Visual approaches and results

Principles

1.3 Balance of use and preservation (cautious conversion)
2.6 Second opinions when in doubt
3.2 Thorough and documented research
3.5 Specifics of uniqueness (pattern, ensemble, detail)
3.6 Maximum information content/conservation of complexity
4.1 Respect for (natural) aging process
4.2 Respect for period/historic continuity, sequence
4.3 Respect for accumulations
4.4 Respect for uniqueness (pattern, ensemble, detail)
4.6 Minimal conjecture/informed invention
5.7 Reconstruction for wholeness
5.8 Moving as last resort
5.9 Façadism as last resort
8.1 Distinctive new work
8.2 Added value (high quality) in new work
8.3 Complementary additions
8.4 Independent additions

References

For general principles of integrating or contrasting old and new, see BRAN94, EDWA46, ICOM86, LYNC72, LYNC76, NATI80, PYE78, RENY86, SCHO82, TECH82 and ZEIS84. More specific attention to townscape is given in BENT85, COHE99, CUMI85, GOON80, HILL82, LENC82, NATI80, HOLD85, PRE70, PRIZ75, TUGN87, WARR98 and WORS69.

The individual fit or neighbourliness of additions or adjacent buildings is discussed in varying aspects in BYAR98, DIBN85, DUTO85, ICOM86, HOLD85, HOW86, NATI80, SHOP86, STEP72, TECH82 and THOR84. For guides to historic styles and features see, for instance, BLUM77, CHIT85, GOWA92, KALM00 and POPP83, as well as other sources noted in "Elements and styles" (page 20).

A visible respect for history

For every conservation project, from the smallest to the largest in scale and expense, there must be consistent and conscientious design, maintaining architectural character in the face of change and respectfully relating old to new. Among the great dangers of conservation treatments is over-enthusiasm — replacing too much, cleaning too well, making a falsely historic appearance in an attempt to recover the feeling rather than the truth of the past. This caveat applies to whole projects, not simply new additions inside or out (see VISUAL HARMONY AND GOOD FIT).

- ❖ Base all designs for replacement or restoration of former features on dependable documentary evidence, distinguishing clearly between features demonstrably part of the building's history, and those that informed experts think existed in that place in the past, but cannot be fully substantiated.
- ❖ Generally, assemble research and inspection information and develop approaches to conservation and existing or new use that aim at a specific and well-crafted final appearance for the job. This means taking a respectful approach to past work combined with intelligent, high-quality new work. The final look should reflect history as a continuum that includes original material and craft, worthy past modifications, and the new work. This entire ensemble will be the future's inheritance.
- ❖ Consider design approaches and existing components according to features of the old and the planned:
  - ❒ Space: the arrangements of rooms, their linkages to interior circulation and exterior views
  - ❒ Mass: profiles, skylines, shades and shadows
  - ❒ Colour: hues and shades as perceived, together with evidence of historic colours
  - ❒ Material/texture: visual, tactile, thermal, acoustic, both historic and contemporary
  - ❒ Light/lighting: natural and artificial, historic and modern, comfort and utility
  - ❒ Furnishings and fixtures
  - ❒ Architectural details
  - ❒ Signs
  - ❒ Mechanical equipment
- ❖ Pay close attention to junctions of old and new, to whether joining will pay most respect to one or the other.
- ❖ Consider carefully the relative independence of old and new portions of the work, especially how they are visually dependent or independent.
- ❖ Be especially careful not to obscure signs of age and irregularities found in the dimensions and materials of older work.

Modes of historical respect

Adopt a mode of respect that is unambiguous, whether clearly contrasting or clearly "snuggling up". The following approaches are part of a continuum of possible ways to design successfully with the old and so should not be considered exhaustive. But the approach used should be generally consistent throughout a project.

- ❖ Take into account the robustness or delicacy of historic style and use — whether by matching or contrast, the historic character must not be overwhelmed by repair, modification or addition. For instance, buildings with relatively robust exterior wooden mouldings and carvings can be made to look lacy and delicate by inserting heavy new elements; this would distort the character of the existing work and should not be done.
- ❖ Examine historic precedents for clues to appropriate conservation strategies and the mating of old and new. Needs to modify, expand, or build next to existing buildings are by no means new, and there are many examples, both good and bad, of how these have been satisfied. Most common is the service wing or "kitchen tail" of older dwellings — the tail may be a simple box, or a reduced but decorated version of the main building, or it may be the original house itself, with the larger front portion being the true addition.

Reconstitution/ period reproduction

Integral respect for the old; choice of new colours, materials, etc. subordinated to the historic architectural character; new functions adapted rigorously to existing and former spaces and details

- Conjectured restoration must not be confused with accurate reproduction of missing features. Handling of details or materials may evoke a period but must not masquerade as that period. This requires informed judgement on the part of designer and observer.
- Specify and use wherever possible the same materials and techniques used for original or early repair work.
- Do not artificially age (chemically or physically) reproduced or restored features. Patina and apparent age distinguish old and new; the new materials will age gracefully in their own time, as did the originals.
- Be faithful to the dimensional modules of the original; these are seldom exact, according to modern practice, and certainly not metric.

Approximation/ complement

Identification with the essential genius loci of the place, using its unique patterns of profile, massing and form as design cues; a more integrative meshing rather than a detail-by-detail matching

- Understand and use the place's overall patterns — symmetries, framed views, hard versus soft textures, arrangements of natural lighting, and so on — to guide design for missing features or new additions.
- On those rare occasions where the original design was only partly completed and plans exist for a completed version, consider completion of the original design only as filling in an overall pattern; do not allow the final look of the project to confuse the true historic building with a new extension or infill.

Cautious contrast/ self-effacement

Departure of the new from the existing, from an analysis of existing spaces and materials, implying old and new are correlated, in context with each other

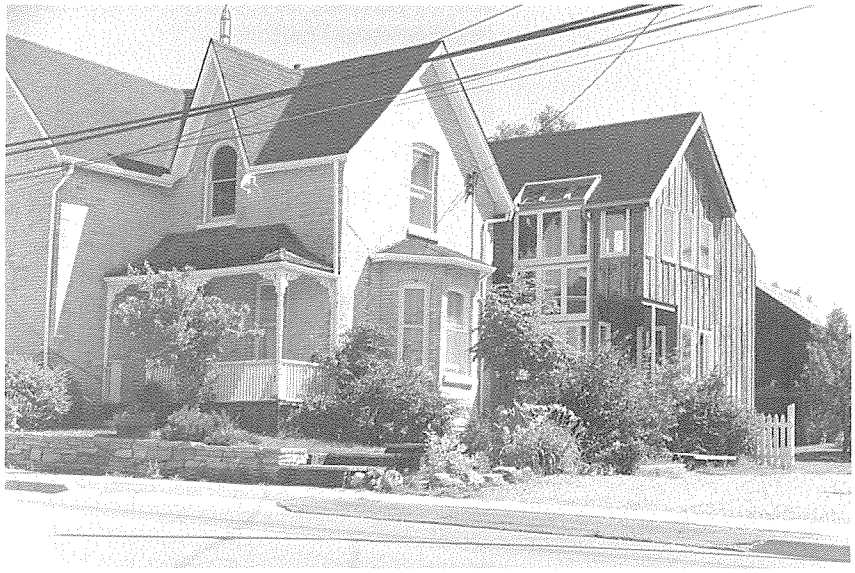
- New, contrasting work should clearly defer to the old, in scale, colour and detail. The new should be sympathetic and harmonious, taking its cues from good work already there.
- Where new work will appear greater in quantity overall, it should be designed as backdrop to the old, through judicious use of axes and viewpoints and through the patterns of access to and within the completed project.
- Consider contrasts as matters of degree; there should be correspondence even in contrasting details. For instance, where new or replacement trim is not to be as ornate as surviving originals, perhaps evoke the originals through painted colour, shades or patterns, even artificial lighting.

