

TECHNICAL PAPER SERIES 10

RESTORATION

PRINCIPLES AND

PROCEDURES

BRITISH COLUMBIA
Heritage
Trust

TECHNICAL PAPER SERIES 10

**RESTORATION
PRINCIPLES AND
PROCEDURES**



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Foreword

The British Columbia Heritage Trust aims to "support, encourage and facilitate the conservation, maintenance and restoration of heritage property in the Province."

The Technical Paper Series is provided as a resource for all people involved in heritage activities be they volunteers or accredited professionals.

The Trust endeavours to provide information on a range of topics that is important to the development of British Columbia's heritage resources. Your suggestions for further issues in this series are welcomed.

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Introduction

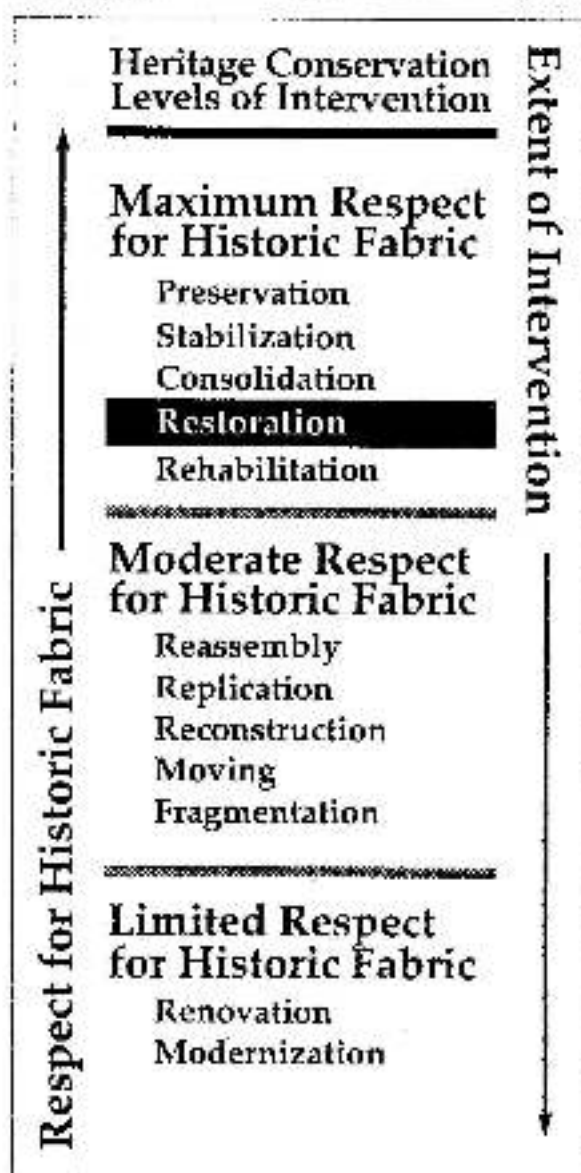
This volume is one of a series of manuals developed by the Province of British Columbia to guide heritage conservation work in British Columbia today. For a general overview of heritage conservation see the introductory volume, *Principles of Heritage Conservation*.

Restoration Principles and Procedures deals specifically with the process involved in restoring historic buildings or sites. The manual includes a set of 10 principles that should be used to guide and assess each stage of the restoration process. The principles reflect current international conservation attitudes, while at the same time taking into account the particular nature of British Columbia's heritage resources.

To help ensure that the principles are followed, Chapter Three reviews what is, or should be, involved in the various stages of the restoration process. Since the technical aspects can vary dramatically from one restoration project to another, the information contained in this section is intended to provide a general, conceptual framework to restoration planning and implementation. It is not a technical or "how-to" manual.

The British Columbia Heritage Trust would like to thank the following individuals who lent their expertise to this project: Jacqueline Murfitt, Heritage Conservation Office, City of Vancouver; Steve Barber, Senior Planner, City of Victoria; and Patrick Frey and Mark Haseltnheimer of the Heritage Conservation Branch.

The Trust extends special thanks to Alastair Kerr, Heritage Conservation Branch for his expertise in both the writing and compilation of this work.



1. What is Restoration?

Restoration is one of several approaches that can be taken to heritage conservation work. These approaches — also referred to as levels of intervention — vary according to the extent of the conservation work involved and the degree to which this work affects the historic fabric of the building or site.

The term “restoration” is often misunderstood and used, incorrectly, to refer to other heritage conservation activities. Restoration is a specific process by which a building or site or part of a building or site is carefully returned to its appearance at an earlier time. This is accomplished by removing material added later and by replacing missing elements and details. However, it does not automatically mean that the building, structure or site is returned to the way it initially appeared nor to just one specific period.

Restoration work in general can be defined as either composite restoration or period restoration.

Composite Restoration

In this form of restoration all significant architectural features from all historical periods are left intact. With this form of restoration — also known as “Principle of Equivalence” — the process becomes one of revealing the continuity of the history of a building. Newer material which is judged to be of little or no value may be removed if this will expose intact historical features of greater value. Missing elements may be replaced, but only when this does not obscure the historic fabric. This approach, which is recommended for most restoration projects, requires a concerted effort at research and documentation.

