

**2020 STRUCTURE INSPECTION APPRAISAL REPORT**

Prepared For:

THE CORPORATION OF THE TOWNSHIP OF AMARANTH

COUNTY OF DUFFERIN



by

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File No. 20-178

**2020 STRUCTURE INSPECTION APPRAISAL REPORT  
TOWNSHIP OF AMARANTH**

**A. INTRODUCTION**

1. Purpose

The purpose of this study report is to summarize the information obtained during the inspection of 19 structures in the Township of Amaranth and to provide recommendations with related preliminary cost estimates for maintenance, improvements or replacement of deficient structures in accordance with the MTO Inventory Manual for Municipal Roads and Structures.

2. Location

The location of all structures undertaken for this study is shown on the key plan. There are 19 structures inspected in total:

- There are 16 concrete bridge structures
- There is 1 twin span concrete box culvert
- There is 1 multi-plate steel arch culvert
- There is 1 twin pipe steel culvert

Note: Bridge 15 was not inspected as it is not currently in service. We are unsure of what the Township's plans are for this particular structure moving forward. Should Bridge 15 be reopened at some point in the future, the biennial bridge inspection for this particular structure should re-commence.

3. Background Information

Reference has been made to the existing OSIM forms for the 19 structures inspected in this report.

4. References

These appraisals, inspections and recommendations for improvement and preventative maintenance are made with reference to the following Manuals:

1. MTO Inventory Manual for Municipal Structures
2. MTO Structure Rehabilitation Manual
3. MTO Roadside Safety Manual
4. Ontario Structure Inspection Manual (OSIM)
5. Canadian Highway Bridge Design Code (CHBDC)



## **B. STRUCTURE INSPECTION**

### **1. General**

Ontario Regulation 104/97 requires every structure greater than or equal to 3.0m (10'-0") in span to be inspected under the direction of a professional engineer every second calendar year. It is the Township's responsibility to identify the location of all these structures and comply with the Regulation. As such, nineteen (19) structures have been selected by the Township to be inspected.

Structures selected for inspection were inspected by K. Smart Associates Limited on July 16 and 29, 2020 in conformance with the Ontario Structure Inspection Manual (OSIM). Each structure was photographed with close-ups of any defects or deteriorations.

A Municipal Structure Inspection Form was completed for each structure. All visible deterioration was recorded. A complete set of the forms is enclosed in Appendix C.

### **2. Observations and Recommendations**

There are several bridges in the Township nearing or at the ends of their useful lives. Should rehabilitations and replacements be delayed, the affected structures may be recommended for closure in the near future.

The general conditions of the 19 structures inspected are summarized below (in order of priority):

- a) In July 2020, a vehicle collided with the south end of the east barrier of Structure 2, severely damaging it as a result. Based on the current condition of the structure, it is recommended for the structure to be replaced as soon as possible, i.e. 2021 or 2022. Prior to replacing this structure, the Township should reduce the load posting to 10 tonnes and increase the frequency of inspections to 4 months. For more information regarding Structure 2, refer to our report under separate cover.
- b) Structure 6 is generally in good condition. The structure underwent a major rehabilitation in 2020. However, it appears the issue of inadequate joints was not addressed. Although the rehabilitation drawings called for modifications to the joints including a specific type of asphalt to be applied overtop, this work was never completed. Currently, there are cracks in the wearing surface along the joints and evidence of leakage on the substructure below. Installing MTO type expansion joints complete with steel retainer bars and rubber seals is strongly recommended.
- c) Structures 2, 10, 11, 12, 13 are identified as requiring replacement in 1-5 years. It is recommended the Township consider closing Bridge 13. For further information regarding Structure 2, refer to our report under separate cover.
- d) Structure 3 is recommended to undergo a major rehabilitation or superstructure replacement in 1-5 years. Part of the work should include replacing the railing system as the current railing system does not meet the requirements of CHBDC.
- e) Structure 5 is recommended for minor rehabilitation in 1-5 years. Repairs should be made to the concrete sidewalk and curbs, the expansion joint



assemblies, and guide rail should be added to the remaining corners of the structure. Strong consideration should be given to waterproofing and paving the deck (which will protect the concrete from salt laden runoff) to extend the useful life of this structure. Some of the “keeper plates” located by girders at both abutments appear to be “walking”, or, sliding out. Further investigation into potential movement of the plates and the reason behind it is recommended. Bedrock was observed as the stream bed material under the west span, and therefore it is assumed that the footing is founded on bedrock. The Township should confirm that this is the case, and should the footing not be founded on bedrock, immediate action to protect the pier footing is recommended.

