IN THE MATTER OF ***THE ENGINEERING AND GEOSCIENCE PROFESSIONS ACT*** AND IN THE MATTER OF AN INVESTIGATION RESPECTING **SCOTT O. GULLACHER, P.ENG**.

DECISION AND INTERIM ORDER

MEMBERS OF THE HEARING PANEL:

Daniel Kishchuk, P.Eng., Chair

Daryl Andrew, P.Eng.

Chanelle Joubert, P.Geo.

COUNSEL FOR INVESTIGATION COMMITTEE:

Lyle Jones, P.Eng., LL.B.

COUNSEL FOR MEMBER:

Peter Bergbusch, Q.C.

COUNSEL FOR THE DISCIPLINE COMMITTEE:

Ron Pearson, P.Eng., JD

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List of Acronyms

CFEM – Canadian Foundation Engineering Manual, 4th edition
CHBDC – Canadian Highway Bridge Design Code, CSA S6-14[1]
CTC – Correlation to Torque

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REPORT OF THE HEARING PANEL APPOINTED AND EMPOWERED BY THE DISCIPLINE COMMITTEE OF **THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF SASKATCHEWAN** PURSUANT TO SECTIONS 33, 34, AND 35 OF ***THE ENGINEERING AND GEOSCIENCE PROFESSIONS ACT***, CHAPTER E-9.3 of the Statutes of Saskatchewan, 1996 as amended (HEREIN REFERRED TO AS THE “ACT”), AND SECTION 22(4) OF ***THE ENGINEERING AND GEOSCIENCE PROFESSIONS REGULATORY BYLAWS, 1997*** as amended (HEREIN REFERRED TO AS THE “BYLAWS”), TO HOLD A HEARING INTO THE CONDUCT OF **SCOTT O. GULLACHER, P.ENG.**

1 THE COMPLAINTS

The following complaints were made by the Investigation Committee of the Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS) with respect to the conduct of **Scott O. Gullacher, P.Eng.** (herein also referred to as the Member).

1.1 COMPLAINTS PER MATTER 33-18-05

Count 1

“Scott O. Gullacher, P.Eng. did not practice in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in determining the factored resistance required of the Dyck Memorial Bridge helical pile foundations.

Particulars:

On September 14, 2018, the Dyck Memorial Bridge in the RM of Clayton No 333 collapsed as a result of settlement of the pier system. **Scott O. Gullacher, P.Eng.** did not employ a site-specific geotechnical analysis at the Dyck Memorial Bridge site, resulting in the use of installation torque converted to axial capacity to determine the factored resistance of the foundations resulting in an overestimation of the helical pile capacity.”

Count 2

“Scott O. Gullacher, P.Eng. did not offer services, advise on or undertake professional assignments only in his areas of competence contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in the foundation design of the Dyck Memorial Bridge.

Particulars:

Scott O. Gullacher, P.Eng. provided geotechnical analysis used in the design of the Dyck Memorial Bridge foundations resulting in the use of installation torque converted to axial capacity to determine the factored resistance of the foundations resulting in an overestimation of the helical pile capacity.”

Count 3

“Scott O. Gullacher, P.Eng. did not practice in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in designing the helical screw piles used in the Dyck Memorial Bridge foundations.

Particulars:

On September 14, 2018, the Dyck Memorial Bridge in the RM of Clayton No 333 collapsed as a result of settlement of the pier system. **Scott O. Gullacher, P.Eng.** did not provide adequate engineering designs for the helical screw piles used in the foundation system for the Dyck Memorial Bridge. Screw pile designs did not provide design axial and bending capacity specifications required, clear descriptions of the pile geometry suitable to fabricate the pile, and target torque requirements necessary to achieve the design axial capacity."

Count 4

"Scott O. Gullacher, P.Eng. did not practice in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in the overall design of the Dyck Memorial Bridge.

Particulars:

The designs sealed by **Scott O. Gullacher, P.Eng.** for the Dyck Memorial Bridge lacked relevant design information including dead and live loads, material properties, dimensions for bracing and cap elements showing length or elevations where components begin and end, and control lines to position the new structure in relation to the existing bridge in order to avoid placing new piles in areas where existing piles were present or had been removed."

1.2 COMPLAINT PER MATTER 33-19-04

Count 1

"Scott O. Gullacher, P.Eng. did not practice in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in the overall design of five municipal bridges, identified as follows:

- RM of Scott No. 98 – Lewvan Bridge Replacement;
- RM of Caledonia No. 99 – Beck Bridge Replacement;
- RM of Purdue No. 346 – Crooked Bridge (Single Span);
- RM of Purdue No. 346 – North Kinley #1 Bridge Replacement (Three Span);
- RM of Mervin No. 499 – Twp Road 502 Bridge Replacement.

Particulars:

The designs prepared by **Scott O. Gullacher, P.Eng.** for the five municipal bridges lacked relevant design information, including:

- Inaccurate representation of bridge designs in documents submitted;
- Numerous Code deficiencies identified through all five sets of plans and designs;
- Lack of critical detail on plans for welding details;
- Bridge rails provided are inadequate for a TL-2 rating;
- Gravel wearing surface on concrete decks will result in damage to the bridge deck and abutment once material is removed from the deck.

Specific to the designs, there are issues with assumptions made regarding lateral load distribution, distribution of load across spans, member resistance. This results in five superstructure designs which are inadequate to carry the minimum loads required by the Canadian Highway Bridge Design Code (CHBDC) S6."

2 THE DISCIPLINE COMMITTEE

At its meeting held on March 29, 2022**,** the Discipline Committee received a formal complaint from the Investigation Committee and appointed Daniel Kishchuk, P.Eng. (Chair), Daryl Andrew, P.Eng., and Chanelle Joubert, P.Geo. to constitute a Hearing Panel to hear the complaints against **Scott O. Gullacher.**

The Discipline Committee did not appoint its public appointee, Larry Doke, to the Hearing Panel due to conflict of interest. Subsection 10(7) of *The Engineering and Geoscience Professions Act* allows for the Discipline Committee to appoint a Panel that does not include the public appointee, as follows:

> "The absence or inability to act as a member of an investigation committee or discipline committee by an appointed councillor or the failure to appoint a councillor pursuant to this section does not impair the ability of the other members of a committee to act."

3 THE DISCIPLINE HEARING

The Discipline Hearing was convened at 10:00 a.m. on June 6, 2022 at the Double Tree by Hilton Hotel at 1975 Broad St in Regina, Saskatchewan.

The Investigation Committee was represented by Lyle Jones, P.Eng., LL.B. and Chris Wimmer, P.Eng., APEGS Director of Investigation and Compliance.

Scott O. Gullacher was present and was represented by Peter Bergbusch, Q.C., legal counsel.

Counsel for the Investigation Committee established jurisdiction by filing proof that a Notice of Discipline Hearing, containing a formal complaint within the meaning of subsection 32(3)(a) of the Act, had been forwarded to **Scott O. Gullacher** pursuant to the Act and the Bylaws. Counsel for **Scott O. Gullacher** acknowledged receipt of the Notice of Hearing within the time limits prescribed by the Act. Attendance at the hearing by **Scott O. Gullacher** was further evidence of the satisfactory service of the Notice of Discipline Hearing and formal complaint upon **Scott O. Gullacher**.

