Revisions to the Bridge Inspection Manual

November 2019 revisions:
1. Chapter 1 Revised
2. Chapter 2 Deleted in its entirety
3. Chapter 3 Revised
4. Chapter 9 Revised
5. Measuring Clearances and Preparing Clearance Diagrams
6. Bridge Component Labeling Systems for Inspection Reporting

Previous revisions:
* EB-2019 -2 Revision No. 3– In-Depth Inspection Criteria
* Memorandum July 11, 2018 Revised Deck Rating Guidelines
* Memorandum June 13, 2018 In-Depth Inspections
* Memorandum May 24, 2018 Sign Supports Inspection Frequency
* Memorandum January 31, 2017 Elimination or Modifications to Bridge Inspections Forms
* EB—2017-2 Revision No. 2 – Priority Codes for Work Items and Bridge Load Ratings
* EB-2016 -2, Revision No. 1 – Chapter 4: QC/QA and Resolution of Inspection Report Photographs

CHAPTER 1

OVERVIEW OF CONNDOT BRIDGE INSPECTION PROGRAM

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OVERVIEW OF ConnDOT BRIDGE INSPECTION PROGRAM

1.1 PURPOSE

The purpose of this Manual is to define the procedures and practices of the Connecticut Department of Transportation (ConnDOT) for determining the physical condition, and maintenance needs of highway bridges in the State of Connecticut.

The provisions of this Manual are intended to:

- Serve as a standard and provide uniformity in the execution of the ConnDOT bridge inspection program.
- Provide bridge inspection, evaluation and reporting procedures.
- Set guidelines for interpretation and implementation of AASHTO and FHWA inspection codes and standards.
- Establish formal quality control and quality assurance procedures.
- Assist in training personnel to perform the various tasks required under the program.

1.2 PROGRAM OBJECTIVES

The objectives of ConnDOT's bridge inspection and evaluation program are:

- To fulfill the requirements of the National Bridge Inspection Standards (NBIS).
- To ensure prompt discovery of any deterioration, defect, or structural deficiency that could be hazardous to the traveling public.
- To maintain an up-to-date inventory that records the condition and load capacity of all qualifying structures on certified public roads in Connecticut.
- To determine the extent of minor deterioration and initiate routine maintenance and repair work.
- To determine the extent of major deterioration and select rehabilitation or replacement candidates.

1.3 BACKGROUND

The general requirements for the inspection, and evaluation of the nation's bridges are defined in the National Bridge Inspection Standards (NBIS) in the Code of Federal Regulations, 23 CFR 650C. Each State is required to conduct biennial bridge inspections of its state and local bridges, and to record structure inventory and appraisal information in a specified format and annually submit the data to the Federal Highway Administration (FHWA), U.S. Department of Transportation.

The NBIS stipulates that each State perform inspections, prepare reports, and determine load ratings in accordance with the provisions of the AASHTO "Manual for Condition Evaluation of Bridges", Bridge Inspector's Reference Manual (BIRM), and the FHWA "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges." In addition, other FHWA Manuals and Technical Advisories and AASHTO Specifications, Codes, and Guidelines serve as source material for state highway departments to conduct operations in compliance with the NBIS.

1.4 DEFINITIONS

AASHTO. American Association of State Highway and Transportation Officials, 444 North Capitol Street, N.W., Suite 225, Washington, DC 20001.

BRIDGE. (NBIS) A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of greater than ~~or equal to~~ 20' (6 m) between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening (from the NBIS Transportation glossary).

QUALIFYING STRUCTURES. All bridges, as defined above, on certified public roadways, all bridges (other than pipes) 6 ft (2 m) or greater on State routes, all pedestrian bridges over State routes, all railroad bridges over State routes and other railroad bridges as identified in the appendix, all single pipes on State routes 6 ft. (3 m) or greater (inside diameter) except for water supply, combined sewer pipes, and pressure conduits.

NBIS (National Bridge Inspection Standards). Federal regulations establishing requirements for inspection procedures, frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of bridge inventory records. The NBIS apply to all structures defined as bridges located on or over all public roads.

ConnDOT. Connecticut Department of Transportation.

DEPARTMENT. Connecticut Department of Transportation.

FHWA. Federal Highway Administration, U.S. Department of Transportation.

MUTCD. The Manual of Uniform Traffic Control Devices.

NICET. National Institute for Certification in Engineering Technologies.

1.5 STANDARD REFERENCES AND GUIDES

The primary standards and references for use in conjunction with this Manual are the most current edition of the following Manuals along with any interims:

National Bridge Inspection Standards, Code of Federal Regulations, Title 23 (Highways), Part 650, Subpart C, United States Department of Transportation

AASHTO, *"Manual for Condition Evaluation of Bridges."*

FHWA, Bridge Inspector's Reference Manual (BIRM)

FHWA *"Bridge Inspectors Manual for Movable Bridges"*

FHWA, *"Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges."* ("FHWA Coding Guide")

AASHTO *Guide Manual for Bridge Element Inspection*

Numerous other references provided by AASHTO and FHWA, including Technical Advisories, are part of the reference body of documents needed to conduct the work in accordance with FHWA guidelines and procedures. These documents include:

AASHTO, *Standard Specifications for Highway Bridges* with annual interim updated specifications.

AASHTO, *Guide Specifications for Strength Evaluation of Existing Steel and Concrete Bridges*.

AASHTO, *Guide Specifications for Fatigue Evaluation of Existing Steel Bridges*.

AASHTO, *Standard Specifications for Movable Highway Bridges*.

AITC, *Timber Construction Manual.*

FHWA, *Inspection of Fracture Critical Bridge Members.*

FHWA, *Culvert Inspection Manual*.

FHWA, *Nondestructive Testing Methods for Steel Bridges.*

Evaluating Scour at Bridges, FHWA Technical Advisory, Federal Highway Administration, Publication No. T 5140.23, October 1991

FHWA, *Underwater Inspection of Bridges*

ConnDOT Structure Inspection Daytime Lane Closure Guide

ConnDOT Bridge Safety Traffic Patterns, January 2012

1.6 CONDITION EVALUATION

The condition evaluation establishes the physical and functional condition of the bridge components including the extent of deterioration and other defects. The evaluation forms the basis for load rating of the bridge, maintenance actions, and repair/rehabilitation programs. The biennial inspection cycle provides a continuous record of bridge condition and rate of deterioration (See Section 5.2 of this manual for inspection types).

The bridge inspector's primary responsibility is public safety. If defects are discovered that present a hazard to safe passage across the structure, or endanger the bridge's normal performance, the Department's emergency response procedures, as described in Section 3.2.7 of this Manual, must be initiated immediately.

The condition of each bridge member is to be evaluated in accordance with the 0-9 numeric coding system described in the "FHWA Coding Guide." ConnDOT guidelines for interpreting defects and deterioration and assigning a numeric rating to the structural element are contained in Chapter 10 in this Manual.

1.7 QUALITY CONTROL AND QUALITY ASSURANCE

In order to maintain the accuracy and consistency of inspections and load ratings, ConnDOT is committed to a defined quality control, quality assurance program. Quality Control procedures are designed to maintain the caliber of bridge inspection at or above a specified standard. Quality Assurance measures are instituted to monitor the level of the overall program. ConnDOT's Quality Control and Quality Assurance procedures and responsibilities are contained in Chapter 4 of this Manual.

CHAPTER 3

PROCEDURES

CHAPTER 3

3.2 INSPECTION

3.2.2 Inspection Frequency

Each qualifying structure will be inspected in accordance with ConnDOT procedures by qualified bridge inspectors at regular intervals of 24 months, unless they meet the interim inspection criteria or decreased inspection interval requirements explained below. The frequency of all inspections shall be reviewed after **each** inspection and adjusted as appropriate. All inspections and inspection reports shall meet the requirements of Title 23 part 650 subpart C of the Code of Federal Regulations.

3.2.2.1 Inspection and Review Time Windows

Inspections should be **started** and completed during the inspection due date month. A request for an extension must be submitted and approved by a Transportation Supervisor Engineer (TSE) for any exception.

Inspection reports should be submitted for Transportation Engineer 3 (TE3) review in SMS within 21 days of the inspection completion date.

The TE3 should review the report within 21 days and may either forward it to a TSE or final approve the report.

The TSE should review and final approve the report within 21 days.

Reports should be final approved no later than 90 days after the inspection completion date.

Definitions for Section 3.2.2.1:

Inspection Due Date: The due date is indicated in SMS and it is generally the month of the previous inspection plus the inspection frequency.

Completed Inspection: The overall completion of the field inspection of the structure.

Completed Inspection Report: The report is submitted for TE3 review.

Final Approval: The report is final approved in SMS and a PDF copy is uploaded to ProjectWise.

SMS: Structure Management System (Bentley software used by the Department.)

3.2.2.2 Interim Inspection Criteria

An increase in the maximum routine inspection interval and/or underwater inspection interval for certain types of bridges and culverts may be permitted when justified. Based on an evaluation of the strength and performance history of a bridge, the inspection interval may be increased to a maximum of forty-eight months when the respective requirements are met with an interim inspection (safety check) performed every 24 months.

A BRI-8 Form "Inspection Frequency Change Request" must be completed for any change in inspection frequency. To qualify for the extended inspection interval, the structure shall meet the requirements as determined for the type of inspection (above water or underwater) as noted in the following sections.

The Transportation Engineer 3 responsible for overseeing the bridge will review each bridge individually and submit where applicable for an increased inspection interval by completing a BRI-8 Form "Inspection Frequency Change Request". The Supervising Engineer overseeing each structure will review and submit the BRI-8 Form to the Bridge Safety Principal Engineer for approval. After approval by the Manager of Bridge Safety and Evaluation, the BRI-8 Forms requesting to increase inspection intervals shall be grouped and sent to the FHWA for final approval.

3.2.2.3 Above Water Inspections

The above water inspection interval may be increased to a maximum of forty-eight (48) month if the structure meets all of the following requirements:
The structure is not one of the following structure types or materials.

Item 43A	Item 43B	Structural Type	Comments
All	03	Steel Girder and Floorbeam	
All	05	Concrete and Steel Box Girders	With total of 3 or less box beams
All	06	Concrete and Steel Box Girders	With total of 3 or less box beams
All	08	Orthotropic Deck	
All	09	Deck Truss	
All	10	Thru and Pony Truss	
All	12	Thru arch	
All	13	Suspension	
All	14	Stayed Girder	
All	15-17	Movables	
All	21	Segmental Box Girder	
9	All*	Aluminum, Wrought Iron, Cast Iron	(*Except for Aluminum Pipes)

All members must possess load path redundancy.

The structure must have been in service a minimum of four (4) years with no significant problems since construction, reconstruction, rehabilitation, or major

repairs. The bridge must have received an in-depth inspection. There is no in-depth inspection requirement for the None-NBIS structures.

The overall condition ratings for deck, superstructure, substructure, and/or culvert, channel and channel protection must be 7 or better (Item Nos. 58, 59, 60, 61, or 62) except where a bridge crosses a waterway Item 58 may be a 6 or where a bridge does not cross a waterway Item 60 may be a 6.

The HS vehicle inventory rating for the structure is greater than or equal to the maximum legal weight limits for all vehicles in Connecticut.

Item No. 113 is rated 7, 8 or 9 (low risk). The Supervising Engineer shall review all the non-NBIS structures that have not been evaluated for scour. Only low risk structures should be proposed for increased inspection intervals.

The maximum span length (Item No. 48) is 100 feet or less. Except for pipes and culverts, the maximum number of spans (Item No. 45) is two.

There is a minimum vertical under clearance of 14'-3" (4.27 m) to the superstructure from an underlying roadways. Structures that fit all the criteria but are known to have a history of repeated over-height vehicle impact are not eligible for increased inspection intervals.

Steel superstructures must not have an ADT in excess of 50,000 and an ADTT not greater than 5,000. Structures that fit all the criteria but are known to have fatigue prone details (Category C and higher) that were not considered in the original design are not eligible for increased inspection intervals. All superstructures other than steel must not have an ADT in excess of 125,000 and an ADTT not greater than 12,500. This criterion does not apply to buried structures such as culverts with a minimum of 3 feet of fill cover.

Steel superstructures cannot be more than 50 years old from its original construction date of the steel components.

Structures that are not open to traffic shall be individually reviewed and may be recommended for increased inspection intervals even though they may not fit some of the above criterion.

The structure has no major deficiencies.

3.2.2.4 Underwater Inspections

The underwater inspection interval may be increased to a maximum of 48 months if the structure meets all of the following requirements:

Scour analysis or scour comparative has been performed and the structure is deemed a low scour risk (Item No. 113 is rated 7, 8 or 9). Structures that meet these criteria but are known to have had exposed footings are not eligible for increased underwater inspection intervals.

The underwater portion of the substructure is rated 6 or better.

The riverbanks are not eroded and the stream alignment is not directed toward the approach roadway. Item Nos. 61 and 71 are rated 6 or better.

Non-NBIS structures that have not been evaluated for scour shall be reviewed carefully for scour potential. Only low risk structures should be proposed for increased underwater inspection interval.

3.2.2.5 Decreased Inspection Interval

Certain bridges may require inspection (Routine or Special) more frequently than at a 24 month interval when known deficiencies or questionable conditions exist. Bridges with condition ratings of 4 or less should be evaluated.

Generally, the decision to conduct inspections at less than a 24 month interval, and the intended intensity of the inspection, will be proposed by the TE3 in charge of the structure, approved by the TSE. All requests shall consider the age, strength, design, conditions, traffic volume, loading, and other appropriate factors. Form BRI-8 "Inspection Frequency Change Request" must be completed for all change requests.

3.2.2.6 Underwater Inspections

Underwater inspections will normally be scheduled every 24 months. Underwater inspection frequency can be increased or decreased to match the routine inspection frequency, up to a maximum of 48 months. Smaller bridges with deep water or difficult access may have Routine and Underwater inspections completed by divers.

3.2.2.7 Overhead Sign Support (OHSS) Inspections

In order to more closely align with the Federal Highway Administration's suggested guidelines for the inspection of sign support structures, the following inspection frequencies have been established:

- Full span overhead supports shall be inspected at 72 month intervals.
- Cantilever and bridge mounted supports shall be inspected at 48 month

intervals.

- Aluminum supports, regardless of structure type, shall be inspected at 24 month intervals.

Any sign support may be assigned a shorter inspected interval if warranted by its condition or other special situation.

Sign supports inspection, review, and report submission timeline should follow the criteria for qualified structures in section 3.2.2.1

3.2.3

3.2.4

3.2.5 Maintenance and Protection of Traffic

During the course of the inspection, it may be necessary to close lanes of highways to gain access to important parts of the bridge. The signing patterns utilized for this work shall be in conformance with the Department's *Traffic Control Patterns for Highway Maintenance Operations* (as revised), Work Zone Safety Guidelines for Maintenance Operations (as revised) and the current edition of the *Manual for Uniform Traffic Control Devices (MUTCD)*. The latest editions of these publications are available from the Bridge Safety office.

Consultants shall provide a detailed two-week schedule of planned activities involving maintenance and protection of traffic to the following:

1. Bridge Safety Principal Engineer
2. First Elected Official of a town or city for local bridges
3. Other parties as identified by the Department

The Department's *Structure Inspection Daytime Lane Closure Guide* shall be used as a guideline when scheduling lane closures. All lane closures will be terminated if extensive traffic backups occur. Additionally, the inspection team is responsible for monitoring traffic backups and having the traffic control signing patterns removed should the backups become excessive. Lane closures are not permitted to exceed two miles in length.

Inspection teams are responsible for informing the highway operations center in the area whenever they close a lane on a State highway. For work in District 3, the Bridgeport Operations Center shall be notified at (203) 696-2690. For work in Districts 1, 2 & 4, the Highway Operations Center in Newington shall be notified at (860)-594-3447. Notification shall be given prior to the start of any lane closure,

after the completion of the lane closure, and whenever it is necessary to change from one lane to another.

3.2.6 Entry on Private Property

Entry onto private property for the purpose of inspecting bridges and structures should not, for the most part, be required. Inspectors should, however, understand the rights of property owners and the restrictions on entering private property. The procedures for obtaining permission, should it be necessary, can be obtained by contacting the Bridge Safety office. An example entry letter is attached in "Appendix B" of this manual.

3.2.7 Critical Finding Reporting Procedure-

When a Critical Finding A or B (see Chapter 9 for examples) is discovered, the inspection team must contact the Bridge Safety and Evaluation office immediately. The inspection team shall not remove any inspection traffic pattern until instructed otherwise.

The following information should be noted for reporting Critical Finding:

1. Structure Number
2. Town
3. Route Number/Road name
4. Features crossed
5. Type of bridge/sign support
6. Type of deficiency encountered
7. Location of deficiency
   a. Span
   b. Girder/Floorbeam/Stringer No.
8. Other pertinent information

The above noted information is to be transmitted by the inspection team by telephone and email to a TE3 (or above) who will in turn inform the TSE for that inspection area. A Work Item should be submitted within 24 hours of the initial notification.

