Timber Element Condition State Guide

Montana Department of Transportation
Bridge Management Section
May 1, 2019

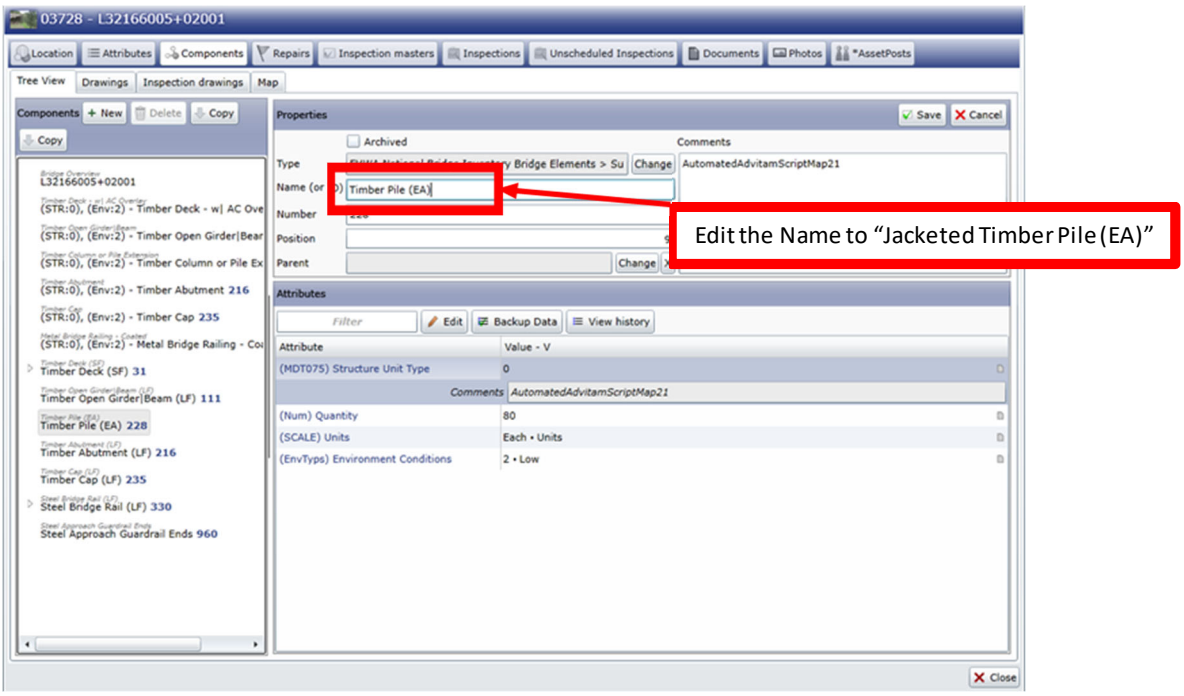
Overview

This document is intended as a supplemental guide to the *Manual for Bridge Element Inspection, 2nd Edition* and the *MDT Timber Bridge Inspection Guide* for rating timber bridge elements in the proper condition state.

Jacketed Timber Piles (Steel or FRP)

A number of timber piles on bridges in the MDT inventory have been repaired using steel or FRP jacket wraps filled with concrete or epoxy. Use the following guidance when inspecting and entering these piles into SMS:

1. Add a second Element 228, but change the name from “Timber Pile (EA)” to “Jacketed Timber Pile (EA)”. This applies to FRP or Steel jacketed timber piles.



2. Adjust the quantities of both of the Element 228's to reflect the new quantity numbers of each type now on the bridge.
3. Upon first inspection, put all *Element 228 – Jacketed Timber Piles* in **Condition State 2** (assuming the work was done properly and no section of the unrepaired timber pile is in a worse condition). Use Defect 1140 (Decay/Section Loss).
4. Adjust any attributes as necessary (Substructure rating, etc…)
5. Take photos of the jacketed piles
6. Remove or "Complete" any Repair Suggestions that were put in for the deteriorated piles that have been jacketed.

Circular Timber Piles with Decay (defect 1140)

Condition state ratings of circular timber piles with interior decay will be based on the *percent of decay by area* when using Resistograph borings. The cross-sectional length of decay through the diameter indicated by the Resistograph boring will be converted to an area assuming that the decay is a circular cross-sectional area. The charts on the following pages indicate the *assumed area of decay* vs. *length of interior decay indicated* for different pile diameters with decay.

Piles with exterior decay or exterior section loss is much less common and the conditions states for elements with these conditions should be based on the *Manual for Bridge Element Inspection* condition state language.

