History of the Development of the *Canadian Foundation Engineering Manual/ Manuel Canadien d'Ingénierie des Fondations*

(updated September 2018)

By Doug VanDine

Background

The British North America Act, which was passed by the British Parliament on July 1, 1867, not only created the country Canada, it also established the distribution of responsibilities and powers for each level of government in Canada. The responsibility for building regulations was given to the provinces and territories, and this responsibility was typically delegated to municipalities. Because each municipality tried to deal with its own needs and issues, these regulations often varied from one municipality to the next. This situation frequently made it very difficult for architects, designers, engineers, product manufacturers and contractors, as well as for national programs that supported construction.

In 1916, the National Research Council of Canada (NRC) was established as part of the war effort to advise the Canadian government on matters of science and industrial research.

In 1937, to help alleviate the difficulties associated with the multitude of municipal building regulations across the country, the federal Department of Finance asked the NRC to develop a building code that could be adopted by all municipalities in Canada. The result was the publication of the first edition of the *National Building Code of Canada* (*NBCC*) in 1941 (*NBCC*, 1941).

The post-World War II construction boom required a revised *NBCC* and, in particular, one that did not require houses and small buildings to be designed by architects or engineers. In response, in 1947, the NRC established the Division of Building Research (DBR) and Robert Legget was appointed the first director[1].

One of DBR's original mandates was to provide research support for the *NBCC*. In 1948, the DBR established the Associate Committee on the National Building Code (ACNBC), and within that associate committee a Standing Committee on Structural Design was established. Under the leadership of the ACNBC, the *NBCC* was updated and revised in 1953, 1960, 1965 and 1970[2].

1975 Draft Edition of the *Canadian Manual on Foundation Engineering*

In planning for the 1975 revision of the *NBCC*, the Standing Committee on Structural Design, established a Subcommittee on Foundations[3] that consisted of the following geotechnical engineers with their identified associations as of 1978:

[1] The DBR has been renamed several times, but since 2012 it has been known as 'NRC Construction'.
[2] Subsequent to 1970, and continuing to the present, the *NBCC* has been updated and revised approximately every 5 years.
[3] It is unknown whether such a subcommittee existed before the early 1970s.

A.G. (Tony) Stermac (Chair), Ontario Ministry of Transportation and Communications
D.J. (Don) Bazett, CBA Engineering
K.N. (Ken) Burn, NRC DBR
J.W. (John) Gadsby, Thurber Consultants
V. (Victor) Milligan, Golder Associates
L. (Laval) Samson, Terratech
F. (François) Tavenas, Université Laval, and
W.A. (Bill) Trow, Trow Group.

The Standing Committee on Structural Design asked the Subcommittee on Foundations to write the first draft of the *Canadian Manual on Foundation Engineering*. It was published as a 318-page document in 1975 as a "draft for public comment" by the NRC Associate Committee on the National Building Code (NRC, 1975, Figure 1).


CANADIAN MANUAL ON
FOUNDATION ENGINEERING

Figure 1: Cover of the *1975 Draft Edition*

The preface of the *1975 Draft Edition* included the following paragraphs:

> "It provides a "state of the art" report on foundation engineering containing recommended procedures for the design, installation and construction of foundations. It is intended to assist the enforcing official and the designer in satisfying the intent of Section 4.2 (Foundations) of the *National Building Code of Canada* 1975 [*NBCC*, 1975]. …
>
> Although the Manual was originally intended as a supplementary document …, no decision has yet been made on its final format and source of publication. The Associate Committee [of the National Building Code] has, therefore, agreed to release this material in its preliminary form in advance of this decision to obtain wide public review."

The draft consisted of 8 chapters.

Chapter 1 provided an introduction, and noted that the draft did not present the subject matter in "strict specification form" as used in the *NBCC* because of the difference between "in-place geological materials and conditions compared with that of manufactured or preselected materials brought to the construction site…". The introduction went on to say that, largely because of the variety of materials and conditions, "foundation engineering" is less precise than structural design and "remains, to an important extent, an art based upon experience and judgement".