Consultant Teams that identify the Critical Finding must immediately contact the Consultant's Project Manager/Engineer who will then assess the problem and notify the Bridge Safety and Evaluation Section.

Critical Findings identified outside of normal working hours, when the Bridge Safety office is not staffed, shall be reported to the Highway Operations Center in Newington or the Bridgeport Operations Center, as appropriate.

Bridge Safety and Evaluation staff should call Bridge Maintenance first, followed by an email notification to the following:

- Office of Maintenance Operations
- Bridge Maintenance
- Federal Highway Administration (FHWA)
- Bridge Management
- Principal Engineers in Division of Bridges
- Division Chief of Bridges
- Engineering Administrator
- Chief Engineer
- Director of Highway Operations

3.3

3.4

3.5 State-Owned or Maintained Bridges

The inspection report reviewer, with input from the inspection team, will prepare a list of possible maintenance items that should be performed to extend the life of the structure and to ensure its continued safety. For State-owned and maintained bridges, work items shall be submitted to Bridge Maintenance and prioritized as indicated below:

Critical Finding A: IMMEDIATE response by Maintenance forces.
Critical Finding B: Response within 1 WEEK.

Priority Repair: Structural or safety concerns

Routine Repair: Of lesser importance, but needing attention

For details and examples regarding Work Items see Chapter 9.

For Town owned bridges and bridges owned by others, contact the appropriate owners by letter for maintenance needs. Critcal Findings will necessitate an immediate telephone call to the owner or owner's representative.

Appendix 3A Digital file storage and SMS Guidelines

CAD Guidelines:

1. Structure outline work in CAD (no text) with border (border line wt. = 4).
2. Set the **border** size to 8.5 x 8.5 (to maximize sketch size in SMS).
3. Use CT DDE CAD Environment and override the line weights. Typically use a line weight = 2 for structure lines.
4. Each structure component CAD sketch should be done in a single Model in a Master dgn. The Model should be titled as the bridge number.
5. The Master dgn will have separate Sheets for each element (framing, top of deck, abutment, piers etc) and the sketch will be referenced from the model into the sheet.
6. The Model should have the following settings:
   a. SETTINGS > DRAWING SCALE = Survey Feet/Inches, Custom CGS, Full scale 1=1.
   b. SETTINGS > DESIGN FILE > WORKING UNITS = Survey Feet/Inches
7. Use "Ctdot_print_pen.tbl" for pen table and use appropriate layer.
8. Blank section loss sketches will be drawn in CAD with deterioration notes in Bluebeam (quick/easy section loss sketches could be drawn in Bluebeam natively.)

Bluebeam (PDF) Guidelines:

1. While the CAD contains all line work, the pdf file will contain all text including the sheet title.
2. All deterioration notes should be in "call outs".
3. Use CTDOT provided hatch for all deterioration such as map cracking, spalls, scour, riprap etc.
4. Draw tables in pdf with "Lines" using "snap to grid" option and text to fill in data.
5. General notes such as "Top of Deck", "Underside", "Channel" etc. should be separate page (Note: could use in the same page if few short general notes like "Abutment and Wingwalls").
6. For General notes Sheet, use Bluebeam and use line spacing = 1.5. Each item should be separated with a space.
7. Heading text size '12', all other text '8', could use smaller text in some cases.
8. Every effort will be made to identify the deterioration note as a callout instead of using a separate deterioration notes page and referencing an alphanumeric callout. In rare instances when necessary, with Department approval, a separate deterioration notes page may be necessary. When the exact same deficiency appears multiple times on the same sheet, the use of an encircled letter should be employed to aid in

report neatness at each location instead of repeating the note each time on the page. The legend for the encircled letter should be on the same page as the sketch.

9. Multiple cracks of the same length in bays between diaphragm/cross frames should be indicated by a single crack line followed by the number or cracks in that bay.
10. Provide a separate sketch for Underside of Deck and Framing Plan if necessary.

File Naming Convention List

FILES: (XXXXX= Bridge Number)

Executive Summary.docx

Executive Summary (Signed).pdf

Clearance Diagram.pdf

Concrete Deterioration Worksheet (BRI-10).xlsx

Concrete Deterioration Worksheet (BRI-10).pdf

Seismic Data Sheet (BRI-11).xlsx

Seismic Data Sheet (BRI-11).pdf

Fracture Critical Data Sheet (BRI-12).xlsx

Fracture Critical Data Sheet (BRI-12).pdf

Photo Log_MonthYear (BRI-13).pdf

"Type" Bearing Measurement Sheet (BRI-14-15-16).xlsx

"Type" Bearing Measurement Sheet (BRI-14-15-16).pdf

Joint Measurement Sheet .xlsx

Joint Measurement Sheet.pdf

Pin and Hanger Data/Analysis Sheet (BRI-29).xlsx

Pin and Hanger Data/Analysis Sheet (BRI-29).pdf

Hinge Data/Analysis Sheet (BRI-30).xlsx

Hinge Data/Analysis Sheet (BRI-30).pdf

Time Log_MonthYear.pdf

Sketches_MonthYear.pdf (only sketches that are included in "Sketches as jpeg files" should be in this pdf package)

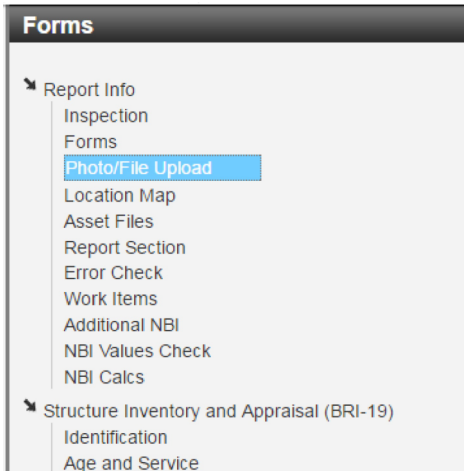
File Uploading Procedure

Steps to upload Files into SMS:

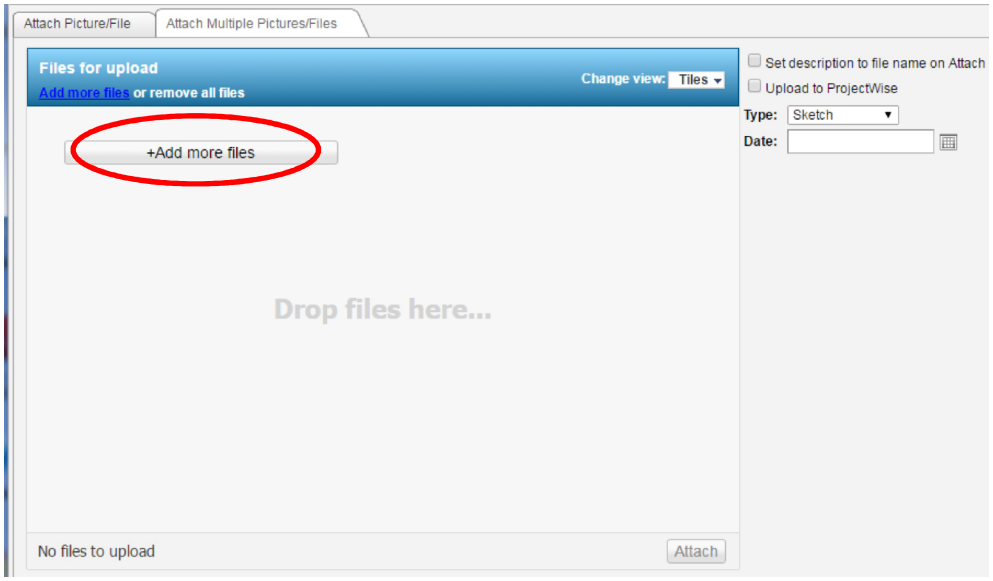
First, you must have all your documents in the correct formats ready to be uploaded.

Files Section:
Attach all the documents that should be uploaded under the "FILES" section. This is any PDF, Word, or Excel file that is required by the Department for the report and renamed according to the File Naming Convention list before uploading into SMS.
The PDF copy of sketches should be named Sketches_MonthYear.pdf and not fieldnotes.pdf (Field notes will not be accepted).
Microstation Files should be uploaded into SMS. They shall be uploaded into the bridge asset folder in ProjectWise. This will also apply to underwater inspection uploads as well.

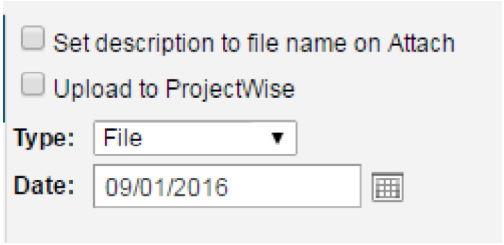
1. Click on Photo/File Upload under the Report Info Section (Highlighted in blue). This will bring you the correct page.



2. Click on the "Attach Multiple Pictures/Files" Tab at the upper Left corner. Now you should see this screen shot below.

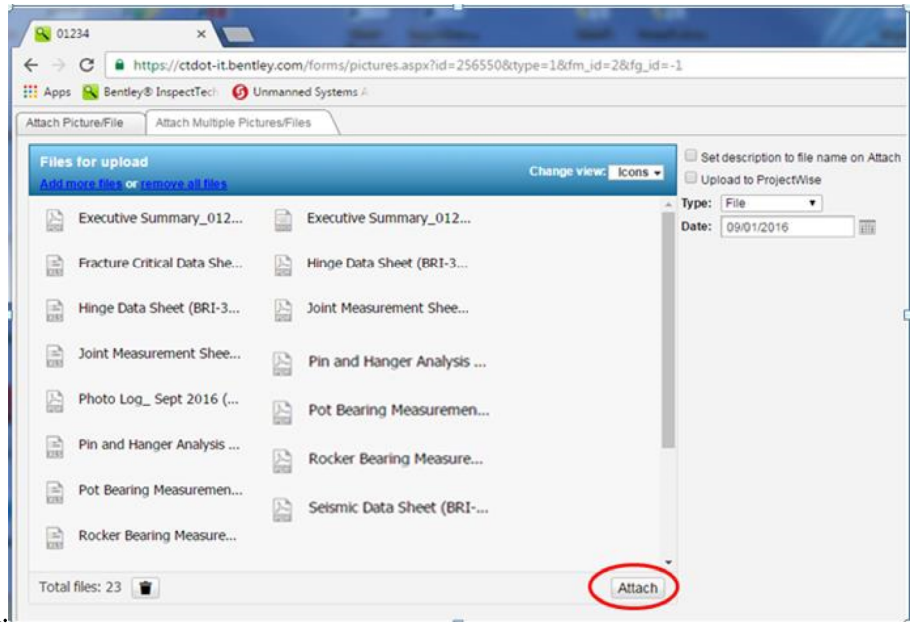


3. Change the **TYPE**: to File and **DATE**: to the start date of the inspection.



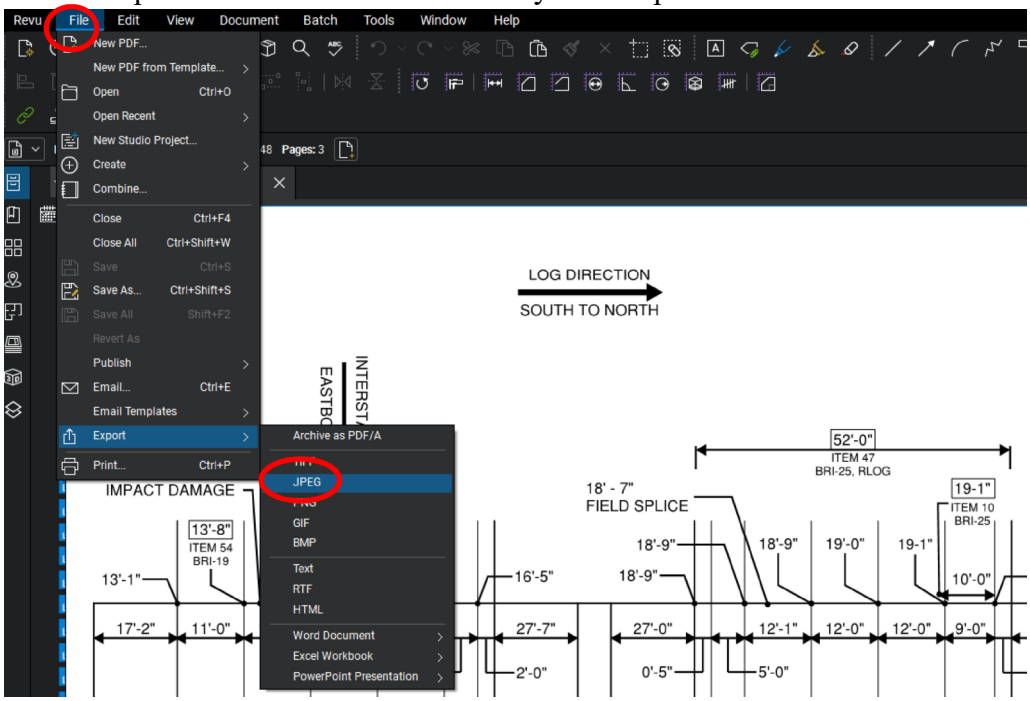
4. You can drag over all the files and drop them into the box "Drop files here…" or click on "+Add more files" to search to a folder on your computer. Once you

have added your files, click "Attach" and they will show up under the "Files" section.

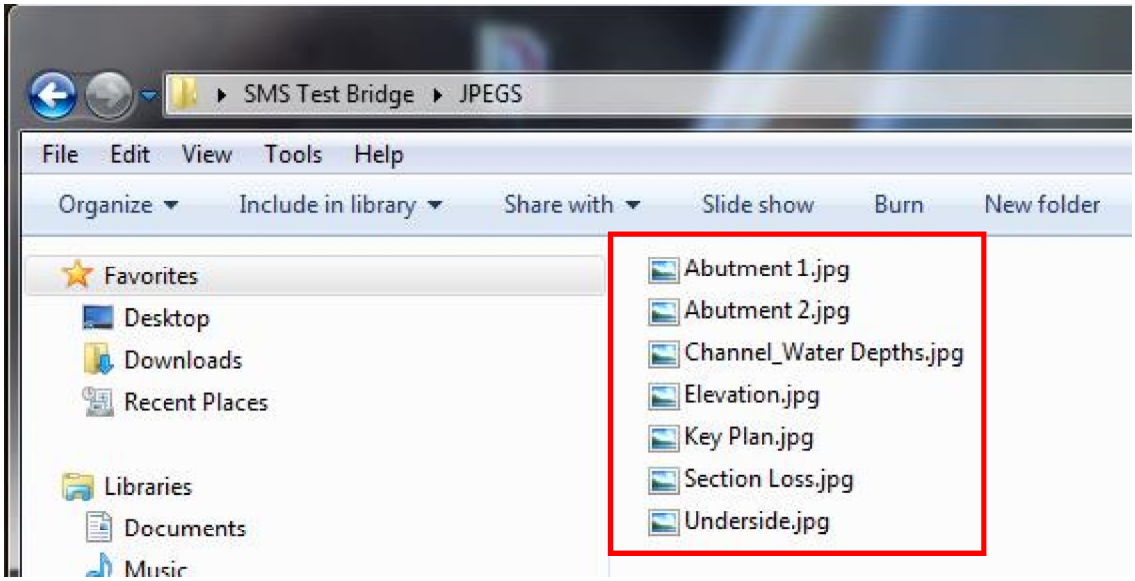


Steps to upload Sketches (JPEG) into SMS:

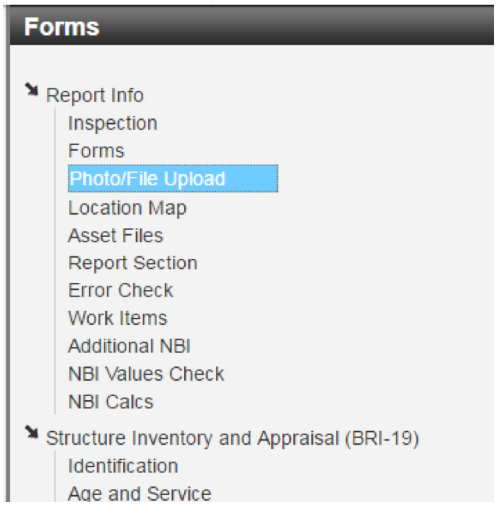
1. **Converting PDF to JPEG (in Bluebeam Revu)-** Open up the Sketches_Sept 2016.pdf and convert the PDF to JPEG
    a. Open the Sketches PDF in Bluebeam and click on the "File" tab then select "Export" then "JPEG" and save to your computer.



