

Province of Ontario

Submissions in Response to Procedural Order No. 9

Submitted: May 30, 2014

In November 1986, the former Ministry of Housing (“MOH”) established an Advisory Committee on the Deterioration, Repair and Maintenance of Parking Garages (the “Advisory Committee”). In July 1988, the Advisory Committee submitted the “Deterioration of Parking Structures” report (the “Report”) to the Ontario Buildings Branch of the former MOH. The Report was one of many prepared from the late 1970s to the early 1990s regarding durability and deterioration of multi-level parking structures. The problem was well known in the sector.

In response to the Advisory Committee’s recommendations, the Government of Ontario (“Ontario”) took a number of steps including: amending the Building Code regulation in 1988 to incorporate the requirements of Canadian Standards Association S413 standard for the design and construction of new parking structures; distributing and publicizing the Advisory Committee’s Report to building owners, engineers, municipalities and the public; participating in and supporting additional studies and research projects related to deterioration of parking structures; and considering whether to establish requirements for the inspection and maintenance of existing structures.

The Report itself was broadly publicized at the time it was received. The former MOH communicated the results of the Report to building sector stakeholders including building owners, engineers, municipalities and the public through a ministry newsletter and through workshops with various members of the building sector. Copies of the Report were printed in both English and French and are currently available in a number of public and university libraries.

Procedural Order No. 9

Procedural Order No. 9, issued on May 12, 2014, included a copy of the Report and requested that Ontario provide submissions in relation to the Report, and in particular, to:

- a. Confirm the authenticity of the Report.
- b. Describe what steps, if any, were taken by the Ontario Government upon receipt of the Report, including whether it established a comprehensive repair and restoration program (see p. ii of Report). If no steps were taken (or no program established), please explain why.
- c. Did the Ontario Government conduct any additional study following the Report? If so, describe.

- d. Did the Ontario Government adopt any of the recommendations set out in the Report? If so, describe the measures taken and how they were implemented?
- e. Provide any documentation in relation to items b, c, and d set out above.

A. Confirm Authenticity of the Report

As indicated in Ontario's letter to Commission Counsel dated May 20, 2014, the Province, through the Ministry of Municipal Affairs and Housing ("MAH"), confirms the authenticity of the Report.

The Deterioration of Parking Structures report was prepared by the Advisory Committee on the Deterioration, Repair and Maintenance of Parking Garages.

According to the Report, the Advisory Committee was established by the former Ministry of Housing in November 1986. The Advisory Committee was comprised "of leading specialists within the Province of Ontario to address matters relating to the deterioration of the provincial stock of parking structures...". The membership of the Advisory Committee included experts from major stakeholders with an interest in parking structures such as provincial, federal and municipal governments, industry and the engineering community.

The Report was submitted to the Ontario Buildings Branch of the former MOH in July 1988. It was assigned International Standard Book Number 0-7729-5324-4.

MAH continues to fully cooperate with the Inquiry. While the Commission did not request the production of documents from MAH during the Inquiry, a search for all documents responsive to the Commission's Procedural Order No. 9 was conducted by MAH upon receipt of the Order, and all documents that could be located are attached to these submissions as appendices.

History of Expert Reports on Deterioration of Parking Structures

At the time the Advisory Committee was established and the Report was submitted, deterioration of parking structures in Ontario and elsewhere in Canada was a well-known concern that had been the subject of a number of studies by various organizations.

In November 1981, Trow Ltd. prepared a report for the Canadian Mortgage and Housing Corporation ("CMHC") entitled "Nature, Extent, and Impact of Residential Parking Structure Deterioration".¹ The report concluded that "the deterioration of parking structures in Ontario and some other provinces is reaching epidemic proportions". The final recommendations from this study indicated that a larger sample should be selected to conduct a more in-depth analysis of the issue.

¹ See Appendix A, "Nature, Extent, and Impact of Residential Parking Structure Deterioration".

At least two further reports were prepared on behalf of CMHC in the early to mid-1980s:

- “Parking Structure Deterioration: A Survey and Analysis of its Extent and Influencing Factors”, by Trow Ltd., December 31, 1984²
- “Deterioration of Parking Structures: Extent, Causes and Repair Considerations”, by Suter Keller Inc., March 31, 1986³

The 1986 report includes as Appendix A an extensive list of other studies, reports and conferences from 1977 to 1986 that identified problems with parking structures and potential options for inspection and ongoing maintenance and repair.⁴ These reports demonstrate that at the time the MOH Advisory Committee was formed, a number of other agencies, industry and the engineering community were also paying a high level of attention to concerns regarding the maintenance and durability of parking structures.