Chapter 1 also included a note on the limitations of use of the manual, and the need for experience and judgement:

> "The methods presented … are applicable to most design problems. It should be understood, however, that strict use of these methods will not always yield the best technical or most economical solutions. Moreover, the design of unusual structures or the occurrence of unusual subsurface conditions may require the use of novel design approaches or methods of analysis beyond the scope of this Manual.
>
> …in the engineering application of the methods shown, neither this Manual nor the textbooks and papers to which it refers should be considered a substitute for the experience and judgement of a person familiar with the complexities of foundation practice."

Chapters 2 and 3 included definitions, symbols and units of terms, and classification systems for soil and rock, respectively.

Chapter 4 summarized subsurface investigations and laboratory testing of soils, rock and groundwater, and included a synopsis of, and an appendix on, "Problem Soils, Rocks and Conditions".

Chapters 5, 6 and 7 covered the topics of excavation and retaining structures, shallow foundations and deep foundations, respectively: basic and alternative design methods; the "limits of validity" of each; references; and comments on specific construction problems.

Chapter 8 presented a number of commentaries on specific topics: the standard penetration test; relative density of cohesionless soils; foundations on swelling and shrinking clays; frost action; pile driving formulas; earthquake-resistant design; and the pressuremeter test.

This document, although published in draft, was quickly embraced by the geotechnical community in Canada and elsewhere. Comparisons were made to US "NAVFAC" (Naval Facility Engineering Command) *DM [Design Manual] 7 Soil Mechanics, Foundations and Earth Structures* (NAVFAC, 1971).

The *1975 Draft Edition* sold for $3.00 (approximately $15.00 in 2017 dollars). It is not known how many copies were printed. A French version of this document was not translated or published.

Because the *1975 Draft Edition asked* for "public comment", many Canadian geotechnical engineers provided written comments to the Associate Committee on the National Building Code.

Hugh Golder provided his comments in the form of a, self-described "subjective", 5-page detailed book review in the *Canadian Geotechnical Journal* (Golder, 1976). Golder, in his inimitable style, had insightful philosophical comments on the purpose, the title of the document and the order and arrangement of the chapters, and offered his suggestions on all these general topics. He then reviewed each chapter and offered suggestions where appropriate. After providing some relatively harsh comments on some aspects of the document, and some accolades on others, Golder concluded with "By and large, the Manual is good. It displays painstaking and conscientious work by experienced engineers". He indicated that his review was intended to "arouse interest in the draft of the Manual" to encourage geotechnical

engineers to read it. “The greater the number of experienced engineers who send in their comments to the editors, the better the final volume will be. It could be very good indeed!”

1978 First Edition* of the *Canadian Foundation Engineering Manual (CFEM)

In 1976, the Canadian Geotechnical Society (then only in its fourth year as a society) assumed responsibility for the manual. The Society formed a “Foundations Committee” for this purpose that consisted of the following geotechnical engineers, with their identified associations as of 1978:

W.A. (Bill) Trow (Chair), Trow Group (and also the only member of the early 1970s NRC Subcommittee on Foundations)
W. (Bill) Birmingham, Birmingham Construction
J. Burgess, Morrison Hershfield Burgess Huggins
J.D. (Don) Scott (Editor) RM Hardy & Associates
K. (Ken) Shelby, Ontario Ministry of Transportation and Communications
D.H. (Don) Shields, RM Hardy & Associates (and CGS President 1977-1978), and
N.E. (Nyal) Wilson, McMaster University.

Between 1976 and 1978, the CGS Foundations Committee revised, updated and reorganized the *1975 Draft Edition* and took “into account the constructive criticism and suggestions that were made of the NRC draft”. The result was the CGS Foundations Committee’s *Canadian Foundation Engineering Manual (CFEM)*, published in 1978 (CGS, 1978, Figure 2). Note the slight change in the title from the *1975 Draft Edition,* the *Canadian Manual on Foundation Engineering.*

In its work, the CGS Foundations Committee was assisted by Arthur Heidebrecht, from McMaster University, who contributed significantly to the topic of earthquake resistant design.

