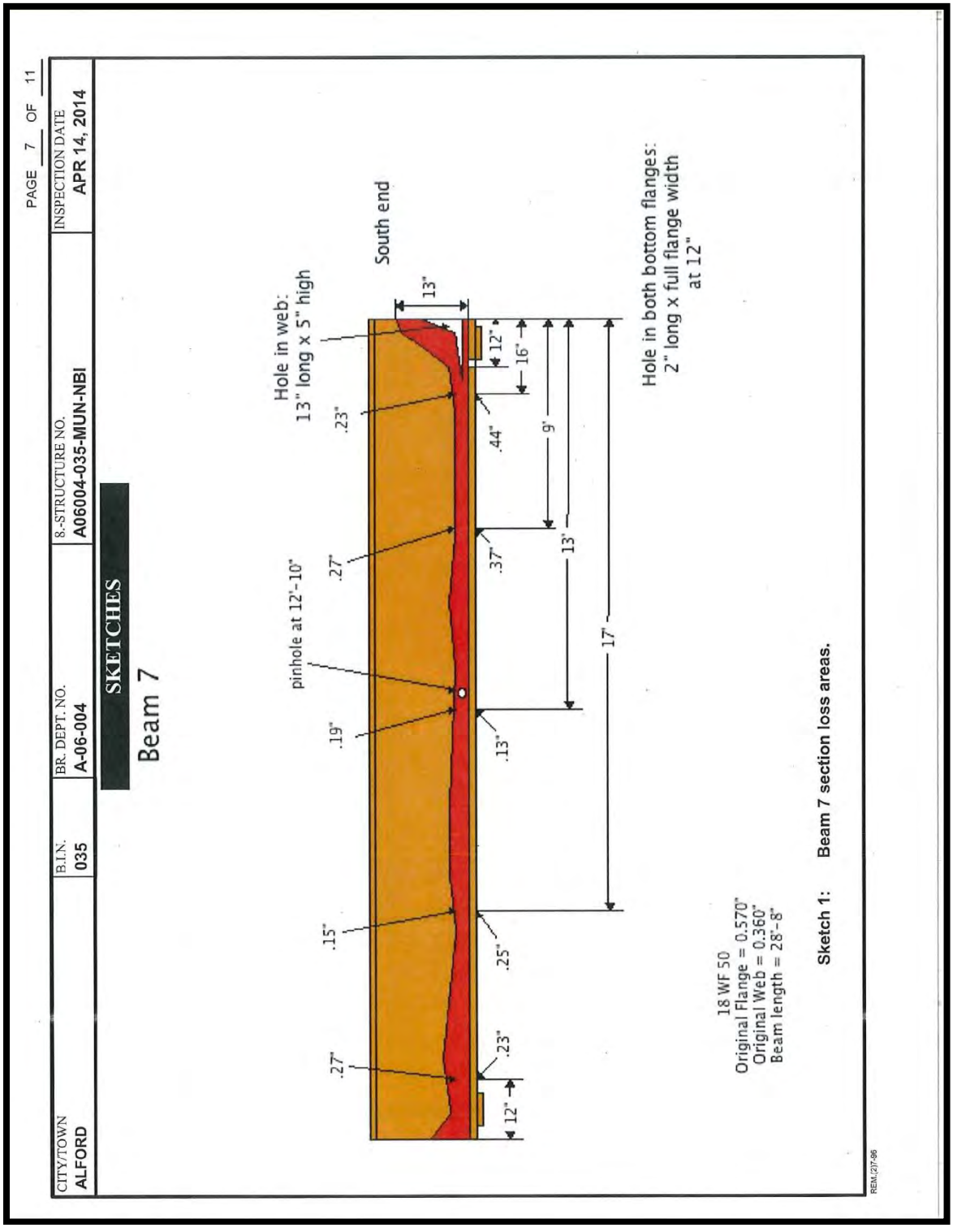
Beam Size	Beams	Flange Thick	Flange width	Web Height	Web Thick
W30x99	2-5, 26-29	.670"	10.458"	29.640	.522"
W33x118	1,6,13-18,25,30	.738"	11.484"	32.660	.554"
W33x130	7-12, 19-24	.855"	11.510"	33.100	.580"

Cover Plates	Beams	Cover Plates	Beams
14x3/4	13, 18	14x1	14-17
14x3/4	13, 18	14x1	14-17