Summary of Advisory Committee’s Report and Recommendations

The former MOH established the Advisory Committee in November 1986. The Advisory Committee’s July 1988 Report made recommendations with respect to both new and existing parking structures.

The Report notes that the Advisory Committee “reviewed and recommended the inclusion of CSA Standard S413-87 (Durable Parking Structures) in the Ontario Building Code”⁵ and also included conclusions regarding the development of a provincial work plan for a comprehensive repair and restoration program.⁶ The Report recommended that consideration be given to technical research being conducted at the time on behalf of the Canadian Institute of Public Real Estate Companies and that building owners fully assess the economic impact of the problem.

The Report included maintenance and monitoring procedures (Chapter 3) as well as information about repair methods for building owners, including contact information for building owners about consulting engineering services, repair contractors and education about this issue (Chapter 2).

B. Steps Taken Upon Receipt of the Report

A number of steps were taken by Ontario in response to the Report. These activities are described in greater detail below and include,

² See Appendix B, “Parking Structure Deterioration: A Survey and Analysis of its Extent and Influencing Factors”.

³ See Appendix C, “Deterioration of Parking Structures: Extent, Causes and Repair Considerations”.

⁴ See pages 57-60 of Appendix C.

⁵ See page i of Appendix B to Procedural Order No. 9.

⁶ See page ii of Appendix B to Procedural Order No. 9.

- making amendments to the Ontario Building Code to specifically provide requirements for the design and construction of new parking structures,
- distributing and publicizing the Advisory Committee’s Report to building owners, engineers, municipalities and the public,
- continuing to participate in and support studies and research projects related to deterioration of parking structures, and
- considering whether to establish requirements for the inspection and maintenance of existing structures.

Amendments to the Ontario Building Code

At the time the Report was submitted, the 1986 Building Code (O. Reg. 419/86) was in force. The 1986 Building Code did not contain specific design requirements for parking structures.

The Report notes that the Building Code was amended in 1988 to reflect the development of the Canadian Standards Association (“CSA”) S413 standard which had been published in November 1987. Although the amendment was made prior to the release of the final Report, the incorporation of the new CSA S413 standard into the Building Code was one of the Advisory Committee’s recommendations.

Effective May 20, 1988, the Ontario Building Code regulation was amended (through O. Reg. 183/88) to add new Sentence 4.3.3.1.(2) that established a specific design requirement for parking structures:

4.3.3.1.(1) Buildings and their structural members made of plain, reinforced or prestressed concrete shall conform to CAN3-A23.3, “Design of Concrete Structures for Buildings”.

(2) In addition to Sentence (1), storage garages shall conform to CAN/CSA-S413 “Parking Structures”.⁷

In addition, Table 2.6.3.A. of the 1986 Building Code was amended to specify that Sentence 4.3.3.1.(2) referred to the 1987 edition of the standard.

MAH does not appear to have records relating to the amendments contained in O. Reg. 183/88, which incorporated by reference the new CSA standard for parking structures. Records related to these amendments appear to have been destroyed in accordance with record retention schedules⁸ at the time of their destruction.

⁷ See Appendix D, excerpt of O. Reg. 183/88.

⁸ See *Archives and Recordkeeping Act, 2006*, S.O. 2006, c. 34, Sched A, s. 11-14.

CSA is an internationally-accredited standards development organization. CAN/CSA-S413 that was first developed in 1987 specifies design and construction standards for the structural durability of new parking structures, storage garages, and parts of buildings subject to vehicular traffic or used for parking. As compared to subsequent updates to the standard described below, ministry staff were not represented on the CAN/CSA-S413 Technical Committee that developed the standard in 1987.

CAN/CSA-S413 has been amended over time. A second edition of the standard was published by CSA in 1994, and was incorporated by reference in the 1997 Building Code (O. Reg. 403/97). A third edition of the standard was published by CSA in 2007, and was incorporated by reference in the 2006 Building Code through Minister's Ruling MR-09-S-06⁹ on June 2, 2009. As described in greater detail below, ministry staff have been represented on the CAN/CSA-S413 Technical Committee during the evolution of the standard.