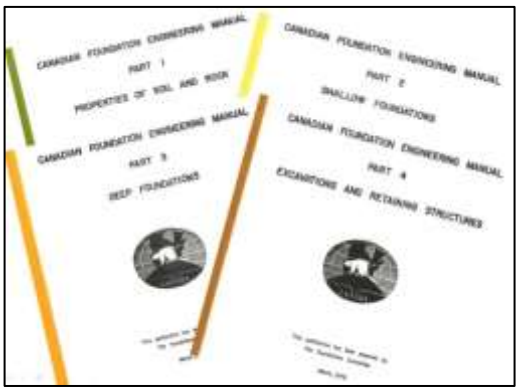

Figure 2: Covers of the stand-alone parts of the *1978 Frist Edition*

The *1978 First Edition* was produced as four stand-alone parts (booklets). The complete manual accompanied by a binder could be purchased, or any of the four booklets could be purchased separately. The document was sold through the, then, CGS office in Montreal, QC.

The four parts consisted of:

Part 1: Properties of Soil and Rock (77 pages)
Introduction; Definitions, Symbols and Units; Identification and Classification of Soil and Rock; Subsurface Investigations; Unusual Site Conditions; Earthquake Resistant Design
Part 2: Shallow Foundations (99 pages)
Introduction; Bearing Pressure on Rock; Bearing Pressure on Soil; Stress Distribution; Settlement; Design Procedure; Swelling and Shrinking Clay; Frost Action
Part 3: Deep Foundations (108 pages)
Introduction; Geotechnical Design; Structural Design and Installation; Load Tests; Inspection; Pile Driving Formulas; Piles Subjected to Horizontal Loads; Vibro Processes, and
Part 4: Excavations and Retaining Structures (68 pages)
Introduction; Theoretical Pressures on Retaining Structures; Excavation Support; Control of Groundwater; Foundation Walls and Retaining Walls.

Among the many differences between the *1975 Draft Edition* and the *1978 First Edition*, the section on “Earthquake Resistant Design” was upgraded from a relatively short “commentary” to a 14-page chapter.

In addition to the statements on limitations and use of experience and judgement, similar to those in the *1975 Draft Edition*, the *1978 First Edition* added:

> “While every reasonable effort has been made to insure the validity and accuracy of the information contained in this Manual, the Canadian Geotechnical Society and its members disclaim any legal responsibility for such validity or accuracy; persons using this Manual do so at their own risk.”

The *1978 First Edition* also stated, “It is the intention of the Society to update the manual from time to time as the need arises”.

A French version of this document was not published. It is not known how many copies of this edition were printed, or the price.

1985 Second Edition* of the *CFEM

In the early 1980s, under CGS Presidents John Adams (1981-1982) and Tony Stermac (1983-1984), the Society presented a series of seminars across Canada on the *CFEM* and its use. Both in the *1978 First Edition* and during the seminars, comments on and suggestions for revisions and additions to the *1978 First Edition* were solicited. True to the Society’s stated intention, in 1983, the CGS requested its Foundations Committee (by then called the Technical Committee on Foundations) to review the comments and suggestions and prepare a revised manual.

This task was carried out under the leadership of the following geotechnical engineers (their organizations at that time were not identified, but have been added):

G.G. (Geoffrey) Meyerhof (Editor), Technical University of Nova Scotia (now a part of Dalhousie University)
B.H. (Bengt) Fellenius (co-Editor), University of Ottawa and Chair of the CGS Technical Committee on Foundations
F. (François) Tavenas, Université Laval and CGS Vice President Technical (and a member of the early 1970s NRC Subcommittee on Foundations), and
M. (Michael) Bozozuk, NRC DBR and CGS Vice-President Administrative and Chair of the CGS Committee on Publications.

David Devenny was CGS President (1985-1986) when the *1985 Second Edition* (CGS, 1985, Figure 3) was published.

Figure 3: Cover of the *1985 Second Edition*

As stated in the preface of the *1985 Second Edition*:

> "The Manual is truly produced by the membership of the Canadian Geotechnical Society. The number of individuals who have contributed to the Manual – first, the preparation of the 1975 draft, then, the 1978 first edition, and, now, the 1985 second edition – is very large. Through the years, there have been about 30 members of the Foundations Committee. In addition, about 100 individual members of the Society have submitted serious comments and suggestions, which have been considered in the revision work. It is impossible to give just credit to all these individuals. The Manual is a manifest of the dedication of the membership at large and owes its existence to the membership."