4 PLEA OF MEMBER

Scott O. Gullacher was asked how he responds to the complaints, guilty or not guilty. Counsel for the member responded that he was instructed to enter a plea of "no contest".

The Hearing Panel directed, in the absence of a plea of guilty or not guilty, that a plea of "not guilty" be entered into the record so that the hearing could proceed. This plea was intended by the

Hearing Panel to apply to all four Counts under matter 33-18-05 and the single count under matter 33-19-04.

5 EVIDENCE PRESENTED

The following Exhibits were entered into evidence by the Investigation Committee and are appended hereto:

D1. Notice of Discipline Hearing – forwarded to **Scott O. Gullacher** on or about May 11, 2022.

D2. Reports to the Discipline Committee from the Investigation Committee dated March 2022 for matters 33-18-05 and 33-19-04.

D3. Pre-hearing report dated February 4, 2022, for pre-hearing conferences conducted for both matters concurrently.

D4. Written complaint from complainant, APEGS Council, dated September 19, 2018 (matter 33-18-05) and written complaint from complainant, Program Management Board (PMB) of the Municipal Roads for the Economy Program (MREP) dated April 29, 2019 (matter 33-19-04).

D5. Threshold report for matter 33-18-05 dated October 25, 2018, threshold report for matter 33-19-04 dated August 8, 2019, and Certificates of APEGS Registrar dated May 30, 2022 for **Scott O. Gullacher, P.Eng.**, Inertia Solutions Inc., and Can-Struct Systems Inc.

D6. Responses from **Scott O. Gullacher** to the Investigation Committee as follows: emails October to December 2018 on matter 33-18-05, email August 2019 on matter 33-19-04.

D7. Dyck Memorial Bridge – Request for Proposals RM of Clayton No. 333, and Proposals by Can-Struct Systems Inc.

D8. Dyck Memorial Bridge – drawing sets by Inertia Solutions Inc.

D9. Failure reports pertaining to matter 33-18-05:
  a) Zacaruk Consulting Inc. report on Dyck Memorial Bridge Collapse dated February 1, 2019.
  b) Inertia Solutions Inc.'s response to February 1, 2019 Zacaruk report dated March 21, 2019.
  c) Inertia Solutions Inc., Dyck Memorial Bridge Failure Report sealed April 30, 2019.
    i. Appendix A: BS1805 Standard 40 ft girder 1961 drawings.
    ii. Appendix B: Standard Timber Bridge drawings.
    iii. Appendix C: Existing Construction Report – Department of Highways and Transportation.

iv. Appendix D: Bridge RFP – Dyck Memorial Road.
v. Appendix E: Bridge Proposal – Can-Struct Systems Inc. dated June 12, 2018.
vi. Appendix F: Dyck Memorial Bridge Rebuild Drawings (original project) – Inertia Solutions Inc. sealed August 21, 2018.
vii. Appendix G: Load Test Summary Report – Inertia Solutions Inc. sealed March 25, 2019.
    1. Midgard Project Management, letter regarding Dyck Memorial Bridge Loading Testing quality assurance, dated April 30, 2019.
    2. Mobile Augers & Research Ltd. standard penetration bore hole report, dated November 23, 2018.
viii. Appendix H: Proco Technical Services Ltd. soil testing and classification.

d) SARM field report, Dyck Memorial Bridge.

D10. Allnorth Structural Assessment Report, Dyck Memorial Bridge, dated May 27, 2019, matter 33-18-05.

D11. P. Machibroda Engineering Ltd. and Topping Engineering Ltd. joint report, Engineering Technical Review of Helical Screw Pile Design & Analysis dated June 16, 2020 summarizing the current engineering practice with respect to the design of helical screw piles.

D12. Gary Yeo, P.Geo., Geology of the Dyck Bridge Area report dated March 2019, unsigned, matter 33-18-05.

D13. Associated Engineering, Independent Bridge Reviews report dated January 21, 2020, matter 33-19-04.

D14. WSP Canada Inc., Bridge Load Evaluation reports all dated April 8, 2019 and pertaining to matter 33-19-04:

a) RM of Scott No. 098, Two Span Bridge.
b) RM of Caledonia No. 099, Single Span Bridge.
c) RM of Perdue No. 346, Single Span Bridge.
d) RM of Perdue No. 346, Three Span Bridge.
e) RM of Bjorkdale No. 426, Three Span Bridge.
f) RM of Mervin No. 499, Single Span Bridge.

D15. RM Bridge drawing sets, Inertia Solutions Inc., six RM bridges, matter 33-19-04. Mr. Jones noted that the drawings for the RM of Crooked River bridge which were included in the package were not relevant.

D16. Chronology of events.

D17. Larger versions of the same or similar photos of three of the thumbnail photos contained in Exhibit D9 d), matter 33-18-05.

D18. Legible versions of drawings that were similar to the drawings contained in Exhibit D9 c), i. and ii., which were representations of typical historical bridge construction of the 1960s / 1970s era, matter 33-18-05.

Counsel for **Scott O. Gullacher** had no additional documentary evidence to submit, but asked that the Hearing Panel take note of the following clarifications, summarized as follows:

1. In Exhibit D16, following the September 14, 2018 entry “Bridge Fails”, the next entry should be September 17, 2018 “Bridge repair work commenced on bridge that had failed.”
2. In Exhibit D16, counsel for the Member had concerns about the source of an entry on page 3 of the chronology related to the depth of gravel on the bridge (photos indicate approximate 7 inches to 9 inches).
3. Counsel for the Member urged the Hearing Panel to accept the opinion of **Scott O. Gullacher** as to the depth of the gravel that had been added to the bridge, (**Scott O. Gullacher** states on page 4 of his March 21, 2019 letter to APEGS "The gravel surface was measured [in] {sic} two places on the bridge deck near the failure and those thicknesses were 14" and 16”").
4. Counsel for the Member suggested that one of the reasons for the failure was that too much gravel had been placed on the bridge.
5. Counsel for the Member suggested that it is not clear who made the comment that the thickness of gravel on the bridge was approximately nine inches. He further suggested that this information may have come from the last page of Exhibit D9 which states that the depth of the gravel “appears to be up to approximately 9 inches in depth” and asked that no weight should be given to this estimate of the depth of gravel put on the bridge.
6. Counsel for the Member explained the law related to the criteria for admitting expert evidence as decided by the Supreme Court of Canada in the case of R. v. Mohan, where it was held that for the purposes of making findings expert witnesses must be:
    a. Properly qualified to give an opinion, and
    b. Opinions expressed by experts must be necessary, and
    c. Reliable.
7. Counsel for the Member stated that the criteria for admitting expert evidence have been met for Exhibits D11 and D13 so the Hearing Panel may rely on the expert opinions contained in them for the purpose of making findings.
8. Counsel for the Member suggested that:
    a. The opinions and conclusions found in The Other Reports (herein referred to as “The Other Reports”, see section 6 for definition) entered as Exhibits should be given little weight.
    b. While The Other Reports may have been useful in informing the investigation, the authors had not been formally qualified (at the hearing) as expert witnesses.

