

Third Revised Edition

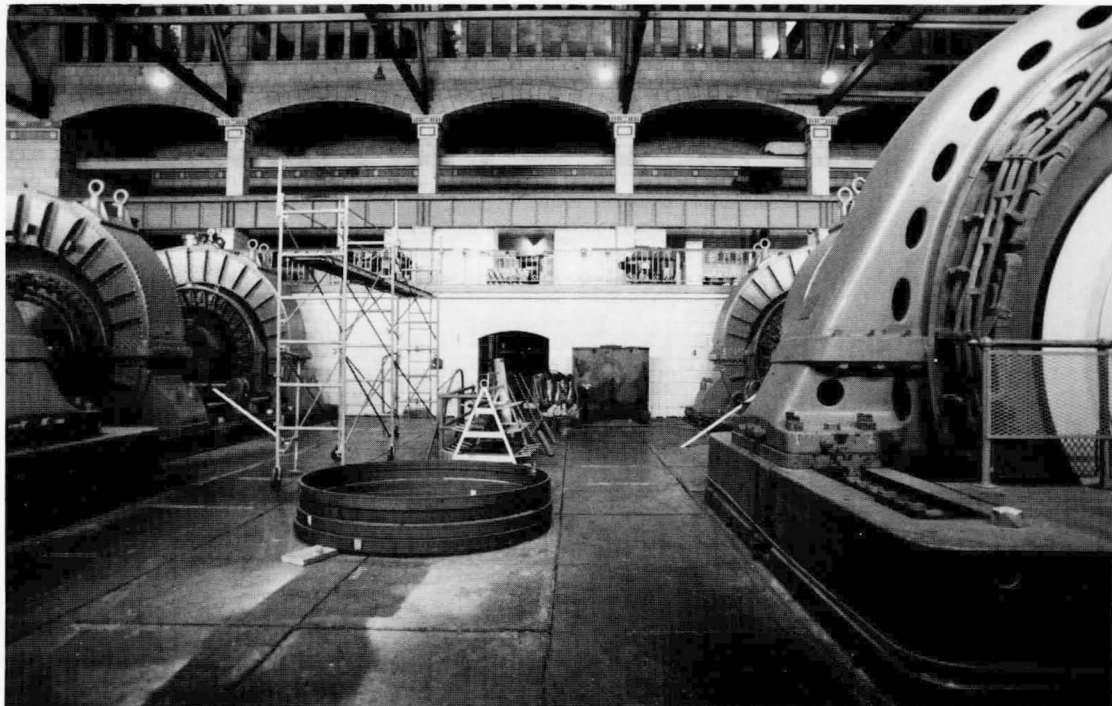
WELL- PRESERVED



THE ONTARIO HERITAGE FOUNDATION'S
MANUAL
OF PRINCIPLES AND PRACTICE
FOR **ARCHITECTURAL**
CONSERVATION

MARK FRAM

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To understand a place one must know its memories.

Richard England

. . . spirit always adheres to forms. *That is why forms survive.* Because even when specifics are forgotten, a form can retain an aura of what originated it and so pass on not the doctrine but the sense of life.

Michael Ventura, "Hear That Long Snake Moan", *Whole Earth Review*, Spring 1987

A builder will probably point out that a cheaper material will show a useful saving. This may be true, but it is at this point that we must summon up all our powers of resistance to temptation, because nine times out of ten the economics are going to be wrong. Not only in the long term will the inferior material add to maintenance costs or deteriorate sooner, but in the short term also will reflect the loss of intrinsic value in the house.

Beverly Pike, *The Good Looking House*, 1980

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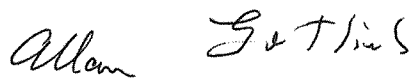
There is a growing interest in heritage and preserving heritage structures across Ontario. Private citizens are restoring and preserving heritage houses, and in some cases, whole neighbourhoods and districts. Owners of both public and private property are increasingly recognizing the value of heritage structures in community revitalization and attracting tourists. And, where once they might have “bulldozed”, far-sighted developers are now more likely to integrate heritage structures as valuable assets into their plans.