Distinct contrast

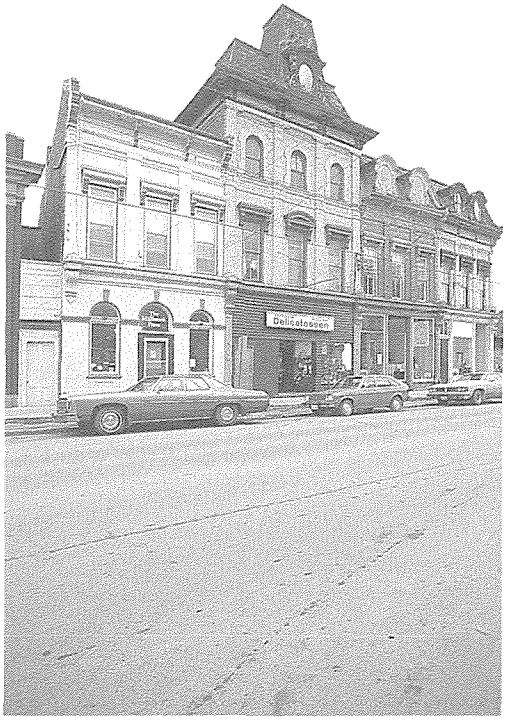
Affirmation of the new vis-à-vis the old, as more or less equal partners, but with due respect to the old

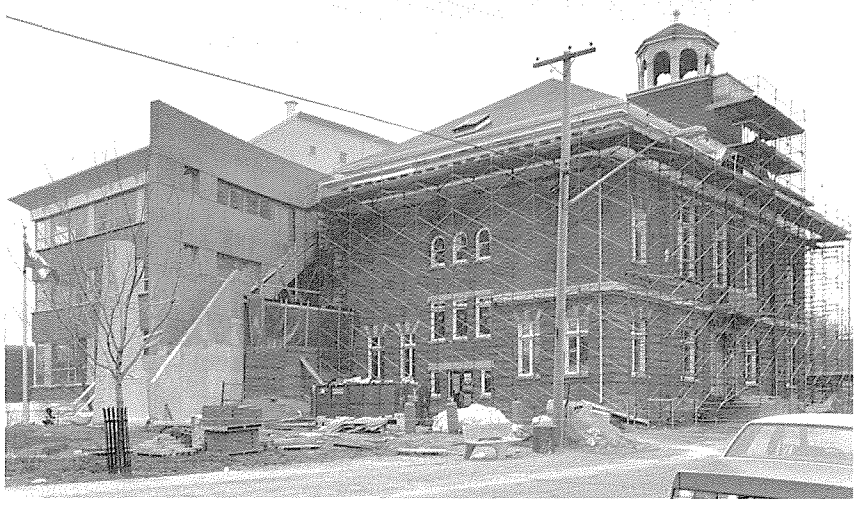
- Whatever design strategies are used to contrast old and new, the new must not trivialize the look of the old.
- Even the most radical contrast should acknowledge the feature of the old to which it should be related; new elements or new substitutions for missing elements must line up properly, obey patterns or rules that guided the original, and emerge from what exists rather than ignoring what exists.

When existing buildings are more or less free-standing within a larger space, it is especially important to respect their fundamental forms (especially how they are seen against the backdrop of sky and surrounding landscape) when repairing, adding on, or building adjacent — whether by conscientious mimicry, approximation, or cautious contrast (right).

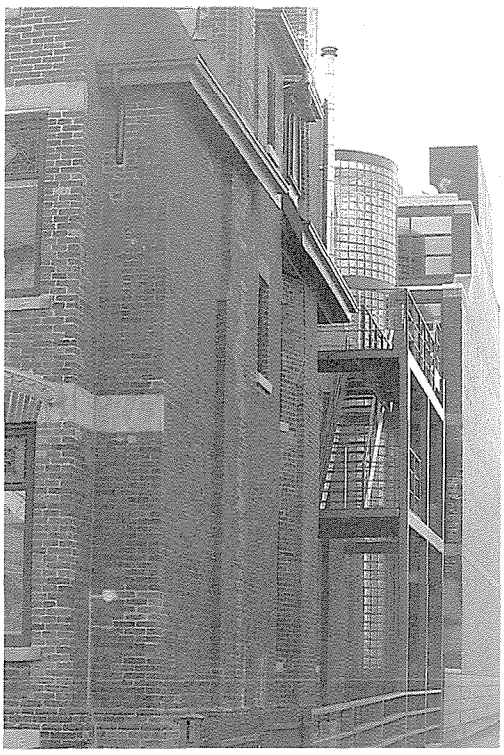


There are many historic examples of matching or filling in street frontages that managed to accommodate additional storeys without trivializing adjacent buildings or the façade beneath.





In built-up urban areas where buildings are generally consistent in overall form, it is possible to work with what exists with more deliberate contrast. Each of these projects introduced new elements — some cautiously, some dramatically — while maintaining the scale and rhythm of their surroundings.



Programming and using space

Principles

1.1 Planned conservation
1.3 Balance of use and preservation (cautious conversion)
1.4 Viable use
2.2 Co-operation among specialties
3.5 Specifics of uniqueness (pattern, ensemble, detail)
4.3 Respect for accumulations
4.4 Respect for uniqueness (pattern, ensemble, detail)
4.6 Minimal conjecture/informed invention
5.2 Fitting use of existing spaces
5.3 Minimal alteration, minimal intrusiveness
5.6 Minimal removals
6.2 Maximum retention
6.4 Respect for craft
7.3 Reversible repair
7.6 Maintainable repairs
8.1 Distinctive new work
8.6 Aided access
9.3 Emergency plan

References

For general considerations of reconciling the character of the old with the performance requirements of the new, see BENT85, ICOM86, LYNC72 and STAH84. Technical aspects of programming and re-use are covered in different ways in BUIL85, BUIL86, MARK79, NATI76, NIBS80, PARNnd, REAL81, SHOP86, STAH84, STEP72, VILA81 and WILL78.

Some explicit guidance for the tailoring of new functions to existing spaces may be found in BALL83, DIBN85, KAPL78/86, STAH84 and TECH82. There are case studies of good and not so good recycling in AUST88, BINN82, DIBN85, ELEY84, HOW86, ICOM86, KIRK84, MARK79, NATI76, NATI80, SHOP86, VILA81 and WARN78.

Matching needs and spaces

Architectural programming is the craft of determining the characteristics of the physical spaces required for the functions to be accommodated in a building. At its minimum, a program is a list of functions and the dimensions of the spaces needed to hold them. But there are many other needs besides "raw" space; a good program will describe lighting, access, acoustics, and other performance requirements that a designer must satisfy, for individual spaces and the overall result.

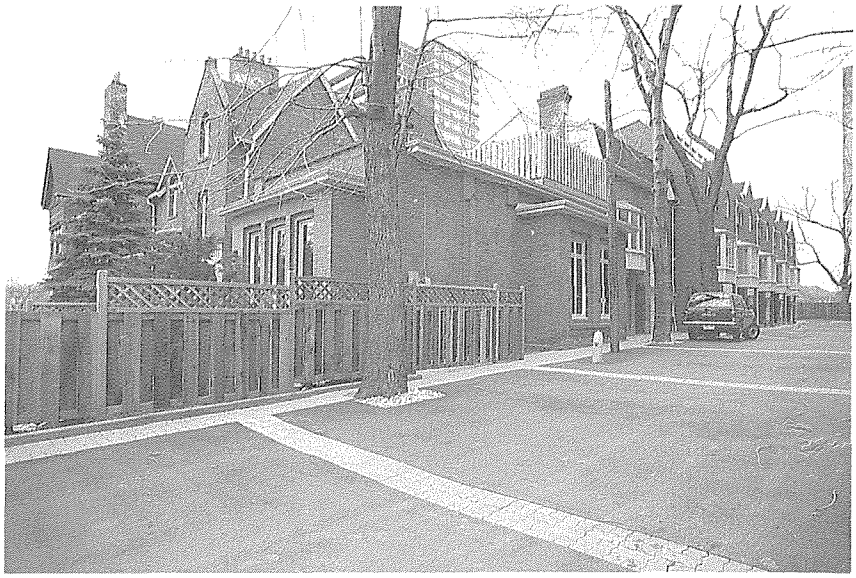
For conservation, the program for future use must be laid out with the existing building and its spaces in mind. The architectural program for continued or new use must be based on the assessment of architectural character (see INSPECTION). Some combinations of old and new cannot work without destroying the old, but that is rare; there are degrees of fit and adjustment, and these should be worked out to maximize the contribution and continued use of existing spaces.