Investigation Committee counsel’s response is summarized as follows:

1. It is up to the Hearing Panel to decide on the weight that they will put on each Exhibit when assessing their applicability as evidence.
2. The standard method of expert witness determination is that the proposed expert is called as a witness, then asked questions to make sure that they have expertise satisfactory to the

Hearing Panel within a particular area that is relevant to the matters to be determined by the Hearing Panel.

3. At the time in the hearing when an expert witness is qualified, the facts have not yet been determined by the Hearing Panel. Therefore, an expert witness can only give opinion evidence based on hypothetical facts. The party relying on the expert witness testimony hopes that the statements by the expert witness will, in the course of the hearing, be established as facts, which are necessary so that the opinions of the expert witness can be relied upon.
4. The Hearing Panel is obliged to consider evidence (exhibits) and hear evidence (testimony) put forward by the Investigation Committee and the Member.
5. As to the question of weight to be given to The Other Reports, it was acknowledged that Mr. Bergbusch's suggestions could be considered by the Hearing Panel at their discretion.
6. The Hearing Panel may use any information submitted as evidence. The Act states that the Hearing Panel can consider anything as evidence that it considers relevant. It is up to the Hearing Panel to decide upon the weight, if any, to be given to any evidence.

The Hearing Panel asked a number of questions of **Scott O. Gullacher** regarding information contained in the exhibits. The clarifications received are summarized as follows:

1. Geotechnical work was not included in the proposal packages submitted to the RM of Clayton by Inertia Solutions Incorporated.
2. In the letter dated March 21, 2019 from Inertia Solutions Incorporated to APEGS (part of Exhibit D9), it notes on page 4 that:
    - The RM of Clayton agreed to proceed without a site-specific geotechnical investigation, and
    - A geotechnical investigation at the pile location was not economically viable and would make it difficult to complete the project within the timeframe the RM required.

   The Member was referred to this information and asked to elaborate on his discussion with the RM. The Member responded, "I laid out for them that the Bridge Code allowed for them as the jurisdiction having authority, which they believed they were, to require or remove any of the requirements from the Code that they saw fit." The Hearing Panel understood this to mean that the Member believed that the RM of Clayton had exercised authority to allow the project to proceed without a geotechnical investigation.
3. The Hearing Panel referred the Member to Exhibit D9c (the Inertia Solutions failure report), page 3 where it states," Additional information was brought forward after the failure about the existing structure and construction. This information was sent to us by email on September 24, 2018, and it is our understanding that this information was in the possession of the Saskatchewan Association of Rural Municipalities (SARM) and was released to the RM of Clayton shortly before it was forwarded to us." On page 10 of this same report, it also referenced additional information provided on Sept 24, 2018. The Member was asked to confirm what this additional information consisted of. The Member was unsure of the specific information but felt that it was a "bridge file" that included records of the site, what had been previously built on the site, notes and other information typically found in an

owner's file. This information was received by Inertia Solutions Incorporated by email on September 24, 2018.

a) The Member was asked to describe how Inertia Solutions became aware of the additional information. He explained that they had verbally requested the information (during the design development phase) from the RM but did not receive it until September 24.
b) Further, the member was asked if historical bridge information was available in a repository somewhere. The Member indicated that he did not know of a consistent source for historical bridge information. However, the information is routinely requested. It was probably requested via telephone call. In this case, the Member believed the historical information was held elsewhere, not with the RM.

4. The Member was asked about the demolition phase, in particular what happened to the existing piles. The Member indicated that the protective planking was cut with a chainsaw to facilitate removal then the existing piles were broken off with an excavator or cut off at ground level. The remaining portions of the piles were abandoned in place.
5. The Hearing Panel requested a legible version of the drawing set included in Exhibit D9 titled 'Standard Precast Prestressed Concrete Bridge' from Investigation Committee representatives and a set of drawings was distributed. Counsel for the Member noted that one of the drawings did not appear to match what was in Exhibit D9. The Member was asked if the drawings could be considered representative of typical bridge construction circa the 1960s and 1970s. The member indicated that the drawings were generally representative. The Hearing Panel then sought permission to enter these drawings into evidence as Exhibit D18 on the basis that they conveyed similar information to the drawings found in Exhibit D9. The Member agreed.
6. The Member was asked what instructions were given to the RM of Clayton about application of the gravel wearing surface on the bridge. The Member's recollection was that verbal instructions were given by Can-Struct's foreman to the RM foreman about the type of gravel material to be used and the thickness of the gravel should be about four inches. The Member confirmed that no written instructions or guidance regarding the depth of wearing gravel were provided to the RM by either Inertia Solutions or Can-Struct.

Final submissions made by Investigation Committee counsel, referring to the documentary evidence found in the Exhibits, are summarized as follows:

1. The expertise of the authors of the reports found in Exhibits D11 and D13 was not in question.
2. In Exhibit D11, the application of Capacity to Torque Correlation (CTC) is only one factor to consider when designing screw piles (hereinafter referred to as helical piles).
3. With respect to the five other bridges described in the Associated Engineering Report (Exhibit D13) the designs were inadequate, resulting in reduced load limits, which constitutes professional misconduct.

Final submissions made by counsel for the Member are summarized as follows:

1. There is no challenge against the reports found in Exhibits D11 and D13.

2. The Member admits that the Hearing Panel can rely on the contents of the reports found in Exhibits D11 and D13 and admits that the authors of those reports are qualified to offer opinion evidence.
3. The Other Reports can be considered for factual reference information only. They may have been useful for the Investigation Committee in deciding whether a formal complaint should proceed, but The Other Reports should not be relied upon in the same manner as reports of accepted expert witnesses. Therefore, no weight should be assigned to the opinions and conclusions in The Other Reports. To do so would require that the Hearing Panel properly qualify the authors as expert witnesses, which was not done.

There was no further evidence presented by the Investigation Committee or the Member.

6 SUMMARY OF EVIDENCE AS DETERMINED BY THE HEARING PANEL

The evidence available to the Hearing Panel was presented by the Investigation Committee as Exhibits D1 through D18. The Hearing Panel received and considered all exhibits as evidence.

The Hearing Panel applied significant weight to Exhibits D11 and D13 as expert evidence. The Hearing Panel defined “The Other Reports” as any documentation or reports that were written by registered professionals except for Exhibits D11 and D13 and except for those written by the Member himself. The Hearing Panel relied on the factual information contained in the other documentation including all professional reports described as The Other Reports primarily for understanding the sequence of events, direct observations, general context. The Hearing Panel recognizes that The Other Reports were prepared by registered professionals. However, the Hearing Panel decided that the opinions and conclusions expressed in The Other Reports would not be given any weight because the authors of The Other Reports were not subjected to the process of expert witness qualification at the hearing and the Member was not prepared to admit that the authors of The Other Reports should be considered as expert witnesses for the purposes of the hearing.

The verbal submissions in the hearing by the Member and his legal counsel were treated as evidence.