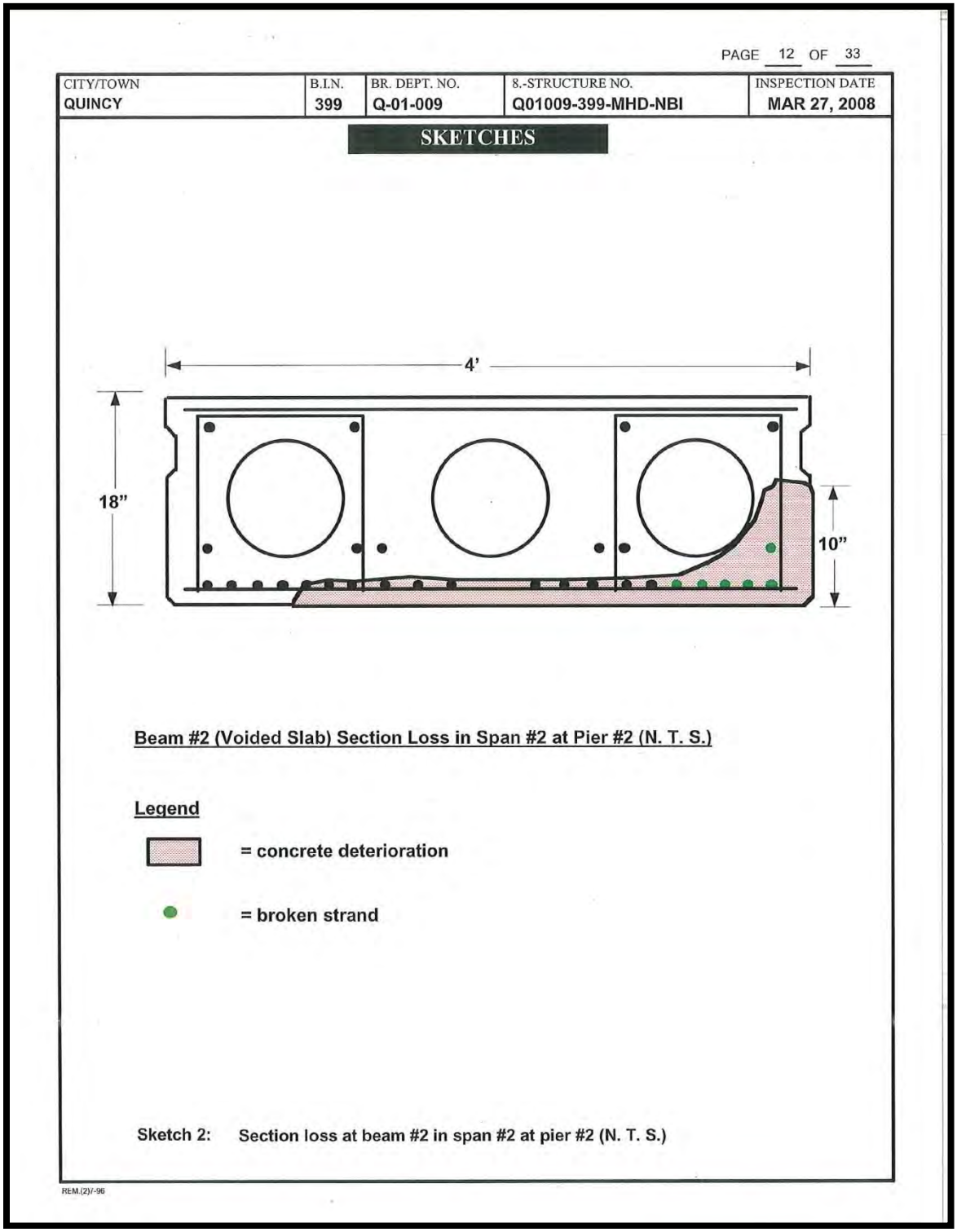
Sketch 3: Section Losses at Beams

REM.(2)7-96

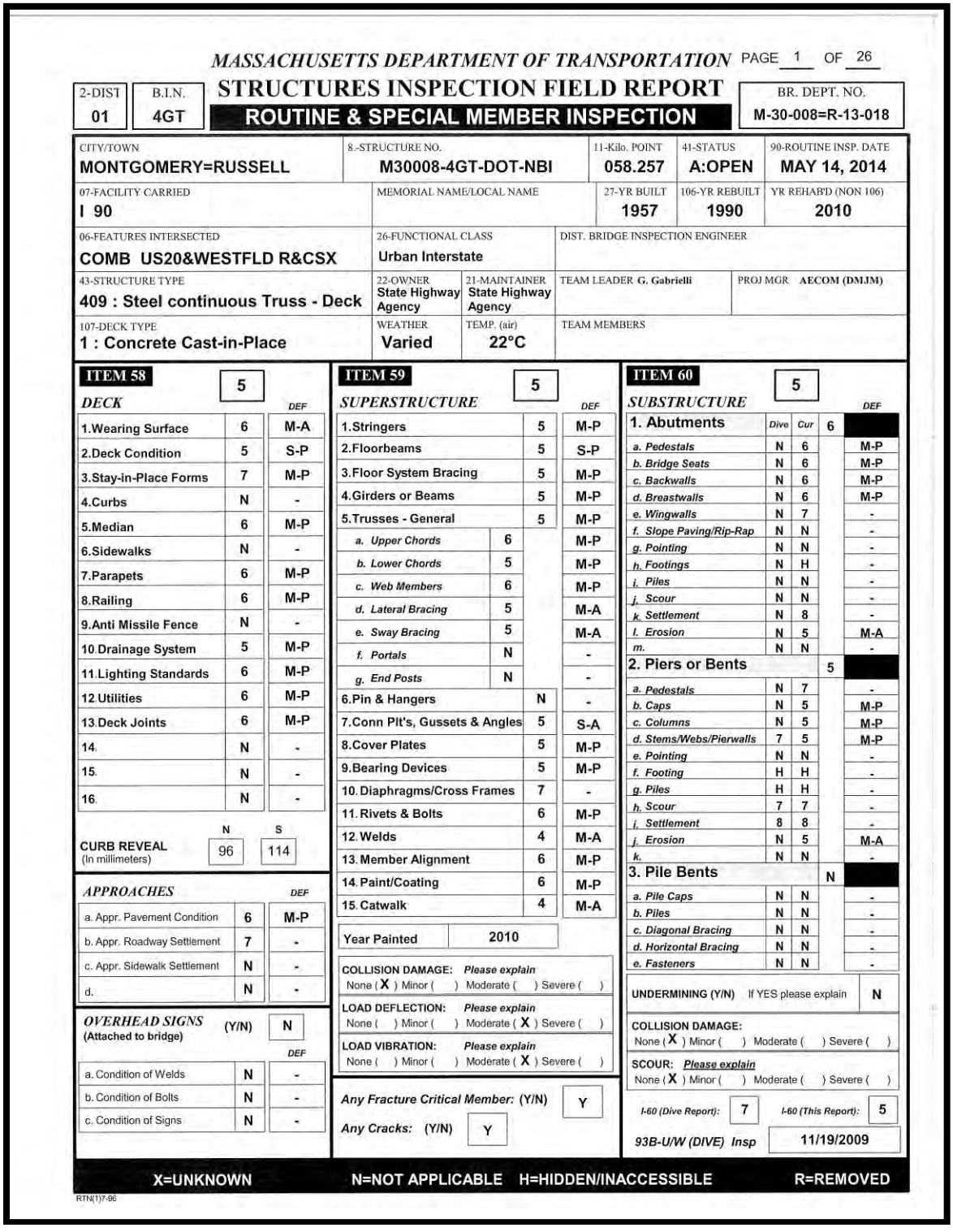
Attachment 4-6: Typical Beam End Elevation Sketch



Attachment 4-7 Typical Beam Elevation Sketch



Attachment 4-8: Typical Cross Section View of Deteriorated Prestressed Concrete Beam



MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 26

STRUCTURES INSPECTION FIELD REPORT

ROUTINE & SPECIAL MEMBER INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
01	4GT	M-30-008=R-13-018

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
MONTGOMERY=RUSSELL	M30008-4GT-DOT-NBI	058.257	A:OPEN	MAY 14, 2014

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
I 90		1957	1990	2010

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
COMB US20&WESTFLD R&CSX	Urban Interstate	

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER G. Gabrielli	PROJ MGR AECOM (DMJM)
409 : Steel continuous Truss - Deck	State Highway Agency	State Highway Agency		

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
1 : Concrete Cast-in-Place	Varied	22°C	

ITEM 58 — 5

DECK

		DEF
1.Wearing Surface	6	M-A
2.Deck Condition	5	S-P
3.Stay-in-Place Forms	7	M-P
4.Curbs	N	-
5.Median	6	M-P
6.Sidewalks	N	-
7.Parapets	6	M-P
8.Railing	6	M-P
9.Anti Missile Fence	N	-
10.Drainage System	5	M-P
11.Lighting Standards	6	M-P
12.Utilities	6	M-P
13.Deck Joints	6	M-P
14.	N	-
15.	N	-
16.	N	-

CURB REVEAL (In millimeters)	N	S
	96	114

APPROACHES

		DEF
a. Appr. Pavement Condition	6	M-P
b. Appr. Roadway Settlement	7	-
c. Appr. Sidewalk Settlement	N	-
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N) N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 — 5

SUPERSTRUCTURE

			DEF
1.Stringers		5	M-P
2.Floorbeams		5	S-P
3.Floor System Bracing		5	M-P
4.Girders or Beams		5	M-P
5.Trusses - General		5	M-P
a. Upper Chords	6		M-P
b. Lower Chords	5		M-P
c. Web Members	6		M-P
d. Lateral Bracing	5		M-A
e. Sway Bracing	5		M-A
f. Portals	N		-
g. End Posts	N		-
6.Pin & Hangers		N	-
7.Conn Plt's, Gussets & Angles		5	S-A
8.Cover Plates		5	M-P
9.Bearing Devices		5	M-P
10.Diaphragms/Cross Frames		7	-
11.Rivets & Bolts		6	M-P
12.Welds		4	M-A
13.Member Alignment		6	M-P
14.Paint/Coating		6	M-P
15.Catwalk		4	M-A

Year Painted 2010

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None ( ) Minor ( ) Moderate (X) Severe ( )

LOAD VIBRATION: *Please explain*
None ( ) Minor ( ) Moderate (X) Severe ( )

Any Fracture Critical Member: (Y/N) Y

Any Cracks: (Y/N) Y

ITEM 60 — 5

SUBSTRUCTURE

	Dive	Cur		DEF
1. Abutments			6	
a. Pedestals	N	6		M-P
b. Bridge Seats	N	6		M-P
c. Backwalls	N	6		M-P
d. Breastwalls	N	6		M-P
e. Wingwalls	N	7		-
f. Slope Paving/Rip-Rap	N	N		-
g. Pointing	N	N		-
h. Footings	N	H		-
i. Piles	N	N		-
j. Scour	N	N		-
k. Settlement	N	8		-
l. Erosion	N	5		M-A
m.	N	N		-
2. Piers or Bents			5	
a. Pedestals	N	7		-
b. Caps	N	5		M-P
c. Columns	N	5		M-P
d. Stems/Webs/Pierwalls	7	5		M-P
e. Pointing	N	N		-
f. Footing	H	H		-
g. Piles	H	H		-
h. Scour	7	7		-
i. Settlement	8	8		-
j. Erosion	N	5		M-A
k.	N	N		-
3. Pile Bents			N	
a. Pile Caps	N	N		-
b. Piles	N	N		-
c. Diagonal Bracing	N	N		-
d. Horizontal Bracing	N	N		-
e. Fasteners	N	N		-

UNDERMINING (Y/N) If YES please explain N

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

SCOUR: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

I-60 (Dive Report): 7 *I-60 (This Report):* 5

93B-U/W (DIVE) Insp 11/19/2009

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

RTN(1)7-96

Attachment 4-9: Example 1: Condition Coding of Item 60

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 8

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
06	APW	D-05-005

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
DEDHAM	D05005-APW-MUN-NBI	000.000	A:OPEN	FEB 20, 2014

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
HWY AMES ST		2012	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
WATER CHARLES RIVER	Urban Collector	J. O'Connor

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER E. J. Ray
101 : Concrete Slab	Town Agency	Town Agency	

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
1 : Concrete Cast-in-Place	Sunny	7°C	J. DAVISON, D. SAMMATARO, M. HART

ITEM 58 8

DECK

		DEF
1.Wearing surface	8	-
2.Deck Condition	8	-
3.Stay in place forms	N	-
4.Curbs	8	-
5.Median	N	-
6.Sidewalks	8	-
7.Parapets	N	-
8.Railing	7	M-P
9.Anti Missile Fence	N	-
10.Drainage System	N	-
11.Lighting Standards	N	-
12.Utilities	8	-
13.Deck Joints	8	-
14.	N	-
15.	N	-
16.	N	-

CURB REVEAL (In millimeters)	E	W
	187	187

APPROACHES

		DEF
a. Appr. pavement condition	8	-
b. Appr. Roadway Settlement	8	-
c. Appr. Sidewalk Settlement	8	-
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N) N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 8

SUPERSTRUCTURE

		DEF
1.Slab	8	-
2.Floorbeams	N	-
3.Floor System Bracing	N	-
4.Girders or Beams	N	-
5.Trusses - General	N	-
a. Upper Chords	N	-
b. Lower Chords	N	-
c. Web Members	N	-
d. Lateral Bracing	N	-
e. Sway Bracings	N	-
f. Portals	N	-
g. End Posts	N	-
6.Pin & Hangers	N	-
7.Conn Plt's, Gussets & Angles	N	-
8.Cover Plates	N	-
9.Bearing Devices	N	-
10.Diaphragms/Cross Frames	N	-
11.Rivets & Bolts	N	-
12.Welds	N	-
13.Member Alignment	8	-
14.Spandrel Wall	7	M-P
15.Arch	5	M-P