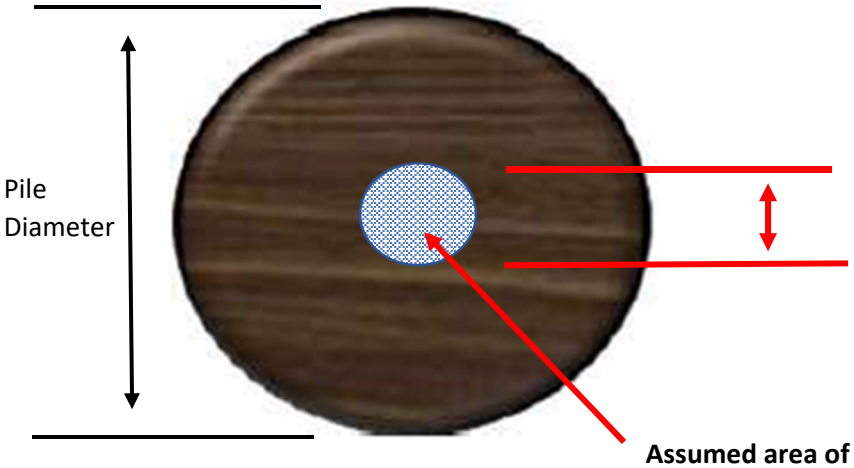
Condition State 1:

No interior decay detected.



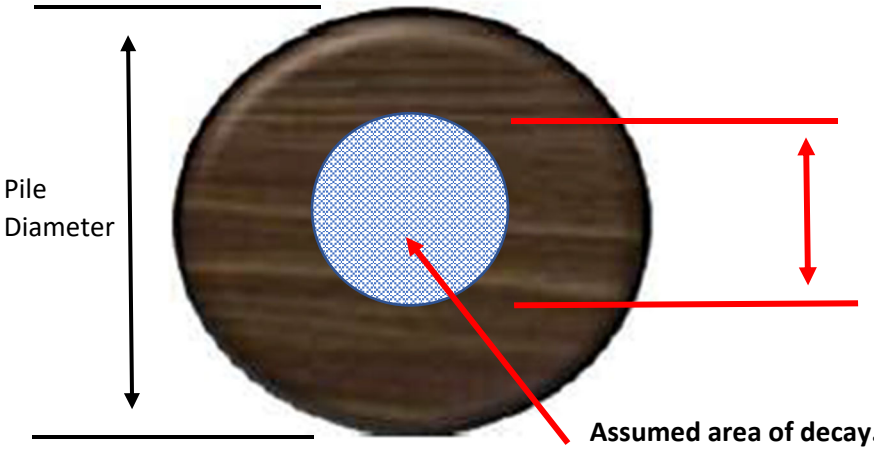
Condition State 2:

Decay exists and affects < 10% of the member cross-sectional area.



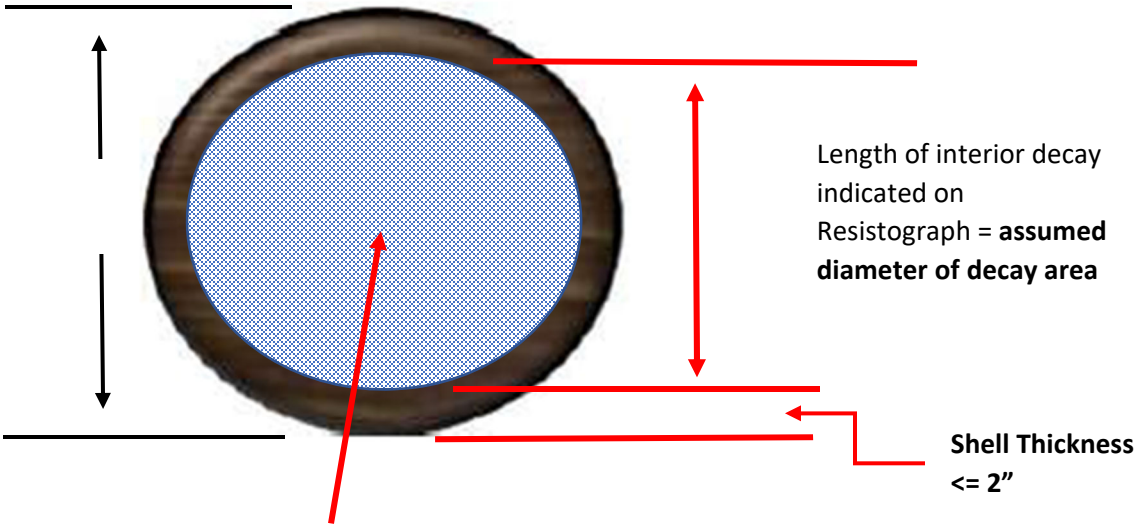
Condition State 3:

Decay exists and affects > 10% of the member cross-sectional area. Member does not exhibit bulging, major delaminations, or other signs of distress.



Condition State 4:

Decay exists and affects > 50% of the member cross-sectional area OR the majority of the remaining exterior shell is <= 2” thick.



Assumed area of decay. Use the charts below determine the % of pile area that is decayed.