The *1985 Second Edition*, similar to the *1975 Draft Edition*, was again a single bound volume. The 456-page document was printed and distributed for the first time with the assistance of BiTech Publishers Ltd. of Vancouver, BC. (Coincidently, John Gadsby, co-owner of BiTech Publishers, was a member of the early-1970s NRC Subcommittee on Foundations that wrote the *1975 Draft Edition*.)

Although a single bound volume, the *1985 Second Edition* was still organized in the same 4 parts as the *1978 First Edition.* The name of Part 1 was changed from "Soil and Rock Properties" to "Fundamentals" to better reflect its content.

There were many changes and additions from the content of *1978 First Edition* to the *1985 Second Edition*. Among them, geotextiles were first referenced; the section on earthquake-resistant design was further enlarged; limit states design was introduced, and the references

were compiled at the end of the document. In addition, the Imperial units that were used in the *1978 First Edition* were converted to metric units.

The *1985 Second Edition* was the first edition to be typed using a word processor, as opposed to the typewriter-typed previous editions. Bengt Fellenius recalls that not only was he co-Editor of this edition, but he personally typed the entire manuscript, and the numerous revisions, on his "trusty" Apple computer using WordStar. He then sent the final WordStar file to BiTech who transferred it to MSWord for printing.

With regard to "limit states design", as stated in Chapter 1 "Introduction":

> "The introduction of limit states design is intended to make the design of foundations consistent with the design of superstructures, as regulated in the National Building Code of Canada and related Canadian Standards Association (CSA) standards."

The *1985 Second Edition* followed Europe's and Ontario's (first) ultimate limit state and serviceability limit state (ULS-SLS) Bridge Code, in that it applied the partial factor of safety method.

The wording in the preface to the *1985 Second Edition* was also changed to:

> "The Manual contains:
>
> 1. Acceptable design guidelines for the solution of routine foundation engineering problem, as based on sound engineering practice.
> 2. An outline of the limitations of certain methods of analysis.
> 3. Information on properties of soil and rock, including certain conditions encountered in Canada.
> 4. Comments on construction problems, where these govern the design or the quality of the foundation.
>
> The material in the Manual is presented as a series of suggested rather than mandatory procedures."

The above content description has remained essentially unchanged up to the current *2006 Fourth Editio*n.

A second printing of the *1985 Second Edition* was carried out in 1987. This second printing corrected a few minor errors in the previous printing and added two new sections: "Section 4.9 Background Information for Site Investigation" and a "Subject Index" at the end of the document. The CGS Engineering Geology Division was recognized as contributing the new Section 4.9.

Approximately 1,800 copies of the *1985 Second Edition* were printed and they sold for $65, for CGS members, $90 for non-members and $50 for students.

1989 French Edition* of the *CFEM (MCIF)

In the late 1980s, Robert Chapuis (École Polytechnique), assisted primarily by Pierre Morin (Memorial University of Newfoundland), translated the *1985 Second Edition*, and in so doing corrected a number of errors they found in the English version – errors mainly associated with unit conversions from Imperial to metric.

The resulting 378-page French version, known as the *Manuel Canadien d'Ingénierie des Fondations* (MCIF), was published by the CGS (in French, La Société canadienne de geotechnique, or SCG) in 1989 and distributed by BiTech Publishers (SCG, 1989, Figure 4). Although based on the *1985 Second Edition of the CFEM*, the *MCIF* was not identified as either the first or second edition.

Figure 4: Cover of the *1989 French Edition*

Translated from the preface of the *1989 French Edition*:

> "The contribution [to Canadian geotechnique] of Francophone members, very active in the profession and within the [Canadian Geotechnical] Society, has necessitated the translation of this Manual, which is essential to learning the important principles and geotechnical methods at the university level".

It is not known how many copies of the *1989 French Edition* were printed, but likely less than 1,000. They sold for $132 for CGS members, $147 for non-members and $84 for students.

Late 1980s

By the late-1980s, the *CFEM* and the *MCIF* were gaining acceptance and copies were being sold quite widely across Canada and internationally. Besides geotechnical engineering consultants, the manual was being adopted by many Canadian universities as a text book for geotechnical engineering courses. The revenue generated from the sales of the *CFEM* and the *MCIF* was starting to make a positive effect on the revenue of the Society and, at least partially because of this revenue, the Society was able to maintain its relatively low membership fees.

