



BrM Configuration and Bridge Data Validation

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Michigan 6.7.1 Optimization Lessons

- Component Deterioration
 - Only for Deck, Super, Substructure and Culvert
- All settings are not equal
- Start Simple
- Junk in Junk Out



One Step At A Time

Measures

Benefit

Funding Allocation
Network Policies

Utility Weight Profile
GCR Deterioration

Actions

Costs

Element Deterioration
Life Cycle Policies

Utility Tree

Inspection Data





Michigan Configuration Start (Recipe)

1. Utility Tree
 - a) Component Ratings Only
2. Costs
 - a) \$1
3. Benefits
 - a) All Make Improvements
4. Actions
 - a) All have Impactful Benefits and Costs
5. Subdivisions
 - a) Simple small populations
6. Network Policy
 - a) No restrictions
7. Performance Measures
 - a) All Components included





Michigan Configuration Approach

1. Replacement only
2. Replacement and Rehab
3. Element Deterioration
4. Replacement by Elements
5. Replacement and Rehab by Elements
6. Replacement/Rehab/Preservation





Optimizer Analysis

- Condition Checks
 - Must Include Component In Performance Measure
- Create New Scenarios
 - New tests require new Scenarios





Bridge Data Validations

- SQL
 - Elements vs Bridge Attributes
 - Element CS vs Component Rating
 - Element Quantity vs Bridge Attributes
- Dashboards
 - Load Rating
 - Condition Flags
- On Save Validations

- If you check it, you need to fix it





SQL - Elements vs Bridge Attributes

```
111
112 case when
113     a.designmain <>'01'
114     and
115     NVL(e54.elem_quantity,0)+
116     NVL(e65.elem_quantity,0)+
117     NVL(e805.elem_quantity,0)+
118     NVL(e806.elem_quantity,0)+
119     NVL(e807.elem_quantity,0)+
120     NVL(e808.elem_quantity,0)+
121     NVL(e809.elem_quantity,0)>0
122
123 then 'Not Slab Bridge But Slab Element Present '
124 else null end ||
125
126 case when
127     a.dkstructyp='8'
128     and
129     NVL(e31.elem_quantity,0) +
130     NVL(e54.elem_quantity,0) =0
131 then 'NBI Coded Timber Deck, No Timber Deck NBE '
132 else null end ||
133
134
135
136 case
137 when
138     a.dkstructyp<>'1' and
139     (e800.elem_quantity>0 or e801.elem_quantity>0 or e802.elem_quantity>0 or e803.elem_quantity>0 or e804.elem_quantity>0
140     or e805.elem_quantity>0 or e806.elem_quantity>0 or e807.elem_quantity>0 or e808.elem_quantity >0 or
141     e809.elem_quantity >0 or e811.elem_quantity>0 or e813.elem_quantity>0)
142 then
143     'Item 107 Not Coded As Concrete Deck but Concrete Deck Elements Present '
144 else null end ||
145
```