7 FINDINGS OF FACT

The Hearing Panel made the following findings of fact:

7.1 FINDINGS OF FACT APPLICABLE TO BOTH MATTER 33-18-05 AND MATTER 33-19-04

a. **Scott Oakley Gullacher, P. Eng.** was a member of APEGS from December 20, 2013 until at least December 31, 2022 under membership #21216.
b. Inertia Solutions Inc. (herein also referred to as Inertia Solutions) was a holder of a Certificate of Authorization with APEGS from November 13, 2015 to December 31, 2019 under registration #35261.
c. There is no record in the APEGS Register that Can-Struct Systems Inc. (herein also referred to as Can-Struct) held a Certificate of Authorization during the period of interest.

d. The Member was an authorized representative for Can-Struct and possessed signing authority to execute contracts on behalf of Can-Struct.
e. The authors of Exhibits D11 and D13 are qualified to provide expert opinion.
f. Exhibit D11 is a credible and relevant source of technical information and expert opinion on subjects including, but not limited to the following:
    i. Current engineering practise for the design of helical piles.
    ii. Identification and interpretation of applicable standards, such as CSA S6-14 (Canadian Highway Bridge Design Code; herein referred to as CHBDC[2]), CSA S6.1-14 (Commentary on CSA S6.1-14), and the Canadian Foundation Engineering Manual, 4th Edition (herein referred to as CFEM).
    iii. Use of limit states as a basis of foundation design.
    iv. Geotechnical and structural engineering recommendations for helical pile design.
g. Exhibit D13 is a credible and relevant source of technical information and expert opinion.
h. The following were referenced from Exhibit D11 and were relevant and applicable for the purposes of understanding and interpreting the evidence presented:
    i. Terms and definitions.
    ii. Sections of the CHBDC.
    iii. Structural and geotechnical practices.
    iv. Commentary and practices found in the CFEM.

7.2 FINDINGS OF FACT RELATING SPECIFICALLY TO MATTER 33-18-05

a. The project scope was for the rehabilitation of the Dyck Memorial Bridge (herein also referred to as the Project) which included replacement of the substructure while retaining and re-installing the existing pre-cast, prestressed girders.
b. Two or more bridges had been located at, or around, the site of the Project. The Department of Highways Bridge File Summary (Exhibit D9 c) iii. shows that in 1951 preservative-treated timber abutments were erected. The summary also shows that in 1976 a three-span bridge was constructed.
c. Below-ground sections of the existing wooden piles were abandoned in the ground as part of the Project.
d. The design-builder for the Project was Can-Struct.
e. Inertia Solutions acted as design-builder's engineering consultant. **Scott O. Gullacher** held Permission to Consult and was the Official Representative for the Certificate of Authorization of Inertia Solutions.
f. The contract for the Project was between Can-Struct and the RM of Clayton.
g. The CFEM is a recognized and accepted source of information on the geotechnical aspects of foundation engineering as practiced in Canada and includes, for example, acceptable design guidelines.
h. The CHBDC was the standard applicable to the design and construction of the bridge structure for the Project.

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[2] CSA S6-14, *Canadian Highway Bridge Design Code*. © 2014 Canadian Standards Association. Please visit store.csagroup.org

i. Inertia Solutions specified the use of helical piles in the new foundation for the Project.
j. The Member relied upon information from other investigations completed in the region, as well as the available information from the existing bridge when designing the foundation system for the Project.
k. "… a subsurface investigation of sufficient scope is required to confirm that the ground conditions are similar when comparing the existing reference site and a new site." (Exhibit D11, page 3). Ground conditions may include, but are not limited to, soil characteristics, stratigraphy, groundwater conditions, site variability, and presence of foreign material.
l. The Member did not undertake, cause to undertake, require, use, or specify a project-specific subsurface investigation or report on the Project.
m. A site-specific subsurface investigation or report was not used for the design of the helical pile foundation that was constructed for the Project.
n. There was no direct, site-specific information on the subsurface conditions at the pile locations used in the design of the bridge foundation for the Project.
o. The Member did not engage, or otherwise collaborate with, a geotechnical engineer on the Project during the planning, design, and construction phases of the Project, or prior to the collapse.
p. The ultimate geotechnical resistance factor selected and used by the Member in the design of the helical piles was 0.55.
q. In accordance with the CHBDC, use of an ultimate geotechnical resistance factor of 0.55 for a compression limit state requires a **High** degree of site understanding. **High** understanding is defined as, "extensive project-specific investigation procedures and/or knowledge are combined with prediction models of demonstrated quality to achieve a high level of confidence with performance predictions." (Exhibit D11, page 4)
r. In accordance with the CHBDC, use of an ultimate geotechnical resistance factor of 0.55 for a compression limit state application implies use of a Dynamic Test method/model to develop a level of confidence in performance predictions and to inform the degree of site understanding. (Exhibit D11, page 4)
s. "There are two recognized design methods currently used for the design of helical piles: the Individual Bearing Method; and the Cylindrical Shear Method." (Exhibit D11, page 1)
t. "A third method of determining the ultimate capacity for helical screw piles is the Correlation to Torque method (CTC)". "The helical pile industry uses torque-capacity correlations [CTC method] as a means for quality control / quality assurance during pile installation." (Exhibit D11, page 2). The CTC method is not a recognized design method.
u. "Where the subsurface soil and groundwater conditions for a site have not been established, use of the CTC method for designing helical screw piles is not recommended." (Exhibit D11, page 2)
v. The Member utilized the CTC method to estimate the expected load carrying capacity of the pile foundations.
w. "… torque measurements in the field are highly influenced by the method of measurement..., the speed of pile installation, the configuration of the helical screw pile… and soil type/shear strength. As such, torque-capacity correlations should be used with caution as they may not be reliable." (Exhibit D11, page 2)

x. The CTC method does not take into account potential variations in the characteristics of the ground at various depths. “Soft zones within the subsurface soil profile that are stressed by the pile load (e.g., soft zones located below the lowermost helix) may not influence torque values recorded during pile installation but could impact the ultimate pile capacity and pile performance.” (Exhibit D11, pages 2, 9)

y. Empirical torque factors are based on laboratory testing of shafts up to 200 mm in diameter. Extrapolation of the empirical load factor, for piles larger than 200 mm in diameter, “should be done with caution and under the guidance of a geotechnical engineer.” (Exhibit D11, page 2)

z. The pile shafts used on the Project were constructed of 350 MPa steel circular tubes with a nominal diameter of 325 mm.

aa. “The helical pile elements must be structurally designed for all load combinations (Serviceability, Fatigue, and Ultimate Limit States) as defined by either the National Building Code of Canada (NBCC 2015) or the Canadian Highway Bridge Code (CHBDC S6-14).” (Exhibit D11, page 7). These loads include, for example, dead loads, live loads, and wind loads.

bb. “The structural designs [of helical steel pile elements] must also consider:
- Potential variations in geotechnical conditions
- Changes in water level
- Changes in geotechnical conditions with time
- Scour
- Corrosion protection and sacrificial material loss
- Feasibility of installation and potential obstructions to installation”

(Exhibit D11, page 8)

cc. “The length of a pile, number, size and thickness of helixes, helix spacing, and welding requirements are all a function of the geotechnical design parameters.” (Exhibit D11, page 8)

dd. Documents that express and depict the foundation system design for the Project prepared by Inertia Solutions (Exhibit D8):
- Do not indicate the classification of the highway.
- Do not specify the design live load.
- Do not indicate the version of the CHBDC used as a basis of the design.
- Do not completely and unambiguously specify material and geometric requirements of foundation system elements, e.g.:
  - The material grade, thickness, finishes and other relevant properties of the pile shaft materials.
  - Information on the number of helixes, helix material, helix thickness and geometry and orientation of the helixes.
  - Bracing system components.
- Do not address welding design and specifications.
- Do not detail the connection of the steel piles to the W12 steel beam pile cap.
- Do not detail connection of the W12 steel beam pile cap sections.
- Do not specify a design or target torque value.
- Do not specify pile length, design depth and minimum embedment.

ee. Post-failure load testing of the piles revealed that the capacity of the piles was lower than expected based on the measured or derived installation torque values: 280 kN to 300 kN versus 350 kN to 400 kN, respectively (Exhibit D9 c), page 8). These pile loading tests were performed on piles resting approximately 1.2 metres below their initial installation elevation.

ff. The east pier of the Dyck Memorial Bridge moved down approximately 1.2 metres but remained within 50 mm of being level.

gg. The Dyck Memorial Bridge in the RM of Clayton No 333 collapsed as a result of settlement of the east pier.