- f) The stream bed at Structure 4 near the inlet is scouring. Without intervention, the scour may expose and undermine the footings, therefore jeopardizing the overall stability of the structure. Re-alignment of the watercourse at the upstream (east) end of the structure and placement of fill material and rock protection is recommended in 1 to 5 years.
- g) Based on the current condition of Structure 3, we recommend the posted load limit to be changed to 16 tonnes.
- h) The remaining 9 structures are in excellent/good condition. Some of these structures, however, do require maintenance work which could be performed by the Townships Work crews.
- i) Consideration for placement of steel beam guide rails at all structures and approaches currently without steel beam guide rail should be given priority based on height/steepness of embankments, roadway width, road grade, records of previous accidents, traffic counts, and hazard potential. Structures currently without guide rails are Structure 2, 3, 5, 6, 10, 11, 12, 13, 14, and 20.
- j) Narrow structure signs are required when a structure has a clear roadway width between 6.0m or less. When the clear roadway width is less than 5.0m, a tab sign reading “One Lane” is required immediately below the narrow structure sign. These signs are to be placed not less than 150m but no more than 250m in advance of the structure. Structures 2, 10, 11, and 13 require both the narrow structure sign and “One Lane” tab, while structures 3 and 12 require the narrow structure sign only.
- k) It is recommended that supplementary “Maximum Tonnes” signs be placed at the intersections prior to structures with current load limits to warn motorists of the upcoming restriction. Structures that currently possess load limits are Structure 2, 10, 11, 12, 13, and 17.

A complete summary of the recommendations and associated costs for each structure can be found in Appendix B.



**C. SUGGESTED TIME FRAME FOR REPLACEMENTS AND REHABILITATIONS**

Structure	Type of Improvement (Rehabilitation or Replacement)	Engineering (Cost)	Construction (Cost)
15	Replacement	Assumed to be already complete	2021 (unknown)
2	Replacement	2020-2021 (\$120,000)	2021 or 2022 (\$800,000)
5	Rehabilitation	2021 (\$25,000)	2021-2022 (\$182,600)
13	Replacement	2022 (\$150,000)	2023 (\$1,000,000)
12	Replacement	2024 (\$150,000)	2025 (\$1,000,000)
10	Replacement	2026 (\$150,000)	2027 (\$1,000,000)
11	Replacement	2028 (\$150,000)	2029 (\$1,000,000)
3	Rehabilitation	2020 (\$25,000)	2031 (\$190,300)

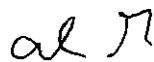
**D. CONCLUSIONS**

There are multiple structures recommended for replacement or rehabilitation within the next five years. The Township is encouraged to follow the suggested schedule (or develop one similar ) so that the recommended replacements and rehabilitations occur in a timely fashion. Should the replacements and rehabilitations continue to be delayed, structures will likely require closure due to them being deemed unfit for public use.

All recommendations contained within this report are recommended to be completed in the suggested timeframes to maintain “an acceptable standard in terms of public safety, comfort, and convenience” (Ontario Structure Inspection Manual, Section 1.2.1).

All of which is respectfully submitted.

If you have any questions please contact the undersigned at any time.



Allan Garnham, P. Eng.



