IN THE MATTER OF the *Public Inquiries Act, 2009*, S.O. 2009, c. 33, Sched. 6

AND IN THE MATTER OF the Elliot Lake Commission of Inquiry, established by Order in Council 1097/2012

CLOSING SUBMISSIONS OF EXP GLOBAL INC. (TROW)

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CLOSING SUBMISSIONS OF EXP GLOBAL INC. (TROW)

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OVERVIEW

1. Trow's closing submissions are structured in two parts.

2. Part I focuses on Trow's involvement with the Algo Centre Mall in the period between 1991 and 1996. During this time, Trow inspected the mall and made recommendations on how to repair the mall's leaking roof and protect the mall's structure. This part of the submissions reviews Trow's factual findings and engineering reports, describes the recommendations and advice that Trow gave, and discusses the relevance of Trow's analysis to what ultimately caused the mall's collapse.

3. Part II of the submissions focuses on policy. To prepare this aspect of its submissions, Trow assembled three top Canadian engineering experts specializing in the design and repair of parking structures. Trow sought their input and advice regarding a number of policy options that have been suggested by various parties during the course of the Inquiry. This part of the submissions sets out the results of that consultation, identifying merits and demerits of certain suggested policy options, and factors the Commission may wish to consider with respect to each.

4. From the evidence relating to Trow's involvement with the Algo Centre Mall, five main facts emerge:

(a) Trow's investigation of the condition of the mall roof was the most comprehensive and detailed of the engineering inspections that occurred during the mall's 32 years of operation.

(b) Trow identified, and explained in its reports, that the ongoing water infiltration through the mall roof was damaging the structural elements of the building, and that repair of the roof was required in order to protect its structural integrity.

(c) Trow recommended a viable repair option for the roof (installation of a waterproofing membrane and asphalt wearing course) that, if carried out, would have prevented the collapse that occurred on June 23, 2012.

(d) Trow recommended an inspection regime for the mall's roof and waterproofing system, to be conducted on an annual basis by an engineering firm following the roof's repair, that would have ensured the continued effectiveness of the repair.

(e) Trow proposed (but was not retained to conduct) an inspection of the mall's structural steel connections, in which Trow planned to expose and inspect the welds and bolts, identify deteriorated components, and remove portions of suspect components for strength testing.

5. The work that Trow did at the Algo Centre Mall in the 1990s has become a point of reference at the Inquiry. Commission counsel have repeatedly relied upon Trow's reports to highlight – through witnesses like Roger Pigeau, Fred Bauthus, Syl Allard, the experts from NORR, and several others – the fact that clear advice existed at an early stage regarding the potential for structural failure and the existence of a viable repair option that would have prevented the collapse. Others have relied upon the Trow reports as a touchstone for what later engineers could have done.

6. It is Trow's hope that the Inquiry's investigation into the complex constellation of facts that contributed to the Algo Centre Mall collapse will help to avert similar tragedies in the future.

PART I - FACTS

7. Trow's submissions on the facts are structured around the following topics:

A. Background regarding Trow

B. Summary of Trow's involvement – 1991-1996

C. Trow's investigations and reports:

(ii) 1991 – First building condition survey

(iii) 1994 – Second building condition survey

(iv) 1995 – Structural analysis

D. Trow's 1996 proposal to inspect the steel connections

E. The structural integrity of the mall (1991-1994)

F. Trow's advice was clear and understood

G. Trow recommended a viable repair option

H. Causation

A. Background regarding Trow

8. At the time that Trow inspected the Algo Centre Mall in 1991-95, Trow was a prominent engineering firm, and a leader in conducting condition assessments of parking structures and bridge decks.[1]

9. Algoma Central Properties Inc. ("Algoma"), which was the owner of the mall in the early 1990s and retained Trow, described Trow's background in a letter to a mall tenant (Woolco) in the following terms:

> Trow is a multi-disciplined firm with offices in Canada and the United States who specialize in geoscience, hydrology, environment, concrete technology and building sciences and they have experience in vehicular structures over malls and habitable areas.[2]

10. For decades, senior engineers at Trow have been leaders in the development of standards for the construction, inspection and repair of parking structures. John Bickley of Trow was the Chairman of the CSA Technical Committee on Durable Parking Structures, which in 1987 produced CSA Standard S413-87 (Parking Structures), which is referred to in the NORR report as providing a "relevant description of acceptable roofing for use as parking surfaces" and "useful guidelines for those advising the Algo Centre Mall management on dealing with the chronic water leakage."[3] Andy Kaminker of Trow was a member of the same Technical Committee in 1987 and is today its co-Vice Chair.[4] Mr. Bickley and Mr. Kaminker are two of the three experts that Trow assembled to prepare the policy submissions set out in Part II. The third expert is John Ryell, one of Canada's foremost experts in concrete technology.

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[1] Transcript (Iamonaco), March 21, p. 2465, lines 22-25 and p. 2521, lines 5-24. For additional information regarding Trow's background, see the Affidavit of Derek McBean, sworn March 1, 2013, paras. 2-3, Motion Record, Motion for Standing by exp Global Inc., Tab 2

[2] Exhibit 596 (Letter from Algoma to Woolco, April 3, 1991), p.1; Transcript (Leistner), March 28, pp. 3556-57, lines 2-8

[3] Exhibit 5191 (CSA Standard S413-87 (Parking Structures)), pp. 5,7; Exhibit 3007 (NORR report), p. 66, Section 4.1.4

[4] Exhibit 5191 (CSA Standard S413-87 (Parking Structures)), pp. 5,7; Curriculum vitae of Andy Kaminker (see Appendix A of these submissions)

B. Summary of Trow's involvement – 1991-1996

11. Trow conducted two building condition inspections of the Algo Centre Mall at the request of Algoma – one in April 1991 and one in August 1994.

12. The two inspections formed the basis of two of Trow's three reports for Algoma. The first Trow report was dated May 1991 (Exhibit 35), and was followed by a letter from Trow dated July 11, 1991 (Exhibit 37) answering questions posed by Algoma about the report. The second Trow report was dated November 9, 1994 (Exhibit 44), and was slightly revised and augmented on January 31, 1995 (Exhibit 46). Trow's third report, dated November 6, 1995 (Exhibit 51), was a structural analysis for Algoma confirming the ability of the mall roof to bear the weight of the recommended waterproofing system.

13. Both the 1991 report and the 1995 report contained recommendations for repairing the mall roof, by installing a new waterproofing system consisting of a waterproofing membrane and an asphalt wearing course.

14. The Trow personnel who conducted the inspections and prepared the reports were Domenic Dell'Aquila and Remy Iamonaco.

15. Mr. Dell'Aquila, a Certified Engineering Technologist in Trow's Structural Rehabilitation department in Brampton, was responsible for Trow's field investigations of the parking structure in Elliot Lake. He attended at the Algo Centre Mall with supporting staff from Trow on April 22-24, 1991[5] and on August 23-24, 1994.[6] Mr. Dell'Aquila specialized in concrete restoration and parking structures.[7]

16. Mr. Iamonaco, a professional engineer in Trow's Structural Rehabilitation department in Brampton, is a civil engineer specialized in the restoration of parking structures.[8] He was the supervising engineer with ultimate responsibility for the advice given and recommendations

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[5] Transcript (Dell'Aquila), March 20, p. 2101, lines 1-17 and March 21, p. 2236, lines 3-17; Exhibit 35 (Trow 1991 report), p. 1, Section 1.0

[6] Transcript (Dell'Aquila), March 20, p. 2155, lines 17-22

[7] Transcript (Dell'Aquila), March 20, p. 2077, lines 3-11

[8] Transcript (Iamonaco), March 21, p. 2439, lines 15-20, pp. 2440-41, lines 19-2

made in the Trow reports.[9] Mr. Iamonaco also attended at the mall on the occasion of the second building condition assessment for one day on August 24, 1994.[10]

17. Trow's final communication with Algoma, after the three reports were supplied, was a written proposal dated June 12, 1996 (Exhibit 410) prepared at Algoma's request, in which Trow proposed to expose and examine the structural steel and its connections in order to inspect and test for structural deterioration. Trow was not asked to proceed with this work or with the repairs that it had recommended.[11]

18. NORR's opinion was that Trow's inspections and analysis relating to the Algo Centre Mall were the most comprehensive, taking into account all of the professional firms that attended at the mall over its 32 years. The NORR report states: "A number of reputable architecture and engineering firms inspected the building with various objectives and varying scope. The most involved of these efforts was that by Trow between 1991 and 1995."[12]

C. Trow's investigations and reports

(i) 1991 – First building condition survey

19. By 1990, water had been leaking through the roof of the Algo Centre Mall and into the mall's commercial areas for approximately 10 years.

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[9] Transcript (Iamonaco), March 21, pp. 2443-44, lines 19-12

[10] Transcript (Iamonaco), March 21, p. 2483, lines 14-16

[11] As was mentioned by some witnesses at the Inquiry, an engineer in Trow's Sudbury office, Dan Gagne, had a brief subsequent involvement with the mall – over a period of a few weeks in July and August 2008. Commission counsel did not call Mr. Gagne as a witness and so there is no direct evidence from Mr. Gagne about his role. Andrew Holford, the structural engineer from Kleinfeldt, testified that when he was preparing a roof repair design and repair specifications for Eastwood Mall Inc. in the summer of 2008, Mr. Gagne was coordinating in the field with contractors who could carry out the repair work: Transcript (Holford), May 9, pp. 8975-81, lines 4-2. Bob Nazarian's evidence was that Mr. Gagne agreed in July 2008 to supervise the roof repair work in the field, but that Mr. Gagne was never actually retained. Emails involving Mr. Gagne that were put to Mr. Nazarian show that Mr. Nazarian once asked Mr. Gagne to become involved in the roof repair design in August 2008, but then did not proceed with the proposed retainer of Mr. Gagne: Transcript (Bob Nazarian), July 25, pp. 18039-45, lines 4-12; pp. 18054-55, lines 1-7; pp. 18060-66, lines 13-24.