Year Painted: N

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member: (Y/N) N

Any Cracks: (Y/N) N

ITEM 60 7

SUBSTRUCTURE

	Dive	Cur		DEF
1. Abutments			7	
a. Pedestals	N	N		-
b. Bridge Seats	N	N		-
c. Backwalls	N	N		-
d. Breastwalls	7	H		-
e. Wingwalls	7	7		-
f. Slope Paving/Rip-Rap	N	N		-
g. Pointing	8	8		-
h. Footings/Cribbing	7	H		-
i. Piles	N	H		-
j. Scour	6	H		-
k. Settlement	7	8		-
l. Curtain wall	7	H		-
m.	N	N		-
2. Piers or Bents			7	
a. Pedestals	N	N		-
b. Caps	N	N		-
c. Columns	8	8		-
d. Stems/Webs/Pierwalls	6	7		M-P
e. Pointing	N	N		-
f. Footing/Cribbing	5	H		-
g. Piles	N	H		-
h. Scour	5	H		-
i. Settlement	7	8		-
j. Curtain Wall	4	H		-
k.	N	N		-
3. Pile Bents			N	
a. Pile Caps	N	N		-
b. Piles	N	N		-
c. Diagonal Bracing	N	N		-
d. Horizontal Bracing	N	N		-
e. Fasteners	N	N		-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

SCOUR: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

I-60 (Dive Report): 5 *I-60 (This Report):* 7

93B-U/W (DIVE) Insp 02/10/2012

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

RTN(1)7-96

Attachment 4-10: Example 2: Condition Coding of Item 60

Example 1:

Written Narrative submitted:
Item 59.9 - Bearing Devices
Sole and masonry plates typically exhibit minor to moderate surface rust with moderate to heavy surface rust at the exterior girders (see Photos 14, 16, 17 and 18). Many of the bearing plate anchor bolts are not fully fastened. At the west abutment, the south bolt on girders 2, 5 and 6, and the north bolt on girder 3 are not fully fastened. At the pierwall, the south bolt on girder 2 is not fully fastened. At the east abutment, the north bolt on girders 2 and 5 are not fully fastened.

Preferred List or Table format :
Item 59.9 - Bearing Devices
Sole and masonry plates typically exhibit minor to moderate surface rust with moderate to heavy surface rust at the exterior girders (see Photos 14, 16, 17 and 18).

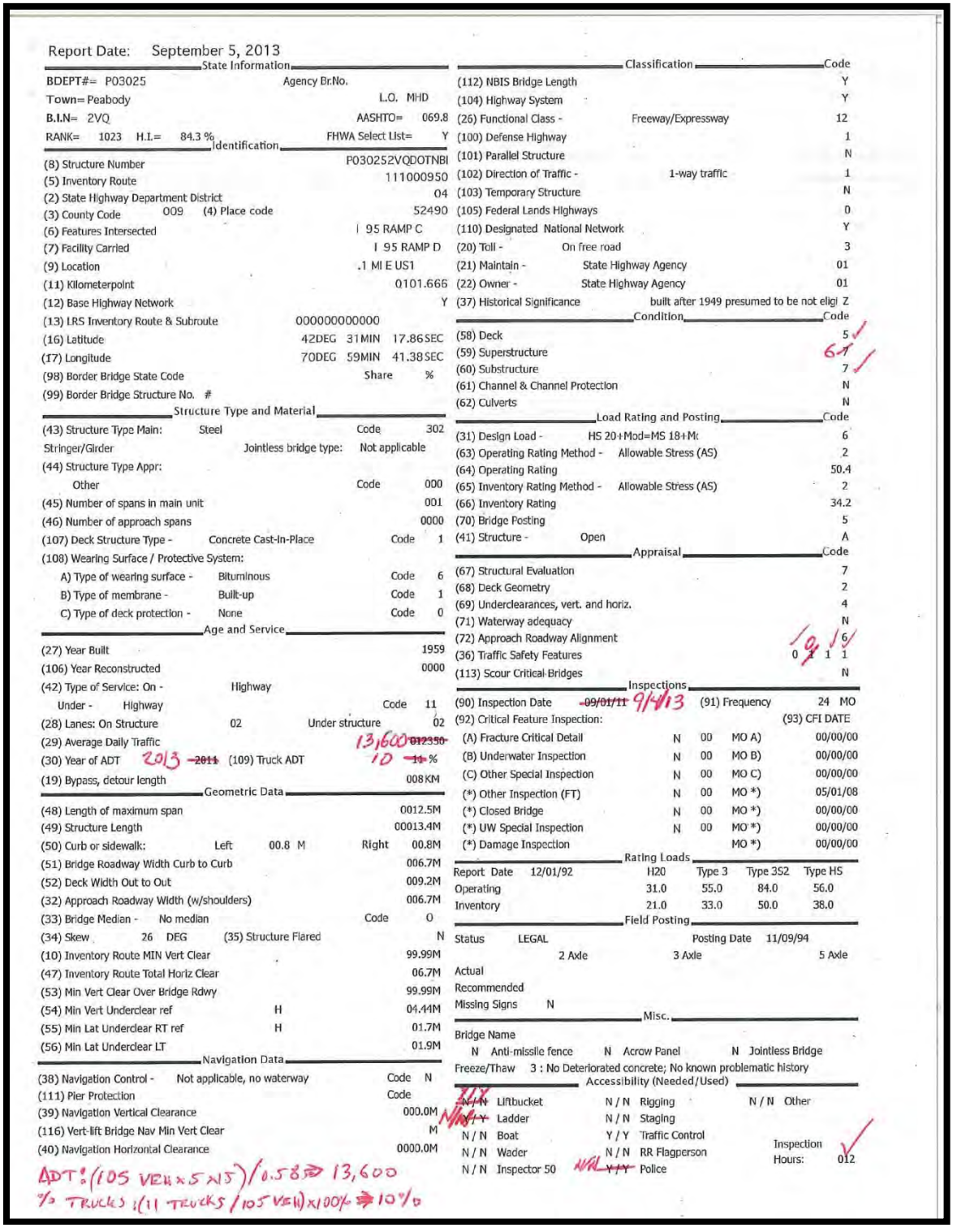
Bearing plate anchor bolts not fully fastened:
West abutment,
Girders 2, 5 & 6, the south bolt.
Girder 3, the north bolt.
Pierwall,
Girder 2, the south bolt
East abutment,
Girders 2 and 5, the north bolt.

Example 2:
Written Narrative submitted:
Item 60.1.c - Backwalls
There is a 3.5' long x 1.5' high x 3" deep spall in the west abutment backwall behind beam 1 (see Photo 21). There is a 1' long x 4" high x 4" deep spall in the west abutment backwall behind beam 4. There is hairline cracking with efflorescence and a 10" high x 4" wide x up to 2" deep spall in the west abutment behind beam 8 (see Photo 22). There is a 2.5' high x 10" wide x 2" deep spall at the east backwall behind beam 1 (see Photo 23). Both backwalls have corrosion staining from the expansion joints (see Photos 19,

Preferred List or Table format :
Item 60.1.c - Backwalls
Both backwalls have corrosion staining from the expansion joints (see Photos 19, 21, 22 and 23).

West Abutment,
Beam 1 - 3.5' long x 1.5' high x 3" deep spall (see Photo 21).
Beam 4 - 1' long x 4" high x 4" deep spall.
Beam 8 hairline cracking with efflorescence and a 10" high x 4" wide x up to 2" deep spall (see Photo 22).
East Abutment,
Beam 1 - 2.5' high x 10" wide x 2" deep spall (see Photo 23).

Attachment 4-11: Example of presenting information in an Inspection Report



Report Date: September 5, 2013

State Information

BDEPT#= P03025 Agency Br.No.
Town= Peabody L.O. MHD
B.I.N= 2VQ AASHTO= 069.8
RANK= 1023 H.I.= 84.3 % FHWA Select List= Y

Identification

(8) Structure Number	P030252VQDOTNBI
(5) Inventory Route	111000950
(2) State Highway Department District	04
(3) County Code 009 (4) Place code	52490
(6) Features Intersected	I 95 RAMP C
(7) Facility Carried	I 95 RAMP D
(9) Location	.1 MI E US1
(11) Kilometerpoint	0101.666
(12) Base Highway Network	Y
(13) LRS Inventory Route & Subroute	000000000000
(16) Latitude	42DEG 31MIN 17.86SEC
(17) Longitude	70DEG 59MIN 41.38SEC
(98) Border Bridge State Code	Share %
(99) Border Bridge Structure No. #	

Structure Type and Material

(43) Structure Type Main: Steel	Code	302
Stringer/Girder	Jointless bridge type:	Not applicable
(44) Structure Type Appr: Other	Code	000
(45) Number of spans in main unit		001
(46) Number of approach spans		0000
(107) Deck Structure Type - Concrete Cast-In-Place	Code	1
(108) Wearing Surface / Protective System:		
A) Type of wearing surface - Bituminous	Code	6
B) Type of membrane - Built-up	Code	1
C) Type of deck protection - None	Code	0

Age and Service

(27) Year Built		1959
(106) Year Reconstructed		0000
(42) Type of Service: On - Highway		
Under - Highway	Code	11
(28) Lanes: On Structure 02	Under structure	02
(29) Average Daily Traffic		13,600 ~~012350~~
(30) Year of ADT 2013 ~~2011~~ (109) Truck ADT		10 ~~11~~ %
(19) Bypass, detour length		008 KM