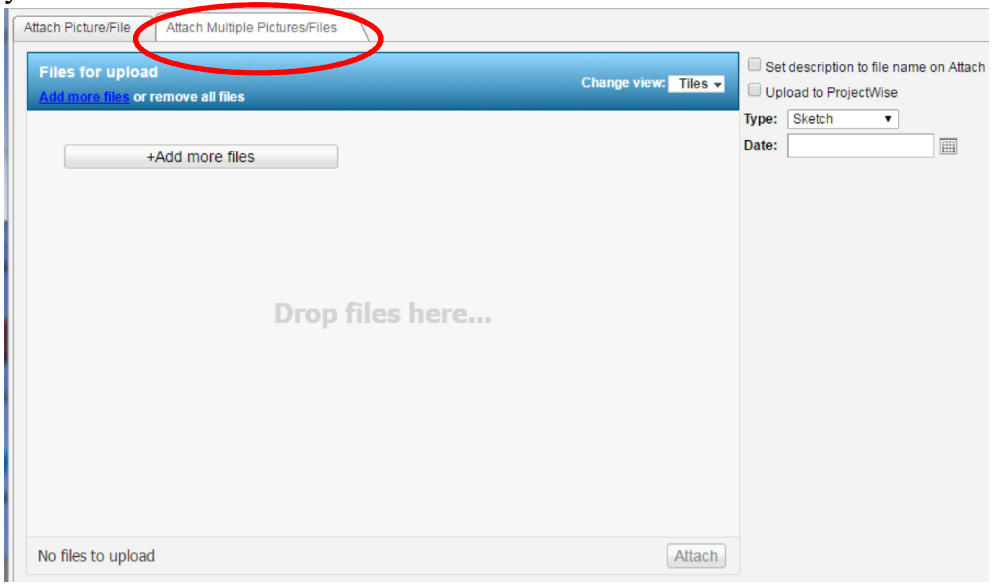
b. Save as individual JPEGs and rename each file to be "Description_Bridge number.JPEG (Bridge number is optional, but description must be first). Each JPEG file should be renamed. For naming convention see the Key Plan and the image below.
For underwater inspection, sketches will be uploaded as PDF.



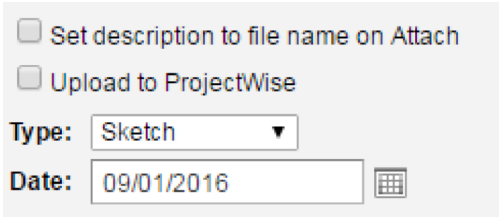
2. Click on Photo/File Upload under the Report Info Section (Highlighted in blue). This will bring you the correct page.



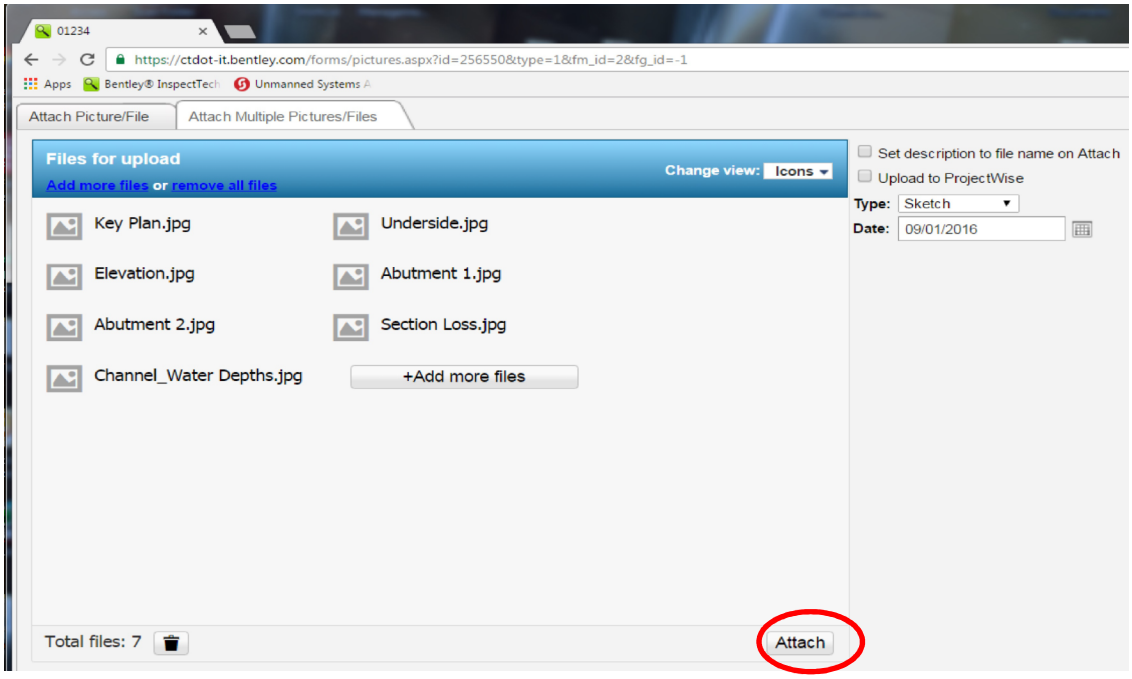
3. Click on the "Attach Multiple Pictures/Files" Tab at the upper Left corner. Now you should see this screen shot below.



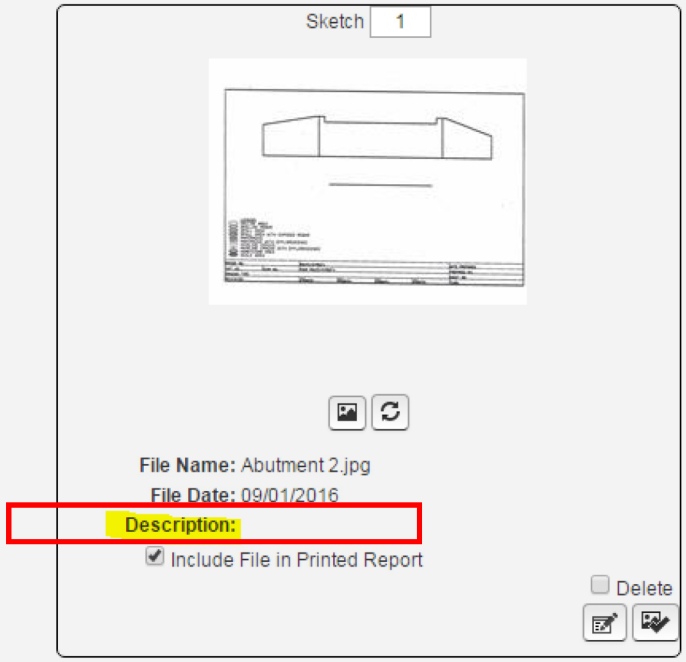
4. Change the **TYPE**: to Sketch and **DATE**: to the start date of the inspection.



5. You can drag over all the sketches and drop them into the box "Drop files here…" or click on "+Add more files" to search to a folder on your computer. Once you have added your files, click "Attach" and they will show up under the "Sketches" section.

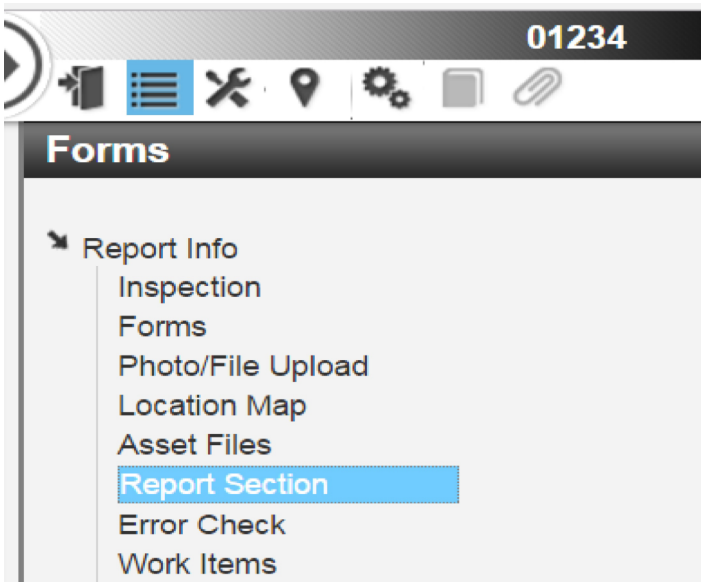


The description for sketches should be left blank.



To upload files to Table of Contents for Output Report: Once you have all your PDF's uploaded into "Files" you need to add some of them to the table of contents. Some files such as the Sketches_monthyear.pdf, Time Log_MonthYear.pdf and Photo Log MonthYear (BRI-13).pdf should not be included into the table of contents. Follow steps below.

1. Click on "Report Section" under Forms



2. Click on "Add Sections/PDF Attachments" This screen below will pop up. Select all PDF's you want to add then click "Update"

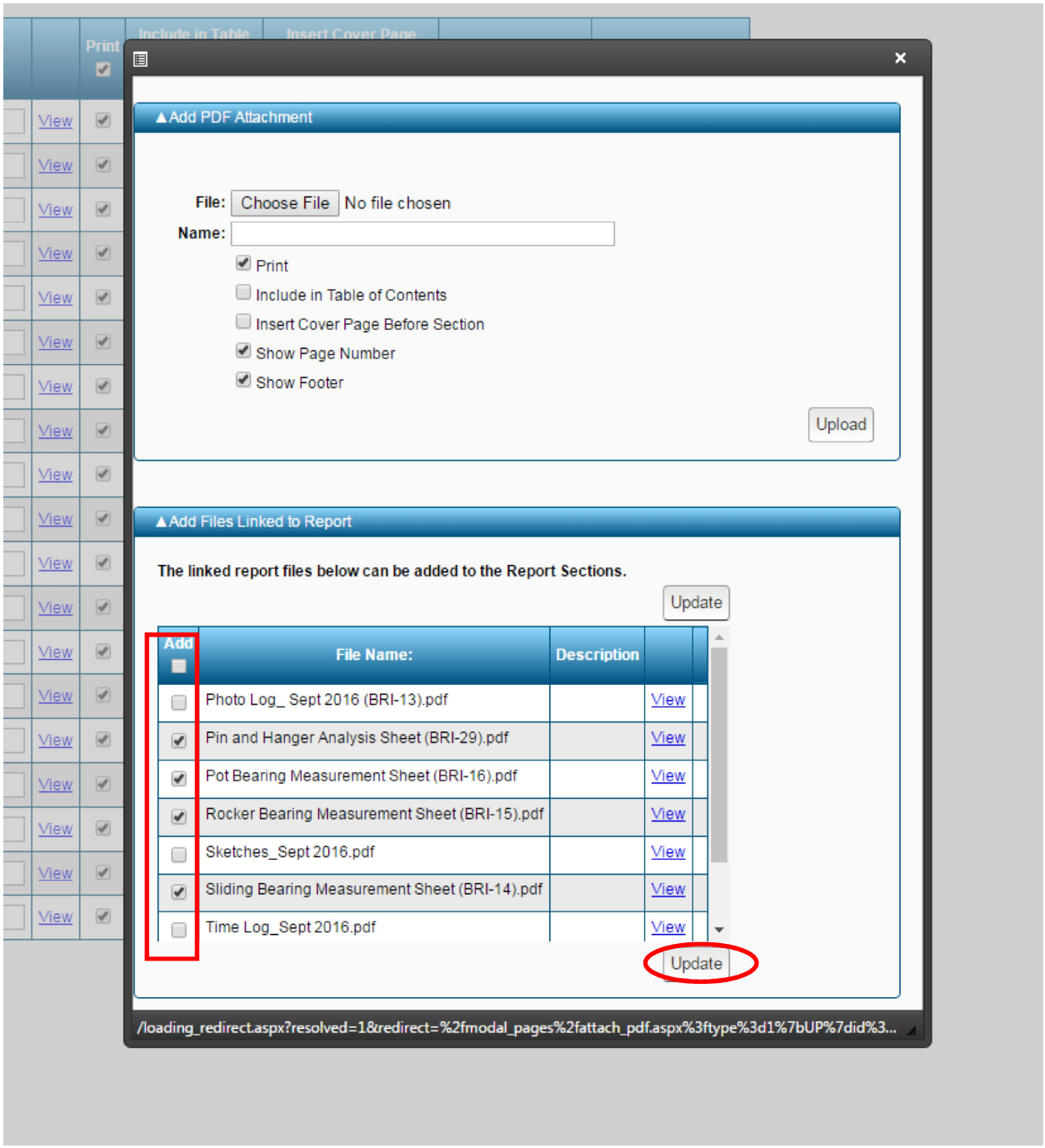
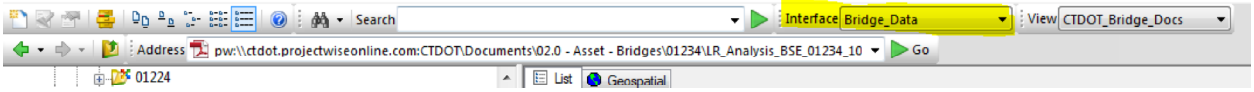

Include in Table
Insert Cover Page
Print
View
▲Add PDF Attachment
File: Choose File No file chosen
Name:
Print
Include in Table of Contents
Insert Cover Page Before Section
Show Page Number
Show Footer
Upload
▲Add Files Linked to Report
The linked report files below can be added to the Report Sections.
Update
Add
File Name:
Description
Photo Log_ Sept 2016 (BRI-13).pdf
Pin and Hanger Analysis Sheet (BRI-29).pdf
Pot Bearing Measurement Sheet (BRI-16).pdf
Rocker Bearing Measurement Sheet (BRI-15).pdf
Sketches_Sept 2016.pdf
Sliding Bearing Measurement Sheet (BRI-14).pdf
Time Log_Sept 2016.pdf
Update
/loading_redirect.aspx?resolved=1&redirect=%2fmodal_pages%2fattach_pdf.aspx%3ftype%3d1%7bUP%7did%3...

Table of Contents should be set up in this order **(based on what you have included in your specific bridge inspection report).**

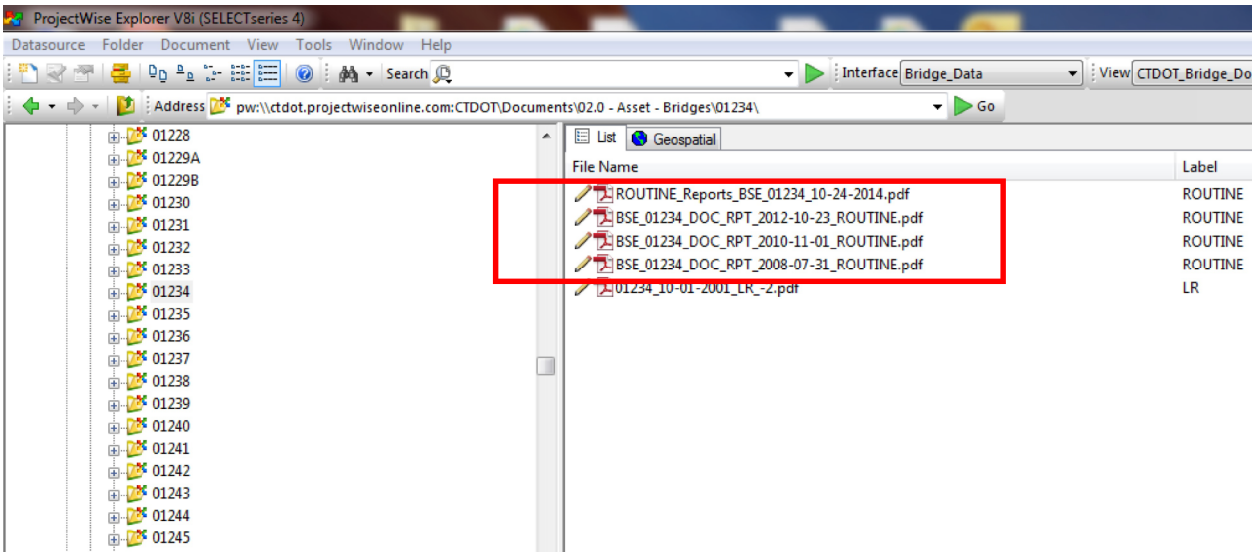
Remove Section	Order	Section Name		Print	Include in Table of Contents	Insert Cover Page Before Section	Show Page Number	Edit Custom Section
	1	Report Cover	View					
	2	Table of Contents	View					
	3	Executive Summary (signed)	View					Edit
	4	Location Map	View					
	5	Structure Inventory and Appraisal (BRI-19)	View					
	6	Inventory Routes Under (BRI-25)	View					
	7	Inspection Data (BRI-18)	View					
	8	National Bridge Elements	View					
	9	Clearance Diagram	View					Edit
	10	Underwater Inspection (BRI-58)	View					
	11	Underwater Inspection (BRI-59)	View					
	12	Special Bridge Inspection Report (BRI-20)	View					
	13	Concrete Deterioration Worksheet (BRI-10)	View					Edit
	14	Sliding Bearing Measurement Sheet (BRI-14)	View					Edit
	15	Rocker Bearing Measurement Sheet (BRI-15)	View					Edit
	16	Pot Bearing Measurement Sheet (BRI-16)	View					Edit
	17	Pin and Hanger Analysis Sheet (BRI-29)	View					Edit
	18	Hinge Data Sheet (BRI-30)	View					Edit
	19	Parapet Joint Inspection (BRI-17)	View					
	20	Joint Measurement Sheet	View					Edit
	21	Seismic Data Sheet (BRI-11)	View					Edit
	22	Fracture Critical Data (BRI-12)	View					
	23	Fracture Critical Data Sheet (BRI-12)	View					Edit
	24	Sketches	View					
	25	Pictures	View					
	26	Construction Punch List (BRI-9)	View					