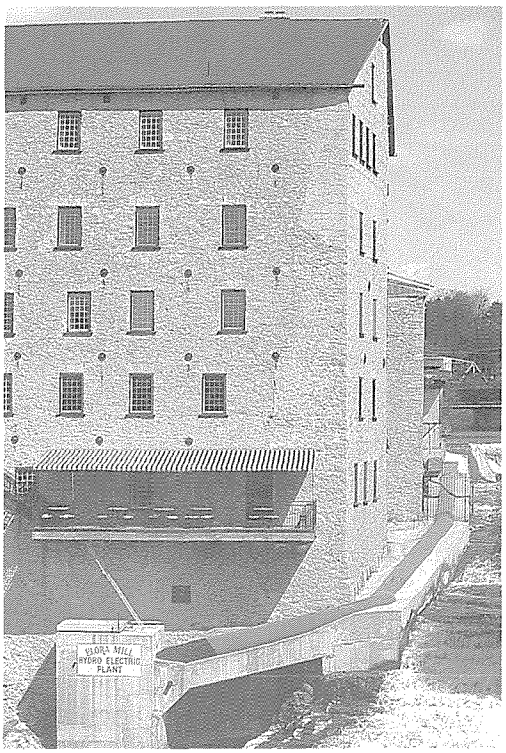
- As much as possible, maintain existing uses and/or users, or restore the original use.
- As much as possible, use existing spaces and access patterns without modification. There should be more flexibility in the use-program for an existing building than for a new one.
- Allocate new uses to existing rooms and spaces so as to incorporate and preserve existing finishes and fixtures. Keep in mind long-term maintenance and durability of historic finishes in new use. As much as possible, concentrate service spaces and areas requiring new finishes or considerable mechanical upgrading in one area.
- Take advantage of "happy accidents" and peculiarities of the existing plan to enhance the program; for instance, should rooms in large old houses be converted to offices, use built-in storage for electronic equipment or file storage.
- Decide which existing spaces can best accommodate physical change. Rank them according to distinctiveness, public accessibility and view, functional requirements for upgrading services, and so on. For instance, public entrances, lobbies, hallways and major public rooms with heritage value may be much less tolerant of changes than areas such as rented offices and service zones (see INSPECTION).
- If the use-program cannot be suited to existing spaces without severe compromises (of program or architecture) add new spaces outside the existing structure.
- Make sure that dimensions of new furnishings and fixtures will let them fit through non-standard doors and corridors and into non-standard room shapes and sizes.

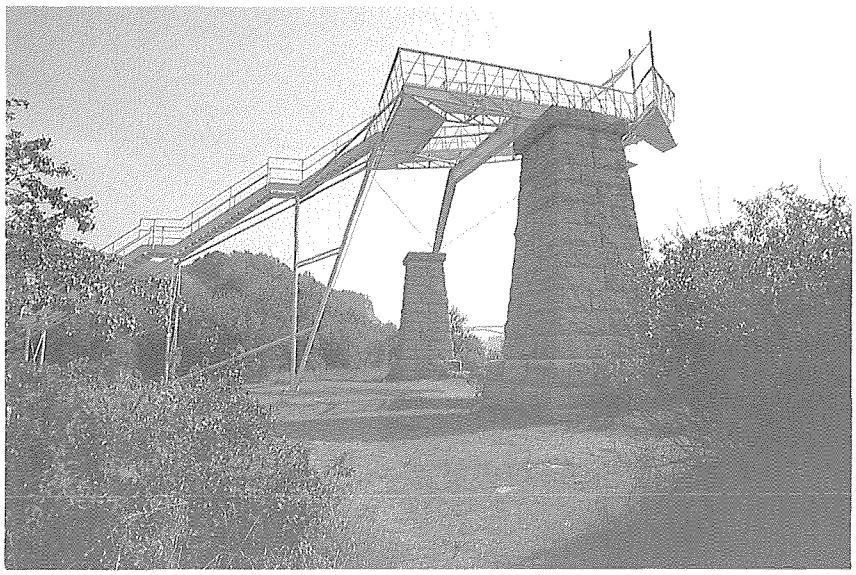
Old building, new performance?

- Upgrade existing structure, utilities, and so on as discreetly as possible, consistent with the chosen approach to fitting new into old (see VISUAL APPROACHES AND RESULTS).
- Maintain existing uses as much as possible; this will help restrict upgrading to repair or replacement of worn-out components.
- Locate new uses demanding structural capacity or occupancies beyond existing capacities on lower floors or in areas that can be upgraded without compromising or upgrading the entire structure.
- In upgrading or recycling do not follow a formula but look at existing conditions and the underlying rationale for upgrading. For instance, do not follow standard approaches to fire safety retrofit but carry out a life-safety study to customize retrofit requirements to the existing building (see CONSERVATION AT LAW).

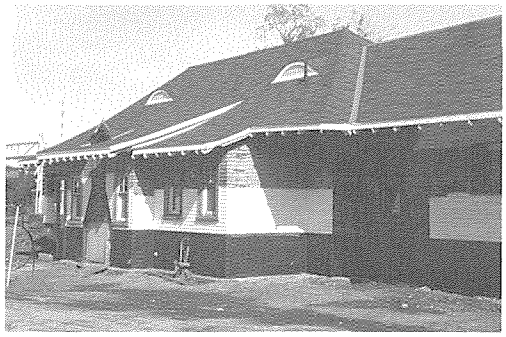
Each of these places "recycles" yet maintains its historic attributes in different ways, from the addition of new housing in the rear yard of a former mansion, to the conversion of a service yard to a public space serving new offices and shops, to the "planting" of a combined sculpture and observation deck atop the piers of a former bridge (right). The conversion of a mill to an inn even manages to take advantage of the water power available by virtue of its location (below).

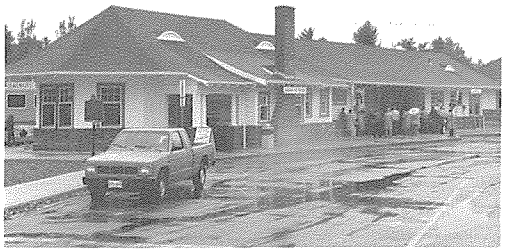






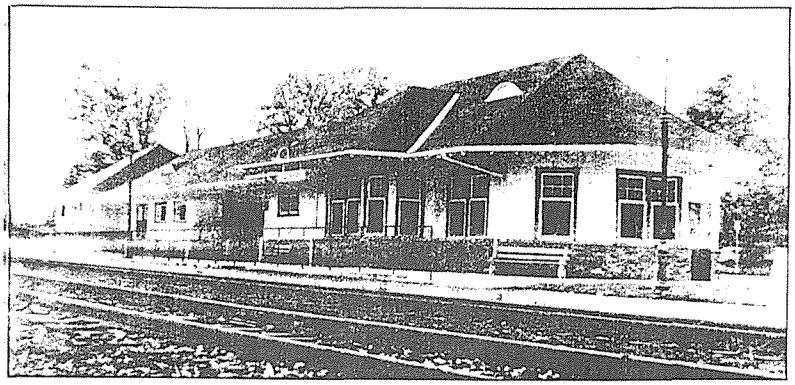
Recycling a railway station — as a railway station. An integrated bus/train and local transport terminal allowed the rehabilitation of a historic structure for current and future requirements. Many other apparently redundant stations could be similarly rejuvenated, if the needs of several users can be co-ordinated.

