RENOVATING DISTINCTIVE HOMES

1 1/2 Storey Post-War Homes

CMHC SCHL

HOME TO CANADIANS

Canada

RENOVATING DISTINCTIVE HOMES: 1-1/2 STOREY POST-WAR HOMES

Renovating Distinctive Homes
1-1/2 Storey Post-War Homes

Prepared by:

Canada Mortgage and Housing Corporation

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The information contained in this publication represents current research results available to CMHC, and has been reviewed by a wide spectrum of experts in the housing industry. Readers are advised to evaluate the information, materials and techniques cautiously for themselves and to consult appropriate professional resources to determine whether information, materials and techniques are suitable in their case. The drawings and text are intended as general practice guides only. Project and site-specific factors of climate, cost, aesthetics, and so on must be taken into consideration. Any photographs in this book are for illustration purposes only and may not necessarily represent currently accepted standards.

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INTRODUCTION

From 1945 to 1960 Canadian builders responded to an increase in demand for new housing that stemmed, in part, from the Depression – builders didn't build many houses in the 30s, because few Canadians could afford them. The post-war population and economic booms added to that demand, so for the first time in years Canadians could afford to buy.

The federal government responded by forming Central Mortgage and Housing Corporation—now Canada Mortgage and Housing Corporation (CMHC). CMHC brought together Canada's best architects, housing engineers and builders. They worked with bankers and municipal planners on a design that could be built anywhere in Canada using local materials, could withstand our country's climate extremes, could be built easily and quickly, would include the most up-to-date building knowledge, would appeal to consumers—and, above all—would be affordable.

One answer was the the 1 1/2 storey house, also known as the Victory House, a simple, easy-to-build, comfortable house that was within the financial reach of most Canadians. Between 1945 and 1960, more than 300,000 1 1/2 storey houses were built in Canadian communities. This book is about those houses, although many of the recommendations will be useful for renovating any 1-1/2 storey home.

Different types of houses pose different renovation challenges and problems. For the 1-1/2 storey house, the size, the semi-attic bedroom and the construction methods all pose special problems.

This book gives you the information you need to plan and successfully renovate your 1-1/2 storey house. It includes:

- technical information about the methods used to build your house, so you and your renovation contractor know what to expect
- information about problems you can expect renovating a 1 1/2-storey house
- information about new housing trends, such as Healthy Housing and FlexHousing™ that you can include in your renovation plans to make your house healthier for the people who live in it and adaptable to their future needs.

Chapter 1 tells you about the construction of your 11/2 storey Home. Chapter 2 is about typical problems in older homes—problems that need attention. Chapter 3 is an overview of renovation and will help you plan your renovation project.

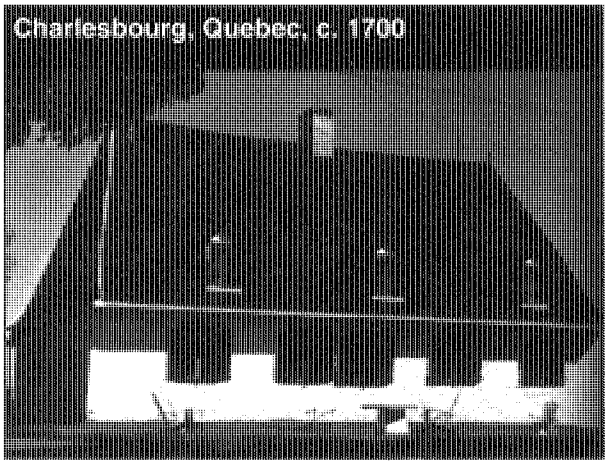
Chapter 4 gives you even more planning help, with worksheets, checklists and a sample renovation contract.

Chapter 5 and Chapter 6 have renovation ideas that have worked and construction tips to help you and your contractor.

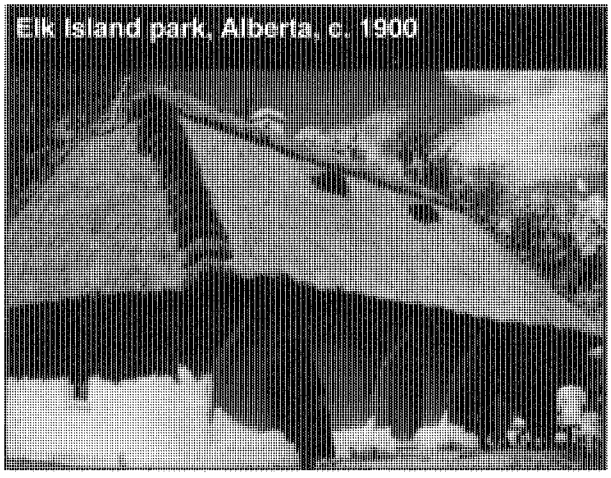
Finally, Chapter 7 tells you where you can find more information about every aspect of renovation.

CHAPTER 1 THE HOUSE DESIGN

Introduction



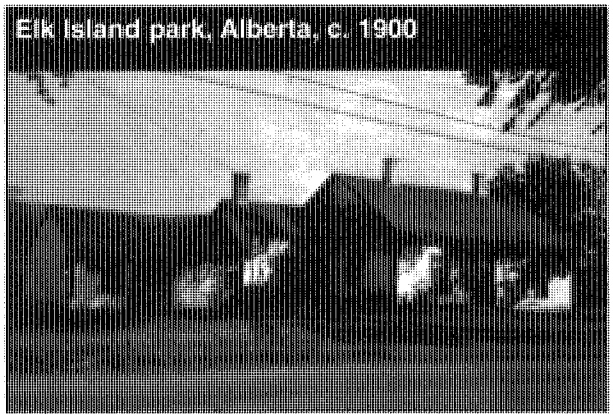
Since pioneer days, the 1-1/2 storey house has been a popular design in Canada—and with good reason. By tucking bedrooms under the sloping roof, this design encloses the maximum amount of usable floor space for the minimum amount of building materials. With its simple shape, it is relatively easy to construct, even for the amateur homebuilder, and it is easy to heat. The design is attractive as is, but is also suited to later additions at the side or rear. The house lends itself to a surprising number of variations in interior layout and can be constructed using readily available local materials and construction methods. The basic building shape can also be dressed in a variety of architectural styles from classical Georgian to 1960s modern.



This chapter takes a closer look at the design of the post-war 1-1/2 storey house from its roots in northern Europe to its construction in booming post-war Canada.

Roots

The Canadian post-war 1-1/2 storey house has deep roots in the folk architecture of northern Europe. The 1-1/2 storey cottage dates from

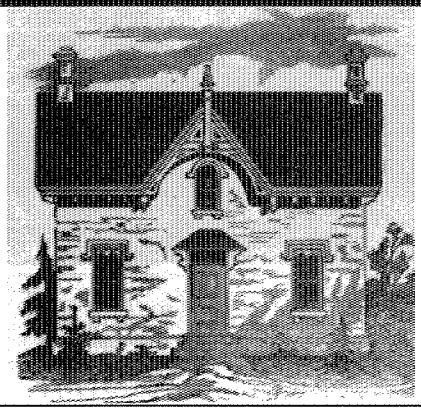


medieval times and earlier. Immigrants to Canada brought their familiar house designs with them to the new world; the Normandy cottage in Quebec, the Ukrainian farmhouse on the prairies and the English country cottage in Ontario and the Maritimes—all different interpretations of the 1-1/2 storey house.

In the 19th century, the 1-1/2 storey design was used extensively, for farmhouses and small houses in the growing villages and towns across Canada. In Ontario, the 1-1/2 storey house offered a major tax saving over a comparatively sized two-storey structure. Throughout this period, the basic 1-1/2 storey house was dressed in a variety of architectural styles from mid-century Georgian Revival to Victorian Gothic.

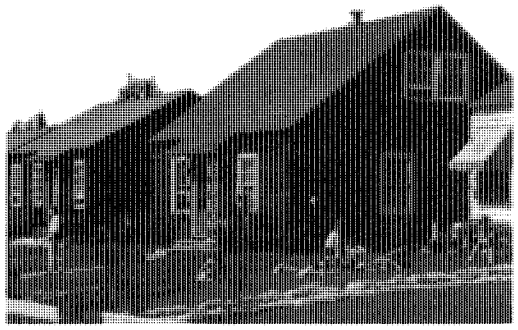
It continued to be a popular housing form for smaller houses well into the 20th century.

Gothic revival, Ontario architecture



In the mid-20th century, the 1-1/2 storey house came into its own as an economical way to meet the surge in housing demand which occurred during and just after World War II. The Great Depression caused a severe downturn in building activity. As World War II began, Canada's housing shortage was estimated at 100,000 homes. The wartime government quickly recognized that creating an efficient, stable labour force for the war industries required the construction of appropriate housing, close to the work sites. The homes had to be attractive and substantial enough for family living, yet they had to be built quickly and divert a minimum of materials away from the critical war effort.

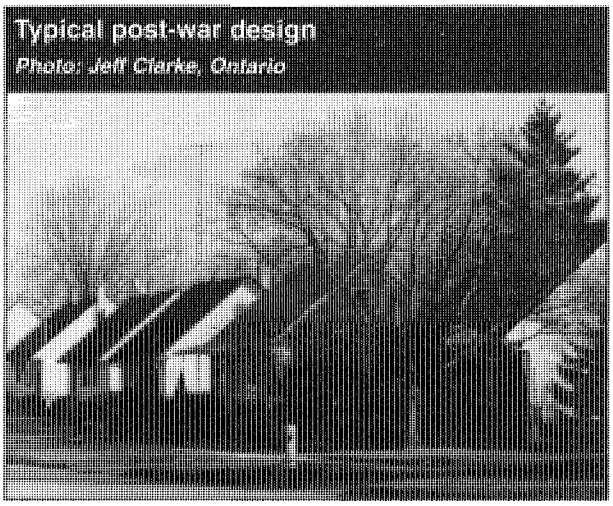
1-1/2 Storey Victory Houses
Photo: Ontario Architecture, John Blumenson, 1990



The solution was found in an adapted version of the 1-1/2 storey house. These Victory Houses, as they were called, offered basic shelter in a familiar house form. To save time and materials, they were designed as temporary structures with an expected five-year life. They were built on cedar post foundations with no basement; heating was provided by a central stove rather than a furnace, and wallboard was used instead of lath and plaster. Using prefabricated wall panels, the houses could be erected and finished in four days. While originally intended as temporary buildings, individual homes have been improved over the years and there are many communities of Victory Houses across Canada today.

The Post-War 1-1/2 Storey House

Typical post-war design
Photo: Jeff Clarke, Ontario



Canada entered the post-war period with a huge pent-up need for new housing. During the Depression, there was no money to build and, in the war years, materials and labour were scarce. Many families had doubled up during the war, and new families were forming at a rapid rate. At the same time, there was a need to upgrade existing housing. Much of the housing stock had never been modernized. In 1945, 31 per cent of Canadian homes still lacked running water and 14 per cent lacked electricity.

In this context, peoples' expressed desires for housing were modest by today's standards. A 1945 nation-wide survey revealed that 42 per cent of Canadian families lived in homes with five rooms or less. Not surprisingly, 62 per cent of those planning to buy a home wanted only five or six rooms and 86 per cent planned only one bathroom.

In the 1940s and '50s, the 1-1/2 storey house became one of the most popular small house designs to meet these growing, but modest housing needs. The 1-1/2 storey design was small and affordable, flexible in design and adaptable to materials and styles in different regions of the country.

The basic design

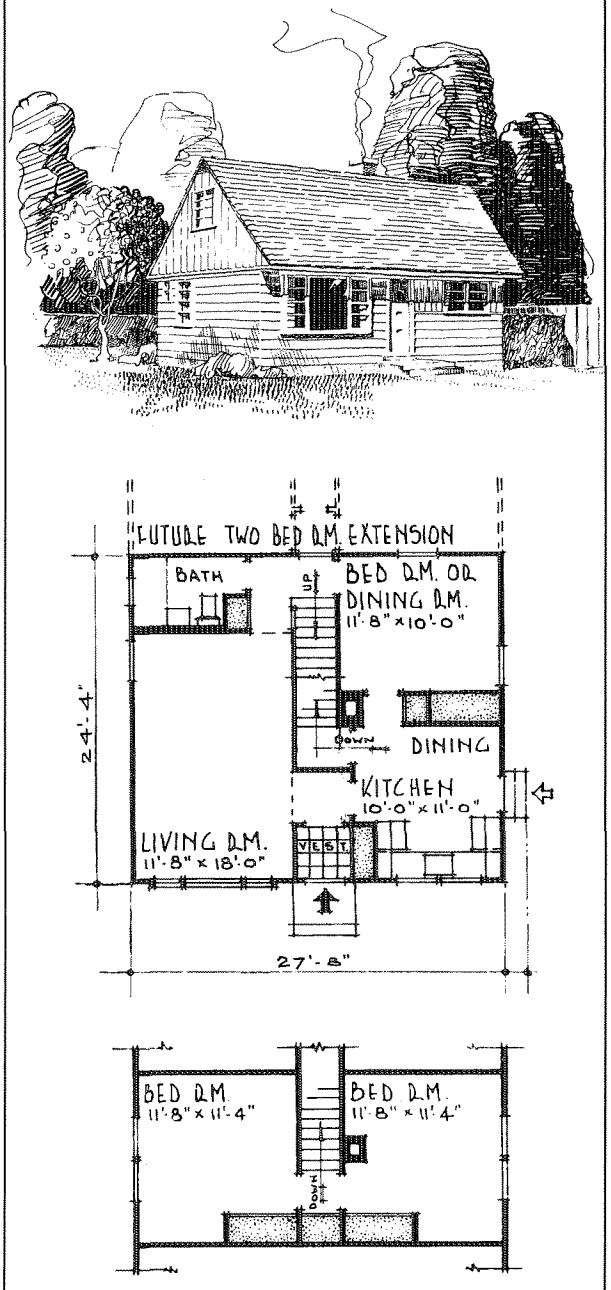
In its simplest form, the 1-1/2 storey house is an expanded cottage with kitchen and living area on the ground floor and two small bedrooms tucked under the eaves on the second floor. The predominant form in the post-war years was a slightly larger version of this basic plan with approximately 111.5 m^2 (1,200 sq. ft.) of living area and three bedrooms, one of them on the ground floor. The post-war design also had a full basement. The house was rectangular in shape with the longer wall facing the street. In some models, a dormer raised a section of roof to make room for a bathroom on the second floor. In many examples, the only bathroom was on the ground floor. The living area consisted of a small eat-in kitchen and a living room. In some plans, the third bedroom could be used as a dining room.

Evolution of the design

In 1945, houses were small compared to many of today's homes. Plans often show unfinished bedrooms on the second floor, reflecting modest incomes and the urgent need for new housing. The evolution of the 1-1/2 storey house from 1945 to 1960 chronicles the changes in Canadian society as families became more affluent and family size declined.

Around 1960, room sizes became larger. What had been a large four-bedroom house in 1945 became a three-bedroom house in 1960. Later models were more likely to have a dormer on the second floor, allowing for a second floor bathroom or, with a full-width dormer, for larger bedrooms. As well, houses in 1960 were more likely to have a finished playroom in the basement.

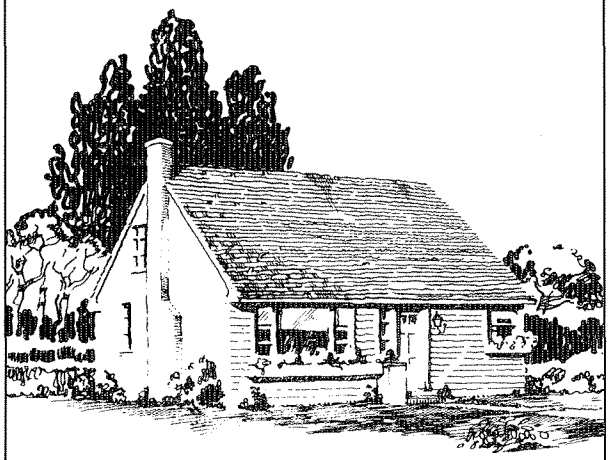
Figure 1:
Plan No. 47-24
67 Houses for Canadians, CMHC, 1947



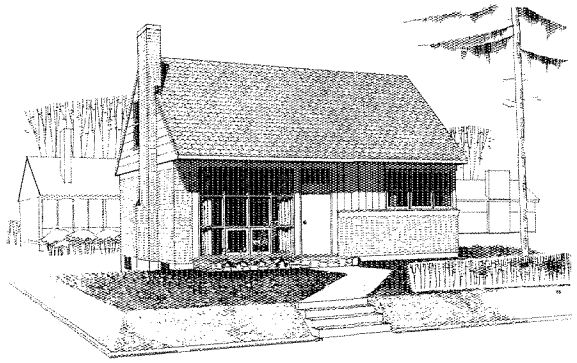
This house form also reflects changing styles in kitchen/dining arrangements. Earlier models had an eat-in kitchen and, where space permitted, a separate dining room. By the 1960s, the open plan living/dining area predominated, with an eat-in or galley kitchen.

Figure 2:
1-1/2 Storey Evolution

1945



1960



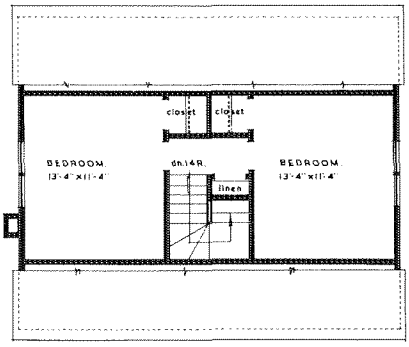
Both houses illustrated in Figure 2 are the same size at 7.3 x 9.1 m (24 x 30 ft.). The difference in the use of space shows how the post-war house evolved. The earlier model has four bedrooms (two downstairs) and one bathroom. The later model has a larger living /dining area, only one bedroom downstairs and two bathrooms—one for each floor.

Variations on a theme

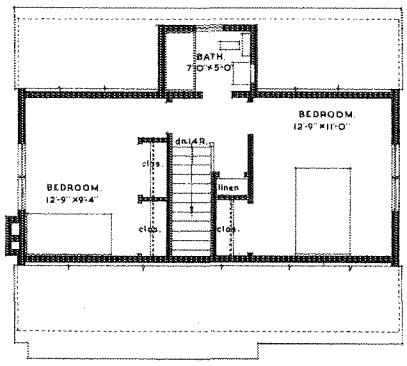
The 1-1/2 storey design is very flexible, especially in slightly larger versions. The shape of the house can vary from rectangular to square. Most designs include a basement but some do not. There are many potential variations in room layout, especially in the placement of bedrooms and treatment of the dining area.

Figure 3:
Variations on Second Floor Designs

Model A
U-shape stairs and two bedrooms on second floor



Model B
Small dormer allows for bathroom



Model C
Three bedrooms on second floor

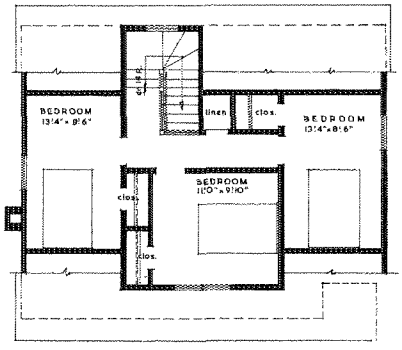
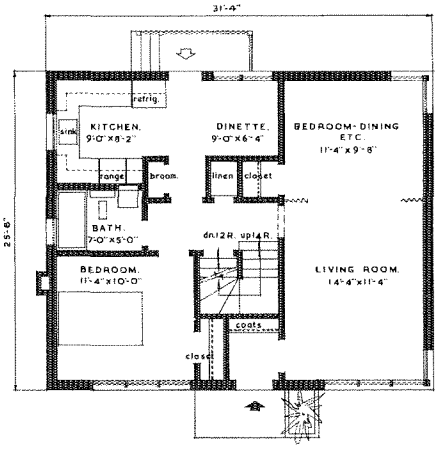
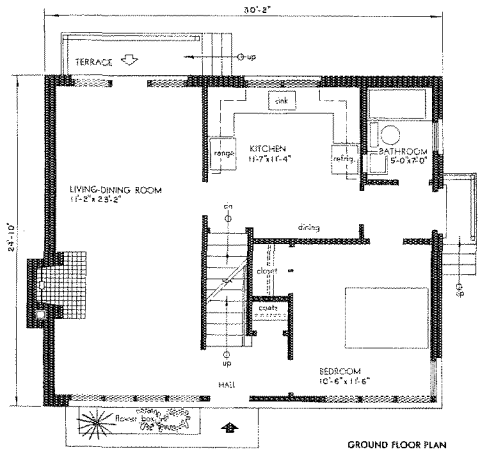


Figure 4:
Variations in Ground Floor Designs

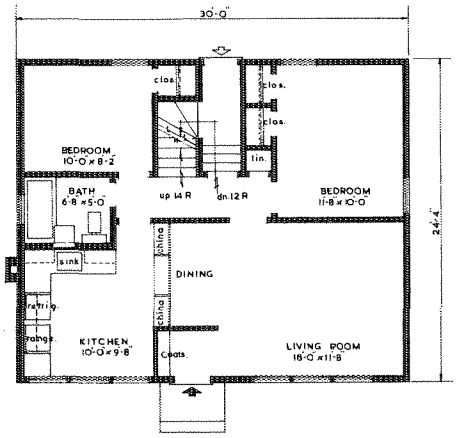
Model A
Alternate bedroom or dining room



Model B
One bedroom on ground floor



Model C
Two bedrooms across back of the house



Anatomy of the 1-1/2 Storey House

You may recognize many features of your home as you read the following description. But, remember that building methods changed during the post-war period, and they varied from region to region and from builder to builder.

Foundation

The foundation allows the house to rest solidly on the ground without shifting or cracking. It must resist the effects of water and lateral soil pressures.

Most post-war homes were built on full basement foundations of concrete block or poured concrete. The foundation walls rest on poured concrete footings which spread the load of the house to the ground. The basement walls were not insulated. If concrete block was used, the wall below grade was sometimes coated with cement parging and/or asphalt to prevent water in the soil from seeping through the block.

Some foundations included a perimeter drain tile. This length of perforated pipe or sectional clay tile collected water near the foundation and directed it away from the foundation and into the storm sewer.

The concrete basement floor was generally poured after the foundation walls were in place. It was also uninsulated. Asphalt-coated roofing felt or roll roofing paper was sometimes laid under the concrete to prevent moisture in the soil from seeping through the concrete floor.

Structure

The structure holds up the roof and provides a framework to enclose the space. It must be strong enough to support the weight of the roof, the house itself, the occupants and their furnishings, and the force of wind pressures and snow loads.

In some post-war homes, the wall structure was built of solid masonry, i.e., a double thickness of brick. However, most were built with a frame structure of lumber. There are several methods of

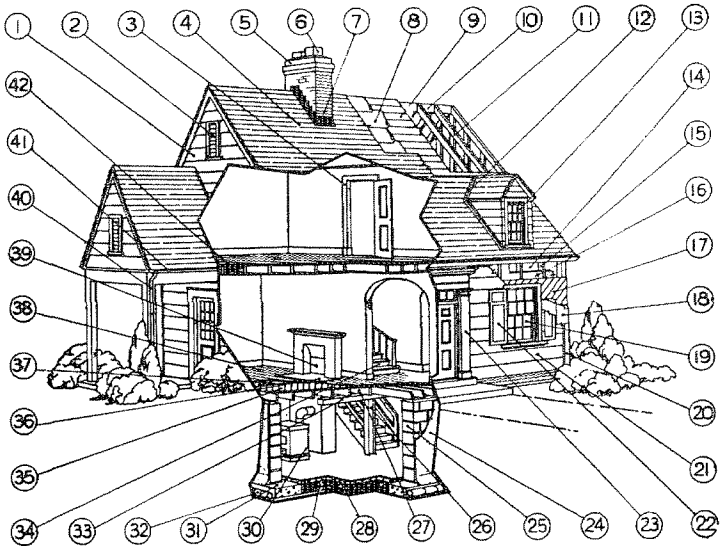
framing with lumber, but platform framing has been the predominant method in Canada since the 1940s. In this method, each storey is built separately; the walls of the first floor rest on the platform formed by the basement ceiling and the walls of the second floor rest on the platform formed by the first floor ceiling.

