Meeting Date: **October 18, 2023**

Submitted by: **Rob Cascaden, P.Eng – Director – Public Works and Engineering**

Prepared by: **Andrew Giesen, C.E.T, PMP – Transportation Manager**

Report No: **PWE 41-2023**

Subject: **2023 Structure Inspection Report**

Recommendation:

THAT Council receive Report PWE 41-2023, 2023 Structure Inspection Report be received for information.

Purpose:

The purpose of this report is to provide information to Council and residents regarding the results and findings of municipal structures (bridges, culverts, and retaining walls) inspection report.

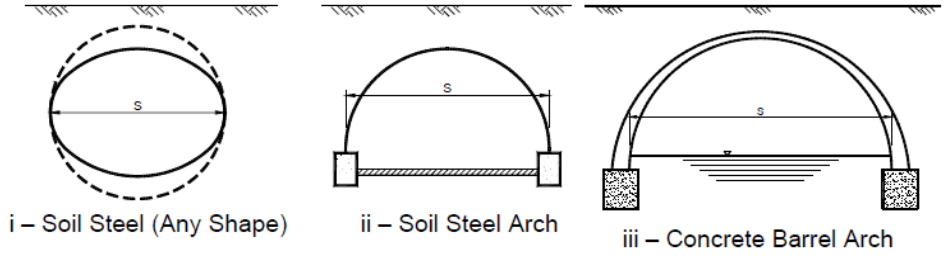
Background:

B.M Ross and Associates Limited was engaged by the municipality to undertake the inspection of all municipal bridge and culvert structures with spans of 3.0 metres or greater as well as a number of larger non-structural culverts (less than but close to 3 metres span). All structures in the municipality are required to be inspected every 2 years in accordance with *O.Reg 104/97: Standards for Bridges*. Inspections are completed in accordance with the Ontario Structure inspection Manual (OSIM).

Analysis:

The provision of a safe, resilient and efficient transportation system is important for the movement of goods and people within the municipality. Structures (bridges and culverts) are critical pieces in the transportation system.

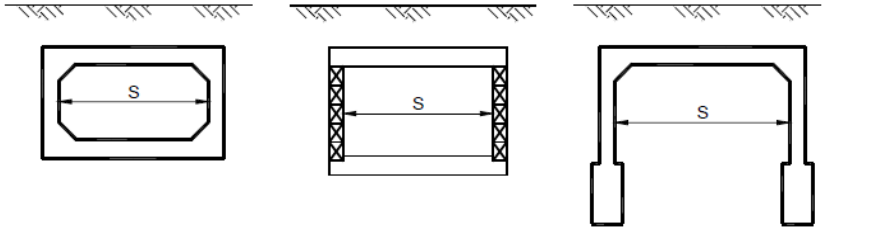
Common Culvert Structure Types



i – Soil Steel (Any Shape)