As an aside, when the author taught at the Institute of Engineering in Kathmandu, Nepal, in 1993-1994, the *1985 Second Edition of the CFEM* was being used there as a textbook. The document was an unauthorized Asian reproduction of the *1985 Second Edition*, printed on light-weight paper, and sold at a fraction of the Canadian price. Others have reported a widespread use of various editions of the Manual in countries such as Hong Kong and Australia.

1992 Third Edition* of the *CFEM

The preface of the *1992 Third Edition* (CGS, 1992, Figure 5) identified the main contributors of that edition as follows (their organizations at that time were not identified, but have been added).

Z. (Dan) Eisenstein (Editor), University of Alberta
P.C. (Peter) Lighthall (co-Editor), Klohn Crippen, and CGS VP Technical
R.J. (Richard) Bathurst, Royal Military College
J.R. (John) Busbridge, Golder Associates
B.H. (Bengt) Fellenius, University of Ottawa
D.G. (Del) Fredlund, University of Saskatchewan
D.W. (Don) Hayley, EBA Consultants
E.C. (Ed) McRoberts, Hardy BBT
R.L. (Robert) Martin, Hardy BBT
I.D. (Ian) Moore, Queen's University
K.R. (Ken) Peaker, Shaheen and Peaker (formerly of the Trow Group)
G.P. (Gerry) Raymond, Queen's University
R.K. (Kerry) Rowe, University of Western Ontario
V.A. (Victor) Sowa, Klohn Crippen, and
F. (François) Tavenas, Université Laval and CGS President (1991-1992) (and a member of the early 1970s NRC Subcommittee on Foundations).

Figure 5: Cover of the *1992 Third Edition*

Bengt Fellenius was the only member directly associated with the *1985 Second Edition,* however, he admits he had little to do with the *1992 Third Edition.* For some reason, Alex Sy of Klohn Crippen was inadvertently omitted from the above list.

The preface also credited the four geotechnical engineers who guided the *1985 Second Edition*. In addition, the preface of the *1992 Third Edition* credited two additional individuals, Trish Pharey and Bonnie Banks (both of Klohn Crippen), "who were responsible for compiling the [*1992 Third Edition* of the] Manual on a word processor [MSWord], and who patiently undertook the numerous edits".

The *1992 Third Edition* revised and enlarged the *1985 Second Edition*, this time to a 512-page document with a wider column width on the page. The 'four parts' of previous editions were

eliminated; the topics were simply organized by chapters, but for the most part in the same order as in the *1978 First Edition* and the *1985 Second Edition*.

Among other changes, the brief mention of “geotextiles” in the *1985 Second Edition*, was expanded to an entire 39-page chapter on various uses of “geosynthetics” in the *1992 Third Edition*. In addition, the chapter on Deep Foundations was extensively updated.

The errors in the conversions from Imperial units to metric units, which appeared in the *1985 Second Edition* and were corrected in the *1989 French Edition*, were also corrected in the *1992 Third Edition*.

It is interesting to note that a subsequent page of errata in the *1992 Third Edition* had the following “Notice to Users”.

> “The use of partial factors of safety in Limit State [sic] Design of Foundations, while advocated in some foreign countries, is currently under review in Canada and the United States. Users of the *Canadian Foundation Engineering Manual* are advised to exercise caution in applying those sections of the Manual referring to partial factors of safety.”

The *1992 Third Edition* was distributed by Bitech Publishers. Approximately 1,800 copies were printed and they sold for $112 for CGS-members, $127 for non-members and $64 for students.

1994 Second French Edition* of the *CFEM (MCIF)

The *1992 Third Edition* of the *CFEM* was translated primarily by, and under the leadership of, Pierre Morin (Memorial University of Newfoundland). Published by the CGS (SCG) in 1994 and distributed by BiTech Publishers, this 558-page document (SCG, 1994, Figure 6) was titled the *MCIF Second Edition*, even though it was a translation of the *1992 Third Edition* of the *CFEM*[4].