[12] Exhibit 3007 (NORR report), p. x

20. Algoma contacted Trow in the fall of 1990.[13] Trow was retained to conduct a detailed survey of the condition of the mall's parking structure, and to develop repair recommendations in order to stop the leaks. The inspection of the mall took place on April 22-24, 1991.[14]

21. Mr. Dell'Aquila's three days of field investigation were divided roughly equally between inspection of the top surface of the parking slab and inspection of the underside of the slab, or soffit. Each half of the work took approximately one and a half days.[15]

22. The inspection of the top surface of the roof involved three main elements:

(a) a visual survey of the accessible top surfaces of the roof slab and pedestrian walkways – in which Trow walked the entire roof of the mall, and mapped cracks in the concrete topping (both sealed and unsealed), as well as areas of broken concrete, repair patches, concrete scaling, staining and other noteworthy features;[16]

(b) a sounding survey (using a chain drag) of the concrete topping, to detect hollow-sounding areas that indicated debonding of the concrete topping from the concrete panels below;[17] and

(c) removing 13 cores from the concrete roof slab to determine the as-constructed details, the chloride ion content in the concrete (which is relevant to future corrosion), and the condition of the top surface of the steel beams supporting the concrete slab.[18]

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[13] Exhibit 33 (Trow October 12, 1990 proposal to Algoma (mis-dated October 12, 1989)); Transcript (Dell'Aquila), March 20, pp. 2081-82, lines 25-6

[14] Exhibit 35 (Trow 1991 report), Abstract and p. 1, Section 2.0

[15] Transcript (Dell'Aquila), March 21, pp. 2236-37, lines 18-2

[16] Exhibit 35 (Trow 1991 report), p. 5, Section 6.1.1; pp. 6-8, Section 8.1; p. 12, Section 10.1; Drawing 1 of 4 ("Top Visual Roof Parking Level and Top Visual of Upper Lower Roof Level"); Drawing 4 of 4 ("Top Visual Lower Level Pedestrian Walkway")

[17] Exhibit 35 (Trow 1991 report), p. 5, Section 6.1.2; p. 12, Section 10.1

[18] Exhibit 35 (Trow 1991 report), pp. 5-6, Section 6.1.3; pp. 8-9, Section 8.2; pp. 10-12, Section 9.2

23. The inspection of the underside of the roof slab (the soffit) and lower level pedestrian walkway was a visual review, also with three main components:

(a) examination of the suspended ceiling panels throughout the mall, to identify areas of rust and water staining;

(b) inspection of the steel beams and columns and the underside of the concrete slabs (above the ceiling panels) at numerous locations, to identify areas of leakage, rust stains, leaching, spalling concrete, and other deterioration; and

(c) identification of other forms of deterioration (debonded fireproofing material, rusted electrical conduits, etc.) and other evidence of water leakage (metal pans, and pails above and below the suspended ceiling, etc.).[19]

24. During the one and a half days that he spent inside the mall inspecting the underside of the parking slab, Mr. Dell'Aquila walked through the entire mall interior, including all the stores and hallways, and documented his observations.[20] He noted any areas of concern that he found on detailed drawings, which were appended to Trow's 1991 report in large-size architectural drawing format.[21]

25. A particularly important drawing from the 1991 report was reviewed in detail with Mr. Dell'Aquila during his testimony – Drawing 2 of 4, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level" (separately marked as Exhibit 1974). The drawing identifies every store in the mall and, within each store, identifies both the staining on the suspended ceiling and the deterioration that Trow found above the suspended ceiling.

26. Mr. Dell'Aquila testified that he inspected all areas that were identified as a potential concern due to the presence of leakage or rust stains on the ceiling tiles. He inspected the steel

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[19] Exhibit 35 (Trow 1991 report), p. 5, Section 6.1.1; p. 6, Section 6.1.4; p. 8, Section 8.1; pp. 9-10, Section 8.3; p. 12, Section 10.1; Drawing 3 of 4 ("Underside of Lower Level Pedestrian Walkway"); Exhibit 1974 (Drawing 2 of 4 from the Trow 1991 report, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level"); Transcript (Dell'Aquila), March 21, pp. 2246-47, lines 10-6

[20] Transcript (Dell'Aquila), March 21, pp. 2246-47, lines 10-6

[21] Transcript (Dell'Aquila), March 21, pp. 2246-47, lines 10-6; Transcript (Rod Caughill), March 19, pp. 1769-70, lines 18-22; Exhibit 1974 (Drawing 2 of 4 from the Trow 1991 report, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level"); Exhibit 35 (Trow 1991 report) - Drawing 3 of 4 ("Underside of Lower Level Pedestrian Walkway")

beams and connections visually by using a tall ladder to climb above the ceiling tiles.[22] He documented, on the drawings appended to the report, the instances of corrosion and deterioration that he observed.[23] It is apparent from Drawing 2 of 4 and from Mr. Dell'Aquila's testimony that he inspected above the ceiling tiles at dozens of locations across the mall, as shown by the notations on the drawing describing the state of the beams, pipes and conduits, identifying missing fireproofing, and showing the location of metal pans and pails.[24]

27. Trow's observations relating to the structural steel, as set out on Drawing 2 of 4 from the 1991 report, included the following:

- "Base of beam rusted"
- "Top and bottom beam flange rusted"
- "Water stains along beam"
- "Exposed beam rusted"
- "Water stain on exposed base of beam"
- "Spalled concrete wall at base of beam"
- "Bottom of beam rusted"[25]

28. Trow observed, and identified on Drawing 2 of 4, numerous other locations where the fireproofing was missing from the steel beams and columns, including at the location of connections.[26]

29. Mr. Dell'Aquila took several photographs during the 1991 inspection that show surface corrosion on the steel beams supporting the parking slab.[27] These include photos of the beam

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[22] Transcript (Dell'Aquila), March 20, pp. 2180-81, lines 19-3; pp. 2239-40, lines 22-23, pp. 2262-63, lines 20-8; Transcript (Rod Caughill), March 19, pp. 1794-96, lines 22-4

[23] Exhibit 1974 (Drawing 2 of 4 from the Trow 1991 report, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level"); Transcript (Dell'Aquila), March 21, pp. 2238-40, lines 4-9; p. 2249, lines 2-25; pp. 2253-54, lines 6-2; pp. 2420-34, lines 1-8

[24] Exhibit 1974 (Drawing 2 of 4 from the Trow 1991 report, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level"); Transcript (Dell'Aquila), March 21, pp. 2238-40, lines 4-9; p. 2249, lines 2-25; pp. 2253-54, lines 6-2; pp. 2420-34, lines 1-8

[25] Exhibit 1974 (Drawing 2 of 4 from the Trow 1991 report, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level")

[26] Exhibit 1974 (Drawing 2 of 4 from the Trow 1991 report, titled "Soffit of Roof Parking Level and Soffit of Upper Lower Roof Level"); Transcript (Dell'Aquila), March 21, pp. 2420-34, lines 1-8

flanges as well as photos of deteriorated connections between steel beams and the concrete wall, and between steel beams on the pedestrian walkway.[28] Mr. Dell'Aquila explained that he took photos when he observed areas of concern, but not necessarily when he observed good conditions. If he had observed conditions worse than what are shown in the photographs that he took, he would have taken a photograph and put it in the report.[29] His evidence was that the degree of corrosion on the steel beams and flanges appeared worse than that on the connections, at the time of his observations.[30]

30. Several of the photos of the corroded steel beam flanges and deteriorated connections were included in Trow's 1991 report, with accompanying language explaining the deterioration observed and whether the deterioration was typical:

(a) Photographs of corroded steel beams at a connection were included as Photograph No. 17 ("Typical leached stains on underside of pedestrian walkway. Note: Rust along flange of beam") and Photographs No. 24 and 25 of the report (showing deteriorated connections between a steel beam and the concrete wall).[31]

(b) Photographs of corroded steel beam flanges were included as Photograph No. 19 ("Typical leakage along joint between precast slabs directly above supporting beam. Note: Surface rust on top flange of beam and water diversion metal pan") and Photograph No. 20 ("Typical fallen/missing fireproofing on bottom flange of beam at leakage location").[32]

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[27] The photos from Trow's 1991 inspection are Exhibits 3038-3098. For examples of photos from 1991 of corrosion and other deterioration involving beams and columns, see Exhibits 3052, 3054-3056, 3058, 3061. Transcript (Dell'Aquila), March 21, pp. 2261-65, lines 6-9; pp. 2271-72, lines 17-9

[28] Exhibits 3058 and 3061 (photos of connections between steel beams and concrete wall); Exhibit 3052 (photo of connection between steel beams on the pedestrian walkway); Transcript (Iamonaco), March 21, pp. 2450-51, lines 4-13; Transcript (Dell'Aquila), March 20, pp. 2156-61, lines 1-11; March 21, pp. 2239-41, lines 19-6; pp. 2270-72, lines 20-9

[29] Transcript (Dell'Aquila), March 21, pp. 2271-72, lines 17-9

[30] Transcript (Dell'Aquila), March 21, p. 2241, lines 3-14; see also Transcript (Iamonaco), March 21, p. 2452, lines 5-15; pp. 2455-56, lines 7-13

