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The Discipline Committee of the Association of Professional Engineers of Ontario

In the matter of a complaint regarding the conduct of

## A licensee (hereinafter referred to as "the member"),

a holder of a Certificate of Authorization (hereinafter referred to as “the company”)

## Decision and Reasons — Stipulated Order

The Complaints Committee in accordance with Section 24 of the *Professional Engineers Act* (hereinafter referred to as the “Act”) referred the above noted matter to be dealt with by way of a Stipulated Order.

A member (hereinafter referred to as “the reviewing member”) of the Discipline Committee of the Association of Professional Engineers of Ontario (hereinafter referred to as “PEO”) met with the involved parties at the offices of PEO in Toronto, Ontario, on July 24, 2000, and had a telephone conference with the engineering expert (hereinafter referred to as “the expert”) engaged by PEO on or about July 20, 2000. On July 24, 2000, at 8:30 a.m., the complaint was reviewed with the complainant (hereinafter referred to as “the complainant”) of Company “A”.

In a meeting on July 24, commencing at 11:30 a.m., the member provided an explanation for his actions in this matter.

The complaint arose from the member’s involvement in the preparation of design drawings for the medical gas piping systems (hereinafter referred to as “the system”) for an Ontario hospital (hereinafter referred to as “the hospital”) constructed in 1998.

The engineering department at the hospital requested that the contractor provide the initial drawing prepared by the member to the complainant for comments. The complainant advised the contractor that he could not provide informed and meaningful comments as the drawing lacked detailed information. A revised drawing prepared by the member was provided to the complainant. The revised drawing

contained errors, omissions and deficiencies and incorrect references in the drawing's "specifications" and "operating conditions" sections.

## Allegations

Paragraph five of the complaint alleged:

5.1 "On May 15, 1998, the contractor provided the complainant of Company "A" with drawing M2, "Medical Gas Plan". The title block indicated that drawing M2 was for the hospital's system.

5.2 The footnote on Company "A's" stationery indicated that Company "A" is "accredited by the Standards Council of Canada as a qualified testing agency for non-flammable medical gas piping systems to C.S.A. Standard CAN/CSA Z305.1".

5.3 The engineering department of the hospital had requested that the contractor provide drawing M2 to Company "A" for review for compliance with C.S.A. Standard CAN/CSA Z305.1.

5.4 Drawing M2 was dated 17.04.98 and indicated a "Plot Date" of 14.05.98. The drawing was sealed and signed, but not dated by the member. The title block portion indicated an alternative name to that of the Company.

5.5 In a telephone conversation, the complainant advised the contractor that he "refused to comment on the drawing due to its incomplete detail with regard to the medical gas lines" as "there was not enough information for [him] to make any informed or meaningful comment".

5.6 On June 1, 1998, the contractor provided the complainant with a revised drawing M2, dated 17.04.98 with a "Plot Date" of 24.05.98. The drawing was sealed and signed, but not dated by the member. The drawing identified that there had been two revisions made to the drawing. These revisions were noted as follows:

5.6.1 Rev.1:15.05.98, Coordination Review; and

5.6.2 Rev.2:24.05.98, Revised as per site review.

5.7 Although the piping detail on revised drawing M2 was much better, the complainant noted errors, omissions and deficiencies, which included the following:

5.7.1 Required services isolation valves were not shown;

5.7.2 Locations of the area alarm sensors were not shown; and

5.7.3 The piping detail shown at the zone valve, located in the wall of the staff washroom, was deficient.

5.8 The complainant also noted errors, omissions, deficiencies, and an apparent lack of understanding, in the revised drawing M2's specifications as follows:

5.8.1 Specifications for the medical vacuum, which is classified as a medical gas in Standard CAN/CSA Z305.1-92 (Standard), were omitted;

5.8.2 The specified joining material was not in accordance with the Standard, which requires a joining material with the AWS Classification of B Cup-5;

5.8.3 The specifications called for gate valves, but the Standard specified that all valves in the piping distribution system must be ball valves; and

5.8.4 The specifications required that all systems were to be tested "to 68 psi with nitrogen or 81 psi with water". The complainant noted that, should water ever be introduced into the piping systems, they would "never pass the purity analysis required by the Standard".

