

Filed: 2020-07-24
Section 101
EB-2020-0160

ONTARIO ENERGY BOARD

IN THE MATTER OF the *Energy Board Act, 1998*, S.O. 1998, c. 15 (Schedule B);

AND IN THE MATTER OF an Application by Enbridge Gas Inc. pursuant to Condition 4 from the Ontario Energy Board's Decision and Order, and Section 101 of the *Ontario Energy Board Act, 1998* for authority to construct a work upon, under or over a highway, utility line or ditch in the County of Essex for the purposes of a natural gas pipeline in respect of which the Ontario Energy Board granted leave to construct in EB-2019-0172 to Enbridge Gas Inc.

AFFIDAVIT OF DR. WILLIAM TAPE

I, Dr. William Tape, of the City of Windsor, in the County of Essex, and Province of Ontario, make oath and say as follows:

Qualifications and Experience

1. I am a Licensed Professional Engineer in the Province of Ontario, with a Master's Degree in Civil Engineering, Water Resources, and a Doctorial Degree in Civil Engineering, Structures. I am also a Welding Engineer recognized by the Canadian Welding Bureau, and I have a Consulting Engineer Designation from Professional Engineers Ontario.
2. I have worked as a Professional Engineer in the public sector for 17 years and as an Engineering Consultant for 14 years, engaging in both civil and structural engineering projects. I also have experience working as a University Instructor and College Professor for 20 years, teaching both basic principles of engineering as well as design

classes at the graduate and undergraduate levels. My curriculum vitae is attached hereto as **Exhibit "A"**.

3. I am currently a Consulting Engineer and Project Leader with Haddad Morgan & Associates Ltd., located at 24 Shepherd Street East, Windsor, Ontario. In that position, I provide various civil and structural engineering services for a wide variety of clients including government and public agencies.

Duty to the Ontario Energy Board

4. I have been advised that Enbridge Gas Ltd. ("**Enbridge**") commenced an Application with the Ontario Energy Board (the "**Board**") for authority to construct a natural gas pipeline (the "**Pipeline**") upon, under, or over a highway, utility line, or ditch pursuant to the *Energy Board Act, 1998* (the "**Application**").
5. The County of Essex (the "**County**") retained me to provide my professional opinion regarding documents prepared by Enbridge Gas Ltd. ("**Enbridge**") relating to the location and depth of the Pipeline along County Road 46.
6. As such, I have been asked to provide this Affidavit addressing the appropriate location and depth of the Pipeline, as well as the standards to apply to construction in the County's right of way along County Road 46. I have been advised that this Affidavit will constitute evidence in the Application.
7. I hereby confirm that I have knowledge of the matters hereinafter deposed. Where I do not have personal knowledge of the matters hereinafter deposed to, I state the source of any information set forth and verily believe it to be true.
8. I hereby acknowledge and agree that it is my duty to assist the Board by impartially giving evidence in this Affidavit that is fair and objective, as set out in "Form A", which is attached hereto as **Exhibit "B"**.

First Pipeline Opinion

9. The County retained me to review Enbridge's Vehicle Loading Analysis (the "**VLA**") dated May 1, 2020 relating to the Pipeline and provide my professional opinion with respect to the VLA.
10. In so doing, I reviewed and relied upon the information contained in Krystal Kalbol's memorandum dated April 27, 2020 and the VLA including the following.
 - a. Enbridge is preparing to replace 29 kilometers of the Pipeline within the County's right of way on County Road 46.
 - b. Enbridge's documents suggested a buried depth of 1 meter for the Pipeline, and construction within 2 meters of the existing road edge.
 - c. The shoulder of the existing County Road 46 is considered a travelled portion based on the use of this region for maintenance activities and other motorist access needs.
 - d. County Road 46 will experience road widening over the course of the Pipeline's life, placing the Pipeline within the drive path.
11. I also reviewed and relied upon standards including CAN/CSA Z662-15 and CAN/CSA Z662-19 regarding Oil and Gas Pipeline Systems, the Transportation of Canada ("**TAC**") guidelines relating to the minimum depth of bury for pipelines, loading analysis for buried pipes and conduits (consistent with the Canada Highway Bridge Code), and fundamentals for buried structures.
12. After considering the information and standards set out above, I provided the County with a letter dated May 7, 2020 setting out my professional opinion, attached as **Exhibit "C"**, in which I found as follows:
 - a. Enbridge calculations were based on a pipeline vehicle crossing over (perpendicular) to the pipeline.