Geometric Data

(48) Length of maximum span				0012.5M
(49) Structure Length				00013.4M
(50) Curb or sidewalk:	Left	00.8 M	Right	00.8M
(51) Bridge Roadway Width Curb to Curb				006.7M
(52) Deck Width Out to Out				009.2M
(32) Approach Roadway Width (w/shoulders)				006.7M
(33) Bridge Median - No median			Code	0
(34) Skew 26 DEG	(35) Structure Flared			N
(10) Inventory Route MIN Vert Clear				99.99M
(47) Inventory Route Total Horiz Clear				06.7M
(53) Min Vert Clear Over Bridge Rdwy				99.99M
(54) Min Vert Underclear ref	H			04.44M
(55) Min Lat Underclear RT ref	H			01.7M
(56) Min Lat Underclear LT				01.9M

Navigation Data

(38) Navigation Control - Not applicable, no waterway	Code	N
(111) Pier Protection	Code	
(39) Navigation Vertical Clearance		000.0M
(116) Vert-lift Bridge Nav Min Vert Clear		M
(40) Navigation Horizontal Clearance		0000.0M

ADT: (105 VEH x 5 NB) / 0.58 ⇒ 13,600
% TRUCKS: (11 TRUCKS / 105 VEH) x 100% ⇒ 10%

Classification

		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Freeway/Expressway	12
(100) Defense Highway		1
(101) Parallel Structure		N
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		Y
(20) Toll -	On free road	3
(21) Maintain -	State Highway Agency	01
(22) Owner -	State Highway Agency	01
(37) Historical Significance	built after 1949 presumed to be not eligi	Z

Condition

	Code
(58) Deck	5 ✓
(59) Superstructure	~~6~~ 7
(60) Substructure	7 ✓
(61) Channel & Channel Protection	N
(62) Culverts	N

Load Rating and Posting

	Code
(31) Design Load - HS 20+Mod=MS 18+M	6
(63) Operating Rating Method - Allowable Stress (AS)	2
(64) Operating Rating	50.4
(65) Inventory Rating Method - Allowable Stress (AS)	2
(66) Inventory Rating	34.2
(70) Bridge Posting	5
(41) Structure - Open	A

Appraisal

	Code
(67) Structural Evaluation	7
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	4
(71) Waterway adequacy	N
(72) Approach Roadway Alignment	~~0~~ 6 ✓
(36) Traffic Safety Features	0 ~~1~~ 1 1
(113) Scour Critical Bridges	N

Inspections

(90) Inspection Date ~~09/01/11~~ 9/4/13 (91) Frequency 24 MO

(92) Critical Feature Inspection:

				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection (FT)	N	00	MO *)	05/01/08
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Rating Loads

Report Date 12/01/92	H20	Type 3	Type 3S2	Type HS
Operating	31.0	55.0	84.0	56.0
Inventory	21.0	33.0	50.0	38.0

Field Posting

Status LEGAL Posting Date 11/09/94

	2 Axle	3 Axle	5 Axle
Actual			
Recommended			

Missing Signs N

Misc.

Bridge Name
N Anti-missile fence N Acrow Panel N Jointless Bridge
Freeze/Thaw 3 : No Deteriorated concrete; No known problematic history

Accessibility (Needed/Used)

~~N/N~~ Liftbucket		N / N	Rigging	N / N	Other
~~N/N~~ Ladder		N / N	Staging		
N / N Boat		Y / Y	Traffic Control		
N / N Wader		N / N	RR Flagperson	Inspection Hours:	012
N / N Inspector 50		~~N/N~~ Y/Y	Police		

Attachment 4-12: Marked up copy of SI&A sheet

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

CRITICAL DEFICIENCY ACTIVITY LOG

DEFICIENCY TYPE: ( ) **STRUCTURAL** ( ) **HAZARD**

City/Town: **Bridge No.:** **BIN No:**

Location:

Team Leader: **Date Reported:** **Time Reported:**

Critical – Deficiency:

Name, Date & Time of oral report to:

District Representative:

Municipality or Custodian:

Boston Bridge Section:

Action Taken/Comments:

Special Follow-Up Inspection:

Needed? Y/N ( )

Estimate Date:

District Bridge Inspection Engineer: **Date:**

CRITICAL DEFICIENCY VERIFICATION

Return to: *(The DBIE's name)*
(Address)

PLEASE SIGN AND RETURN THIS FORM, NOTING ANY CORRECTION ACTION AND ATTACH DOCUMENTATION REGARDING THE FOLLOWING":

( ) **Immediate Corrective action taken on:**

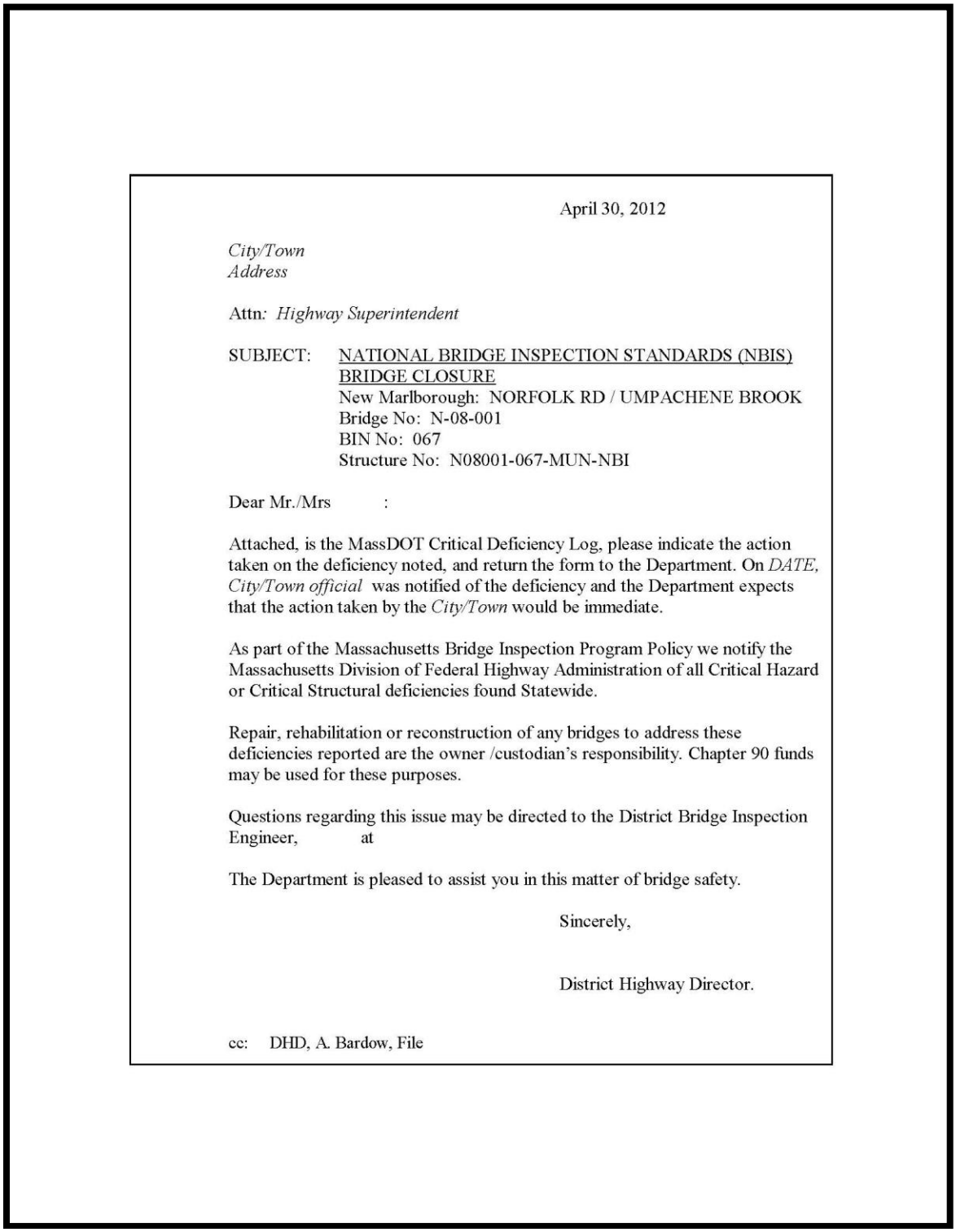
( ) **Future additional corrective action to be taken by:**

Action Taken/Comments:

Signed: **Date:**

cc: Bridge Inspection Engineer

Attachment 4-13: Critical Deficiency Activity Log/Critical Deficiency Verification Form



April 30, 2012

City/Town
Address

Attn*: Highway Superintendent*

SUBJECT: NATIONAL BRIDGE INSPECTION STANDARDS (NBIS)
BRIDGE CLOSURE
New Marlborough: NORFOLK RD / UMPACHENE BROOK
Bridge No: N-08-001
BIN No: 067
Structure No: N08001-067-MUN-NBI

Dear Mr./Mrs :

Attached, is the MassDOT Critical Deficiency Log, please indicate the action taken on the deficiency noted, and return the form to the Department. On *DATE, City/Town official* was notified of the deficiency and the Department expects that the action taken by the *City/Town* would be immediate.

As part of the Massachusetts Bridge Inspection Program Policy we notify the Massachusetts Division of Federal Highway Administration of all Critical Hazard or Critical Structural deficiencies found Statewide.