[31] Exhibit 35 (Trow 1991 report), Appendix B – Photographs

[32] Exhibit 35 (Trow 1991 report), Appendix B – Photographs

31. After his field investigation, Mr. Dell'Aquila discussed his findings with Mr. Iamonaco.[33] Mr. Dell'Aquila and Mr. Iamonaco then prepared Trow's May 1991 condition survey report, documenting their findings and setting out their concerns and recommendations. The focus of their investigation was to find the worst conditions and report on them.[34]

32. On the top surface of the roof, Trow found the concrete topping to be debonded from the hollow core slabs below, in widespread areas along the joints between the slabs. At the primary control joints directly above the steel beams, Trow found 60% of the joints to be debonded. The joint sealant at many locations was also debonded, and Trow found large areas of surface scaling of the concrete topping, as well as previous repair patches.[35]

33. On the underside of the roof slab, Trow found that it exhibited numerous signs of leakage, mainly through the control joints between the precast panels as well as through expansion joints and some cracks. The following is a selection of representative statements from Trow's 1991 report regarding the condition of the underside of the slab (including the condition of the structural steel), and regarding the state of corrosion in the roof assembly:

> "The soffit of the suspended roof slab was generally in good condition but indicated evidence of excessive leakage through the joints of the precast hollow slabs above the mall level. Some water stains were also noted on the soffit of the pedestrian walkway slabs."[36]
>
> "[S]ome evidence of leakage and staining was observed on the underside of the slab and along the supporting steel beams. This situation was typical at both levels."[37]
>
> "Core No. 4 was … extended to the full depth of the precast slab in order to expose the top surface of the supporting open web steel beam. The top surface of the steel beam was noted to contain surface rust."[38]
>
> "The components of the parking structure other than the suspended slabs were, generally, in good condition with the following exceptions:

[33] Transcript (Iamonaco), March 21, p. 2454, lines 10-16

[34] Transcript (Iamonaco), March 21, p. 2457, lines 11-12; Exhibit 35 (Trow 1991 report)

[35] Exhibit 35 (Trow 1991 report), p. 7, Section 8.1; p. 12, Section 10.1

[36] Exhibit 35 (Trow 1991 report), Abstract, para. 7

[37] Exhibit 35 (Trow 1991 report), p. 8, Section 8.1 [emphasis added]

[38] Exhibit 35 (Trow 1991 report), p. 9, Section 8.2 [emphasis added]

1. Impending spalls due to movement were detected under some of the steel beams on the west wall.

2. Many of the slab supporting steel beams contained surface rust at locations which coincided with leakage.

3. The fireproofing material on the steel beams at the majority of the leakage areas has become debonded or fallen off. …

4. Many of the suspended ceiling panels and tracks are water and/or rust stained.

5. Some electrical conduits have become corroded from the ingress of water and salt through the slab.

…

9. The exposed steel elements of the pedestrian walkway stairwell and slab soffit were rusted."[39]

"The chloride ion threshold value considered necessary…to allow corrosion to proceed…[is] 0.025 percent water soluble chloride ion by mass of concrete. … [T]he test results indicated that the slices taken in the concrete topping…are substantially above the threshold value…."[40]

"The repaired east-west Gennie expansion joint is debonded along its entire length, and there is evidence of some leakage at the soffit of the slab. The other two (2) expansion joints also contain signs of leakage on the slab soffit."[41] (Section 12.0, Conclusions)

"Corroded wire mesh…exposed rusted N-S strands…surface rust on beam"[42]

34. As these passages show, Trow's 1991 report contains multiple references to the corrosion caused by the roof leaks – corrosion of the wire mesh in the concrete topping, corrosion of the pre-stressed strands in the hollow core slabs, corrosion of the steel beams, and corrosion of components like electrical conduits and the suspended ceiling. Mr. Caughill testified, with regard to Trow's 1991 report, that the report features "repeated reference to the existence of

[39] Exhibit 35 (Trow 1991 report), pp. 9-10, Section 8.3 [emphasis added]

[40] Exhibit 35 (Trow 1991 report), p. 11, Section 9.2 [emphasis added]

[41] Exhibit 35 (Trow 1991 report), p. 13, Section 12.0

[42] Exhibit 35 (Trow 1991 report), Appendix A, Core Logs – Remarks [emphasis added]

corrosion in the steel elements." This was "a consistent message that Trow was sending at that time."[43]

35. In setting out its conclusions arising from its 1991 inspection, Trow explained that water and salt penetration would cause increased deterioration of both structural and non-structural elements, stating: "Water and salt penetration through cracks and joints will cause deterioration of the concrete, prestressed cables, steel beam sprayed on fireproofing, false ceiling tiles and electrical conduits to increase."[44]

36. Trow concluded that the design used for the roof slab was inappropriate for achieving a watertight condition over the mall's commercial areas.[45]

37. Trow's primary recommendation was that a waterproofing system consisting of a waterproof membrane and asphalt wearing course should be installed over the entire parking deck to prevent further water and salt penetration. Trow identified two options – one that involved applying the waterproofing system on top of the existing concrete topping, and one that involved first removing the concrete topping. Trow recommended the second option, and recommended that a structural analysis be performed before pursuing the first option.[46] Trow's conclusion that the concrete topping could be removed was based upon its review of the original structural drawings for the mall, which showed a layer of insulation between the concrete topping and the hollow core slabs.[47]

38. With respect to the repair of the structural steel, in line with its finding of surface rusting, Trow recommended: "Clean all rusted steel beams, stairwell supports and coat with compatible rust paint as required."[48] This recommendation was intended to renew the coating and encapsulate the steel in order to protect it from ongoing corrosion. Trow's view is that corrosion

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[43] Transcript (Rod Caughill), March 19, p. 1815, lines 17-25

[44] Exhibit 35 (Trow 1991 report), p. 13, Section 12.0

[45] Exhibit 35 (Trow 1991 report), p. 13, Section 12.0. In hindsight, Mr. Monroe of H.S. Peterson agreed with Trow's conclusion – see Transcript (Monroe), March 8, pp. 682-83, lines 18-4

[46] Exhibit 35 (Trow 1991 report), pp. 14-16, Sections 13.0 and 14.0

[47] Transcript (Dell'Aquila), March 20, pp. 2183-85, lines 11-9

[48] Exhibit 35 (Trow 1991 report), pp. 14-15, Section 13.0

on the steel members and connections would have been substantially reduced had this recommendation been implemented.[49]

39. Trow recommended that waterproofing of the roof slab be carried out as soon as possible in order to maintain the structural integrity of the slab and to reduce the potential for further deterioration. Trow stated that further deterioration was very likely, and that the expected life of the roof slab would be affected if proper repairs were not carried out before further ingress of water and salt. The relevant passages from the report state:

> 14.0 RECOMMENDATIONS
>
> …
>
> Considering the above and due to the history of leakage problems at this parking facility it is very likely that further deterioration and leakage will continue to occur if the entire slab and expansion joints are not waterproofed.
>
> …
>
> 15.0 REPAIR PRIORITY
>
> …[W]e would recommend that the repairs be carried out as soon as possible in order to maintain the structural integrity of the slab and to reduce the potential for further deterioration, leakage and probable insurance claims for water damaged property inside the stores.
>
> … Since the roof slab is not protected with a waterproofing system, continued moisture and chloride ion penetration can be expected to further increase chloride levels with time (depending on the usage of the parking area) thereby initiating corrosion of the prestressed cables and deterioration of the concrete topping and precast slabs. … If this procedure is properly carried out before any further ingress of chlorides, the life of the roof slab would be significantly extended.[50]

40. In June 1991, Algoma posed a number of questions to Trow in writing arising from the May 1991 report. One of the questions was directed to the rate of deterioration of the hollow core precast slabs, and how long the structure would last.[51]

41. In a letter dated July 11, 1991, Trow reiterated the finding in its May 1991 report that corrosion had begun in the structural elements and that chloride ion levels in the concrete

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[49] Transcript (Dell'Aquila), March 21, pp. 2356-58, lines 14-2

[50] Exhibit 35 (Trow 1991 report), pp. 16-17, Sections 14.0 and 15.0 [emphasis added]

[51] Exhibit 425 (letter from Algoma to Trow dated June 27, 1991), p. 1, q. 7

topping (conducive to corrosion) were high. Trow repeated its recommendation that Algoma should waterproof the parking deck as soon as possible ("now"). Trow's stated opinion was that immediate waterproofing using Trow's recommended method of repair would ensure that the precast panels would last their design life:

> [W]e are stating that if Option 2 is selected [i.e., the second waterproofing option from the May 1991 report], this will provide the best protection to the structural precast slabs from ingress of chlorides and water entry into the mall…. If the precast elements are repaired and protected now, it is our opinion that they will last their design life."[52]

42. Trow was not asked to pursue either repair option identified in its May 1991 report.[53]

(ii) 1994 – Second building condition survey

43. In 1994, Algoma asked Trow to prepare an update to its 1991 condition survey of the structural components of the parking structure at the mall, including the steel beams and columns. Trow prepared a report dated November 9, 1994,[54] which was revised on January 31, 1995.[55] One of the reasons Algoma requested this investigation was because it knew that there was corrosion in 1991, and wanted to determine the extent to which the corrosion had progressed.[56]

44. Trow again attended at the mall, and conducted the field investigation over two days.[57] Mr. Dell'Aquila conducted a visual survey of the underside of the parking slab, as he had done in 1991, by walking through the stores in the mall, with more emphasis on those with a history of

[52] Exhibit 420 (letter from Trow to Algoma dated July 11, 1991), p. 2, item 7

[53] Transcript (Dell'Aquila), March 20, p. 2149, lines 9-17; p. 2150, lines 1-6

[54] Exhibit 44 (Trow 1994 report)