To upload CAD file (.dgn) to ProjectWise:

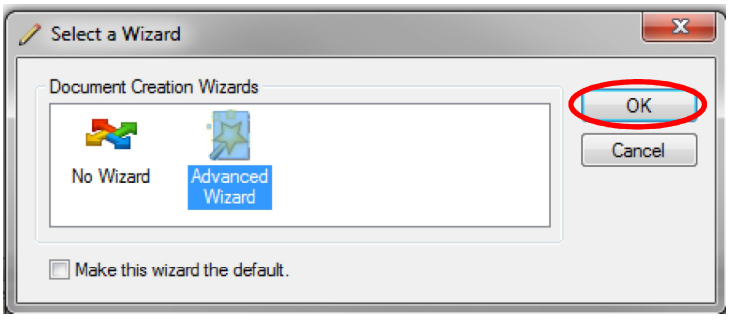
1. Make sure the Interface is set to Bridge_Data



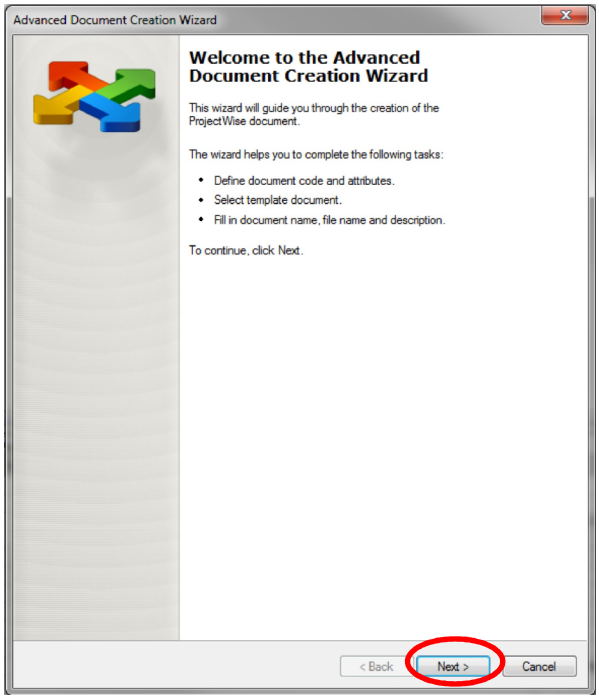
2. Drag and drop your CAD file under the appropriate asset folder (Bridge No. Folder).



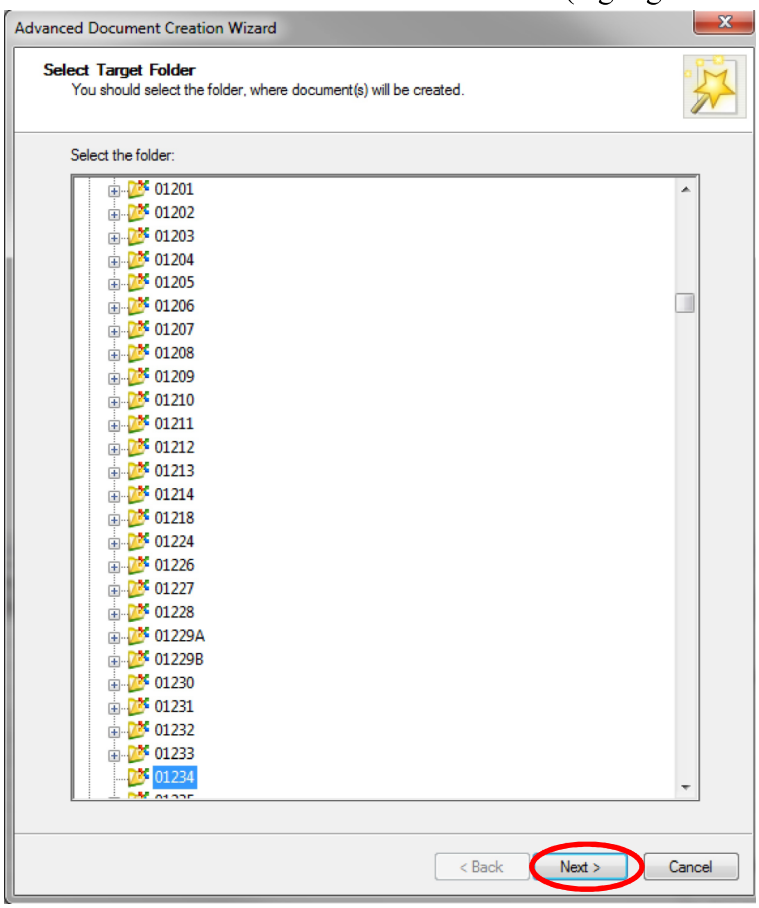
3. Click on Advanced Wizard and then press OK



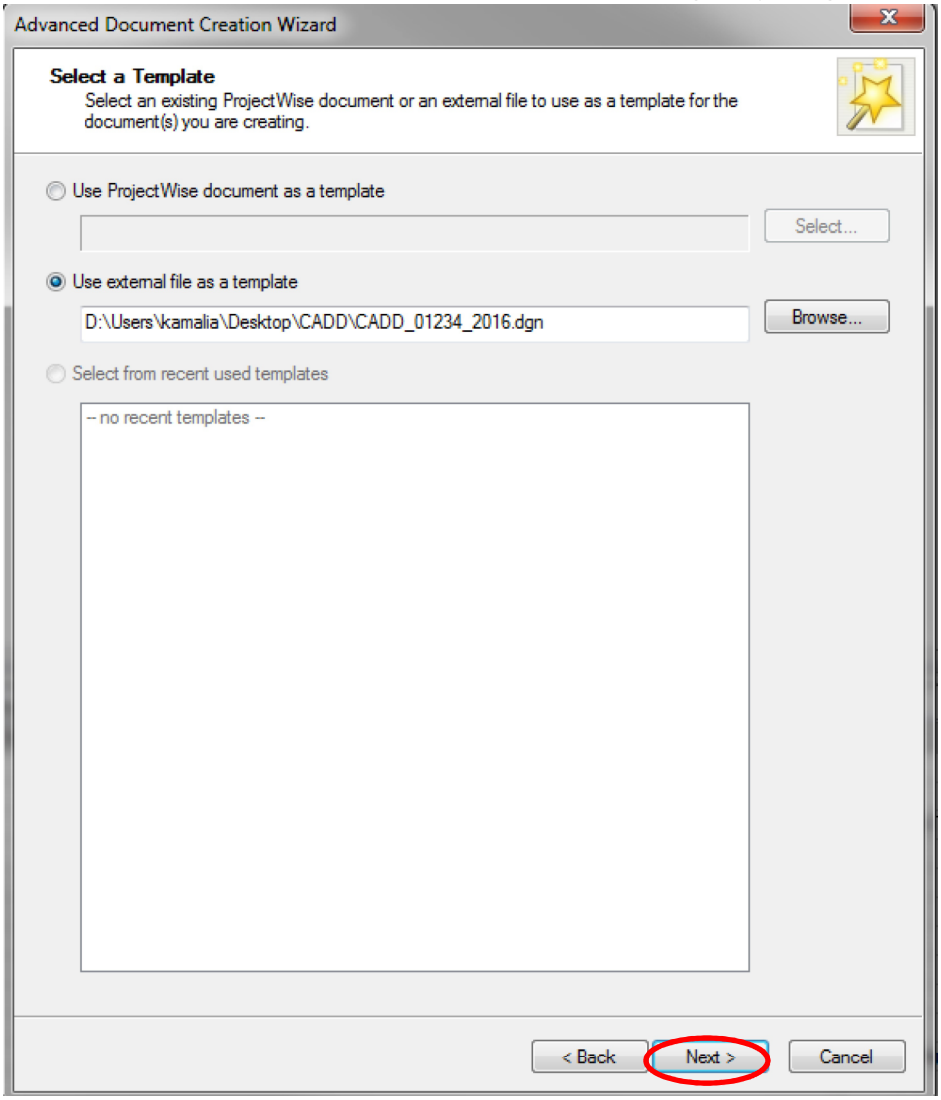
4. Press Next



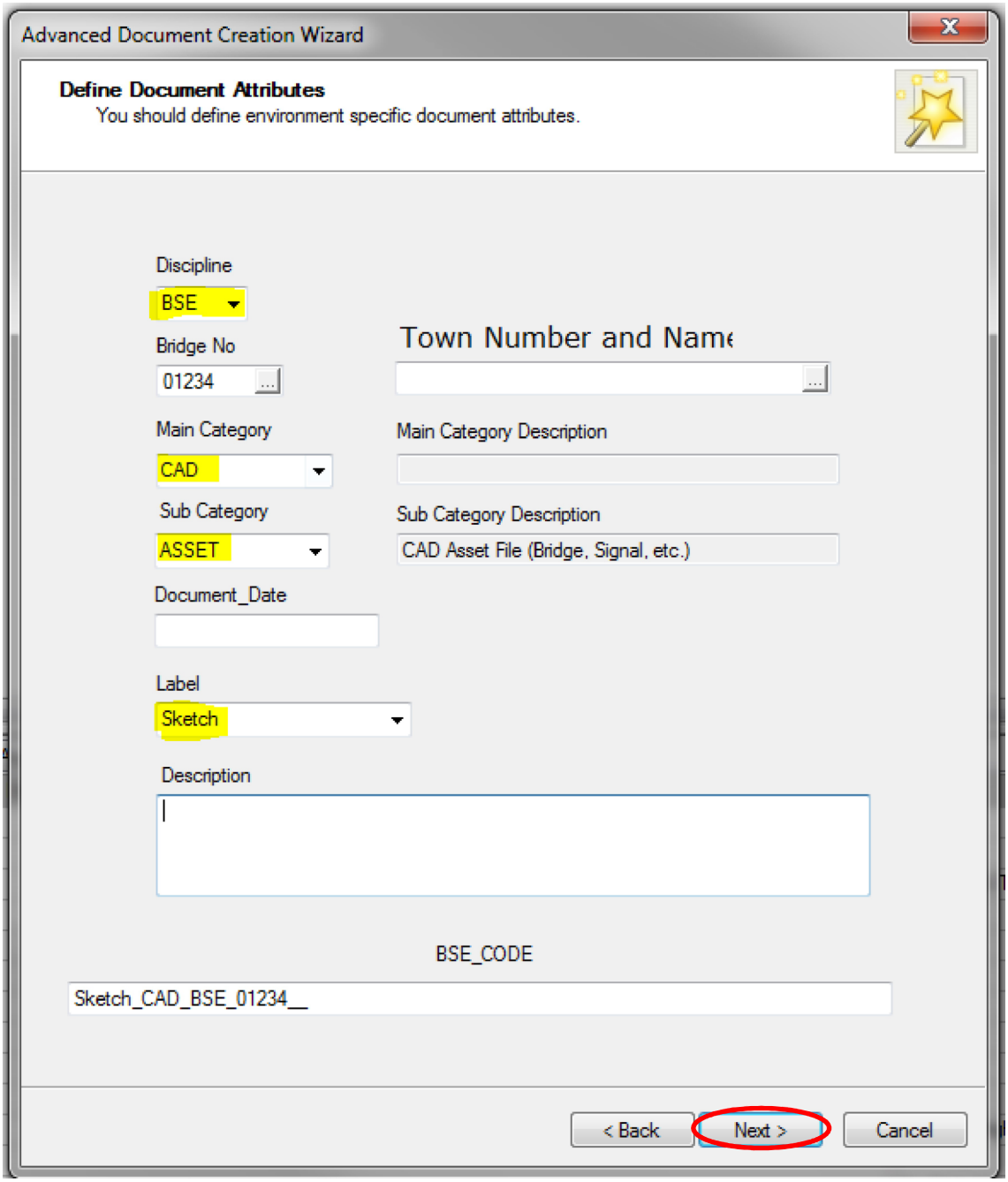
5. Make sure the correct folder is selected (highlighted in blue) then press next



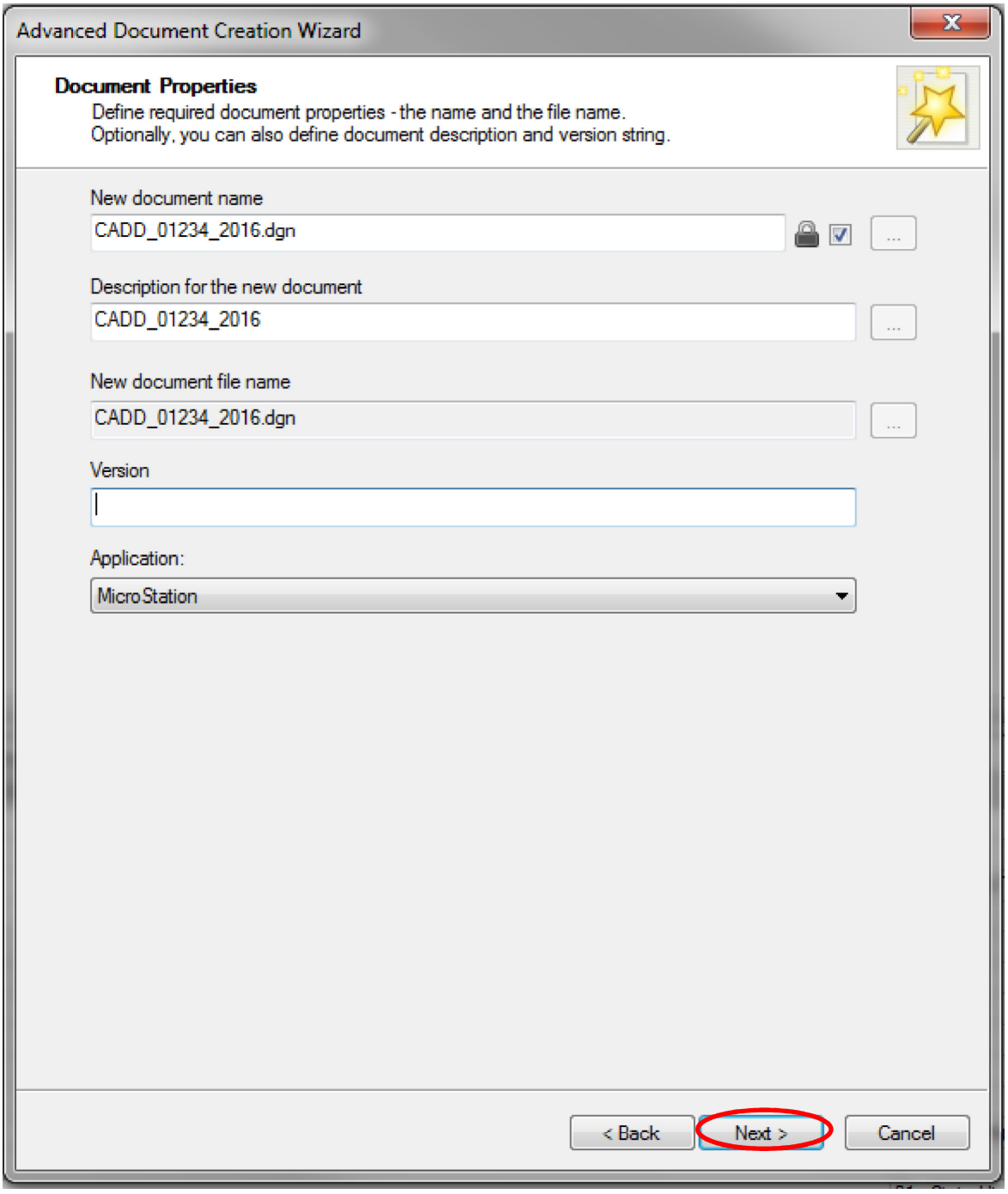
6. This window shows the file path. Do not change anything here. Click Next.



7. Make sure the Discipline, Main Category, Sub Category, and the Label are filled in as shown below.
   Then click Next.