The Ontario Heritage Foundation is pleased to be a partner in reprinting *Well-preserved* for the third time since it was first published in 1988.

We consider it vital that everyone involved in conserving built heritage — property owners, communities, public agencies, interested groups, and practitioners — have access to a common base of knowledge and principles about heritage conservation. This book meets that need with comprehensive information about good conservation practices for the maintenance and restoration of heritage structures.

Not only is this book popular with both public and private owners of heritage buildings, it is also in demand as a college and university text across the country.

Well-preserved is a unique, practical source of guidance for both professionals and non-professionals in the architectural and heritage conservation fields.

A handwritten signature in cursive script that reads "Allan Gotlieb".

Allan Gotlieb
Chairman
Ontario Heritage Foundation
November 2002

You can find many “how-to” books dealing with old buildings. This is much more a book about *what* to do. And, no less important, about *why* to do it.

Well-preserved is about environments of buildings and landscapes, both old and new, both urban and rural (and even suburban) — and not just the picture-postcard views of monuments, but the modest architecture of countrysides and city streets, from farm fields and forests to window frames and doorknobs. Including monuments, yes, but also commonplaces, or what some call “vernacular architecture”. This book is about recognizing the important qualities of all these places, and about conserving those qualities and places, for now and for the future.

It isn’t enough to simply preserve buildings and landscapes without attending to the quality of conservation work itself. This book encourages both recognition of “heritage”, wherever you may find it in your own environment, and recognition of the difference between good work that respects that heritage, and bad work that detracts from it. It’s essential to do the work well. Thus the title, “*Well-preserved*”.

Picture books and other visual media that document and illustrate traditional characteristics of buildings and places often reveal a yawning gulf between the quantitative measures of economic status and the quality of where and how we live. Very few new buildings age very well (even if they do not overshadow their neighbours or sprawl relentlessly over the landscape in the first place). In reacting to the inadequacies of the new, we look back at what we have inherited from previous generations and cultures, and see in many cases how well that legacy has endured.

Of course the past, however it looks, remains in the past. So, to respect both past and present, we must acknowledge which is which. Nostalgia may be powerful and at times useful, but conservation cannot be blindly nostalgic or romantic — its gaze requires honesty and truthfulness about the past.

Conservation of places, buildings and objects involves both art and science, but it seems most truly a matter of *craft*. Conservation, well done, brings together intelligence, eye and hand to protect the material inheritance from the past, to keep it alive and to pass it down to the next generation.

We no longer make buildings, streets and landscapes the way we or our predecessors once did. This heritage is distinctive, even unique, to specific times and places. It is a very finite resource, and far too often an endangered species. This book is intended to help maintain these kinds of places in order to keep alive the qualities of craft they embody, and the memories that they carry. Think of this material cultural heritage as part of our genetic diversity. It’s very much worth keeping.

That said, there’s hardly anything *new* in this book.

After all, conserving buildings, places and environments is by no means new. In each of the several subdivisions of heritage conservation — architecture, historical research, archaeology, museology, archival management, and so on — a wealth of data, experience and advice awaits the patient observer and practitioner. But the information is specialized, fragmented and sometimes even contradictory. Though there is a lot of common sense in conservation, it is unfortunately seldom followed. Too much is misinterpreted, too little really understood.

So this book is an attempt to put this information together in a way that would make it easy for you to either find out just enough to let you do what needed doing, or to find out more about it before you went ahead, or to find someone to help you do it.

One very strong impetus for this book in the first place, and for keeping it in print for more than a dozen years, was the continually growing number of inquiries to public agencies or private offices about what to do about old buildings and properties (and how to do it well) — and the lack of enough knowledgeable people to answer them (and to answer them well).

The reasoning for *Well-preserved* went like this: let's put down in one find-it-yourself resource enough guidance to take care of most of the questions, and turn the experts loose on the really difficult problems. So, since there are few experts at hand, this book tries to give answers to most of the many regular questions while giving some direction toward solving the more difficult problems, and while waiting for the conservation pros to arrive and, one hopes, save the day.