Repair, rehabilitation or reconstruction of any bridges to address these deficiencies reported are the owner /custodian's responsibility. Chapter 90 funds may be used for these purposes.

Questions regarding this issue may be directed to the District Bridge Inspection Engineer, at

The Department is pleased to assist you in this matter of bridge safety.

Sincerely,

District Highway Director.

cc: DHD, A. Bardow, File

Attachment 4-14: Critical Deficiency Log/Verification Letter to Municipalities

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
INTEROFFICE MEMORANDUM

TO: District Highway Director

ATTN: District Bridge Engineer

FROM: Alexander K. Bardow, P.E., State Bridge Engineer

DATE:

RE: **CRITICAL –STRUCTURAL DEFICIENCY**

Town Name: Facility Carried / Facility Intersected
Bridge No:
BIN No:
Structure No:

We are informing you that no action has been taken since we reported this Critical Structural deficiency for the subject structure. Please be advised that a Critical-Structural Deficiency is a deficiency to a structural element of a bridge that poses an extreme unsafe condition, due to the failure or imminent failure of the element which will affect the structural integrity of the bridge. Critical- Structural deficiencies require immediate corrective action.

Please inform this Office with regards to the corrective action that has taken place as soon as possible. Also, please return the Critical –Structural Deficiency Activity Log/Verification Form attached with action taken.

If you have any question with regards to this issue please contact the Brian Clang, Bridge Inspection Engineer at 857-368-9425.

cc: DBIE D#, BBC

Enclosure: Critical –Structural Deficiency Activity Log/Verification Form

Attachment 4-15: Follow Up Critical Structural Deficiency Memo for State Owned Bridges

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
INTEROFFICE MEMORANDUM

TO: District Highway Director

ATTN: District Bridge Engineer

FROM: Alexander K. Bardow, P.E., State Bridge Engineer

DATE:

RE: **CRITICAL –HAZARD DEFICIENCY**

Town Name: Facility Carried / Facility Intersected
Bridge No:
BIN No:
Structure No:

We are informing you that no action has been taken since we reported this Critical Hazard deficiency for the subject structure. Please be advised that a Critical-Hazard Deficiency is a deficiency in a component or element that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Critical- Hazard deficiencies require immediate corrective action.

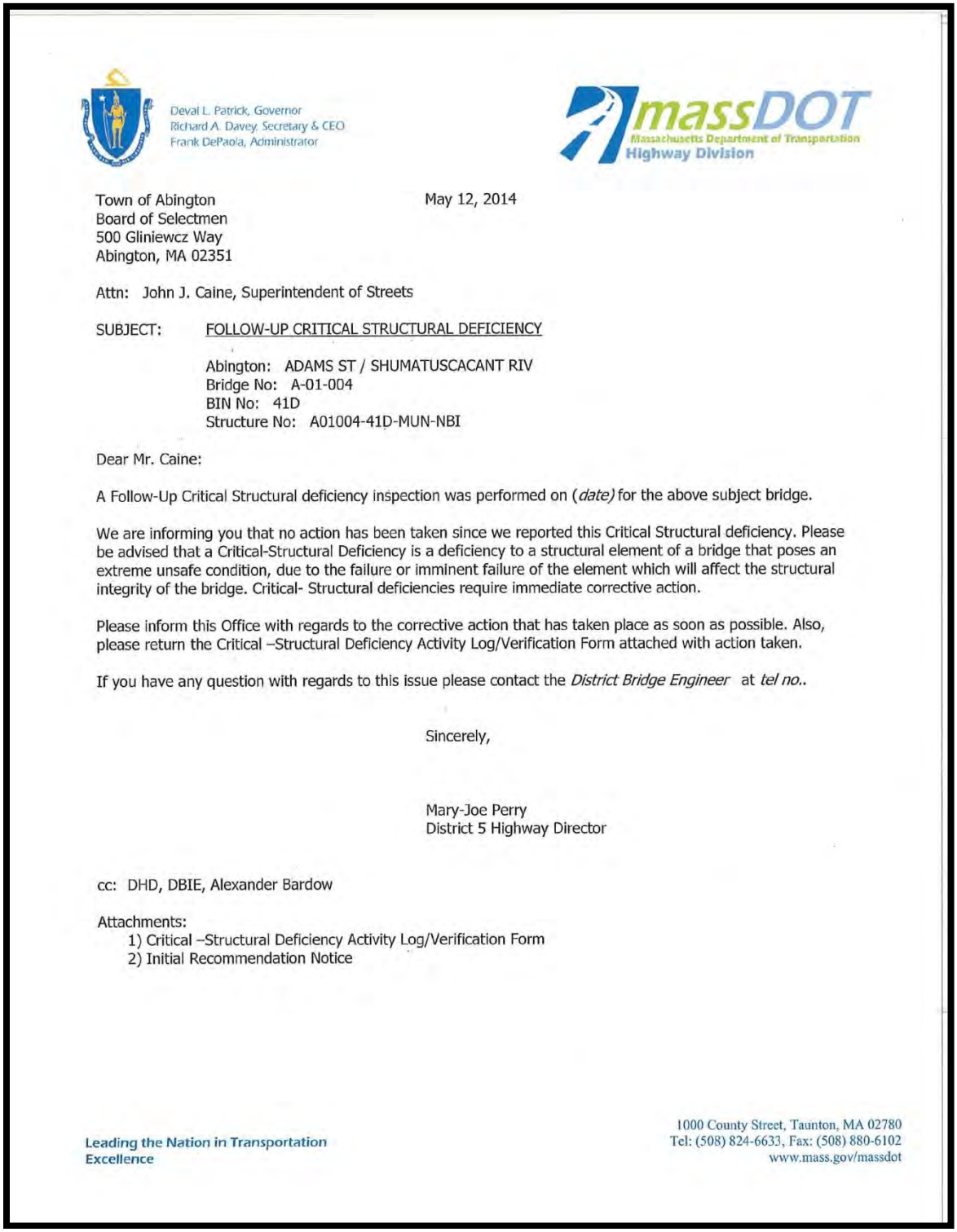
Please inform this Office with regards to the corrective action that has taken place as soon as possible. Also, please return the Critical –Hazard Deficiency Activity Log/Verification Form attached with action taken.

If you have any question with regards to this issue please contact the Brian Clang, Bridge Inspection Engineer at 857-368-9425.

cc: DBIE D#, BBC

Enclosure: Critical –Hazard Deficiency Activity Log/Verification Form

Attachment 4-16: Follow Up Critical Hazard Deficiency Notification Memo for State Owned Bridges



Deval L. Patrick, Governor
Richard A. Davey, Secretary & CEO
Frank DePaola, Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

Town of Abington
Board of Selectmen
500 Gliniewcz Way
Abington, MA 02351

May 12, 2014

Attn: John J. Caine, Superintendent of Streets

SUBJECT: FOLLOW-UP CRITICAL STRUCTURAL DEFICIENCY

Abington: ADAMS ST / SHUMATUSCACANT RIV
Bridge No: A-01-004
BIN No: 41D
Structure No: A01004-41D-MUN-NBI

Dear Mr. Caine:

A Follow-Up Critical Structural deficiency inspection was performed on (*date)* for the above subject bridge.

We are informing you that no action has been taken since we reported this Critical Structural deficiency. Please be advised that a Critical-Structural Deficiency is a deficiency to a structural element of a bridge that poses an extreme unsafe condition, due to the failure or imminent failure of the element which will affect the structural integrity of the bridge. Critical- Structural deficiencies require immediate corrective action.

Please inform this Office with regards to the corrective action that has taken place as soon as possible. Also, please return the Critical –Structural Deficiency Activity Log/Verification Form attached with action taken.

If you have any question with regards to this issue please contact the *District Bridge Engineer* at *tel no.*.

Sincerely,

Mary-Joe Perry
District 5 Highway Director

cc: DHD, DBIE, Alexander Bardow

Attachments:
1) Critical –Structural Deficiency Activity Log/Verification Form
2) Initial Recommendation Notice