8. Do not change anything in this window. Click Next



9. Click Next. Now the document is loaded into ProjectWise

CHAPTER 9

DEFICIENCIES AND MAINTENANCE WORK ITEMS

During the inspection of a bridge or other structure, there are two types of deficiencies that should be noted; critical and noncritical.

Critical deficiencies are those that, if left unattended, will create a hazard to the traveling public or severely limit the use of the structure. If critical deficiency items are discovered during the inspection process, they should be immediately reported in accordance with Section 3.2.7 - Critical Finding Reporting. These deficiencies are to be addressed by a Critical A or B work item.

Noncritical deficiencies are those that if left unattended will lead to further deterioration of the bridge. These deficiencies are to be addressed by a Priority or Routine work item. The repairs will be programmed into a maintenance schedule and may be performed by state Maintenance forces, by a contractor retained by the Maintenance section, or be reason for inclusion of the bridge in a bridge rehabilitation/replacement project through the Design Section.

Work items should fully identify the size, location and the quantity of the required repairs and the priority of each repair be indicated.

The attached work flows indicate the procedures for issuing work items in InspectTech (SMS).

It is not the intention of Bridge Safety and Evaluation (BS&E) to enumerate basic and routine maintenance work with SMS work items. These items may be included in the inspection report, but will not be called out for repair if they do not have a significant effect on the bridge structure or public safety.

Priority Codes for Work Items

The following priority codes and respective response times will be used when specifying required repairs to bridges and sign supports. The examples listed are only general guidelines and should not be considered a complete listing. The criticality of any defect should be reviewed on a case-by-case basis.

Critical Finding A: IMMEDIATE response by Maintenance forces.

Examples of Critical Finding A deficiencies:

- Cracks in main steel members.
- Substantial section loss on steel members requiring immediate strengthening.
- Holes through decks or sidewalks.
- Critical bearing deficiencies such as but not limited to: severely spalled concrete bearing pedestal not supporting masonry plate, cracked bronze bearing plate or severely tilted rocker bearing.
- Severely damaged or missing bridge rail/parapets/fence.
- Major distortion/bowing/buckling of primary steel members.
- Obvious sagging or deflection of concrete members.
- Broken and protruding metal steel deck joint sections requiring immediate action.
- Loose concrete above key features (a roadway, parking lot, pedestrian walkway or other area of foot traffic, active railroad line or waterways likely to be used for boating or other activities).
- Significant undermining of substructure elements.
- Overhead signs or supports that have been severely damaged by impact or deterioration.

Critical Finding B: Response within 1 WEEK.

Examples of Critical Finding B deficiencies:

- Substantial section loss on steel members.
- Loose deck joint components.
- Navigation lights not functioning.
- Spalls in a sidewalk surface that pose a pedestrian hazard.
- Uneven sidewalk transitions (critical approach settlement). Notify appropriate owner.
- Damaged pedestrian barriers (rail, fence or parapet) with openings six (6) inches or greater in diameter.
- Damaged protective barrier over electrified railroad. Notify appropriate owner.

Priority Repair: Structural or safety concerns - Examples of Priority Repair deficiencies:

- Missing structural fasteners. Provide location, quantity and size (i.e. diameter, length and grade).
- Settlement at the bridge joints that causes uneven roadway.
- Uneven sidewalk transitions (>1 inch). Notify appropriate owner.
- Exposed strands on prestressed concrete members.
- Isolated defective bridge expansion bearings.
- Weep pipes draining onto steel structural members.
- Impact damage to guide rail to parapet attachment sections.
- Debris in a waterway that affects hydraulic capacity or scour.
- Damaged protective fencing over non-electrified railroad (for protective fencing ownership other than the State, notify appropriate owner instead of creating a work item).
- Fully clogged scuppers.
- Dents/gouges in beams.
- Cracked welds affecting primary elements (i.e. cover plate welds).
- Minor undermining of substructure.
- Large voids, shifting or cracked stones in masonry elements.
- Missing sections of bridge rail that do not pose an immediate safety hazard.
- Intact hollow concrete over key features.

Routine Repair: Of lesser importance, but needing attention

Examples of Routine Repair deficiencies:

- Cohesion cracks or extensive adhesion cracks in asphaltic plug joints.
- Active leaking through deck joints.
- Locations of severe rusting on steel members (isolated locations are assigned to Bridge Maintenance).
- Cleaning pigeon debris. May be a higher priority if needed for inspection access.
- Isolated severe or widespread moderate spalls or severe scale with exposed reinforcing steel (the intent is not to create a work item for every miscellaneous spall or area of scale).
- Weep pipes draining onto concrete structural members.
- Debris that is affecting structural components.
- Missing, damaged or non-functioning drainage components.
- Scour along substructure.
- Significant masonry repointing necessary.
- Spot painting needs.
- Cracked welds affecting secondary members or welds that could propagate to affect primary members.
- Damaged pedestrian barriers (rail, fence or parapet) with openings less than 6 inches in diameter.
- Erosion with damaged/ undermined concrete block slope protection.

Other Work Items:

The following work items should be assigned to the bridge ("ATB") by the Bridge Safety Project Engineer (See "Work Flow Process" flow chart):

- Painting for full length of beams or full lines of beam ends.
- Replacing full lines of bearings.
- Installation of elastomeric bearing pads.
- Confined space entry issues.
- Scour mitigation needs.

Non Work Items

These items require an e-mail with photographs to Bridge Maintenance and will not be generated as work items.

Examples of E-Mail Items:

- Potholes in a bridge deck or approach that could damage a vehicle or cause a driver or motorcyclist to lose control of their vehicle.
- Cutting back vegetation that impedes traffic vision.
- Damaged approach guide rail.
- Damaged impact attenuator systems.
- Drainage systems discharging into the travel way.
- Electrical work (missing hand hole and junction box covers, damaged light standards, burned out bulbs, etc.).
- Tree and brush cutting for inspection access – provide 3 months advance notice, if possible.
- Embankment erosion or undermining of roadway beyond wingwalls.
- Damaged/missing posting signs.

Commentary:

- Hollow haunches should be a separate work item from hollow concrete.
- Dirt approach path transitions to sidewalks do not warrant a work item.
- All work items shall be based on the current needs of the bridge. The lead inspector is responsible for reviewing open work items to determine if the work is still required based on the above criteria.
- Since the repairs are tracked by structural component, there may be a need to create more than one work item for the same defect. For example, if there are hollow areas on the abutments and deck, one work item would be created for "Hollow Concrete – Substructure" and one for "Hollow Concrete – Deck"
- All work items should have a photograph of the deficiency if available. Note - only the first attached photograph will appear on the printout that Maintenance receives. Sketches may be attached in pdf format to clarify the location of deficiencies.
- For bridges that have a project going into construction within the next year, check the plans to see if the deficiencies are to be addressed under the project. If so, do not create work items unless they are for immediate safety concerns. If the deficiencies are not included in the project, contact the designer to see if they can be added. Bridges still in early design phase, unless a replacement is planned, should still have work items – which should be incorporated into the design.
- The inspection team should contact the BS&E office regarding work item deficiencies that are discovered in a location that requires a complex pattern, road/ramp closure or other difficult traffic control aspect so that Maintenance has the option to utilize the inspection traffic pattern.
- Quantities of defects may be updated in any open work item to reflect changes found during a recent inspection. Significant changes, or additional new locations requiring repair should be followed by an e-mail to alert Bridge Maintenance of the change in repair scope.

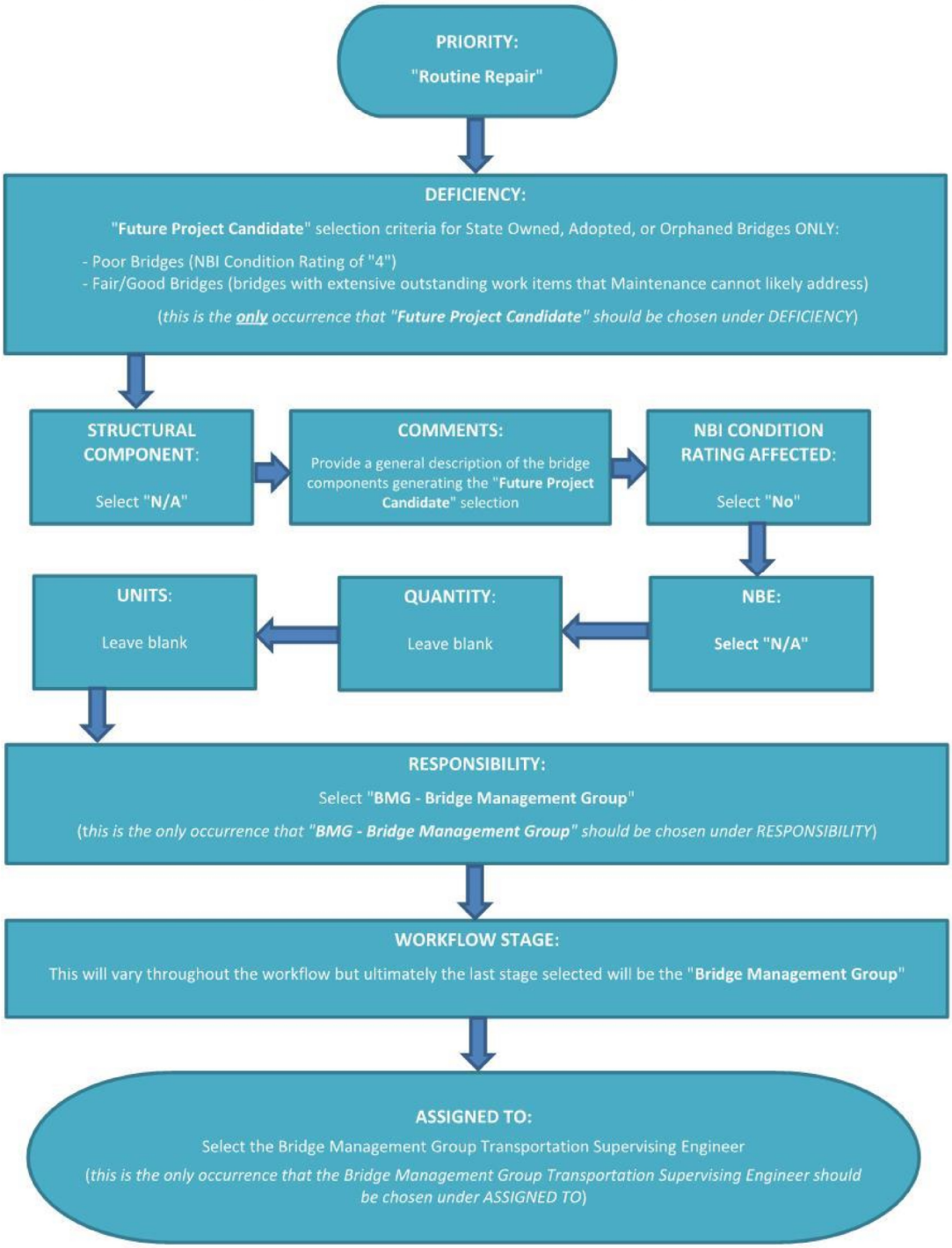
Priority	Deficiency	Responsibility	Workflow Stage	Assigned to
Critical Finding A *1. Call Bridge Maintenance. Do not submit Work Item until discussing with Bridge Maintenance.* *2. Submit the Work Item.* *3. Email the Bridge Safety & Evaluation Unit's Administrative Assistant/Secretary with a copy of the Work Item.*	Should Select: • **Bearing** • **Bridge Rail** • **Collision Damage** • **Deck Joint** • **Electrical** • **Embankment Erosion** • **Fence** • **Hollow Concrete** • **Hollow Haunch** • **Masonry** • **Mechanical** • **Parapet** • **Scour** • **Sidewalk/Safety Walk** • **Spalls** • **Steel Corrosion** • **Welds/Cracks** • **Other** Should Not Select: • **Approach Rail Transition** • **Debris** • **Debris in Waterway** • **Drainage System** • **Pigeon Waste** • **Protective Coating** • **Weep Pipe** • **Future Project Candidate**	Should **Only** Select: • **BMT - Bridge Maintenance** Should Not Select: • **ATB - Assign to Bridge** • **BMG - Bridge Management Group** • **HMT - Highway Maintenance** • **SBD - State Bridge Design** • **CBD - Consultant Bridge Design** • **MJR - Major Bridge Group** • **HWD - Highway Design** • **TWN - Town** • **UTL - Utility** • **RRD - Railroad** • **AIR - Airport** • **PVT - Private**	Should Select: • **Supervisor Review** • **Completed** • **TE 3 Review** • **Maintenance Review** Should Not Select: • **Project Manager** • **Bridge Management Group**	Should Select: • Pass for any **Bridge Safety & Evaluation Supervising Engineer** for the **Supervisor Review** selection • Pass for N/A for the **Completed** selection • Pass for any **Bridge Safety & Evaluation Transportation Engineer 3** for the **TE 3 Review** selection • Pass for the **Bridge Maintenance Transportation Bridge Safety Principal Engineer** for any **Maintenance Review** selection

Priority	Deficiency	Responsibility	Workflow Stage	Assigned to
Critical Finding B *1. Call Bridge Maintenance. Do not submit Work Item until discussing with Bridge Maintenance.* *2. Submit the Work Item.* *3. Email the Bridge Safety & Evaluation Unit's Administrative Assistant/Secretary with a copy of the Work Item.*	Should Select: • Approach Rail Transition • Bearing • Bridge Rail • Collision Damage • Debris • Debris in Waterway • Deck Joint • Drainage System • Electrical • Embankment Erosion • Fence • Hollow Concrete • Hollow Haunch • Masonry • Mechanical • Parapet • Scour • Sidewalk/Safety Walk • Spalls • Steel Corrosion • Welds/Cracks • Other Should Not Select: • Pigeon Waste • Protective Coating • Weep Pipe • Future Project Candidate	Should Only select: • BMT - Bridge Maintenance Should not Select: • ATB - Assign to Bridge • BMG - Bridge Management Group • HMT - Highway Maintenance • SBD - State Bridge Design • CBD - Consultant Bridge Design • MJR - Major Bridge Group • HWD - Highway Design • TWN - Town • UTL - Utility • RRD - Railroad • AIR - Airport • PVT - Private	Should Select: • Supervisor Review • Completed • TE 3 Review • Maintenance Review Should Not Select: • Project Manager • Bridge Management Group	Should Select: • Pass for any **Bridge Safety & Evaluation Supervising Engineer** for the Supervisor Review selection • Pass for N/A for the Completed selection • Pass for any **Bridge Safety & Evaluation Transportation Engineer 3** for the TE 3 Review selection • Pass for the **Bridge Maintenance Transportation Bridge Safety Principal Engineer** for the Maintenance Review selection

Priority	Deficiency	Responsibility	Workflow Stage	Assigned to
Priority Repair	Should Select: • Approach Rail Transition • Bearing • Bridge Rail • Collision Damage • Debris • Debris in Waterway • Deck Joint • Drainage System • Electrical • Embankment Erosion • Fence • Hollow Concrete • Hollow Haunch • Masonry • Mechanical • Parapet • Scour • Sidewalk/Safety Walk• Sidewalk/Safety Walk • Spalls • Steel Corrosion • Welds/Cracks • Weep Pipe • Other Should Not Select: • Future Project Candidate • Pigeon Waste • Protective Coating	Should Select: • BMT - Bridge Maintenance • TWN - Town • UTL - Utility • RRD - Railroad • AIR - Airport • PVT - Private Should Not Select: • ATB - Assign to Bridge • BMG - Bridge Management Group • HMT - Highway Maintenance • SBD - State Bridge Design • CBD - Consultant Bridge Design • MJR - Major Bridge Group • HWD - Highway Design	Should Select: • Supervisor Review • Completed • TE 3 Review • Maintenance Review • Open Should Not Select: • Project Manager • Bridge Management Group	Should Select: • Pass for any **Bridge Safety & Evaluation Supervising Engineer** for the Supervisor Review selection • Pass for N/A for the Completed selection • Pass for any **Bridge Safety & Evaluation Transportation Engineer 3** for the TE 3 Review selection • Pass for the **Bridge Maintenance Transportation Bridge Safety Principal Engineer** for the Maintenance Review selection • Fail for **ATB, ATB** for the Open selection