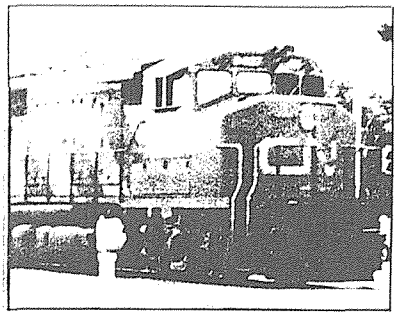


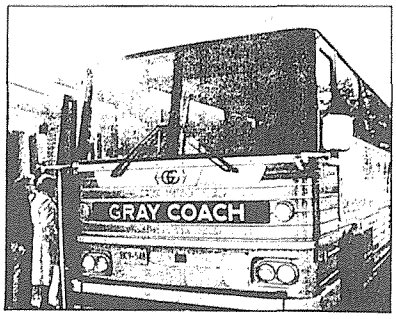


A SALUTE TO THE GRAVENHURST STATION

A community success story for Gravenhurst

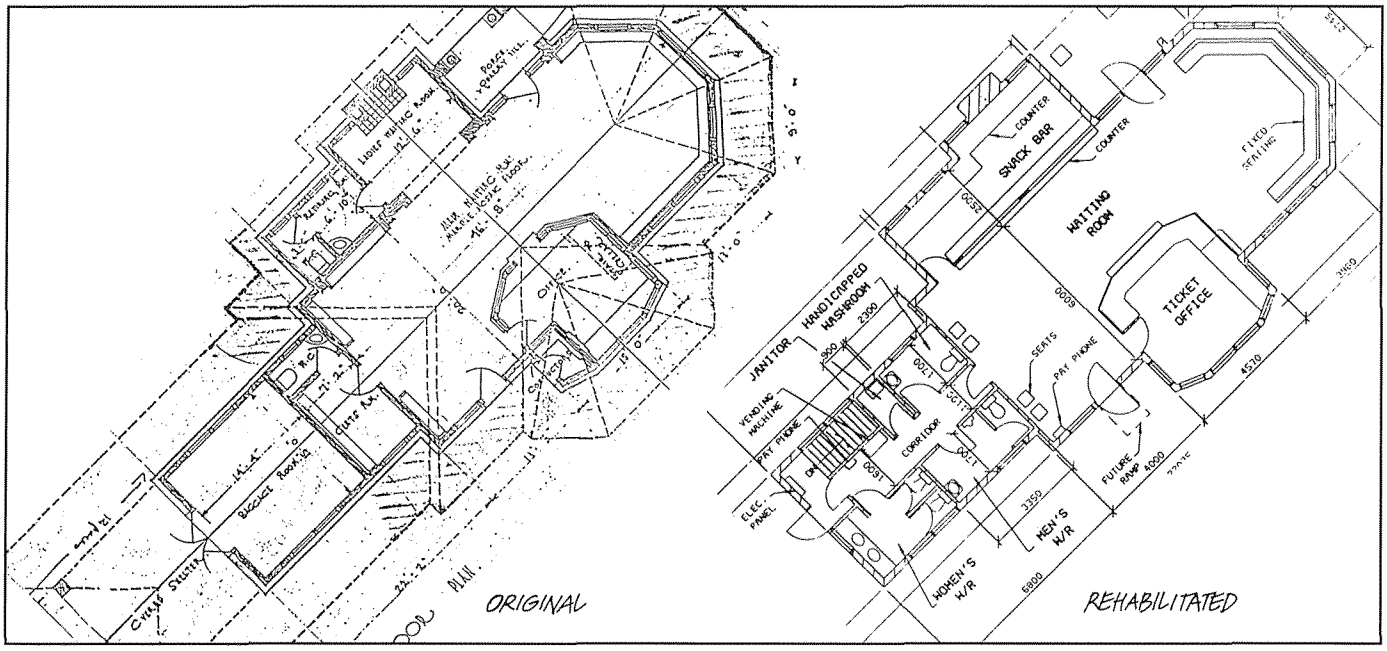


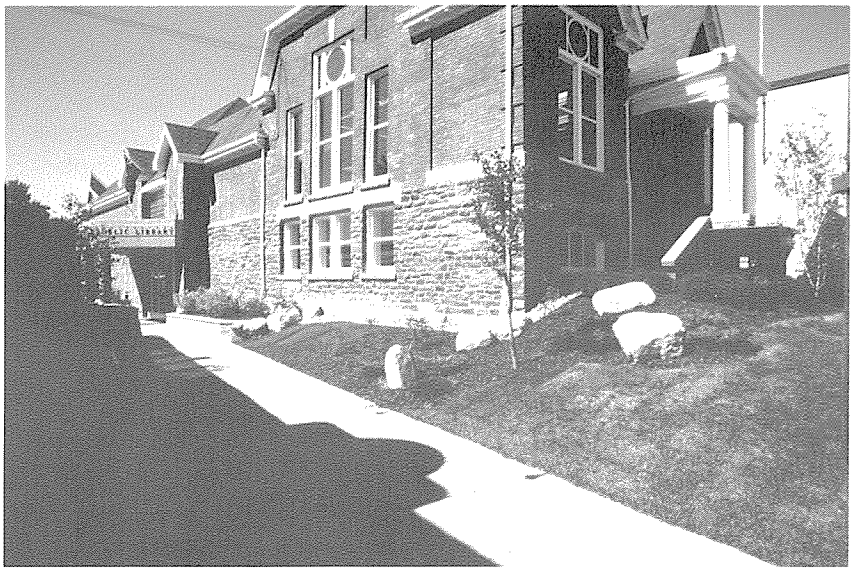




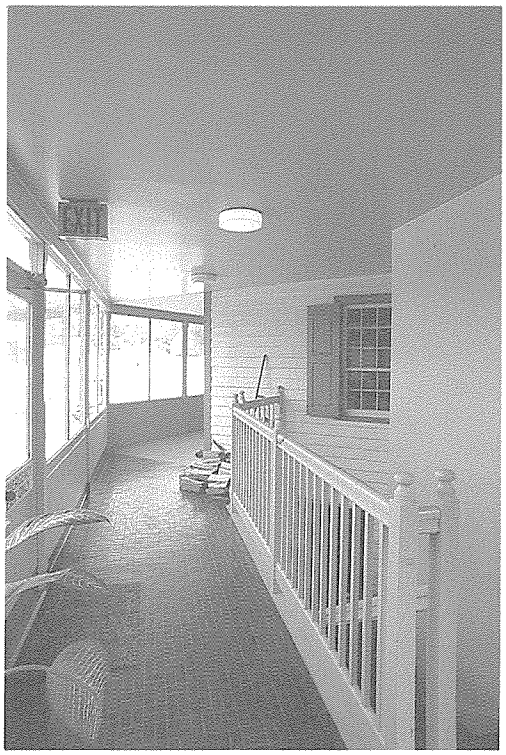
Reflections on the past, direction for the future

Official opening: Oct. 4, 1986 at 2:30 p.m.





Using carefully fitted additions to provide new space, modern services and better public access, especially for the disabled.