Period Restoration

This is a more extreme form of restoration in which a building or site is

returned to its appearance at an earlier time. Period restoration — also known as the “Principle of Preference” — or “Unity of Style” is an exacting intervention that should be used *only* when a compelling case can be made for it on the basis of the exceptional architectural, historical or cultural importance — and consequent educational value — of the state to which the building is to be restored, or when the removal of later additions will reveal the unity of the original work. Material and components which have been added since the period to which the resource is being restored may be removed — even though they may have historic value in their own right — and missing elements may be replaced. There must be sufficient evidence to allow restoration without conjecture. And all material which is removed must be properly documented.

Combining Approaches

A restoration, whatever the form, is rarely if ever a “pure” restoration. Many different levels of intervention are usually required. For example, even when a compelling case can be made for returning a building to the unity of appearance it had at a particular time in the past — that is, when the intervention is a “period restoration” — it may be necessary to reinforce historic structural elements (“consolidation”), upgrade entrances, exits and services (“rehabilitation”), replace missing elements (“replication”) and perhaps rebuild a long-demolished appendage (“reconstruction”).

The most important consideration at every stage of the restoration process is to respect the integrity and the authenticity of the historic building or site. To achieve a true restoration, this respect cannot be compromised.

2. Principles of Restoration

The following principles apply to the restoration of historic buildings and sites in British Columbia. The principles incorporate the six principles of conservation contained in *Principles of Heritage Conservation*, the introductory volume to the Heritage Trust's conservation series.

The principles of conservation and restoration should be followed in the planning and implementation of all restoration projects. They should also be used by heritage groups and municipal and provincial planning agencies to assess and review the proposed restoration of historically and culturally significant heritage buildings or sites in British Columbia.

The restoration principles are similar in spirit to other widely accepted sets of principles, including those outlined in ICOMOS's *Venice, Burnt, and Appleton Charters* and the U.S. Secretary of the Interior's *Standards for Restoration*. The principles presented here, however, are directed towards the restoration of British Columbia's built heritage.

General Conservation Principles

- ◆ All heritage conservation work, whether it be on a building, monument, or site, should be based upon and preceded by sufficient historical research, site analysis and documentation to identify and safeguard fully the heritage values to be conserved.
 - ◆ The evolution of the structure(s) and the site should be respected. The contributions of all periods are important to the historical development and merit retention. Decisions about appropriate levels of intervention shall be based upon the heritage values of each contribution.
 - ◆ Long-term protection of the historic resource should be identified prior to undertaking any work.
 - ◆ The approach to all heritage conservation projects should be one of minimal intervention to ensure the maximum preservation of the existing and authentic physical fabric and the retention of the signs of age (also known as the patina).
 - ◆ Conjecture and the falsification of building elements should be avoided in all heritage conservation projects.
 - ◆ A well-defined maintenance plan should be clearly established in order to prepare for an appropriate level of maintenance and care upon completion.
-

Specific Restoration Principles

- ◆ The goals of all restoration projects, including the use to which the building or site will be put, must be clearly established prior to commencing work. If it is appropriate, for compelling interpretive reasons, to undertake period restoration and establish an earlier time to which the building or site is to be restored, this must be determined at this time.
- ◆ Upon close inspection, new material which is part of the restoration work must be distinguishable from the original building fabric and historic additions.
- ◆ All work done to the historic fabric shall be reversible whenever possible, as it may be necessary or desirable in the future to alter or remove the restoration work for historic, aesthetic, or functional reasons. New work shall be designed in spirit and material so that it may be removed, leaving the essential form and integrity of the building intact.
- ◆ New or untested conservation products and methods should be avoided until their reliability has been clearly demonstrated so as to ensure that the restoration work does not inadvertently lead to accelerated deterioration of the historic resource.

3. Restoration Procedures

Restoring a building or site involves a particular process to ensure that the restoration principles are followed and that the work is carried out in the most thorough and sensitive way possible. The following are the steps involved in that process.

Deciding to Restore

Setting Restoration Goals

Recording

Site Analysis and Condition Report

Research

Building and Site Stabilization

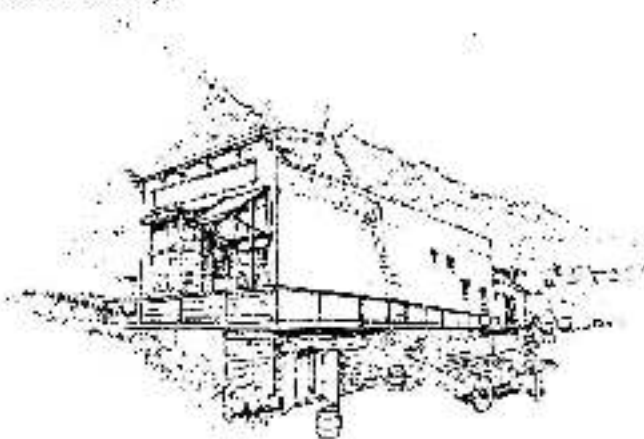
Balancing Restoration Goals and Building Code Requirements

Project Design

Construction

Ongoing Maintenance

Although the steps are listed in the order in which they should be undertaken, some recording, site analysis and condition report and research — for example, will usually be carried out concurrently.



Deciding to Restore

The first task is to decide whether to restore or whether another approach or approaches would be more appropriate. This process involves establishing the following factors:

- ✧ Adequate information, in terms of both documentation and physical evidence, is available;
- ✧ The proposed use is compatible with the nature of the restoration work;
- ✧ There are sufficient technical skills, money and time to do the work; and,
- ✧ There is a compelling reason — or reasons — that justifies the highly specialized restoration approach.