[55] Exhibit 46 (revisions to Trow 1994 report)

[56] Transcript (Rod Caughill), March 19, p. 1823, lines 5-21

[57] Transcript (Rod Caughill), March 19, p. 1824, lines 10-20

leakage.[58] At suspect areas, he removed the ceiling panels and conducted a visual survey of the underside of the parking slab using a tall ladder.[59]

45. As in 1991, core samples were removed and tested to determine their chloride ion content and also to reveal the condition of the top surface of the structural steel beams.[60]

46. Mr. Dell'Aquila's observations were recorded on an updated drawing of the underside of the parking slab, in which the data from 1994 was superimposed on the original soffit drawing (Drawing 2 of 4) from Trow's 1991 report. This updated drawing showed the conditions in 1994 compared to those in 1991.[61] During the Inquiry, Mr. Dell'Aquila prepared a colour-coded version of this drawing, which he explained in his testimony, highlighting the distinctions between his observations in 1991 and those in 1994.[62]

47. Some of Trow's new observations relating to the structural steel, as set out in notations on the updated drawing, included the following:

- "Rust stains on beam face and bottom flange"
- "Bottom flange of beam rusted. Conduits corroded."
- "Fireproofing on beam bottom flange fallen off. Face of flange rusted."
- "Bottom flange of beam missing fireproofing (Fell off)."[63]

48. Trow found that the leakage had doubled from 1991 to 1994.[64] There was more corrosion on the steel beams overall than in 1991, but the connections remained in better condition than the flanges of the steel beams.[65]

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[58] Exhibit 46 (revisions to Trow 1994 report), p. 10, Section 7.1; Transcript (Dell'Aquila), March 21, pp. 2273-74, lines 16-3; pp. 2275-76, lines 19-9

[59] Exhibit 46 (revisions to Trow 1994 report), p. 10, Section 7.1; Transcript (Dell'Aquila), March 20, pp. 2180-81, lines 1-3

[60] Exhibit 46 (revisions to Trow 1994 report), pp. 10-11, Sections 7.2-8; Exhibit 44 (Trow 1994 report), pp. 10-11, Section 7.2

[61] Transcript (Dell'Aquila), March 20, p. 2180, lines 4-18; March 21, p. 2284, lines 5-12; p. 2427, lines 2-19; p. 2433, lines 3-15; Exhibit 1121 (Drawing 1 of 1 from the Trow 1994 report)

[62] Exhibit 3142 (highlighted copy of Drawing 1 of 1 from the Trow 1994 report); Transcript (Dell'Aquila), March 21, pp. 2284-90 , lines 5-3

[63] Exhibit 3142 (highlighted copy of Drawing 1 of 1 from the Trow 1994 report)

49. As he had done in 1991, Mr. Dell'Aquila took photographs of the steel beams and connections on which corrosion was most significant. These include photographs that show beam-to-beam and beam-to-column connections, including both bolted and welded connections.[66] In a note to file prepared at the time of Trow's August 1994 site visit, Mr. Caughill of Algoma described Trow as having taken "several photographs of the underside of the deck and the beams and connections at the beams and columns."[67]

50. Relevant photo captions from Trow's November 1994 report include:

> Photograph 8: Typical photo showing rusted top flange of steel beam on underside of parking deck.
>
> Photograph 9: Typical photo showing rusted steel beam and water stains on underside of parking deck.
>
> Photograph 10: Typical photo showing missing fireproofing on bottom flange of steel beam due to water damage.
>
> Photograph 11: Typical photo showing rust stains on insulation foil on underside of parking deck above false ceiling panels in stores.[68]

51. During the 1994 field investigation, Trow took a measurement of the thickness of one of the beam flanges. Trow picked a beam that was among those that had corroded most significantly. The measurement revealed a negligible-to-no loss of section of the beam.[69] Mr. Caughill described Trow's measurement in his note to file in the following terms: "…beams in Woolco were examined more closely and scale/rust were removed from the assumed worst area

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[64] Transcript (Dell'Aquila), March 20, pp. 2186-88, lines 24-9

[65] Transcript (Dell'Aquila), March 21, p. 2275, lines 11-18

[66] The photos taken by Trow in 1994 are Exhibits 3099-3140. Examples of photos showing connections include Exhibits 3107, 3112, 3122 and 3125. Transcript (Dell'Aquila), March 20, pp. 2156-61, lines 1-14; March 21, pp. 2275-83, lines 11-8; p. 2428, lines 12-19; Transcript (Rod Caughill), March 19, pp. 1830-31, lines 18-25

[67] Exhibit 611 (August 25, 1994 note to file by Rod Caughill), p. 1

[68] Exhibit 44 (Trow 1994 report), Appendix B: Photographs

[69] Transcript (Dell'Aquila), March 20, p. 2168, lines 3-9; pp. 2181-82, lines 24-3; March 21, pp. 2242-43, lines 2-1; p. 2268, lines 1-20; Exhibit 46 (revisions to Trow 1994 report), p. 10, Section 7.1

to determine the extent of corrosion damage. The "flakes" removed indicated only a minor amount of actual metal has been affected."[70]

52. On the basis of its visual survey and the corrosion measurement, Trow concluded that the corrosion observed on the steel beams and connections was surface corrosion which did not pose an immediate structural concern.[71]

53. The following excerpts are examples of statements in Trow's November 1994 report regarding the state of corrosion of the structural steel:

> The steel beams were noted to be rusted at the locations where there was evidence of water leakage.[72]
>
> The structural steel members are sound with some surface corrosion.[73]
>
> The top and bottom flanges of the steel beams were noted to be rusted at the locations where there was evidence of water leakage. … The bottom flange of the steel beam along line 5 near core no. 3 , which was considered the worst condition of the rusted beams noted, was measured by removing the scaled rust. The thickness of the bottom flange was measured to be 18 mm. … The specified flange thickness of this beam is 17.5 mm. The rust noted on the bottom flange is considered minor surface rust at this time since the flange thickness measured was approximately 18 mm. …the measurement confirms the flange has negligible loss of sections.[74]
>
> The top flange of the steel beam at the core location was found to contain some surface rust.[75]
>
> Based on our review of the structural steel beams at selected locations where the worst evidence of leakage was noted, the beams appeared to be sound with some surface corrosion.[76]

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[70] Exhibit 611 (August 25, 1994 note to file by Rod Caughill), p. 2

[71] Transcript (Dell'Aquila), March 21, pp. 2241-44, lines 7-4; Exhibit 44 (Trow 1994 report), p. 15, Section 10

[72] Exhibit 46 (revisions to Trow 1994 report), p. 10, Section 7.1 [emphasis added]

[73] Exhibit 46 (revisions to Trow 1994 report), p. a, Abstract [emphasis added]

[74] Exhibit 44 (Trow 1994 report), p. 11, Section 7.2 [emphasis added]

[75] Exhibit 44 (Trow 1994 report), p. 11, Section 7.2 [emphasis added]

[76] Exhibit 44 (Trow 1994 report), p. 15, Section 10 [emphasis added]. The NORR report includes statements suggesting that Trow did not look at the steel when it performed its site inspections. For example, NORR states that Trow's 1991 report "appears to have been concentrated almost solely on the condition of the precast hollow core panels" (p. 17), that "it is not clear to what extent Trow inspected the steel framing" in 1994 (p. 21) and that prior to

54. In setting out its conclusions based on the conditions found in 1994, Trow cautioned that corrosion of the steel beams (and other forms of potential structural deterioration) would increase if the water and salt penetration continued. Trow stated that, with time, continued deterioration of the parking slab would become a structural concern. Trow recommended that a structural review and analysis be carried out as soon as possible in order to assess the availability of remedial options. The relevant statements are in Conclusions #2 and #4 of the November 1994 report, which state:

> Based on the data obtained from this survey, we are able to make the following conclusions:
>
> …
>
> 2. Water and salt penetration through joints will cause deterioration of the concrete, prestressed cables, steel beams, sprayed-on fireproofing for steel beam, false ceiling tiles and electrical conduits to increase.
>
> …
>
> 4. It is our opinion that a structural review and analysis should be carried out to confirm whether a bonded concrete topping is required and to further recommend possible modifications in order to recommend a waterproofing system. We suggest this assessment be carried out as soon as possible. … [W]e do not feel that the percentage of previously noted debonded topping produces an immediate concern. However, it should be noted that, with time, the amount of debonding is likely to increase, thus becoming a structural concern.[77]

55. After delivering its November 1994 report, Trow was asked to remove the recommendation that a structural review and analysis should be carried out.[78] Trow declined to remove the recommendation, and instead elaborated upon the reasons for the recommendation in revisions to the report issued on January 31, 1995.[79]

1996 "Trow had only performed cursory visual inspections" (p. 23). As the above descriptions of Trow's 1991 and 1994 site investigations and reports show, these statements by NORR are inaccurate. Trow examined the steel, and other aspects of the soffit, in some detail on both occasions. It emerged during the NORR testimony that, at the time they prepared their report, they had not been provided with the detailed drawing of Trow's observations of the soffit (Drawing 2 of 4) from the 1991 report (Exhibit 1974) or the updated drawing of the soffit inspection prepared for the 1994 report (Exhibit 3142): Transcript (NORR), May 30, pp. 12468-70, lines 10-3.