Aided accessibility

- Plan for added handicapped accessibility without removing historic fabric.
- Insert wider doorways, elevators, chair-lifts or ramps adjacent to but not impinging on valuable historic fabric or make such access part of distinct additions.
- Where possible, use elevators that do not require rooftop additions; use centrally located elevators, rather than internal ramps, to connect uneven levels in the existing building or between old building and new addition.
- Use internal ramps only when space permits a sufficiently safe shallow slope.
- Where staff is constantly in attendance, consider portable ramps.
- Provide wheelchair-accessible entrances as close as possible to existing floor levels with external ramps and where possible, to minmize their visual impact, make them slope down from ground level to a lower-level entrance rather than up.
- Where new external ramps are unavoidable, place them so as not to disturb the formal symmetry or balance of the building and design them to fit discreetly into the overall look of the place. In practice, this may mean using a side or rear elevation as a new major entrance. Small adjustments to external grade levels may reduce or eliminate the need for ramps outside the building or for level changes inside (see SPATIAL DEFINITION AND HARD LANDSCAPING).

Specifying the work: drawing and specification-writing

Principles

1.2 Comprehensive understanding
3.1 Record of found state
3.5 Specifics of uniqueness (pattern, ensemble, detail)
3.6 Maximum information content/conservation of complexity
4.6 Minimal conjecture/informed invention
5.7 Reconstruction for wholeness
7.1 Traditional repair (proven technology)
7.4 Cautious high-tech repair
7.5 Recipes tested before application
8.1 Distinctive new work

References

General instructions that can be used as models for dealing with some aspects of conservation work may be found in DAVE80/86, KIRK84, MULL81, POWY29, REID84 and SHOP86. More specific professional and technical advice is in FEIL82, FERG86, LEVI78, MEAD86, STAH84 and TIMM76. Some books provide sample specifications in outline form; for instance, see BOWY80, HIGG85 and INSA72.

Old pattern books and construction texts can offer very useful guidance on earlier construction practice. Some have reappeared in reprint form, but one exceptionally useful text on specifications, MACE98, can be found only in the odd library or old-book store.

Specifying quality: making good work easier to do

Specifying and getting results of high quality are difficult for any construction project, old or new, but have special importance for conservation, where it is seldom possible to recover from damage due to poor work. It is necessary to instruct properly those doing work, telling them what to do and in some cases how to do it. In general, specifications are documents — drawings, photographs, written and verbal descriptions of procedures, general instructions on packages, legal requirements in building codes, and so on. Among these may be a formal "construction specification", a written set of instructions that forms part of a legal contract to carry out construction work.

Getting the best results requires the attention and care of everyone, from owner to worker, and clear communication at every stage. Because conservation involves taking records of the existing building and transforming them into plans and specifications for work, there may be shortcuts from the standard new-building sequence — program to design to working drawing (and specification) to contracting to supervision. For instance, on modest conservation jobs, documents generated by inspection and recording may provide sufficient instructions for repairs or replacements, by the addition of clear notes to drawings and photographs.

Nevertheless, this informal approach must be used with caution — it may lead to problems itself. It will produce good results only if both specifier and worker are fluent in that method of communication and have the appropriate skills. For a conservation job to go well, everyone involved must understand clearly where it might go wrong.

Specifications (both written and drawn) thus act as the bridge between the documentary record and the work itself. Every activity in heritage conservation requires written and graphic instructions. But since much repair work is not reversible, written instructions — in the construction specification, on working drawings, and in memoranda and change orders — must be right, because they direct the quality of the work. They will provide the reference against which success or failure is judged, including matters of liability.

Documentation: informal specs to contract documents

- Every conservation project should be specified on the basis of a full inspection record; there should be enough graphic and verbal information to enable specifier or designer to make instructions for the necessary work without having to redo those instructions during the work (unless "surprises" cause new problems).
- Drawn, photographic, written and verbal communications should all comprehensive and consistent (common sense, but not so common practice). Drawings and written instructions should reflect the irregularities and uniqueness of the existing building.
- As far as possible, develop specifications and drawings on the standard construction specification model but ensure that preservation and repair prescriptions are located throughout the documents in the appropriate places, not just under general "Requirements".
- As far as possible, use accepted conservation specifications or specifications modelled after a project widely recognized as successful, rather than inventing new prescriptions. Shared experience makes conservation work more efficient and effective. (Unfortunately, there are few models available at present.)
- Instructions should be in forms and styles appropriate to the type of work and the audience:
  - Sketch drawings and annotated photographs for client and public agency approvals should be accompanied by written descriptions of the pertinent general quality standards.
  - Construction drawings and the written specification (including annotated photographs of details) for tendering and contracting should describe in detail the instructions for job quality that *must* be met by the contractor and those other areas where trade-offs may be possible without sacrificing quality overall or in detail.
  - Contract documents and instructions to site workers must state general quality standards together with instructions

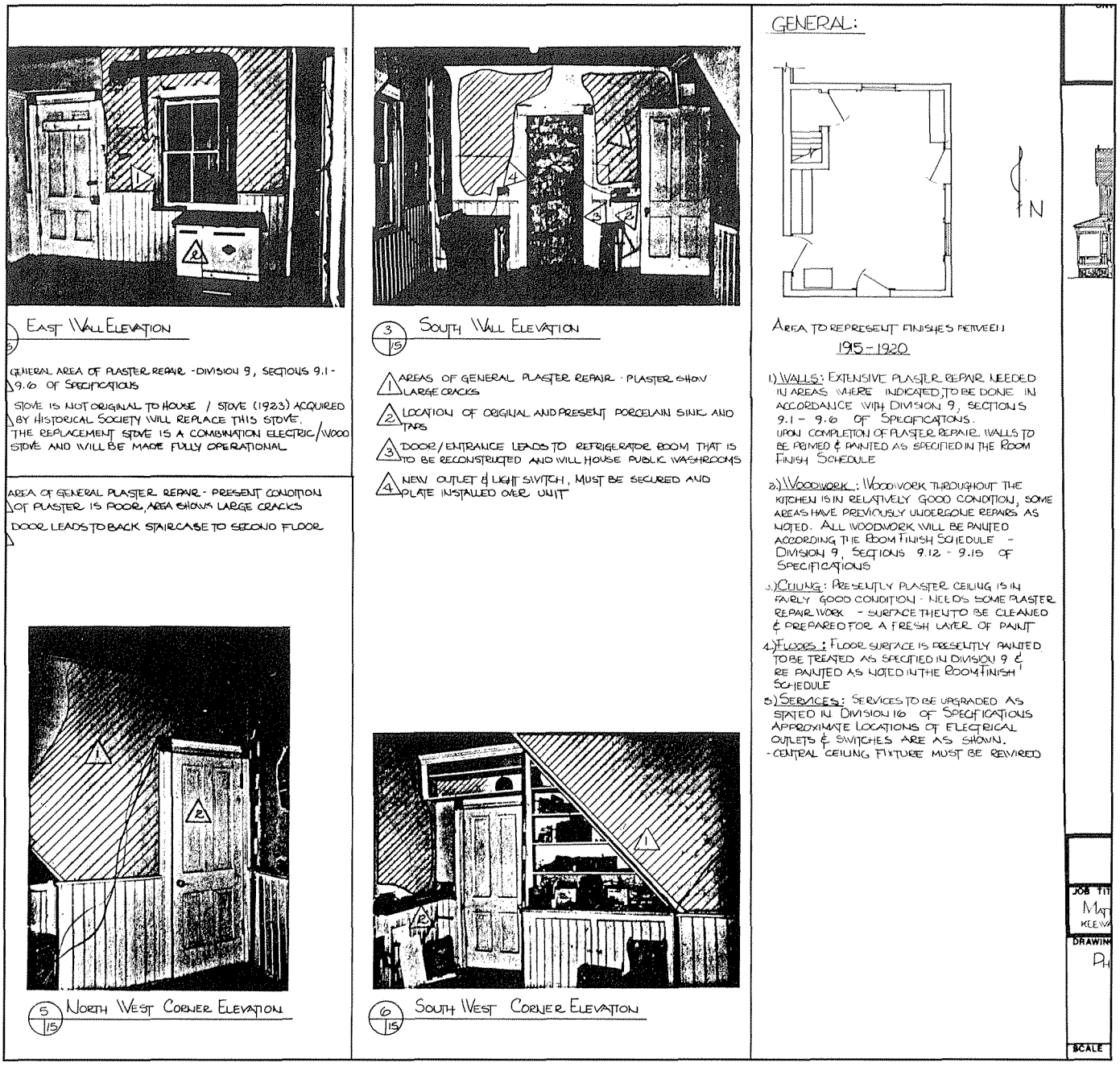
Photo-drawings are among the most useful formats for describing conservation problems and specifying work, either as advisory materials to help clients and contractors understand what needs doing and how it ought to be done, or as elements of the contract documents themselves. They efficiently describe existing conditions and they help localize areas that are most likely to produce surprises when work begins.

for quality on specific details, emphasizing where standard new-construction approaches are not permissible and making instructions comprehensible to workers, by demonstration if necessary.