Accordingly, this book is what you might call an "expert system", or at least the prelude to one. Computers can be programmed to compile and analyze and regurgitate not only huge databases of information, but also the rules for making decisions from that information. So-called expert systems attempt to harness not only the human expert's data but also his or her methods of understanding and making decisions. Such systems can be useful where there are many fairly standard diagnostic techniques and solutions, and where human expertise is not only hard to get but also more urgently required for the non-standard situations.

At the beginning of this book's development in late 1986, the idea was to construct just such a computer-based system, with an accompanying book as something like a user's manual. Of course, that would have taken a few extra years to do. The technology was not quite ready for such a modest effort as this.

As a result — minus the software — you have in your hands the user's manual for conservation. The "system", curiously enough, has never really caught up. You still need to talk to real people. Besides, it's a "well-known fact" that no-one reads computer manuals.

The core of principles and basic techniques in *Well-preserved* seems to have stood up well through two previous editions in English and one in French; indeed, better than both author and publisher had expected. People continue to find the book a useful tool. A pleasant surprise is its steady demand as a college and university text across North America, in addition to its day-to-day use by individuals and communities. The surprise is not that the book should be a useful instructional text, but rather that there are so many more educational programs in heritage conservation and historic preservation than there were a dozen years ago.

With this book in your hands (still much more portable and useful on-site than a desktop computer) you should be able, at the very least, to ask the right questions and to know that they *are* the right questions. That would be much of the real work out of the way.

Then you can concentrate on your special problem — or, rather, on what is special and important and *interesting* about your particular piece of cultural heritage, the endangered species that you are working to save.

Old and improved

There are special punishments reserved for authors of books that mean to be useful and long-lived — in addition to having to follow their own advice. Thus the major revisions in the appendices, including a greatly expanded bibliography and updated reference guide, as well as a new selection of Internet contact points.

The web sites listed were current for the middle of 2002. The very helpful links via ICOMOS Canada have been in virtual place for several years, and may be treated as virtually permanent for several more.

Setting your web-search engine to “architectural conservation”, “heritage conservation” or “historic preservation” will open up some other very interesting explorations, too.

That this book continues to have a steady life of its own has a great deal to do with the great many people who helped me make it in the first place.

I was very fortunate to have had the counsel of conservation professionals in Toronto, Ottawa, Montreal, New York, Washington, London, York, Edinburgh, and Paris when I first assembled this material. I am especially grateful for the time and attention given my early efforts by the following people, each of whom provided verbal or written comments, both critical and supportive. I hope the final product fairly respects their advice. While I have remained in contact with some of them, and have even continued to work with one or two over the years, I have retained their old (“historic”) affiliations as they were in the first edition. I also note with sadness that several people on the list have passed away in the intervening years.

Laurie Beckelman, New York Landmarks Conservancy
 Heather Broadbent, Ontario Heritage Foundation
 Margaret Carter, Consultant, Ottawa
 Lynne DiStefano, Brescia College, London, Ontario
 Neil Einarson, Manitoba Historic Resources Branch, Winnipeg
 Jane Fawcett, UK ICOMOS and Architectural Association, London, England
 Anne M. de Fort-Menares, Architectural Historian, Toronto
 Wesley Haynes, New York Landmarks Conservancy
 Desmond Hodges and others, Edinburgh New Town Conservation Committee
 Donald W. Insall, Donald Insall & Associates Ltd., London, England
 Alistair Kerr, B.C. Heritage Trust, Victoria
 H. Ward Jandl, Preservation Assistance Division, U.S. National Park Service
 Frank G. Matero, Center for Preservation Research, Columbia University
 Michael McClelland, Toronto Historical Board
 Marilyn Miller, Heritage Branch, Ministry of Culture and Communications
 Richard Moorhouse, Heritage Branch, Ministry of Culture and Communications
 Susann Myers, Heritage Branch, Ministry of Culture and Communications
 Lee H. Nelson, Preservation Assistance Division, U.S. National Park Service
 Bonnie Parsekian, RESTORE, New York City
 Matthew Saunders, Ancient Monuments Society, London, England
 Jean Simonton, Heritage Branch, Ministry of Culture and Communications
 Peter H. Smeallie, Building Research Board, U.S. National Research Council
 Rod Stewart, Rod Stewart Construction Ltd., Port Hope
 Herb Stovel, Heritage Canada, Ottawa
 Ted Teshima, Ontario Heritage Foundation
 Christopher Tossell, Ontario Heritage Foundation
 Martin Weaver, Heritage Canada, Ottawa
 Anna M. Young, Ontario Heritage Foundation