[77] Exhibit 44 (Trow 1994 report), p. 15, Section 10 [emphasis added]

[78] Exhibit 45 (letter from Algoma to Trow dated December 5, 1994, p. 2, item 1

[79] Exhibit 46 (letter from Trow to Algoma dated January 31, 1995, p. 1, item 1; Transcript (Dell'Aquila), March 20, pp. 2189-91, lines 22-9; p. 2191, lines 21-25; p. 2195, lines 11-16

56. During Mr. Iamonaco's testimony, Commission counsel asked him why Trow had not stated in its 1994 report that the corrosion would increase "exponentially" if the leakage was not stopped.[80] The question stemmed from the note to file that Mr. Caughill had prepared at the time of Trow's field inspection in August 1994, which states: "Iamonaco does not believe that we have a structural problem yet but he cautions that the corrosion seen will accelerate exponentially if the leakage is not treated."[81] While Trow's 1994 report confirms that water and salt penetration will cause corrosion of the steel beams to increase, it is the word "exponentially" that Commission counsel suggested Trow could have included in its report.

57. It may be helpful to clarify the evidence on this point. NORR confirmed, both in its report and in testimony, that the rate of corrosion of the steel at the mall was constant and linear, not exponential. The report states: "There is no evidence or technical reason to suggest that the rate of corrosion suddenly accelerated" during the mall's later years. Rather, in the ordinary course the rate of corrosion "tend[s] to reduce…over the years until it reaches a steady, somewhat reduced rate".[82] Dr. Saffarini and Mr. Dinovitzer testified that, while the rate of corrosion at the mall may not have reduced over time as would otherwise be typical, it also did not increase over time.[83]

58. It would thus have been factually inaccurate for Trow to have stated in its 1994 report that the corrosion of the structural steel at the mall could be expected to increase exponentially. Mr. Iamonaco's evidence was consistent with NORR's – he said he would not have used the word "exponentially" in reference to the rate of corrosion.[84]

(iii) 1995 – Structural analysis

59. In 1995, Algoma retained Trow to complete the structural analysis recommended in Trow's 1994 report, and to prepare repair recommendations based on that analysis. The purpose of the analysis was to confirm whether the concrete topping on the surface of the roof slab was

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[80]Transcript (Iamonaco), March 21, pp. 2484-85, lines 16-5; pp. 2487-88, lines 25-19

[81] Exhibit 611 (August 25, 1994 note to file by Rod Caughill), p. 2 [emphasis in original]

[82] Exhibit 3007 (NORR report), pp. 44, 125

[83] Transcript (NORR), May 30, pp. 12457-58, lines 21-12; p. 12462, lines 12-19

[84] Transcript (Iamonaco), March 21, pp. 2487-88, lines 25-19

required to be bonded to the hollow core slabs, and to determine what type of waterproofing system could be installed (i.e., thick or thin) depending on the allowable loading of the slab.[85]

60. Trow retained the structural engineering firm of Alex Tobias Associates Limited ("ATA") to perform the structural analysis. Trow and ATA consulted with two representatives of Coreslab (the manufacturer of the hollow core slabs), who advised that, contrary to what was shown on the original structural drawings, the concrete topping had to be fully bonded to the hollow core slabs. Based on this advice, ATA prepared its structural analysis using the assumption that the concrete topping could not be removed.[86] (Sonia Saari, the structural engineer from Coreslab who testified at the Inquiry, has since advised that a bonded concrete topping was not in fact required.)[87]

61. ATA's conclusion was that the hollow core slabs with a fully bonded concrete topping could safely support an additional 20 pounds per square foot (psf) of dead load. This meant that a waterproofing system up to a weight of 20 psf could be installed over the existing concrete topping once the debonded portions of the topping were repaired.[88]

62. Based on the ATA analysis, Trow recommended that the roof of the mall be repaired through the installation of a continuous waterproofing membrane, with a thin asphalt wearing course, over the entire surface of the roof. Various related repairs were also recommended, including repairs to the debonded topping, installation of new expansion joints, and installation of a roof canopy over selected areas where the roof slab could be overstressed due to snow piling and rain load based on the ATA analysis.[89]

63. The waterproofing option that Trow recommended in its 1995 report (Option 1) was, with some modifications, the same as the first waterproofing option from its May 1991 report.[90] The

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[85] Exhibit 51 (Trow 1995 report), p. 1

[86] Exhibit 51 (Trow 1995 report), pp. 1-2 and attached ATA report at p. 3

[87] Transcript (Saari), May 28, pp. 12086-089, lines 15-18

[88] Exhibit 51 (Trow 1995 report), p. 2 and attached ATA report at p. 3

[89] Exhibit 51 (Trow 1995 report), pp. 3-4

[90] The NORR report includes a statement that, in 1995, Trow realized that both repair solutions proposed in Trow's 1991 report could not be accommodated (p. vi). Dr. Saffarini clarified in his testimony that this statement applies

second waterproofing option from the May 1991 report – which contemplated removal of the concrete topping – was not pursued in light of the advice from Coreslab at the time that a bonded topping was required.[91]

64. Trow advised in its 1995 report that the installation of the recommended waterproofing system "assures complete repair to the parking structure facility and minimizes long term maintenance costs."[92] Trow recommended that the waterproofing be carried out as soon as possible, suggesting that an updated survey of the parking deck be carried out in spring 1996 in order to gather information and determine quantities so as to prepare the repair specifications.[93]

65. As it had done in its 1991 and 1994 reports, Trow identified in its 1995 report a structural concern if the mall roof was not repaired immediately. Trow specifically flagged this in 1995 as a safety issue – that the roof slab would not be able to safely bear the loads if the deterioration and corrosion continued. Trow's recommendation that the waterproofing be carried out as soon as possible was made because repairs were needed "to maintain the structural integrity of the slab."[94] Trow explained:

> The roof deck presently contains areas of debonded concrete topping. These areas need to be removed and a new bonded topping installed to maintain the structural integrity of the slab. This should be carried out as soon as possible.
>
> If the debonded topping is not repaired, the core slabs will not be able to safely carry the dead load of the topping since the topping and core slabs must be bonded. On going leakage through the joints in the topping and core slabs will continue to cause deterioration of the topping and core slabs due to freeze/thaw cycles and chloride contamination of the core slabs and subsequent corrosion of the prestress strands in the core slabs and the supporting steel beams.[95]

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only to the second option from 1991, and that the first option from 1991 was consistent with Option 1 in the 1995 report. See Transcript (NORR), May 30, p. 12453, lines 12-18; pp. 12454- 56, lines 5-17

[91] Transcript (Dell'Aquila), March 20, p. 2213, lines 1-16; March 21, p. 2306, lines 2-8;

[92] Exhibit 51 (Trow 1995 report), p. 4

[93] Exhibit 51 (Trow 1995 report), p. 3; Transcript (Rod Caughill), March 19, pp. 1835-37, lines 2-5

[94] Exhibit 51 (Trow 1995 report), p. 3

[95] Exhibit 51 (Trow 1995 report), p. 3 [emphasis added]

66. Trow also identified in its 1995 report a second repair option (Option 2), which involved repairing the caulking in the joints on the roof slab after repairing the debonded concrete topping and performing various related repairs.[96]

67. Trow did not recommend Option 2. The 1995 report explained that Option 2 would not stop the leakage: "Option 2 only addresses a small percentage of the problem," unlike Option 1 (the waterproofing recommendation) which "assures complete repair." Option 2 was also identified as more costly over the long term because of ongoing maintenance costs and repair costs. The report stated:

> Although Option 2 may initially be less costly, the long term maintenance costs will exceed the initial costs of Option 1. In addition Option 2 only addresses a small percentage of the problem and in the long term it will be more costly to conduct on going local repairs. On going local repairs also creates the problem of numerous construction joints in the concrete topping system and inconvenience to the mall and parking deck.[97]

68. Algoma understood that Option 2 would only address a small percentage of the leakage problem,[98] and that the installation of a waterproofing membrane was one of the more favourable options to ensure that the leakage was stopped.[99]

69. In its 1995 report, Trow also recommended that a regular inspection regime be implemented following the completion of repairs. Trow proposed monthly inspections by mall maintenance staff, and an annual inspection regime to be carried out by an engineering company.[100] NORR agreed that an appropriate monitoring regime after repairs would have been once annually.[101]

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[96] Exhibit 51 (Trow 1995 report), p. 4

[97] Exhibit 51 (Trow 1995 report), pp. 4-5. See also Transcript (Dell'Aquila), March 21, p. 2307, lines 2-12; Transcript (Iamonaco), March 21, pp. 2489-90, lines 5-7; pp. 2492-93, lines 15-1; pp. 2495-96, lines 14-19; p. 2498, lines 18-24

[98] Transcript (Leistner), March 28, p. 3585, lines 1- 15

[99] Transcript (Leistner), March 27, p. 3322, lines 5-8; Transcript (Rod Caughill), March 19, pp. 1940-41, lines 20-4

[100] Exhibit 51 (Trow 1995 report), p. 3

[101] Transcript (NORR), May 29, pp. 12264-65, lines 11-10

70. Trow was not retained to provide repair specifications for the installation of a waterproofing system, to implement Option 1 or to conduct further inspections. [102]

D. Trow's 1996 proposal to inspect the steel connections

71. In the spring of 1996, Algoma asked Trow to submit a proposal setting out the cost to perform a structural review of the mall in order to confirm that the building was designed properly and that its construction mirrored its design. Algoma was concerned about the structural integrity of the mall because of the suspension of the engineering license of John Kadlec, the structural engineer who designed the Algo Centre Mall. The requested inspection of the mall was to involve a review of any suspect areas and the spot-checking of steel beam design and field conditions.[103]

72. Trow submitted a proposal in response to Algoma's request in June 1996. The proposal contemplated a detailed inspection of the structural steel connections, stating:

> [W]e propose the following scope of work:
>
> …
>
> 8. Exposing and measurements of existing structural members where details (design) are not available.
>
> 9. Spot checking of structural steel connections. Carry out welding inspection and/or torque testing of bolts where and if required.
>
> 10. General review to identify any deteriorated structural elements.
>
> 11. Removal of portions of existing structural steel elements for strength testing of suspect members.[104]

73. Trow felt strongly at the time that, if it was going to check the as-built conditions against the design drawings, it had to inspect the connections.[105]

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[102] Transcript (Leistner), March 28, pp. 3574-75, lines 24-7; Transcript (Dell'Aquila), March 21, pp. 2437-38, lines 20-9

[103] Exhibit 410 (June 1996 Trow proposal), pp. 1-2; Transcript (Iamonaco), March 21, pp. 2525-28, lines 14-9; Transcript (Rod Caughill), March 19, p. 1849, lines 5-23

[104] Exhibit 410 (June 1996 Trow proposal), pp. 1-2; Transcript (Iamonaco), March 21, p. 2527, lines 3-21

[105] Transcript (Iamonaco), March 21, p. 2527, lines 3-21

74. Algoma chose not to retain Trow to do this work. Instead, Algoma retained Paul Meyer, a structural engineer whose proposal was less expensive and involved a more limited scope of work.[106]

75. Mr. Meyer described Trow's 1996 proposal as a "much more detailed review" of the condition of the building than he had proposed. He also described Trow's 1991 condition survey as a "much more thorough examination of the structure" than the inspection he completed.[107] The differences between Trow's 1996 proposal and the work performed by Mr. Meyer were described in the NORR report:

> In 1996, as a result of the original Engineer losing his license, another engineering review was requested by ACP. Trow proposed a thorough investigation into the initial design paired with an in depth investigation into the framing including the connections and review and identification of any deteriorated members. Unfortunately, this proposal was not realized as ACP hired Paul Meyer who asked for far less to perform what they believed would be a comparable investigation. This was not the case, as Meyer did not report on the deteriorated conditions of members or corrosion. Instead Meyer's report focused mainly on a design review.[108]

E. The structural integrity of the mall (1991-1994)

76. In its inspections of the Algo Centre Mall in 1991 and again in 1994, Trow found the roof to be structurally sound. As explained above, Trow did not find any structurally significant corrosion of the steel beams, columns or connections.[109] While the corrosion was widespread, as of November 1994 the corrosion was in the nature of surface corrosion and did not pose any immediate structural concern.

77. Mr. Dell'Aquila explained, and NORR confirmed, that surface corrosion is rust that occurs without any significant loss of section (or thickness) in the structural steel element (i.e., less than half a millimeter), with the result that the structural capacity of the steel is left intact.

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[106] Transcript (Rod Caughill), March 19, p. 1848, lines 6-18; Exhibit 2084 (June 18, 1996 note to file by Rod Caughill)

[107] Transcript (Meyer), April 4, p. 4066, lines 7-25; p. 4122, lines 2-9

[108] Exhibit 3007 (NORR report), p. 45

[109] Transcript (Dell'Aquila), March 21, p. 2234, lines 8-15

More severe corrosion, which does compromise structural integrity, occurs where corrosion is sufficiently severe that it involves a significant loss of thickness of the steel element.[110]

78. As noted above, when Trow measured one of the most corroded beam flanges for loss of section in 1994, it found negligible or no section loss. Mr. Dell'Aquila testified that, had Trow found more severe corrosion in the structural steel beams or the connections, it would have addressed the issue in its reports and recommended that a structural engineer inspect the corrosion to determine a course of action.[111]

79. Trow's observations of surface rust and Trow's conclusion that the corrosion did not pose an immediate structural concern were corroborated by the NORR evidence. NORR confirmed that, when Halsall inspected the mall in 1998-99, the mall was structurally sound.[112] It follows, *a fortiori*, that the mall was structurally sound when Trow inspected it in 1991 and 1994.

80. NORR noted that Trow's observations of surface rust are consistent with NORR's analysis regarding the likely progression of the corrosion at the mall.[113] NORR relied upon Trow's observations and measurements of corrosion to corroborate its conclusions.[114]

81. NORR confirmed Trow's evidence that, when only surface rust is present and there is no section loss, there is no immediate structural concern, and so nothing that the engineer inspecting the building needs to do. There is no reason for an engineer to "raise the alarm" about the corrosion unless there is section loss.[115] Conversely, NORR explained that, when there is section loss, there is reason to raise the alarm, and there is a need to inspect the structural steel connections separately from the beams and columns.[116]

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[110] Transcript (Dell'Aquila), March 21, pp. 2241-43, lines 15-1; pp. 2266-67, lines 3-23; Exhibit 3007 (NORR report), pp. vi, viii, 44, 106-07

[111] Transcript (Dell'Aquila), March 21, pp. 2243-44, lines 2-4

[112] Transcript (NORR), May 29, pp. 12333-34, lines 24-3

[113] Exhibit 3007 (NORR report), pp. vi, 44-45

[114] Transcript (NORR), May 29, pp. 12255-57, lines 11-12

[115] Transcript (NORR), May 29, pp. 12263-64, lines 3-14; May 30, p. 12572, lines 1-14; Transcript (Dell'Aquila), March 21, p. 2351, lines 7-20; pp. 2410-11, lines 12-8; Transcript (Iamonaco), March 21, p. 2519, lines 10-25

[116] Transcript (NORR), May 29, pp. 12271-72, lines 24-9. Dr. Saffarini explained that it is acceptable for an inspecting engineer not to inspect connections at all when structural steel beams and columns are pristine and not

F. Trow's advice was clear and understood

82. The advice and recommendations in Trow's reports, and Trow's findings regarding the deterioration of the mall and the potential for future structural failure, were clear and understandable. This fact was demonstrated through several witnesses who testified at the Inquiry, both from Algoma and otherwise.

83. The Algoma witnesses testified that they understood, as a result of Trow's reports and other advice, that:

(a) there was widespread surface corrosion on the structural steel elements in the mall;[117]

(b) the surface corrosion had not caused structural damage to the steel;[118]

(c) if the steel elements continued to be exposed to water and chlorides, they would continue to corrode; [119]

(d) corrosion of the structural steel would cause a structural concern in the future if left unchecked; [120]

(e) deterioration in the concrete slabs would also cause a structural concern in the future;[121]

(f) repairs needed to be completed in order to address the potential structural concern; [122]

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exposed to water (Transcript (NORR), May 29, p. 12271, lines 12-23). He did not opine on whether it is necessary for the inspecting engineer to inspect the connections, as the evidence shows Trow did, when the steel beams and columns show surface rust only, with no section loss. His evidence that there is no reason for the engineer to "raise the alarm" when there is only surface rust suggests that there would be no expectation of special problems with the connections when the beams and columns show surface rust.

[117] Transcript (Rod Caughill), March 19, p. 1800, lines 1-12; pp. 1808-09, lines 18-9

[118] Transcript (Rod Caughill), March 19, p. 1834, lines 9-17

[119] Transcript (Rod Caughill), March 19, p. 1819, lines 3-8

[120] Transcript (Rod Caughill), March 19, p. 1816, lines 12-19; pp. 1826-28, lines 9-13; p. 1834, lines 12-17; Exhibit 429 (November 28, 1994 Algoma memo), p. 5; Transcript (Leistner), March 28, pp. 3563-64, lines 7-5

[121] Exhibit 429 (November 28, 1994 Algoma memo), p. 5; Transcript (Leistner), March 28, pp. 3563-64, lines 7-5

[122] Transcript (Rod Caughill), March 19, p. 1820, lines 6-15

(g) Trow was recommending that the leakage be fixed as soon as possible, because otherwise the structural concern would be exacerbated;[123]

(h) Trow was recommending complete waterproofing of the roof deck in order to protect the structural elements (including the steel) from further deterioration;[124] and

(i) complete waterproofing of the roof slab could be achieved only by installing a waterproofing membrane over the entire roof.[125]

84. After they received Trow's advice, Algoma's representatives recorded in writing their understanding of the advice given. One example is Mr. Caughill's note to file from the August 1994 Trow field inspection of the mall, where he confirmed his understanding from Trow that the corrosion was increasing and that there would be a resulting structural problem if the water leakage was not treated.[126]

85. Another example is a memo that Mr. Leistner, Algoma's then General Manager and Vice-President, sent to Algoma's President shortly after the delivery of Trow's November 1994 report. He confirmed his understanding of the potential for structural failure of the mall by one of two mechanisms – failure of the concrete or corrosion of the steel. He stated:

> I am also concerned with the long-term structural integrity of the parking deck due to the already mentioned leakage problems. The subject water leakage has caused concerns with both the disintegration of the concrete and the corrosion of the structural steel…[127]
>
> [W]e have long-term structural concerns which we do not have answers to as yet and therefore monetary values cannot be

[123] Transcript (Leistner), March 27, p. 3334, lines 1-8

[124] Transcript (Rod Caughill), March 19, pp. 1812-13, lines 22-8; pp. 1840-42, lines 13-2; Transcript (Leistner), March 27, pp. 3256-57, lines 19-7

[125] Transcript (Leistner), March 27, p. 3322, lines 5-8

[126] Exhibit 611 (August 25, 1994 note to file by Rod Caughill)

[127] Exhibit 429 (November 28, 1994 Algoma memo), p. 5; Transcript (Leistner), March 28, pp. 3563-64, lines 7-5

> estimated at this time, but it is apparent that the building will not last indefinitely without costly repairs.[128]

86. Mr. Leistner testified that Algoma's understanding of the structural concern resulted from the advice that Trow gave to Algoma,[129] and that the "costly repairs" he referred to in his memo to the President involved the installation of a waterproofing membrane as recommended by Trow.[130]

87. Several other witnesses, not from Algoma, also confirmed their understanding of the advice in the Trow reports, when Commission counsel asked them what they would have done if they had seen the reports.