The first edition of CAN/CSA-S413 developed in 1987 included guidelines for maintenance of parking structures that were designed and constructed under the standard.¹⁰ As one of the purposes of the *Building Code* is to establish standards for the design and construction of new buildings and significant renovations, it does not include standards for the maintenance of existing buildings. Rather, standards for the maintenance and occupancy of existing buildings may be regulated by municipal property standards by-laws. While these by-laws are authorized by the *Building Code Act*, they are distinct from the *Building Code*.¹¹ Accordingly, only the design and construction standards of CAN/CSA-S413 are incorporated by reference into the *Building Code*.

The 2007 edition of the standard is the current version and continues to be referenced in the Building Code. The CSA is in the process of updating the standard to reflect current knowledge and experience. Ontario's requirements for parking structures are the same as those in the model National Building Code of Canada.

Report Made Publicly Available

Following receipt of the Report, files of the former MOH indicate a number of steps were taken to ensure the Report was widely available to stakeholders and the public.

Progress reports on the status of the Advisory Committee's review and the receipt of the Report were sent by the former MOH to industry, municipalities, designers, building owners and other purchasers of MOH's Building Code publication through MOH's Building Action Newsletters.¹²

⁹ See page 5 of Appendix E.

¹⁰ See Appendix F - Excerpt of CAN/CSA-S413-87 "Parking Structures", CSA, November 1987.

¹¹ See pages 47-53 of the Province of Ontario's written submissions for Phase 1 of the Inquiry: http://www.elliottlakeinquiry.ca/submissions_I/Province_of_Ontario/Submissions_of_the_Province_of_Ontario.pdf.

¹² See pages 11, 19, 25, 29, 34, 35, 43 and 49 of Appendix G, Building Action Newsletters.

The Report was published by the former MOH in both English and French. A large number of copies were printed and distributed to individual Building Code users as well as university and public libraries.¹³

In addition, the Advisory Committee findings were publicized through workshops with building owners and others. A draft of the Advisory Committee's findings were presented at technical seminars conducted by the Nova Scotia Institute of Technology in 1987¹⁴ and workshops on the maintenance of parking structures conducted by the Canadian Institute of Public Real Estate Companies ("CIPREC") for its members in Toronto and Montreal in March, 1989.¹⁵ Portions of the Advisory Committee's Report were presented as "guideline procedures for maintenance and monitoring of parking garages".¹⁶

Participation in Additional Studies

After the Report was made public, the former MOH continued to participate in a number of studies, research projects and standards development activities relating to parking structures and their repair. These activities are described under "C. Additional Studies".

Consideration of Potential Maintenance Requirements

MAH records indicate that the Province considered establishing standards for the maintenance and repair of parking structures. MOH's Building Action Newsletter #7 from July 1988 notes:

Now that the work of the Advisory Committee on Parking Garage Deterioration is complete, the Buildings Branch has begun the second phase of the project. This is an impact study of the possible methods of enforcement of the requirements for repair and maintenance [of] existing parking structures.

The study, which will be conducted over the next three months, will seek opinions from building owners, managers, parking tenants, professional associations, condominium owners, municipalities, non-profit housing agencies, legal firms, and other concerned parties...¹⁷

The former MOH's Building Action Newsletter #8 from February 1989 notes:

A policy paper on what should be done to counteract the deterioration of concrete and steel in parking garages throughout the province is in draft stage...

¹³ See Appendix H, Libraries where the Report is Available.

¹⁴ See page 25 of Appendix G, Building Action Newsletter (Number 6, March 1988).

¹⁵ See pages 2 and 16 of Appendix I, "Deterioration of Parking Structures Research Project, Progress Report for the Period 1988/09/01 – 1989/06/30".

¹⁶ See page 17 of Appendix I.

¹⁷ See page 35 of Appendix G, Building Action Newsletter (Number 7, July 1988).

The committee's work was followed by an impact study in which building owners, managers, tenants, and municipalities were surveyed to elicit opinions on possible solutions and any problems associated with them.

The policy paper focuses on three scenarios – the status quo, a requirement for periodic inspection, and a requirement for regular certification...¹⁸

Copies of the impact study and policy paper, and documents related to them, have not been located. Given the length of time that has elapsed from the receipt of the Report, it has been challenging to find records about any additional steps that were considered or taken. Records relating to the Report and steps taken by the Province in response to the Report, other than those included with these submissions, appear to have been destroyed in accordance with ministry record retention schedules at the time.

C. Additional Studies

As described above, records indicate that the former MOH conducted an impact study following receipt of the Advisory Committee's Report.