Others who encouraged and helped included: Liz Addison, Jim Anderson, David Bouse, Melissa Gordon, Christine Gutierrez, Denis Heroux, Diana Jervis-Read, Dana Johnson, Harold Kalman, Ray and Cindy Kipfer, Mark London, Carol Priamo, Jeff Stinson, Margo Teasdale, John Weiler, and Phillip Wright, together with my many professional colleagues from what is now called the Ontario Ministry of Culture.

The “culture” ministry was sufficiently generous to have given me the opportunity to do much of this work as a special assignment, and for that I remain very thankful. The ministry was prodded by the then directors of the Ontario Heritage Foundation who served on its Architectural Conservation Committee, especially Lynne DiStefano and Anna M. Young, who, in chairing the Committee, made it impossible for either the ministry or me to let this project slip away.

Over the years before this book was produced, I (and my colleagues) dealt with all sorts of requests, comments, complaints and cries for help from hundreds of individuals and communities in Ontario. I was grateful for both the challenges these people threw at us and the help they gave us too, sometimes simultaneously. These are far too numerous to name, so I continue to thank them all by trying to keep this book up to date, as a very modest return on their investment of energy, time and interest in heritage conservation.

This book was a relatively early computerized production: drafted, composed, laid out and typeset (with codes) on a Macintosh before page layout programs had crawled up to version 1.0. So the project still needed some of the more traditional (now archaic?) help of actual hands.

I was especially grateful for the hospitality and encouragement of Henry Sears, Catharine Tanner and David Hollands of Sears & Russell Architects, and for the assistance of Scott Kerr who shared the daunting task of whipping the drawings into shape and onto these pages. John Parry did an excellent job in editing my sometimes wayward prose, and John Denison of The Boston Mills Press enthusiastically helped me to help him get this book out in reasonably good order.

I must acknowledge as well an added contributor, my colleague Christiane Lefebvre, who was instrumental in producing the French version of this book, *Conserver, un savoir-faire*. A few small improvements to this third edition came from what we did in 1993.

Some things haven’t changed. Liz Addison has remained my constant muse. And John Denison is still the publisher.

Of course, as compiler and author, I bear the usual responsibilities for inadequacies that might persist in this re-finished edition. Still, it seems to be a pretty good tool for the job. Use it well.

MF

November 2002

Architecture is what you do to a building when you look at it.

Walt Whitman



A commitment to conserving historical memories and patterns adds immeasurably to our lives and the arguments for their demolition on the grounds of “progress” are quite indefensible; if technology is to add to our lives, then a route via destruction cannot be justified because it impoverishes us.

Terry Farrell, “British Architecture After Modernism” (1984)

A tool for conservation

WELL-PRESERVED is three rather different things. It is a narrative, arranged to reflect how heritage conservation ought to take place, from understanding to planning to doing to maintaining. It is a compendium that can be read in almost any order, offering pieces of information about many topics, from general to specific. It is a catalogue, providing access to other more detailed sources.

Though this book, like a building, has to do many jobs at the same time, its basic purpose is to tie together principle and practice. The principles come from diligent research and international charters; the practice comes from many how-to guides, technical publications, and the shared experience of many trained professionals.

Before now there has been no comprehensive reference available that bridges principle and practice. In conservation, there are sometimes cases where principle and practice seem to conflict. *WELL-PRESERVED* tries its best to show the difference between good practice based on principles and bad practice based on expediency. It tries to show how good practice, in the end, can be more efficient than bad, once the full value of the building or site is understood and factors of time and durability are taken seriously.