7.3 Findings of Fact Relating Specifically to Matter 33-19-04

a. The Member was the design-builder's consultant on the five bridges.

b. The Member was responsible for the design documents for the five bridges.

c. The designs of the superstructures were inadequate to carry the minimum loads required by the CHBDC (Exhibit D13).

d. There was inaccurate representation of bridge designs in documents submitted (Exhibit D13).

e. Numerous code deficiencies were identified in the plans and designs for the five bridges (Exhibit D13).

f. Critical detail was missing on plans for welding details for the five bridges (Exhibit D13).

g. An appropriate design for this type of structure requires sufficient composite action between the deck and steel girders (Exhibit D13).

h. "Composite action refers to connecting the deck to the girder sufficiently that they function as a unit to resist loads." (Exhibit D13, page 19)

i. The composite action between the deck and the steel girders was insufficient due to the inadequate number of shear studs. (Exhibit D13, page 21)

j. "For all of these structures, the number of studs provided in a single "shear panel"…is significantly less than that required to achieve full composite action." (Exhibit D13, page 21)

k. "Deficiencies in the degree of composite action imply that the steel girder sections are undersized and the superstructures less strong and less stiff than assumed in the design… It also suggests the superstructure flexibility would lead to excess deflections under self-weight and traffic, and likely higher vibrations under truck passage. The latter implies more rapid deterioration of the superstructure from dynamic loads and from cumulative fatigue cracking." (Exhibit D13, page 21)

l. The designs require continuity of load across multiple spans. This is not achieved due to a lack of capacity at ultimate limit state. (Exhibit D13, pages 21 through 23)

m. "There are deficiencies in the ability of this detail to transfer load across spans.... Therefore the spans cannot be considered continuous for live loads or superimposed dead loads.... the connection does not have the required capacity to make the spans act continuously." (Exhibit D13, pages 22 through 23)

n. The bridge rail provided did not meet the requirement for a TL-2 rating as required by CHBDC. (Exhibit D13, page 23)

o. “In the absence of evidence of an evaluation, the inference is that a sub-standard barrier was provided for cost saving reasons.” (Exhibit D13, page 23)

p. “Gravel wearing surface on concrete decks will result in damage to the bridge deck and abutment once material is removed from the deck.” (Exhibit D13, page 31).

q. “The designs all indicate in cross section that gravel wearing surface is crowned and taper down to a minimal thickness at the edges. This section gives the indication that bridge deck drainage will be achieved. In practice this is not achievable. There are no gravel stops provided at the deck edges to retain material from spilling over the edge. The loss of material will result in substantial bump at the bridge end, leading to future deck damage from dynamic loads. The ride quality will also be reduced.” (Exhibit D13, page 24)

r. “…the amount of weld provided is deficient for full load transfer between the panels and the steel girder in the positive moment region. In the negative moment region over the pier a continuous weld is provided; however, it is unclear if the detail satisfies the fatigue requirements in the code [CHBDC]. The use of the overhead weld in the field is also problematic as it is difficult to execute and provide a quality end product, and it is unclear if any testing was done to confirm the design assumptions were satisfied in the field. The weld is also problematic as it can result in fatigue cracking in both the weld itself as well as the concrete deck panel.” (Exhibit D13, page 24)

s. “All the bracing connections utilize a single bolt and it is unclear from lack of dimensions whether or not the minimum requirements for edge distance have been satisfied. It is also unclear if the bolts were pre-tensioned during installation as required by CHBDC.” (Exhibit D13, page 24)

8 LAW APPLICABLE TO BOTH MATTERS 33-18-05 AND 33-19-04

Section 5 of the Act, states that the objects of the Association (APEGS) are the following:

(a) to ensure the proficiency and competency of members in the practice of professional engineering or the practice of professional geoscience in order to safeguard the public;

(b) to regulate the practice of professional engineering and the practice of professional geoscience by members in accordance with this Act and the bylaws;

(c) to promote and improve the proficiency and competency of members;

(d) to foster the practice of professional engineering and the practice of professional geoscience by members in a manner that is in the public interest.

Section 30 of the Act defines professional misconduct as follows:

"Professional misconduct is a question of fact, but any matter, conduct or thing, whether or not disgraceful or dishonourable, is professional misconduct within the meaning of this Act if:

(a) it is harmful to the best interests of the public or the members;

(b) it tends to harm the standing of the profession;

(c) it is a breach of this Act or the Bylaws; or

(d) it is a failure to comply with an order of the investigation committee, the discipline committee or the council."

Further, subsection 20(1) of the Bylaws states:

> "All members and holders of temporary licences shall recognize this code as a set of enduring principles guiding their conduct and way of life and shall conduct themselves in an honourable and ethical manner, upholding the values of truth, honesty and trustworthiness, and shall safeguard human life and welfare and the environment."

And subsections 20(2)(a) and (b) of the Bylaws state:

> "…members and licensees shall:

(a) hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace;

(b) offer services, advise on or undertake professional assignments only in areas of their competence and practise in a careful and diligent manner;

…"

9 ANALYSIS AND JUDGEMENT

The Member was charged with four counts of professional misconduct in connection with Investigation Committee file 33-18-05 (the Dyck Memorial Bridge) and further charged with one count of professional misconduct in connection with Investigation Committee file 33-19-04 concerning the overall design of five municipal bridges identified in Exhibit D2 (herein also referred to as The Five Bridges). The following is the analysis and reasoning for the decisions made by the Hearing Panel for each count.

The Hearing Panel recognizes that self-regulating professions have an obligation to the public and to other professional members to make the discipline process and decisions as clear and transparent and understandable as possible. Evidence was presented to the Hearing Panel through detailed professional reports and through clarifications provided by the Investigation Committee, Counsel for the Member and by the Member himself.

The Investigation Committee advised the Hearing Panel that they were prepared to qualify and call expert witnesses to give opinion evidence, if necessary. The Member, through his legal counsel, accepted Exhibit D11 and Exhibit D13 as expert evidence. The Hearing Panel subsequently decided that it would not seek any testimony from any authors of the documents they had been provided with or from any other expert witnesses.

The role of the Hearing Panel was limited by statute to hearing the evidence presented to it and then making a determination of whether the charges against the Member were proven, on a balance of probabilities. The Hearing Panel was not tasked with determining the cause or causes of the collapse of the Dyck Memorial Bridge.