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SQL - Element CS vs Component Rating

```
375 when
376 NVL(c.dkrating,'X') = '3'
377 and
378 (NVL(e800.elem_qtystate3,0)+
379 NVL(e801.elem_qtystate3,0)+
380 NVL(e802.elem_qtystate3,0)+
381 NVL(e803.elem_qtystate3,0)+
382 NVL(e804.elem_qtystate3,0)+
383 NVL(e805.elem_qtystate3,0)+
384 NVL(e806.elem_qtystate3,0)+
385 NVL(e807.elem_qtystate3,0)+
386 NVL(e808.elem_qtystate3,0)+
387 NVL(e809.elem_qtystate3,0)+
388 NVL(e813.elem_qtystate3,0)+
389 NVL(e12.elem_qtystate3,0)+
390 NVL(e13.elem_qtystate3,0)+
391 NVL(e15.elem_qtystate3,0)+
392 NVL(e16.elem_qtystate3,0)+
393 NVL(e28.elem_qtystate3,0)+
394 NVL(e29.elem_qtystate3,0)+
395 NVL(e30.elem_qtystate3,0)+
396 NVL(e31.elem_qtystate3,0)+
397 NVL(e54.elem_qtystate3,0)+
398 NVL(e60.elem_qtystate3,0))
399 <0.10*
400 (NVL(e800.elem_quantity,0)+
401 NVL(e801.elem_quantity,0)+
402 NVL(e802.elem_quantity,0)+
403 NVL(e803.elem_quantity,0)+
404 NVL(e804.elem_quantity,0)+
405 NVL(e805.elem_quantity,0)+
406 NVL(e806.elem_quantity,0)+
407 NVL(e807.elem_quantity,0)+
408 NVL(e808.elem_quantity,0)+
409 NVL(e809.elem_quantity,0)+
410 NVL(e813.elem_quantity,0)+
411 NVL(e12.elem_quantity,0)+
412 NVL(e13.elem_quantity,0)+
413 NVL(e15.elem_quantity,0)+
414 NVL(e16.elem_quantity,0)+
415 NVL(e28.elem_quantity,0)+
416 NVL(e29.elem_quantity,0)+
417 NVL(e30.elem_quantity,0)+
```

```
NVL(e804.elem_qtystate4,0)+
NVL(e805.elem_qtystate4,0)+
NVL(e806.elem_qtystate4,0)+
NVL(e807.elem_qtystate4,0)+
NVL(e808.elem_qtystate4,0)+
NVL(e809.elem_qtystate4,0)+
NVL(e813.elem_qtystate4,0)+
NVL(e12.elem_qtystate4,0)+
NVL(e13.elem_qtystate4,0)+
NVL(e15.elem_qtystate4,0)+
NVL(e16.elem_qtystate4,0)+
NVL(e28.elem_qtystate4,0)+
NVL(e29.elem_qtystate4,0)+
NVL(e30.elem_qtystate4,0)+
NVL(e31.elem_qtystate4,0)+
NVL(e54.elem_qtystate4,0)+
NVL(e60.elem_qtystate4,0))
<0.01*
(NVL(e800.elem_quantity,0)+
NVL(e801.elem_quantity,0)+
NVL(e802.elem_quantity,0)+
NVL(e803.elem_quantity,0)+
NVL(e804.elem_quantity,0)+
NVL(e805.elem_quantity,0)+
NVL(e806.elem_quantity,0)+
NVL(e807.elem_quantity,0)+
NVL(e808.elem_quantity,0)+
NVL(e809.elem_quantity,0)+
NVL(e813.elem_quantity,0)+
NVL(e12.elem_quantity,0)+
NVL(e13.elem_quantity,0)+
NVL(e15.elem_quantity,0)+
NVL(e16.elem_quantity,0)+
NVL(e28.elem_quantity,0)+
NVL(e29.elem_quantity,0)+
NVL(e30.elem_quantity,0)+
NVL(e31.elem_quantity,0)+
NVL(e54.elem_quantity,0)+
NVL(e60.elem_quantity,0))
then
'Deck Rating = 3 and CS3<10% and CS4<1%'
```

```
(NVL(e810.elem_quantity,0)+
NVL(e815.elem_quantity,0)+
NVL(e816.elem_quantity,0)+
NVL(e817.elem_quantity,0)+
NVL(e818.elem_quantity,0)+
NVL(e819.elem_quantity,0))
and
(NVL(e810.elem_qtystate4,0)+
NVL(e815.elem_qtystate4,0)+
NVL(e816.elem_qtystate4,0)+
NVL(e817.elem_qtystate4,0)+
NVL(e818.elem_qtystate4,0)+
NVL(e819.elem_qtystate4,0))
<0.01*
(NVL(e810.elem_quantity,0)+
NVL(e815.elem_quantity,0)+
NVL(e816.elem_quantity,0)+
NVL(e817.elem_quantity,0)+
NVL(e818.elem_quantity,0)+
NVL(e819.elem_quantity,0))
then
'WS Rating = 5 and CS2<1% and CS3<1% and CS4<1%'
```