Balloon framing is more common in Atlantic Canada. With this method, the walls are built in one unit, from the top of the foundation to the top of the second storey, forming a balloon or uninterrupted frame around the whole building. Then the structure for the flooring on the second floor is hung from the walls.

Whichever framing method was used, the connection of the wooden frame to the foundation wall was similar. A thick board the width of the foundation (sill plate) was bolted to the top of the foundation wall. (In some locations, a metal termite shield was installed between the foundation and the sill plate.) Another board (the rim joist) was fastened on edge on top of the sill plate all around the foundation. The supporting framework, i.e., the floor joists for the first floor were nailed to the sill plate and the rim joist.

Floor joists were 38 x 190 mm (2 x 10 in.) or 38 x 152 mm (2 x 8 in.) dimensional lumber spaced 40 cm (16 in.) apart. The joists were reinforced at intervals with wooden or metal pieces (cross bridging) to prevent them from twisting. For longer spans, the joists were supported in the middle by a beam of dimensional lumber, laminated wood or steel that ran the length of the basement. The posts supporting the beam were made of concrete block or timber.

Figure 5:
"The Illustrated Do-It-Yourself Encyclopedia"
Arlrich Publishing, 1956



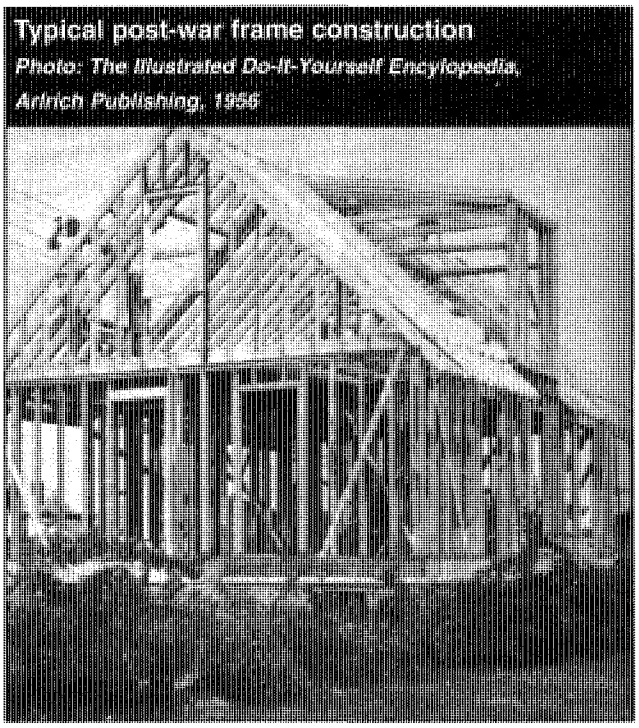
House—Structural Parts

1. Gable end.
2. Louver.
3. Interior trim.
4. Shingles.
5. Chimney cap.
6. Flue lining.
7. Flashing.
8. Roofing felt.
9. Roof sheathing.
10. Ridge board.
11. Rafters.
12. Roof valley.
13. Dormer window.
14. Interior walls.
15. Studs.
16. Insulation.
17. Diagonal sheathing.
18. Sheathing paper.
19. Window frame and sash.
20. Corner board.
21. Siding.
22. Shutters.
23. Exterior trim.
24. Waterproofing.
25. Foundation wall.
26. Column.
27. Joists.
28. Basement floor.
29. Gravel fill.
30. Heating plant.
31. Footing.
32. Drain tile.
33. Girder.
34. Stairway.
35. Subfloor.
36. Hearth.
37. Building paper.
38. Finish paper.
39. Fireplace.
40. Downspout.
41. Gutter.
42. Bridging.

The subflooring, which was nailed to the floor joists, completed the structural part of the floor. Earlier models used 76 mm (4 in.) or 114 mm (6 in) wide boards for the subfloor. These were laid perpendicular to the joists or on the diagonal. Later versions used plywood. The second floor was framed in the same fashion as the first floor.

Walls were constructed of 38 x 89 mm (2 x 4 in.) studs. In platform frame models, they were assembled on the platform then tilted into place and anchored to the platform. Short ends were used for bridging to prevent the frame from twisting. Additional boards 19 x 89 mm (1 x 4 in.) were fastened diagonally to the frame at the corners to provide lateral restraint and prevent the whole structure from shifting.

The roof was typically framed with 38 x 114 mm (2 x 6 in.) rafters fastened to the top of the walls. These were covered (sheathed) with 19 x 114 mm (1 x 6 in.) boards, although plywood roof sheathing became more common in the late 1950s. Near the peak of the roof, 19 x 89 mm (1 x 4 in.) boards (collar ties) connected and reinforced each pair of opposing rafters.



Typical post-war frame construction
Photo: The Illustrated Do-It-Yourself Encyclopedia, Arlrich Publishing, 1956

Exterior finishes

The exterior finish encloses the space and protects the structure from damage. It must resist the entry of water, snow, wind and vermin.

Rigid sheathing was installed on the outside of the studs. The sheathing could be wide boards, plywood or asphalt-coated fibreboard. Wood or plywood sheathing was covered with asphalt-coated building paper to protect the wooden structure from any water which penetrated behind the siding. Siding materials varied from horizontal board siding, to brick and stucco, depending on location and available materials. Asbestos cement shingles and tempered hardboard were also used. Examples of all siding types are found in every region of Canada, but wood siding is found more often in the Atlantic Provinces, brick in central Canada and stucco in the Prairies. Some designs combined two siding materials. For example, on brick veneer homes, horizontal siding was often used on the dormers.

The roof was usually protected with asphalt shingles laid over building paper. Asbestos cement shingles, wood shingles or sheet metal roofing were occasionally used. In some regions, a 10 cm (4 in.) strip of sheet metal was installed under the shingles at the eaves. This drip edge was to prevent water which accumulated at the eaves (ice damming) from penetrating the roof assembly.

Interior finishes

The interior finish protects the structure on the inside of the home. It must provide attractive, durable surfaces and protect the structure from water vapour originating inside the house.

In early post-war models, interior walls were finished in lath and plaster. Drywall began to make some inroads in the 1950s. Wood panelling, hardboard and plastic-surfaced hardboard were popular options for the do-it-yourselfer, used mostly to finish basements. Baseboards and trim were cut to size on site from specially milled dimensioned lumber. Closet and room doors were initially the panelled type, giving way to plywood hollow-core doors in later models.

The flooring of choice for living areas was hardwood. Tongue-and-groove strips of hardwood were nailed to the subflooring, then sanded and finished on site. Where a plywood subfloor was used, parquet hardwood floors were sometimes installed. These consisted of prefinished squares of hardwood that were glued to the subfloor. Kitchen and bathroom floors were generally sheet linoleum or asphalt tiles.

Kitchen cabinets were most often built on site using lumber and plywood and finished with enamel-based paints. Plastic laminate counter tops were assembled on site.

Bathroom floors were usually asphalt tile but, occasionally, could be finished in ceramic tile set in a layer of concrete. Tub and shower enclosures were usually finished in ceramic tile.

Thermal protection

Thermal protection is added to the foundation, walls and roof to protect the structure from extreme variations in temperature and to provide greater comfort for the occupants. It must form an even blanket around the building, without gaps or paths where heat can escape.

It is now understood that there are three components needed for the thermal protection of a house:

- insulation to keep the heat in;
- a continuous air barrier to prevent both heat and moisture from being carried out of the house through gaps and cracks in the building envelope and to prevent moisture condensing inside the walls, causing water damage to the structure; and
- a vapour barrier to prevent water vapour in the house from penetrating through the building envelope.

Thermal protection in the standard post-war house was minimal. Walls were often uninsulated, although mineral or glass wool insulation became more common in the 1950s. The insulation batts had a coated paper on one side. When the batts were stapled to the studs with the paper on the room side, the paper provided a vapour barrier. Similarly, 10 cm (4 in.) batts were laid in the space between the ceiling joists in the attic with the paper side down to form a vapour barrier. Loose mineral wool or vermiculite was sometimes used as attic insulation.

There was no air barrier in the post-war house but doors were usually equipped with weatherstripping to prevent drafts. Common weatherstripping materials included felt and brass.

Standard windows were single pane with wooden sashes, and wooden-framed removable storm windows. The most common style of window was the single-hung vertical sash.

Mechanical systems

Mechanical systems provide the occupants with heat, electric power, light and ventilation, and with water and waste water services.

Heating systems vary according to the type of fuel used and how the heat is distributed throughout the house. The two most common types of heating distribution in post-war Canada were radiant hot water systems and forced air. In 1945, twice as many Canadians preferred radiant hot water heating to hot air, with easterners leaning to hot water heating and westerners to air systems. Both hot water and air systems could be distributed passively by gravity or forced through the system using pumps or fans. By the 1960s, forced air systems became more common, particularly in smaller homes. In most homes, the same energy source was used for both space heating and domestic hot water heating, whether oil, gas or electricity.

Electrical service in most homes was 60 amp although 100 amp service was sometimes used. Plumbing was all metal, with cast iron used for waste and vent lines and galvanized steel or copper for water supply piping.

There was no separate ventilation system. In a few cases, homes were equipped with a range hood that vented to the outside. Otherwise, the house depended on open windows and air leakage to exchange fresh air for stale air.

Changing construction methods

The period from 1945 to 1960 saw tremendous changes in the way houses were built in Canada.

In 1945, while the house designs on a street might look the same, in fact, each house was individually built on site, as houses had been for generations. By the 1960s, houses began to resemble engineered products, assembled from factory-built components and new composite

materials that required far less on-site labour. For example, in earlier versions, carpenters cut the lumber for the roof structure and built the roof on site. Later homes incorporate prefabricated roof trusses which are simply lifted into place. Similarly, in 1945, windows and kitchen cabinets were built on site with factory-built windows and kitchens becoming common in the 1950s. As well, masons laid concrete block foundations on site while later homes were built with poured concrete basement walls.

In the years immediately following the war, most houses were built of integral materials which were modified and assembled on site, e.g., lumber or plaster. By 1960, composite materials, such as plywood and drywall, were widely used. For example, subflooring is laid over the floor joists to provide a base for the finish flooring. Where this was originally provided by softwood lumber (up to 30.5 cm or 12 in. wide), later models used sheets of plywood (122 cm or 48 in. wide) which could be installed faster. Similarly, the application of a lath and plaster finish for interior walls was very labour intensive. It involved nailing the lath to the wall studs, then applying three or four coats of plaster. In comparison, drywall panels had only to be nailed or screwed to the studs and plastered at the joints—a much faster process.

Conclusion

Although construction methods changed, the 1-1/2 storey design was easily adapted to the new methods, and its popularity remained constant. Between 1945 and 1977, almost 300,000 1-1/2 storey houses were built across Canada.

Atlantic	30,000
Quebec	42,000
Ontario	105,000
Prairies	58,000
British Columbia	53,000

The simplicity, economy and versatility of the 1-1/2 storey design ensured that this house form continued as a familiar feature in Canadian communities.

CHAPTER 2: 50 YEARS OLD

Introduction

People get attached to houses. How otherwise to explain the continuous adaptation of built space that has been going on for centuries in some cities? Even in Canada, there are homes that have been continuously occupied for over 200 years.

No doubt—despite the expense and inconvenience—people continue to adapt, expand, upgrade, modernize, refurbish and restore their homes. In short, they renovate.

Why do people renovate? The simple answer is to make the house into a better place to live. Families change, affecting the amount and kind of space required in a home. Styles and standards change, prompting the desire to upgrade and modernize. This chapter explores changing expectations about housing.

People renovate to satisfy their wants and needs but, after 50 years, a house needs some attention for its own sake. This chapter takes a closer look at problems which occur in older houses and which should be addressed as part of any renovation.

Since the post-war years, research and experience have broadened understanding about many aspects of housing. This chapter introduces new considerations, such as the House-as-a-System, FlexHousing and Healthy Housing which should be considered as part of any renovation plan.

Changing expectations about housing

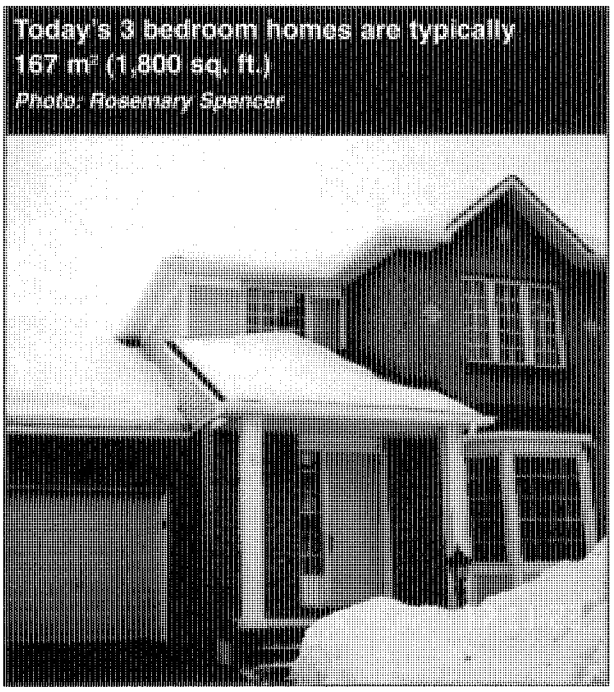
Post-war houses were built primarily to serve the influx of young families entering the housing market. Today, family structure is more diverse. There are many single-parent households. Families with an elderly parent or an adult child are becoming more common. Increasing numbers of households have one member working from home. These changes affect the design and use of space in the home.

In 1945, Canadians' desires for housing were modest. Today, more amenities and a higher level of comfort and convenience are expected—even in smaller homes.

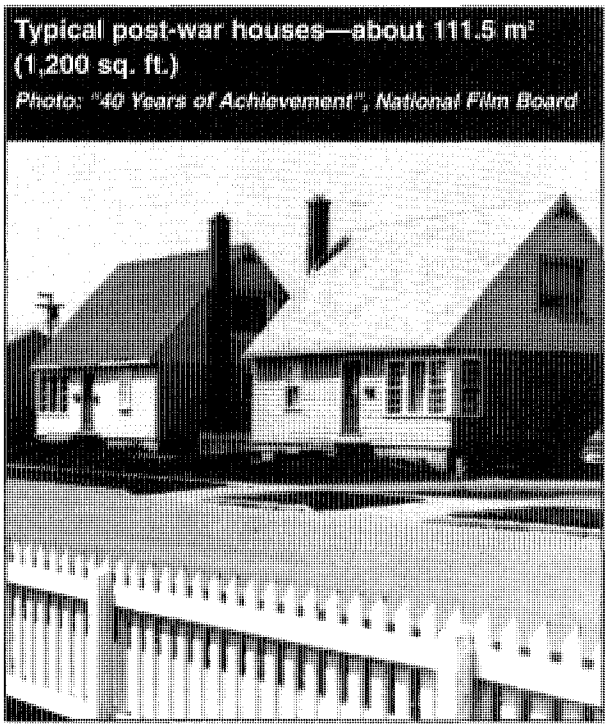
Space considerations

A typical three-bedroom, 1-1/2 storey post-war house provided 111.5 m^2 (1,200 sq. ft.) of living space. While there were more children per family in the 1950s, two or sometimes three children shared a bedroom. The basement was unfinished and was generally used for storage and a home workshop. Today's homes are definitely larger. A similar three-bedroom starter home would be 167 m^2 (1,800 sq. ft.). Typically, the additional space is devoted to a larger master bedroom with ensuite bath and to a family room on the main floor. Also, the 1-1/2 storey home was designed solely for a two-parent family with children. There was no provision for a larger private suite for other adults to live with the family.

Storage space is another consideration. Today's homes have more and larger closets than the



Today's 3 bedroom homes are typically 167 m^2 (1,800 sq. ft.)
Photo: Rosemary Spencer



1940s and '50s houses. As well, basements in today's homes are often completely finished, allowing for a fourth bedroom or home office as well as a games room and work area.

Upgrading and Modernizing the Home

Services

In 1945, 60-amp electrical service was standard. The norm is now 100 with a 200-amp service for electrically heated homes. Many older homes have knob and tube wiring. Since it does not provide secondary grounding, there is more danger of receiving a shock from touching a shorted metal case. Knob and tube wiring may not be considered a hazard but it should not be incorporated with any new circuits added to the system. Homeowners often prefer to replace it when doing major renovations.

Most post-war small homes had only one bathroom. A second, two-piece washroom is standard in new homes now. Larger homes have two or even three full bathrooms.

The gravity-type heating system common in post-war houses was slow to respond to changes in outdoor temperature. This resulted in overheated or cool houses, especially in spring and fall when the weather is changeable. The burners on today's furnaces are more fuel efficient, and the forced air or pumped hot water distribution makes the system more responsive. As well, automatic thermostats offer better control, allowing the temperature to be set back at night and during the day when the house is unoccupied.

Convenience

Houses require regular maintenance. In the 1940s, exterior wood trim and siding had to be painted regularly—every three to four years. Homeowners have welcomed the new maintenance-free materials that result in less ladder time and more leisure time. These include aluminum siding, soffit and fascia, and permanent storm windows and screens.

Comfort and air quality

Older frame houses were built with little or no insulation and with no air barrier to keep out drafts. In winter, basements were often cold and rooms on the first and second floor could be drafty with cold spots near the windows and outside walls. Today's houses are well insulated and sealed to prevent air leakage. Windows are more energy efficient, and houses are easier to heat and more comfortable. There are minimal drafts or cold spots—even when sitting near windows. Basements are insulated and can be comfortably used as living space.

Houses built in the 1940s and '50s depended on air leakage and open windows for ventilation. Often, this was not enough to dispel cooking odours or excess humidity from laundry or showers. Today's houses offer more control over air quality through a mechanical ventilation system. Odours and moisture can be minimized with kitchen and bathroom exhaust fans. Heat recovery ventilators are more comprehensive ventilation systems that provide fresh air to the house and exhaust indoor pollutants. Some ventilation systems are tied into the furnace distribution system. To avoid high electricity

costs, an efficient fan motor is essential with these systems.

Limitations to the Post-War 1-1/2 Storey House

Besides the problems common to all older houses, there are other conditions which make renovating the post-war 1-1/2 storey house a challenge.

Basement and foundation

Since they were originally designed as storage or work areas, basements generally have low ceilings. Converting them to usable living space may require increasing the basement ceiling height. Often, basements were not properly waterproofed on the exterior resulting in moisture seeping through foundation walls. Attempts to finish the basement without correcting this problem can lead to trapping of moisture behind the newly finished basement interior wall, causing damage and mold growth.

Since basements were not designed as living space, there was little or no provision for heating. As well, the location of older, large heating systems often resulted in the inefficient use of basement space.

First floor

First floor living areas are often small, particularly the eating area. The placement of the stairs often makes it difficult to use the third bedroom as a dining room or to open up the ground floor to create a "great room." Also, the addition of a two-piece washroom on the ground floor may be desirable but difficult to accomplish in the limited space.

Second floor

For many housing styles, it is relatively easy to upgrade attic insulation. The space is easily accessible and disruption to the living area of the house is minimal. However, the 1-1/2 storey house poses special problems because the living area is tucked under the roof in what would ordinarily be the attic. The sloping roof section is difficult to insulate without a major retrofit to either the interior ceiling or the roof exterior. As well, the small space behind the short knee walls at the base of the sloping ceiling is a difficult area to air seal.

Some conditions make renovating the post-war house a challenge
Photo: Charles Wood, New Brunswick

Storage

Storage space is limited in the post-war 1-1/2 storey house. Since the bedrooms are already small, it is difficult to expand the closet space without cutting into valuable living area. Where there is any dampness in the basement, it is not advisable to store books, papers or clothing as they could be affected by mold and moisture damage.

When Houses Age

Post-war houses are now 40 to 50 years old. As any homeowner will tell you, maintenance is never ending. But, there are special problems which can occur with an older house. Problems such as excessive moisture may not be obvious at first but they can cause serious damage to the house over time. It is especially important with older houses to approach renovation from a practical point of view: underlying problems must be dealt with before any other renovation work is undertaken. Preventive maintenance should be part of any renovation project.

The following are some of the conditions which commonly occur as houses age and which should be considered as part of any renovation planning.

Components reach the end of their service life

Some building components were never designed to last the lifetime of the house. Asphalt shingles are rated for 15 or 20 years after which time they begin to curl and crack. Furnaces have a service life of about 25 years and should be replaced to meet new standards and energy-efficiency requirements. Electrical panels can become outdated or rust. Even plaster walls were not designed to last forever. After 50 years, bulges may appear in walls or ceiling where the plaster has pulled away from the supporting lath.

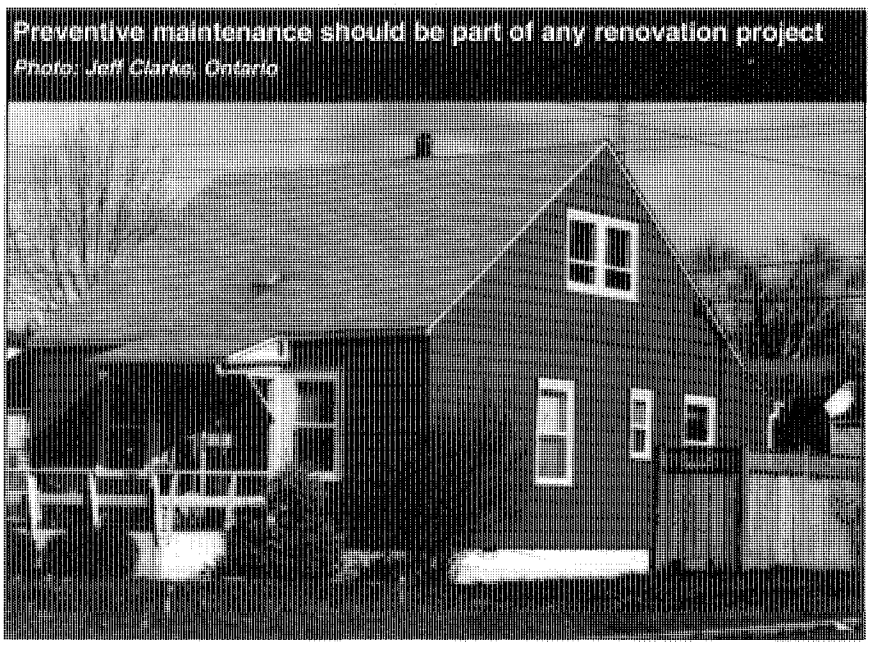
Some components wear out

Some components, particularly finishes such as exterior paint, putty and caulking, simply wear out after a few years. If they are not renewed regularly, more serious deterioration can occur to the underlying material. For example, eavestroughing can become rusted and corroded, allowing rainwater to soak the exterior house wall.

Interior components such as tile, sheet flooring or carpeting can wear out in less than 20 years, depending on the material and the traffic volume in the house. Even very durable hardwood flooring eventually wears out and needs to be replaced.

Other interior finishes such as paint and wallpaper need refreshing every few years. Panelling and cabinetry also need attention, although less frequently.