At this stage, a statement of historical, architectural and cultural significance should be prepared, outlining the reasons why the resource has heritage value. This statement will provide justification for the restoration and begin to indicate areas where documentary research and physical investigation should be concentrated. The statement should answer the following questions:

- ✧ Is the resource significant for its architectural, cultural, historic or archaeological value?
- ✧ Why is the building or site being considered for restoration: to enhance its value for commercial purposes, for educational purposes, as an attraction, or for other reasons?
- ✧ Is the condition of the structure good enough to warrant — and enable — restoration work?

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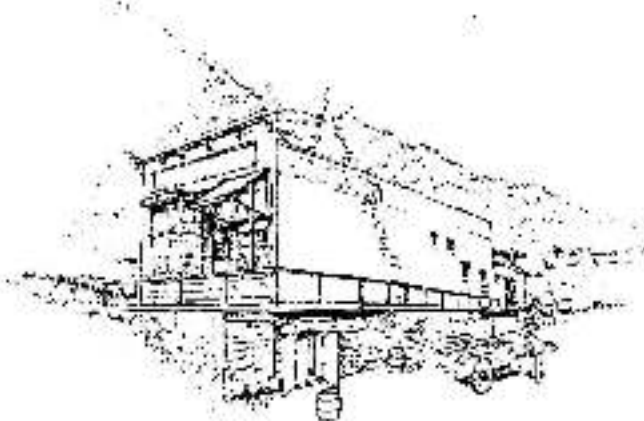
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Setting Restoration Goals

Once the decision has been made to restore a building, site or structure, it is important to then establish the goals and objectives of the project. These will guide the restoration work and provide a planning framework for future decisions.

◆ Type and Condition

Setting project goals involves looking at the restoration opportunities that exist and the subsequent challenges they present. Certain factors must be identified and analyzed in order to determine the extent of restoration that is both desirable and feasible. These include, but are not limited to:

- ◆ Building type (residential, commercial, industrial, other)
- ◆ Historic, architectural or cultural significance
- ◆ Extent of the changes and/or additions
- ◆ Building or site condition
- ◆ Site features and setting (original or moved)
- ◆ Parks and landscapes
- ◆ Surrounding areas and the degree of change to the site since the original construction
- ◆ The amount of documentation available on the period to which the building and/or site is to be restored.

Since restoration work cannot be based on conjecture, this latter factor is extremely important and will determine the extent of restoration work that is possible.

◆ Intended Use

It is essential to determine the ultimate use of the building or site before detailed planning starts since many design decisions will be based upon the intended use. One of the main factors to consider is code compliance. Since use determines classification under the building code,

intended use must be established at the outset in order to take into account the applicable code requirements — fire separations and exits, for example — in the planning stage. In a restoration project, the objective is to carefully balance alterations required to meet code regulations with the need to safeguard historic material. Other factors which relate to use are future management and ongoing maintenance needs.

The intended use should be compatible with the nature of the building so that minimal intervention is required (Conservation Principle Four). Preference should be given to reinstating the original use of the building wherever feasible. Should this not be feasible, then it is important to find a use which achieves a balance between the protection of the building fabric and the demands of the new use (Conservation Principle Three).

In cases where the intended use is not readily apparent, options for future use should be carefully assessed. Considerations should include some of the following:

- ◆ What was the building and/or site used for during the period to which it is being restored?
- ◆ Should this become the new use? What is the most appropriate new use?
- ◆ What are the needs of the surrounding area?
- ◆ Should a market analysis be undertaken?
- ◆ What are the financial implications of the various uses?
- ◆ What are the technical constraints?
- ◆ Can these uses be changed at some future time?

◆ Technical Expertise

Every project will have its particular requirements as far as technical expertise is concerned. The personnel required will depend to a large extent on the nature and extent of the restoration project. The range

of professional skills which are most often required for restoration projects include the following:

- ◆ Architect (preferably a conservation architect with specialized conservation training and expertise)
- ◆ Historian and/or architectural historian
- ◆ Preservation technologist
- ◆ Structural engineer
- ◆ Mechanical/electrical engineer
- ◆ Building code specialist
- ◆ Landscape architect
- ◆ Archaeologist
- ◆ Recording specialist
- ◆ Cost consultant or quantity surveyor
- ◆ Contractor with experience in restoration
- ◆ Craftspersons and sub-trades with traditional skills

The coordination of all professions requires strong project management. Especially in the case of large, complex restorations, decisions that will affect the outcome of the project should be made by representatives of the various disciplines, perhaps within a committee-like structure under the direction of the project manager. It is within such a forum that philosophical and technical issues are dealt with best.

For any project to succeed as a restoration, it is essential that all professional and technical participants be committed to respect the conservation and restoration principles.

◆ Budget and Time

Restoring a building or site requires sufficient financial resources to do the work in an appropriate manner. Budgets are too often inadequate. As a result, there may be pressure to compromise standards or omit vital parts of the project. The establishment of a budget, therefore, that realistically anticipates the needs of the project is essential. This budget will also be useful if

fundraising is required.

If funds are limited, then a realistic analysis should be carried out to define the options. It may be possible, for example, to undertake the work in phases, room by room, as money comes available. If funds are too limited, then it may be best not to attempt a restoration. A good rehabilitation may be better than a bad restoration.