- ❒ Instructions to site supervisors should be the same as those to the contractor and building workers (again, common sense, but not so common practice).

- ❖ Every recipe or procedure whose results vary with conditions must be tested on site. Specifications and instructions must express this requirement clearly, allowing sufficient time and assigning responsibility for testing and for assessing results.

- ❖ Consultants and clients should use pre-tender or pre-construction meetings to verify bidders' or contractors' understanding of specifications, and to inquire how those instructions might be improved (see CONTRACTING AND SUPERVISION and PROFESSIONAL ADVICE FOR HIRE).



Contracting and supervision

Principles

2.1 Co-ordinated work
2.2 Co-operation among specialties
2.5 Appropriate skills
2.6 Second opinions when in doubt
5.1 Priorities of features, priorities of work
6.4 Respect for craft
6.5 Safe working conditions

References

Though their actual listings are specific to to their locales (Scotland and New York, respectively), see SCOT84, SCOT85 and REST86 for suggestions on what to seek in conservation specialists. Other references about dealing with the professional specialists include COMM83, INSA72, KIRK84, MELV73, MILL86, MITC82, SHOP86 and VILA81. See also "Professional advice for hire" (pages 194-199).

For site supervision, see LEVI78 for an especially good point-by-point guide; see STAH84 for larger buildings and LITC82 for smaller ones. A more general reference on construction supervision, with a section on refurbishment, is FERG86.

Retaining good help

There is as much need for careful hiring and supervision of work as for good planning and design. The quality of conservation work is crucial. Quality can be assured (at least optimized) only if the contractor for every phase of the work is well qualified, and if work is monitored to assure that it meets defined standards and is well and fully co-ordinated with what comes before, during and after.

- Ask to see an appropriate demonstration of the skill being hired — ask a researcher for previous reports; an architect or contractor for previous projects; a craftworker for details of previous work. Visits to previous projects are essential; do not rely on descriptions that may be biased (intentionally or not). Unless viewed with a very conscientious eye, photographs of finished work can be particularly misleading; if they're available, look closely at work-in-progress photographs as well. And ask their previous clients about details of projects and their progress, not just the final product.
- For a project used as a reference, find out who on the project team did what; in joint ventures or large firms, ascertain individual responsibilities.
- If a previous project's quality and success were the result of collaboration, seek to have all of that team, not just its "co-ordinator", retained for your project; often the combination of individuals is greater than their independent contributions. Individuals seldom succeed in conservation work on their own. Conversely, an unsuccessful project does not necessarily mean that all team members performed poorly.
- In competitive tendering, which normally seeks the lowest possible price, ensure that a low bid is comprehensive and fully meets the terms of the specifications. The selection process must not abandon the standards of quality and workmanship for what appears to be the lowest price. Though important for new-building work, high standards are even more critical for conservation.
- Consultants, contractors and clients should meet very early in the process, even before tendering or starting work. Participants should get to know one another and agree about the work to be done — especially about procedures to follow if things do not go according to plan.

The wide range of skills and practitioners is covered under PROFESSIONAL ADVICE FOR HIRE, which also outlines important cautions to be taken when retaining professionally qualified people for any aspect of conservation.

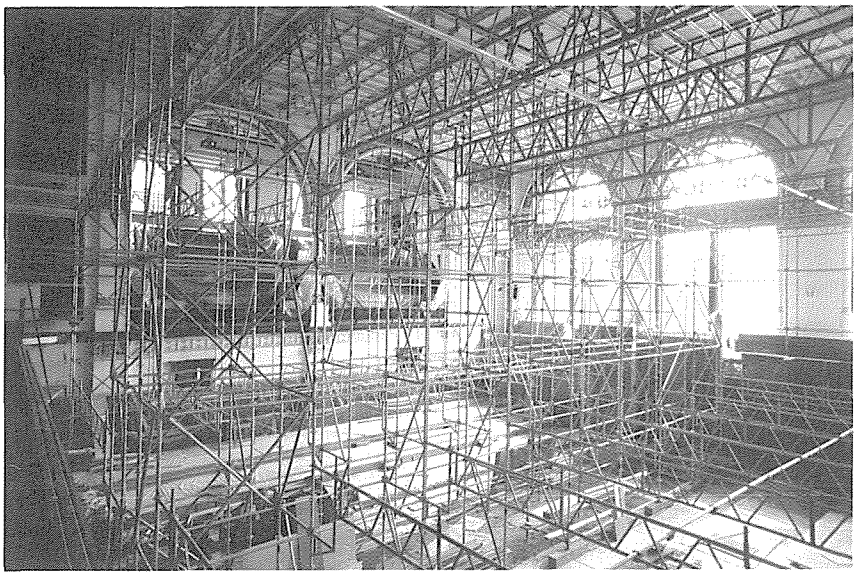
Balancing cost, time and quality

Supervising any building work involves trade-offs between quality of workmanship and budget and schedule. The final product, including both finished work and balance sheet, must be the criterion of success, whatever may happen during the job.

However, conservation work requires a different sort of balance among these factors than new construction. The overwhelming need to preserve historical and architectural character should give the finished product more weight than short-term economies in balancing schedule, cost and quality. Site and job supervision will require a firmer and more capable hand than usually needed for new work.

Sometimes this means added supervision costs and slower work — to be balanced against the flexibility of working in a building already there, often occupied and paying for itself, as well as long-term savings from better work and less consequent maintenance and repair.

- Where possible, have a clerk of works constantly on site to monitor progress and maintain contractually determined quality control, rather than relying solely on periodic visits by architects and other consultants. On-site monitoring may be cost-effective, reducing the number of costly visits by senior consultants, but places a great responsibility on the clerk, who must monitor all aspects of work, even in areas where he or she may not be expert.



- Follow a standard text on site supervision for checklists of what to watch for and how to deal with difficulties. Despite the great variety of conditions (and the many different opinions of architects and other building professionals), there is much shared experience in print that is surprisingly poorly used (see margin).
- Make notes and instructions on drawings and in specifications complete and unambiguous, so that questions of interpretation are minimized or obviated altogether. Many delays in conservation work are the result not of poor workmanship or "loss" of traditional techniques but of unclear or inconsistent instructions and time wasted waiting for interpretation or clarification.
- Keep lines of communication open. Make meetings efficient. Have someone take meeting notes and include these in the project record.

The more complex the work, the greater the need for contractors and workers with demonstrated skills and successful experience in similar work. On small projects, a client may be able to engage directly in certain types of work alongside professionals, or be active in informal supervision of the work. But for larger projects, good management practice often involves delegating responsibilities to an organized team in a consistent, disciplined and professional manner, with much less scope for informality.