Figure 6: Cover of the *1994 Second French Edition*

Approximately 1,100 copies of the *1994 Second French Edition* were printed. The selling price is not known.

[4] This has caused some confusion, because no Third Edition of the *MCIF* was ever produced.

2006 Fourth Edition of the *CFEM*

The preface of the *2006 Fourth Edition* (CGS, 2006, Figure 7) identifies the specific individuals who contributed to this edition as follows (their organizations are not identified in this edition, but have been added where known).

D.E. (Dennis) Becker (Editor), Golder Associates and CGS President (2005-2006)
I.D. (Ian) Moore (Editor), Queen's University
J. (Jean) Lafleur (Editor, French Edition), École Polytechnique
S.L. (Lee) Barbour, University of Saskatchewan
R.J. (Richard) Bathurst, Royal Military College
S. (Storer) Boone, Golder Associates
R.W.I. (Richard) Brachman, Queen's University
B. (Bill) Brockbank, Reinforced Earth Canada
M. (Mark) Diederichs, Queen's University
M.H. (Hesham) El Naggar, University of Western Ontario
J. (Jonathan) Fannin, University of British Columbia
D. (Del) Fredlund, Golder Associates
J. (John) Howie, University of British Columbia
D.J. (Jean) Hutchinson, Queen's University
J-M. (Jean-Marie) Konrad, Université Laval
S. (Serge) Leroueil, Université Laval
K. (Kent) Novakowski, Queen's University, and
J. (Julie) Shang, University of Western Ontario

Figure 7: Cover of the *2006 Fourth Edition*

Of this group, only Ian Moore and Richard Bathurst were formally involved in the *1992 Third Edition*. Barbara Goulet, a publishing consultant in Calgary, is acknowledged in the preface to the *2006 Fourth Edition* as the individual who undertook the layout and design.

Dennis Becker recalls that he 'volunteered' to be a co-Editor of the 2006 Fourth Edition, because he saw the need for the Limit States Design chapter in the *1992 Third Edition* to be updated to be consistent with the, then, recently updated *NBCC* and the *Canadian Highway Bridge Design Code (CHBDC).* Dennis Becker's background was appropriate for the task. His informal involvement with the *CFEM* began with the *1978 First Edition* when, as a PhD student (University of Western Ontario), he was asked to review several chapters by his supervisor, KY

Lo. He was peripherally involved in the *1985 Second Edition* and the *1992 Third Edition*. In the 1990s he became quite involved in the technical committees associated with both the *NBCC* and the *CHBDC.*

The preface to the *2006 Fourth Edition* includes the following paragraph:

> "The Manual provides information on geotechnical aspects of foundation engineering, as practiced in Canada, so that the user will more readily be able to interpret the intent and performance requirements of the *National Building Code of Canada* (the release of this fourth edition coincides with publication of the *NBCC* (2005) and the *Canadian Highway Bridge [Design] Code* (2000). The Manual also provides additional material on matters not covered by these Codes."

The *2006 Fourth Edition* is the first edition in which the *CHBDC* was referenced.

Although some revisions and additions were made to the *2006 Fourth Edition*, the length of this edition was reduced to 488 pages, down slightly from the 512 pages of the *1992 Third Edition*. This reduction was accomplished by reducing the content of some chapters, such as "Background Information for Site Investigations", by combining a number of chapters, and by using a slightly smaller font and a wider column width. Chapters that were added or substantially enlarged included "Selection of Design Parameters", "Earthquake-Resistant Design", and "Machine Foundations".

As might be expected, the *1992 Third Edition* chapter on "Safety and Limit States Design" was totally revised in the *2006 Fourth Edition* and was renamed "Limit States and Limit States Design". The introduction to this chapter provides background to the development and benefits of using limit states design in geotechnical engineering practice, specifically when working on projects with structural engineering components. The introduction to the chapter indicates that some design codes in the early 2000s had already introduced or required limited states design for foundations. It concludes with the statement:

> "LSD [limit states design] can be viewed as a logical extension to the traditional WSD [working (allowable) stress design] approach for foundation design. It is considered that LSD will eventually become the general state of practice by geotechnical engineers for foundation design."