Less obvious components, such as water supply pipes, can also wear out. Corrosion can restrict the water flow in older, galvanized steel pipes so low water pressure is experienced in the house.



Preventive maintenance should be part of any renovation project
Photo: Jeff Clarke, Ontario

Foundation and structural problems become more evident

In the first few months after construction, houses settle slightly and minor cracks may appear. This is not a concern. However, real problems can arise if the structure is later weakened by moisture or water damage, by damage from insects (termites or carpenter ants) or by alterations to the building.

Structural deterioration can occur in the form of twisted

or rotted beams and posts, sagging floor joists, and moldy or rotting timbers. Over time, these problems in the underlying structure can cause plaster to crack, doors and windows to stick and floors to sag or heave.

New, improved products and systems become available

Housing technology has been evolving rapidly in the second half of the 20th century. Furnaces, lighting and appliances are far more efficient. Wiring is safer, many materials are maintenance free and some are more durable.

Some components are damaged by exposure

Sunlight can rapidly weather materials; it causes paint to deteriorate in just a few years. Air pollution causes pitting and corrosion of metal siding. Over a longer period, air pollution also damages the mortar in brick work. After 50 years, a house may be ready to have some of the mortar repointed.

Moisture damage of some sort has likely occurred

Next to the occupants, moisture is the single biggest cause of damage to buildings. Over time, unwanted moisture can weaken the foundation, damage the structure and ruin interior and exterior finish materials.

In older houses, the foundation walls are often made of porous concrete block or of a lower-quality poured concrete which also tends to be porous. Under these conditions, ground water can seep through the basement walls, causing the concrete or block to crumble. As well, the additional dampness in the basement creates ideal conditions for wood rot to develop in structural members. Signs of moisture damage include water stains, damp spots on foundation walls or the floor, cracked and crumbling mortar, or a white powdery deposit (efflorescence) on walls.

Above grade, moisture damage can occur when exterior building elements are not sufficiently protected from the weather. For example, holes in corroded eavestrough can allow the siding to be soaked from rain. Paint failure, decay and buckling of wood siding can all occur when edges of the siding are unprotected or when there are open joints or gaps in the material. A missing or damaged roof shingle or piece of flashing can allow water to penetrate the roof, causing damage to the attic and to the ceiling below.

Moisture damage from ice damming is visible as stains on exterior siding and on the interior wall and ceiling.

Moisture damage can also occur when the building envelope is not protected from moist, indoor air leaking into the walls or attic and condensing. This causes wetting and damage to the building structure. Signs of excess humidity and potential problems include wet insulation in the attic, stains on the ceiling, visible condensation on windows, water stains, blistering and peeling paint, and soft or rotten plaster or drywall.

As well, localized water damage can occur to counter tops, flooring, tub enclosures and cabinets when fixtures, such as sinks and tubs, are not properly sealed.

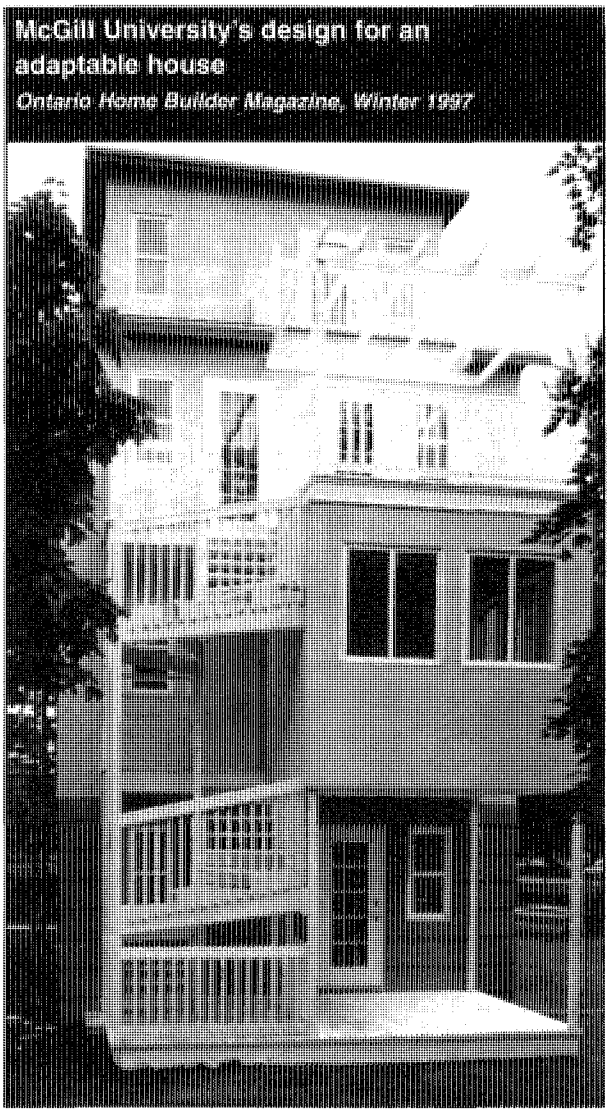
New Considerations in Housing

House-as-a-System

The House-as-a-System approach recognizes that all components of the house—the building shell, the heating and ventilation systems—interact as part of one system.

Understanding that the house acts as a system is especially important in renovation work, since changes to one component can bring unexpected results. For example, upgrading the building envelope can lead to higher indoor humidity and condensation on windows unless the ventilation system is upgraded at the same time.

House-as-a-System best practices are incorporated in the construction details for each sample

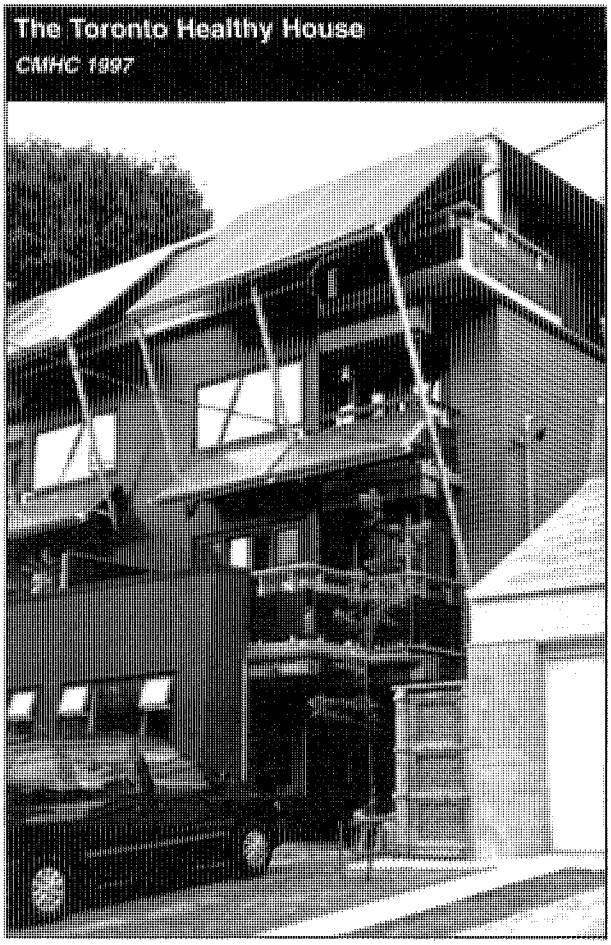

McGill University's design for an adaptable house
Ontario Home Builder Magazine, Winter 1997

renovation project outlined in chapters 5 and 6.

Adaptability

Housing is a very durable commodity. Most houses in Canada last 80 to 100 years—some even longer. In this century, we have seen family needs, population and communities change rapidly. It only makes sense that housing should be adaptable to our changing requirements.

For example, by planning ahead to include the required wiring, a nursery can be used later as a home office. Similarly, an open plan may be nice when children are small, but the simple addition of pocket doors will allow more flexible use of space for a house full of teenagers. Or, in bathroom renovations, the addition of grab bars,


The Toronto Healthy House
CMHC 1997

and easy-access faucet handles and door will make the house more usable for an elderly person or someone with disabilities.

This approach to homebuilding and renovation is called FlexHousing. Tips on how to incorporate FlexHousing principles are included in the detailed coverage of each sample renovation project.

Health and environmental considerations

Healthy Housing is a new approach to building and renovating houses. It recognizes that the houses we live in can affect our health, and they have a major impact on the environment around us as well. Consider these facts.

- **Occupant health—air quality**: Canadians spend 90 per cent of their time indoors. The indoor environment can be three to four times more polluted than outdoor air. Thirty-six per

cent of households report someone with allergies or breathing problems. Healthy Housing supports occupant health by choosing materials, products and systems that maintain good indoor air quality.

- **Natural resources—water:** In Canada, demand for water is increasing much faster than the population, straining water infrastructure and, in some communities, limited water resources. Between 1972 and 1981, the population increased by five per cent but water use rose by 50 per cent. Residential water use now averages 350 litres per person per day compared to 140 litres in Europe. Many communities now experience water shortages. Healthy Housing uses low-flow shower heads and toilets to reduce water use by up to 50 per cent. As well, this approach carries through to the efficient use of all natural resources.

- **Environmental responsibility—waste water:** In 1991, 75 per cent of Canadians were served by a sewage collection system. However, 16 per cent of these systems had no waste water treatment. A large portion of existing treatment systems require upgrading to meet today's environmental standards. Healthy Housing uses equipment and materials that reduce pollution of water, air and land.

- **Energy efficiency:** Canada is one of the highest per capita energy consumers in the world, partly as a consequence of climate, geography and industrial base. Housing accounts for 20 per cent of national energy use. Over 37 per cent of Canada's houses were built before 1960, when houses were poorly insulated. The energy efficiency of existing housing will have to be improved if Canada is to meet commitments to greenhouse gas reductions. Healthy Housing achieves energy savings of up to 50 per cent through improvements to the building envelope, heating system and lighting, and through the use of renewable energy sources such as wood heating or solar energy.

- **Affordability:** In 1991, one in 10 owners spent more than 30 per cent of household income on shelter. At the same time, 30 per cent of these owners, who were spending over the norm on shelter, were living in housing that was overcrowded or in need of major repairs.

Healthy Housing is for everyone. Many of the improvements can save renovation costs and substantially reduce the cost of operating the house. See the descriptions of renovation projects, in chapters 5 and 6, for tips on how to incorporate Healthy Housing principles into your next renovation.

Conclusion

The 1-1/2 storey house is an enduring and popular design—adaptable, easy to build and economical. Still, after 50 years of occupancy, there are many reasons why a post-war house requires more than just maintenance. Over 50 years, families and society have changed, and these changes are reflected in the way we use our homes. Standards for building components and services have risen over the years. The post-war house may need upgrading. Over the years, problems may have developed through simple wear and tear or through failure of building components. New knowledge has shown that these houses can be more efficient, and have less of an impact on the environment and on the pocketbook.

Changing expectations, new considerations and problems which need attention—all should be addressed as part of any renovation plan.

CHAPTER 3: THE RENOVATION PROCESS

Introduction

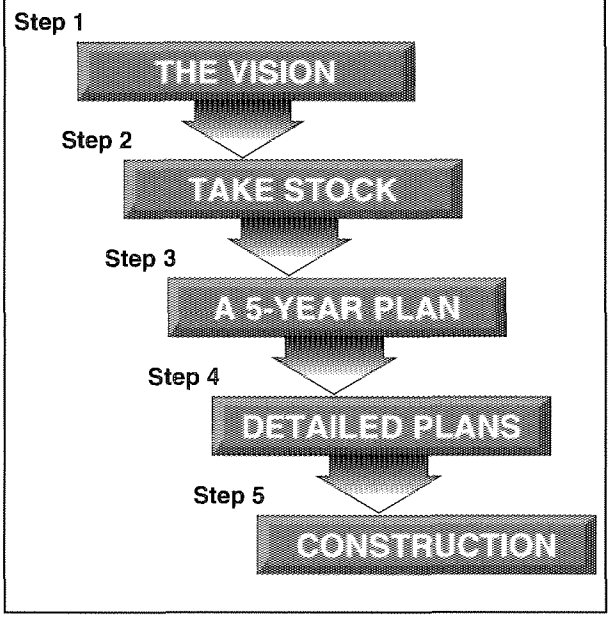
Most owners of older homes are constantly renewing their house, doing a large job every few years—a new roof this year, a year or two later the furnace. Many will undertake some jobs, e.g., repainting or building a deck, themselves. Once in a while, a major project, such as redoing the kitchen or putting on an addition, will require work from several trades. Yet, despite this constant attention, effort and expense, all too often the results are unsatisfactory.

- The quality of the finished work didn't measure up to expectations.
- The desired look or feel of the space was not achieved.
- The project cost far more than anticipated.
- Work had to be redone because a necessary permit had not been obtained.
- The job dragged on far too long.
- Some existing problems were ignored and had to be dealt with later at greater expense.
- The renovation changed the house in unexpected ways.
- Unexpected problems were discovered, requiring more work and expense.
- The work had to be ripped out three or four years later to accommodate a subsequent renovation.

Many of these common pitfalls can be avoided with a better understanding of the renovation process and proper attention to planning and preparation. This chapter provides an overview of the renovation process from vision to construction. It offers a step-by-step description of what is involved and what tasks you, the homeowner, need to accomplish in order to achieve a successful renovation.

The Renovation Process

Figure 6:
Step by Step



Remember why people renovate? To make the house into a better place to live. The renovation process starts with your vision of what you would like the house to be and moves through several steps to the completion of individual projects.

Along the way, you will need to **take stock.** Develop a solid understanding of the house—what needs attention, its good features and limitations, problems and opportunities.

With a vision in mind, and a thorough knowledge of what you have to work with, you can develop **the big picture**—a rough plan of what you aim to accomplish over the next three to five years.

Then, you can get down to the pleasant task of making your dream a reality by tackling individual projects. Depending on circumstances, your plan may spread projects over several years or group them into one major renovation effort. Whether the project is big or small, you will need to develop **detailed plans and preparations** and manage the actual construction work.

Step 1: The Vision

If you don't know where you're going, how will you know when you get there?

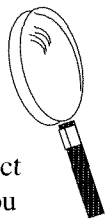
You may already have some very specific ideas about your house—improvements you would like to make or problems you would like to fix. But step back for a moment and look at the house as a whole. What kind of house would you like to have in three to five years?

How do you and other family members picture your ideal home? A large family room with a glowing fire? A fully equipped hobby room or a state-of-the-art kitchen? Has your family changed or do you anticipate changes? Do you need more space or would you like to use the space for different activities?

Dreaming doesn't cost anything, and it can help to identify those features that would give you the most satisfaction. Besides, drawing a vision of your future home will help you to get a picture of how the various ideas and projects you have in mind fit together.

Use the checklist in Chapter 4 to help develop the vision of your ideal home.

Step 2: Take Stock



Even if you do not plan to do any of the work yourself, you need to understand enough about your house so you can direct the renovation process. To begin with, you should know what it will take to bring the house up to current codes and standards of construction.

While some things, such as the need for a paint job, are obvious, other potential problems are only noticeable when you look in out-of-the-way places such as the basement or attic.

Besides identifying hidden problems, getting to know your house better will help you to identify opportunities for combining jobs efficiently, e.g., dampproofing and insulating while finishing the basement.

The separate parts of a house form one complete system. Understanding how the parts interact can help you anticipate how a planned renovation to one component will affect others. For example, a planned addition may put too great a load on the existing heating system and a new furnace may be required. Similarly, removing an interior wall may require additional structural reinforcement or rerouting of the plumbing and wiring enclosed in the wall cavity.

Finally, a thorough understanding of the house and all its possibilities will help you to stage the improvements in a logical order and avoid unnecessary work and expense.

The best way to gain an understanding of your house is to have a thorough inspection done by a renovator or experienced home inspector. If you are already knowledgeable about house construction, you may do the inspection yourself.

The inspection is similar to a general physical check-up. It should cover all aspects of the house—basement, mechanical systems, the exterior and the main floors—not just the areas you are presently interested in renovating, or the areas where you know there are problems.

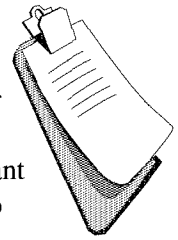
For each component, the inspection should give you answers to the following questions.

- How is the house built? What is it is made of and how was it assembled?
- Is it safe? Are there any hazards that need immediate attention such as unsafe heating system, broken handrails or stair treads?

- Is it built to current standards? What should be upgraded while renovating?
- Does it need repair or replacement? If so, how soon?
- Are there less obvious problems that could become serious later?
- What are the opportunities for making the house more energy efficient?
- What are the opportunities for improving indoor air quality?

A sample inspection checklist is included in Chapter 4.

Step 3: A Five-Year Plan



This is where you begin to put your dreams on paper. When complete, your plan will identify what you want to accomplish over the next three to five years, roughly how much each project will cost and when it will be done.

Even if your renovation work is limited to one major job every year or so, having an overall plan to guide the process will:

- help to clarify the direction you are taking with the house;
- ensure that essential jobs are given top priority and that components of the house are renewed before they break down, preventing unpleasant surprises;
- ensure that projects are undertaken in a logical sequence, saving you time and money;
- allow you to space out major jobs so they don't have to be done all in the same year; and
- allow you to plan and budget for home maintenance and renovation in a realistic manner.

List the projects

To begin developing your plan, list and prioritize all the projects and tasks that need to be done to fulfill your vision and to address problems identified in the inspection. The planning worksheet in Chapter 4 is a useful aid for this step.

Describe the work

Change may be due but, before starting any renovation, it is important to have a clear idea of what you want to accomplish. Otherwise, you may get more (or less) than you bargained for.

Develop a simple description for each job including a ballpark estimate of the costs and comments on when it should be done. For smaller jobs, such as replacing the furnace, a few notes will suffice. You can usually obtain ballpark estimates from the trades involved.

For larger projects, it is important at this stage to try to visualize how your finished project will look. Start a clipping file to collect ideas and design illustrations you like. If you are rearranging space or adding new space, develop a floor plan to scale so you can try out different furniture arrangements and traffic patterns. (Templates of typical furniture and recommended space allowances are included in Figure 7 in Chapter 4.)

Keep an open mind. There is usually more than one solution to a problem and the best one may not be the most obvious. Mentally walk through the space imagining traffic flows and the view from room to room. Do a sketch of any addition to help you visualize how it will look from the outside.

Don't ignore the essentials. Finishings can be easily upgraded or added later but it's very costly to redo structural work, add more space or upgrade services after the fact.

At this point you may have more questions than answers. What's involved in removing this wall?

How much will it add to the cost of the renovation? Are there other possible ways to add more space? It is often wise to seek the advice of a qualified home inspector, contractor or designer. For an hourly consultation fee, they will walk through your home with you and answer questions about your proposed plans. Sometimes, they will even provide a sketch showing an alternate concept. For large projects, this is money well spent. The hourly fee is often paid back through money saved and mistakes avoided during the renovation.

Contractors, magazine articles and friends are all good sources for ballpark costs. But remember, costs for renovation work can vary significantly depending on:

- the quality of workmanship;
- the quality of materials, especially finish materials used;
- unforeseen problems discovered during the course of the work, e.g., rotten floor joists; and
- prevalent rates in various parts of the country.

Reality check

Once you have put your dreams on paper, it's time for a reality check. You will need to ask yourself if your plans are permitted under current zoning by-laws, and whether they're practical and financially feasible.

- Check to see that your dream addition conforms to the local zoning by-laws. If not, you may need to apply for a variance. It is not usually difficult to obtain a variance for a minor change in setback or lot coverage, especially if your renovation is in keeping with the other houses on the street. However, it is best to obtain permission before committing to the work.

- With ballpark costs in hand you can begin to look at some practical issues. For any improvements beyond preventive maintenance, you should consider these questions.

  - How long do you plan to stay in the house?

  - How much of the renovation cost will you likely get back on resale?

  - Will your planned renovation put your house sale price out of line with other houses in the neighbourhood?

  - If the project is practical from an equity point of view, what are the implications for operating costs?

  - Will the renovation increase costs for heat, hydro and water?

  - How will it affect the assessed value of your home? Will your property taxes and home insurance go up as a result?

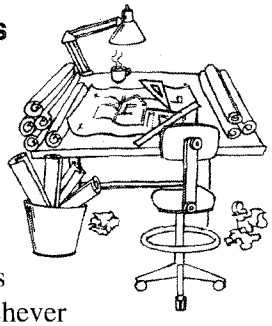
Finally, is the project financially feasible? Can you carry the additional costs of the renovation work and any increase in operating costs? How will you finance the work? For major projects, a personal loan is one possibility, whereas increasing the size of the mortgage allows you to pay for the work over a longer period of time. Keep in mind that lenders prefer to see a minimum of 15 per cent equity in the home and costs for principal, interest and taxes at no more than 30 per cent of income. If you are considering a major project, before proceeding further, it's best to check with your banker to make sure you will qualify for any needed financing.

Finalize your five-year plan

After the reality check, you may need to revisit your priorities or scale back your plans somewhat. Then, as you finalize your five-year plan, you will need to organize projects into a logical sequence. When complete, your plan will:

- give priority to essential maintenance and repair work which must be done;
- take advantage of opportunities to save money by combining jobs; and
- schedule projects to suit your financial resources.

Step 4: Detailed Plans



Your completed plan may consist of a series of individual projects spread over several years or you may decide to carry out all the work in a few months as one major renovation. Whichever you decide, it's a good idea to review all the tasks which need to be done before construction starts, from preparing detailed plans to last minute preparations of the work site.

Detailed plan

On major projects, detailed plans will be needed for building permit approvals, but even small jobs go much smoother with a proper set of plans and specifications. A detailed plan will:

- provide the information you need to obtain quotes from contractors; and
- help you to visualize what is involved and what the finished appearance of the job will look like.

For smaller jobs, e.g., reroofing, you will only need a short description of the work that includes the following items.

- What is the scope of the job? What is included and what is not? For example, on a roofing job, is the sunroom roof to be included as well?

- What are the specifications for the quality of materials and workmanship? For example, will the shingles be 15-year or 20-year type? Does the job include installing a membrane or metal flashing along the eaves to prevent water entry in the winter?

- Sketch any particular detail that is out of the ordinary, e.g., how the new flashing should be installed at the chimney.

- Determine the types of guarantees.

- Who is responsible for debris removal?

- What are the payment terms?

For this type of project, you could write up the detailed specifications yourself. However, you may want to seek the advice of a contractor or designer. They will often be aware of a wider choice of materials other than what is available through your local building supply depot.

Large projects, such as an addition, will require more information including a site plan, floor plans, elevations, drawings of construction details and written specifications.

There are several options to obtain detailed plans for larger projects. You could hire an architect or architectural technologist. The usual fee for an architectural service is 10 per cent of the value of the work. You could ask a contractor. Most contractors are prepared to develop detailed drawings and usually include this cost in their quote for the work. However, it is not fair to take the drawings of one contractor and use them to obtain quotes from others. A better practice is to pay the contractor directly for the drawings. They are then your property and you can use them as you like. Alternately, if you are skilled in this area and have some time, you could prepare the drawings yourself.

Who will do the work?

The size and complexity of the job will be your guide in deciding who will actually do the work. Some small jobs, such as painting or installing a fence or deck, can be done by a neighbourhood handyman/woman or yourself. You will want to hire a skilled tradesperson for other tasks such as roofing, wiring or plumbing.

Larger jobs will involve several trades. For example, a kitchen renovation could involve a cabinetmaker, general carpenter, electrician, plumber, drywall installer, flooring installer and painter. These larger jobs require the services of a general contractor to coordinate the work, hire the trades and handle scheduling.

Should You Act as Your Own General Contractor?