- b. The ten times analysis performed by Enbridge was conservative, and such conservative approaches exceeded those prescribed in other standards. Enbridge's analysis supported that the proposed material was able to carry the applied loads under hook stress. However, as hoop stresses were the only analysis performed, care should be given to ensure that the bedding of the pipe is free of large or stiff elements.
- c. The VLA assumed a modulus of soil reaction that should be verified by a qualified Geotechnical Engineer, and the failure to do so would be considered contrary to good Engineering practices and could have an impact on the capacity of the Pipeline.
- d. Enbridge's consideration of soil response did not include areas that were disturbed or were formed with non-native soil to create the road, driveways, and road shoulders over the years, to name a few instances of disturbance.
- e. The VLA was based on CAN/CSA Z662-15. However, there is a more current version of this standard, namely, CAN/CSA Z662-19.
- f. CAN/CSA Z662-19 specifically notes a minimum depth of bury below travelled surface road of 1.2 meters, which is more than what was proposed by Enbridge, and it provides that cover requirements for buried pipelines shall not be less.
- g. CAN/CSA Z662-19 states that it is intended to establish the minimum standards. Emphasis should be placed on the declaration of minimum. Thus in the presence of other guidelines, the most stringent should be considered in the interest of best engineering practices and public safety.
- h. The TAC Guidelines form an established and widely accepted standard for works within the right of way, and the TAC Guidelines for geometric design specifically speak to the placement of utilities in the right of way.

- i. The TAC Guidelines place emphasis on the responsibility of the County as the Road Authority to ensure compliance with the recommendations set forward by the industry, such as the TAC Guidelines.
- j. The TAC Guidelines provide for a minimum depth of 1.5 meters for the non-encased Pipeline underneath a paved surface, but not less than 1 meter below ground elevation.
- k. By requesting compliance with the TAC Guidelines in the right of way, the County fails to create a condition of undue hardship on Enbridge. The County would be within its rights as Road Authority to implement and mandate a standard requiring greater depths of bury.
- l. The County could accept a depth of 1.2 meters for the Pipeline provided that the main was encased, which would protect the Pipeline from loading criterion and other hazards faced by underground utilities within the right of way.

13. Therefore, in the interest of best engineering practices and good right-of-way management, I recommended that the minimum depth of the Pipeline from the drive surface (or anticipated drive surface) be 1.5 meters versus the proposed 1.0 meter depth if compliance with the TAC Guidelines is to be consistently applied by the County within its right of ways.

14. With regard to liability, I noted that should in the unfortunate situation an event occur which creates a threat or risk to the public, specific to the proposed Pipeline, failure to adhere to the TAC Guidelines or consistently follow an established standard could result in the County being in part liable for failure to follow best practices.

15. Finally, I concluded that the County Road 46 expansion within the Pipeline's life span further supported following the current guidelines and maintaining a depth of cover that represents the most conservative approach in the interest of public safety, specifically 1.5 meters, and this would also be supportive of the statements made in CAN/CSA Z662-19 and the TAC Guidelines.

Second Pipeline Opinion

16. The County provided me with Enbridge's response to my above-noted professional opinion (the "**Response**"). Enbridge's comments appeared to focus on the applicability of any standard other than CAN/CSA Z662.

17. After reviewing and considering Enbridge's Response, and conducting further research regarding appropriate standards, I prepared a letter for the County dated May 19, 2020, setting out my opinion and further comments, which is attached as **Exhibit "D"**. In particular, I found as follows:

- a. The County and other Road Authorities follow the TAC Guidelines as a standard practice. The failure to adhere to it because of another organization's report or opinion does not negate the risk of liability, as alleged by Enbridge. Enbridge's statement that there is no risk to the County is arguable and cannot be based fully on fact.
- b. Contrary to Enbridge's assertions, the absence of past experiences does not meet a reasonable test of absence of potential issues.
- c. My research into this matter, specifically regarding the Utility Policy Manual of the Ministry of Transportation and Infrastructure of British Columbia 2019, suggests that the TAC guideline of 1.5 meters is generously in favour of Enbridge taking into account re-grading of the road during construction and the buffer that should be adopted to ensure drainage requirements are addressed.
- d. The Technical Standards and Safety Authority's ("**TSSA**") failure to adopt CAN/CSA Z662-19 to date does not mean that it is flawed or that such an adoption will not happen in the future, as suggested by Enbridge. Standards act as industries' best knowledge, and it is good practice to follow the more stringent in the interest of all parties.
- e. Enbridge's comments with respect to the TSSA's requirement of a depth of 0.75 meters are contrary to its assertion that it should follow CAN/CSA Z662,

the most recent of which provides that a pipeline requires a minimum cover of 1.2 meters below a travelled surface of a road.

- f. It appears unreasonable for a utility to mandate the need for the County to prove a standard or recommendation by others. It is within the right, responsibility, and mandate of a Road Authority to apply industry standards or recommendations, or the most updated version of standards or recommendations.
- g. The TAC Guidelines require that the County consider the future or potential impacts of the highway and its use in the design and location of utilities installments. By advising Enbridge to lower the Pipeline to support the future road expansion, the County has reasonably performed its due diligence.
- h. As the County applies the TAC Guidelines as a standard, it is reasonable to expect those utilities wishing to be within the right of way adhere to same and maintain a depth of 1.5 meters in the right of way. By doing so, the County and its agents would be acting in the best interest of the rate payers and public at large, particularly in light of the future expansion of County Road 46, and it would constitute proper right of way management.
- i. Enbridge's position appears to rest on their analysis of the mechanical response of the pipe, which was based on very specific assumptions such as soil type and response. This analysis failed to account for variation in soil-structure and the disturbed condition commonly found within right of ways due to past works and intersecting driveways, intersections, and drainage works.