The *2006 Fourth Edition* has been reprinted in 2008 (2nd printing), in 2012 (3rd printing) and again in 2017 (4th printing) but without any revisions. As with all English and French editions since 1985, the *2006 Fourth Edition* has been distributed by BiTech Publishers. Approximately 5,000 copies of the 2006 Fourth Edition have been printed in the four print runs. In 2006 the selling price was $160 for CGS members, $235 for non-members and $100 for students. Currently (2018) the selling price is $204 for CGS members, $284 for non-members and $139 for students. Most of the price increase over the years has been due to increased postage rates for this, almost 1.5 kg, document.

Any document of the size and complexity of the *CFEM* is bound to have a few corrigenda and errors. Those noted up to the end of March 2018, were corrected in an April 1, 2018 Errata, available on the CGS website www.cgs.ca.

2013 Fourth French Edition of the CFEM (MCIF)

In 2013, the French translation of the *2006 Fourth Edition* of the *CFEM* was completed under the editorship of Jean Lafleur (SCG, 2013, Figure 8). The 488-page French version is called *MCIF*, *4e* (Fourth Edition).[5]

Figure 8: Cover of the *2013 Fourth French Edition* (there was no Third French Edition)

Less than 1,000 copies of the *2013 Fourth French Edition* were printed and are being distributed by BiTech Publishers. The current (2018) prices for the *2013 Fourth French Edition* are the same as for the 2006 *Fourth (English) Edition;* $204 for CGS members, $284 for non-members and $139 for students.

Currently (2018)

The *2006 Fourth Edition* of the *CFEM* and the *2013 Fourth French Edition* of the *MCIF* are currently (2018) the most-up-to-date editions.

The CGS has purposely not scanned or otherwise made the *2006 Fourth Edition* and the *2013 Fourth French Edition* available "online". Besides being distributed by BiTech Publishers, new and used hardcopies of the current (and earlier editions) are sometimes available online through distributors such as Amazon and eBay.

The *CFEM* and *MCIF* continue to have a positive effect on CGS revenue, and this continues to subsidize many of the Society's other activities and keeps the membership fee relatively low.

Future Edition (Online)

[5] There is no *Third Edition* of the *MCIF*. The numbering of editions jumped from the *1994 Second Edition* of the *MCIF* (a translation of the *1992 Third Edition* of the *CFEM*), to the *2013 Fourth Edition* of the *MCIF (*a translation of the *2006 Fourth Edition* of the *CFEM*).

In 2014, the CGS decided to start planning for a future edition of the *CFEM*, and proposed that this future edition would be an 'online' edition. Again it is changes to the *NBCC* and *CHBDC* that are driving the need to update *CFEM*, specifically with respect to limit states design for foundations. It's important, if not imperative, that the *CFEM* keep up to date because the *CFEM* is referenced by these codes and is the primary authoritative reference in Canada for foundation engineering.

In 2015 a CGS CFEM Technical Advisory Committee (TAC) was formed, chaired by Dennis Becker of Golder Associates (co-Editor of the *2004 Fourth Edition*). Shortly after the formation of the TAC, a search began for an editor to oversee the new 'online' edition. After multiple unsuccessful attempts to secure an editor, the CGS Executive Committee took on a more active role to facilitate the update of the *CFEM*. This involved, in part, updating the 4th Edition errata, as noted above, and reviewing the existing model under which the manual had previously been developed. Following this review, and in consultation with the TAC, the current plan is to develop a formal call for a project coordinator to oversee the technical update of the manual.

A parallel effort was also launched by the CGS Vice President Technical to provide a digital update of Chapter 8 of the 4th Edition on Limit States and Limit States Design, and possibly other chapters, as an addendum(s) early 2019. The next 'online' update of the CFEM is currently planned for completion by 2021.

Concluding Remarks

For more than 40 years, the *Canadian Foundation Engineering Manual* has greatly contributed to the field of foundation engineering in Canada. In its various editions, the *CFEM* and the *MCIF* have highlighted the technical advances made in the field. Because the *CFEM* and *MCIF* continue to be held in high regard, both nationally and internationally, they continue to enhance the status of the Canadian Geotechnical Society[6]. It truly has become an ambassador of the Society.

