Engineering Manual Preamble

This manual provides guidance to administrative, engineering, and technical staff. Engineering practice requires that professionals use a combination of technical skills and judgment in decision making. Engineering judgment is necessary to allow decisions to account for unique site-specific conditions and considerations to provide high quality products, within budget, and to protect the public health, safety, and welfare. This manual provides the general operational guidelines; however, it is understood that adaptation, adjustments, and deviations are sometimes necessary. Innovation is a key foundational element to advance the state of engineering practice and develop more effective and efficient engineering solutions and materials. As such, it is essential that our engineering manuals provide a vehicle to promote, pilot, or implement technologies or practices that provide efficiencies and quality products, while maintaining the safety, health, and welfare of the public. It is expected when making significant or impactful deviations from the technical information from these guidance materials, that reasonable consultations with experts, technical committees, and/or policy setting bodies occur prior to actions within the timeframes allowed. It is also expected that these consultations will eliminate any potential conflicts of interest, perceived or otherwise. MDOT Leadership is committed to a culture of innovation to optimize engineering solutions.

The National Society of Professional Engineers Code of Ethics for Engineering is founded on six fundamental canons. Those canons are provided below.

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform Services only in areas of their competence.
3. Issue public statement only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, reasonably, ethically and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

Michigan Bridge Element Inspection Questions

BEAM ENDS:

Question:

363 Section Loss SmFlag: As you stated, Smart Flags are gone. Being a decent engineer I knew that the new element replacing the smart flag would be in Superstructure. And I did find it. #826 “Beam End”: Measurement = Each. The each item is not too difficult. The issue here is that there is no way to do a word search to find the new item with the old item description. You have to sit and read the book. Worse yet is that the old “PONTIS” book had an index at the front listing all the items with the page #s. This book does not. So you have to scroll through the pages to find something. This is not impossible but will be time consuming at your desk and more so in the field. Going out in the field with an old report will not tell you the changes so a prudent inspector has to go over the whole report beforehand to see what changes have been made so they can obtain the new quantities in the field.

Answer:

The Beam End element was added again to getter better counts on the conditions of these elements. The description states that you only add the Beam End element when you have certain defects. So for a good bridge w/ no to minor section loss you will not have this element. But when a bridge has significant section loss this element will be added. This begins the process of monitoring a condition that is going to get worse if not repaired quickly. Once the section loss gets to a point where the beam cannot support load, then it is either repaired or temporary supported. We have often been asked by bureau management how many temp supports do we have out there. The Beam End element will give us an accurate count of the bridges with Beam End Repairs, Temporarily supported Beam Ends, and Beam Ends that are poor condition. All management items we struggle to have accurate data on. University Drive is a perfect example where this Beam End Element would have helped in maybe a little quicker decision process, but more importantly we now will have an accurate count to the number of beams that are temp. Supported on this bridge, and which ones are going need supported next.

ARCH LENGTH:

Question:

This single span earth filled arch bridge has 4 different sections. Would you call each a rib, and if so, would the length for the element be # ribs x length?

Answer:

The joints may be present simply because of shrinkage concerns/pour sequencing/formwork limitations. If the reinforcement is uniform throughout it may make sense to identify it as one arch rib. You are right, if you were to isolate each rib it would be the # ribs x length. Here is an example:

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The total arch quantity shall be the sum of the horizontal length of each arch. For example, four arches comprise each span for the bridge shown in Figures 5.13.06 and 5.13.07. The total quantity of Element 144 would be calculated as $L_{Total} = (L_1 + L_2 + L_3 + L_4 + L_5) \times 4$ in feet.

Figure 5.13.06 Open Spandrel Concrete Arch with Multiple Ribs

Figure 5.13.07 Horizontal Length along the Traveled Way Must Be Used for Arches

CMP PROTECTIVE COATING:

Question:

Are we to include steel coating for galvanized corrugated metal pipes?

Answer:

Yes, simply use 2 x 3.14 x R x L for the interior surface only.

CULVERT JOINTS:

Question:

The revised CSIR has removed the previous leakage field. Why? There is also now an element for Culvert Joints, but does this include longitudinal joints as well? How is the element supposed be used?

Answer:

The CSIR was revised due to the many cases that occurred where the data entered was incorrect corrupting the database. Several of the fields that were being collected are not required for NBIS inspections and were no longer being used at the state level.

Combining the routine and element reports should allow for improved efficiency and time savings. FHWA is also currently conducting a study to require element inspections to be applied to the entire NBI inventory. Although there are currently no federally mandated requirements to perform element level inspections on bridges located off of the National Highway System the revised report will allow for an improved response once the change does occur.

The Culvert Joints element was requested because of the variety of occurrences whereby the last section of pipe is perched and the joint separates, or where loss of fill has happened due to the joint condition. The element is intended to be used for joints between pipe and box sections. It is only added when the joint condition affects the ability for the structure to perform as designed or impacts the subgrade of the roadway above. The Culvert Joints element should allow for improved response by direct or contract maintenance forces. The element is an ADE and will not be evaluated during FHWA NBIP reviews.

PRECAST ELEMENTS:

Question:

Will precast elements for abutments, columns, and footings be added to a future manual revision?

Answer:

There has been discussion about precast substructure units as elements or as an inventory item. These elements will not be included in the spring 2015 Michigan Bridge Element Inspection Manual but may incorporated in a future revision pending additional dialogue.