18. As such, I concluded that the construction of the Pipeline should be done with consideration for any potential required grading changes and pavement structures without compromise due to insufficient depth, and the County's proposed depth of 1.5 meters would provide the ability to modify cover without concern during the road expansion and associated regrading process.

19. Moreover, if Enbridge's proposed depth of 1 meter is used the County may have to compromise on its soil-structural system and/or drainage plan for the roadway via modified grading, which could result in liabilities associated with encroaching into private lands, and it would be contrary to best practices and its own guidelines.

Third Pipeline Opinion

20. The County provided me with a copy of the "Enbridge Pipeline Vehicle Loading Analysis Stress Report" dated May 19, 2020 (the "**Wood Report**") and asked me to provide my professional opinion about same.
21. After reviewing the Wood Report, I provided the County with a letter dated May 29, 2020, attached as **Exhibit "E"**, which concluded as follows:
- a. The Wood Report placed a high focus on an analytic assessment of the structural mechanics of the pipe itself, specific to its loading limits. As I had indicated before, the analysis of the Pipeline itself was not in question but rather the application of the TAC Guidelines as the County's standard.
 - b. The Wood Report's analysis was based on CAN/CSA Z662-15. However, the latest version of this standard is CAN/CSA Z662-19.
 - c. The Wood Report's analysis was based on "minimum cover should the road expand over the pipeline in the future". It was my understanding that the 1.0 meter cover proposed was based on the current ground elevation and such an elevation fails to offer adjustment for grades in the future. During road reconstruction and expansion increases and, more importantly, decreases in elevation must be anticipated thus contradicting the analysis assumptions under future conditions.
 - d. The Wood Report's analysis is based on a geotechnical report, which cannot identify all soil conditions, but rather only those that occur at the test location.

- e. Appendix E of the Wood Report does not dispute the validity or importance of the TAC Guidelines, it simply notes that they have not dealt with a municipality that applies the TAC Guidelines to date. Further, I confirmed that in my office's experience it is common place to be referenced to the TAC Guidelines by the County, and it is becoming increasingly common with the City of Windsor.
- f. Appendix E of the Wood Report further provides that "the exception to this practice has been at a location of an actual or anticipated future conflict, where addition depth of bury has been required." This confirms the application of the TAC Guidelines and associated mandate.
- g. Appendix E of the Wood Report discusses that additional depth is afforded in future resulting in the targeted 1.5 meter depth "or more". This supports that the 1.5 meter depth is appropriate, as recommended by the TAC Guidelines. However, while the logic of increased depth under the widening of a road is prudent and appropriate, the concept of increased depth due to reconstruction is somewhat flawed. Any future work would be unlikely to significantly raise the overall grade along the road. In fact, more common in road reconstruction the design intent would be to minimize cut and fill on site and thus use the existing road as a benchmark and develop a well defined longitudinal and cross-sectional geometry that promotes positive drainage. As such, and to maintain a constant cross-sectional fall if the existing center line is closely maintained, in the new construction the cover as found pre-road widening would be decreased by the actions of the construction, mandating a relocation of the utility to a greater depth.
- h. Appendix E of the Wood Report notes a 500 millimetre or more cover increase. However, such thicknesses would be commonly associated with the granular base and pavement structure of the road. If one anticipates that the road centerline at any point stays near, or at, its current elevation (a reasonable base assumption) during construction, then the depth of cover to the main during active construction would reduce to 500 millimeters or less, at which time the

pipeline itself would see loading from construction equipment similar to that of heavy vehicular traffic loading while being subject to insufficient cover. One must also consider that the existing pavement surface and associated granular materials are removed and replaced with new materials, which are unlikely to increase depth along the length of the pipeline. This condition speaks strongly to why the TAC Guidelines recommend the 1.5m depth and its importance to account for future operations, inclusive of maintenance, by the Road Authority

- i. The Wood Report failed to speak to the mandate placed on Enbridge by the Board to obtain approval for construction from the Road Authority. As the County is the Road Authority and it applies and mandates the TAC Guidelines, it has failed to meet the mandate of the Board by refusing to adhere to same.

22. I swear I am making this this Affidavit to provide information and my professional opinion with respect to Enbridge's Application to the Board, and for no other or improper purpose.

SWORN BEFORE ME at the City
of Windsor, in the County of Essex
and in the Province of Ontario, this
24th day of July, 2020



DAVID M. SUNDIN
A Commissioner, etc.



DR. WILLIAM TAPE, P.E., P. ENG.