Yes, if you:

- have the time to spend organizing and supervising the work;
- have a great deal of patience;
- are a competent handyman/woman;
- understand construction practices thoroughly;
- can find the right subtrades and get competitive bids;
- are assertive enough to provide the supervision and scheduling;
- work well under stress; and
- have the support and agreement of your family.

There are other, easier ways to save money on your renovation than acting as your own general contractor. You (and a few friends) could handle some of the demolition. You could negotiate with the contractor to provide site clean-up or you could arrange to do some of the finishing work yourself, e.g., painting.

Hiring a contractor

Whether the job is a single task such as building a deck or a full addition involving several trades, the process of hiring a contractor is the same. Canada Mortgage and Housing Corporation gives some sound advice in the booklet "How to Hire a Contractor." The following information is summarized from that booklet.

First, you will need to contact a minimum of three candidates to ask for quotes. You can get referrals from your designer, friends and neighbours, or local homebuilders' association.

Provide all the candidates with the same information: your detailed plans and specifications. Ask them for three references of previous clients. Follow up these references. Visit sites of previous work and work in progress, if possible, and ask the owners about the contractor's performance.

When evaluating the bids, use the contractor checklist in Chapter 4 and keep these points in mind.

- Suitable experience: Does the contractor have experience with the scale of job you have in mind?
- References: How do previous customers view the contractor's performance?
- Working relationship: Will you be able to form a good working relationship?
- Licences and insurance: Do they carry the appropriate licences and insurance to cover public liability and property damage?
- Price: The lowest bid isn't necessarily the best. If it's much lower than the others, the contractor may have misunderstood the scope of the work, made a mistake or be trying to get a foot in the door and counting on charging for extras later.

The contract

Whether your project is large or small, a contract is essential. It records the agreement and understanding between you and your contractor. The contract can vary from a simple letter to a document of many pages but the essential features are the same. All contracts should include:

- address of the property where the work will be done;
- the client's name and address;
- the contractor's name, address and phone number and the name of the person who will be in charge on site;
- a detailed description of the work to be performed under the contract (for larger

projects this is done by attaching the drawings and specifications as part of the contract);
- dates for starting and completing the work;
- an itemized price for the contracted work and the terms of payment;
- a statement of any warranties or guarantees on the work; and
- the signature of both parties, with each retaining an original signed copy of the contract.

For larger projects or additions the contract will also need to include:

- agreement on who is responsible for obtaining any necessary permits, licences and certificates;
- agreement on who is responsible for removing all construction debris;
- a statement of the contractor's public liability and property damage insurance coverage;
- a statement on who is responsible for increased fire and theft coverage for the new work under construction (usually the homeowner);
- a statement that the contractor is responsible for any applicable workers' compensation coverage; and
- a statement naming the person (usually the homeowner) who is responsible for providing the contractor and his subtrades with access to the property, electrical power, water, washrooms, etc.

See Chapter 4 for a sample contract.

Follow These Rules

- Always get it in writing.
- Don't sign anything the first time it's presented. Take the time to think about it.
- Don't sign anything without getting other quotes.
- Compare any contracts against what's needed. Don't be shy about making changes or additions to any contract presented by the contractor.

Getting permits

While the contractor or tradesperson may arrange to get the required permits, the homeowner is ultimately responsible to ensure they are in place. If you are not sure whether you need a permit, call your municipal building department. It's always less costly in the end to spend time on permits and inspections up front than to have to redo work later.

- Building permits make sure the work is inspected and verified to be in accordance with building codes. A building permit is generally not required if the project is replacing a worn building component such as roofing. Permits are required for any structural changes or additions to a building, to excavate or build a foundation and to install new plumbing, heating or air conditioning.

- Permits are required for any changes to plumbing, heating and electrical systems. Generally the respective tradesperson arranges for the permit.

- Some municipalities require a permit to remove all or part of a building, e.g., to remove a back porch and replace it with a deck.

- Planning approvals are only required when the renovation plans will not conform to the local by-law regarding setbacks from the property line or coverage of the lot by the building. In these circumstances, the owner must apply to the municipality for an exception or variance to the by-law.

Last-minute preparation

As the homeowner, you are responsible for providing space, access and utilities that the workers need. Whether the job is big or small, you will need to make these arrangements.

- Remove or protect anything that could be damaged by construction activity. Outdoors, this could include brickwork, prize shrubs

and plants. Indoors, be sure to protect carpets, cabinetry and panelling, furniture and artwork.

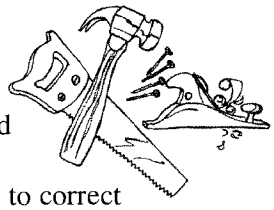
- Provide an area for workers to store materials, tools and refuse. If a dumpster is required, choose a location that will minimize damage to your lawn.

- Provide workers with access to water, washrooms and a telephone.

- Seal off areas where major interior work is occurring to protect the rest of the house from dust and disruption or, if this is not possible, arrange to move out for a while.

- Talk to the contractor to get an idea of the sequence of the work so you can make appropriate plans for periods of greatest noise or disruption, including times when water and hydro may be turned off.

Step 5: Construction



Once the work is under way, it's important, as the homeowner, to stay involved to make sure the project is going according to plan and to correct any problems before they get out of hand. During construction you are responsible for:

- informing the renovator about deficiencies or mistakes as soon as possible;
- paying for the job; and
- deciding whether the job has been done to your satisfaction.

Communication

Difficulties are bound to arise in the course of any job but, with a good working relationship, the homeowner and contractor can quickly sort things out. The key is communication.

Keep in touch. Don't hesitate to call the contractor if you have a question or if there is some change on the job site that you weren't prepared for. For larger jobs, it's a good practice to set up a regular meeting time, once or twice a week, with the contractor and your designer if you have one. This arrangement saves time for both you and the contractor. It provides a relaxed forum to review the work to date, resolve any questions about materials or methods, and deal with change orders and any complaints you may have.

Keep lines of communication clear. You may ask questions of the workers on site but always deal directly with the contractor to settle any issues.

Hear the other side. When difficulties do arise, try to see it from the contractor's point of view and clarify the issue amicably, before positions harden.

Inspections

If your renovation project involved a permit, then the work will be inspected, in some cases, several times. Major additions are generally inspected three or four times:

- after the footings and foundation wall are constructed and before the foundation is backfilled;
- when any new framing is complete;
- after the insulation is installed; and
- when the job is complete.

Plumbing inspections are generally done just once, after the pipes are installed, but before the fixtures are in. Heating and electrical systems are usually inspected twice. Although it is the responsibility of the contractor to arrange the inspections, it's good practice to be on hand when the inspector is there. With their wealth of experience, inspectors can be a good source of information and suggestions.

Mid-course changes

Very few renovation jobs go completely as planned. You may decide to add more features part way through the project, or material costs may be higher than expected, prompting some

cutbacks in other areas. In some cases, problems are discovered in the course of the work. For example, opening a wall may reveal rotten structural members that need to be replaced before the work can go forward. At times like these, the time spent building a good working relationship with the contractor will really pay off. You will need to agree on an approach to be taken and record it as a written change order, signed by both parties.

Final inspection

When the job is complete, you will want to walk through it with the contractor to do your own final inspection. At this point, you should identify any deficiencies or incompleteness in the work and come to an agreement with the contractor on how they will be resolved.

CHAPTER 4: TOOLS

Introduction

This chapter is your tool kit for planning and managing successful renovation in your home. The tools presented here cover the steps in the renovation process from developing a vision of your ideal home to preparing a contract for the work. They include:

- a vision worksheet to note your ideas and to identify just what you want to accomplish in your home;
- a sample house inspection checklist to take stock;
- a renovation planning worksheet to help you grasp the big picture as you prepare your five-year plan;
- a set of scaled templates for planning room layouts;
- a contractor checklist to use when hiring a contractor; and
- a sample contract.

Vision Worksheet

1. We need to correct an obvious problem:

Fuel bills are too high.	The electrical system is overloaded/not enough outlets.
The house is hard to heat/uncomfortable.	The roof leaks.
Components of the house have reached their lifespan.	The basement leaks.
The house affects family members who have allergies, asthma or other health sensitivities.	The house is too damp and moldy.
Other	

Our vision includes: _____

_____

_____

2. We basically like the house as it is but would like to make some improvements:

To make the layout more convenient.	To make the house more appealing/attractive.
To cut down on maintenance.	To make it more comfortable.
To modernize the wiring and plumbing.	To update the kitchen.
To modernize the bathroom.	To open up the floor plan.
Other	

Our vision includes: _____

_____

_____

3. Our interests/family have changed. We need to change the space to accommodate:

More children.	A nanny.
Growing children or teenagers.	A parent coming to stay.
A rental suite.	Grown children returning.
A home office.	An entertainment centre.
A home daycare.	A growing hobby or craft interest.
Other home business.	Other

Our vision includes: _____

_____

_____

House Inspection Checklist

This checklist is designed to assist you in making a quick but broad examination of your home. It should bring to your attention areas that need attention or further investigation. It will also help familiarize you with your home, in preparation for discussions with contractors.

• Number of occupants	Daytime: _____ Nightime: _____
• **Usual indoor temperature**	Daytime: _____ Nightime: _____
• Humidity levels	acceptable ___ high ___ low ___
• Humidity sources	_____
• Odours	acceptable complaints: _____
• Drafts	acceptable complaints: _____
• Thermal comfort	acceptable complaints: _____
• Special uses	_____

Basement/Crawlspace

Foundation Walls	
• Construction	poured concrete___ concrete block___
	preserved wood___ concealed___ other_____
• Cracks, movement	concealed___ none___ minor___ notes_____
• Signs of moisture	water leakage: none___ location and notes_____
	moisture pass-through: none___ effluorescence___ dampness___
	condensation: none___ location and notes_____
• Insulation	none___ interior___ exterior___ fibre___ foam___
	thickness___ R___ condition_____
• Vapour barrier	concealed___ none___ good___ poor___
• Moisture barrier	concealed___ none___ exterior___ interior___ good___ poor___
Floor	
• Construction	poured concrete___ dirt___ raised___ finished___
• Cracks, movement	concealed___ none___ minor___ other_____
• Signs of moisture	water leaks: none___ location and notes_____
	moisture pass-through: effluorescence___ spalling___ dampness___
• Floor drainage	none___ drain___ sump pump and location_____
Floor Support	
• Header	concealed___ signs of moisture/rot___ good___
• Joists	concealed___ size___ spacing_____ span_____
	signs of moisture/rot___ good___ cut outs___ notching___
• Posts	concealed___ none___ adequate___ poor___
• Beams	concealed___ none___ wood___ steel___ good___ poor___

NOTES

Mechanical Systems

Heating System	
• Fuel	oil___ gas___ electric___ wood___
• Type	forced air___ hydronic___ baseboard___
• Capacity	_____ kW or BTU/hr
• Condition	good___ questionable___ poor___
• Combustion air	supplied from exterior___ interior___ signs of spillage/backdrafting_____
• Accessory operation	humidifier___ air cleaner___ air conditioner___ heat pump___
• Furnace air filter	good___ needs replacement___
Fireplace:	
• Type	none___ open face___ doors___ recirculating___ stove___
• Chimney condition	clean___ dirty___
• Combustion air	supplied___ not supplied___
• Evidence of spillage	none___ stains___
Hot Water System	
• Fuel	oil___ gas___ electric___ wood___ solar___ combination___
• Type	central hot water tank___ instantaneous___
• Ownership	rental___ owned___
Plumbing System	
Supply:	
• Type	copper___ iron___ plastic___ mixed___ galvanized___
• Shut-off valve	location_____ concealed___ operational___ not operational___
• Condition, leaks	good___ questionable___ poor___ notes:_____
• Potential for freezing	safe___ possible___
• Flow rates	good___ low pressure___ restricted flow___
Drainage:	
• Type	cast iron___ plastic___ copper___
• Stack location	_____
Electrical System	
Service:	
• Capacity	60 amps___ 100 amps___ 200 amps___ other___
• Distribution	fuse___ breaker___ spare circuits___
Wiring:	
• Type	copper___ aluminum___ grounded (3 prong)___ ungrounded (2 prong)___
• Age/condition	good___ old___ unsafe___
• Outlets	distribution: good___ need additional plug outlets_____
• Fans	none___ kitchens___ bathrooms___
• Ground fault breaker	bathrooms___ outdoors___ garage___ whirlpool bath___

NOTES

Main Floors

Exterior Walls	
• Construction	single stud: 38mm x 89mm___, 38mm x 114mm___ insulated sheathing (R_____)
• Insulation	none___ cellulose___ fibre___ foam___ R_____
• Finish	drywall___ plaster___ panelling___
• Cracks	none___ minor___ notable_____
• Signs of moisture	none___ stains___ mold___ dampness___ peeling paint___
	soft plaster/drywall___, location_____
Interior Walls	
• Finish	drywall___ plaster___ panelling___
• Cracks	none___ minor___ notable_____
• Signs of moisture	none___ stains___ mold___ dampness___ peeling paint___
	soft plaster/drywall___, location_____
Ceilings	
• Finish	drywall___ plaster___ panelling___
• Cracks	none___ minor___ noteable_____
• Signs of moisture	none___ stains___ mold___ dampness___ peeling paint___
	soft plaster/drywall___, location_____
Floors	pre-finished tile or sheet material___
• Finish	carpet___ tile___ linoleum___ hardwood___ ceramic___ other___
• Level	good___ foundation movement___ interior support___ sag___
• Squeak	none___ acceptable___ requires correcting___

Windows and Doors

Windows	
• Type	fixed___ awning___ casement___ sliders___
• Glazing	single___ single and storm___ double___ triple___ other_____
• Frame	wood___ moisture damage___ rot___
	aluminum___ vinyl___ other___
• Condition	good___ poor___ notes:_____
• Seal/weatherstripping	good___ poor___ notes:_____
• Sill condition	good___ moisture damage___ rot___
Doors	
• Type	wood___ metal___ insulated___
• Storm	none___ aluminum___ wood___
• Weatherstripping	none___ good___ loose fitting___

NOTES

Attic Ceiling Space

• Type	flat roof___ cathedral ceiling___ peaked___ other_____
• Structure and Condition	concealed___ joist___ rafter___ truss___ concealed___ good___ damaged___ rot___
• Sheathing and Condition	plank___ plywood___ composite___ other_____ concealed___ good___ damaged___ rot___
• Insulation	none___ blown___ batts__ mica___ cellulose___ fibreglass___ other_____ R value_____
• Vapour barrier	none___ poly___ other_____
• Air barrier	none___ well sealed___ evidence of air leakage___
• Evidence of roof leakage	none___ description/location_____
• Evidence of condensation	none___ general staining___ condensation on sheathing___ wet or packed insulation___
• Evidence of air leakage	attic hatch___ plumbing stack___
• Ventilation	soffits___ peak___ gable___ mushroom___ adequate___ inadequate___

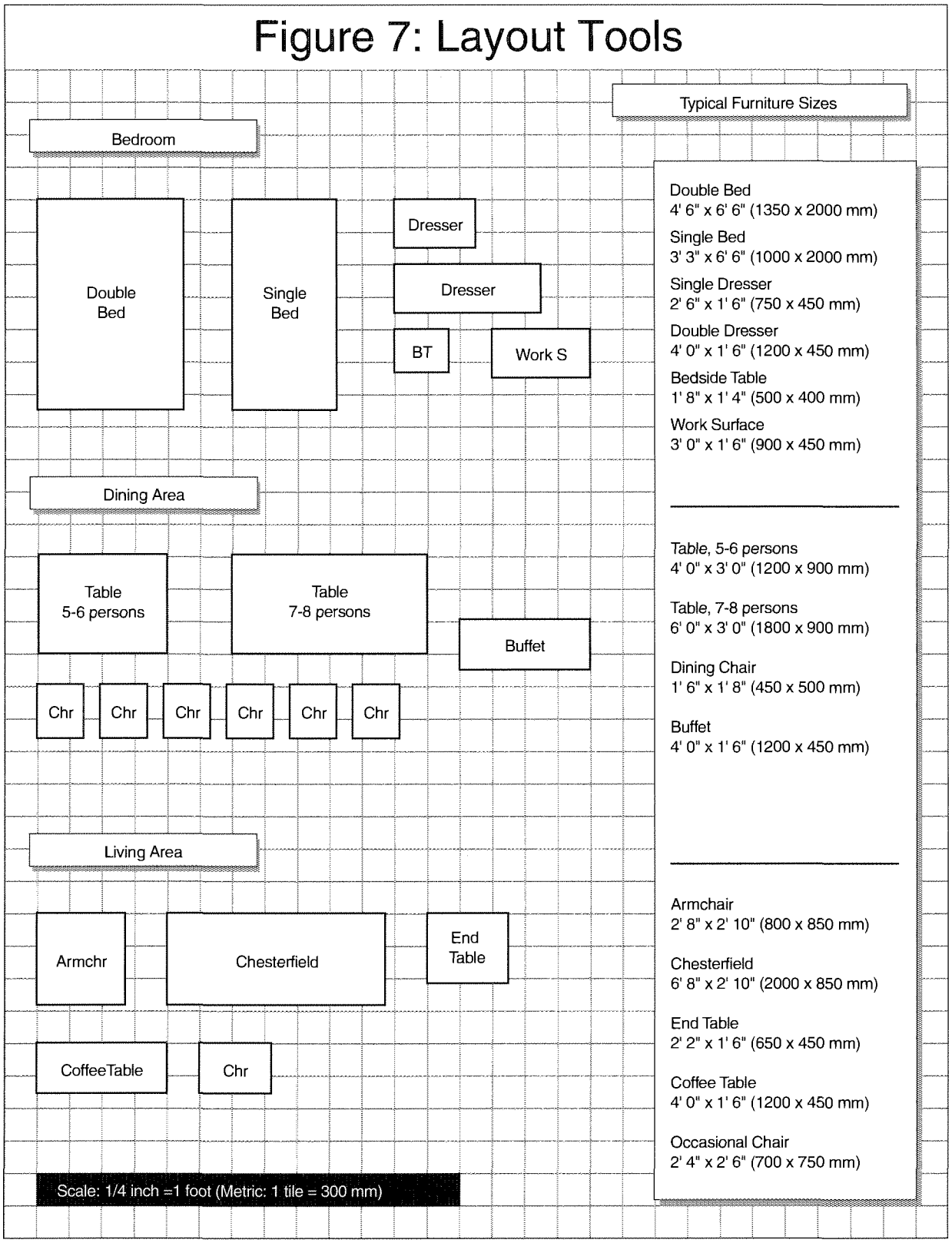
House Exterior

Foundation	
• Signs of moisture	none___ exterior source___ interior source_____
• General condition	good___ poor___ description_____
• Cracks	none___ minor___ noteable_____
• Grading	positive slope away from house___ slope toward house at___
Chimney	
• Condition	good___ repoint___ rebuild___
Exterior Walls	
• Finish	brick___ stucco___ wood___ aluminum___ vinyl___ stone___ other_____ good condition___ needs attention___
• Cracks, bows, sags	none___ minor___ notable_____
• Signs of moisture	none___ exterior source___ interior source___
Windows	
• Type	fixed___ awning___ sliders___ casement___ boarded up___
• Signs of moisture	none___ stains___ rust___ rot___
• Cracks, bows, sags	none___ notable_____
• Flashing and caulking	good___ needs repair___ replacement___
Roofing	
• Expected life	1-3 yrs___ 5 yrs___ 10 yrs___ longer___
• Type	asphalt shingle___ slate shingle___ wood shake/shingle___ tar/gravel___ other___
• Condition	good___ minor repair___ major repair/replacement___
• Heat loss	okay___ winter snow melt___ winter icicles___
• Eavestrough/downspout	good___ needs repair___
• Drainage	good___ pooling___

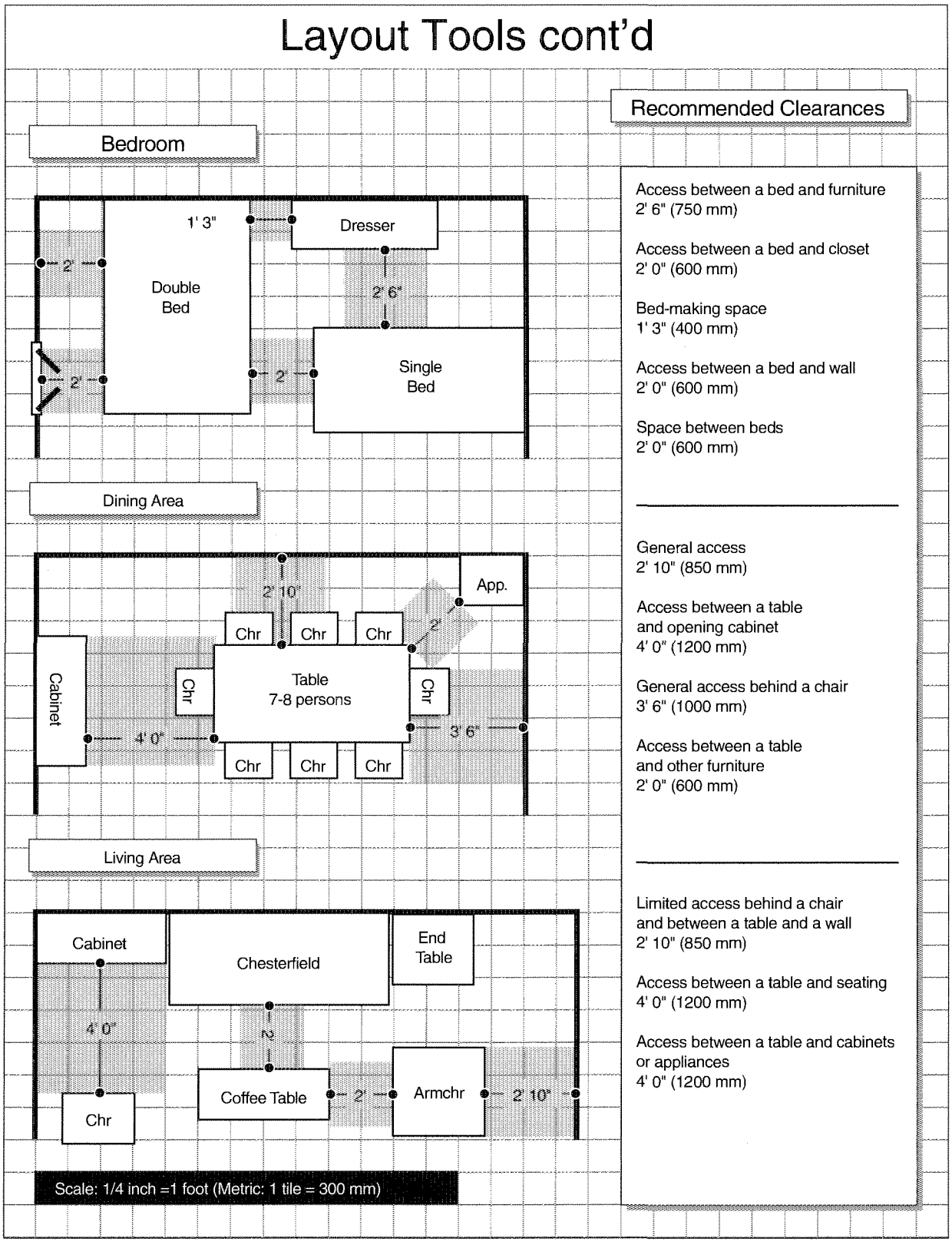
Renovation Planning Worksheet

PROJECTS AND TASKS	Priority	Trade Required OR Do-It-Yourself	Ballpark Cost
The Essentials ...addressing immediate problems and preventive maintenance			
Reroofing			
Basement waterproofing			
Correct moisture problem			
Repaint exterior siding/trim			
Recaulk siding			
Correct electrical problems			
Correct plumbing problems/tub enclosures			
Service HVAC equipment			
Correct indoor air quality problems			
Home Improvements ...improving the existing space			
Upgrade wiring			
Upgrade plumbing			
Upgrade HVAC system			
Modernize kitchen			
Modernize bathroom			
Change interior room layout/move walls			
Replace/upgrade flooring			
Replace interior finishes/stairs and railings			
Re-siding			
New windows			
Upgrade insulation and air sealing			
Space Related ...adding new rooms			
Finishing the basement			
Second storey expansion			
Ground floor addition			