5.9 The complainant further noted that in the "Operating Conditions" information on revised drawing M2:

5.9.1 The relief pressure shown for nitrous oxide was incorrect, in that the Standard required it to be 65 psi, not the 75 psi shown;

5.9.2 The "test pressures" shown were all incorrect, in that the Standard required the "test pressure" to be 1.5 times the nominal operating pressure or 150 psi, whichever is greater; and

5.9.3 With a "relief pressure" of 75 psi, the "test pressure" of 75 psi contravened the *Ontario Boiler and Pressure Vessels Act*.

5.10 It is alleged that the member and the Company:

5.10.1 Prepared two versions of a final drawing, which were both incomplete and lacked sufficient details for construction;

5.10.2 Omitted piping specifications for the medical vacuum, which is classified as a medical gas in Standard CAN/CSA Z305.1-92;

5.10.3 Specified joining material that did not meet the requirements of Standard CAN/CSA Z305.1-92;

5.10.4 Specified the use of gate valves instead of ball valves, contrary to Standard CAN/CSA Z305.1-92;

5.10.5 Specified, as an alternative testing procedure on all systems, the use of water, when the use of water in the systems would likely result in the systems failing the purity analysis required by Standard CAN/CSA Z305.1-92;

5.10.6 Incorrectly specified the "relief pressure" for the nitrous oxide piping system as 75 psi instead of 65 psi, contrary to Standard CAN/CSA Z305.1-92;

5.10.7 Incorrectly specified the "test pressure" of 75 psi for the systems, contrary to

Standard CAN/CSA Z305.1-92;

5.10.8 Breached the *Ontario Boiler and Pressure Vessels Act* by specifying a "test pressure" of 75 psi, while specifying a "relief pressure" of 75 psi;

5.10.9 Lacked understanding of the Standard CAN/CSA Z305.1-92, and the *Ontario Boiler and Pressure Vessels Act*; and

5.10.10 Provided professional engineering services under an alternative name when the Certificate of Authorization issued by PEO was for the Company.

5.11 It is alleged that the member and the Company are guilty of professional misconduct and/or incompetence as defined in the *Professional Engineers Act*.

The Form of Complaint was signed by the complainant and dated April 13, 2000.

On July 20, 2001, the expert advised the reviewing member in a telephone conference that he had reviewed the drawings prepared by the member dated May 14, 1998 and May 24, 1998. It was the expert's understanding that the drawing dated May 14, 1998 was issued for construction and that the drawing dated May 24, 1998 was issued in response to the complainant's concerns.

The expert advised that the medical gas design and installation standards and practices are a very well defined field of engineering and that CSA has produced a comprehensive standard for medical gas piping systems in hospitals and other health care facilities. This standard CAN/CSA Z305.1 is mandated in the Ontario Building Code under Article 3.7.5.2 which states that, "All medical gas piping systems shall be designed, constructed, installed and tested in conformance with CSA/Z305.1".

The expert advised that the CSA Standard is also considered the standard of practice for hospitals in Ontario. The standard defines that an independent medical gas testing agency be retained directly by the hospital to review and test the medical gas piping installation to ensure that it meets the standard. The independent testing agencies are accredited by the Standards Council of Canada in order to be considered as qualified. Company "A" is one of these independent testing agencies.

The expert advised that on review of the drawing prepared and stamped by the member dated May 14, 1998, he agreed with the complainant's comments that the drawing was not complete or sufficient for proper review.

The expert advised that this drawing was below the standard that one would expect of a professional engineer undertaking this work.