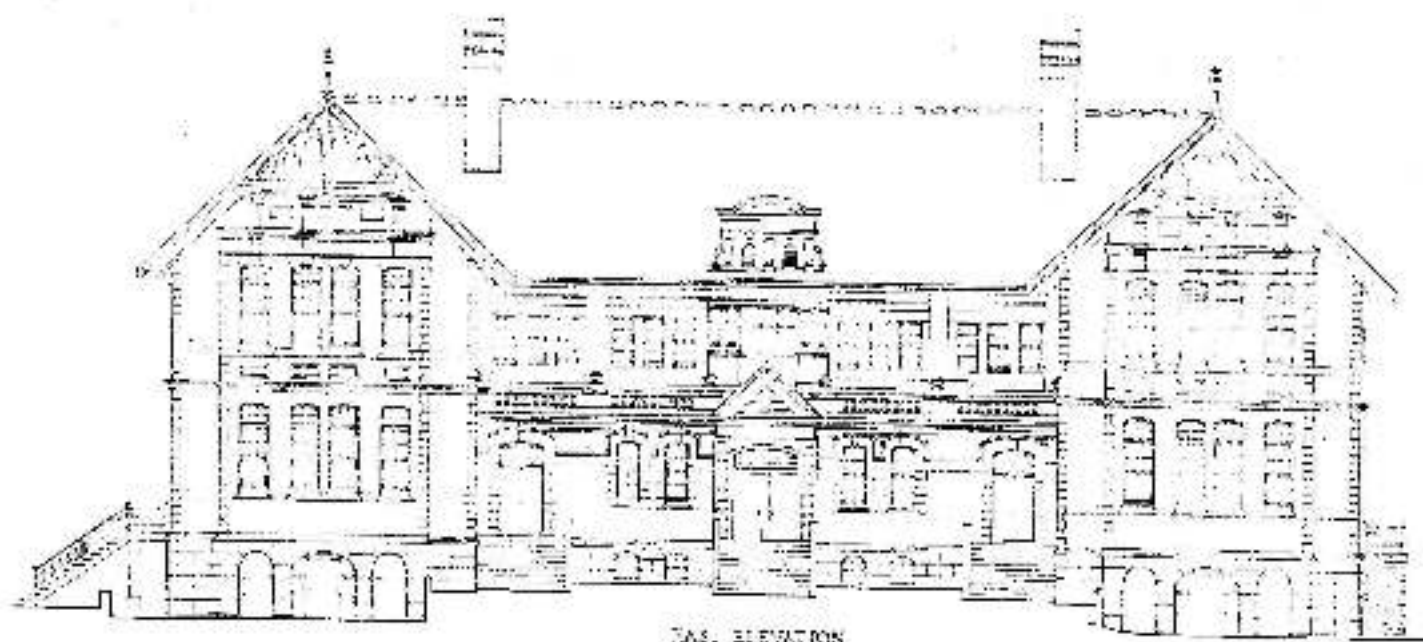
Once the project begins, sufficient time must be allocated to allow each step in the process to be done properly. The project manager should prepare a schedule indicating what is happening and when, and must insist that each participant meets the established deadlines.

◆ Interpretation

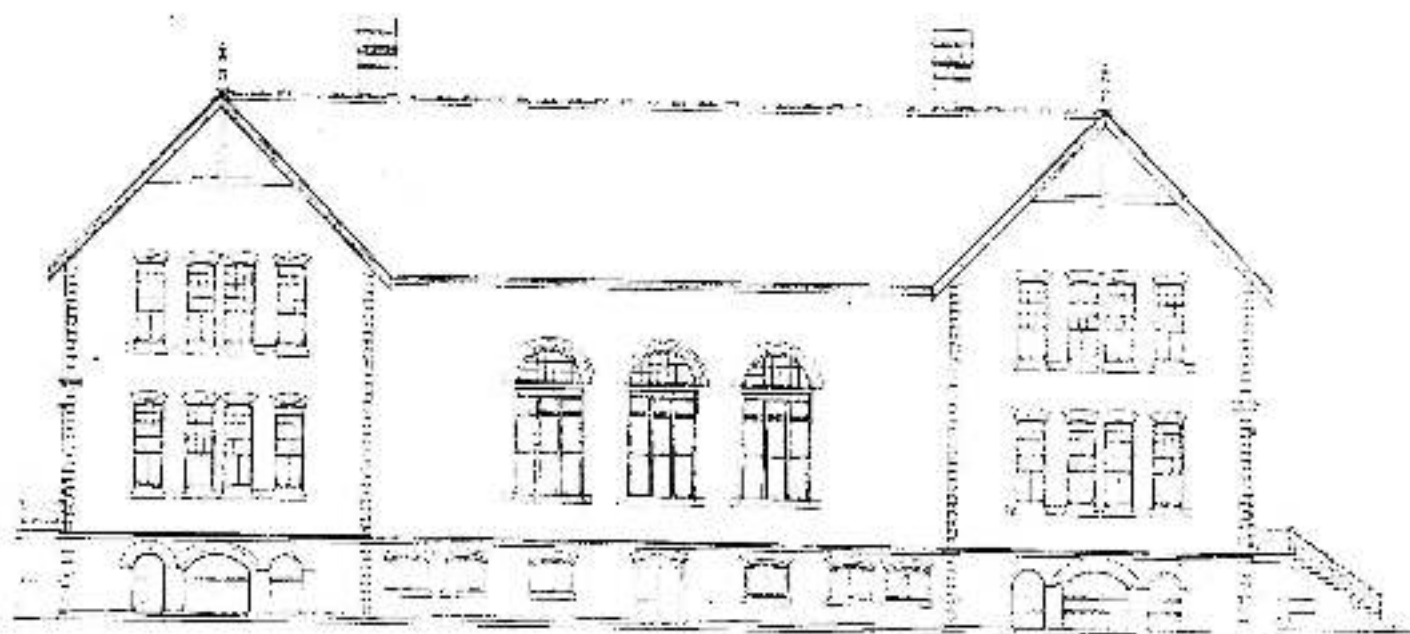
Early planning should take into consideration the goals of future public interpretation programs. These programs will require planning in themselves and will play a role in identifying the potential impact — and potential need — of restoration interventions. Factors that should be taken into consideration in terms of public interpretation include displays, lighting, environmental controls, security, washrooms, live and static loads, handicapped ramps and storage.