Figure 7: Layout Tools



Layout Tools cont'd



Recommended Clearances

Access between a bed and furniture
2' 6" (750 mm)

Access between a bed and closet
2' 0" (600 mm)

Bed-making space
1' 3" (400 mm)

Access between a bed and wall
2' 0" (600 mm)

Space between beds
2' 0" (600 mm)

General access
2' 10" (850 mm)

Access between a table
and opening cabinet
4' 0" (1200 mm)

General access behind a chair
3' 6" (1000 mm)

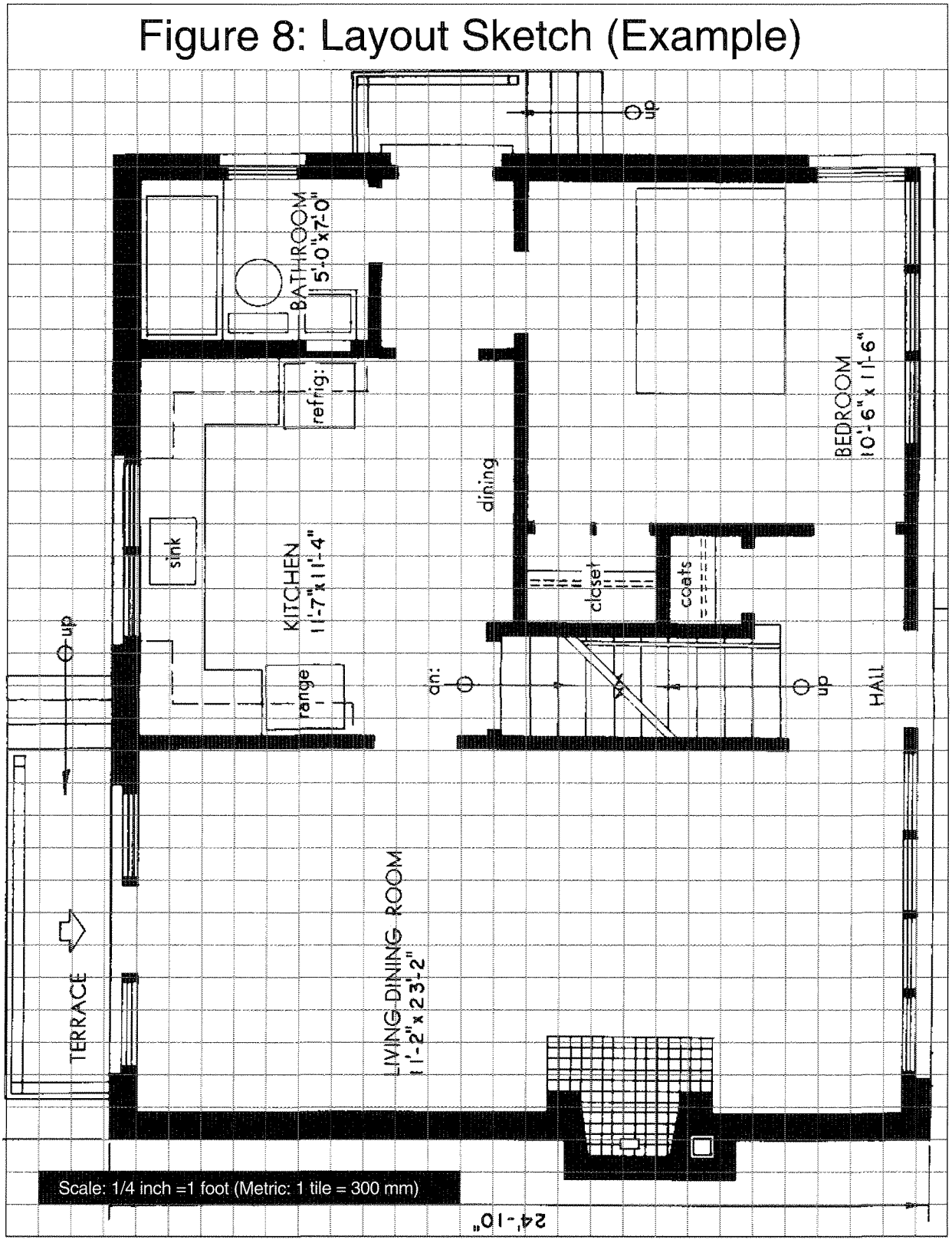
Access between a table
and other furniture
2' 0" (600 mm)

Limited access behind a chair
and between a table and a wall
2' 10" (850 mm)

Access between a table and seating
4' 0" (1200 mm)

Access between a table and cabinets
or appliances
4' 0" (1200 mm)

Figure 8: Layout Sketch (Example)



Contractor Checklist

CONTRACTOR 1

1. Suitable experience for the job at hand.

2. References

3. Working relationship

4. Licences, insurance, prof. affiliations

5. Price

CONTRACTOR 2

1. Suitable experience for the job at hand.

2. References

3. Working relationship

4. Licences, insurance, prof. affiliations

5. Price

CONTRACTOR 3

1. Suitable experience for the job at hand.

2. References

3. Working relationship

4. Licences, insurance, prof. affiliations

5. Price

Sample Contract

Between the Owner
And the Contractor
Subject Property

Contract Documents:
1) This agreement
2) Attached drawings and specifications signed by both parties
3) Additional documents and contract amendments (extras and deletions) signed by both parties during the course of this agreement.

The Contractor Shall:
1) Furnish all labour, materials, supervision and services to carry out the work detailed in the attached plans and specifications (to be initialled by the contractor and the owner) at the above address.
2) Be licensed and maintain full public-liability and property-damage insurance covering the above work.
3) Maintain workers' compensation coverage on all employees as required by provincial law, and ensure that all subcontractors maintain such coverage on their employees. Maintain site safety at all times.
4) Acknowledge the right of the owner to retain a mechanic's lien holdback as specified by provincial law.
5) Do all work to the requirements of the applicable building codes.
6) Be responsible for the work carried out under this contract by any subcontractors the contractor may employ.
7) Agree to start the work within 10 days of the signing of this contract, and to complete it not later than _____ days after the work has started.
8) Remove all construction debris from the property on completion of the work and, if damage occurs, restore the property to its original condition.
9) Warrant the work and materials for a period of one year from the date of completion, and, during this time, repair any defects immediately on receiving written notice from the owner. This warranty does not replace the following manufacturers' warranties on materials and equipment (details to be included or attached).

Permits:
1) The responsibility for obtaining any necessary permits is as designated below:

	Owner	**Contractor**
a) Building permit		
b) Heating permit		
c) Hydro permit		
d) Plumbing permit		
e) Site-works permit		
f) Other		

The Owner Shall:
1) Be responsible for assuring that the property meets municipal zoning by-laws and, if necessary, that special permission has been obtained from the appropriate authorities for the work covered in this contract.
2) Provide the space and freedom of movement on the property for the contractor's workers to do their jobs.
3) Pay the sum of $ ..... (including all applicable taxes) to the contractor as follows: $_____ on _____, $_____ on _____ and $_____ on _____ .

Signed: _____ _____
Owner **Contractor**

Date: _____

CHAPTER 5: CHANGING THE SPACE

Introduction

Amid all the fads and trends, some renovation projects are perennial favourites. Upgrading the kitchen or bathroom is at the top of the list for most homeowners. As well, for owners of the post-war 1-1/2 storey house, creating more space by adding up or out is often a priority. Books and magazines abound yet, all too often, finding information specific to the type of projects you may have in mind can be difficult. This chapter and the next present an owner's guide to the most popular renovation projects as applied to the post-war 1-1/2 storey house. The projects covered include:

Chapter 5: Changing the Space

- one storey addition;
- second storey bump-up;
- finished basement with bathroom; and
- accessibility retrofit.

The presentation of each project includes a discussion of design considerations to keep in mind when drawing up your plans, tips on construction techniques to follow for successful results and opportunities to introduce FlexHousing and Healthy Housing features into your renovation project. The sections on the one storey addition and second storey bump-up also include sample floor plans showing how the renovation can be designed to suit various models of the post-war 1-1/2 storey house.

ONE STOREY ADDITION

Overview

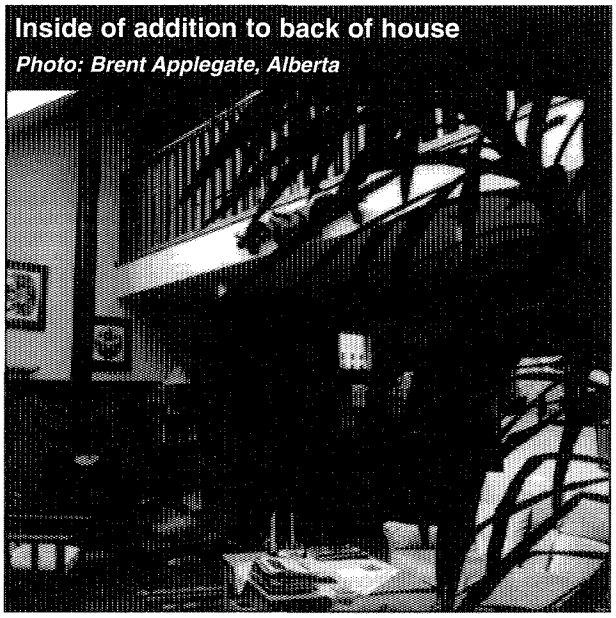
Many owners choose a one storey addition as the best way to expand the living area of a 1-1/2 storey house. An addition can be constructed with only minor disruption to the existing home and, generally, will not require major structural changes to the house. To get it right, some basic issues need to be considered at the outset.

- What will the addition be used for—a family room, a home office, a kitchen/dining room addition or a new bedroom?
- Where will the new space be added? The most common approach is to extend the rear of the house, but if the lot is wide enough, the house may be extended into the side yard.
- How large should it be? The width and depth will be dictated by the proposed use, lot size, design considerations and budgets.
- How will it affect the appearance of the house?
- The addition should complement the existing house roof lines and elevations.

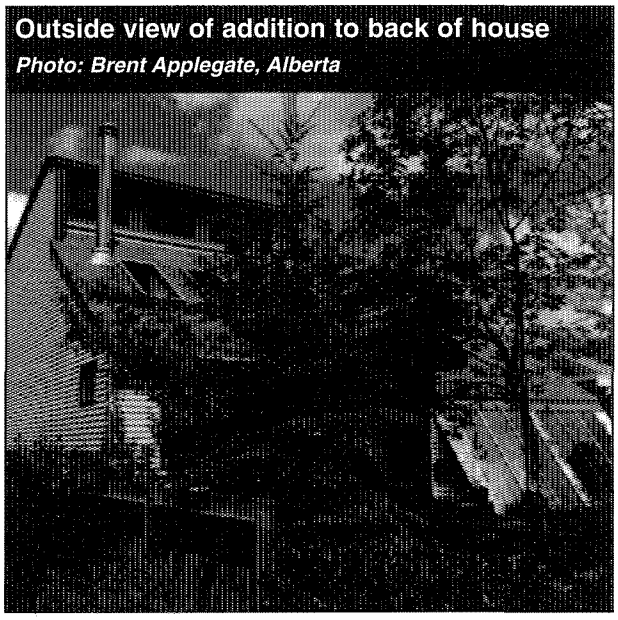
Design Considerations

In planning an addition, it is important to answer some questions about how the space will be used and how it will affect the rest of the house.

- How will the new space affect present use of the main floor of the house? Will some uses, e.g., the kitchen, be moved into the addition?
- Will access to the addition affect traffic patterns through the house? Would a larger opening through the house improve traffic flows?
- Will the floor level be maintained or would a "sunken" space work better?
- Will the space be usable throughout the year—comfortable in both summer and winter?
- How will the addition affect daylighting to existing rooms on that side of the house? Will they need new or enlarged windows?
- Can plumbing and electrical services be easily integrated?



Inside of addition to back of house
Photo: Brent Applegate, Alberta



Outside view of addition to back of house
Photo: Brent Applegate, Alberta

- How will the space be heated—by extending the current house heating system or by installing new equipment? Is there potential for passive solar heating?

- Is additional basement space needed, requiring the construction of a full-height basement under the addition, or would a crawl space or slab on grade foundation prove adequate?

- How will the roof line of the addition meet the existing house? Will it affect windows/ skylights, chimneys and other penetrations?

- What type of roof line will work best in the proposed addition—raised or cathedral ceilings, or a more traditional flat ceiling?

- What type of windows, cladding and other exterior elements will best complement the existing house?

- How will the addition link the house to the garden? For example, an extension across part of the house could create an L-shaped backdrop for a new patio.

Construction

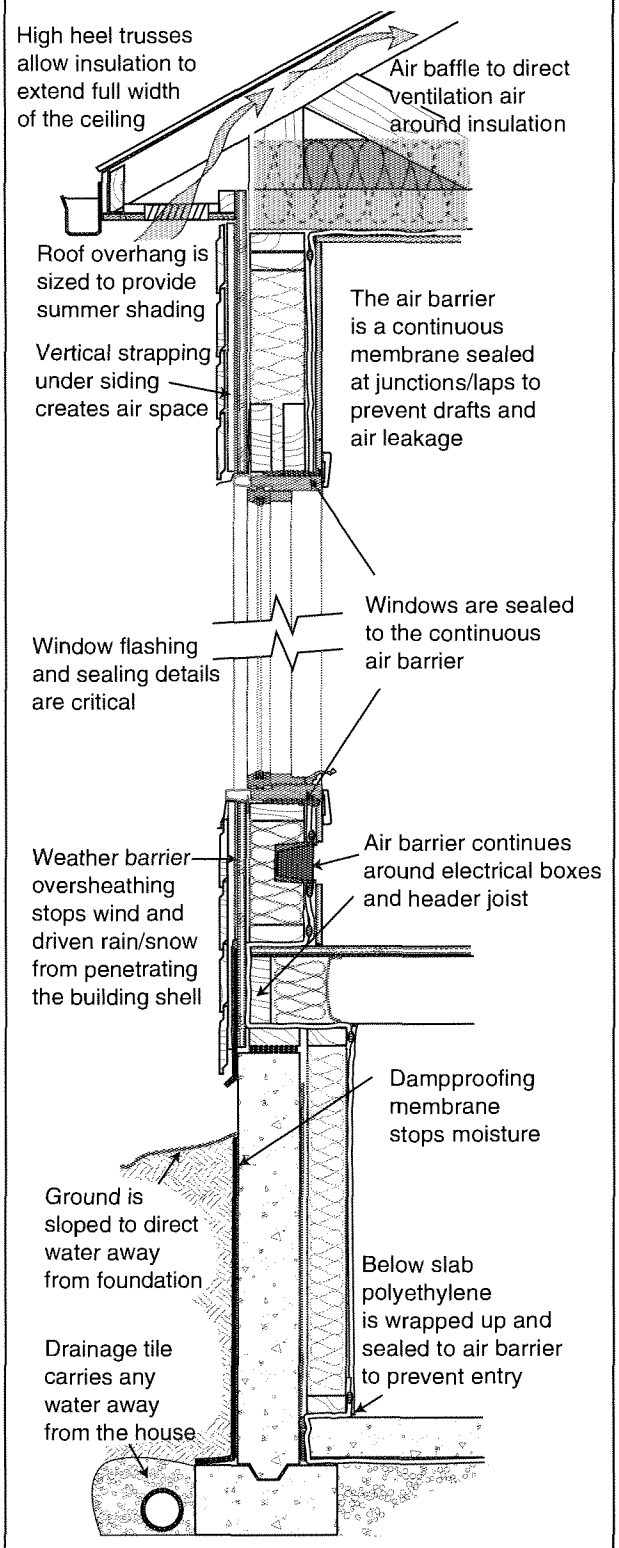
Design and construction practices will be governed by building codes. However, many aspects of working around existing structures are not dealt with in codes. Several key construction considerations must be addressed to ensure the long-term durability and energy efficiency of the addition.

Foundations

- Excavation and construction of the addition must not affect the structural integrity of the existing house. Where it is constructed on a rubble foundation, or on a foundation without a sound footing, underpinning may be required.

- A full basement or crawl space must be accessible from the existing house. Some

Figure 9:
Construction Details
New Addition



structural alterations may be required unless there is a window or door in the existing foundation.

- Unheated crawl spaces are not recommended as they can lead to cold floors and frozen service lines.
- Heated crawl spaces must be well connected to the house ventilation system.
- Surface and soil moisture must be directed away from the foundation walls. Consider using drainage layer membranes or free-draining insulation materials.
- Dampproofing and ground cover must be provided to resist the entry of moisture from the soil. The more you plan to use the crawl space, the better the construction quality of your floor will have to be.

Framing

- The floor system must be permanently tied into the existing house structure, using either threaded rods or lag bolts. Floor systems in the addition should be constructed level, even where the floor of the house is out of level.
- If considering expanding the size of window or door openings through the existing house walls, additional structural support may be required.

Wall systems

- The joint between the existing house cladding and addition must be sealed to prevent rain and snow entry.
- An effective air seal must be provided to minimize air leakage at the junction of the addition and existing house.

Roofing

- The new roof must be professionally joined to the existing roof to reduce the potential for leakage. Upgrading of the existing house roof may be justified at this time.
- Scissor trusses permit design of cathedral ceilings.
- Use raised-heel trusses to permit insulation over the full attic area.
- To prevent snow buildup and ice damming at the eaves, allow for good ventilation of the attic/roof space and install required eave protection.
- Skylights can help to provide natural light to the interior of the addition.

Figure 10:
Roof Options

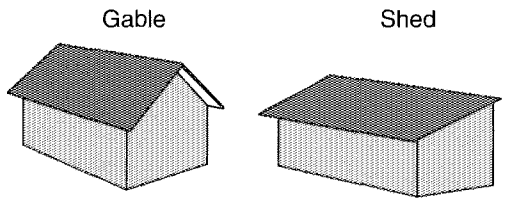
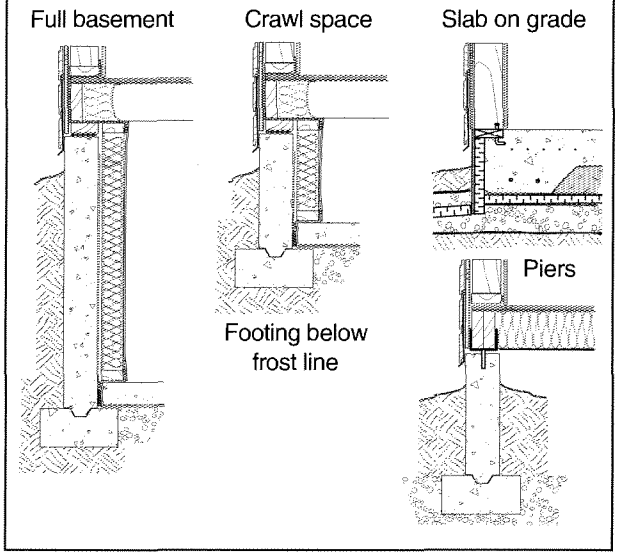


Figure 11:
Foundation Options



- Care must be shown to provide adequate structural support and weather protection for the new roof. Where the new roof joins the existing roof, some doubling of rafters in the existing house may be required.

- Ensure that roof drainage (eavestrough and downspouts) direct water away from the house.

Other considerations

- Services can usually be run from the existing house through the floor assembly.

- Construction sites are messy. Resist the temptation to open the house into the addition until the very end of the project. This will reduce the amount of construction dirt and airborne particles entering the house.

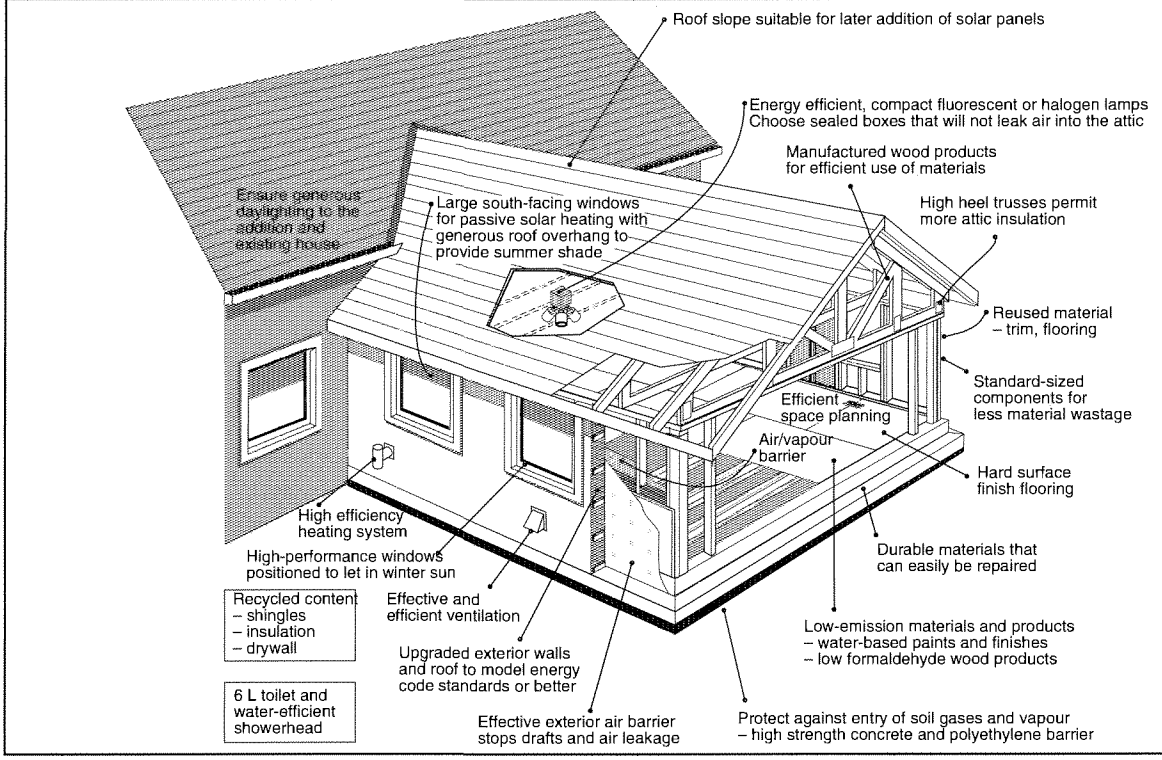
- Ensure that the finished grade slopes away from the house to divert water away from the foundation.

FlexHousing

A ground floor addition can be one of the most adaptable and useful spaces in the home, provided it has all the necessary facilities. These do not need to be built on immediately, but future disruption will be minimized if they are roughed in when the addition is built.

For example, a home office may require additional wiring for equipment and more overhead lighting. At the initial building stage, this would involve ensuring that sufficient wiring circuits and telephone lines are allocated to the addition. Similarly, a ground floor addition is the ideal location for a nanny or granny suite. Minimally, this would require a two-piece bathroom, but a full bath and even kitchenette would be ideal. Plumbing and electrical services could be provided for these functions when the addition is built and the fixtures added later as needed.

Figure 12:
Healthy House Options



Accessibility to the space is also an important consideration, e.g., a separate outdoor entrance which can accommodate a wheelchair ramp. The new space should also be accessible to the main part of the house. Make sure that connecting doorways are sufficiently wide and that any changes in floor level can be traversed with ease.