9.1 MATTER 33-18-05 – COUNT 1

The Hearing Panel accepts that there are two recognized design methods that are currently used for the design of helical piles: 1) Individual Bearing Method, and 2) Cylindrical Shear Method.

In both design methods, determination of ultimate helical pile capacity involves calculating the unit bearing capacity of the soil and applying it to the helical plate areas to determine the end bearing resistance (i.e., bearing capacity) of the helix (or helixes).

Thus, for both the Individual Bearing Method and the Cylindrical Shear Method, the value of geotechnical parameters (including shear strength, unit weight and classification) of the soil within the pile/soil stress envelope are required in order to calculate the ultimate pile capacity.

No pre-existing information about subsurface geotechnical conditions was available and no subsurface geotechnical investigation was undertaken on the Project. Without knowledge of subsurface geotechnical conditions, including characteristic geotechnical parameter values, it would not have been possible to calculate the unit bearing capacity of the soil and a factored ultimate geotechnical resistance value using either the Individual Bearing Method or the Cylindrical Shear Method.

The helical pile industry uses torque-capacity correlations as a means for quality control/quality assurance during pile installation. The CTC method is a form of commissioning activity and not a design method.

The expert opinion expressed in Exhibit D11 states that:

- Torque-capacity correlations should be used with caution as torque values measured in the field can have a high degree of uncertainty and therefore that torque-capacity correlations may not be reliable.
- Extrapolation of the empirical torque factor for piles larger than 200 mm in diameter should be done with caution and under the guidance of a geotechnical engineer.
- A good understanding of the ground conditions at pile locations, within and extending beyond the zone that is expected to be stressed as a result of loads on the pile is essential.
- Installation torque should be used for monitoring purposes only and not to determine helical pile capacity.

The helical pile shaft diameter on the Project was considerably beyond the available empirically derived information introducing significant design and performance risk (325 mm versus 200 mm).

The CTC method was not a reliable predictor of foundation system performance, potentially leading to over confidence in the results and overestimation of the geotechnical resistance.

The Hearing Panel concludes that:

1) A decision was made to proceed without a site-specific subsurface investigation to avoid the associated cost and time requirements.
2) The Member elected to proceed with design and construction work:

    a) Without undertaking, or causing to have undertaken, a site-specific subsurface investigation.
    b) Without reviewing available record information about the existing foundation system.
    c) While relying on information from other investigations undertaken in the region.
    d) While relying on drawings and details considered to be typical for bridge structures designed and constructed in the 1970s.
3) The Member did not calculate an ultimate geotechnical resistance value at ultimate limit states based on site-specific characteristic geotechnical parameters.
4) The Member utilized a CTC method to produce an apparent geotechnical resistance value as an alternative to, or substitute for, calculating an ultimate geotechnical resistance value at ultimate limit states using site-specific characteristic geotechnical parameter values.
5) The Member selected and utilized a geotechnical resistance factor that is applicable when there is a high degree of site and prediction model understanding, including ground properties and geotechnical properties throughout the site. However, reliance on limited representative information requires that a low geotechnical resistance factor be used.
6) A site-specific subsurface investigation was warranted for practise in a careful and diligent manner for the Project due to unknown subsurface conditions and factors arising from such considerations as:
    a) The potential severity of any resulting impacts of a foundation failure on the superstructure and/or public safety.
    b) The Dyck Memorial Bridge was a multiple span bridge structure.
    c) The potential impact of previous bridge developments at the site.
    d) The potential variations or changes in subsurface soil and groundwater conditions.

The Hearing Panel determined that Scott O. Gullacher, P.Eng. did not practise in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in determining the factored resistance required of the Dyck Memorial Bridge helical pile foundation.

The nature and extent of information about the existing structure and site and the site's history warranted that Scott O. Gullacher, P.Eng. not proceed with the design and construction of a foundation system in the absence of a site-specific subsurface investigation. Sole reliance on the Correlation to Torque Method to gauge the suitability and adequacy of helical pile design, in the absence of site-specific geotechnical information, created an unacceptable level of risk to foundation system performance.

The lack of site-specific subsurface information for the Dyck Memorial Bridge project, in combination with the reliance of the Correlation to Torque Method was not in accordance with practise in a careful and diligent manner given the conditions present at the Dyck Memorial Bridge site. Scott O. Gullacher's application of the Correlation to Torque method for the Dyck Memorial Bridge resulted in an overestimation of the helical pile capacity.

9.2 MATTER 33-18-05 – COUNT 2

When read together with the preamble, Count 2 can be re-stated as follows:

> **Scott O. Gullacher P.Eng.** committed acts of professional misconduct contrary to the provisions of subsection 30(c) of *The Engineering and Geoscience Professions Act*, in that he breached *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* subsection 20(2)(b) by **offering services, advising, or undertaking professional assignments outside of his area of competency**.

The Hearing Panel did not receive sufficient evidence to prove Count 2. The evidence presented did not include suitable and adequate information to enable the Hearing Panel to:

- Fully understand the Member's areas of competence.
- Differentiate between the defined or generally accepted definitions of engineering disciplines such as geotechnical engineering and structural engineering in bridge substructure design applications.

In the absence of such information, the Hearing Panel would be required to develop and apply their own interpretations and definitions and were not in a position to do so.

There was insufficient evidence to prove Count 2 on a balance of probabilities.

9.3 MATTER 33-18-05 – COUNT 3

Helical pile elements used in bridge foundations must be structurally designed for all load combinations as defined by the CHBDC. Structural designs must also consider other factors such as the variability of the conditions of the site not accounted for by site understanding, the construction sequence and site constraints.

The CHBDC requires that the ultimate geotechnical resistance of a geotechnical system at a specific site be determined from calculations based on information obtained from a site-specific geotechnical investigation or from assessed values. The CHBDC also requires that characteristic geotechnical parameter values be used to determine the ultimate geotechnical resistance. Assessed values are values of geotechnical parameters inferred from the performance of similar geotechnical systems in similar geotechnical conditions.

Recognized helical pile design methods require determination of characteristic geotechnical conditions of the soil within the pile/soil stress zone in order to calculate the ultimate and factored resistance values of the affected soil and to develop an acceptable helical pile design. The length of a pile, the number, size and thickness of helixes, helix spacing, and welding requirements are all a function of the helical pile design parameter values selected. With no site-specific geotechnical information available upon which to base a design, it was not possible to determine by an engineering design process what a pile configuration needed to be.

Documents such as drawings and specifications that express, convey, and communicate a foundation system design must be detailed and comprehensive enough to ensure that construction is carried out in the manner and to the standards assumed in design and implicit in the CHBDC and other relevant standards.

Drawings and specifications are a type of control measure that help ensure that the product of the construction process fulfils the design intent, including compliance with applicable codes and standards. In the absence of a suitably or adequately documented design, the risk of miscommunication, misunderstanding, uncertainty about expectations and unintended results is exacerbated.

The construction documents for the Project lacked essential information needed by constructors to understand and fulfil their responsibilities and by persons performing inspections or construction observation, for example.