The key to the connection of principle and practice is to understand that heritage resources are irreplaceable. Each building or tool or document represents or embodies a specific event or moment or episode or trend in human life. Even something mass-produced may merit special attention for having been used in a unique way. This uniqueness is not replaceable or reproducible by any means, even by copying or counterfeiting. It may not be valuable in a monetary sense but may be culturally important, because people are *attached* to things and places — they feel their lives lessened by the deterioration or disappearance of a heritage resource. This basic message runs throughout the book, from general to particular.

A guide for decision-making

WELL-PRESERVED stresses that heritage resources are precious, irreplaceable, and deserving of every effort to retain and maintain them.

Heritage resources run from collections of small objects in museums to entire landscapes and regions displaying the legacy of past generations. They have essential and tangible everyday uses yet are important symbols of cultural values and aspirations. Heritage conservation mirrors this duality — it is of growing importance as an economic activity and as a cultural pursuit.

Conserving the material legacy of the past under a wide range of conditions requires people with many different skills and interests. They must co-ordinate their decisions to keep heritage resources intact as connections to the past and as assets for the future.

This book focuses on the immovable resources of lands, buildings and structures, not as isolated features but as places with contexts in time and place. Though conservation must pay great attention to myriad details, a property’s surroundings and wider community interests must not be forgotten.

A directory of information sources

WELL-PRESERVED is a catalogue to other sources of guidance in print. Topical references are given in the form of a simple code: a four-letter abbreviation of the author’s or editor’s name and two digits indicating year of publication. The codes are compiled alphabetically in the bibliography at the end of the book. The bibliography attempts to be comprehensive and up-to-date, though many useful items do not appear for reasons of space. In some cases, there may be a more recent edition of a listed book.

Ontario has no single easily accessible public repository of information about heritage conservation, though some government agencies, universities and public libraries have excellent collections of books and articles on specific topics. With patience, one can find any item through public libraries, by inter-library loan.

Building owners should find here the basic questions and concerns they will need to address in relating their contemporary needs to the architectural heritage of their buildings. Most of the answers should be here, too. For small projects and capable owners, the advice may be taken straight, but the book should be equally useful as a reference to aid in understanding and evaluating the advice of consultants, specialists and contractors. Since it concentrates on both details and their larger contexts, the guide's advice can be used for conservation projects from the very small to the very large.

Architects and engineers should find the guide a vehicle for communicating with their clients and an outline of criteria for building evaluation and remedial work that emphasizes the value (both aesthetic and pragmatic) of retaining as much as possible of the architectural distinction of an older building in the course of extending its useful life. Architects must recognize the many differences between new construction and conservation work in old-building projects and take them into careful account in meeting the needs of both client and building.

Heritage organizations, such as local architectural conservation advisory committees (LACACs), historical societies, museums, and even libraries, will be able to use this guide as a sourcebook of advice and information resources to respond to requests for conservation assistance. Published material is not always readily available and what is at hand may not satisfy immediate needs.

Municipal officials and LACAC advisers can use this guide to help owners of properties designated or eligible for designation under the Ontario Heritage Act decide how best to (and how not to) rehabilitate, restore or modernize in order to maintain historical and architectural character.

Builders, contractors and construction trades should find here explicit guidance on the special care and techniques needed to maintain the aesthetic and functional integrity of older buildings. The guide will give builders a sense of how to integrate individual trades, and how owners and their consultants will assess ongoing work and overall results. Much of the manual's advice is directed toward improving workmanship by pre-planning and careful monitoring.

Specialized building consultants, such as energy retrofit consultants, will find here the full context within which to modify new-building or energy-conserving techniques to suit real conditions and constraints. Retrofit measures that achieve sharp short-term efficiencies are seldom suitable for older buildings, and the unmistakable look and feel of some retrofit techniques do not suit landmark buildings or even modest residences.