◆ Social Context

The needs of current residents and users of a building or site should be considered when establishing restoration goals. The displacement of residents may occur when insufficient care is taken to ensure that their needs are met. Although social contexts do change when buildings and districts are conserved, this should not be done at the expense of the resident population.



EAST ELEVATION



WEST ELEVATION

Recording

As stated in the first conservation principle, restoration must be preceded by careful research and documentation. Since recording and documentary research complement each other, they should be undertaken concurrently.

The structure and the site are together the most important primary resources available. Since restoration means returning the building or site to an earlier appearance, it will never be the same as on the day before restoration work commenced. Therefore, it is essential that a detailed as-found record of the resource and its context be made at the outset.

Creating the as-found record (or extant record) involves the preparation of a thorough set of drawings, photographs and notes of the building and site in their existing form and condition. A set of as-found records commonly includes the following:

- ◆ Measured drawings
- ◆ Sketches
- ◆ Photographs
- ◆ Field notes
- ◆ Site plan
- ◆ Details of significant features
- ◆ Descriptions of portions which have been altered
- ◆ Samples of surface finishes which may be restored

The extent to which the resource should be documented depends upon many factors, including the goals of the project, the heritage value of the building and the skills and funds available. The items specified above will suffice for many projects. Some government agencies, such as the Canadian Parks Service, are in a position to record buildings and sites in a very detailed manner using the most sophisticated techniques available. A local heritage society or a private property owner is not likely to be able to afford, nor to need to undertake, so detailed a recording process.

The as-found record should be objective and avoid speculation; irregular and broken elements should be documented as such and missing components should not be shown as if they were there. Recording is an analytical, not a conjectural process. A comprehensive discussion of recording techniques can be found in Robert Patterson's *Manual for the Preparation of "As Found" Drawings* published by the British Columbia Heritage Trust.

A project file should be set up as a permanent record into which information is added on a continual basis. Separate from, and subsequent to, the as-found recording is a process of ongoing recording of the restoration from start to finish. The project file documents the work and the continual changes to the building and site. It can also take the form of a daily journal supplemented by photographs, sketches and film or video documentation. Ongoing recording may begin when temporary stabilization measures are in place and should continue systematically through to project completion.

The permanent record will be particularly useful if there is to be a publication or exhibit upon the conclusion of the project. Gathering photographs, making sketches and otherwise recording the activity on a daily basis is much easier than attempting to recreate the process after completion.



Site Analysis and Condition Report

Once the existing state of the building has been recorded, it is time to undertake a more analytical investigation. An architect or architectural historian will try to explain the clues and anomalies revealed in recording — variations in nails or hardware, for example, or 'ghost' images of former structural members.

An investigation should be made of the building's structural, mechanical and electrical systems and an assessment made of their value and their potential for re-use. This work should be done by engineers, preferably those who are experienced in historic construction. If possible, a close inspection could be made as well by a restoration technologist who is trained to diagnose problems which may be prevalent in older materials, structures and systems. The data will usually be presented as annotations on a set of as-found drawings and may be supported by field notes.

Information regarding the condition of the building should be collected in a condition report. This report becomes an important resource document during the subsequent project design phase and should be added to the project file. A carefully prepared condition report provides a thorough understanding of the physical fabric and helps to develop a program that addresses key problems and proposes solutions that entail minimal intervention.

Since buildings do not exist in isolation, the entire site merits careful analysis. The general character of the property and the site features which are present or which evidence shows were once present — such as fences, walls, vegetation, topographic features, roadways or outbuildings — all contribute to the overall appearance and may themselves have heritage value. Adjacent land use, services, views and boundaries should be reviewed, as should public access to and from the site.

Archeological and environmental assessments, if necessary, should also be undertaken at this time. This will help to plan the scope of the entire project and may increase the understanding of the building or site, particularly if historic documents are scarce, contradictory or confusing. Locating the original foundations, for example, will indicate historic configuration(s) of a building.



Research

A sound knowledge of the building's history is as important as familiarity with its fabric. Thorough research on the building, its occupants, its uses and its builders is essential to identify and safeguard the heritage values to be conserved (Conservation Principle One). Research and a site investigation analysis should be done concurrently as they are inter-dependent. In the initial planning stages (*Deciding to Restore* and *Setting Restoration Goals*), general research is required to provide the historic information necessary to justify restoration and to establish the restoration goals. In the further stages of research, the information required becomes much more detailed.