In addition, MOH actively participated in studies and research projects related to deterioration of parking structures concurrent to the Advisory Committee's work as well as subsequent to receipt of its Report. These studies and research projects were primarily conducted by CMHC and the Institute for Research in Construction of the National Research Council ("NRC"). In most aspects of Building Code development, Ontario, like other provinces, relies on research conducted by, and requirements and standards developed by, the federal government and federal bodies.

NRC – Deterioration of Parking Structures Research Project

The most significant of the NRC research projects was the "Deterioration of Parking Structures Research Project" conducted between 1987 and 1992. The research project was a long-term study initiated by CIPREC that included CMHC, NRC, the former MOH and Public Works Canada.

As described in the CMHC document "Three Decades of Innovation in Housing Technology, 1966 – 1996", the "performance of 62 parking garages was monitored over a four-year period and extensive supporting research was undertaken. Non-destructive testing methods were explored. The NRC evaluated sealers and elastomeric waterproofing membranesThe results of these research efforts were compiled into a comprehensive manual on cost-effective concrete repair and led to a cross-Canada seminar series in 1994, sponsored by CMHC, the NRC and the Canadian Portland Cement Association".¹⁹

¹⁸ See page 43 of Appendix G, Building Action Newsletter (Number 8, February 1989).

¹⁹ See Appendix J, excerpt of "Three Decades of Innovation in Housing Technology, 1966 – 1996".

The former MOH participated throughout the NRC research project. The former Manager (and later Director) of the Ontario Buildings Branch, A.G. Arlani, was a member of the Steering Committee for the project. Other former MOH staff contributed to the project, including G. Feher of the Ontario Buildings Branch and E.M. Sanderson of the Technical Support Services Branch.

The Final Report of the Deterioration of Parking Structures Research Project²⁰ provided “information aiming to assist engineers and owners to formulate the repair strategy and maintenance practices of existing garages built without adequate corrosion protection”.²¹ The report noted that the data and conclusions of the research project “were to be made available to the engineering community, the industry and the owners enabling them to select a course of maintenance and repair most appropriate for a particular facility, as no single approach was expected to be suitable for all deteriorated structures. An important objective was to achieve wide and rapid transfer of the obtained results through publication in the open literature, presentations and conferences and, by participating in the work of standards writing committees.”²² Details about these activities are set out in Appendices F-H of the report.²³

The NRC report described the problem of deterioration of parking garages and the studies and reviews undertaken. It also made a number of recommendations to buildings owners, including that owners should develop a policy of continuous maintenance; that owners should keep log books containing records of recommended and performed maintenance actions, test reports, descriptions of repairs, and recommendations of suppliers and design engineers; and that owners should retain on a long-term basis the services of a consulting engineer who could become familiar with the structure and recommend action.²⁴ It also recommended further interdisciplinary research aimed at identifying solutions to problems.

The findings of the NRC research project were communicated to buildings owners, property managers and others, including through documents such as the March 1994 “Durability Guidelines for the Design, Construction, Repair and Maintenance of Parking Structures” from Public Works and Government Services Canada (“PWGSC”).²⁵ The Guidelines note that “much of the knowledge gained from [the NRC] multi-year research study was used in the development of these guidelines”.²⁶ The Guidelines include a “Manual for the Operation and Maintenance of Parking Garages” (in Chapter 5) and “Technical, Practical and Economic Considerations for the

²⁰ See Appendix K, “Deterioration of Parking Structures Research Project”.

²¹ See page 4 of Appendix K.

²² See page 22 of Appendix K.

²³ See page 45 of Appendix K, and Appendices G-I beginning on page 309 of Appendix K.

²⁴ See pages 9-10 of Appendix K.

²⁵ See Appendix L, “Durability Guidelines for the Design, Construction, Repair and Maintenance of Parking Structures”. Available from the PWGSC website at: <ftp://ftp.tech-env.com/pub/Durabil/parkingstruct.pdf>.

²⁶ See page 3 of Appendix L.