Heritage consultants, such as architectural historians, researchers, archaeologists and conservators, will find here the context for their special work within the project as a whole. Skilled reconnaissance of a building often supplies many answers about appropriate treatment and technique, but only when done at the right time and with practical application in mind.

Enthusiasts and volunteers can use this book as a guide to the finer points of old buildings, structures and sites, and as a point of departure for local surveys and inventories of notable buildings, structures and districts. Much valuable information about heritage resources is gathered, recorded and maintained by a growing number of informed and public-spirited individuals and specialist groups interested in archaeology, history, architecture, agriculture, industry and landscapes.

ACCESS TO INFORMATION

Throughout the book, look for bibliographic and other information in this column, as well as for the underlying principles of the "Good practice" guidelines. See the diagram opposite for help in navigation.

Organization

WELL-PRESERVED has four main parts.

"The inheritance" looks at the material heritage of building and environment built up in Ontario over the past two centuries and more. It outlines forces and influences that determined the look of buildings, communities and landscapes. It concludes with a guide to help define the value and demonstrate the importance and use of this built heritage for the future.

"Careful conservation" defines the terms and principles governing conservation of buildings and their environments. The principles collect and connect the experience of international organizations and local builders, and stand at the heart of the book's guidelines on good practice. They should also guide conservation decisions and activities beyond this book's limitations.

"Good practice" is filled with practical applications for these conservation principles on the job. Numerous brief case studies and illustrations bring to life the principles within the context of practical guidelines based on a great deal of experience. Some information and advice is repeated, to make each section self-contained, with cross-references to other topics and other resources. Every job, from archival research to mixing mortar, is traced to specific principles of careful conservation.

"Ways and means" surveys the human and material resources available to promote and guide heritage conservation. The information is current for 1988, but may become dated as professionals, organizations, legislation, and funding programs develop in response to economic and environmental changes, to the increasing age of buildings, and to the evolution of conservation techniques.

Appendices provide background information on charters, codes and organizations that aid or govern conservation work. The extensive references list many published sources for further information.

Applying the advice

Though the book is in a particular order, conservation seldom proceeds so neatly. Good conservation work involves stepping back from the job at hand to see a larger picture, that of the building or site over many generations, from past to future. Every building project, old or new, involves many sideways and even backward steps. No simple diagrams of process can easily explain this "shuffling". The maxim "look before you leap" covers much of the advice in this book. Sometimes that may mean pausing deliberately when circumstances otherwise press for completion.

This book presumes basic understanding of elementary building principles. Its advice is abridged, but offers directions to more detailed technical information from a wide range of sources. Both novices and experts should find extra help through the book's topical references.

Other books, magazines, and even television offer a rapidly growing body of information on practical matters of heritage conservation, but often ignore many useful *connections* between specialties. Good conservation practice involves many different skills and levels of skill, tied together by strong bonds of communication and co-operation. Though much of the finest construction and conservation work may be the legacy of one person, a successful project requires collaboration among many.

Where to find things on the page

1. Section heading.

2. Conservation principles on which the advice is based (elaborated in pages 44 to 55).

4. Topic title.

5. Background information and explanation.

6. Technical or other supplementary information.

7. Guidelines offering advice about what to do or not to do in a specific situation, based on the conservation principles for the topic (marked by a ❖).

1 Exterior features/1

4 Roofing

2 Principles

- 2.3 Work in order
- 2.4 Work at right pace
- 2.5 Appropriate skills
- 2.6 Respect for uniqueness (pattern, ensemble, detail)
- 2.7 Minimal conjecture/informed invention
- 2.8 Respect for uniqueness (pattern, ensemble, detail)
- 2.9 Minimal conjecture/informed invention
- 2.10 Priorities of features, priorities of work
- 2.11 Maximum retention
- 2.12 Patina preserved
- 2.13 Safe working conditions
- 2.14 Traditional repair (proven technology)
- 2.15 Replacement in kind/ recycled materials
- 2.16 Reversible repair
- 2.17 Cautious hi-tech repair
- 2.18 Recipes tested before application

3 References

For general information on repairs to all types of roofing on small buildings, especially houses, see BQWY80, CUNB84, DVE65/80, FINEB, HANSE, HUTC80, KAP13/80, RIRB84, RUC83, LAB80, LTC82, LOND84, LYNCE, MEL73, POND83, READ73, REAS82 and STL0nd. For larger and more complex buildings see FEL82 and STMB4.