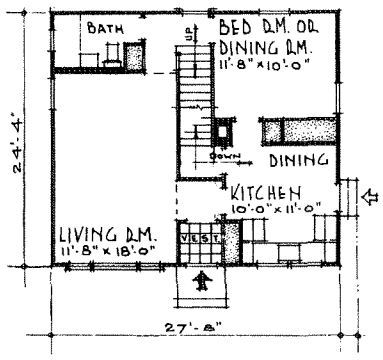
Financial Implications

Choice of features and finishing materials will affect the overall cost of the project significantly. Additional features could include a wood or gas-burning fireplace, a powder room or three-piece bathroom, a wet bar or kitchen. If the addition is built to energy-efficient standards, it should have minimal effect on the house heating bill. If the main house is upgraded at the same time, the overall heating bill, including the addition, can be less than the bill for the original house alone.

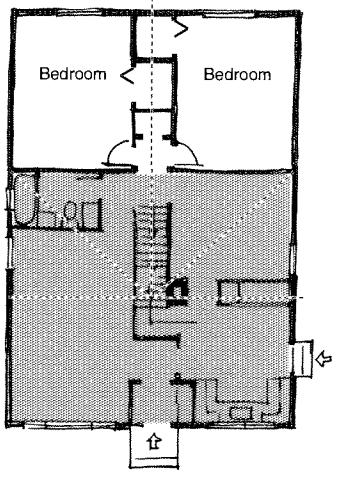
Construction costs for an addition can range between $75 and $125/sq. ft. depending on local construction costs, and the design and materials chosen. The integration of new kitchen space or a bathroom as part of the addition will significantly increase the costs.

Alternate Floor Plans for One Storey Addition

Figure 13: Typical Layout



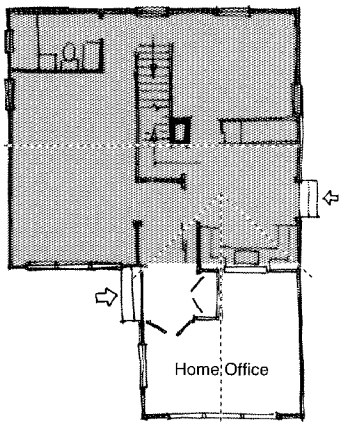
Original Layout



a) Rear Addition

a) Rear addition

- Provides two bedrooms on the ground floor.
- This arrangement frees up previous third bedroom for kitchen/dining expansion.
- Bathroom could be enlarged into the new addition or a second bathroom could be added to create an ensuite.
- In an alternate arrangement, if only one bedroom is provided in the addition, the kitchen/dining area could be enlarged into the addition with a family room opening onto the garden.
- Alternately, the addition could accommodate a self-contained granny suite.
- The rear addition does not solve the problem of no bathroom on the second floor.
- Except for the family room configuration, it does not relate the living area of the house to the rear garden.

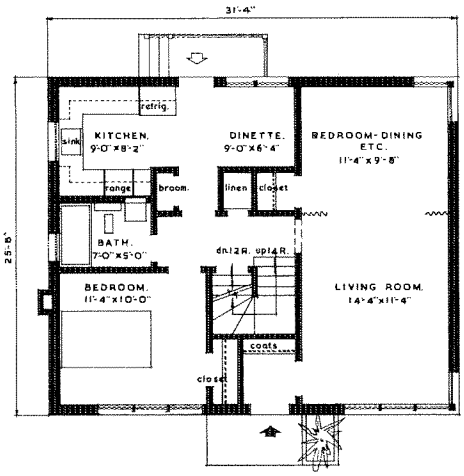


b) Front Addition

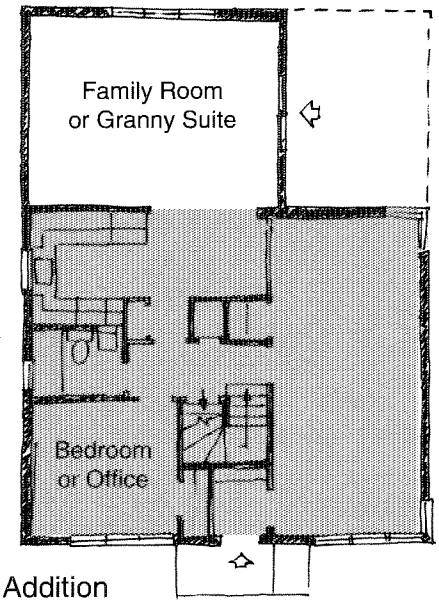
b) Front addition

- If the lot size allows, a smaller addition at the front of the house could accommodate a home office.
- The location at the front of the house separates the office from the family living area and allows for interviews and business visitors without disrupting family life.

Figure 14:
Model A



Original Layout

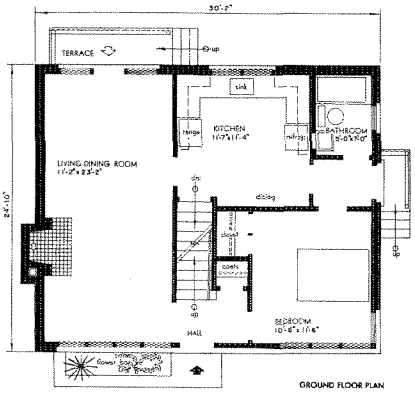


a) Rear Addition

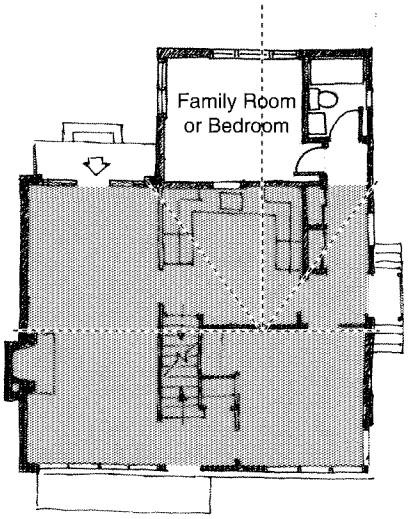
a) Rear addition

- Since the kitchen is at the rear of the house, the addition is suited to a family room.
- A deck at the side or rear of the family room would connect the family living area to the garden.
- By relocating appliances and removing the kitchen wall above the counter, the kitchen could be better connected to the family room.
- At the same time, rearrangement of internal walls could create a larger formal dining room.
- If there is no bathroom on the first floor, a two-piece bathroom could be added off the family room.
- Since the kitchen lies between the addition and the ground floor bathroom, the addition is suitable for bedrooms only if a full bath is provided.
- With a full bath, the addition would also be suited for use as a granny suite.
- The front bedroom in this design is suited to conversion to a home office or study by removing the closet and allowing entry directly from the front hall.

Figure 15:
Model B



Original Layout

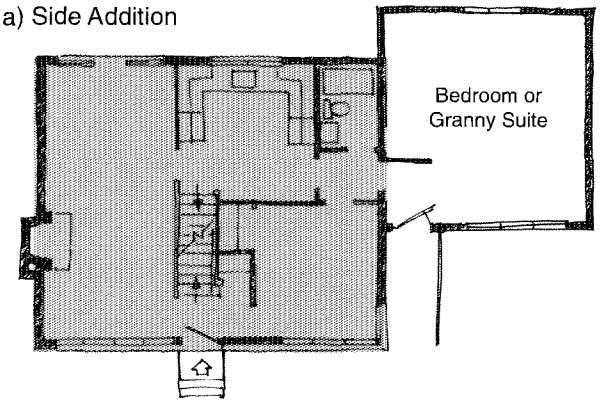


b) Rear Addition

a) Side addition

- An addition to the side allows for the conversion of the front bedroom to a family room.
- Depending on its size, the new addition could be used for a modest-sized bedroom or an expanded master bedroom or granny suite with ensuite bath.
- Since the addition also faces the street, it is a good location for a granny suite or a home office.

a) Side Addition

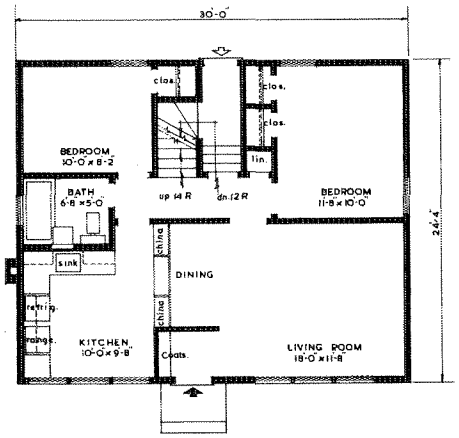


- Alternately, with a change in interior partitions, the former front bedroom could become a formal dining room. The former dining room could become a family room opening onto a deck or terrace.

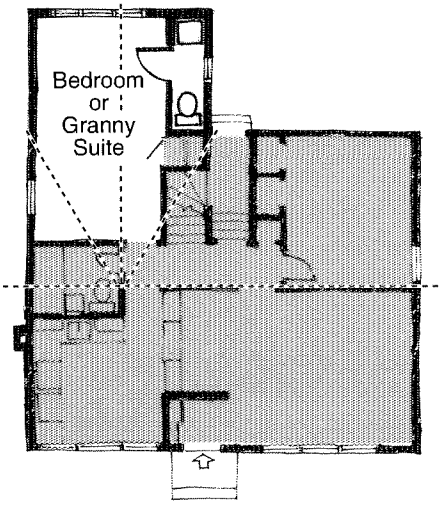
b) Rear addition

- Removing the bathroom makes it possible to move the addition to the rear of the house.
- In this location, the addition could serve as either the family room or a bedroom.
- If a family room, the kitchen wall could be removed to counter height, allowing for better connection to the kitchen.
- A deck could be added with access from both the family room and the dining room.

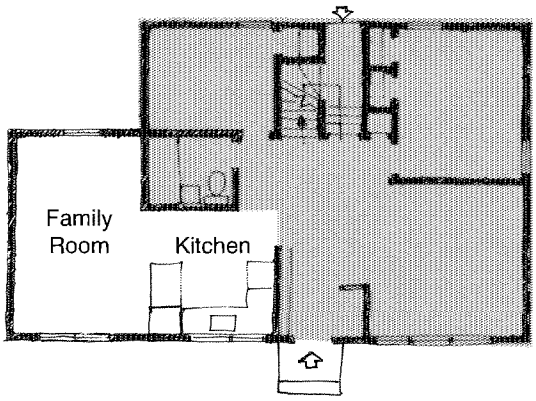
Figure 16:
Model C



Original Layout



b) Small Addition



a) Side Addition

a) Side addition

- An addition to the side allows for a generous family room.
- This arrangement involves reconfiguring the kitchen and moving the front entrance.
- The resulting plan provides for better traffic circulation and avoids guests having to pass through the dining and living area to reach other parts of the house.

b) Small addition

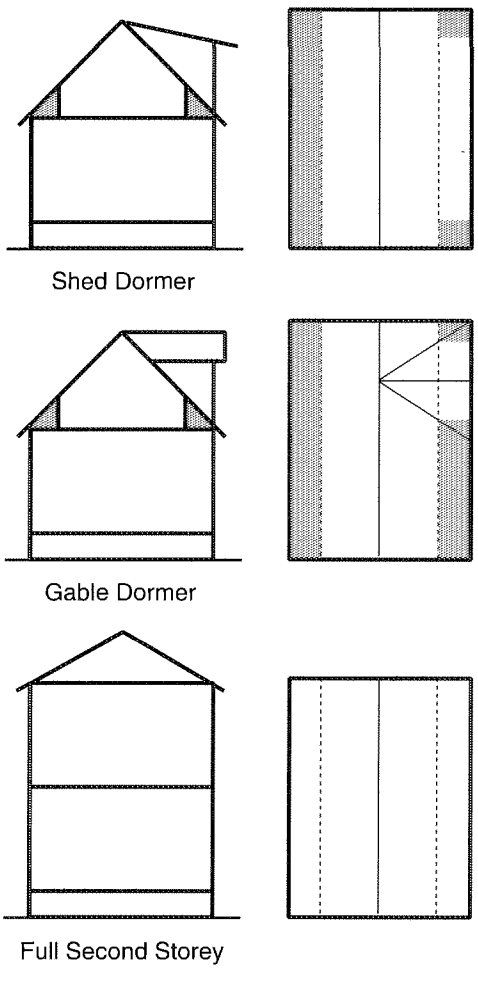
- A small addition to the rear creates a master bedroom or granny suite with ensuite, two-piece bath.
- This plan does not resolve the problem that traffic to other parts of the house must still pass through the dining/living room.
- The change in level at the rear entrance and the location of the kitchen at the front of the house make it impractical to locate a family room in a rear addition.

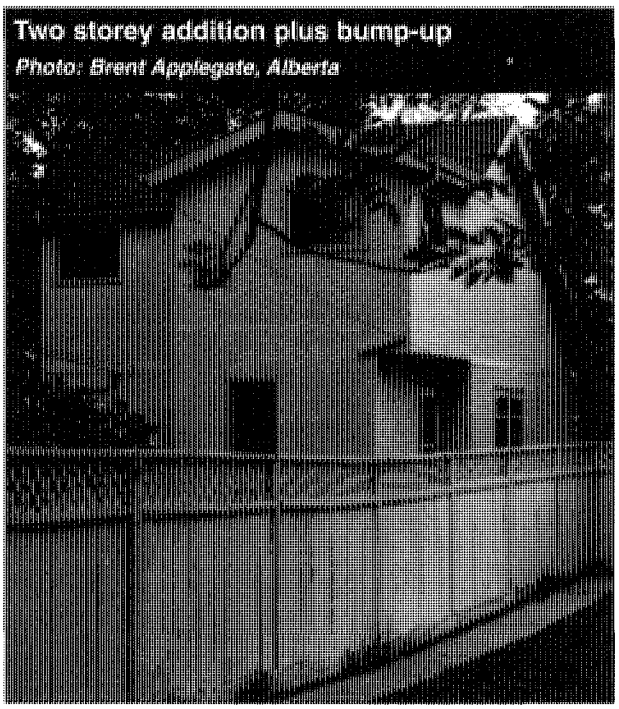
SECOND STOREY BUMP-UP

Overview

When looking around for room to grow in a 1-1/2 storey house, enlarging the second floor is a logical solution. The basic structure is already in place—walls, floor and roof. By adding or extending dormers, the usable space can often be increased by one third. With careful attention to appearance and construction details, an expanded second floor can be successfully blended with the original house.

Figure 17:
Second Storey Options





Design Considerations

Space

There are three approaches to enlarging the second floor. Each provides a different amount of headroom or usable floor area.

- Add a large gable dormer over one half of the roof on one or both sides. This approach may be more in keeping with the original design of the house and it is the easiest to construct but it doesn't provide as much headroom as a shed dormer.

- Raise a large shed dormer on one or both sides of the roof. This provides more usable space, although the ceiling height under the shed dormer section may be slightly lower. This is perhaps the most common approach.

- Remove the roof entirely and build a full-height second storey on the house. This offers the greatest amount of living space with full ceiling height throughout. However, it involves a lot more work and is probably the most costly approach.

In deciding which approach to use, the amount of space gained, effect on the appearance of the house and cost will all be factors. If the lot is large enough, it may be more cost effective to build a ground floor addition.

Layout

The most common reasons for enlarging the second floor are to enlarge the master bedroom and add an extra bathroom. Plumbing will be simpler and costs lower if the new bathroom is located over existing plumbing running to the kitchen or ground floor bathroom.

Enlarging the second floor allows for evaluating the size and location of the stairwell. Is it large enough to move bulky furniture (e.g., a queen size bed)? Are the stairs wide enough to accommodate a chair lift at a later date? Does the stair location work as well on the ground floor as it does on the second floor?

Appearance

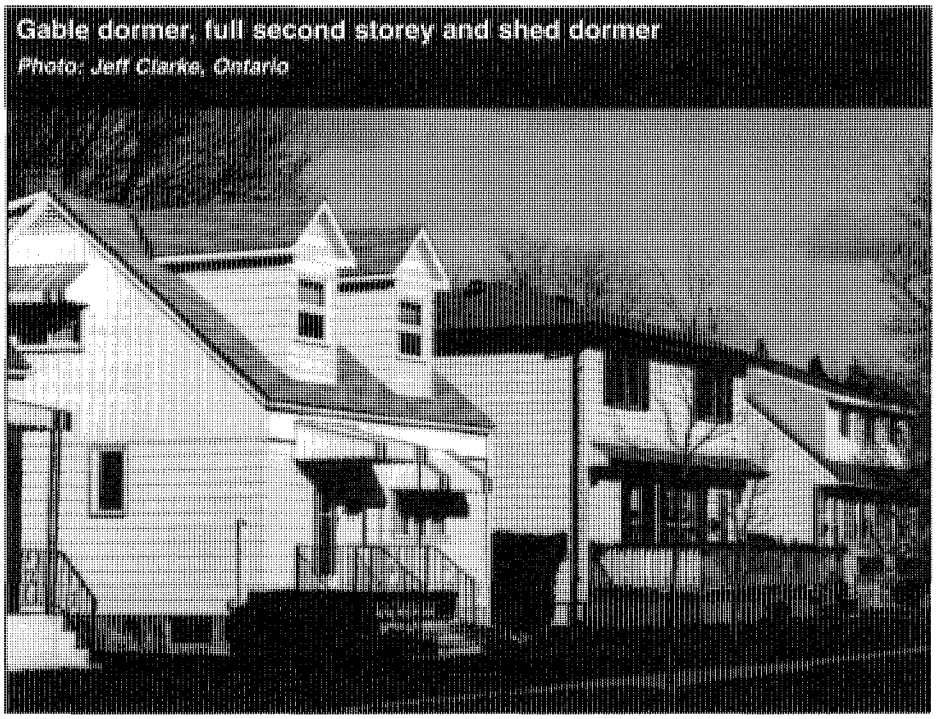
Many homeowners choose to add a single shed or gable dormer at the rear of the house, where it will not affect the street-side appearance.

Whatever the location, the extension should be in proportion to the rest of the house. Window size and styles, window height, siding and trim should all be compatible so the house looks as if it was built to that size originally. Consulting a designer or architect will be especially helpful with this type of project.

Construction

Structure

If a full second storey is planned, the house structure must be analyzed to determine if it can take the additional load of extended walls and roof. Where dormers are added or expanded, care must be taken with framing at the intersecting roof joints. The larger the dormer opening in the roof, the more structural work will be required. For a simple dormer, structural members in the existing roof will need to be reinforced to support the wider opening. For larger openings, a new central roof ridge beam will be required to support the entire roof. The ridge beam must have adequate bearing, either through structural support at either end of the roof or on a central partition wall.

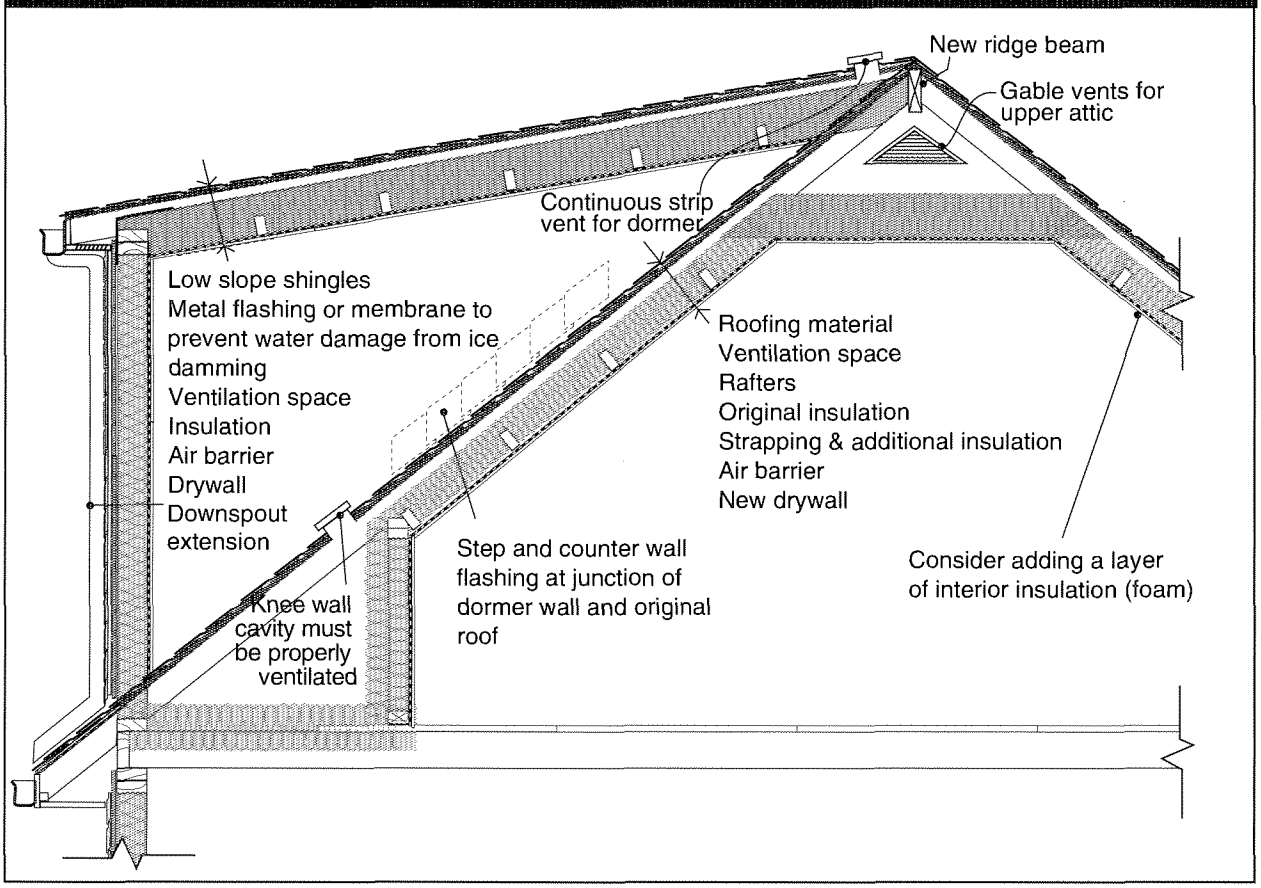

Gable dormer, full second storey and shed dormer
Photo: Jeff Clarke, Ontario

Roof details

Weatherproofing the house while the roof is open is a key construction issue. The larger the roof opening, the greater the chance of flooding during construction. Adequate coverage with a tarp and weatherproofing must be provided to protect the house and contents from rain damage.

Construction details require special attention to waterproofing and roof drainage. Extend

Figure 18:
Construction Details—Shed Dormer Addition



new valley flashings 0.9 m to 1.2 m (3 ft. to 4 ft.) under the existing roofing. Metal flashing material is recommended. The roofs of many shed dormers have a very shallow pitch. Consider special roofing materials (low-slope shingles) for these locations. Low-sloped roofs require extra care to prevent ice damming. As well, downspout extensions must be added so downspouts from the new roof do not discharge directly onto an existing roof.

Insulation

In sloped roof situations, the areas at the knee wall and on the sloping roof section are usually under-insulated compared to the small attic section. Care must be taken to ensure uniform levels of insulation throughout the roof. When insulation is added from the interior, there is some loss of headroom in the living area. If the dormer extension is very large, or if the project involves reshingling the entire roof, consider insulating the roof from the exterior before adding a new layer of roofing. It will be easier to obtain uniform levels of insulation without detracting from the amount of usable space.

Reinsulation work requires the installation of effective air and vapour barriers. The air barrier must be continuous throughout the building assembly. Special attention will be required at the junction of the first and second storeys.