Development of Strategies for the Repair of Deteriorated Garages” (in Chapter 8).²⁷ The former MOH Advisory Committee Report is also noted as a reference document in the Guidelines.²⁸

The NRC research project included the preparation of a number of studies, including:

- Interim Report on the Condition Survey of the Parking Garage at 380 Murray Street, Ottawa, Ontario (Suter Keller Inc. for CMHC – September 1988)²⁹
- Deterioration of Parking Structures Research Project – Progress Report for period 1988/09/01 – 1989/06/30 (NRC – June 1989)³⁰
- Evaluation of Elastomeric Membrane Systems Used in Parking Garage Protection (NRC – 1989)³¹
- Investigation of the Performance of Parking Garage Decks Constructed with Epoxy Coated Reinforcing Steel (NRC – June 1989)³²
- Cathodic Protection for the Rehabilitation of Concrete Parking Structures (CMHC – March 1990)³³
- User’s Guide to Cathodic Protection of Reinforced Concrete Parking Structures (CMHC – March 1990)³⁴

CSA Standards Development

Staff of the former MOH were involved in the development of the 2nd and 3rd editions of the CAN/CSA-S413 “Parking Structures” standard. George Feher, at the time an employee of MOH’s Ontario Buildings Branch, participated on the Technical Committee for the 2nd edition of the standard, which was published in 1994.³⁵ Andrew Steen, an employee of MAH’s Building and Development Branch, participated on the Technical Committee for the 3rd edition of the standard, which was published in 2007,³⁶ and the pending 4th edition of the standard.

These ministry staff provided technical advice to the Committee, and provided context with regard to the standard and its references in both the model National Building Code and Ontario’s Building Code.

²⁷ See Chapter 5 beginning at page 126 of Appendix L, and Chapter 8 beginning at page 191.

²⁸ See page 30 of Appendix L.

²⁹ See Appendix M, “Interim Report on the Condition Survey of the Parking Garage at 380 Murray Street, Ottawa, Ontario”.

³⁰ See Appendix I, “Deterioration of Parking Structures Research Project, Progress Report for the Period 1988/09/01 – 1989/06/30”.

³¹ See Appendix N, “Evaluation of Elastomeric Membrane Systems Used in Parking Garage Protection”.

³² See Appendix O, “Investigation of the Performance of Parking Garage Decks Constructed with Epoxy Coated Reinforcing Steel”.

³³ See Appendix O, “Cathodic Protection for the Rehabilitation of Concrete Parking Structures”.

³⁴ See Appendix Q, “User’s Guide to Cathodic Protection of Reinforced Concrete Parking Structures”.

³⁵ See Appendix R, excerpt of Canadian Standards Association CAN/CSA-S413-94, “Parking Structures”.

³⁶ See Appendix S, excerpt of Canadian Standards Association CAN/CSA-S413-07, “Parking Structures”.

Former ministry staff were also involved in the development of the CSA S448.1 “Repair of Reinforced Concrete in Buildings” standard. George Feher participated on the Technical Committee for the 1st edition of this standard, which was published in 1993. The standard provides recommended maintenance procedures for concrete structures.³⁷

D. Adoption of Recommendations

Standards for New Construction

As described above, Ontario adopted the Advisory Committee’s recommendation to amend the Building Code to reference the new CAN/CSA-S413 standard for parking garages.

Standards for Existing Buildings

Ontario did not adopt a legislative comprehensive repair and rehabilitation program for existing parking structures. It appears that Ontario did consider such requirements through an impact study and development of a policy paper, however, as noted above, no documents relating to the impact study or the policy paper can now be located.³⁸

The *Building Code Act* and Building Code at the time the Report was received did not establish requirements for the maintenance or operation of existing buildings. In 1992, the *Building Code Act* was repealed and replaced. New subsection 34(2) of the *Building Code Act, 1992* provided that the Lieutenant Governor in Council “may make regulation to establish standards that existing buildings must meet even though no construction is proposed, including regulations ... (b) establishing standards for maintenance, occupancy and repair...”.³⁹

With the sole exception of maintenance inspections for small on-site sewage systems,⁴⁰ no regulation has been made to date under this subsection to address inspection and maintenance of any other aspects of existing buildings, including parking structures. No documentation is available through the searches conducted by MAH to provide any background to the policy decision made at the time not to establish standards for existing parking structures.

Whether or not to exercise a regulation-making power or extend the scope of a regulation is a policy decision of the Lieutenant Governor in Council. Generally, there are a number of policy factors that are considered in deciding whether to make a regulation, including for example, difficulty in establishing standards capable of being enforced through regulation, or challenges with effective and efficient enforcement. For example, even during the Commission’s Policy Roundtables in November 2013, a wide range of opportunities and challenges affecting the

³⁷ See Appendix T, excerpt of Canadian Standards Association CSA S448.1-93, “Repair of Reinforced Concrete in Buildings”.