❖ Site-Specific Research

Thorough research provides an understanding of the building and/or site's history, development, use and context through the years. Every change to the building should be documented as well as possible from available records. This will permit a soundly-based assessment of the nature and significance of every building component.

Research should be both historical and architectural. It may be done in libraries and in public and corporate archives and will likely involve studying both secondary sources (books, articles, newspapers and directories) and primary sources (maps, drawings, photographs, government and corporate records and title deeds), as well as first person interviews. *Researching Heritage Buildings*, by Margaret Carter, published by Parks Canada, is a useful manual on the subject.

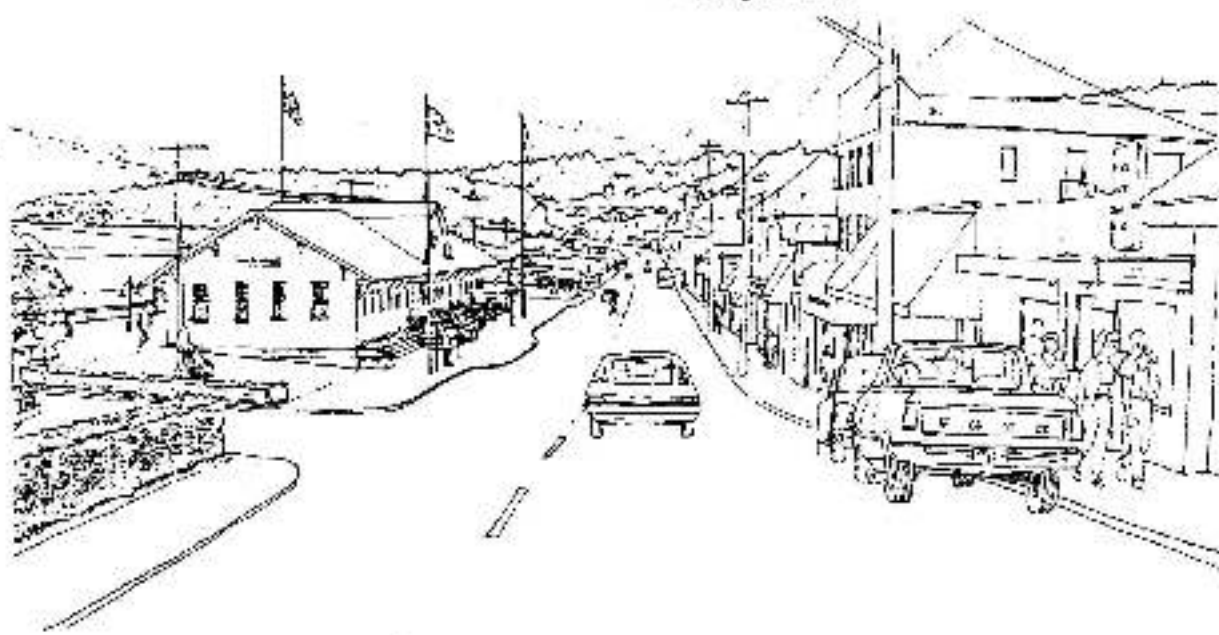
Proper documentation of all research material is essential. A detailed bibliography should be made of all sources and the likely accuracy of secondary sources should be assessed. A record of all resource people should be kept for future reference.

The careful synthesis and skilled interpretation of these different sources, aided by cross-references to the as-found recording and building/site analyses will lead to a comprehensive understanding of the property. It will help to explain the evolution of the resource and will lead to an assessment of the heritage value of 'the contributions of all periods' (Conservation Principle Two). Only sound research can allow the restoration to avoid conjecture (Conservation Principle Five).

It is this emphasis on historical research which distinguishes restoration from the other, less rigorous levels of intervention. Even though the two standards cited above are applicable to all heritage conservation projects, they must be applied particularly strictly to restorations.

Research is best undertaken by a professional historian and/or architectural historian. Major decisions will be based on this research and the more expert the research, the more dependable the results.

The building and site history, the condition report and an assessment of the findings of the as-found record are usually collected and presented as a *historic structure report*. This is a compilation of the research and the documentation required to meet the standards set by Conservation Principle One.



Building and Site Stabilization

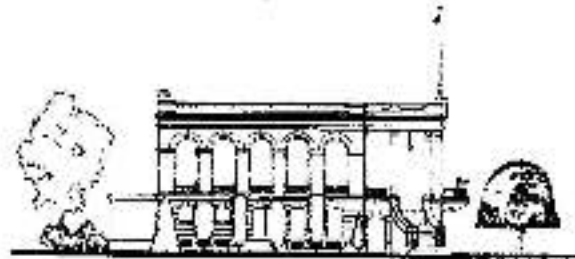
A building may have to be temporarily protected or stabilized prior to restoration. This is particularly important when detailed recording is underway in order to protect the building and site from further deterioration. Curious onlookers may wish to investigate the work, but this should be discouraged since it may be hazardous and it risks destroying historical evidence.

Simple precautions can be taken to avoid this. Examples include installing a fence around the property, putting up signs to deter casual visitors from walking through the site and protecting exposed areas from the elements.

Temporary stabilization measures may be relatively minor, such as shoring up a staircase. In other cases, more elaborate measures may be necessary, such as installing additional joists to support a floor. Regardless of the type of interim measures required, the temporary work should be based on the conservation and restoration principles. In particular, the work should be reversible and untried techniques should be avoided so as not to accidentally compound existing structural problems. These temporary measures should not leave permanent marks on the structure, nor should they inhibit the other phases of the restoration process.