The various editions of the *CFEM* and *MCIF* have been, and continue to be, planned, organized, written, reviewed, updated, revised and translated by volunteer members of the Society. CGS members take a great deal of pride in the manual and the important part it plays in the *National Building Code of Canada*, the *Canadian Highway Bridge Design Code* and the continuing development of Canada, in general.

Acknowledgements:

The author would like to acknowledge the assistance of the following individuals in preparing this story. Don Shields and John Gadsby provided some of the early history on the subject. Heinrich Heinz and Steve Bean of Thurber Engineering, and Bryan Watts, Alex Sy and Ana Rose Blue of Klohn Crippen Berger assisted by lending the author, or providing information on, past editions of the *CFEM*. Robert Chapuis, Paul Chiasson, Serge Leroueil and Jean Lafleur did the same for past editions of the *MCIF.* Don Scott, Bengt Fellenius, Robert Chapuis, Peter Lighthall and Dennis Becker provided information on the specific editions with which they were

[6] Over the many editions, it is estimated that approximately 85% of the copies distributed by BiTech Publishers have gone to Canadian addresses, and 15% to international addresses.

involved. Lynn Pugh (BiTech Publishers) provided information on the number of copies printed and the pricing of the various editions. Don Shields, John Gadsby, Michel Aubertin (Past President, 2009-2010, and current CGS Executive Director), Jim Graham (Past President, 1997-1998, and past CGS Secretary General, 1999-2006), Suzanne Powell (past Chair of the CGS Heritage Committee and current CGS Vice President Technical) and Heinrich Heinz (current Chair of the CGS Heritage Committee) provided excellent review comments.

The author, however, accepts responsibility for any errors or misinterpretations of facts. If readers have any additional information, or comments, on the history of the development of the *CFEM* and the *MCIF*, please send them to the author at vandine@islandnet.com.

References

Canadian Geotechnical Society (CGS), 1978, *Canadian Foundation Engineering Manual*, Parts 1 to 4, published by the CGS, Montreal, QC.

Canadian Geotechnical Society (CGS), 1985, *Canadian Foundation Engineering Manual*, 2nd Edition, published by the CGS c/o BiTech Publishers Ltd., Vancouver, BC, 465 p.

Canadian Geotechnical Society (CGS), 1992, *Canadian Foundation Engineering Manual*, 3rd Edition, published by the CGS c/o BiTech Publishers Ltd., Vancouver, BC, 512 p.

Canadian Geotechnical Society (CGS), 2006, *Canadian Foundation Engineering Manual*, 4th Edition, published by the CGS c/o BiTech Publishers Ltd., Vancouver, BC, 488 p.

Canadian Standards Association (CSA), 2000, *Canadian Highway Bridge Design Code* S6-00, published by the CSA, Toronto ON.

Golder, H.Q, 1976, The Canadian manual on foundation engineering—a review, Canadian Geotechnical Journal, vol. 13, p. 499-504.

Naval Facilities Engineering Command (NAVFAC), 1971, *DM* [*Design Manual] 7 Soil Mechanics, Foundations and Earth Structures,* published by the NAVFAC, Alexandria, VA.

National Research Council (*NBCC*), 1941, *National Building Code of Canada*, published by the NRC, Ottawa, ON

National Research Council (*NBCC*), 1975, *National Building Code of Canada*, published by the NRC, Ottawa, ON

National Research Council (NRC), 1975, *Canadian Manual on Foundation Engineering*, published by the NRC Associate Committee on the National Building Code, Ottawa, ON, 318 p.

National Research Council (NRC), 2005, *National Building Code of Canada*, published by the NRC, Ottawa, ON

Société Canadienne de Géotechnique (SCG), 1989, *Manuel Canadien d'Ingénierie des Fondations*, published by the CGS c/o BiTech Publishers Ltd., Vancouver, BC, 378 p.

Société Canadienne de Géotechnique (SCG), 1994, *Manuel Canadien d'Ingénierie des Fondations*, 2ème Édition, published by the CGS c/o BiTech Publishers Ltd., Vancouver, BC, 558 p.

Société Canadienne de Géotechnique (SCG), 2013, *Manuel Canadien d'Ingénierie des Fondations*, 4e Édition, published by the CGS c/o BiTech Publishers Ltd., Vancouver, BC, 488 p.