³⁸ See footnotes 17 and 18.

³⁹ *Building Code Act, 1992*, S.O. 1992, c. 23, s. 34(2).

⁴⁰ O. Reg. 332/12 (Building Code), Section 8.9. of Division B.

potential for establishing standards for inspection and maintenance of existing buildings were identified by a number of participants.

While no provincial standards have been established to address the inspection and maintenance of existing buildings (with the exception of on-site sewage systems), there were and are legislative powers related to the safety of existing buildings.

Since 1972, municipalities have had the discretionary authority to establish standards for the maintenance and occupancy of existing buildings through municipal property standards by-laws.⁴¹ To enforce property standards by-laws, municipalities may carry out inspections (including requiring the preparation of reports), issue orders for repairs to be carried out, and effect repairs if orders are not complied with.

In addition, the *Building Code Act* has, since 1975, provided broad authority for chief building officials and building inspectors related to unsafe existing buildings to protect health and safety. Powers include the ability to inspect buildings to determine if they are unsafe (including requiring the preparation of expert reports), to issue orders for repairs to be carried out, to issue orders prohibiting occupancy, and to effect repairs if orders are not complied with.⁴²

Sector and Public Education

As described in more detail above, although standards for existing parking structures were not made, Ontario took a number of steps to disseminate the information and maintenance best practices contained in the Advisory Committee's report to industry, building owners (who are in the best position to maintain their buildings), municipalities (who have certain powers with respect to existing buildings), designers and the public, and to further the technical understanding of the problem and potential solutions through participation in research studies.

E. List of Documents

Appendix A – “Nature, Extent, and Impact of Residential Parking Structure Deterioration”, Trow Ltd. for CMHC, November 1981

Appendix B – “Parking Structure Deterioration: A Survey and Analysis of its Extent and Influencing Factors”, Trow Ltd. for CMHC, December 31, 1984

Appendix C – “Deterioration of Parking Structures: Extent, Causes and Repair Considerations”, Suter Kelley Inc., March 31, 1986

Appendix D – Excerpt of O. Reg. 183/88

Appendix E – Minister's Ruling MR-09-S-06

⁴¹ *Building Code Act, 1992*, s. 15.1. Prior to 1997, property standards by-laws were addressed in the *Planning Act*.

⁴² A more extensive description of property standards by-laws and unsafe building powers is set out on pages 51-53 of the Province of Ontario's written submissions for Phase 1 of the Inquiry:
http://www.elliottlakeinquiry.ca/submissions_I/Province_of_Ontario/Submissions_of_the_Province_of_Ontario.pdf.

Appendix F – Excerpt of CAN/CSA-S413-87 “Parking Structures”, CSA, November 1987

Appendix G – Former Ministry of Housing “Building Action Newsletters”

Appendix H – Libraries at which the Report is Available

Appendix I – “Deterioration of Parking Structures Research Project, Progress Report for the Period 1988/09/01 – 1989/06/30”, NRC, June 30, 1989

Appendix J – Excerpt of “Three Decades of Innovation in Housing Technology, 1966 – 1996”, CMHC, 2000

Appendix K – “Deterioration of Parking Structures Research Project”, NRC, August 21, 1992

Appendix L – “Durability Guidelines for the Design, Construction, Repair and Maintenance of Parking Structures”, PWGSC, March 1994

Appendix M – “Interim Report on the Condition Survey of the Parking Garage at 380 Murray Street, Ottawa, Ontario”, Suter Keller Inc. for CMHC, September 1988

Appendix N – “Evaluation of Elastomeric Membrane Systems Used in Parking Garage Protection”, NRC, 1989

Appendix O – “Investigation of the Performance of Parking Garage Decks Constructed with Epoxy Coated Reinforcing Steel”, NRC, June 1989

Appendix P – “Cathodic Protection for the Rehabilitation of Concrete Parking Structures”, CMHC, March 1990

Appendix Q – “User’s Guide to Cathodic Protection Systems for the Rehabilitation of Concrete Parking Structures”, CMHC, March 1990

Appendix R – Excerpt of CAN/CSA-S413-94 “Parking Structures”, CSA, December 1994

Appendix S – Excerpt of CAN/CSA-S413-07 “Parking Structures”, CSA, June 2007

Appendix T – Excerpt of CSA S448.1-93 “Repair of Reinforced Concrete in Buildings”, CSA, November 1993