Additional temporary stabilization measures may be required later during the construction phase. For example, a facade may require shoring while the structural members that support it are reinforced.

In the process of protecting a structure, new information may be revealed about its construction. This should be added to the previously recorded information as a part of the ongoing recording process.



Balancing Restoration Goals and Building Code Requirements

Should the restoration project introduce a new, more intensive use than existed previously — for example, if a residence were to be adapted for commercial or public purposes — then it is likely that upgrading will be needed to meet the requirements of applicable building codes. The restoration project will then involve the delicate integration of historic material with the necessary upgrading of structure, services and access. In some cases, a balance is not possible and a decision will have to be made as to whether the new use or preservation of the historical fabric will take precedence. If continuing functionality is more important, the project should be considered a rehabilitation, not a restoration.

Historic buildings rarely comply with current building codes, particularly with regard to life safety, access, exiting and resistance to earthquakes. Some municipalities have recognized some of these discrepancies by allowing certain equivalences for historic materials to meet current standards. For example, the continued use of historic unstamped lumber is permitted if it is of sufficient dimensions and in good condition. Discussions with municipal building officials and fire inspectors early in the the project design stages will help highlight areas of concern and may reveal certain alternate solutions.

A structural engineer and/or architect will be required on projects of a certain scale and those which involve access to the public. These professionals will determine

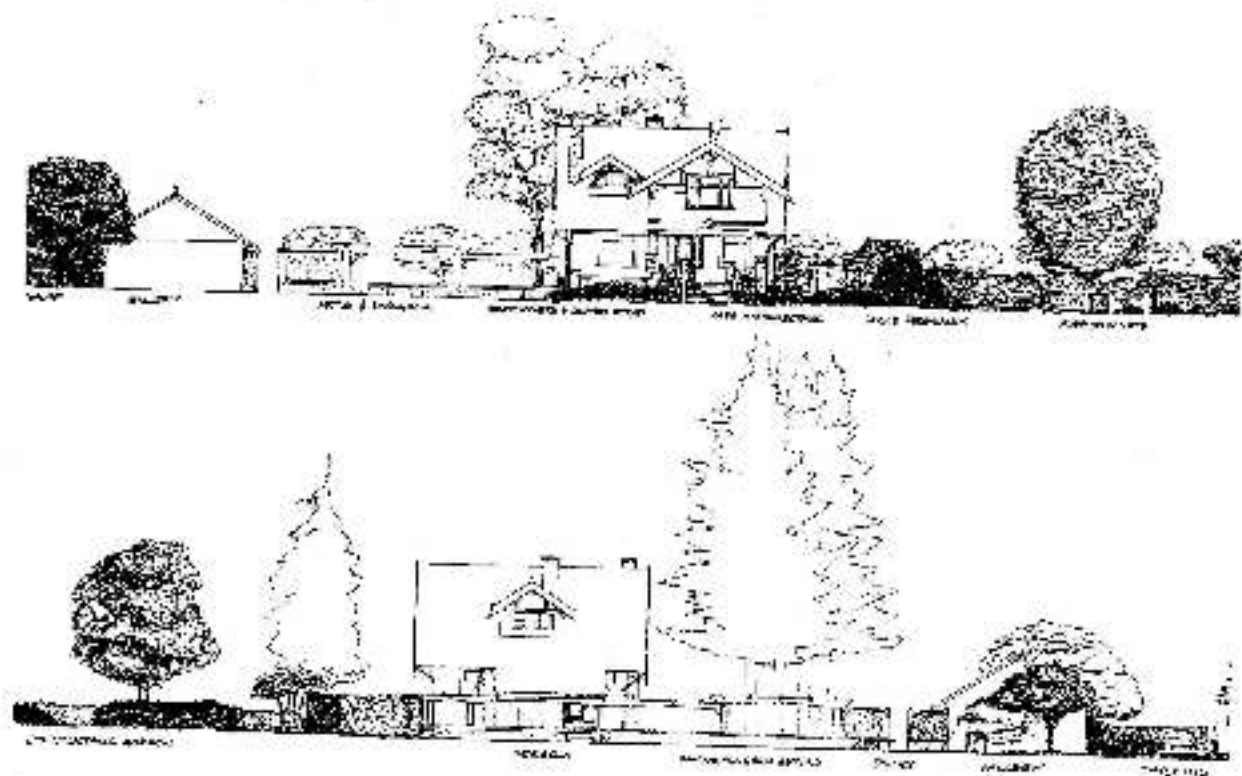
the extent of the structural upgrading needed to meet public safety and seismic requirements and the amount of reinforcing needed to meet new uses and loads. Elements of structural consolidation should be inserted in a sympathetic and unobtrusive manner that respects the protection of historic material.

Historic systems, such as elevators, lighting and heating devices, should be retained if they contribute to the historic value and character of the building. If possible, they should be maintained in use. Should it not be possible to retain or repair an existing part of the electrical system due to technological changes or the need to comply with current building codes, then it may be appropriate to replicate or recreate parts, such as light fixtures. Replication should be done only when the original or subsequent component no longer exists and when sufficient evidence of its appearance is available to avoid conjecture.

Provisions for disabled access, if required, should be co-ordinated with the visitation/interpretation plan and be treated in a manner that is distinguishable, reversible and unobtrusive.