The expert was critical of the drawing prepared and stamped by the member dated May 14, 1998. The expert stated in a report to PEO dated November 10, 2000 and confirmed in his telephone conversation with the reviewing member that the drawing does not meet the present codes and standards for the following reasons:

1. No reference has been made on the layouts or specifications that the medical gas installation shall meet Standard CAN/CSA Z305-1.92. It is considered good engineering practice from a contractual construction point of view to have made such a reference. The only indication to Standard CAN/CSA Z305-1.92 is in the testing specification. However, the method described for testing is not in accordance with the standard referenced. Refer to item No. 8 for additional information on this issue.

2. The 1-1/4" diameter vacuum line is shown to connect and become a half-inch medical air line.

3. The new medical gas zone valve box is shown within a room that includes NO, which is an anaesthetic. CAN/CSA Z305-1.92, Article 4.4.3(e), indicates that the zone shut-off valve shall "be located immediately outside each anaesthetic location".

4. The relocated medical gas outlets drawing note also indicates the outlets are "complete with shut-off valves". CAN/CSA Z305-1.92, Article 4.4.4, indicates, "Where isolation shut-off valves are located between zone valves and terminal units, the isolation valves shall be locked in the open position". The "locked in the open position" has not been indicated on the documents as a requirement.

5. The joining material specified on the drawing does not comply with CAN/CSA Z305-1.92, Article 5.5, which very clearly defines the "joints". The joining material should be conforming to AWS classification B Cup5.

6. The specification on the drawing only refers to gate valves. Standard CAN/CSA Z305-1.92, Article 4.4.1, clearly states that, "All shut off valves in a medical gas piping system, except those in the source of supply and those in the terminal units, shall be ball-type valves....". Therefore, the new medical zone valves, if provided with gate valves, as inferred in the specification, would not comply.

7. Medical vacuum has been shown on the plan of the drawing; however, the drawing specification makes no reference to it. Medical vacuum is classified as a medical gas in Standard CAN/CSA Z305-1.92.

8. The drawing specification indicates that the system is to be tested with "nitrogen" or "water". CAN/CSA Z305-1.92 Standard, Article 15.2.1(a), states, "The test gas shall be all-free dry air or all-free dry nitrogen".

9. The drawing specification indicates that the "contractor to provide labels and directional flow on piping service". CAN/CSA Z305-1.92, Article 5.6, requires a very specific "identification of medical gas pipelines" to be provided.

10. The new medical gas outlets have not been specified to meet the requirements of CAN/CSA Z305.5 M86. Only a reference to a manufacturer has been provided.

11. The relief pressure indicated for nitrous oxide on the drawings is 75 psi. CAN/CSA Z305-1.92, Article 4.3.3.3, defines, "The main line pressure relief valve for nitrous oxide pipeline shall be capable of relieving the pressure so as not to exceed 70 psi".

12. The test pressure indicated on the drawing is 75 psi. CAN/CSA Z305-1.92, Article 15.2.1(b), clearly states that, "Each station of the pipeline shall be subjected to a test pressure of 1-1/2 times the maximum working

pressure or 150 psi, whichever is greater, except vacuum pipeline shall be tested to a maximum of 60 psi". As such, the test pressures indicated on the drawing do not conform.

In his report to PEO, the expert stated that based on the above review information, many errors, omissions, and deficiencies have occurred in the details of the design of the medical gas system under question. Fundamentally, the design appears to reflect that the member and the Company did not apply the requirements of Standard CAN/CSA Z305-1.92.

The expert confirmed in his telephone conference with the reviewing member his conclusion that the design for the medical gas system for the project under review had errors and omissions most specifically related to technical details as required by CSA. The technical details are more the indicator of a more significant issue rather than being the issue itself. The more significant issue is that the technical detail errors and omissions are an indication of a lack of appreciating and applying the standard of practice, namely CAN/CSA Z305-1.92.

The expert confirmed his opinion to the reviewing member that an engineer or engineering company practising in the field of health care must be aware of and understand the fundamental standards and make every effort to reasonably apply them.

The reviewing member was also provided with a brief report from a second expert to PEO dated October 26, 1999, which stated, inter alia: "Very simply, the drawings and specifications indicate a lack of knowledge with regard to the installation of medical gas piping.