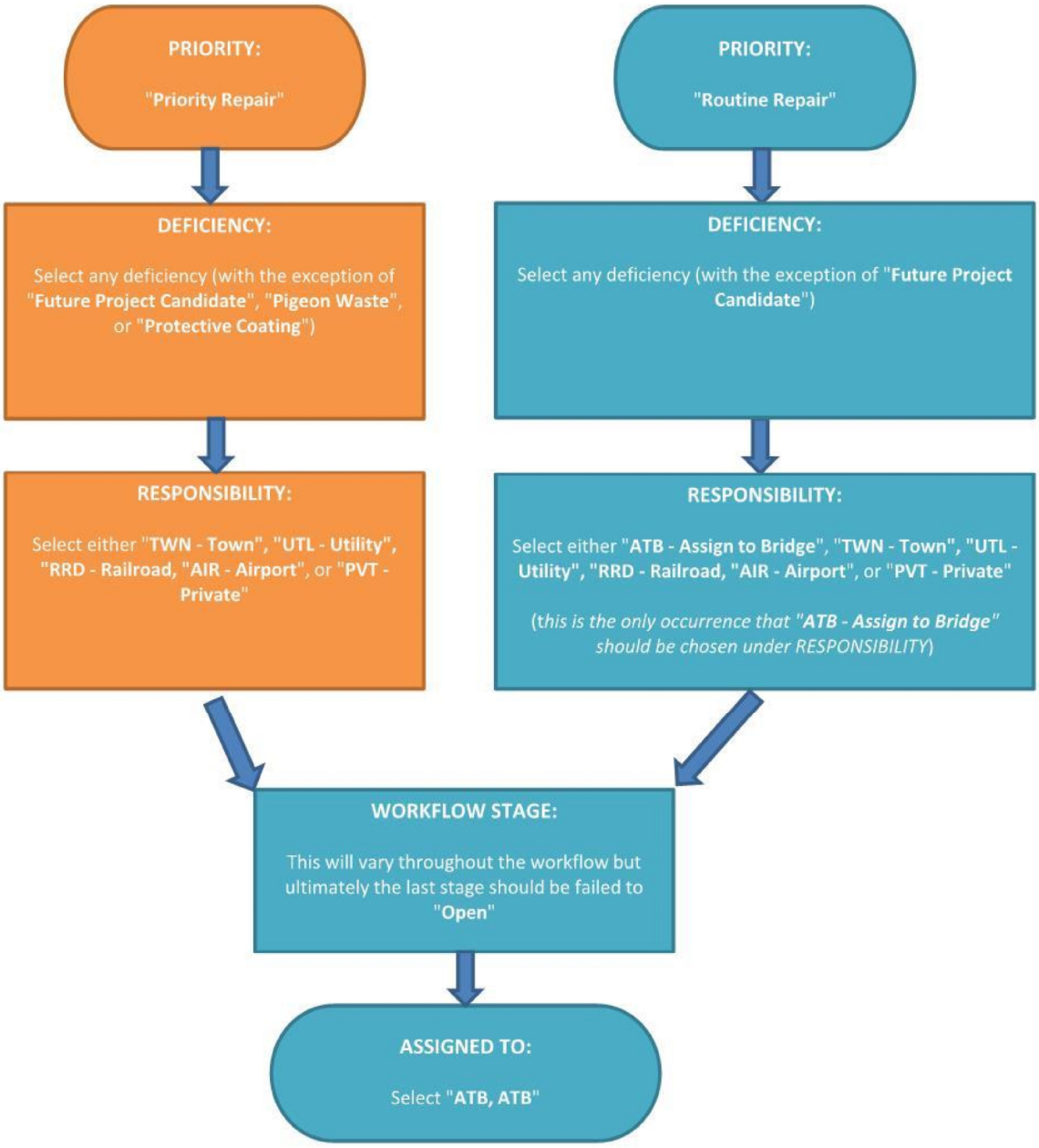
Priority	Deficiency	Responsibility	Workflow Stage	Assigned to
Routine Repair	Should Select: • **Approach Rail Transition** • **Bearing** • **Bridge Rail** • **Collision Damage** • **Debris** • **Debris in Waterway** • **Deck Joint** • **Drainage System** • **Electrical** • **Embankment Erosion** • **Fence** • **Hollow Concrete** • **Hollow Haunch** • **Masonry** • **Mechanical** • **Parapet** • **Pigeon Waste** • **Protective Coating** • **Scour** • **Sidewalk/Safety Walk** • **Spalls** • **Steel Corrosion** • **Welds/Cracks** • **Weep Pipe** • **Other** • **Future Project Candidate**	Should Select: • **ATB - Assign to Bridge** • **BMT - Bridge Maintenance** • **BMG - Bridge Management Group** • **TWN - Town** • **UTL - Utility** • **RRD - Railroad** • **AIR - Airport** • **PVT - Private** Should Not Select: • **HMT - Highway Maintenance** • **SBD - State Bridge Design** • **CBD - Consultant Bridge Design** • **MJR - Major Bridge Group** • **HWD - Highway Design**	Should Select: • **Supervisor Review** • **Completed** • **TE 3 Review** • **Maintenance Review** • **Bridge Management Group** • **Open** Should Not Select: • **Project Manager**	Should Select: • Pass for any **Bridge Safety & Evaluation Supervising Engineer** for **Supervisor Review** selection • Pass for N/A for the **Completed** selection • Pass for any **Bridge Safety & Evaluation Transportation Engineer 3** for the **TE 3 Review** selection • Pass for the **Bridge Maintenance Transportation Bridge Safety Principal Engineer** for the **Maintenance Review** selection • Pass for the **Bridge Management Group Transportation Supervising Engineer** for the **Bridge Management Group** selection • Fail for **ATB, ATB** for the **Open** selection

Work Flow Process (Bridge Safety & Evaluation Staff)
for the selection of "Future Project Candidate"



Work Flow Process (Bridge Safety & Evaluation Staff)
for Assigning Work to a Bridge (ATB, ATB)

*For deficiency that bridge maintenance **cannot** do and that can wait an unspecified period of time until a future project can inherit the work*
Or for Responsibility assigned to Town, Utility, Railroad, Airport or Private



MEASURING CLEARANCES AND PREPARING CLEARANCE DIAGRAMS

Reference: The Department's Policy on Posting Vertical Clearances

Clearance diagrams must be on file for all bridges over roadways or railroads. These diagrams give the necessary horizontal and vertical clearance information needed to complete the coding items required by the *FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges* (Ref. FHWA Coding Guide Item Nos. 10, 47, 50, 51, 53, 54, 55 & 56) These measurements provide important information on the maximum size vehicles that can pass under or through the bridge structure. Where these measurements are less than legal minimums, they are used for establishing posted limits on the bridge.

Clearance diagrams should be drawn as a plan view of the bridge showing all lane markings and curblines on the roadway, or the position of all train tracks. Roadside or trackside obstacles including guide rail, substructure elements, top or toe of slopes steeper than 3:1, etc., should also be shown. Minimum dimensions that are to be coded for the FHWA Items above, should be labeled on the clearance diagram. See the example in Figure 6.0b.

For multiple span bridges, it may be necessary to provide a sketch for each roadway crossing to adequately record the necessary clearance measurements. For through type structures (like a truss), or if the bridge is located in a multi-level interchange with roadways overhead, a clearance diagram for the over-bridge clearances will be required in addition to an under-bridge clearance diagram.

A new clearance diagram will be required if there is not one currently on file or any time a change to the roadways at the bridge cause measurements to change. These changes could include the roadway being overlaid or milled, lane positions being relocated/adjusted, the addition or relocation of guide rail or traffic barriers, the addition of a new sign support over the structure, etc.

On routine inspections, a copy of the previous clearance diagram shall be included in the inspection report. All minimum clearances shall be verified in each span of the bridge and enough additional measurements shall be checked to verify that changes to the roadway (i.e. lane relocation, overlaying, etc.) have not taken place. The controlling vertical and horizontal clearances in each span shall be verified on every inspection. When verifying measurements, dimensions should not normally change unless there has been some work done to change the measurement. The minimum clearance dimensions are what are desired. Do not change previously coded clearance measurements without documentation as to why they have changed.

Vertical Measurements

For spans over railroads, take vertical clearances at each rail of each track and at both fascias of each span that crosses the tracks. For spans over roadways, vertical clearances should be taken at each painted line marking (one at the center of double lines), each curbline, at the edge of the pavement, and at all visible breaks in grade where the cross slope on the road changes direction. These measurements are duplicated at both fascias in each span that crosses a roadway. (For roadways with limited or no pavement markings, see below for instructions.)

Measurements for **over-bridge clearances** are taken to the underside of the above structure or all sign structures over the roadway, but not to light standards, trees or overhead wires.

It is important to remember that the objective of these measurements is to locate a minimum clearance. As such, it may be necessary to take different or additional measurements when minimum clearances are not at the usual edge of lane or fascia locations.

Examples:

- The roadway beneath the bridge may have a cross slope with a crown that is not located right on a lane line. Take the clearance at the crown of the roadway.
- If the roadway beneath the bridge has a rise beneath the bridge or is on a vertical crest curve that peaks beneath the bridge, the minimum vertical clearance may be located near the middle of the bridge rather than at the fascias. Be aware of this possibility particularly on very wide bridges.
- If the road beneath the bridge dips significantly at the bridge, it may be possible for a long vehicle to get stuck under the structure due to "bridging" of the truck chassis. If it is suspected that this potential exists, additional investigation should be requested. Surveying may be necessary to determine the effective vertical clearance.
- If the roadway beneath the bridge is on a grade, the vertical clearance to one side of a fascia beam may be less than the other side. Check the fascia edge and the interior edge. This will be more prominent on wide beams like box beams.
- If a bridge beam has a bolted splice or other attachment to the underside that protrudes from the bottom of the structure, the vertical clearance should be checked at this location.
- Always check and record the vertical clearances at locations of impact damage on the bridge.

Item No. 10 in the FHWA coding guide is intended to identify the largest (tallest) vehicle that can be moved beneath the structure within a 10-foot lane width. If the lane widths where measurements were taken are greater than the typical 12 feet then additional measurements should be taken to code Item No. 10. Locate the maximum vertical clearance at the largest (tallest) lane opening under the bridge. Take an additional vertical clearance measurement 10 feet to either side of the maximum clearance.

When measuring vertical clearances, only a direct reading vertical measuring rod should be used (bridges with clearances in excess of the normal 25 feet measuring rod are an exception). Survey leveling rods are not appropriate for this work. The rod must be held vertical to get the proper measurement. This should be checked using a bubble level on the rod or by having another inspection team member sight the rod to insure it is plumb. The rod may be swept back and forth to ensure that the minimum clearance is obtained. Vertical measurements should be taken to the nearest inch with fractional inches truncated (i.e.: 14' – 5 ¾" is recoded as 14' – 5").

Currently, vertical clearances of less than 14'- 6" require the structure to be posted for the lowest clearance. All clearances less than the posting limit should be carefully verified. Current policy is to post structures for 3 inches less than the minimum measured clearance to account for snowfall, vehicle bounce, etc. Additionally, CTDOT Traffic Guidelines call for advance warning posting signs to be installed if the posted restriction is less than 13'- 6". Advance signs may be placed at approach road intersections, or other points where the affected vehicle can detour or turn around.

Vertical clearance warning signs may be present – located at the approaches to the structure and\or attached to the fascia beams of the structure. Photographs must be taken and locations of the vertical clearance warning signs must be verified at every inspection. Note the absence, disfigurement and non-serviceability of these signs, as well as any construction work at bridge, such as bituminous concrete overlay or pavement removal, or line restriping. These factors may result in a revision to the posted clearances of the bridge.

Horizontal Clearance Measurements

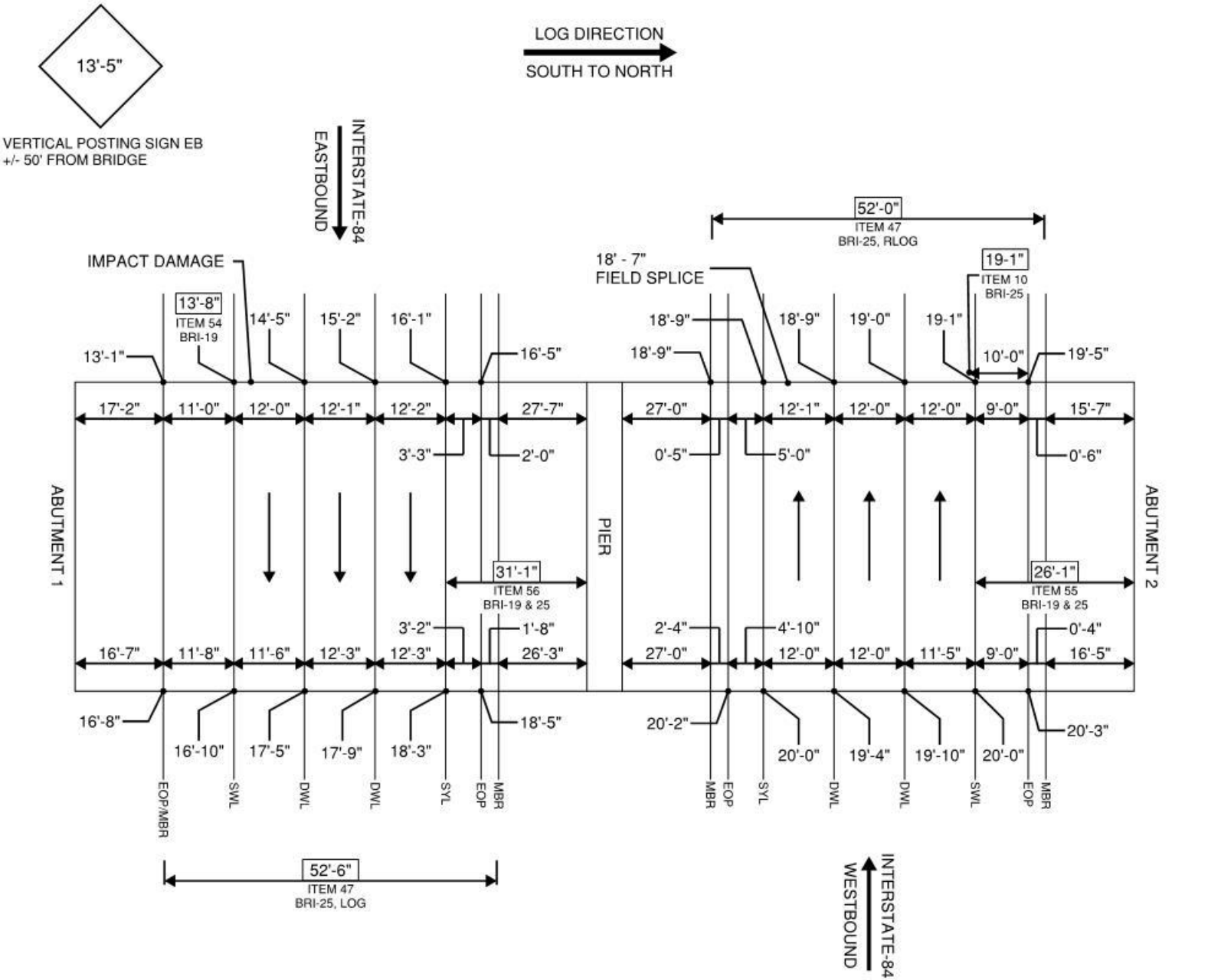
Lateral clearances must be measured in accordance with the FHWA coding guide Item Nos. 47, 51, 55 and 56. All lane widths, shoulder widths, distances to guide rails, fences and substructure units or toe\top of slope (greater than 3:1) should be measured and shown. Lateral clearance measurements from the edge of the travel way to a roadside obstruction or substructure unit should be taken at each fascia of the bridge to locate the minimum in case the roadway is skewed to the bridge or curved. When measuring clearances at railroad tracks, measure from the nearest trackside obstruction to the closest rail as well as distance between rails and distance to adjacent tracks. Caution: Do not lay metallic measuring tapes across railroad tracks, as they can affect rail signal systems.

When measuring lane widths, note that standard highway designs and normal paving equipment produce standard size lane widths such as the 12 feet lane. Minor deviations in lane striping should not be used to show a typical lane configuration if plans are available to indicate that the standard sizes were intended. In general, indicate the typical lane widths if actual measurements are within ±3 inches. Likewise, paved shoulder widths are normally intended to be in multiples of ±6 inches. Lateral clearance measurements from the edge of the traveled way (not the shoulder) to the nearest roadside or trackside obstacle should be recorded exactly as measured. (For roadways with limited or no pavement markings, see below for instructions.)

Clearance Measurements for Bridges with No Lane Markings

The roadway may or may not have painted striping at the centerline of the roadway or along the shoulders or pavement edges. In cases where only the centerline striping is present – use a 12-foot lane width for a standard size lane or lanes – when the standard lane of 12 feet is not appropriate, a lane width as small as 8 feet may be used. In the case where the centerline striping is not present, judgement must be used in determining the centerline of the roadway. Observe the natural traffic flow in the assumed traffic lanes to determine the best centerline of the roadway.

Vertical and Horizontal clearance measurements should be made at the assumed centerline and edge of lane locations, as well as other appropriate places, such as edge of pavement, curbline, etc. The clearance diagram should clearly indicate the locations and dimensions of assumed traffic lanes, as shown in the example.