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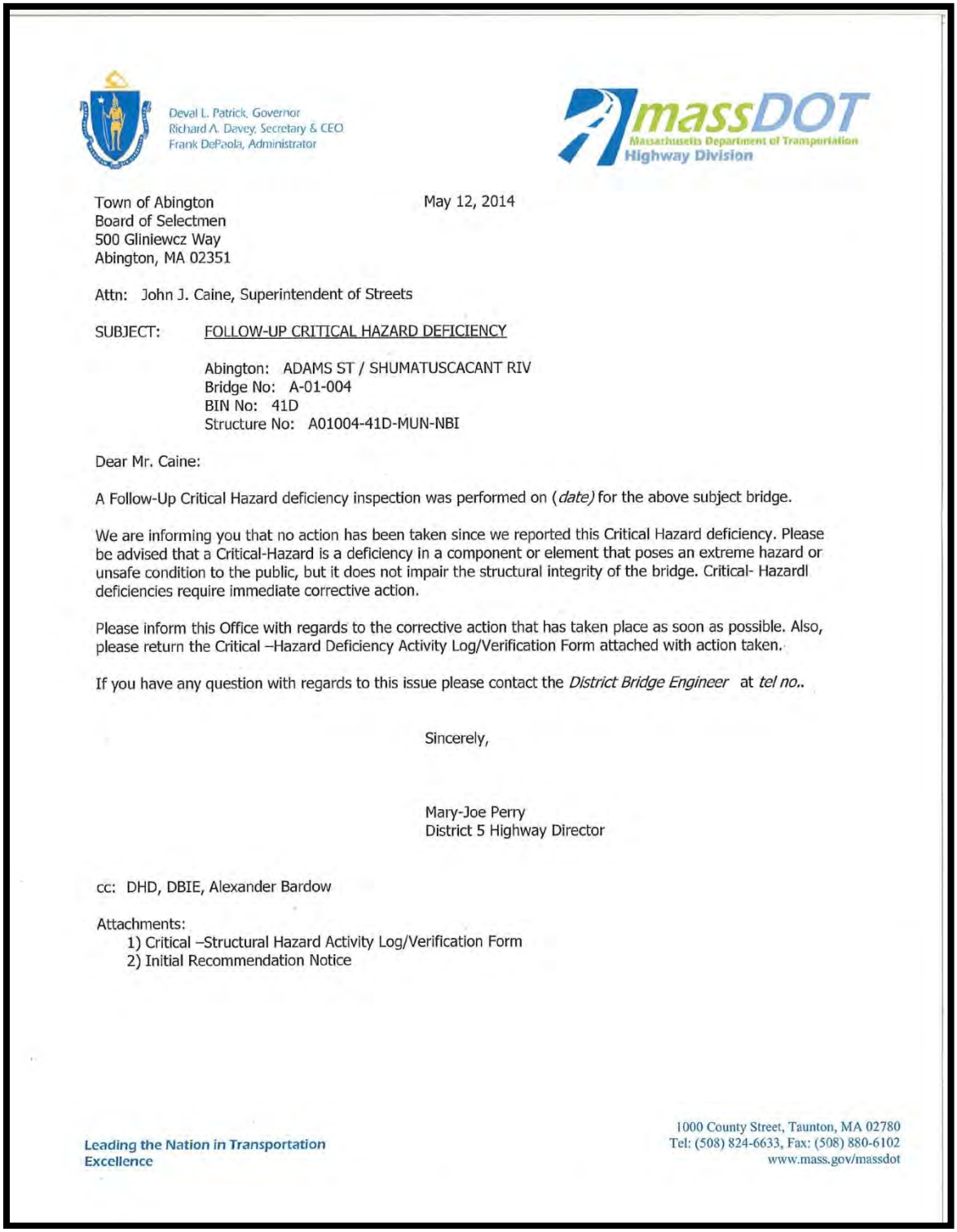
1000 County Street, Taunton, MA 02780
Tel: (508) 824-6633, Fax: (508) 880-6102
www.mass.gov/massdot

Attachment 4-17: Follow Up Critical Structural Deficiency Notification Letter to City/Town



Deval L. Patrick, Governor
Richard A. Davey, Secretary & CEO
Frank DePaola, Administrator

massDOT Massachusetts Department of Transportation Highway Division

Town of Abington
Board of Selectmen
500 Gliniewcz Way
Abington, MA 02351

May 12, 2014

Attn: John J. Caine, Superintendent of Streets

SUBJECT: FOLLOW-UP CRITICAL HAZARD DEFICIENCY

Abington: ADAMS ST / SHUMATUSCACANT RIV
Bridge No: A-01-004
BIN No: 41D
Structure No: A01004-41D-MUN-NBI

Dear Mr. Caine:

A Follow-Up Critical Hazard deficiency inspection was performed on (*date)* for the above subject bridge.

We are informing you that no action has been taken since we reported this Critical Hazard deficiency. Please be advised that a Critical-Hazard is a deficiency in a component or element that poses an extreme hazard or unsafe condition to the public, but it does not impair the structural integrity of the bridge. Critical- Hazardl deficiencies require immediate corrective action.

Please inform this Office with regards to the corrective action that has taken place as soon as possible. Also, please return the Critical –Hazard Deficiency Activity Log/Verification Form attached with action taken.

If you have any question with regards to this issue please contact the *District Bridge Engineer* at *tel no.*.

Sincerely,

Mary-Joe Perry
District 5 Highway Director

cc: DHD, DBIE, Alexander Bardow

Attachments:
1) Critical –Structural Hazard Activity Log/Verification Form
2) Initial Recommendation Notice

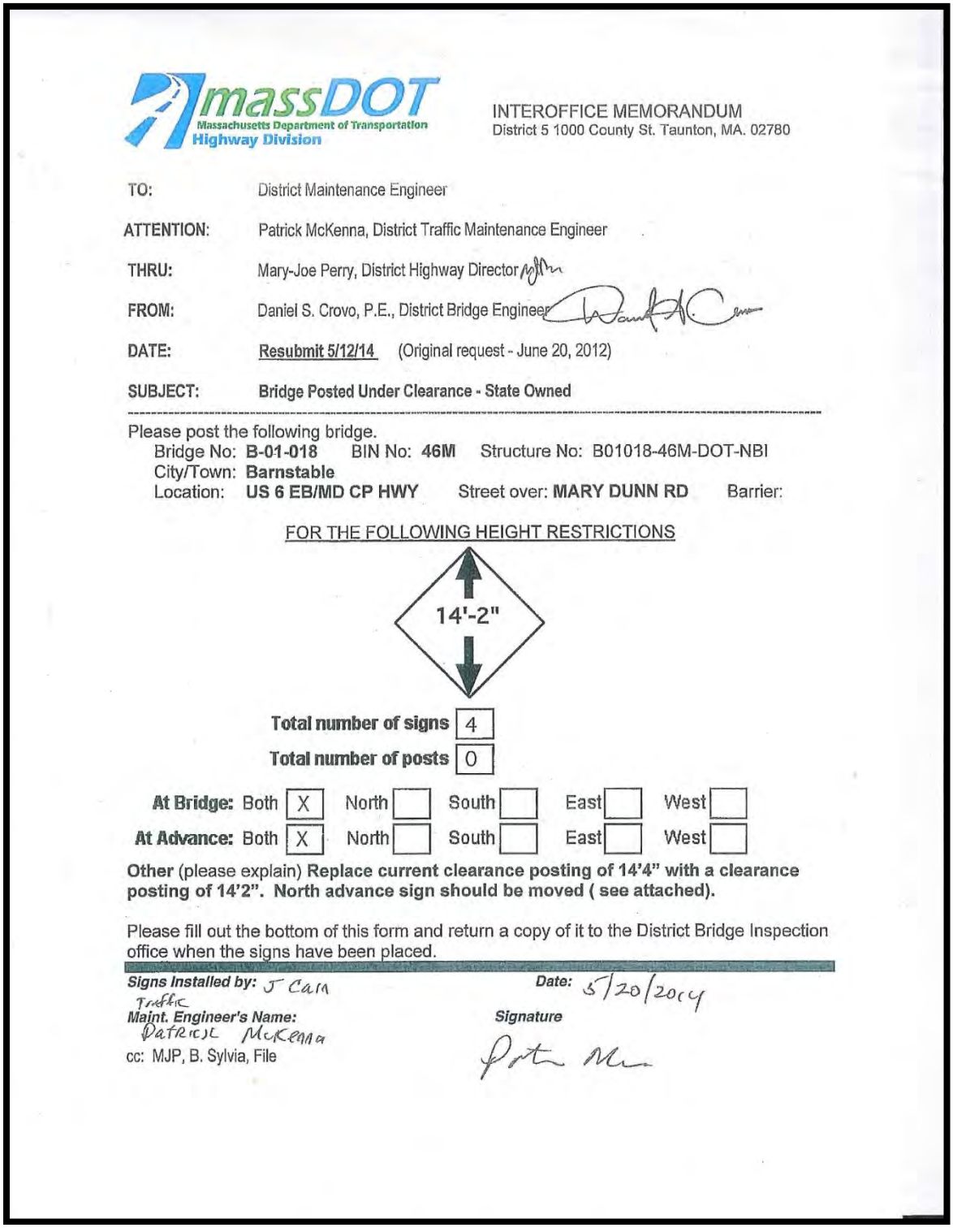
Leading the Nation in Transportation Excellence

1000 County Street, Taunton, MA 02780
Tel: (508) 824-6633, Fax: (508) 880-6102
www.mass.gov/massdot

Attachment 4-18: Follow Up Critical Hazard Deficiency Notification Letter to City/Town

Attachment 4-19: Example of Vertical Clearance Posting for Rigid Frame Structure

Attachment 4-20: Example of Vertical Clearance Posting for Truss Portal Structure



massDOT
Massachusetts Department of Transportation
Highway Division

INTEROFFICE MEMORANDUM
District 5 1000 County St. Taunton, MA. 02780

TO: District Maintenance Engineer

ATTENTION: Patrick McKenna, District Traffic Maintenance Engineer

THRU: Mary-Joe Perry, District Highway Director

FROM: Daniel S. Crovo, P.E., District Bridge Engineer

DATE: Resubmit 5/12/14 (Original request - June 20, 2012)

SUBJECT: Bridge Posted Under Clearance - State Owned

Please post the following bridge.
Bridge No: **B-01-018** BIN No: **46M** Structure No: B01018-46M-DOT-NBI
City/Town: **Barnstable**
Location: **US 6 EB/MD CP HWY** Street over: **MARY DUNN RD** Barrier:

FOR THE FOLLOWING HEIGHT RESTRICTIONS

Total number of signs 4
Total number of posts 0

At Bridge:	Both	X	North		South		East		West	
At Advance:	Both	X	North		South		East		West	

Other (please explain) **Replace current clearance posting of 14'4" with a clearance posting of 14'2". North advance sign should be moved (see attached).**

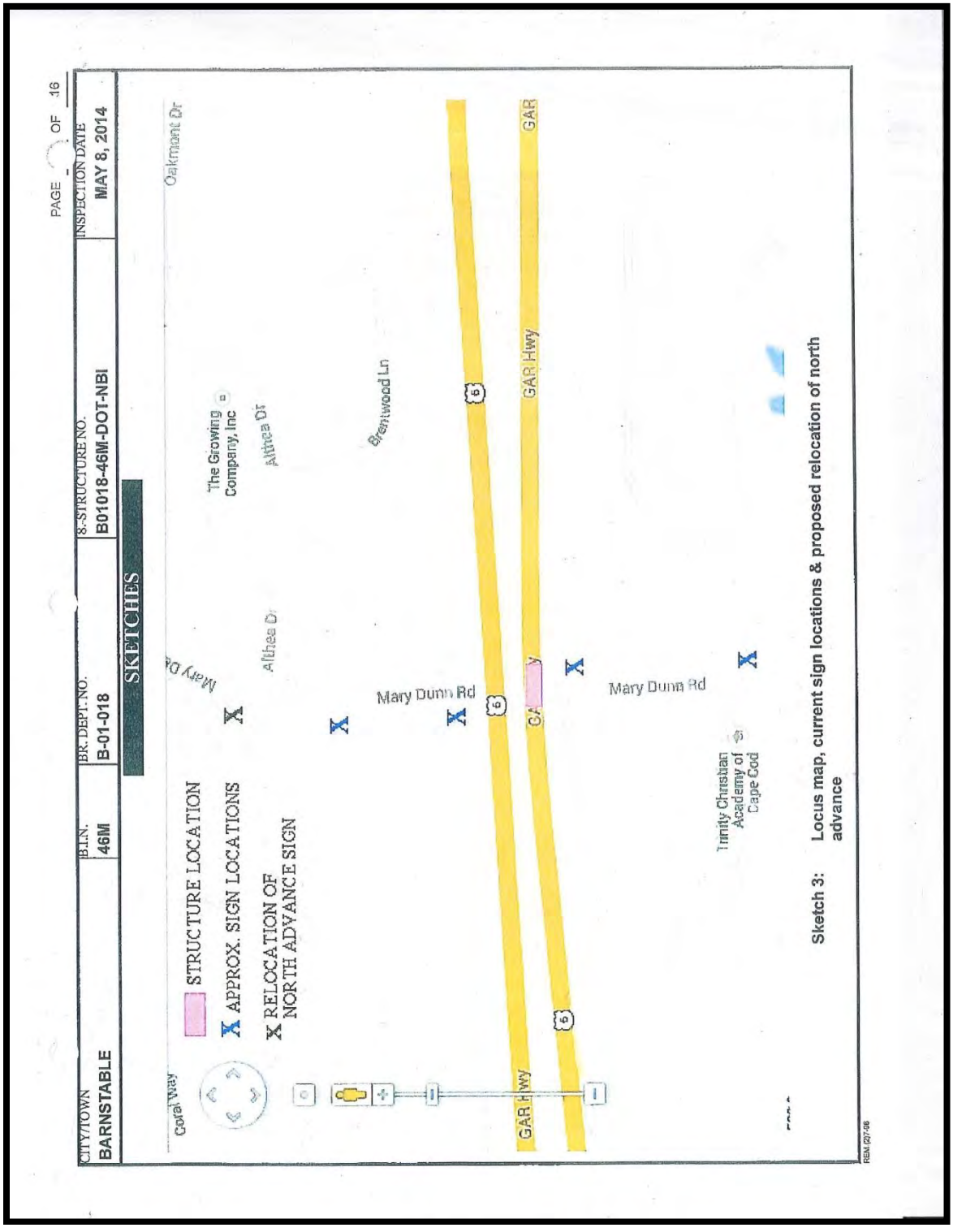
Please fill out the bottom of this form and return a copy of it to the District Bridge Inspection office when the signs have been placed.

Signs Installed by: J Cain Traffic — ***Date:*** 5/20/2014

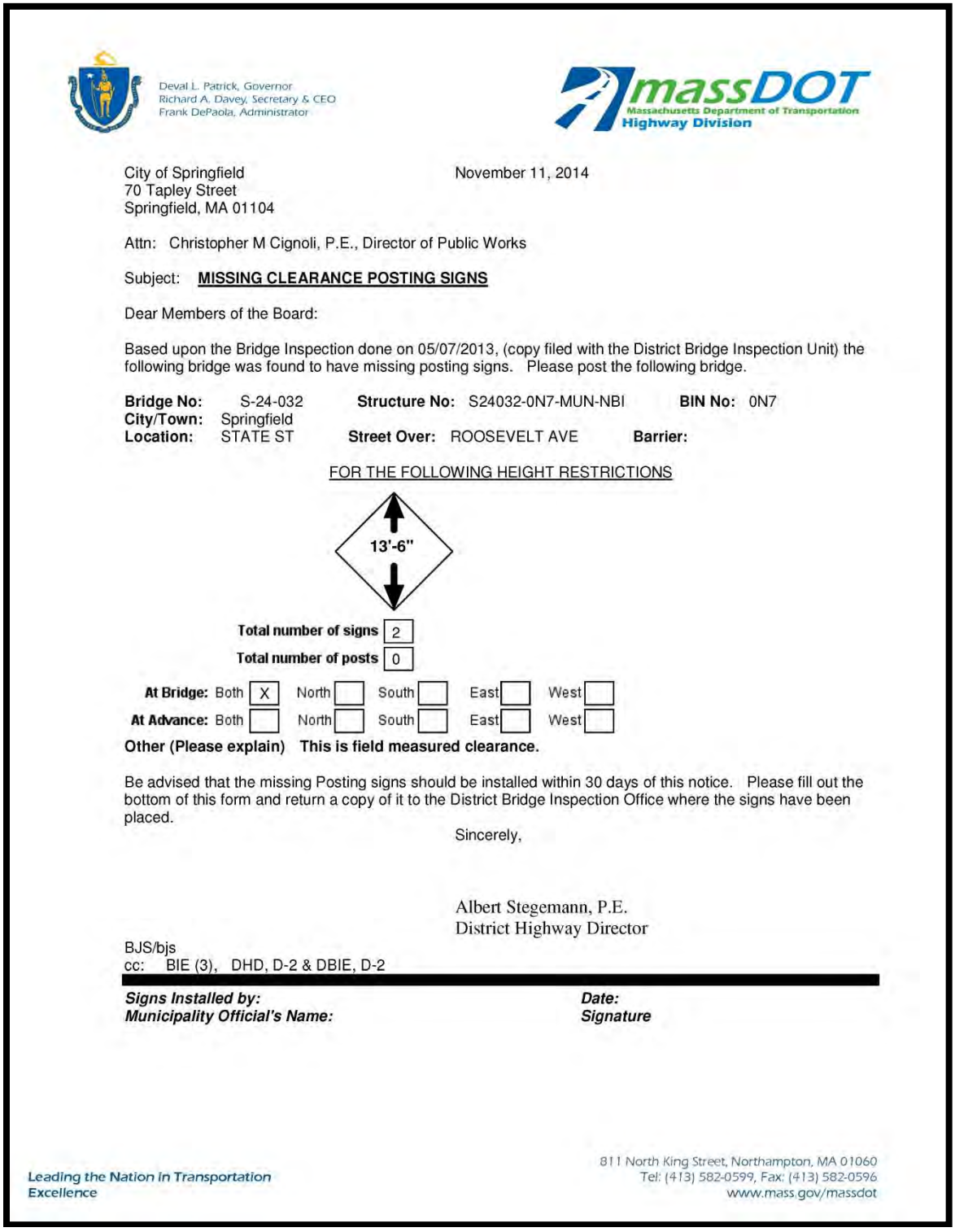
Maint. Engineer's Name: Patrick McKenna — ***Signature***

cc: MJP, B. Sylvia, File

Attachment 4-21: Letter for Missing Vertical Clearance Posting, State Owned Structure, Page 1 of 2



Attachment 4-21: Letter for Missing Vertical Clearance Posting, State Owned Structure, Page 2 of 2



Deval L. Patrick, Governor
Richard A. Davey, Secretary & CEO
Frank DePaola, Administrator

massDOT Massachusetts Department of Transportation Highway Division

City of Springfield
70 Tapley Street
Springfield, MA 01104

November 11, 2014

Attn: Christopher M Cignoli, P.E., Director of Public Works

Subject: **MISSING CLEARANCE POSTING SIGNS**

Dear Members of the Board:

Based upon the Bridge Inspection done on 05/07/2013, (copy filed with the District Bridge Inspection Unit) the following bridge was found to have missing posting signs. Please post the following bridge.