Pile Diameter (in)	Pile Area (in^2)	Indicated length of interior decay (in)	Assumed area of decay (in^2)	Percent of Decay by area	Element Condition State
11	95.0	0	0.0	0%	1
11	95.0	1	0.8	1%	1
11	95.0	2	3.1	3%	2
11	95.0	3	7.1	7%	2
11	95.0	4	12.6	13%	3
11	95.0	5	19.6	21%	3
11	95.0	6	28.3	30%	3
11	95.0	**7**	**38.5**	**40%**	**4**
11	95.0	**8**	**50.2**	**53%**	**4**
11	95.0	**9**	**63.6**	**67%**	**4**
11	95.0	**10**	**78.5**	**83%**	**4**
Pile Diameter (in)	**Pile Area (in^2)**	**Indicated length of interior decay (in)**	**Assumed area of decay (in^2)**	**Percent of Decay by area**	**Element Condition State**
12	113.0	0	0.0	0%	1
12	113.0	1	0.8	1%	1
12	113.0	2	3.1	3%	2
12	113.0	3	7.1	6%	2
12	113.0	4	12.6	11%	3
12	113.0	5	19.6	17%	3
12	113.0	6	28.3	25%	3
12	113.0	7	38.5	34%	3
12	113.0	**8**	**50.2**	**44%**	**4**
12	113.0	**9**	**63.6**	**56%**	**4**
12	113.0	**10**	**78.5**	**69%**	**4**
12	113.0	**11**	**95.0**	**84%**	**4**

Pile Diameter (in)	Pile Area (in^2)	Indicated length of interior decay (in)	Assumed area of decay (in^2)	Percent of Decay by area	Element Condition State
13	132.7	0	0.0	0%	1
13	132.7	1	0.8	1%	1
13	132.7	2	3.1	2%	2
13	132.7	3	7.1	5%	2
13	132.7	4	12.6	9%	3
13	132.7	5	19.6	15%	3
13	132.7	6	28.3	21%	3
13	132.7	7	38.5	29%	3
13	132.7	8	50.2	38%	3
13	132.7	**9**	**63.6**	**48%**	**4**
13	132.7	**10**	**78.5**	**59%**	**4**
13	132.7	**11**	**95.0**	**72%**	**4**
13	132.7	**12**	**113.0**	**85%**	**4**

Pile Diameter (in)	Pile Area (in^2)	Indicated length of interior decay (in)	Assumed area of decay (in^2)	Percent of Decay by area	Element Condition State
14	153.9	0	0.0	0%	1
14	153.9	1	0.8	1%	1
14	153.9	2	3.1	2%	2
14	153.9	3	7.1	5%	2
14	153.9	4	12.6	8%	3
14	153.9	5	19.6	13%	3
14	153.9	6	28.3	18%	3
14	153.9	7	38.5	25%	3
14	153.9	8	50.2	33%	3
14	153.9	9	63.6	41%	3
14	153.9	**10**	**78.5**	**51%**	**4**
14	153.9	**11**	**95.0**	**62%**	**4**
14	153.9	**12**	**113.0**	**73%**	**4**
14	153.9	**13**	**132.7**	**86%**	**4**

Pile Diameter (in)	Pile Area (in^2)	Indicated length of interior decay (in)	Assumed area of decay (in^2)	Percent of Decay by area	Element Condition State
15	176.6	0	0.0	0%	1
15	176.6	1	0.8	0%	1
15	176.6	2	3.1	2%	1
15	176.6	3	7.1	4%	2
15	176.6	4	12.6	7%	2
15	176.6	5	19.6	11%	3
15	176.6	6	28.3	16%	3
15	176.6	7	38.5	22%	3
15	176.6	8	50.2	28%	3
15	176.6	9	63.6	36%	3
15	176.6	10	78.5	44%	3
15	176.6	**11**	**95.0**	**54%**	**4**
15	176.6	**12**	**113.0**	**64%**	**4**
15	176.6	**13**	**132.7**	**75%**	**4**
15	176.6	**14**	**153.9**	**87%**	**4**

Pile Diameter (in)	Pile Area (in^2)	Indicated length of interior decay (in)	Assumed area of decay (in^2)	Percent of Decay by area	Element Condition State
16	201.0	0	0.0	0%	1
16	201.0	1	0.8	0%	1
16	201.0	2	3.1	2%	1
16	201.0	3	7.1	4%	2
16	201.0	4	12.6	6%	2
16	201.0	5	19.6	10%	2
16	201.0	6	28.3	14%	3
16	201.0	7	38.5	19%	3
16	201.0	8	50.2	25%	3
16	201.0	9	63.6	32%	3
16	201.0	10	78.5	39%	3
16	201.0	11	95.0	47%	3
16	201.0	**12**	**113.0**	**56%**	**4**
16	201.0	**13**	**132.7**	**66%**	**4**
16	201.0	**14**	**153.9**	**77%**	**4**
16	201.0	**15**	**176.6**	**88%**	**4**