Phasing and scheduling

Principles

1.1 Planned conservation
2.1 Co-ordinated work
2.2 Co-operation among specialties
2.3 Work in order
2.4 Work at right pace
3.4 Archaeology (site & structure) for reconnaissance
5.1 Priorities of features, priorities of work
5.4 Archaeology (site & structure) for rescue of artifacts

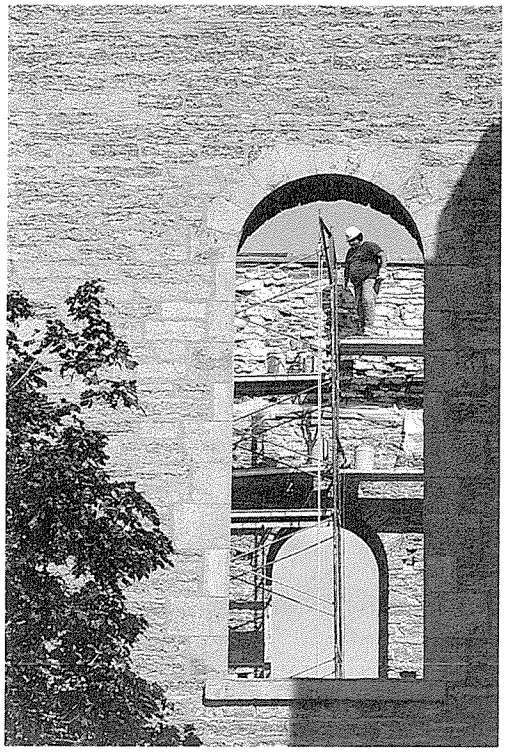
References

Doing things at the right time and in the right order is a central theme of the better references. See, for instance, FEIL82, FERG86, FINE86, INSA72, KIRK84, LEVI78, LYNC82, MELV73, POOR83, SHOP86, TIMM76 and VILA81.

Doing things in order

The most important first step is *not* to demolish or destroy *anything* until its condition, use, potential and value are understood. No approaches of last resort should be taken until all other options have been exhausted. For instance, removing sound interior plaster simply to reach spaces inside walls might make installation of utilities easier, but ignores the aesthetic, thermal and acoustical properties of plaster walls that cannot be replaced by plasterboard. In a conservation project, such gutting is technical incompetence, a sign of an inability to understand a building and to handle conservation work.

The following very basic outline is not necessarily comprehensive for every conservation project; it simply suggests phases and the order of work in general. Much conservation work can run in parallel; for example, interior and exterior work can proceed simultaneously, coming together at such points as window repairs. Parts of a building may be in use while conservation is underway. But do not rush — always leave time for physical and chemical processes to cure properly. Co-ordinate use of exterior scaffolding; its rental, erection and removal are expensive (see STABILIZATION).



Co-ordinating activities such as material deliveries and the use of scaffolding and hoists is absolutely essential to successful conservation work, even more so than for new construction.

Stabilize and secure

- ❒ Do a full inspection before doing any irreversible work.
- ❒ Ensure that site services are available throughout the project, including electricity, water, wastewater disposal, and debris disposal.
- ❒ Provide safe and well-marked temporary access to areas that will remain in normal use during work.
- ❒ Provide areas in or near building for temporary storage and workspace.
- ❒ Arrest exterior deterioration, especially roof leaks and areas of moisture damage. *Any temporary repairs at this stage must be reversible.*
- ❒ Eliminate fire hazards (debris, inoperative doors, etc.).
- ❒ Eliminate or cordon off hazardous areas.
- ❒ Secure loose building elements.
- ❒ Remove standing water.
- ❒ Inspect for and exterminate insect infestations.
- ❒ Secure door and window openings against unauthorized entry.
- ❒ Mask floors, unpainted woodwork and other delicate finishes against damage from clean-up and construction work.

Record and clean up

- ❒ Clean up loose rubble, taking care to record and store anything of potential value. *Do not pry off loose elements unless they are easily reattachable.*
- ❒ Photograph, measure and sketch the complete exterior and interior, and add the resulting documents to the project record.
- ❒ Clean away loose dirt and dust; scrub off peeling paint, but do not (yet) strip it all off (save samples for colour and chemical analysis).
- ❒ Establish work priorities based on the inspection and on plans and designs for new or continuing use.
- ❒ Order materials and arrange deliveries and special crafts well before they are needed.

HEAT AND COLD

Particularly sensitive to thermal extremes are painting and masonry cleaning and pointing — none should be done at temperatures below 10°C (50°F). Lime mortars must never be applied in direct, hot sunlight. Certain methods of chemical cleaning must not be carried out in direct sunlight either.

It is sometimes possible to enclose and heat exterior areas temporarily to accelerate work through cold weather, but the shelter must remain heated to keep the workers warm and to let compounds such as mortar cure properly. And curing time may add an extra month or more to the rental and heating charges for the enclosure.

Work in sequence: exterior

- ❒ Stabilize the structure (temporary and removable reinforcements).
- ❒ Do site work on adjacent grounds to prevent further deterioration: regrading, drainage, waterproofing.
- ❒ Repair and reinforce structure for permanent occupancy: foundations, bearing walls, floors (working up from lower floors).
- ❒ Complete permanent roof repairs, both structural and waterproofing, including flashing and gutters.
- ❒ Clean exterior surfaces as necessary, including removing paint.
- ❒ Repair and repoint masonry, replacing deteriorated units as required.
- ❒ Repair ornamental metal and woodwork.
- ❒ Repair windows (reglazing where necessary).
- ❒ Stain and prime exterior surfaces.
- ❒ Seal and caulk exterior.
- ❒ Paint exterior.
- ❒ Clean up around exterior; remove debris.
- ❒ Complete landscaping.

Work in sequence: interior

- ❒ Stabilize the structure (temporary and removable reinforcements).
- ❒ Remove finishes and fixtures where necessary (store for possible salvage).
- ❒ Repair and reinforce structure for permanent occupancy (working up from lower floors).
- ❒ Install hidden mechanical services and utilities.
- ❒ Install insulation, vapour barriers (using great care to prevent moisture problems).
- ❒ Repair windows (reglazing where necessary).
- ❒ Clean up debris from plaster, etc.
- ❒ Make good holes, cracks and other construction damage.
- ❒ Seal and caulk interior.
- ❒ Install new finishes.
- ❒ Complete priming and painting (once dust has died down from previous work).
- ❒ Repair and reinstall salvaged fixtures.
- ❒ Install new fixtures.
- ❒ Repair and refinish masked surfaces.
- ❒ Clean up.

Seasonal work and contingencies

Construction work is usually seasonal, but an existing building or structure offers considerable flexibility in scheduling. A large portion of conservation takes place inside, and once immediate causes of deterioration are dealt with, interior work can be finished in any season.

On the other hand, roof repair, exterior cleaning, and exterior refinishing must be done in good weather, during the regular spring-to-autumn construction season. Heat, direct sun, cold, and wet conditions can affect curing processes and workers' capabilities and must be controlled as well as possible.

Estimates of time and personnel must also allow for contingencies, delays and surprises. Provide sufficient secure area to stockpile materials and tools, and proper space for an on-site workshop. Even materials ordered well in advance may not arrive on time: keep the schedule as flexible as possible to work around such delays. And keep on hand materials and props for temporary shoring or reinforcement in case of unanticipated structural deterioration or weakness.

Project records and progress diagrams

Principles

3.1 Record of found state
3.4 Archaeology (site & structure) for reconnaissance
5.6 Minimal removals
6.1 Record of changes during project
9.1 Record of altered state
9.5 Records maintained and accessible

References

Though keeping records during any construction or conservation work should be a matter of common sense, it requires consistency and discipline: see especially FERG86, HECK79, INSA72, KIRK84, LEVI78 and MELV73.