Without confirmation that the ground conditions at an existing reference site and the Project site were similar in stratigraphy and have similar soil, hydraulic and other relevant properties:

- Use of inferred geotechnical parameter values as a basis of design was not appropriate.
- The design and construction experience from other sites had limited value and weight.
- Adopting or adapting a design from another project attached significant risks.
- The performance of a proposed foundation system design that had similar design characteristics to foundation systems at other sites could not be meaningfully predicted.
- An apparent geotechnical resistance value produced using a CTC method may be misleading with respect to ultimate pile capacity and pile performance.
- The choice of a geotechnical resistance factor that corresponded to a high degree of site understanding could not be justified.

Post-failure load testing of the piles revealed that the capacity of the piles was lower than expected based on the measured or derived installation torque values: 280 kN to 300 kN versus 350 kN to 400 kN, respectively. These pile loading tests were performed on piles that had dropped and were resting approximately 1.2 metres below their initial installation elevation. These post-failure load tests correspond to the in-situ depth of piles and current bearing conditions. For the piles at the east pier, these post-failure results may not correspond to the original pre-failure load capacity based on pre-failure bearing soil conditions.

The Hearing Panel concludes that:

1. The methodology that the Member used to develop the foundation design did not limit the probability that, as a result of the design and construction, the bridge would be exposed to an unacceptable level of risk of failing to perform as required.
2. The design and construction documents developed by the Member for the Project did not fulfil the requirements of the CHBDC and did not adequately ensure that the product of construction complied with applicable standards.
3. Site-specific subsurface information was not used in the design of the piles installed for the Project.
4. In the absence of characteristic geotechnical parameter values for the Project site, a factored soil resistance value could not be calculated and utilized to develop a helical screw pile design.
5. An apparent value of the ultimate resistance value of the subsurface soil at the Project site was produced by application of a CTC method.

6. Without knowledge of the subsurface soil conditions and without an engineered helical pile design, a valid design or target torque value could not be estimated.

The Hearing Panel determined that Scott O. Gullacher, P.Eng. did not practise in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in designing the helical piles used in the Dyck Memorial Bridge foundations.

In particular, Scott O. Gullacher, P.Eng. did not provide adequate engineering designs for the helical piles used in the foundation system for the Dyck Memorial Bridge. The helical pile designs did not provide the axial and bending capacity specifications required, clear descriptions of the pile geometry suitable to fabricate the piles, and target torque requirements necessary to achieve the design axial capacity.

9.4 MATTER 33-18-05 – COUNT 4

The Hearing Panel did not receive sufficient evidence to prove Count 4. Count 4 asserts that **Scott O. Gullacher** did not practise in a careful and diligent manner contrary to subsection 20(2)(b) of the Bylaws in the overall design of the Dyck Memorial Bridge. The Hearing Panel interpreted this to mean that **Scott O. Gullacher** was responsible for the design of the entire bridge. However, the scope of work contracted to Can-Struct by the RM of Clayton predominantly involved replacing the timber substructure with a new substructure and was not a complete bridge replacement.

The Member's proposal may have also included work relating to the superstructure, but this scope was not sufficiently defined for the Hearing Panel. The design-build nature of the Project affects the type and content of required construction documents. The documents must be sufficient to convey the design intent, meet applicable regulatory or code requirements, obtain regulatory approvals, and provide records for future reference. However, the nature of design-build is such that the degree of information required on certain documents may be somewhat reduced from that which would be expected from traditional design-bid-build projects and/or may be presented on another construction document. The Hearing Panel could not determine if the information alleged to be absent from the Member's design documentation was part of his scope of work and what any deficiencies may have been.

9.5 MATTER 33-19-04 – COUNT 1

The independent bridge reviews found in Exhibit D13 raised several issues about The Five Bridges. The issues, as they relate to practise in a careful and diligent manner and the conduct of the Member are detailed below.

1. <u>Inaccurate representation of bridge designs in documents submitted</u>

In the title block of the drawings and documents provided to the RMs it states that "All construction shall be in conformance with CSA S6". This statement can be taken as a representation that The Five Bridges were intended to be designed in accordance with the CHBDC. However, for bridge designs to be in accordance with CHBDC, the drawings and documents provided to the RM's needed to include sufficient technical detail to meet the standard.

The following are examples of design criteria that were missing from the bridge design documents:

- Composite/non-composite action of bridge superstructure.
- Bolt grades and strength.
- Weld sizes, lengths, locations, and weld strength.
- Dimensions for back walls.
- Documents provided confirm that the guardrails did not conform to the CHBDC, but the non-conformity was not noted on design criteria or within notes on the drawings.

An aspect of the designs which was particularly problematic was the lack of detail provided on the plans regarding safety-critical details of the superstructure to be communicated to the Construction Contractor.

Examples of information required for safety that were not indicated on the plans include the following:

- Weld locations, size, length, and pitch.
- Bolt grades, sizes, preparation, installation methods.
- Field-changed structure connections, such as bolts changed to welds.
- Construction staging information that would allow an assessment of girder continuity.

The information listed above is necessary in order to determine whether lateral load transfer, composite action of the superstructure, and continuity of the spans is adequate.

Also missing from the plans was any requirement for inspection or testing to ensure that the projects were executed in accordance with design intent.

2. Critical welding detail missing on plans and other welded and bolted connection deficiencies

The three multi-span bridges relied on welded connections between the deck panels and the steel girders for continuity. None of these welds were detailed on the plans. Therefore, it would not be possible for the contractor to know the required length, size, and weld strength to satisfy the design intent.

The amount of weld provided was deficient for full load transfer between the panels and the steel girder in the positive moment region. In the negative moment region over the pier a continuous weld was provided. However, it was unclear if the detail satisfied the fatigue requirements in the code (CHBDC). The use of the overhead weld in the field was also problematic as it was difficult to execute and provide a quality end product and it was unclear if any testing was done to confirm the design assumptions were satisfied in the field. The weld was also problematic as it could result in fatigue cracking in both the weld itself as well as the concrete deck panel.

Bolted connections in the plans specified the use of 3/4 inch bolts however the grade of the bolt was not indicated, and the grade used in the field was not documented. All the bracing connections utilized a single bolt, and it was unclear from lack of dimensions whether or not the minimum requirements for edge distance were satisfied. It was also unclear if the bolts were pretensioned during installation as required by the CHBDC.

3. Non-conformity to code requirements

There were several examples of non-conformity with the CHBDC. Areas of concern included the following:

- No design life was stated in the plans.
- Design details required by the code were missing from the plans.
- Quality control, inspection and testing requirements were not included in any of the documentation.
- Concrete deck panels did not meet the code.
- Structural steel did not meet the code.
- No specifications for bolts were indicated in the plans.
- The code requires fracture critical members to be connected by continuous welds. On four of the five bridges stitch welds were used.
- Shear studs were not adequate to meet the assumption of composite action.
- The code requires that connections contain at least two bolts. All bracing connections were made with a single bolt.
- The plans did not indicate the requirement for pre-tensioning or torquing of bolts.
- The materials used for plates and tension members did not meet the code requirements.
- The code requires erection diagrams, shop details, welding procedures, erection procedure drawings and calculations to be submitted to the owner. The plans did not satisfy these requirements of the code.
- The traffic barriers (railings) did not meet the code.

4. Insufficient capacity due to lack of composite action in superstructure members

Composite action refers to connecting the deck to the girder sufficiently that they function as a unit to resist loads.