For examples of appropriate materials and styles for early residences, see MACH83, MCR75 and MCA84. See MACH83, REAF85 and POW79 for early specifications and drawings of roof construction. The special problems of metal roofing is covered in GALE80, INSA72, OTC and TMM70. Of the building sources noted in LAB80 and POND83 have advice on repairs to stone roofing, while DVE80/86 and LTC82 cover chimney repairs for old houses (see also WLLB83).

Types and materials

The roof is the most exposed part of a building; it often defines a building's visual character, but is also the single element most vulnerable to weathering and thus to periodic change. Even when well maintained (and inaccessibility makes maintenance difficult) roofing materials do not last as long as other parts of the exterior. Much deterioration throughout a building is caused by too much moisture in the wrong place over a period of time — and much of this moisture gets in through gaps or weaknesses in the roofing, especially at junctions or edges. At some points in a building's life an owner will face a crucial decision whether to continue repairs or to replace the roofing entirely. In these cases, where conservation may mean renewal rather than repair, the craft, durability and visual impact of the old must be recalled very carefully by the new.

Roofing materials in 19th-century Ontario included shingles in wood, slate, and metal, as well as continuous sheeted sheets of metal. Metals for roofing included copper, tin-plated iron, terne-plate (an iron-lead-tin alloy), and (very rarely) lead. The early 20th century added asphalt shingles and clay and concrete tiles to the repertoire. With few exceptions, the general lightness of structures (compared to European precedents) was echoed in lightweight roofing materials — copper rather than lead, thin slates rather than heavy stone flags. Even lowly asphalt has had a long career on roofs, tested by the Royal Engineers as waterproof roofing in Kingston as early as 1840.

Roofing techniques distinguish between flat or very shallow roofs where water-pushing is needed to resist moisture penetration from standing or slowly evaporating water and snow, and more or less steep roofs which emphasize rapid water-sliding.

In Ontario, flat and shallow roofs are usually covered with continuous sealed membranes of tar or bitumen (usually laid with gravel to protect the membrane) on a built-up base of paper and felt over a wooden substructure of joists and roof boards. Much care for low-pitch roofs is sheet metal (copper or terne-plate) with interlocking flat seams — extremes of temperature make metal roofs especially vulnerable to creeping, curling and punctures.

A flat roof must retain its integrity despite accumulations of rain and snow as well as tremendous variations in temperature from day to day — even hour to hour. Many tar-and-gravel roofs on quite old buildings sit on top of worn-out metal. Few built-up roofs last long without leaking, though the effective life of a well-maintained flat roof ranges from five years to perhaps 30.

On sloping roofs, metal roll or sheet provides a smooth, relatively impervious surface, but can fail at seams and joints as well as at punctures. Thermal expansion and contraction tax every part of a metal roof — most deterioration comes at folds or standing seams that cannot move enough to relieve strains. The use of standing seams or even wooden battens at seams gives metal roofs a characteristic vertical emphasis and also offers the metal considerable room to expand and contract.

Repairing metal roofing is expensive and requires experienced experts; poor short-term repairs will accelerate deterioration. Single roofing in any material is more vulnerable to leaks between units and at flashings, but it is more amenable to bit-by-bit repairs; a roof's overall life can be extended by those repairs, but only to a point. The flashing and drainage of all sloped roofs are critical, for any water build-up can back up underneath shingles or sheets by capillary action, as if the roof were sucking on a straw. Locating sources of leaks may not be so easy as looking for obvious dampness; much moisture may be coming via capillary action from the side or even from below.

❖ Carefully assess the remaining life expectancy of a roof before deciding to repair or replace part or all of its surface — especially slate roofs, where many slates may or may not be reusable (see "Replacement", below).