Building from existing records

- Incorporate historical documentation into project plans and specifications, in the form of comparable early and modern photographic views or copies of original construction drawings, wherever possible. Such documentation is essential when elements are to be returned to an earlier or original condition or replicated, to prevent "fictionalization" of the historical appearance of a property.
- Keep a full copy of research materials on the job (especially drawings and photographs), together with drawings and specifications. Use these materials to give workers and visitors a sense of the direction of the work in progress. Where there is a clerk of works, he or she should have custody of these materials.
- Once the contract is awarded, incorporate the contractor's schedules, supporting documents and standard procedures into the project record. Even though these are not contract documents, they may be vital for future maintenance as well as current work. Despite drawings and specifications, site workers often follow their previous training and their foremen's instructions; having a record of these on-the-job changes will help in figuring out later the best means of repair.

Keeping track

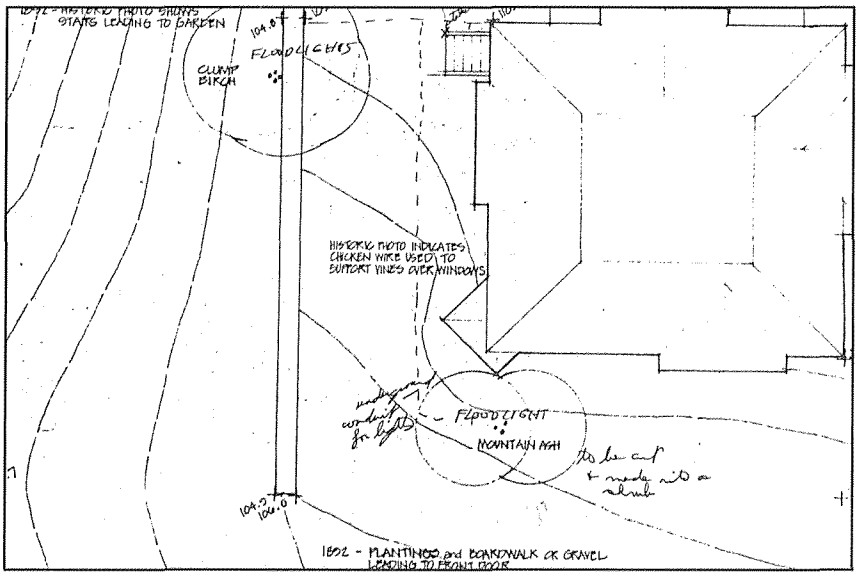
- Make no irreversible changes without recording, in notes, drawings or photographs, conditions before and after those changes. Such records will be invaluable in case of contingencies and delays due to unforeseen problems and will assist in long-term maintenance.
- Record both process and products of any required dismantling in order to assess structure and materials. This may have great value in specifying structural repairs and in understanding how the construction corresponds to conventions of the period or to historical records.
- Maintain a running diary of conservation work, by type of work and even by trade or worker. Though the clerk of works must keep a diary as part of the job, encourage everyone on the project to do so. Where a team may be doing several similar projects, sharing experience from one project will aid other work, and even the same job later on.
- Keep an account of progress and critical events in comparison to the planned schedule; this will be an invaluable aid in making mid-project adjustments and resolving disputes.
- When a contractor or worker suggests procedures different from those in the drawings and specifications for achieving a high-quality result, the suggestion should be taken seriously and adopted if it will achieve an equivalent or better result. *The altered procedure must be recorded in the project records.* This will be great important in resolving any disputes later on. There must be no unauthorized changes in the way work is carried out.

Completed project records

- Make *two* copies of a complete dossier of the project, assembled from copies of construction documents (annotated with changes made during work), diaries maintained by the clerk and others, and before-and-after photographs of work in progress. One copy should be filed with the owner of the project, to be part of the maintenance documentation, the second in a suitable local repository for safekeeping and future consultation.

The porch in the historic photograph (top) was reproduced from the evidence of the photograph itself — but on close inspection, the replica (middle) does not quite match. How important such a slight mismatch might be in other cases depends on the specific project — in this case the overall effect is sufficiently close to satisfy most observers.

Keeping notes on the construction documents themselves will be valuable for maintenance and for future repairs.



Surprises: on-site reassessments and archaeological finds

Principles

2.1 Co-ordinated work
2.2 Co-operation among specialties
2.3 Work in order
3.4 Archaeology (site & structure) for reconnaissance
3.6 Maximum information content/conservation of complexity
5.1 Priorities of features, priorities of work
5.5 Minimal emergency action/ stabilization to buy time
9.3 Emergency plan

References

See KING77, FLAD78 and FEIL82 for different perspectives on chance archaeological finds. For dealing with surprises in and around buildings, see LEVI78, FEIL82, FERG86, INSA72, KIRK84, SHOP86, TRIL72/73 and VILA81.

ARCHAEOLOGICAL FINDS

For advice about chance archaeological finds, contact one of the provincial archaeological field offices in London, Ottawa, or Thunder Bay as listed in the appendices, or the data coordination and licensing office in Toronto. It bears repeating that, by law, all archaeological finds in the province belong to the people of Ontario.

Building archaeology

There is a very thin line between rigorous archaeological exploration anticipated (and authorized) by the Ontario Heritage Act and less formal digging and poking around at a conservation project. Wherever a property has been previously occupied there may be hidden remains in the ground or in concealed spaces of a building. Careful and thorough records must be made of *what* artifacts are found and *where* they are found.

Signs of previous structures may show up as variations in the colour of a lawn or as unevenness of a sodded or paved surface. Within buildings, signs of previous walls or even structural alterations may show up as small changes in painted surfaces, or as small breaks in mouldings or windowframes, or even as a pattern of minute cracks. Whether or not there is a formal archaeological program, this evidence should be recorded as part of the inspection and fault diagnosis and watched for very carefully throughout the project.

- ❖ In the event of any finds of hidden artifacts, the owner, supervisor or clerk of works should document their type and location, and any associated artifacts. Where archaeological investigation has taken place, its report should be part of the project record, and its author on call to assess chance discoveries.
- ❖ In the event of *any* doubt — especially about animal or human bones — consult a professional archaeologist (see margin).

Structural hazards

- ❖ Watch carefully and record processes and products of any required demolition. This will be especially valuable in determining how the structure of an older building actually went together (distinct from how it was meant to go together). *Even the smallest removal must not destabilize all or part of the remaining structure.*
- ❖ Brace temporarily every doubtful portion of the structure before work begins — indeed, before regular access begins. Make doubly sure that temporary props and supports are on solid footing.
- ❖ Before new work or new installations, reinforce joists and other members that may have been cut to install services over the years. Structural weakness is seldom inherent in old buildings but is often caused by subsequent "modernizations".

See INSPECTION, RECORDING, and STABILIZATION DURING REPAIRS.

Failures

- ❖ In the event of any structural shift or failure, even minor, stop work *immediately* and arrange for emergency inspections of both failed areas and adjacent structure.
- ❖ Stabilize the condition with temporary props and record fully the situation before undertaking *any* remedial work. Often only one element in a complex structure has failed. Wholesale demolition must be resisted until it is clear whether a complete assembly has failed or simply a single element or connection.

See FAULT DIAGNOSIS.

Concealed deterioration

- ❖ Open up only parts of structure and finished surfaces that must be inspected for hidden deterioration and make these openings in inconspicuous areas. Removing finishes will destroy much of the subtle evidence of hidden conditions. For instance, though foundations may have settled and put a building's features out of plumb, such conditions often have stabilized long ago. Only if there are *recent* patterns of cracks in interior plaster should one consider making more than minimal repairs or reinforcements (apart from any need to upgrade the load-carrying strength of a structure).
- ❖ Continue to look for hidden deterioration while work is in progress.
- ❖ Watch closely for signs of weakness or rot around mechanical services, especially plumbing in bathrooms, kitchens and service areas. Allow for delays in the work schedule for replacement of rotten structural members, particularly at joints.

Conservation work may hold surprises, but they should not be unanticipated surprises. The possibilities of archaeological finds, structural weaknesses or hidden material deterioration must always be kept in mind, just in case.