88. Witnesses from the City of Elliot Lake testified that, had they seen Trow's reports, they would have ordered that the repairs be completed. Roger Pigeau, the Chief Building Official from 1980 to 1999, stated with respect to each of the 1991, 1994 and 1995 Trow reports that, had he seen the report, he would have issued an order under the municipal property standards by-law or under the Building Code to require that the leaks be dealt with.[131] Mr. Pigeau stated that he had the authority to require repairs to make the building watertight in accordance with the property standards by-law.[132] He expressed the opinion that the collapse of the mall could have been avoided if he had known of the Trow reports.[133]

89. Fred Bauthus, the Chief Administrative Officer from 1990 to 2000, testified that if he had seen the Trow reports he would have communicated with the mall owner about remedying the leakage, and that if the leakage was not remedied he probably would have considered using the City's regulatory powers under the property standards by-law.[134]

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[128] Exhibit 429 (November 28, 1994 Algoma memo), p. 7

[129] Transcript (Leistner), March 28, p. 3564, lines 2-5

[130] Transcript (Leistner), March 28, p. 3568, lines 9-24

[131] Transcript (Pigeau), March 22, pp. 2599-2601, lines 18-10; pp. 2604-2605, lines 17-6; pp. 2612-2613, lines 22-17; pp. 2615-2617, lines 13-8; pp. 2709-2710, lines 17-6

[132] Transcript (Pigeau), March 25, p. 2839, lines 5-11; p. 2840, lines 16-21

[133] Transcript (Pigeau), March 25, pp. 2861-62, lines 16-5

[134] Transcript (Bauthus), March 26, pp. 2928-36, lines 3-22; pp. 2241-45, lines 1-19

90. Syl Allard, the Chief Building Official from 2002 to 2008, echoed Mr. Pigeau's and Mr. Bauthus' testimony. He stated that he would have taken action had he seen the Trow reports. In his view, the Trow reports clearly communicated Trow's concerns about the mall's future structural integrity if the leaks were not stopped. As Mr. Allard put it, Trow "made it pretty clear in the reports that the roof was leaking, had been leaking for a while, and that it was causing damage to the structure."[135]

91. Commission counsel asked at least 25 other witnesses about the effect that seeing the Trow reports would have had on their conduct and decision-making. Many testified that they would have been influenced in one way or another by the reports.[136]

G. Trow recommended a viable repair option

92. Throughout its involvement at the Algo Centre Mall from 1991 to 1995, Trow consistently recommended that a waterproofing system, made up of a waterproofing membrane and an asphalt wearing course, be installed in order to stop the leakage and to prevent deterioration of the structure. Trow never recommended any other solution.[137]

93. The evidence at the Inquiry has shown that Trow's repair recommendation was a viable one, and indeed was the best and most effective option.

94. In order to meet the 20 psf weight restriction identified by ATA,[138] Trow contemplated using a waterproofing membrane covered with a thin asphaltic wearing course, rather than the more conventional thick asphalt wearing course.[139]

95. The waterproofing system Trow recommended had the following features:

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[135] Transcript (Allard), April 19, pp. 5899-5900, lines 24-7

[136] See, e.g., Transcript (Kennealy), April 17, pp. 5388-5389, lines 4-4; Transcript (Celli), April 5, p. 4255, lines 1-15; Transcript (Truman), April 9, pp. 4529-4530, lines 12-9; Transcript (Luciw), April 10, pp. 4749-4750, lines 7-6; Transcript (Buckley), April 8, p. 4388, lines 12-25; p. 4389, lines 5-11; Transcript (McDonald), April 24, pp. 6606-6607, lines 1-3; Transcript (Sarvinis), June 5, p. 12900, lines 16-23

[137] Transcript (Iamonaco), March 21, p. 2525, lines 2-5

[138] Exhibit 51 (Trow 1995 report), p. 2

[139] Transcript (Dell'Aquila), March 20, pp. 2184-85, lines 25-9; pp. 2291-94, lines 4-18; Exhibit 51 (Trow 1995 report), p. 4

(a) a rubberized asphaltic membrane would be used, applied as a fluid with a squeegee such that it would be seamless and without joints, would cover 100 percent of the roof area and would be upturned at the perimeters so as to prevent water from breaching the membrane along the sides; [140]

(b) the membrane would be flexible and able to bridge cracks; [141]

(c) the membrane would be of the type specialized for use with a thin asphalt wearing course; [142] and

(d) a thin asphalt wearing course with a thickness of approximately 1 ½ inches would be placed directly over the membrane. [143]

96. Mr. Dell'Aquila testified that Trow had a specific light-weight asphalt system in mind – using the Multi-Guard 2 product – that would meet these requirements and would weigh less than 20 psf.[144] Mr. Dell'Aquila referred to his contemporaneous notes from 1995 in which he identified the product and performed a calculation to determine the maximum thickness of asphalt to achieve the 20 psf threshold.[145] Trow had recommended this system previously to others and had implemented it on several similar rooftop systems where loading was a potential issue so that a conventional thicker system could not be used.[146] The system contemplated by Trow is still in use today.[147]

97. Trow's evidence was that the thin waterproofing system proposed by Trow was the only waterproofing option that could have kept the roof slab dry. If properly installed, there should

[140] Transcript (Dell'Aquila), March 21, pp. 2291-92, lines 4-6

[141] Transcript (Dell'Aquila), March 21, p. 2291, lines 4-25

[142] Transcript (Dell'Aquila), March 21, p. 2293, lines 16-25

[143] Transcript (Dell'Aquila), March 21, p. 2293, lines 9-12

[144] Transcript (Dell'Aquila), March 21, pp. 2301-03, lines 2-22

[145] Transcript (Dell'Aquila), March 21, pp. 2301-03, lines 7-19; Exhibit 1124 (Mr. Dell'Aquila's November 6, 1995 handwritten notes)

[146] Transcript (Dell'Aquila), March 21 pp. 2294-95, lines 6-5; pp. 2303-04, lines 1-16

[147] Transcript (Dell'Aquila), March 21, pp. 2303-04, lines 20-4

have been no areas of the roof where water could still have leaked through.[148] Its life span would have been approximately 20 years, with maintenance.[149]

98. NORR's lead structural engineer, Dr. Saffarini, agreed with Trow's repair recommendation. Dr. Saffarini testified that the ATA analysis was acceptable and that it was a legitimate course of action to assume that there was about 20 psf of dead load capacity available that could be used to apply a thin asphaltic waterproofing system on the roof as Trow had proposed.[150] Dr. Saffarini confirmed Trow's evidence that products existed in 1995 that made the thin asphaltic waterproofing system an available option at that time.[151]

99. Dr. Saffarini endorsed Trow's repair recommendation as the ideal solution, and the only effective solution to the leakage that caused the collapse.[152]

100. Dr. Saffarini confirmed that the waterproofing system Trow proposed in 1995 was consistent with the requirements of CSA Standard S413-87 (Parking Structures) – which, as noted above, is described in the NORR report as a "relevant description of acceptable roofing for use as parking surfaces" and "useful guidelines for those advising the Algo Centre Mall management on dealing with the chronic water leakage."[153]

101. The structural engineer for Coreslab, Ms. Saari, similarly confirmed in her testimony that a waterproofing system of up to 20 psf could have been supported by the hollow core slabs.[154] Her calculations indicated that this type of waterproofing system could have been accommodated even without a bonded concrete topping, and that if the concrete topping were properly bonded the slabs could have supported a waterproofing system of up to 50 psf.[155]

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[148] Transcript (Dell'Aquila), March 21, p. 2299, lines 10-17

[149] Transcript (Dell'Aquila), March 21, p. 2298, lines 9-16

[150] Transcript (NORR), May 30, pp. 12436-38, lines 14-7

[151] Transcript (NORR), May 30, pp. 12438-39, lines 18-1; pp. 12439-40, lines 25-10; Exhibit 3007 (NORR report), p. 66

[152] Transcript (NORR), May 29, pp. 12255-56, lines 17-2; pp. 12337-38, lines 25-13

[153] Transcript (NORR), May 30, pp. 12449-50, lines 19-2; Exhibit 3007 (NORR report), p. 66; Exhibit 5191 (CSA Standard S413-87 (Parking Structures))

[154] Transcript (Saari), May 28, pp. 12086-089, lines 15-18; Exhibit 5149 (Ms. Saari's May 3, 2013 letter), p. 1

[155] Transcript (Saari), May 28, pp. 12086-89, lines 15-18

102. Roger Jeffreys, the investigating engineer from the Ontario Ministry of Labour, confirmed that the waterproofing recommendation was appropriate, describing it as "a proper and long lasting solution".[156]

H. Causation

103. There are many different ways that the question of what caused the collapse of the Algo Centre Mall can be answered.

104. Arguably, the collapse was caused by the design of the mall roof, by the multiple decisions not to implement comprehensive repairs, by the limited information-sharing, by the non-enforcement of rules, by the involvement of specific individuals, by the exclusion of certain others, and by myriad other factors.

105. From the perspective of Trow's involvement in the 1991-95 period, however, the causation question is much simpler. The question is whether the mall would have collapsed if Trow's repair recommendation had been implemented at a sufficiently early stage.

106. The answer appears to be no – the mall would still be standing today if a waterproofing system had been installed within a reasonable time after Trow recommended it.