"The drawing, each detail and the specification for the piping are not correct.

Medical gas is an extremely delicate issue. A mis-application could have catastrophic consequences".

The complainant met with the reviewing member at the PEO office on July 24, 2001. The complainant advised that the complaint was with respect to two drawings prepared and stamped by the member. The complainant advised that this was a turnkey operation from the manufacturer of imaging equipment. It was the complainant's belief that the hospital had a contract with the equipment supplier who subcontracted the engineering and construction. The complainant confirmed that his company is a certifying agent accredited by the Standards Council of Canada.

The complainant stated that he was hired by the hospital to carry out an independent inspection. In his capacity as a certifying agent, he would have the power to withhold certification. If certification is withheld, a process then takes place through the CSA.

Following his review of drawing M2 dated May 14, 1998, which was prepared and sealed by the member, the complainant informed the contractor that there was insufficient detail on the drawing to make any informal or meaningful comment and he requested more information.

The complainant advised that he requested more information including additional detail of the isolation and zone valves.

The complainant advised that a new room was being built for a new system and he was involved in the certification of the gas piping, which was for patient use. The room was a critical care room. Referring to the drawing prepared by the member, he indicated that the isolation and zone valves shown were not in compliance with CAN/CSA Z305-1.

The drawings did not show where the distribution pipes went.

The complainant advised that if a branch of the distribution piping was more than 15 feet, it needed an isolation valve and these were not specified in the drawing or on the specifications.

Subsequent to his request for additional information, a second drawing dated May 24, 1998 prepared by the member was submitted. The complainant advised that there are a number of deficiencies on this drawing, and of most concern to him the isolation valves were not shown.

The complainant informed the reviewing member that the second drawing contained numerous deficiencies. The complainant advised that CAN/CSA Z305-1 is a very clear code and not open to interpretation. He advised that the contractor installed the medical gas system in compliance with the requirements of the Ontario Building Code and CAN/CSA Z305-1, and it was certifiable. He also advised that if a less competent contractor had been involved in the project, the medical gas system might have been built as designed by the member and it was possible that inspection following construction would not have identified all of the deficiencies.

The complainant advised that the most serious concerns on the second drawing were the specifications, which did not refer to Z305.1-M92.

The complainant advised that the member's specifications for joining material were inappropriate and that the member specified gate valves when ball valves were indicated.

He advised that the solder joints specified by the member's design were inappropriate and that the testing of the system with water was inappropriate because of corrosion and bacterial growth.

The complainant advised that the test pressures specified by the member were totally inappropriate. With reference to the member's response to the complaint dated May 15, 2000 in which he states that the drawings were preliminary, the complainant stated that there was nothing on the drawings indicating that they were preliminary or not for construction purposes.

In the member's response, he stated that he was not aware of the concerns expressed by the complainant. The complainant advised that he believed that the contractor raised his concerns with the member and the member prepared the second drawing in response to the complainant's concerns. The complainant advised the reviewing member that the member's design showed a lack of understanding of the requirements of the Ontario Building Code and CAN/CSA Z305.1. In his capacity as a certifying agent of medical gas systems, the complainant stated that he does a lot of reviews, and this was the worst design that he had seen.

With respect to whether the member was guilty of professional misconduct and/or incompetence, the complainant stated that the member knew that there was a standard and designed the system without having or obtaining the standard, and that in his opinion, the member should have had the standard available to him and understood the requirements before undertaking the design.

The complainant advised the reviewing member that a pipe designer should be able to train themselves with reference to CAN/CSA Z305.1-92, and that there

are resources available including CSA inspectors to interpret the requirements.

The complainant advised that the member should have known that isolation valves were required at 15 feet. In the complainant's opinion, the original drawing was so deficient and lacking in detail and information that it would suggest that the designer was not competent. The complainant advised that the specifications on the second submission were unprofessional. He advised the reviewing member that this design was for a life support system, but with checks and balances, in most cases, it would probably never be built and certified, but there was a possibility that the design could have resulted in catastrophic consequences.