Pedram Yazdan Panah, EIT



**APPENDIX A**  
**INVENTORY MAP**







# TOWNSHIP OF AMARANTH STRUCTURE INVENTORY MAP



KEY PLAN  
NOT TO SCALE

**LEGEND**

-  - Provincial Highway
-  - County Road
-  - Township Road
-  - Structure Location

**APPENDIX B**

**STRUCTURE INVENTORY**





**Township of Amaranth  
Structure Inventory  
Updated August 2020**

Structure Number	MTO Structure Number	Approximate Year of Construction	Location		Span (meters)	Skew	Roadway Width (m)	Structure Type	Current Load Limit	Recommended Load Limit	Time & Preliminary Cost of Improvement				Remarks	
			Con.	Lot							6 to 10 Years	1 to 5 Years	< 1 Year	Urgent		
1	4-106	2007	5 & 6	1	12.4	15	8.0	Single Span Concrete Slab on Steel I-Girders Bridge	--	--	Approaches/Replace asphalt pavement	10,000		1,100		Excellent Condition
											Approaches/Saw cut curbs at approach slabs					
											Approaches/Patch repair poor area of asphalt at NE		1,100			
											Barriers/Replace missing end cap at SE		1,100			
											Barriers/Reset parapet tube railing to allow for expansion and contraction		1,100			
											Decks/Clean deck as part of regular maintenance		1,100			
											Embankments & Streams/Place fill and protect with rock and vegetation		2,200			
2	4-105	1900 ±	6 & 7	3	8.5	0	4.0	Single Span Concrete Side Girder Bridge	16	10	Structure/Replace Structure		800,000			Replacement of structure is recommended in 1 to 5 years. Inspection frequency to be increased to 4 months.
3	4-104	1920 ±	7 & 8	3	9.3	5	5.4	Single Span Reinforced Concrete Beam Bridge	--	16	Abutments/Re-face bottom half of abutments		38,500			A major rehabilitation of the structure is recommended in 1 to 5 years, although instead of repairing each individual element, it may be more economical to replace the entire superstructure.
											Abutments/Chip and patch poor concrete areas at wingwalls		11,000			
											Approaches/Install steel beam guide rail complete with energy attenuators and structure connections at approaches		33,000			
											Barriers/Replace barrier system overtop of structure		44,000			
											Beams/ML's/Chip and patch poor concrete areas		16,500			
											Decks/Install deck drains		5,500			
											Decks/Chip and patch poor concrete areas at soffit		33,000			
											Decks/Remove excess granular from top of concrete deck		3,300			
4	4-103	1995	8 & 9	3	10.5	0	10.2	Single Span Corrugated Steel Arch Culvert	--	--	Sidewalks/Curbs/Replace curbs		5,500			Good Condition
											Accessories/Install hazard markers at each end of steel beam guide rail		1,100			
											Barriers/Replace steel beam guide rail system complete with energy attenuators		33,000			
											Embankments & Streams/Re-align watercourse at inlet (east)		5,500			
											Embankments & Streams/Place fill and protect with rock at deep area at southeast		5,500			
5	4-155	1980	9 & 10	2	20.8, 20.8 (41.6 Total)	0	8.0	Two Span Concrete Slab on Concrete Box Girder Bridge	--	--	Approaches/Replace asphalt wearing surface at approaches			2,200	1,100	Good Condition
											Approaches/Provide drainage at west					
											Approaches/Install steel beam guide rail complete with energy attenuators and structure connections at NE, SE, and SW		27,500			
											Barriers/Tighten post bolts as part of regular maintenance		1,100			
											Barriers/Replace missing end caps		1,100			
											Decks/Chip and patch scaled concrete areas		16,500			
											Decks/Waterproof and pave bridge deck		38,500			
											Embankments & Streams/Place fill and rock protection or mass concrete at abutment/footing embankments		5,500			
											Embankments & Streams/Place fill and protect with large angular rock at northwest quadrant		3,300			
											Joints/Replace expansion joints		66,000			
											Piers/Confirm footings are founded on bedrock; address exposed pier footing accordingly			1,100		
											Piers/Place large, angular rock or mass concrete		11,000			
											Sidewalks/Curbs/Chip and patch poor concrete areas		5,500			
											Sidewalks/Curbs/Patch repair asphalt sidewalk ramps at SW and SE		2,200			
6	4-101	1968	9 & 10	4	20.5, 28.1, 20.5	45	8.6	Three Span Concrete Slab on CPJ Girders Bridge	--	--	Joints/Replace expansion joint assemblies			60,000		Structure is in overall good condition. While the 2020 rehabilitation drawings call for the replacement of the expansion joints/joint seals, it does not seem like the replacement took place.
7	4-102	1991	9	5 & 6	18.3	40	7.5	Single Span Reinforced Concrete Rigid Frame Bridge	--	--	Approaches/Replace rotted posts as required			1,100		Good Condition
											Approaches/Install energy attenuators at ends of steel beam guide rail		22,000			
											Decks/Clean deck as part of regular maintenance		1,100			
											Decks/Chip and patch poor concrete areas		5,500			
											Decks/Waterproof and pave bridge deck		11,000			
											Decks/Clean deck drains as part of regular maintenance		1,100			
8	4-66	1993	8 & 9	6	18.0	20	7.5	Single Span Reinforced Concrete Rigid Frame Bridge	--	--	Approaches/Replace steel beam guide rail at approaches complete with energy attenuators and structure connections			2,200		Good Condition
											Decks/Fill void in parapet wall with sealant		1,100			
											Decks/Clean deck top and deck drains as part of regular maintenance		1,100			
											Embankments & Streams/Place fill and protect with rock or vegetation at eroded area at top of NE embankment		1,100			