107. NORR's evidence was clear on this point: the ongoing leakage caused by the absence of an adequate waterproofing system is the reason that the roof failed. A waterproofing system of the type recommended by Trow was "the only solution".[157]

108. The evidence of the Trow witnesses was to the same effect. A waterproofing system would, if implemented, have prevented further water and salt from corroding the steel beams and connections that held up the roof slab. If the waterproofing had been carried out and properly

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[156] Exhibit 6227 (Engineering Report, Ontario Ministry of Labour, June 23, 2013), p. 95; Transcript (Jeffreys), July 31, pp. 19340-343, lines 9-9

[157] Exhibit 3007 (NORR report), pp. 126-130; Transcript (NORR), May 29, pp. 12255-56, lines 17-2; pp. 12337-38, lines 25-13

maintained, the structural steel would today be in a similar condition to its original condition at the time of installation.[158]

PART II - POLICY SUBMISSIONS

109. As noted above, in order to prepare the policy component of its submissions, Trow assembled three top Canadian engineering experts specializing in the design and repair of parking structures. Trow sought their input and advice regarding a number of policy options that have been suggested by various parties during the course of the Inquiry. This part of the submissions sets out the results of that consultation, identifying merits and demerits of certain suggested policy options, and factors the Commission may wish to consider with respect to each.

110. The three experts that Trow brought together are John Bickley, Andy Kaminker and John Ryell – who, combined, have over 170 years of engineering experience. Copies of their resumes are attached as Appendix A.

111. John Bickley is a civil engineer with over 60 years' experience, who has specialized in concrete technology since 1955. He worked at Trow for 21 years, from 1967 to 1988. He has chaired or served as a member of many standards bodies including, in 1987, chairing the CSA Technical Committee on Durable Parking Structures which produced the CSA standard for parking structures (CSA S413-87 (Parking Structures)).

112. Andy Kaminker is a structural engineer with over 49 years' experience, specializing in parking structures and concrete rehabilitation. He worked at Carruthers and Wallace for many years. That firm is now part of exp, where he continues to work. As noted above, Mr. Kaminker was a member of the Technical Committee on Durable Parking Structures in 1987, and today is Co-Vice Chair of that body, which is currently working on revisions to the S413 standard.

113. John Ryell is a civil engineer with over 60 years' experience, who has specialized in concrete construction and rehabilitation for most of his career. Before joining Trow in 1986, Mr. Ryell worked for the Ontario Ministry of Transportation, with a focus on the use of concrete in highways and bridges. He has worked in CSA standards committees since 1960 and has been a

[158] Transcript (Iamonaco), March 21, pp. 2471-73, lines 12-6; p. 2525, lines 6-10; Transcript (Dell'Aquila), March 21, p. 2308, lines 6-19

member of almost every committee and task force dealing with cement, aggregate, concrete and allied material.

114. The format of Trow's consultation with these three experts was as follows: Trow identified several policy options that have been suggested over the course of the Inquiry, and asked the experts to consider the pros and cons of each option, as well as issues or concerns that the options raise. The experts met in Toronto on July 25, 2013 to share their thoughts. The comments set out in the following pages are the result of that meeting, focused around six policy options.

A. Registering engineering reports against title to property

115. The suggestion has been made on several occasions at the Inquiry that it should be mandatory for property owners to register engineering reports against title to the property to which they relate. The three experts saw both significant benefits and significant drawbacks in connection with this proposal.

116. The principal benefits of registering reports against title were considered to include:

(a) providing disclosure of problems affecting a building to the municipality and all persons interested in the building;

(b) as a result of (a), requiring owners to address the problems;

(c) allowing municipalities a greater ability to enforce safety-related requirements; and

(d) the relatively modest financial cost associated with implementing the registration requirement.

117. The principal drawbacks of requiring the registration of engineering reports against title were identified as:

(a) the likelihood that it would produce perverse results, such as:

(i) inducing property owners not to seek engineering advice, or to request the advice orally rather in writing;

(ii) creating a black market in engineering advice provided "under the table";

(iii) causing engineers, who are already under pressure to produce reports favourable to the property owner's interests, to tailor their advice in inappropriate ways;

(b) the difficulty of enforcing compliance by owners with the registration requirement;

(c) the detrimental effect of registering a flawed engineering report against title (which could result in a decreased property value through no fault of the owner); and

(d) the potential for expansion of an engineer's liability to third parties, since the engineer's reports would be made available to a broad audience.

118. The experts raised a variation on the mandatory registration idea, that of requiring that all engineering reports be filed with the Chief Building Official for the municipality, with or without limits on the availability of the reports to members of the public such as prospective purchasers, mortgage lenders, and the like.

119. On the whole, the experts were positively disposed toward some type of mechanism for encouraging the sharing of engineering reports relating to a building, but they recognized the reality that this may not be a feasible policy option in light of the significant drawbacks identified.

B. Creating or amending CSA standards

120. The group noted that, even today under CSA standard S413-07 (the 2007 revision of the S413-87 standard for Parking Structures that was in place at the time that Trow performed its work at the mall in the 1991-95 period), it is acceptable to have a parking structure that lacks a waterproofing system of the type that Trow recommended. Section 7.8.2 of S413-07 permits the tooling and caulking option, without a waterproofing membrane, that was favoured at the Algo Centre Mall (although the experts did not comment on whether the methods of tooling and caulking actually used at the mall met the requirements of the standard).

121. There was discussion of whether the Technical Committee responsible for the S413 standard should consider revising the standard to make a waterproofing membrane a required

element for all parking structures. It was agreed that having the Technical Committee turn its mind to this issue, in connection with the next revision of the standard, would be worthwhile.

122. The group noted that there is not, currently, a comprehensive CSA or other standard governing the inspection and testing of existing buildings. There was discussion of the possibility of developing such a standard, either for buildings generally or for parking structures specifically (in the latter case, possibly as an appendix or supplement to CSA S413).

123. It was noted that existing CSA standard S448.1-93 (Repair of Reinforced Concrete in Buildings) already includes standards for inspection and testing, but only for buildings constructed of the types of reinforced concrete addressed by the standard – which does not cover hollow core slabs. The group also noted that the Institute for Research in Construction (a division of the National Research Council of Canada) published a set of "Protocols for Building Condition Assessment" in 1993, but that these Protocols do not specifically provide for inspection of structural steel connections within a building.

124. The three experts agreed that an inspection standard applicable to buildings like the Algo Centre Mall would be helpful. It was suggested that an inspection standard could be structured so as to delineate different types of inspection, with different elements and different degrees of comprehensiveness. Engineers performing building inspections could then explain in their reports the type of inspection they performed, and the additional inspection or testing elements that could (or should) be performed in order to address more thoroughly or more adequately the conditions found in the building.

125. The group discussed whether to make such an inspection standard mandatory. Currently there is no provincial legislation regulating the inspection of existing buildings, but municipalities can enact inspection by-laws. One possibility would be to add a requirement to the Ontario Building Code that building inspections be carried out with reference to the inspection standard. This could be linked to a specific requirement that inspections be carried out on existing buildings.

C. Amending the Building Code to require inspections after construction

126. The Ontario Building Code does not currently require periodic inspections of buildings, after construction, to assess their structural integrity. One policy option would be to amend the Building Code to require periodic inspections of the structural components of parking garages and their protective systems, and of the components of other buildings that are subject to corrosion and deterioration. The experts generally liked the idea of requiring such periodic inspections. Mandatory inspections promote compliance with safety requirements and encourage proactive remediation.

127. A possible means of imposing the inspection requirement is through legislation mandating that building owners retain a qualified professional engineer to carry out a comprehensive condition survey of the structure and its protective systems on regular intervals. The group was of the view that structural inspections should be carried out by, or under the direction of, a structural engineer, specifically.

D. Expanding the inspection powers of municipalities

128. The group's view was that municipalities already possess the necessary powers enabling them to inspect potentially unsafe buildings and to issue orders to protect public safety, either by requiring repairs or by restricting access to a building or requiring its demolition.

129. The concern was expressed that some Chief Building Officials and other municipal officials lack the required expertise to exercise their existing powers effectively, and that expanding their powers may result in undesirable over-regulation and abuses.

130. Instead of expanding municipal inspection powers, three other options were suggested: (a) improving the credentials or expanding the training required for a person to assume the role of Chief Building Official; (b) providing better guidance to Chief Building Officials about what powers they possess and when to exercise them in the public interest; and (c) creating a penalty, enforceable by municipalities, for property owners that do not repair parking garage leakage within a specified period of time.

E. Modifying the PEO Code of Ethics

131. There was consensus that it would be beneficial to highlight the primacy of public safety more clearly in the Code of Ethics administered by the Professional Engineers of Ontario, and also to explain in more detail the factors that an engineer must consider in assessing whether a real public safety risk exists or will soon exist.

132. Currently, the Code of Ethics requires the practitioner to regard the duty "to the public welfare" as paramount, without specifically referring to public safety.

F. Special training or certification of structural engineers

133. The three experts expressed the view that the problems at the Algo Centre Mall did not appear to be the result of training inadequacies within the engineering profession. The training of engineers in Canada is sophisticated and good. However, as in any profession there is a range of competence and diligence among the members of the engineering profession, as well as a range of commitment to principles of ethics.

134. The group did endorse the suggestion of specialist certification for structural engineers. Currently, engineers self-identify as structural engineers, and a member of the public has no way of knowing based on the engineer's representation alone what level of experience or expertise is possessed. A specialist certification program could impose training or testing requirements, as well as a requirement to demonstrate a specified number of years of work under a structural engineer.

135. At the same time, the group stressed that the problem of engineers self-identifying as structural engineers should not be over-stated. Many professions allow their members to specialize without imposing regulated certification requirements, and the vast majority of specialists are well-qualified in their areas.

ALL OF WHICH IS RESPECTFULLY SUBMITTED this 8th day of August, 2013.

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