The reviewing member of the Discipline Committee met with the member on July 24, 2001. The member admitted that he prepared drawing M2 dated May 14, 1998. He advised that this was a design-build concept. The member stated that the hospital retained the contractor and the complainant, and that the contractor hired an architect, who retained him (the member). His direct contract was with the architect.

The member stated that he met the complainant and the contractor before he prepared his design. He did not know if there were any minutes of that meeting. He stated that at this meeting, they reviewed the existing piping.

The member stated that on the project, he was doing the design for the medical gas piping. He stated that he had previously carried out two designs for medical gas. He admitted that he should have indicated that the drawings were preliminary, if that was the case.

He admitted that both the drawings dated May 14 and May 24, 1998 were not appropriate for construction purposes. He admitted that no further drawing (for construction purposes) was prepared after the drawing dated May 24, 1998.

The member stated that he was planning to get information from the hospital on the operating condition of the system and he was also waiting to obtain CAN/CSA Z305.1-92. He admitted that he stamped two drawings that were not correct, and that he did not revise the drawing at any time to comply with the proper codes and standards.

The member advised that medical gas on this project has always been a design-build concept and that the hospital required drawings stamped by a professional engineer. The member agreed that the Ontario Building Code requires the design to meet the requirements of CAN/CSA Z305.1-92. The member admitted that the specification on the drawing dated May 24, 1998 did not comply with CAN/CSA Z305.1-92. The member advised the reviewing member that he had done two designs for medical gas systems prior to this project and he did not have CAN/CSA Z305.1-92 at the time that he prepared and stamped the drawings dated May 14 and May 24, 1998.

The member stated that he could not remember who he did the designs for. The member stated that he did a subsequent medical gas system design, and at that time, he still did not have a copy of CAN/CSA Z305.1-92 and he called the publishers. He admitted that he did three designs of medical gas systems without the standard. He advised the reviewing member that he had done piping design for a number of years and has a lot of experience.

The member admitted that medical gas is a very serious issue and that there are detailed codes for it. He admitted that he signed and sealed both drawings in the knowledge that his design was incomplete. He stated that he understood that the complainant was going to certify the medical gas system. He also admitted that he was aware of the code requirements and that he prepared the drawings and specifications and knew that they did not comply with the code requirements.

The member admitted that he prepared the second drawing after being made aware that the complainant was not satisfied with the drawing dated May 14, 1998. The complainant advised the reviewing member that the second drawing was still not sufficient, but he did not expect the contractor to build from the drawing. He stated that he told the contractor not to use the drawing to build the system. He added that the contractor built using the gas contractor's sketches and not his drawings.

In contradiction to what he had stated to the reviewing member earlier in the meeting, the member stated that since this project, he had not carried out any medical gas design.

The member admitted that drawing M1 was not complete and that his standards for his other drawings on other projects are 100 per cent better. He admitted that he did not finish the drawing and he stated that he did not do an as-built drawing, as the contractor did not request one.

The member stated that following a site meeting on May 15, he was informed by the contractor that the complainant was not happy with the original drawing and that a new issue was required. He stated that the contractor did not tell him, however, what the complainant required, but simply that he wanted more information.

The member stated that there was nothing on either drawing indicating that the drawings were preliminary or not to be used for construction. The member stated that the complainant could have given him more time or could have called him. He agreed that he did not call the complainant to discuss the additional information that was required by him. The member agreed that he did not know about the complaint until two years later and did nothing in the interim to correct the drawing. The member advised the reviewing member that he received CAN/CSA Z305.1-92 after the system was built.

The member advised that when he discovered that the complainant had informed the contractor that the first drawing was deficient, he did not call the complainant to inquire what additional information was required. The member informed the reviewing member that the contractor had told him that an alarm panel was required. The member advised that he knew that the complainant was reviewing the drawings for CSA purposes, and he knew that the first drawing was incomplete, and he re-issued it and the re-issued drawing was incomplete, and he never issued another drawing. The member stated that he knew it was incomplete because in order to prepare the design he needed knowledge of Standard CAN/CSA Z305.1-92.