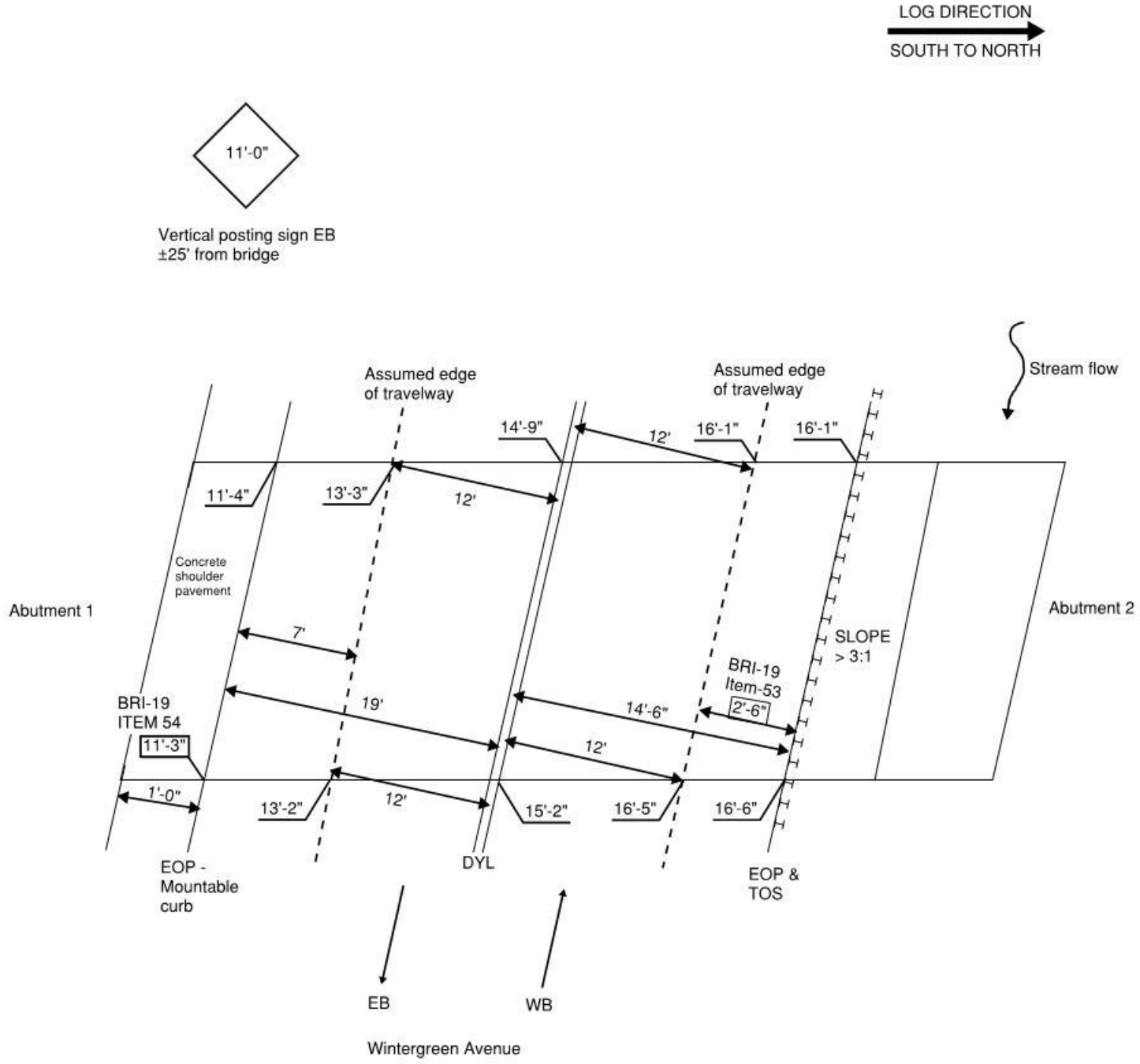


LEGEND:

SWL SOLID WHITE LINE
DWL DASHED WHITE LINE
SYL SOLID YELLOW LINE
EOP EDGE OF PAVEMENT
MBR METAL BEAM RAIL

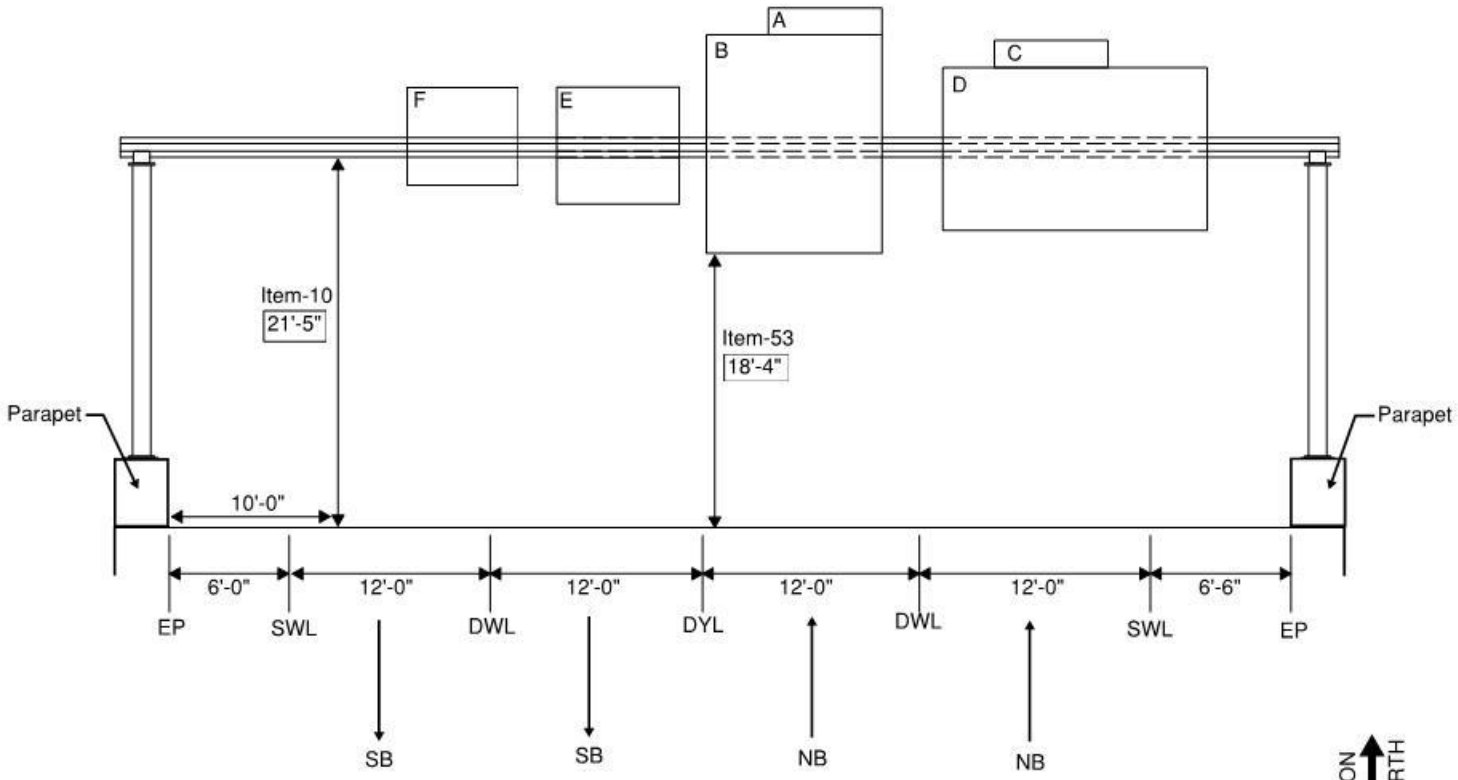
CLEARANCE DIAGRAM

(N.T.S.)



LEGEND:
EOP - Edge of Pavement
TOS - Toe of slope
SWL - Solid white line
DWL - Dashed white line

Clearance Diagram



NOTE:
Two way traffic on the bridge
Overhead sign over the bridge

LEGEND:
EOP - Edge of Pavement
SWL - Solid white line
DWL - Dashed white line
DYL - Double Yellow line

Clearance Diagram

Revised June 1, 2019

Bridge Component Labeling Systems for Inspection Reporting

Reference: BIRM NOVEMBER 2015 – Section 4.4.4

The proper labeling of the bridge components is necessary to be able to record and describe the locations of deficiencies. Regardless of the structure's orientation, the bridge component labelling system should be established based on the log direction of the inventory route crossing the structure. Labeling advances from the beginning to the end of the bridge progressing in the log direction.

The proper log direction may be established by using one of the following Connecticut Department of Transportation (CTDOT) documents, available on the CTDOT website.

1. Highway Log – Connecticut State Numbered Routes and Roads
2. Traffic Log – Traffic Volumes – State Maintained Highway Network
3. Town Road List – Listing of Locally Maintained Roads by Town

It is possible (and common) to have a bridge that is oriented West to East on a roadway logged North or a bridge oriented South to North on a roadway logged East. Also, there are several state routes and town roads that are logged North to South or East to West (e.g.: Interstate-691, Route 618, Route 629 & Route 639). Remember that compass direction is independent of which way the roadway is logged. For town roads, two or more bridges on the same road must have the same log direction and orientation.

When establishing the bridge orientation, the log direction of the route should be referenced. The abutments and piers should be referenced by a number (e.g. Abutment No. 1, Abutment No. 2, Pier No. 1, Pier No. 2, Pier No. 3, Etc.), to allow someone in the field to easily orient the labeling system. The wingwalls should be labeled, (i.e. – Wingwall 1A (WW1A) for the Abutment No. 1 "Left" Wingwall, – Wingwall 1B (WW1B) for the "Right" Wingwall, etc.) The girders and stringers are numbered from left to right facing in the log direction. The Floorbeams are numbered from the beginning (Abutment No. 1) to the end (Abutment No. 2) of the bridge facing in the log direction. It may be useful to show other special or critical features on the key plan (e.g. Pin & Hangers, Steel Cross-Girders & Bents, Ship-Laps, Bolted Girder Splices, Steel Sheet Piling Left-In-Place, Cat Walks (Inspection Staging), Fracture Critical Steel Details & Etc.) to assist with planning for inspection access.

Once a bridge labeling system is determined, a key plan should be prepared that shows the labeling for all the bridge components as shown in Figure 6.0a, 6.0b and 6.0c. It may be necessary to have several key plans for one bridge – the size of the structure and the number of bridge components will be a factor for number of the key plan sheets. This key plan or key plans should remain a part of the permanent file and be referenced for all subsequent inspections.

The following are features that should be shown on the key plan.

- "North" Arrow (Magnetic North)
- Inventory Route Log Direction Arrow
- Direction of Stream Flow
- Direction of Tidal Flow
- Roadway or Roadways (Arrows Showing Direction of Traffic)
- Railroad Tracks (Track Numbers If Any)
- Concrete or Masonry Dams/Spillways

The following are examples of the abbreviations that should be used on the key plan.

- Abutment = A1 & A2
- Pier = P1, P2, P3, Etc.
- Girder = G1, G2, G3, Etc.
- Floorbeam = FB1, FB2, FB3, Etc.
- Stringer = STR1, STR2, STR3, Etc.
- Column = COL1, COL2, COL3, Etc.
- Wingwall = WW1A, WW1B, WW2A & WW2B

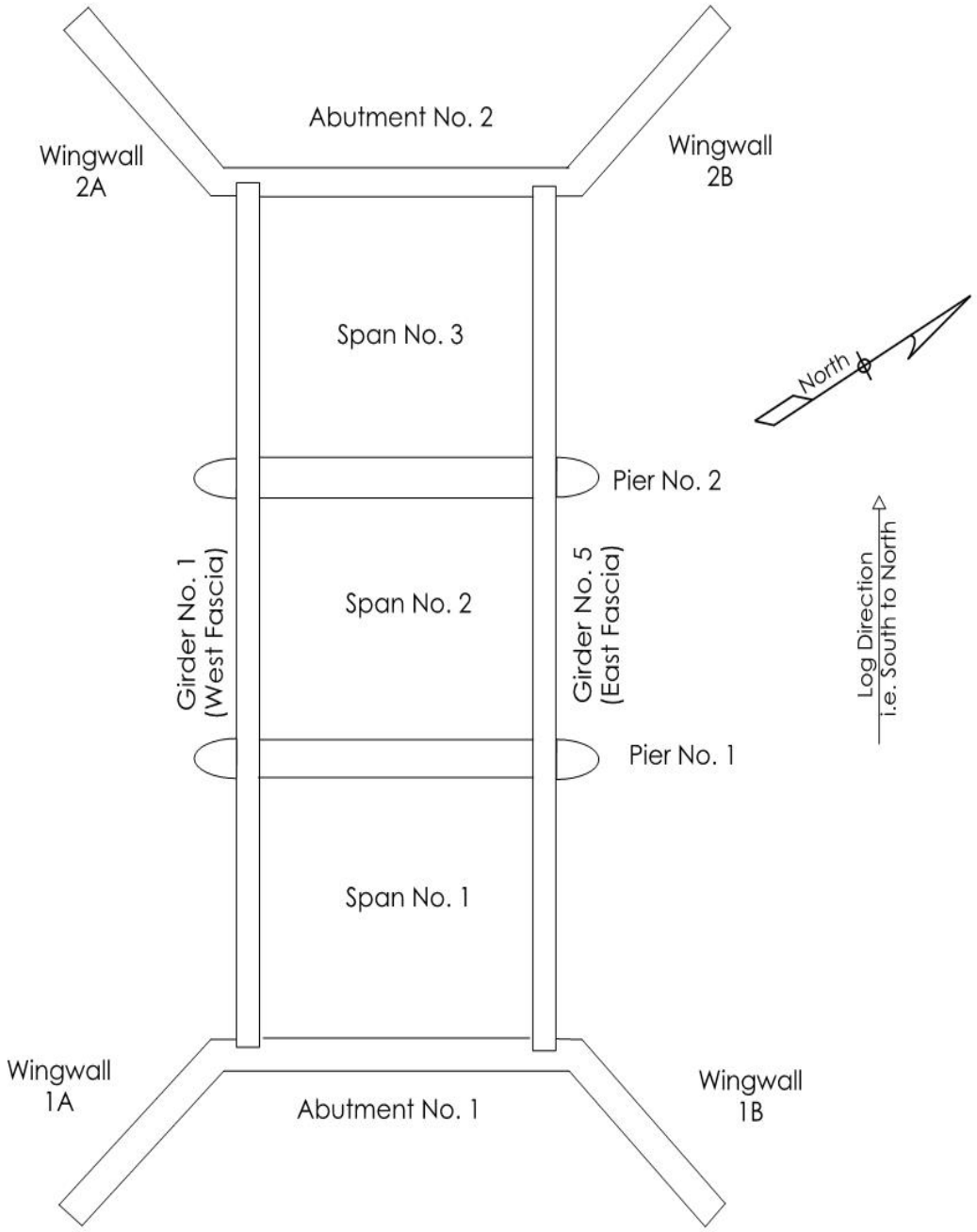
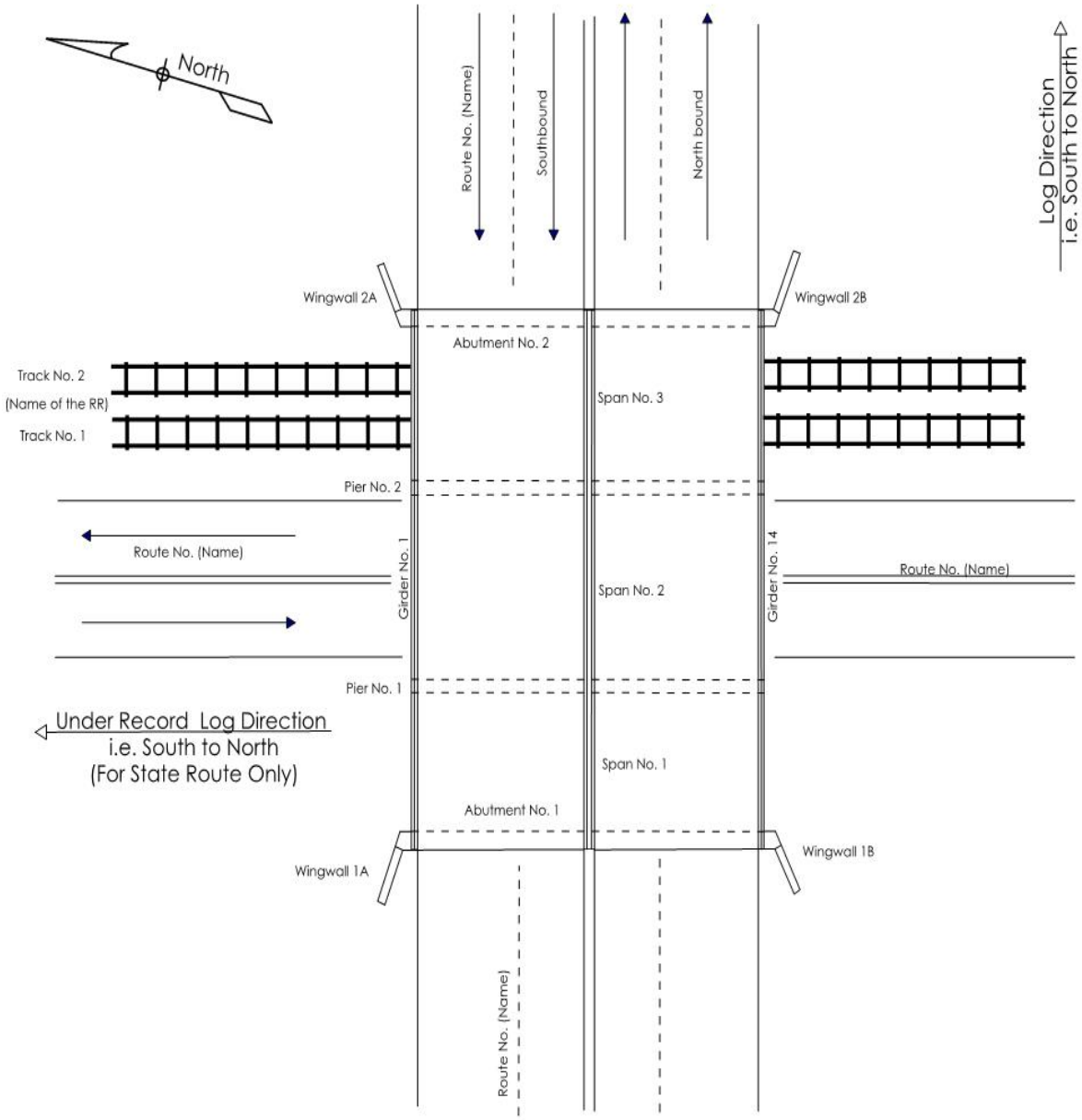