Bridge No: S-24-032 **Structure No:** S24032-0N7-MUN-NBI **BIN No:** 0N7
City/Town: Springfield
Location: STATE ST **Street Over:** ROOSEVELT AVE **Barrier:**

FOR THE FOLLOWING HEIGHT RESTRICTIONS

13'-6"

Total number of signs 2
Total number of posts 0

At Bridge: Both [X] North [ ] South [ ] East [ ] West [ ]
At Advance: Both [ ] North [ ] South [ ] East [ ] West [ ]

Other (Please explain) **This is field measured clearance.**

Be advised that the missing Posting signs should be installed within 30 days of this notice. Please fill out the bottom of this form and return a copy of it to the District Bridge Inspection Office where the signs have been placed.

Sincerely,

Albert Stegemann, P.E.
District Highway Director

BJS/bjs
cc: BIE (3), DHD, D-2 & DBIE, D-2

Signs Installed by: ***Date:***
Municipality Official's Name: ***Signature***

Leading the Nation in Transportation Excellence

811 North King Street, Northampton, MA 01060
Tel: (413) 582-0599, Fax: (413) 582-0596
www.mass.gov/massdot

Attachment 4-22: Letter for Missing Vertical Clearance Posting, Municipally Owned Structure

BRIDGE INSPECTION CONSULTANT PERFORMANCE EVALUATION REPORT

MassDOT Highway Division- Bridge Section

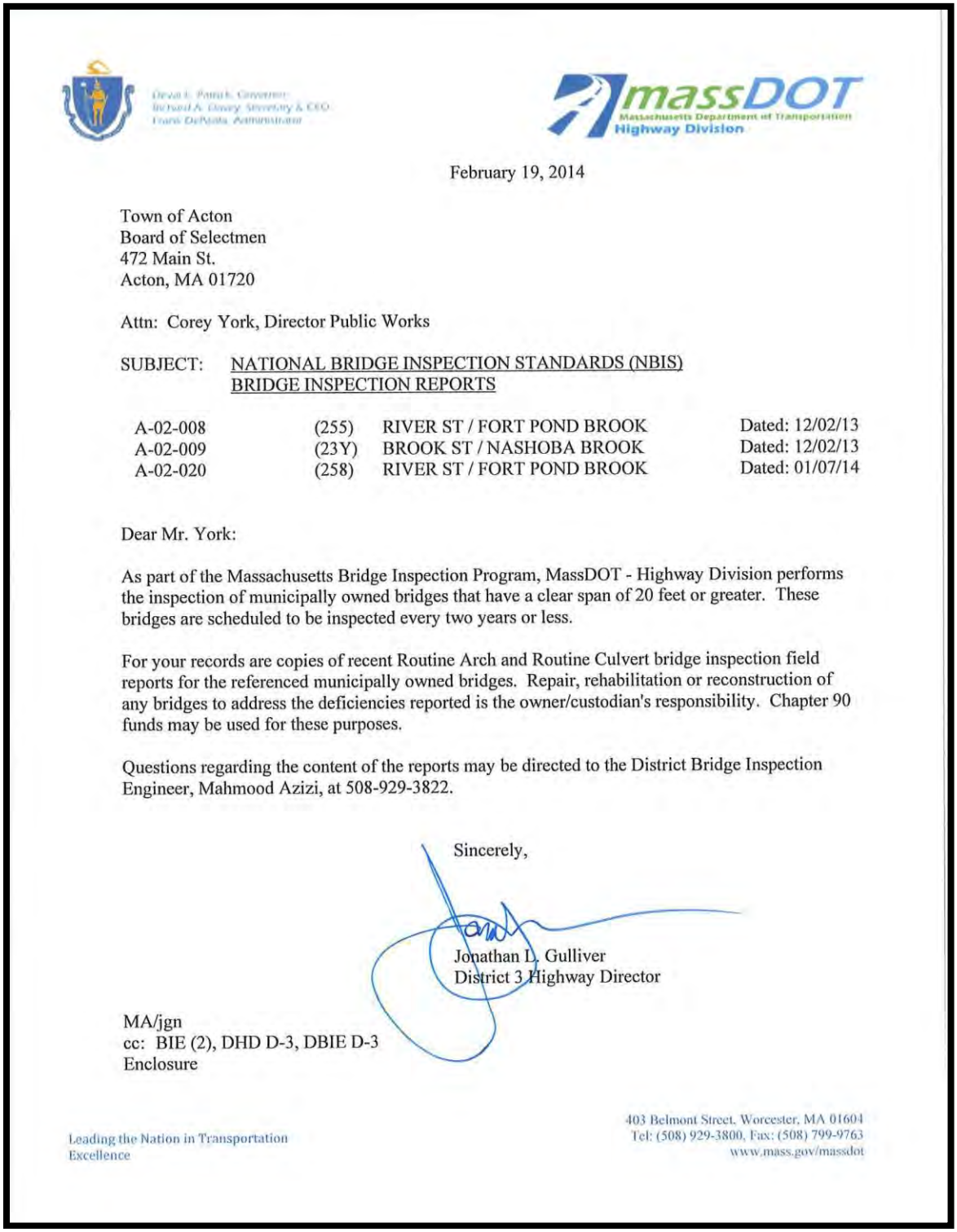
Consultant's Name	Contract No.	Assignment No.
MASSDOT Evaluator's Name	MASSDOT Evaluator's Signature	Consultant Overall Score (1-10)
Bridge & BIN No(s).	Location(s)	

In order to comply with Engineering Directive E-98-001 Consultant Performance Evaluation, the Inspection reports that are prepared by Consultants will require that the District Bridge Inspection Engineer provide a score for each of the Inspection reports received and processed.

CONSULTANT PERFORMANCE EVALUATION INSPECTION SUB ELEMENTS	
Sub Element Grading Items	Score (1-10)
Inspection Frequency – Did the Consultant complete the field inspection in the month that the inspection was due in accordance with NBIS and were all required elements inspected?	
Field Activities– Did the Consultant complete a Roadway Work Notification Form if required with the appropriate lead time? Did the Consultant inform the DBIE of the field inspection in advance?	
Critical Deficiency Notification – If a Critical Deficiency was identified during the inspection, did the Consultant immediately inform the DBIE of the situation?	
Electronic Submission – Was the first electronic submission of the inspection report completed within an acceptable time frame?	
Inspection Report Quality – Were an excessive number of review comments and corrections required in order to produce an acceptable Inspection Report?	
Consultant Responsiveness – Was the final approved inspection report submitted in a timely manner and was the Consultant responsive and cooperative throughout the assignment?	

CONSULTANT PERFORMANCE EVALUATION RATING SCALE GUIDE
Exceptional Performance (9 & 10) – Consultant consistently exceeded expectations. The submitted inspection report consistently exceeds requirements in all phases of the work. This level should be reserved for only special occasions where the Consultant always exceeds expectations.
Above Average Performance (7 & 8) – Consultant frequently exceeded expectations. Performance is above average. Consultant requires a minimal amount of monitoring. Agency coordination and public involvement activities are always timely and well done. Consultant reacts well to criticism.
Average Performance (4, 5 & 6) – Consultant consistently met expectations. Meets quality/performance expectations. Assignment is completed on time. There may be some areas that need minor improvements but the tasks are usually done on time and with minor revisions. Good inspection practices/management.
Below Average Performance (2 & 3) – Consultant frequently failed to meet expectations. Some work or time requirements need improvement but with monitoring are acceptable. Consultant's work is done solely by rote. Consultant should have a plan for improvement if they expect to be selected for additional projects.
Unacceptable Performance (0 & 1) – Consultant consistently failed to meet expectations. The consultant's work has numerous errors/omissions and the consultant requires a high degree of monitoring to complete the work. Significant improvements need to be made before consideration for future work.

Attachment 4-23: Bridge Inspection Consultant Performance Evaluation Report



Deval L. Patrick, Governor
Richard A. Davey, Secretary & CEO
Frank DePaola, Administrator

MassDOT Massachusetts Department of Transportation Highway Division

February 19, 2014

Town of Acton
Board of Selectmen
472 Main St.
Acton, MA 01720

Attn: Corey York, Director Public Works

SUBJECT: NATIONAL BRIDGE INSPECTION STANDARDS (NBIS)
BRIDGE INSPECTION REPORTS

A-02-008	(255)	RIVER ST / FORT POND BROOK	Dated: 12/02/13
A-02-009	(23Y)	BROOK ST / NASHOBA BROOK	Dated: 12/02/13
A-02-020	(258)	RIVER ST / FORT POND BROOK	Dated: 01/07/14

Dear Mr. York:

As part of the Massachusetts Bridge Inspection Program, MassDOT - Highway Division performs the inspection of municipally owned bridges that have a clear span of 20 feet or greater. These bridges are scheduled to be inspected every two years or less.

For your records are copies of recent Routine Arch and Routine Culvert bridge inspection field reports for the referenced municipally owned bridges. Repair, rehabilitation or reconstruction of any bridges to address the deficiencies reported is the owner/custodian's responsibility. Chapter 90 funds may be used for these purposes.

Questions regarding the content of the reports may be directed to the District Bridge Inspection Engineer, Mahmood Azizi, at 508-929-3822.

Sincerely,

Jonathan L. Gulliver
District 3 Highway Director

MA/jgn
cc: BIE (2), DHD D-3, DBIE D-3
Enclosure

Leading the Nation in Transportation Excellence

403 Belmont Street, Worcester, MA 01604
Tel: (508) 929-3800, Fax: (508) 799-9763
www.mass.gov/massdot

Attachment 4-24: Cover Letter from DHD to Municipality transmitting Inspection Report