ii – Soil Steel Arch

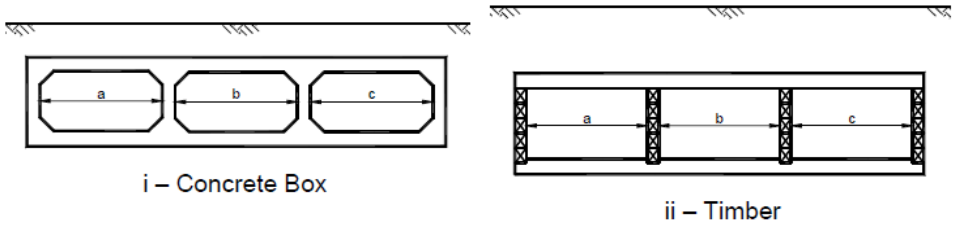
iii – Concrete Barrel Arch



iv – Concrete Box

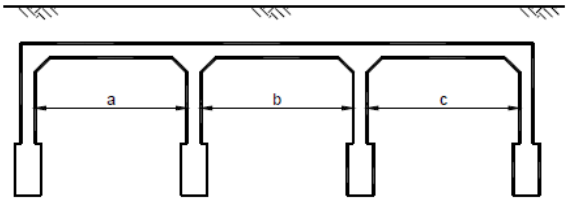
v – Timber

vi – Concrete Open Footing

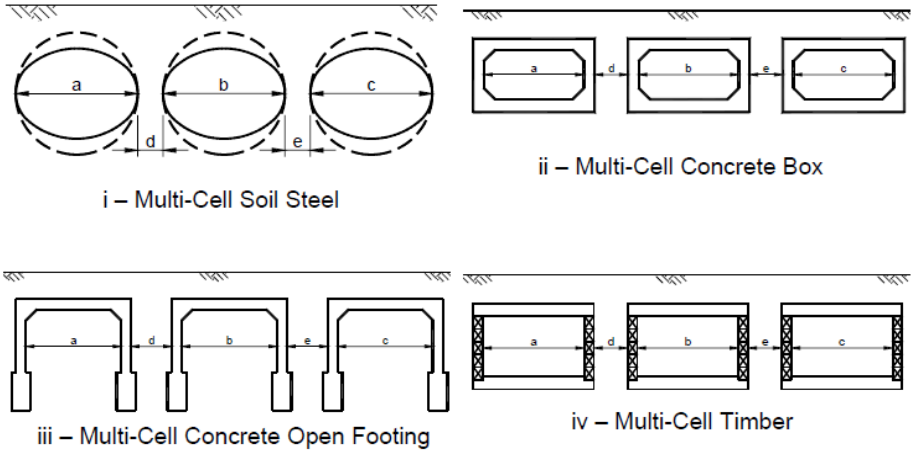


i – Concrete Box

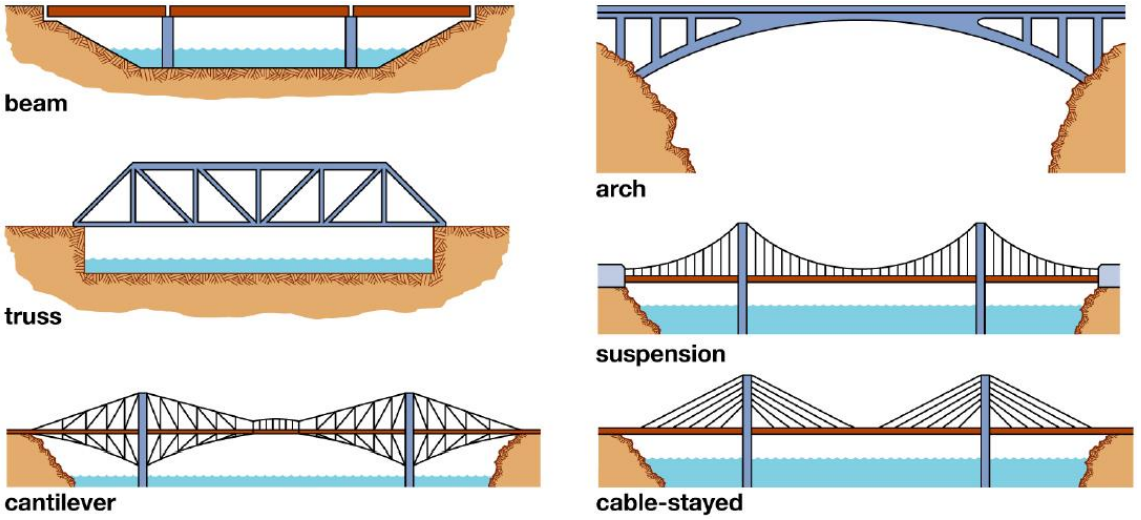
ii – Timber



iii – Concrete Open Footing



Common Bridge Structure Types:



In accordance with legislated requirements the municipality engages with a structural engineering firm to complete bi-annual structure inspections in accordance with the Ontario Structures Inspection Manual (OSIM). This manual is prepared by the Ontario Ministry of Transportation and provides a uniform inspection process and reporting method, and reviews and considers major components of the bridge to develop a Bridge Condition Index (BCI).

BCI Ratings:

90-100 – Excellent Condition
70 to 89 – Good condition
40 to 69 – Fair Condition
40 or less – Poor Condition

The Municipality's current Asset Management Plan (AMP) does not have a specified target for BCI, it is suggested an average BCI of 70 would be appropriate for the Municipality. A BCI of 70 would ensure these critical transportation assets are maintained in a state of good repair providing access and movement to residents of Middlesex Centre.