**Township of Amaranth  
Structure Inventory  
Updated August 2020**

Structure Number	MTO Structure Number	Approximate Year of Construction	Location		Span (meters)	Skew	Roadway Width (m)	Structure Type	Current Load Limit	Recommended Load Limit	Time & Preliminary Cost of Improvement				Remarks		
			Con.	Lot							6 to 10 Years	1 to 5 Years	< 1 Year	Urgent			
9	4-65	2008	7 & 8	11	26.0	40	8.0	Single Span Concrete Slab on Steel I-Girders Bridge	--	--						Excellent Condition	
10	4-72	1900 ±	6 & 7	14	15.2	0	4.9	Single Span Concrete Side Girder Bridge	16	16			1,000,000			Replacement of structure is recommended in 1 to 5 years	
11	4-73	1900 ±	6	15	15.2	0	4.6	Single Span Concrete Side Girder Bridge	12	12			1,000,000			Replacement of structure is recommended in 1 to 5 years	
12	4-76	1910 ±	5 & 6	15	15.2	0	5.5	Single Span Concrete Bowstring Arch Bridge	12	12			1,000,000			Replacement of structure is recommended in 1 to 5 years	
13	4-75	1910 ±	5 & 6	16	15.2	0	3.9	Single Span Concrete Bowstring Arch Bridge	14	14			1,000,000			Replacement of structure is recommended in 1 to 5 years	
14	4-74	2000	5 & 6	17	14.0	0	8.0	Single Span Reinforced Concrete Rigid Frame Bridge	--	--						Good Condition	
15*	4-71	1900 ±	6 & 7	19	15.2	10	4.9	Single Span Concrete Side Girder Bridge	12	12				900,000		Closed - Superstructure Removed Replacement of structure is a work in progress	
16	4-69	1988	6 & 7	20	8.0, 8.0	20	12.1	Twin Cell Concrete Rigid Frame Box Culvert	--	--						Good Condition	
17	4-70	2018	6	21	23.20	0	9.2	Single Span Concrete Slab on Box Girder Bridge	--	--						Excellent Condition	
18	4-50	2007	6	25	12.0	25	8.0	Single Span Reinforced Concrete Rigid Frame Bridge	--	--						Excellent Condition	
19	4-49	2002	5 & 6	27	8.0	0	8.0	Single Span Reinforced Concrete Rigid Frame Bridge	--	--						Good condition	
20	4-78	1980 ±	3 & 4	14	3.8, 3.8	0	8.0	Twin Cell Multi-Plate Corrugated Steel Pipe Arches	--	--						Good to fair condition	
											<b>TOTALS:</b>	<b>\$ 112,300</b>	<b>\$ 5,399,000</b>	<b>\$ 902,200</b>	<b>\$ 27,500</b>		

The costs in this chart are for budget and comparison purposes only. The costs do not include contingencies, engineering or contract administration fees (which could be estimated at 30% of the total cost).

Consideration for placement of steel beam guiderails at all structures and approaches currently without guide rail should be given priority based on: height/steepness of embankment, width of road, profile of road, records of previous accidents, traffic counts and hazard potential.

Please refer to the OSIM Forms and Photos for Complete Condition Information and Recommendations.

\* Structure 15 was not included as part of this investigation, as it is closed and the superstructure has been removed.