He stated that after receiving this standard and reviewing it, he knew that the drawings were incorrect. He admitted that he did not inform anyone that they were incorrect. He stated that the drawings were not issued for construction.

The member stated that he knows that in the future, he can only seal drawings that he knows to be 100 per cent correct. With respect to his response to the complaint dated May 15, 2000, he stated that the contractor knew that the drawings were preliminary.

He stated that the pressures on the drawings were assumed and he never obtained the operating pressures from the hospital. The member admitted that there was no indication on the drawing of any missing information. The member admitted that the two drawings were incorrect and stated that he did not recall doing a final inspection.

With respect to paragraph 5.5 in the complaint, the member stated that he was aware that the complainant had concerns, but was not aware of the specific concerns. He agreed that alarm sensors should have been shown on the drawings and they were not. With respect to the testing pressures, he advised the reviewing member that if he had the standard, he would have complied with the standard. The member stated that he did not get information that he requested from the hospital and he did not receive any specific concerns from the complainant. He stated that he quite often does get such comments. He advised the reviewing member that the deadline on the job was short and that it was an error on his part to stamp the drawings.

The reviewing member of the Discipline Committee retired to deliberate and consider the available information.

Based on the evidence provided in the documentation and during the meetings conducted on July 24, the reviewing member found that the conduct of the member was both unprofessional and incompetent in that:

1. The member knowingly stamped and signed documents that were incomplete and incorrect and did not finalize these documents for construction.
2. The member did not notify his client or the end user (the hospital) that the documents did not meet the requirements of the Ontario Building Code or Standard CAN/CSA Z305.1-92 medical gas piping code.
3. During construction, the member made no attempt to correct the known errors in the documents.
4. The member carried out the design of the medical gas system without the knowledge of the applicable codes and knew that his work was incomplete and incorrect after he received the proper code.
5. The member made no attempt to gain the knowledge of the proper design procedures prior to sealing the drawings.
6. The member relied on the contractor and testing agency of the medical gas design system to certify and construct the medical gas system in accordance with the standard and not as designed by the member.

**Based upon the foregoing, in the reviewing member's view, there has been a breach of Section 72(2)(d); 72(2)(h); and 72(2)(j) of Ontario Regulation 941 made under *The Professional Engineers Act*, specifically:**

**◆ Section 72(2)(d): "Failure to make responsible provision for complying with applicable statutes, regulations, standards, codes, bylaws and rules in connection with work being undertaken by or under the responsibility of the practitioner";**

**◆ Section 72(2)(h): "Undertaking work the practitioner is not competent to perform by virtue of the practitioner's training and experience"; and**

**◆ Section 72(2)(j): "Conduct or an act relevant to the practice of professional engineering that, having regard to all the circumstances, would reasonably be regarded by the engineering profession as unprofessional."**

**The parties have agreed on the basis of the reviewing member's finding of a breach of Section 72(2)(d), 72(2)(h), and 72(2)(j) of the Act to the following Order:**

1. **The member's licence to practise as a professional engineer will be suspended for a period of six months, effective February 1, 2002, but that the suspension will not come into force provided that by February 1, 2002 the member successfully completes at his own expense:**
   - **i) a peer review assessment to be conducted by a qualified member of PEO to be approved by the Registrar and satisfy the peer review assessor that he is competent to practise in his field of engineering;**
   - **ii) take and pass the Professional Practice Examination.**

**If the member completes the above requirement, there will be publication of the Decision and Reasons for the Stipulated Order without reference to names.**

**If the member does not meet the above requirements, the suspension (six months) will become effective on February 1, 2002 and the Decision of the Stipulated Order will be published with reference to names.**

Dated this 24th day of August 2001.

Bryan J. Parkinson, P.Eng. (Discipline Committee Member)

## Note from Department of Legal and Professional Affairs

The member passed the Professional Practice Exam prior to February 2002, and also successfully completed the peer review assessment of his practice.