In 2019, the Municipality had an average BCI rating of 67.0. In 2021, the average BCI rating is 64.7. and for 2023 the average BCI is 62.9. Some of the rationale for the decrease in the BCI is due to the addition of 24 structures which had not been previously captured in the 2021 inspections. The reduction in average BCI can also in part be attributed to the age distribution of the structures in the Municipality, with 123 structures being 40 years old or older.

The life expectancies of concrete structures is approximately 75-80 years, for corrugated steel pipe (CSP) structures it is approximately 50 years. This assumes life cycle interventions/repairs are undertaken to maintain the structures.

On lower volume roads it is possible and likely the Municipality can expect to see some longer service lives for some structures, however major repairs and ongoing routine maintenance would still be required to ensure extended service lives are possible.

Major repairs and interventions may consist of; water proofing and re-surfacing, patching and repairing concrete, superstructure replacements, replacing barriers and curbs, replacing or repairing deck drains, among other items.

Based on the review of the structures, and using the BCI, and prioritization scoring as a guide for identifying replacements and repairs a; 1-5 year, 6-10 year, and 11-20 year capital priority list was prepared to help staff properly allocate funding for the timely repair and replacement of these important transportation assets.

The details of the recommended repairs and replacement's can be found in Appendix A which contains a summary report of the OSIM inspection findings and prioritization of maintenance and replacement activities.

Due to changes in the roadside safety manual (increasing the length of structures), and more fields being tiled there are increased demands for capacity of structures. It is generally noted that structure replacements are seeing on average a minimum 10% increases to hydraulic capacity, as a result of the above noted changes. Overtime, this necessary increase in capacity will see some culverts that currently do not meet the legal definition of a structure (3 meter or more span) being replaced at a slightly larger size that may then meet the legal definition of structure. As a result, it is expected municipal structure inventory will grow slightly over time.

Cost reduction strategies:

A number of items were identified in the summary Inspection report to minimize and reduce costs as it relates to structure repair and replacement.

Grouping of similar projects. Staff already actively group like projects together to realize economies of scale and competitive pricing, this can be seen in recent culvert replacement, bridge superstructure replacement and bridge rehabilitation work.

Pre purchasing or procuring long lead items in advance of construction tender. Staff recently completed this for the Fernhill Drive culvert replacement whereby the culvert to be installed was procured by the Municipality and provided to the successful contractor This can result in a shorter time frame between contract award and project completion as the contractor will not have to wait for the material to be ordered. This can also result in better pricing for the Municipality as there is not a contractor mark up on the material supplied.

One consideration identified in the report was for municipal staff to undertake some of the work in house such as guiderail installation, minor maintenance activities and or culvert replacements. It was noted that the consultant has worked with other municipalities that undertake this work in house and that costs savings of up to 35% have and or could be achieved.

Based on the 1 to 5 year replacement list, it is expected that staff could realistically install and replace guiderails, and culverts for which the total estimate for this work in the next 5 years is $5,434,000.00. However, the current staffing complement would not be able to deliver this type of capital work as staff are already delivering road reconstruction, tar & chip, and sidewalk construction in house in addition to maintenance activities.

To deliver the above noted work using municipal staff would require additional staffing resources or reallocation of existing staff resources.

Staff will look to undertake a detailed analysis of what in house delivery might look like and costs, staffing and equipment resources that might be required to deliver these projects to allow Council to consider possible capital project delivery methods and impact on future capital and operating budgets.

Staff will look to prioritize the sustainable replacement and repair of these critical transportation assets, looking to realise the most cost-effective replacement method.

Financial Implications:

With the age distribution of the municipal structures, continued growth in traffic, and increased use of de-icing salts municipal structures are will continue to degrade and reach the end of their useful lives.

With the adoption of the Asset Management Plan (AMP), and completion of the 2023 Structure Inspection Report. Staff will look to update the AMP to ensure all assets are properly captured and monetized. This will allow staff to properly forecast capital budget needs required to maintain these critical assets.

Strategic Plan:

This matter aligns with following strategic priorities:

- Sustainable Infrastructure and Services

The timely replacement and repair of bridges and culverts will ensure a safe and efficient transportation system, for Middlesex centre residents.

Attachments:

Appendix A – 2023 OSIM Structure Inspection Summary Report