New mechanical, electrical and fire-protection systems should be installed in an unobtrusive manner. There may be cases where exposing new mechanical, electrical and protection systems may be preferable to causing damage to historic material in the process of concealing this work. For example, it may be best to expose a new sprinkler system so as to avoid damaging an historic decorative wall surface. Work should be based on the goal of minimal intervention. (Conservation Principle Four).

Environmental upgrading (heating, air conditioning and humidification) should be done with care to avoid damage to historic fabric. Consideration should be given to the impact of equipment vibration, condensation, high diurnal changes in relative humidity and other negative effects. Attempting to achieve high environmental standards (whether for human comfort or for museum use) may sometimes do irreparable damage to an historic building. Poor retrofitting may create condensation problems that eventually cause severe rot and deterioration.



Project Design

Project design is a central aspect of any restoration project. Though this important and complex activity is not the subject of this volume, it is appropriate to review here those restoration principles which must guide the design process.

The project design phase represents the realization of all preceding work. It permits the sensitive revelation of the significant features of the building or site. There must be a balance between retaining the integrity of the resource and meeting utilitarian requirements. This balance must be achieved in a harmonious manner, respecting the historical evolution of the resource and not creating an appearance which may never have existed.

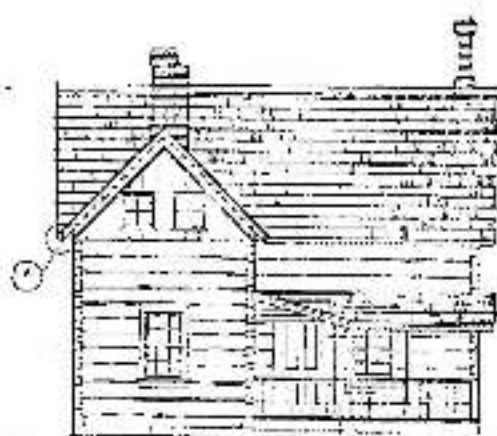
New design work should not overwhelm the building or site. It should blend in and at the same time be distinguishable as a chapter in the history of the property (Restoration Principle Two). This applies whether the new work involves simply replacing a missing part of moulding or adding an elevator tower for disabled access. Distinguishability prevents the obliteration of evidence from the past.

Restoration Principle Three requires that all restoration work be reversible whenever possible, so that if necessary it may be removed later and will leave "the essential form and integrity of the building intact".

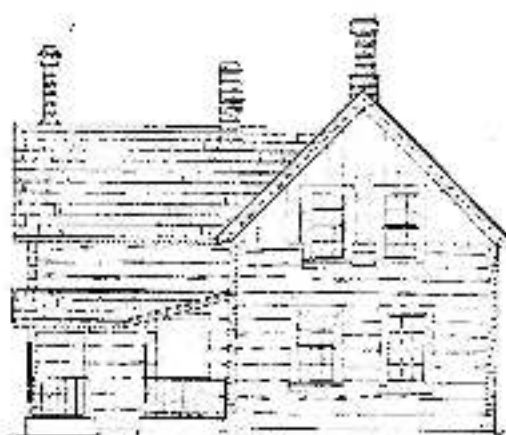
This objective is achievable some of the time — such as by adding new decorative detail or using new finishes that are easily removable. However, reversibility may be more difficult or even impossible to achieve when work involves a structural member. Decisions as to the relative importance of reversibility, structural integrity and cost will have to be made on a case-by-case basis.

No restored building should appear to be older than it ever was, nor should it be embellished with decorative features which belong to another era or location or bear the conspicuous marks of the contemporary era. Instead, there should be a subtle revelation of the significant values which have been uncovered during the restoration process. Achieving this balance is not always easy and requires a considerable amount of foresight and planning.

Restoration Principle Four cautions against the use of new or untested products and methods. Many new technical products are on the market — preservatives, consolidants, adhesives, cleaners and more. Some are excellent, but many promising ones are so new that their long-term behavior has not yet been assessed. Some may prove in the long run to cause damage to structures. A valuable historic building should not become a laboratory for testing materials. Designers should specify materials and techniques whose properties are known.



EAST ELEVATION



WEST ELEVATION

Construction

Construction, like design, lies outside the scope of this publication. It is important to ensure that the project is executed with an appropriate form of contract management which safeguards the historical fabric as well as the budget. The best intentions and planning cannot replace good workmanship and attention to details. Tradespeople and contractors with experience working on historic buildings and sites should be sought when available.

Ongoing Maintenance

Providing a plan for the ongoing maintenance and protection of a building or site is the best long-term investment in heritage conservation. This should be a prime concern for all projects, particularly those which receive public funding and are open to the public. There is a justified expectation that buildings will retain their restored condition and will not deteriorate to the same state in which they were when the project commenced. To ensure that the restored structure does not deteriorate, a maintenance plan should be established as a routine part of the restoration work. This will give consideration to such diverse activities as sweeping to prevent grit from abrading the floors, painting to protect wood surfaces from the weather and watering and pruning plant materials.

This plan should specify the type, extent and frequency of regular maintenance work. The amount of detail contained in the maintenance plan will depend on the scale of the project and the resources available. Scheduled periodic or 'cyclical' maintenance will reduce future repair needs and keep costs down since it will avoid the deferral of maintenance which would lead to accelerated deterioration.



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