Roof ventilation

Every section of the insulated roof must be ventilated, not just the attic section. Strapping or special baffles can be used to create a ventilation space in the sloped roof section. Alternatively, cathedral ceilings may be unventilated provided

the cavity is completely filled with insulation and the ceiling is properly air sealed on the interior.

FlexHousing™

When designing the layout of the space, consider potential future uses as well as your immediate needs. For example, you may be planning to use the larger room as a master bedroom. Could it be used later as a children's play room, a studio or home office or a bedsitting room for an elderly family member? What features could you include now to ensure that the space can be used differently in the future?

Access to the second floor may be an issue in the future. Consider widening the stairs to accommodate a chair lift at a later date.

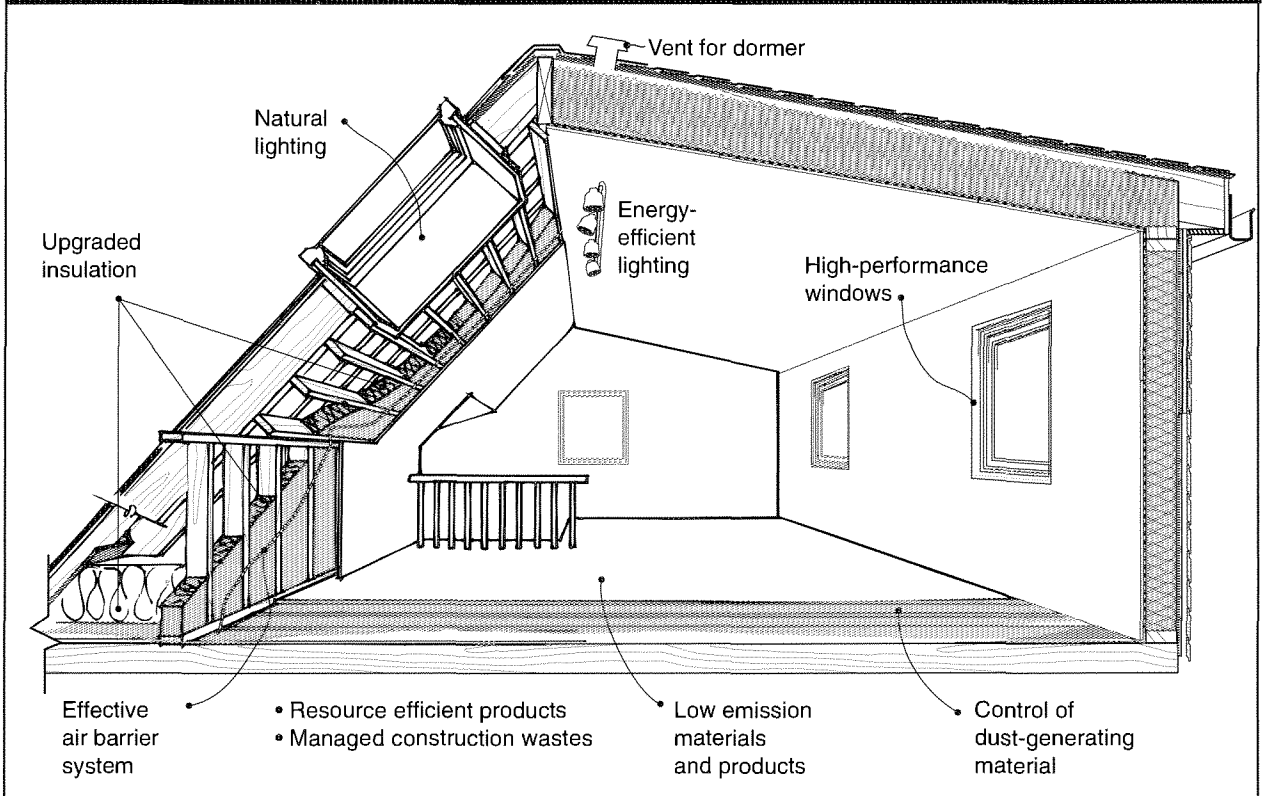
Healthy Housing

Consider upgrading the insulation levels on the walls and roof throughout the second floor. This will create a more comfortable space, both summer and winter. Make use of passive cooling strategies to minimize or avoid air conditioning. Overhangs on south-facing windows will shade the house from the midday summer sun. Use deciduous trees or vines to cool the east and west sides of the house. A light or medium tone roof colour will help to avoid heat buildup.

For family members with asthma, allergies or respiratory ailments a "clean air" bedroom provides an oasis where the body may rest and recover. Avoid wall-to-wall carpeting in bedrooms and pay special attention to the choice of materials and finishes.

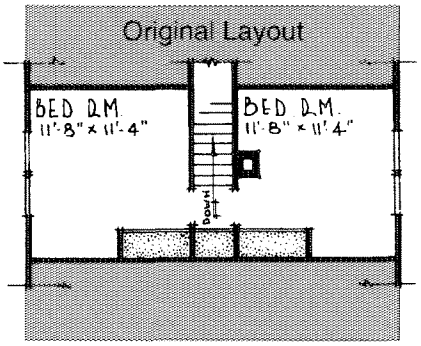
See CMHCs "Clean Air Guide."

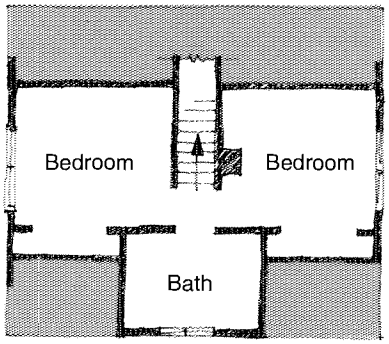
Figure 19:
Healthy House Options



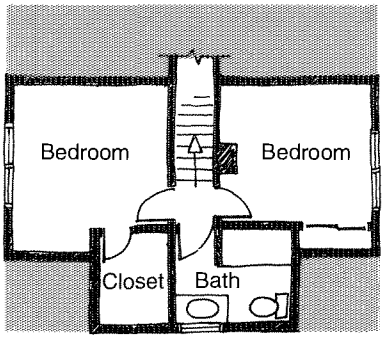
Alternate Floor Plans for Second Storey Bump-Up

Figure 20:
Typical Layout

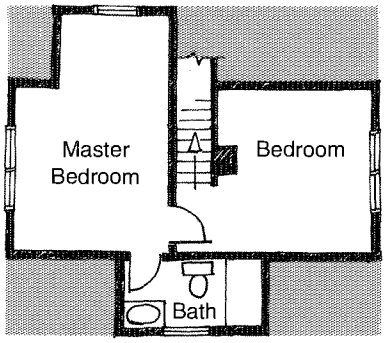




a) Central dormer



b) Central dormer



c) Front and rear dormer

On the ground floor, the plumbing is located at opposite corners of the house. The stairs are arranged so one arrives on the second floor, facing the front of the house.

a) A central dormer to provide for a second floor bathroom:

- takes advantage of accessible plumbing connections to the kitchen below; and
- allows for a pleasing appearance on the exterior.

b) A central dormer:

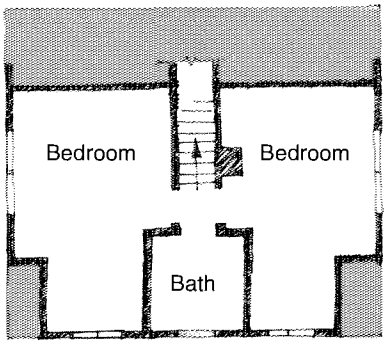
- creates a master suite with walk-in closet and ensuite bath but it does not add appreciably to the usable floor area of the master bedroom.

c) Front and rear dormers:

- allows for a larger master suite with an ensuite bath.

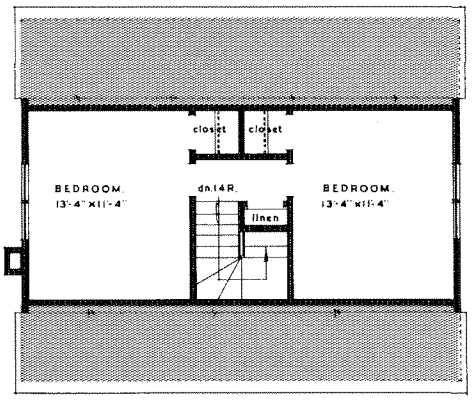
d) A full-width shed dormer on one side only:

- allows for a shared bathroom and slightly larger bedrooms on the second floor; however, the addition of three windows in the dormer may not present a pleasing appearance from the exterior.



d) Full-width shed dormer

Figure 21:
Model A



Original Layout

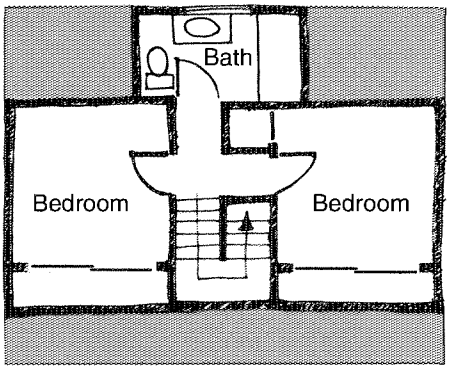
Both kitchen and bathroom are located on one end wall of the main floor.

a) A single rear dormer added at the rear and some interior partitions moved:

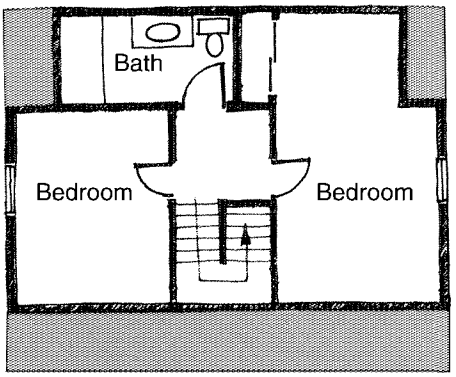
- allows for the provision of a shared bath.

b) Full-width shed dormer:

- allows for the expansion of one bedroom into a master bedroom. The bathroom could be shared or ensuite.

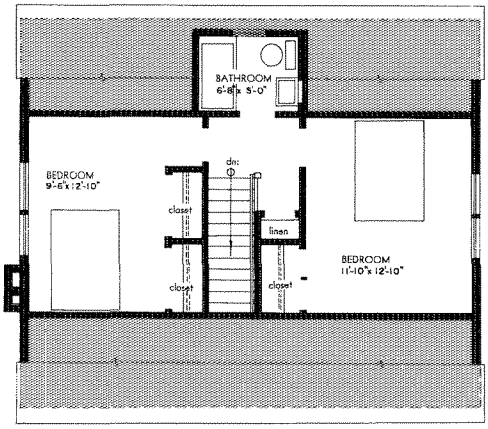


a) Single rear dormer

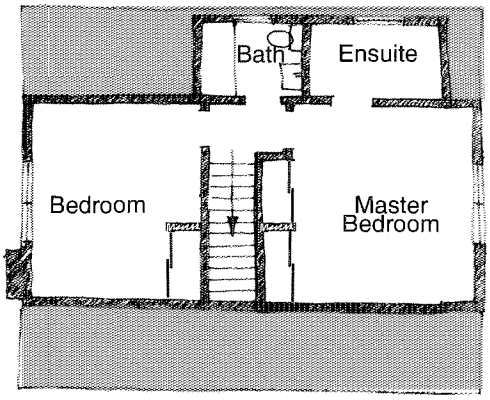


b) Full-width shed dormer

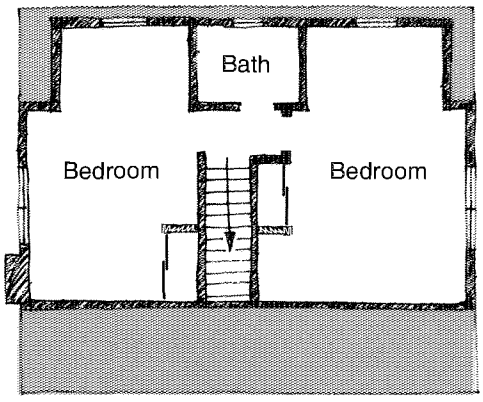
Figure 22:
Model B



Original Layout



a) Larger dormer on one side



c) Full-width rear dormer

Both the kitchen and bathroom are located at the rear on the ground floor. The stairs arrive at the second floor facing the rear of the house.

a) A larger dormer on one side only:

- allows for a shared bath and the one bedroom as a master bedroom with ensuite.

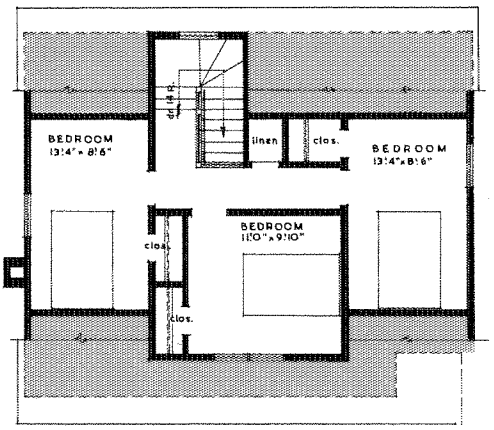
b) A larger dormer at the rear and a new dormer at the front:

- allows for a full-sized master bedroom with an ensuite bath.

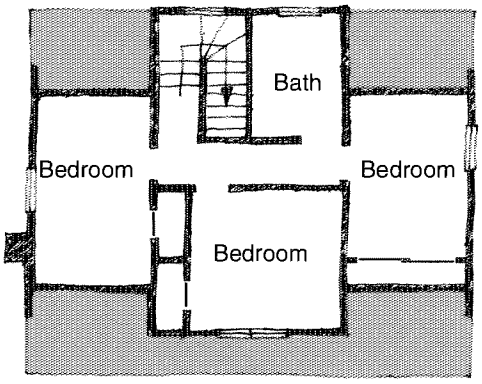
c) A full-width dormer at the rear:

- allows for expansion of both bedrooms and, since the addition is at the rear, the configuration with three windows in the dormer is not as critical for appearance.

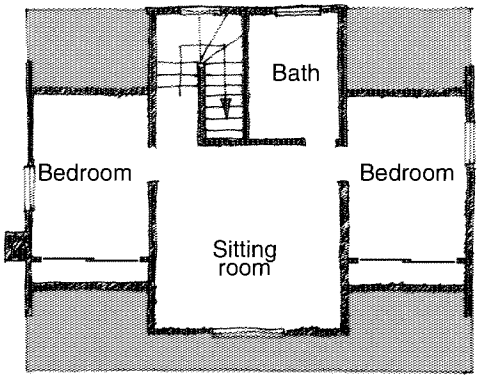
Figure 23:
Model C



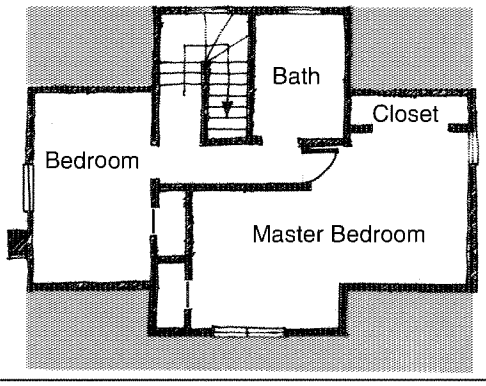
Original Layout



a) Enlarge shed dormer



b) Change interior partitions



c) Enlarge shed dormer

This house already has a small shed dormer at the front and rear.

a) Enlarge rear shed dormer:

- allows a small bath to be stacked over the first floor bath; with this plan, one bedroom would lose a closet, although a small closet could be installed in the knee wall cavity.

b) Enlarge rear shed dormer and change interior partitions:

- by installing the bath as in (a) and moving some closets, a teenagers' suite could be created that would include a shared sitting room and two small bedrooms. This plan results in the loss of one bedroom.

c) Enlarge rear shed dormer as in (a) and move some interior partitions:

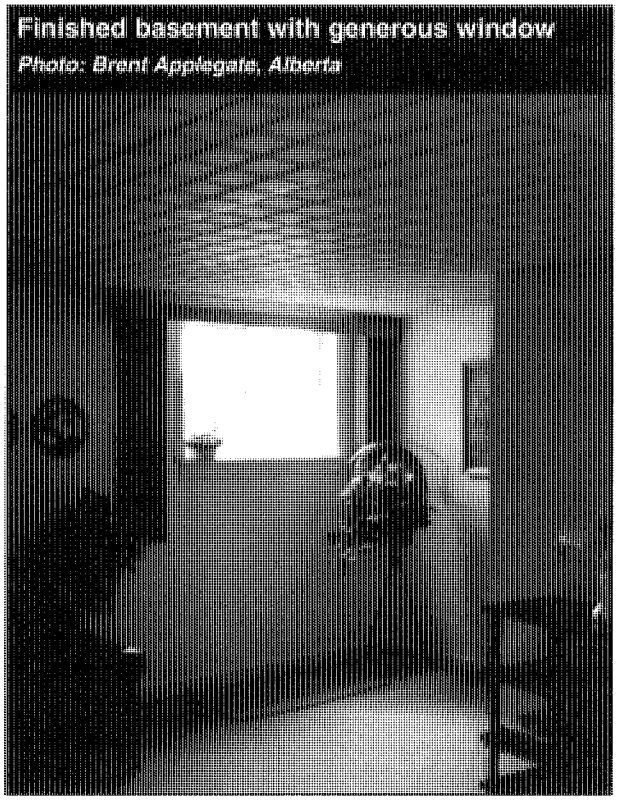
- creates a large master suite. With this plan, one bedroom is lost.

FINISHED BASEMENT WITH BATHROOM

Overview

When householders look about for additional space, the basement is a likely candidate. The basic raw space is already there and often underused. Much of the additional work required to upgrade may be done on an incremental do-it-yourself basis. And, the work will not greatly affect the other living areas of the house. When tackling a basement renovation, there are two key issues to address.

- What is the space to be used for—recreation space, a bedroom, a rental suite? The design will change accordingly, but it may be best to keep future options open.
- What do you have to work with? Is the foundation sound? What about dampness or water leakage? To protect the building structure, never finish a damp basement without first solving the water problems.



Finished basement with generous window
Photo: Brent Applegate, Alberta

Design Considerations

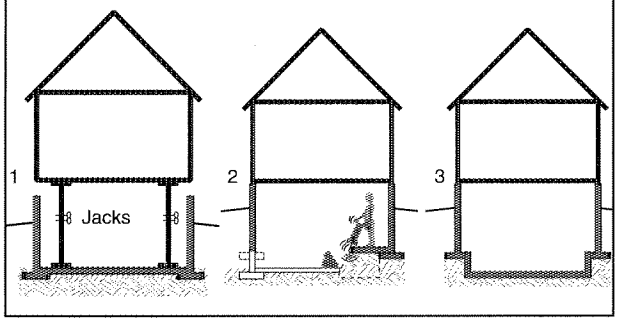
Basements in post-war homes were originally built to house the furnace, laundry, workshop, a cold cellar and storage. As potential living space, they often lack some essential requirements: adequate ceiling height, adequate daylighting, safety and provision for plumbing, heating and ventilation. A successful basement renovation will address these issues and also retain sufficient space for the original basement functions, i.e., the utility room and storage.

Ceiling height

Ceiling heights should be a minimum of 210 cm (6 ft. 11 in.) from finished floor to finished ceiling. There are three options for increasing the ceiling height in older basements.

- Temporarily raise the house on jacks and increase the height of the basement walls.
- Underpin the old footings and dig out the full basement floor, thereby increasing the height of the basement wall.
- Dig out the centre area of the basement floor, leaving the footings and walls intact with a "shelf" or "bench" around the perimeter. This is the least disruptive, lowest cost approach.

Figure 24:
Alternate Methods of Increasing Ceiling Height



Daylighting

Codes require that habitable spaces have adequate windows, yet basements have very small windows which one can only see out of when standing. The simplest solution is to increase the size of the windows in critical living areas, using window wells to bring the window sill to table height. This is especially suitable where there is already a generous portion of basement wall above grade. However, window wells are only advisable where good drainage is possible. Another alternative, to brighten the living area, is to create a basement walkout with glass doors. This option works well where there is a sloping site or a need for a second entrance to the space.

Safety

Safety is just as important in basement living areas as on the main floor. Include at least one smoke detector in the finished basement space. Ensure that fire separations between materials and electrical installations conform with local code requirements. A second exit is a must if the space is to be used for sleeping or as a rental suite. Since this will expose the footings for the house, frost protection must be provided.

Plumbing, heating and ventilation

Adding a bathroom or kitchen will require additional plumbing in the basement, and a pump may be required to lift waste to the level of the waste line that connects to the municipal sewer system.

Unfinished basements were heated minimally or not at all. In houses with forced air systems, simply tapping into the existing overhead ducts will not make the basement comfortable. A finished basement may require significant changes to the existing house heating and ventilation systems.

In addition to operating windows, a finished basement will require exhaust fans in kitchen and bathroom areas to remove excess moisture from the house. Care should be taken to ensure an adequate supply of air to the furnace room, especially if fuel-burning appliances are enclosed in a small room. Spillage-resistant heating appliances, such as direct vent furnaces, may be advisable.

The essentials

It is important not to over-finish the basement area. In terms of mechanical systems, the basement is the nerve centre of the house. Accessible space is required for utilities such as the furnace, water heater, electrical panel and laundry. Floor drains should not be covered, and access is required to plumbing shut-off valves, electrical and phone cable junctions and cleanouts at the base of vertical plumbing stacks. Since many of the services for the upstairs run through the basement ceiling, a suspended ceiling or other form of accessible ceiling is recommended. As well, storage space is essential, and it is useful to retain at least a small work area for hobbies or home repair chores.

Construction

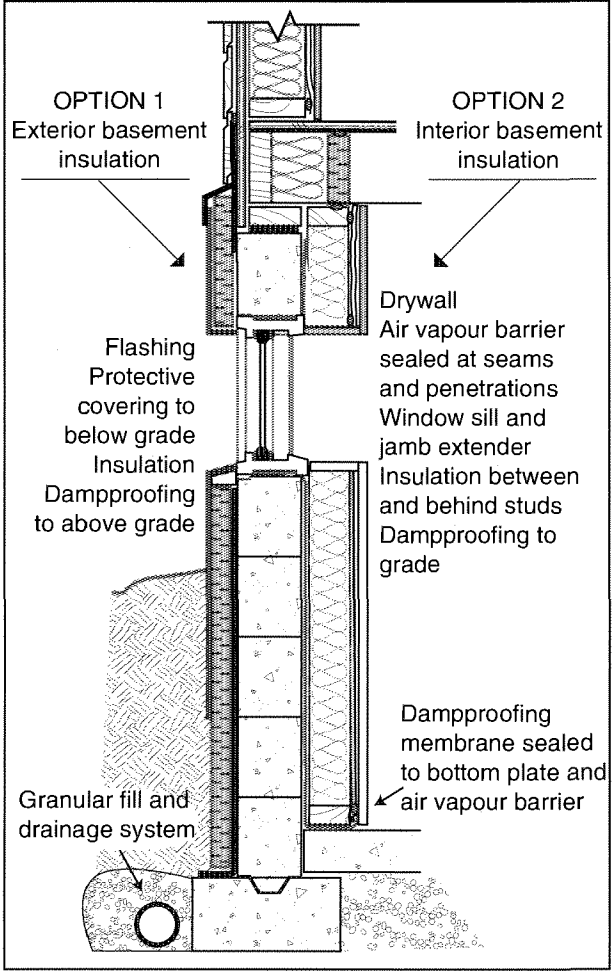
Basements must be made dry

All basements must be dry before finishing. Finishing a damp basement will lead to mold growth and possible health problems. It is preferable to stop excess moisture at its source—outside. See CMHC's "Investigating, Diagnosing and Treating Your Damp Basement," for details.