❖ Look and feel very carefully in attic spaces for subtle signs of damp or rot that may not be apparent from above. Inspect the roof in wet weather to see it at its worst.

❖ Ensure that the space beneath the roof is properly ventilated, so that any moisture can readily evaporate without damage to structure or materials and to dissipate summertime heat build-up.

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6 Exterior features/1

7 Roofing

6 DURABILITY

Ontario's climatic extremes take their toll on roofing. Slate and copper are the most durable of the historic materials, lasting up to 100 years without needing major repairs or replacement, openly installed, wooden shingles may last 25 to 30 years or more; asphalt shingles may last 15 to 20 years. Each material has advantages and disadvantages. Slate is heavy and brittle, but durable. Metals are light, but prone to punctures and leaking. Wood is light, but vulnerable to rot unless treated, and even more vulnerable to fire. Asphalt shingles are light — and relatively cheap — but not so durable as more traditional coverings. Heartfangled lightweight composition materials try to imitate the texture and colour of slate, with more durability than asphalt, but their lifespan is uncertain.

❖ Make certain the roofing is properly anchored and that the anchors are not corroded or broken.

❖ Make vents, skylights and other new elements fit as discreetly as possible, both visually and materially. Flash and seal any openings fully and inspect them regularly. There are many traditional ways to conceal or incorporate such elements, as part of the roofing itself or in conjunction with gables, dormers or chimneys (see VISUAL HARMONY AND GOOD FIT).

❖ Make sure there is proper protection against damage by lightning, especially for high buildings in rural areas. Lightning rods on barns and churches may or may not be properly grounded; if not, they will be worse than nothing in the event of storms.

7 deterioration around them. Do not artificially age the appearance of new sections of copper — in time, they will fit into the general appearance of the roof without assistance.

❖ Ensure chemical and physical compatibility between roofing, fastenings and flashings. Do not use copper with cedar shingles. Do not use different together — fasten copper with copper, terne-plate with lead-coated nails, etc. On decorative iron cresting designed for slate roofing will not go with a copper replacement roof. Watch for signs of corrosion of metal flashings and drains from stone particles eroded from slate roofs and replace deteriorated troughs and downspouts.

8 Replacement

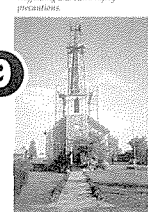
❖ Whenever possible, replace worn-out roofing with the same materials. Where there is sufficient documentary or archaeological information, consider replacing modern short-life roofing with the more durable covering of the building's earlier years. Do not presume that the original material was necessarily wood shingles or copper sheeting. Consider a conjunctural "period" substitution only when it proves impossible to determine the authentic materials and techniques used for the roofing for when the historic technology is no longer available, and then only treatments commonly used in the region during the period of construction.

❖ Do not lay new roofing over top of existing roofing. Ensure that roofing can expand and contract without losing its integrity.

❖ Consider the choice between repair or replacement of slate roofing with the following in mind:

- ☐ Soundness of the slates in general
- ☐ Integrity and durability of existing flashing
- ☐ Capacity of existing roof structure
- ☐ Percentage of slates that can be re-used — thickness, brittleness, sound nail-holes, cracking
- ☐ Estimated life of sound slates

9 In extreme cases such as steeply sloping roofs require special scaffolding and extra safety precautions.



3. References, in a shorthand code: the first four letters of the author's or editor's name (or the book title if there is no author), plus two digits for the year of publication (or "nd" if no date is available), and in a few cases an extra "a" or "b" to distinguish

otherwise identical codes for two different books. The codes and their complete references are listed alphabetically in the bibliography, pages 220 to 231. The bibliography is limited almost entirely to books; though it is

comprehensive and very current, it is by no means a complete listing of what is available. There are also many helpful magazine and journal articles, but these would be far too many to list and generally less accessible than books.

8. Checklists of elements, decision-making criteria or actions (marked by a ☐).

9. Photographs or drawings that supplement the text, giving examples of good, questionable or bad practice.