The connection between the deck and the girder can be made by attaching “Nelson studs” to the girder and then grouting the Nelson studs into pockets on the bridge deck.

The number of studs provided was significantly less than that required to achieve full composite action.

Deficiencies in the degree of composite action implied that steel girder sections were undersized, and the superstructure was less strong and less stiff than assumed in the design.

Without sufficient composite action, the traffic load for these bridges had to be reduced. Also, superstructure flexibility would lead to excessive deflections and more rapid deterioration of the superstructure.

5. Insufficient superstructure continuity for multi-span structures

For multi-span bridges it is necessary that individual spans are connected in such a way that continuity is created between the spans. By having continuity between the spans, the load can be shared among the spans.

Whether or not there was continuity between the spans, affects the sizing, strength and stiffness of the girders and was not clear on the drawings.

Although the Member provided typical splice detail in the drawings used for the multi-span bridges, with the design intent of achieving superstructure continuity, the splicing method was not adequate to provide continuity between the spans.

There were deficiencies in the ability of the structure to transfer load across spans therefore the spans could not be considered continuous for live loads or superimposed dead loads. The connection did not have the required capacity to make the spans act continuously.

6. Use of non-compliant bridge rail design

The bridge rail design did not meet the CHBDC TL-2 rating for the following reasons:

- The height was only 508 mm versus 680 mm in the code.
- The bridges only had single rails contrary to the code which requires the use of two rails.
- There were no detailed calculations of the bending, shear and punching loads on the connection of the bridge rails and therefore it was not possible to determine if the anchorage provided met the requirements of the code.

The CHBDC contains clauses which permit the use of non-compliant rail designs in restricted circumstances, but this requires documentation of both the use of non-compliant rails and the rationale for that decision. Project documentation does not reference the rails as being non-compliant, nor does the documentation include any rationale for the use of non-compliant rails or the associated risks. In the absence of evidence of an evaluation, the inference is that a sub-standard barrier was provided for cost saving reasons.

7. Insufficient details or specifications for gravel wearing surface

The designs all indicated in cross section that the gravel wearing surface should be crowned and tapered down to minimal thickness at the edges. This section gives the indication that bridge drainage would be achieved. In practice this is not achievable. There were no gravel stops provided at the deck edges to retain material from spilling over the edge. The loss of material would result in a substantial bump at the bridge end, leading to future deck damage from dynamic loads. The ride quality would also be reduced.

8. Minimum loads required by the CHBDC

Specific to the designs, there were issues with assumptions made regarding lateral load distribution, and distribution of load across bands under resistance. This resulted in five superstructure designs which were inadequate to carry the minimum loads required by the CHBDC.

Conclusions respecting Matter 33-19-04, Count 1:

The Hearing Panel therefore concludes as follows:

- There was inaccurate representation of bridge designs in documents submitted.
- Numerous code deficiencies were identified in the plans and designs.
- Critical detail was missing on plans for welding details.
- The composite action between the deck and the steel girders was insufficient due to an inadequate number of shear studs.
- The designs lacked continuity of load across multiple spans.
- The bridge rails did not meet the requirement for a TL-2 rating.
- Gravel wearing surface on concrete decks will result in damage to the bridge deck and abutment once material is removed from the deck.

The Hearing Panel determined that Scott O. Gullacher, P.Eng. did not practise in a careful and diligent manner contrary to subsection 20(2)(b) of *The Engineering and Geoscience Professions Regulatory Bylaws, 1997* in the overall design of five municipal bridges identified as:

- **RM of Scott No. 98 – Lewvan Bridge Replacement;**
- **RM of Caledonia No. 99 – Beck Bridge Replacement;**
- **RM of Purdue No. 346 – Crooked Bridge (Single Span);**
- **RM of Purdue No. 346 – North Kinley #1 Bridge Replacement (Three Span);**
- **RM of Mervin No. 499 – Twp Road 502 Bridge Replacement.**

In particular, the designs prepared by Scott O. Gullacher, P.Eng. for the five municipal bridges lacked relevant design information, including:

- **Inaccurate representation of bridge designs in documents submitted.**
- **Numerous Code deficiencies identified through all five sets of plans and designs.**
- **Lack of critical detail on plans for welding details.**
- **Bridge rails provided were inadequate for a TL-2 rating.**
- **Gravel wearing surface on concrete decks would result in damage to the bridge deck and abutment once material is removed from the deck.**

Specific to the designs, there were issues with assumptions made regarding lateral load distribution, distribution of load across spans, and member resistance. These issues resulted in five superstructure designs which were inadequate to carry the minimum loads required by the Canadian Highway Bridge Design Code S6.

10 SUBMISSIONS AS TO DISPOSITION DEFERRED

The Investigation Committee and the Member were asked for Submissions as to Disposition. Counsel for the Investigation Committee indicated they were ready to proceed with submissions. Counsel for the Member requested an adjournment so that submissions could be formulated following receipt of the written decision and reasons to allow adequate time to prepare the submission.

Counsel for the Member also indicated that the Member was not working as an engineer. A request was made for the Hearing Panel to consider reconvening via a virtual platform to minimize costs.

Counsel for the Investigation Committee stated that if the Hearing Panel found the request reasonable, the Investigation Committee would not object.

11 Adjournment Sine Die and Interim Order

The Hearing Panel consented to the request to adjourn sine die subject to the following conditions:

1. That the hearing reconvenes within four weeks of the written decision and reasons being distributed to **Scott O. Gullacher, P.Eng.**
2. That under the interim order that **Scott O. Gullacher, P.Eng.** not practice as a professional engineer until such time as the Hearing Panel makes final orders related to the disposition of the matters.

The Hearing Panel takes note of one of the objects of APEGS as defined in subsection 5(a) of the Act, which requires the Association "… ensure the proficiency and competency of members in the practice of professional engineering or the practice of professional geoscience in order to safeguard the public." To safeguard the public, the Hearing Panel has ordered that the Member not practice as a professional engineer until a final order is made. This interim order shall not in any way prejudge the final decision of the Hearing Panel as to the disposition of these matters. The Investigation Committee and the Member shall have an opportunity to make submissions as to disposition and these submissions shall be heard by the Hearing Panel before final orders are made.

Failure to comply with this interim order of the Hearing Panel shall result in **Scott O. Gullacher, P.Eng.** being suspended from the Association of Professional Engineers and Geoscientists of Saskatchewan, and he shall remain suspended until there has been compliance with the interim order.

The request to reconvene on a virtual platform was granted.

Adjournment sine die occurred at 10:51 a.m. on June 8, 2022, with the hearing to be reconvened as indicated in the interim order. When the hearing resumes, it shall be for the purpose of hearing submissions as to disposition by the Investigation Committee and the Member. The Hearing Panel shall determine the date the hearing shall be reconvened in consultation with the Investigation Committee and Counsel for the Member.

Respectfully submitted and ordered on behalf of the Discipline Committee at Saskatoon,

Saskatchewan, this 24th day of January 2023.

Daniel Kishchuk, P.Eng., Chair, Hearing Panel

Daryl Andrew, P.Eng., Member, Hearing Panel

Chanelle Joubert, P.Geo., Member, Hearing Panel