Figure 6.0a – Bridge Component Labeling System



Key Plan

Figure 6.0b – Key Plan Example No. 1

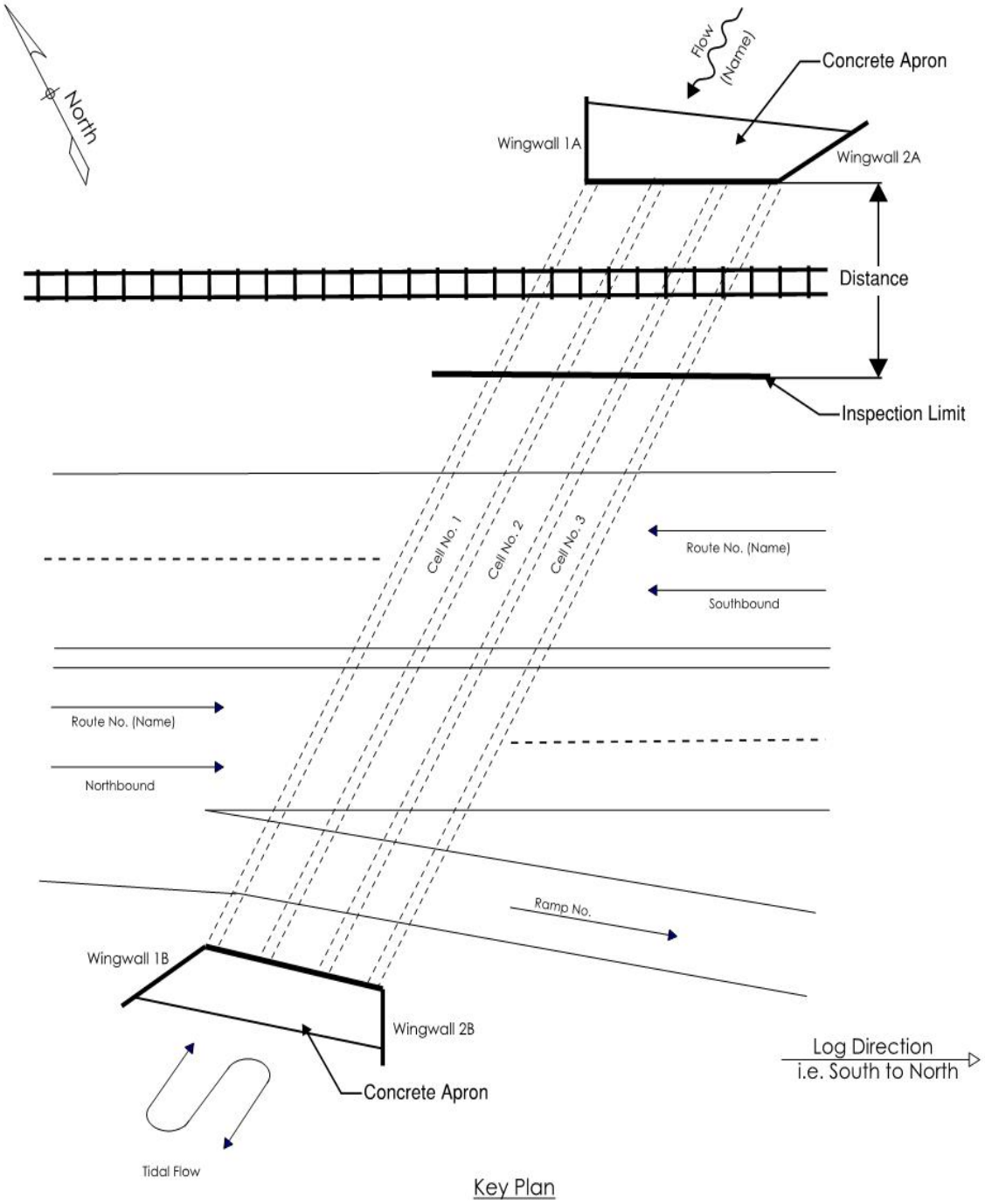


Figure 6.0c – Key Plan Example No. 2

Connecticut DOT

Office of Engineering

Number: EB-2019-2

Date: March 18, 2019

ENGINEERING BULLETIN

Theodore H. Nezames, P.E.
2019.03.27
12:17:15-04'00'

Division Chief, Bridges

Revisions to Bridge Inspection Manual

As described in Bridge Safety Memo 2018-2, the criteria for In-Depth inspections is now revised. The new definition of In-Depths focuses on individual bridge components only, rather than a "hands-on" inspection of the entire bridge. In-depth requirements only apply to bridges with an a NBIS length of more than 20 feet. The CTDOT Bridge Inspection Manual (BIM) will be updated in the future to include the outlined changes.

Definitions:

Key Feature - a roadway, parking lot, pedestrian walkway or other area of foot traffic, active railroad line or waterways likely to be used for boating or other activities

Suspect Areas – an area of a concrete element with suspected delamination, or showing evidence of cracking, scaling, dampness or efflorescence

The following components will require periodic in-depth inspections, with the suggested interval in months shown in parentheses (intervals may vary, based on structural condition rating, special design features or materials, etc., based on the judgement of the Engineer. In-depths will generally be performed concurrently with the Routine inspection):

Concrete Decks and Superstructures (120)

- Bare decks shall be chain dragged, or tested by other means.
- 100% of haunches shall be sounded over key features.
- 100% of suspect areas over key features shall be sounded, plus 25% of areas over key features showing no apparent deterioration. Suspect areas on exterior faces of parapets and/or substructure units over key features shall also be sounded 100%.

Metal Decks (120)

- Metal grid decks (open or filled) shall be inspected 100% hands-on.

Steel Pins (120)

- Ultrasonic testing (UT) of pin and hanger assemblies, along with other types of fracture critical rods and/or bars, in load path non-redundant structures (2 or 3 girders) or where they are not retrofitted with a redundant support system (catcher's mitt, etc.). Stainless steel pins will not require UT unless directed by the Supervising Engineer. will also be considered for UT.

Steel Multi-Girders (120)

- An in-depth will be scheduled only if there are fatigue prone locations (cover plate ends, diaphragm or lateral bracing connection plate welds to webs, etc.) that are difficult to inspect and would require special equipment or lane closures to access, or were otherwise not inspected hands-on over a 120-month cycle.

  Alternately, a hands-on inspection of the entire superstructure may be scheduled where record keeping for each inspection would be too complex.

Steel Girder and Floorbeam Systems/ Trusses/ Open Spandrel Steel Arches/ Steel Cross Girders (120)

- UT of all transverse, full penetration groove welds found in tensile zones of fracture critical members. Also, if any welded detail on the bridge has experienced fatigue cracking in the past, all similar details shall be considered for testing, as determined by the Supervising Engineer.
- Bridges carrying limited access highways - In addition to requirements for routine inspections, all welded connections shall be inspected hands-on.

Steel Box Girders (120)

- In addition to requirements for routine inspections, all external diaphragms and bracing, including connections, shall be inspected hands-on.

Steel Expansion Bearings (120)

- Measurements of all lines of steel expansion bearings for spans greater than 50 feet shall be taken and recorded on the appropriate sheet in Chapter 6 of the BIM. Typically, the fascia beams and one interior beam near the center will be measured and recorded per bearing line.

Scour Critical Structures (24)

- Bridges with Item 113 rated 3 or lower shall have a full channel plan sketch with soundings shown in representative locations. Additionally, soundings shall be shown along all substructure units on elevation view sketches.

Other (24-120)

- Any other details/locations as determined by the Transportation Engineer 3 and concurred by the Supervising Engineer. Note the locations and the inspection method required in the In-Depth Tracking form in SMS.

Each bridge requiring in-depth inspection on one or more of the components listed above shall have the In-Depth Tracking form filled out and included with the inspection report, as appropriate. Any special inspection methods or access requirements shall be included with the description. The information shall be checked and updated at each inspection, including proposed dates and date of most recent in-depth inspection for each component. In-depths that are no longer required will be deleted as necessary. The form will be included immediately after the Location Map in the PDF output report for each inspection. Bridges with no in-depth requirements will not include the form in the report.

The Bridge Inspection Manual will be updated to reflect these changes in the future.

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

m e m o r a n d u m

subject: Bridge Safety and Evaluation
Bridge Safety Memo 2018-03
Revised Deck Rating Guidelines

date: July 11, 2018

to: Bridge Safety Staff and Consultants

from: Robert P. Zaffetti Date: 2018.07.11 11:53:59-04'00'
Transportation Bridge Safety
Principal Engineer
Bureau of Engineering & Construction

In order to better align with the descriptions in the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Coding Guide), Section 10.1 of the Connecticut DOT Bridge Inspection Manual (BIM) has been revised. The paragraph beginning with "Decks integral with the superstructure…" is deleted and replaced with:

Decks integral with the superstructure, such as concrete slabs, tee-beams, deck units, box beams, rigid frames (without fill), etc., shall be rated based on the visible portion of the underside of the top flange; evidence of deck deterioration noted in the overlay, such as reflective longitudinal cracking (indicating possible shear key failure in deck units or box beams), concrete pumping through cracks or spalls in the overlay, etc.; or evidence of possible deterioration noted from below, such as leakage, efflorescence, differential movement, etc. If there is no visible top flange and no evidence of deterioration, the deck will be assigned a good rating. For integral superstructure bridges where the approach pavement is carried across the bridge on top of fill material, such as filled arches, frames or culverts, there is no deck and the overall deck rating will be "N". However, the condition of any deck elements present (overlay, railings, etc.) should be noted and the condition rating of those individual items coded in the BRI-18 fields.

The remainder of Chapter 10 of the BIM, and other sections of the manual, are being revised and will be issued as they are completed.

cc: Theodore H. Nezames
Robert P. Zaffetti - Theodore D. Lapierre

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

m e m o r a n d u m

subject: Bridge Safety and Evaluation
Bridge Safety Memo 2018-02
In-Depth inspections

date: June 13, 2018

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to: Bridge Safety Staff and Consultants

from: Robert P. Zaffetti Date: 2018.06.11 13:51:44-04'00'
Transportation Bridge Safety
Principal Engineer
Bureau of Engineering & Construction

The criteria for In-depth Inspections is being revised. The new definition of In-depth Inspections will eliminate the need for hands-on inspection of very low-risk structures (e.g. newer or recently rehabilitated structures, box culverts, etc.), and will more closely align with the definition in the FHWA Bridge Inspector's Reference Manual (BIRM).

This will not change the requirements for providing Bluebeam sketches. A full set of sketches must still be included with each Routine Inspection report.

An In-depth Inspection will be classified as a closer, hands-on inspection of a particular component, or components of the bridge to check for potential or suspected deficiencies. The components requiring this level of inspection will be determined by the Transportation Engineer 3 and concurred with by the Transportation Supervising Engineer. Requirements for the In-depth Inspections will be recorded in the notes/comments section of the BRI-18. The frequency of the inspections may vary from 24 months to 120 months, or could be one time only, and should be scheduled to be concurrent with the corresponding Routine Inspection.

Examples of In-depth Inspections include, but are not limited to:

- UT testing of pins
- Fatigue prone details
- Deck haunches and deck undersides over traffic lanes
- Steel bearing measurements
- Channel measurements along substructures
- Other details as determined

Once established, the In-depth Inspection requirements and frequencies should typically not change. Additionally, problems found during Routine Inspection may necessitate an In-depth Inspection of other similar locations.

Inspections of known deficiencies done more frequently than the routine interval will still be classified as Special Inspections. Hands-on inspection of non-redundant steel components will still be scheduled as Fracture Critical Inspections and will not need to be called out as In-depths.

cc: Theodore H. Nezames
Robert P. Zaffetti – Theodore D. Lapierre

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

m e m o r a n d u m

subject: Bridge Safety and Evaluation
Bridge Safety Memo 2018-01
Sign Support Inspection Frequency

date: May 24, 2018

to: Bridge Safety Staff and Consultants

from: Robert P. Zaffetti Date: 2018.05.24 08:41:47-04'00'
Transportation Bridge Safety
Principal Engineer
Bureau of Engineering & Construction

In order to more closely align with the Federal Highway Administration's suggested guidelines for the inspection of sign support structures, the following inspection frequencies will be established:

Full span overhead supports shall be inspected at 6 year intervals.

Cantilever and bridge mounted supports shall be inspected at 4 year intervals.

Aluminum supports, regardless of structure type, shall be inspected at 2 year intervals.

Any sign support may be assigned a shorter inspection interval if warranted by its condition or other special situation.

These changes will take effect immediately.

cc: Theodore H. Nezames
Robert P. Zaffetti

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

m e m o r a n d u m

subject: Bridge Safety and Evaluation
Bridge Safety Memo 2017-2
Elimination or Modifications
To Bridge Inspection Forms

date: January 31, 2017

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to: Bridge Safety Staff and Consultants

from: Robert P. Zaffetti
Robert Zaffetti, P.E.
2017.01.31
14:42:16-05'00'
Transportation Manager of Bridge
Safety and Evaluation
Bureau of Engineering & Construction

A Lean Session at the end of last year resulted in an initiative to eliminate or modify bridge inspection forms. As a result, the following changes shall be implemented immediately:

Elimination of Inspection Forms:
BRI-10 – Concrete Deterioration Worksheet*
BRI-11 – Seismic Data Sheet
BRI-13 – Photo Log
BRI-17 – Joint Measurements
BRI-27 – Inspection Report Transmittal Form
BRI-31 – Inspection Scheduling Form

* - Until more detailed guidelines are available, the Bridge Inspector is to use the NBE ratings, along with a comparison of the deck condition described and rated in the previous inspection report to assist in assigning an NBI deck condition rating.

Changes related to Forms:
BRI-18 – Bridge Inspection Report Form. The inspector is to use comments in brief, bullet-form format to describe conditions and only focus on deficiencies.

cc: Theodore H. Nezames
Robert P. Zaffetti
David Hiscox
Mary E. Baker
Timothy D. Fields
Rabih M. Barakat
Ted J. Aldieri, FHWA

Connecticut DOT

Office of Engineering

Number: EB-2016-8

Date: December 21, 2016

ENGINEERING BULLETIN

Theodore H. Nezames, P.E.
2016.12.21 14:36:23-05'00'

Division Chief, Bridges

Revisions to Bridge Inspection Manual

The Department's bridge inspection requirements for Quality Control/Quality Assurance and minimum resolution of Bridge Inspection Report photographs are hereby revised. The new requirements are summarized below and are effective immediately.

Quality Control/Quality Assurance

Chapter 4, "Quality Control/Quality Assurance" of the Bridge Inspection Manual has been replaced in its entirety. The requirements of the new chapter shall be used for all Department activities and actions involving the safety inspection of bridges and other structures.

Resolution of Inspection Report Photographs

Per this bulletin, photographs in Bridge Inspection Reports shall have a minimum resolution of eight (8) megapixels. The photograph specifications within the Bridge Inspection Manual have not yet been revised but are hereby superseded.