SQL - Element Quantity vs Bridge Attributes

```
227 case
228 when
229 q.deck_area>1.1* (
230 NVL(e800.elem_quantity,0)+
231 NVL(e801.elem_quantity,0)+
232 NVL(e802.elem_quantity,0)+
233 NVL(e803.elem_quantity,0)+
234 NVL(e804.elem_quantity,0)+
235 NVL(e805.elem_quantity,0)+
236 NVL(e806.elem_quantity,0)+
237 NVL(e807.elem_quantity,0)+
238 NVL(e808.elem_quantity,0)+
239 NVL(e809.elem_quantity,0)+
240 NVL(e813.elem_quantity,0)+
241 NVL(e12.elem_quantity,0) +
242 NVL(e15.elem_quantity,0) +
243 NVL(e16.elem_quantity,0) +
244 NVL(e28.elem_quantity,0)+
245 NVL(e29.elem_quantity,0)+
246 NVL(e30.elem_quantity,0)+
247 NVL(e31.elem_quantity,0)+
248 NVL(e54.elem_quantity,0)+
249 NVL(e60.elem_quantity,0))
250
251 then 'Deck Area >10% More than Sum Of Deck Element Area'
```

```
when
NVL(e815.elem_quantity,0)+
NVL(e816.elem_quantity,0)+
NVL(e817.elem_quantity,0)+
NVL(e818.elem_quantity,0)+
NVL(e819.elem_quantity,0)>0 and
NVL(a.dksurftype,'X') not in ('0','1') and
NVL(r.roadwidth,0)*a.length + NVL(e320.elem_quantity,0)+NVL(e321.elem_quantity,0)
<0.9* (
NVL(e815.elem_quantity,0)+
NVL(e816.elem_quantity,0)+
NVL(e817.elem_quantity,0)+
NVL(e818.elem_quantity,0)+
NVL(e819.elem_quantity,0))
then 'Roadway Area >10% Less than Sum Of WS Element Area'
```



Dashboards – Load Rating

Compliance Summary	Count	Other Data Coding Issues	Count
Posting / Closing Issues	0		
Posting Recommended	0	Item 64F or Item 66 = 0 with No Temp Condition	0
Structure Should be Posted	0	Load Rating Methods Inconsistent	0
Structure Should be Closed	0	Load Rating Method No Longer Accepted	0
		Null Rating Value	4
Load Rating Issues	6		
Assigned Rating Not Applicable	0	<input type="radio"/> Non-NBI Only	
Built/Rebuilt > 2010 & NOT LRFR	2	<input checked="" type="radio"/> NBI Only	
Built/Rebuilt/Overlay > 1993 & ASR	0		
Item 64F < 22T	0		
Item 64F < or = Item 66	0		
Judgment Rating Not Applicable	0		
NHS & ASR	0		
No Rating Performed	6		
Poor Condition & Rating Does Not Represent Current Condition	0		

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Dashboards - Condition Flags

Structure Inventory Summary

	Count
Total No. of Structures	5,916
Highway (NBI) Structures greater than 20'	4,504
Highway Structures less than 20'	1,117
Rail Road Structures (X)	125
Pedestrian Structures (P)	157
Other Non-Highway Structures (V, Plaza)	13

Additional Bridge Inventory Information

Posted Structures	25
Closed Structures	20
Fracture Critical Structures	82
Scour Critical Structures	479
Scheduled/Under Construction (S, G)	136

Structure Condition Summary

Structure Condition Summary	Count
Good/Fair (5 or Greater)	5,497
Highway included in NBI	4,217
Non NBI Structures (<20, RR, Ped, etc.)	1,280
Poor (4)	356
Highway included in NBI	254
Non NBI Structures (<20, RR, Ped, etc.)	102
Serious/Critical (3 or less)	55
Highway included in NBI	33
Non NBI Structures (<20, RR, Ped, etc.)	22
Unrated Structures	8
Highway included in NBI	0
Non NBI Structures (<20, RR, Ped, etc.)	8

SD/FO Summary

SD/FO Summary	Count
*Structurally Deficient	287
*Functionally Obsolete	1,021
*Non-Deficient Structures	3,195
*No Current SD/FO Rating	229

NBI Condition - Goals Summary

NBI Condition - Goals Summary	Pct.
*Good/Fair (5 or Greater)	93.6%
Freeway	94.1%
Non-Freeway	92.9%
*Poor/Serious/Critical (4 or Less)	6.4%
Freeway	5.9%
Non-Freeway	7.1%
*Good NHS Deck Area	20.1%
*Fair NHS Deck Area	73.4%
*Poor NHS Deck Area	6.6%
*Applies ONLY to Highway Structures > 20'	

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Dashboards – 7.0 Dashboard

Data Quality Analysis v1.2

By Mayvue

Overview

Created and Supported by Mayvue

The following queries represent a check against the most common errors encountered by Mayvue in databases. Depending on the filters used, these data problems could cause errors with running optimization s. Tools to address some of these challenges are provided at the bottom of the page. If your site is hosted by Mayvue, please contact Mayvue support to get these scripts run against your database.

Critical Errors	Bridges	Errors
Bridges with no deck area:	0	
Element Quantity Problems	0	0
Component Rating Problems	0	0
No Lifecycle Policy Assigned	0	

Integrity Errors	Count
Duplicate Bridge ID check	0
Duplicate Parameters Check	0
Duplicate Parameter Null Values	0
Duplicate Param Order Values	1
Element Foreign Key Violation	0

Non-Critical Warnings	Count
No NBI Inspection - Not Required 6.5+	5529
No Element Inspection - Not required 6.5+	3654

Optimizer Health	Records
Orphaned Projects	0
Orphaned Results	0

Optimizer Size	Records
Pon_Prog_Bridge_Results	282432
Pon_Scenario	7
Pon_Projects	0



Save Validations

Warning verbiage	Is displayed when
Some values on this page may remain unchanged from a previous rating. By clicking "OK", you are agreeing that all unchanged values apply to the current rating.	User is editing an existing Load Rating event
Per the AASHTO Manual for Bridge Evaluation, a load rating must be based on the current structural condition of members. If deterioration is included in this load rating, or if no deterioration is present that affects the structural capacity, choose "Yes".	Rating Considers Field Condition of Members value is 'No'
An image of the posting sign from each end of the bridge should be uploaded in the Load Ratings Multimedia folder after changing Load Posting Status (B.PS.01) to PP, TP, SP, PR, TR, SR.	Load Posting Status (B.PS.01) in PP, TP, SP, PR, TR, SR.



Save Validations

Warning Message (not hard stop, does not prevent save)	Is Displayed When
Structures coded as a 1 or less for the primary structural elements should be closed. Please update item 41 when the structure is closed to traffic.	At least one of the following fields has a rating in (1, 0). (1) Deck (SIA-58) (2) Stringer (SIA-59) (3) Abutments (SIA--60) (4) Piers (SIA-60) (5) Culvert (SIA-62)
Comments should be included if <Field label> rating is less than or equal to 4.	At least one of the following fields has a rating in (4, 3, 2, 1, 0): (1) Surface (SIA-58A) (2) Expansion Joints (3) Other Joints (4) Railings (5) Sidewalks (6) Deck Bottom Surface (SIA-58B) (7) Deck (SIA-58) (8) Stringer (SIA-59) (9) Paint (SIA-59A) (10) Bearings (11) Abutments (SIA-60) (12) Piers (SIA-60) (13) Slope Protection (14) Approach Pavement (15) Approach Shoulders Sidewalks (16) Channel (SIA-61) (17) Scour Inspection

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Questions?

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