Exterior treatment (Option 1 in Figure 25) involves installing a drainage membrane or dampproofing from the outside and the addition of free-draining backfill material and new drain tile. This is the most effective option.

Alternatively, basements can be treated from the inside (Option 2, Figure 25). Leakage through cracks and holes in the foundation can be reduced by injecting epoxy from the inside. Movement of soil moisture through the walls and floor can be prevented by using a liquid sealer or by installing a plastic sheet material against the foundation wall on the interior.

Figure 25:
Construction Details
Basement Upgrade Options



For basements with severe foundation problems, it is possible to build a new foundation within the old. Where the basement has experienced moisture problems, any structural damage to walls, floor or supporting timbers must be repaired and any mold removed before proceeding with the renovation.

Basements must be warm

For comfort and heating efficiency, the basement walls and floor must be insulated and an effective air barrier system installed. At a minimum, all exterior walls should be insulated to their full height, whether from the interior or the exterior. If possible, it is best to do both dampproofing and insulation from the exterior. This keeps the foundation wall warm and dry. Wall finish can then be added on the interior, or the concrete simply painted.

If access to the outside of the foundation is a problem, walls can be dampproofed and insulated from the interior. This requires construction of a stud wall with insulation and an air barrier and vapour barrier, or installation of rigid board insulation directly to the foundation wall. When insulating from the interior, it is important to stop air leakage at the floor header assemblies (where the floor joists meet the outside wall) and to insulate this space. This can be done by caulking all around the joint and filling the space with batt insulation or by fastening rigid insulation between the joists.

Insulating a basement floor can improve comfort and minimize the potential for condensation. There are two approaches to creating a warm floor. If the basement has been dug out and a new floor slab is being poured, insulation is placed under the floor. Alternately, insulation can be laid over the existing concrete floor and a new wood floor built on top. With this method it is essential to provide dampproofing between the wood and the original concrete floor.

Some basements with irregular stone foundations are very expensive to finish properly. For these foundations, it may be better for your house and your health to avoid finishing the basement walls and floor in any way.

Basements must be usable

A finished basement should be equipped to the same standard as the rest of the house. This means that electrical services must comply with code requirements for sufficient outlets and ground fault protection on outlets in kitchen and bathroom areas. It may be necessary to upgrade the electrical service to the house to provide sufficient service to the new living area.

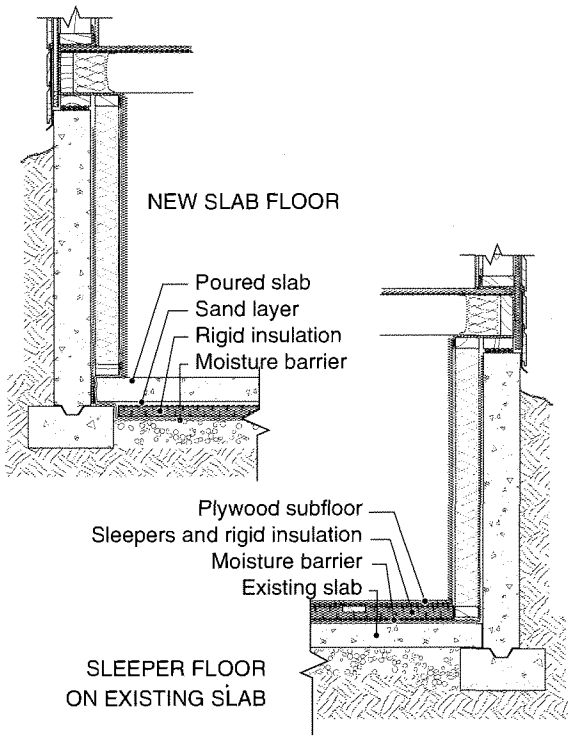
Sound is also important. The finished basement space must be isolated from the noise of furnace fans, clothes dryers and washing machines.

Control of noise from the floor above must also be addressed.

Don't create new problems

Some alterations will require special care. Where a basement walkout is added, the footings will be exposed to frost and potential uplift damage. This requires extra excavation to insulate around the footings. Similarly, the addition of window wells in front of enlarged windows can expose the foundation to rainwater run-off unless proper drainage is provided. New bathroom and kitchen facilities require exhaust fans to expel the additional moisture from bathing and cooking.

Figure 26:
Basement Floor Options



FlexHousing

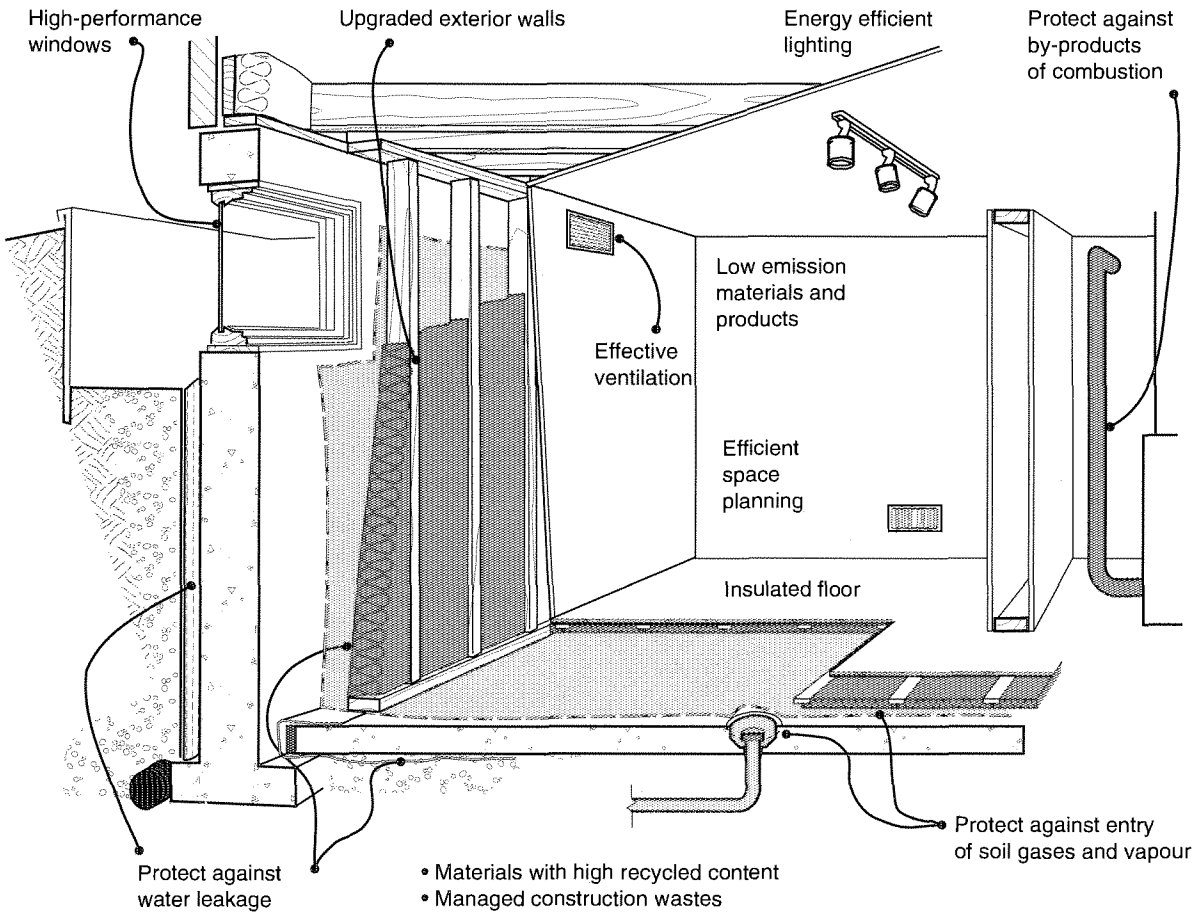
Even if only a limited renovation is planned initially, the key to future flexibility is to plan ahead and keep your options open. For example, plan the space layout to accommodate a future walkout and second entrance. Rough in the services for a kitchenette before closing in the walls and ceiling. Upgrade any older plumbing and wiring before closing them in.

Healthy Housing

Attention to good design and construction practice will address three key Healthy Housing issues: adequate daylighting, energy efficiency and protection from dampness and mold.

Good indoor air quality can be achieved in a basement living space by providing an effective ventilation system and choosing low-emission materials. Pay extra attention to protection from combustion by-products. To avoid dangerous backdrafting, make sure that combustion appliances are not excessively depressurized by house fans, furnace fans or leaky drafts. Sealed combustion or fan-forced appliances may be necessary to avoid backdrafting or combustion spillage.

Figure 27:
Healthy House Options



ACCESSIBILITY RETROFIT

Overview

Even more than other renovation projects, adapting the home to improve accessibility depends on the individual family's needs and desires. The house can be made more adaptable in anticipation of future needs by incorporating such features as wider door openings, and framing for bathroom grab bars or lowered sink and cook top whenever renovation is taking place. But, when a specific situation arises, the family will need to take an inventory of the house to determine what features need to be changed.

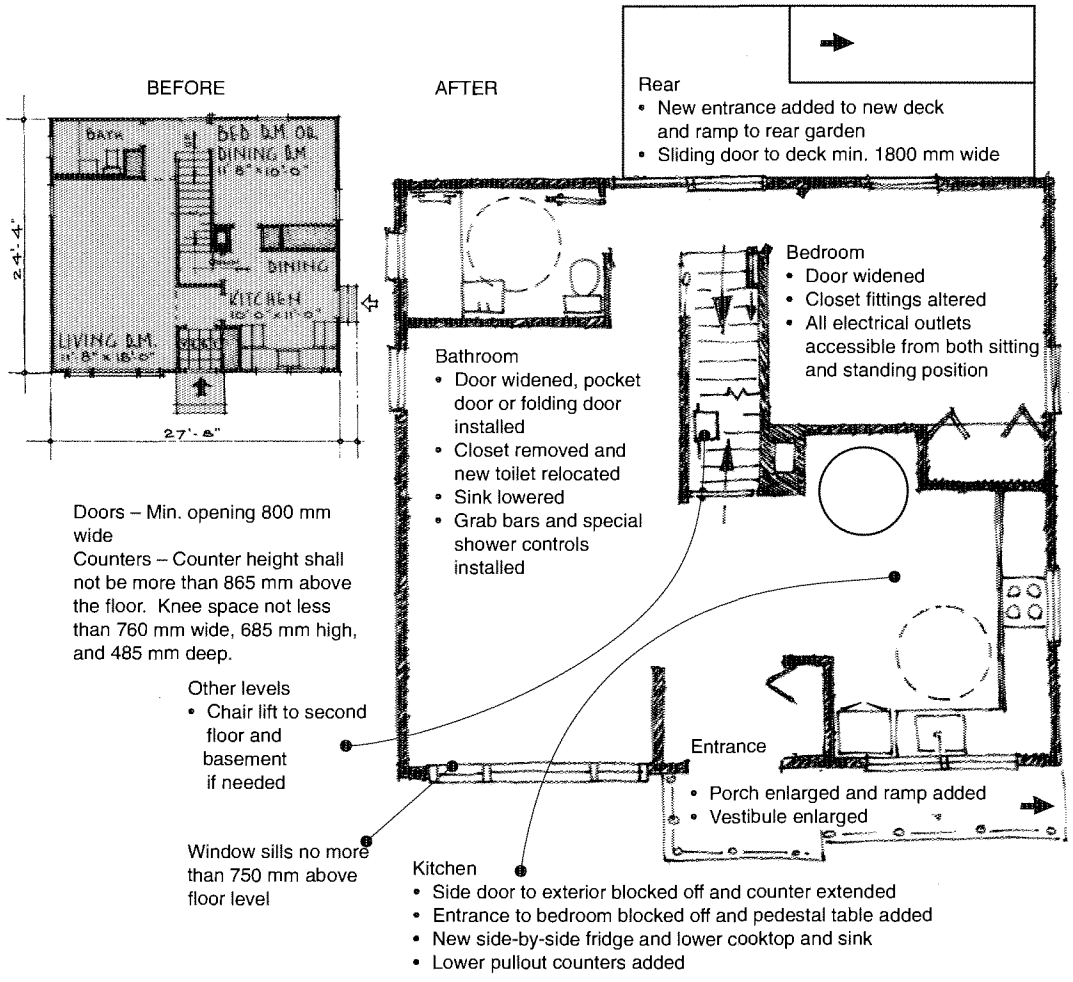
The extent of the renovation will depend on the original design of the house, the nature of the person's infirmity and whether the person has a caregiver or will be living totally independent.

Design Considerations

Mobility

The most significant changes are required to accommodate persons with limited mobility: people who can't climb stairs, who use a walker for support or a wheelchair.

Figure 28:
Alterations for Mobility



Access to the outdoors can be arranged by installing a ramp with firm handrails or by altering the front porch or rear deck to accommodate a motorized lift. For persons who are housebound most of the time, it is important to provide a deck or sheltered porch for sitting out, preferably where street activities can be seen.

With many 1-1/2 storey house designs, there is already a bedroom and bathroom on the main floor. With some modifications, these could be suitable for a person in a wheelchair. Alternately, a chair lift to the second floor could be provided. Bathrooms in 1-1/2 storey homes were often small. The bathroom may need to be enlarged to accommodate turning and space for a caregiver to assist with bathing.

If the home is being altered to accommodate a person who is wheelchair bound and living independently, the kitchen will need more extensive renovations. Alterations will include a lower cook top and a sink with knee space underneath. Pull-out counters at tabletop height, pull-down cabinets, a side-opening wall oven and a side-by-side freezer, refrigerator all make the kitchen more accessible. Storage carts which pull out from under the counters are an alternative to lower cabinets.

To improve access, doorways in all living areas will need to be enlarged, swing clear door hinges installed and doors equipped with lever-type handles. All living areas will also benefit from windows with lower sill height so people can see outdoors from a seated position.

Visibility

Changes to improve accessibility for people with visual impairment are less structural. The main consideration is to provide low-glare surfaces but high colour contrast at the edge of all surfaces. Low-gloss paints and floor finishes should be used and even, diffuse lighting provided. Glare from windows can be reduced by using adjustable blinds or screens. High colour contrast finishes and paints can be used to define the edges of counters and cabinets, baseboards and doorways. Visual and tactile warning strips make stair treads safer and easier to negotiate.

Hearing

Adjustments for people with a hearing impairment require that communication and warning devices communicate visually. For example, smoke detectors may be equipped with a large strobe light and telephones with a telephone device for the deaf. Video monitors may be installed so the front door or a child's room is visible from the living area or kitchen.

Construction

All alterations should be firmly supported. Bathroom grab bars require extra reinforcing. Widened doorways require new framing and a wider lintel. Outside ramps must have a secure foundation.

Doorways should be at least 0.9 m (3 ft.) wide and have a clear area to one side of the handle of at least 46 cm (18 in.). Where space is at a premium, consider pocket doors. They are also easier for people in wheelchairs to use. Door thresholds should be no higher than 1.25 cm (1/2 in.).

Replacing a stove with a separate cook top and wall oven will require a change in the wiring. Also, relocate switches and outlets so they are reachable.

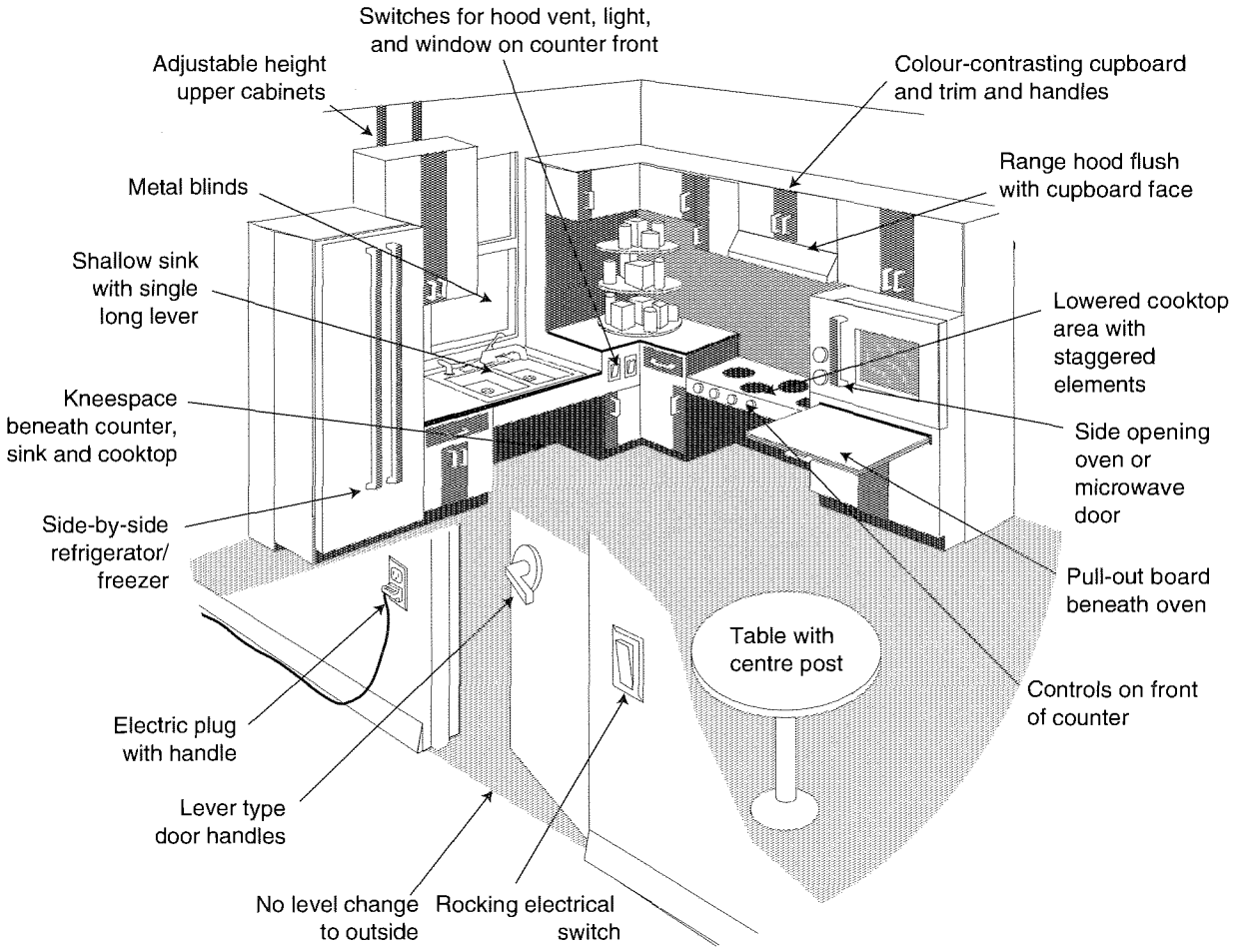
Plumbing fixtures may also need to be changed to facilitate transfer. This would involve a higher tub and toilet and a lower vanity sink.

See CMHC's "Housing for Persons with Disabilities" and "Design Options for Barrier-Free and Adaptable Housing."

Healthy Housing

Daylighting is especially important for people who spend more time indoors. Make sure that living areas have adequate window openings and that sills are low enough to permit people to see out when seated.

Figure 29:
Details—Kitchen Remodelling for Accessibility



CHAPTER 6 UPGRADING

Introduction

The projects covered include:

Chapter 6: Upgrading
- kitchen remodelling;
- bathroom remodelling;
- re-siding and/or new windows;
- upgrading heating, ventilating and air conditioning (HVAC) systems; and
- reroofing and ice damming.

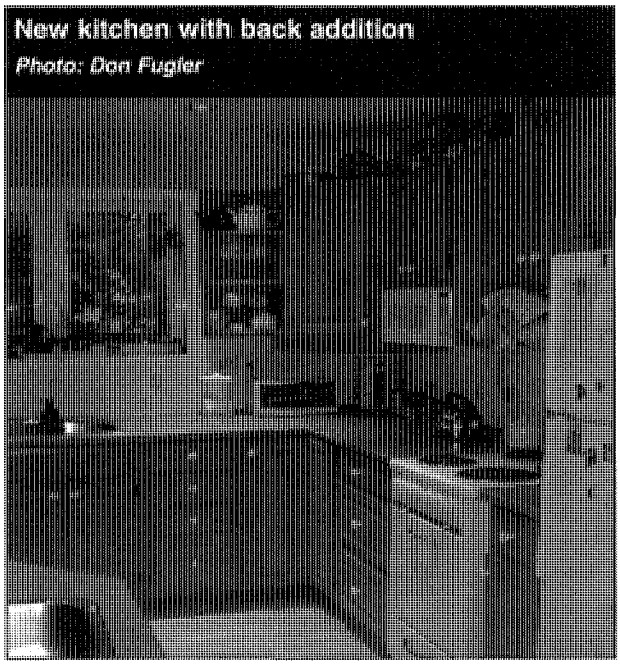
The presentation of each project includes a discussion of design considerations to keep in mind when drawing up your plans, tips on construction techniques to follow for successful results and opportunities to introduce FlexHousing and Healthy Housing features into your renovation project.

KITCHEN REMODELLING

Overview

In the post-war house, the kitchen was a relatively small room, designed for utility and separated from the living and dining area. The greatest change in kitchen design has been the reintegration of the kitchen with the family living areas of the house. The farmhouse-style kitchen and great room concept are two expressions of this trend. As the kitchen returned to its position as the focal point of family life, style and appearance became more important.

Now, a kitchen remodelling project can range from a simple facelift with cabinet resurfacing, new paint and flooring, to a complete renovation, involving a new room layout, new cabinets and appliances.



New kitchen with back addition
Photo: Don Fugler

Design Considerations

Scope

Kitchens are one of the most costly areas in the house to remodel. Changes to layout may require moving plumbing and wiring. A major renovation also presents the opportunity to add or change windows and to insulate and air seal exterior walls. Before deciding on a complete renovation, consider how long you plan to be in the house. If the room layout is acceptable, a facelift and perhaps new appliances may suffice.

What works best for you

A kitchen is first and foremost a workshop for cooking. In designing your kitchen, think about the extent and type of cooking you do at home. Consider too, how you might use the kitchen in the future; you may not want a microwave now, but is there space to add one? Read books, clip pictures and visit showrooms to gather ideas. You might consider working with a kitchen company. They are experienced in kitchen layout and will do the design for you if you are ordering their cabinets.

Size

Post-war kitchens were small, but even professional chefs don't need a large preparation area. Consider space savers such as pull-out counters, roll-away work carts, overhead pot racks, a walk-in pantry cupboard, small-scale appliances for tight spaces and auxiliary food storage elsewhere in the house. Space for the social side of the kitchen can often be found by opening the kitchen to an adjoining room, for example turning a wall into a bar counter. Alternatively, a large pass-through with folding doors allows for more flexible use of the space.

Style

At 50 years of age, the post-war house is a period piece. While 1950s style may not be to your taste, it is a good idea to reference the period of the house in your renovation. By using similar baseboards and trim to those found in the rest of the house, for example, the new kitchen will fit right in. By avoiding the extremes of current trends, your new kitchen will age more gracefully and won't look out of date in five years. Similar considerations apply to the exterior. If your

kitchen renovation involves moving or enlarging a window opening, use a window style appropriate to the age of the house. Starkly modern or fake colonial will look out of place and detract from the overall appearance.

Construction

Cabinets and finishes

When installing cabinets in an older home that has settled, it may be difficult to find a point of reference that is level or plumb. Take time to level floors that are significantly out of alignment, before installing the cabinets and new flooring. Upper cabinets must be securely fastened to solid blocking in the walls.

Thermal comfort

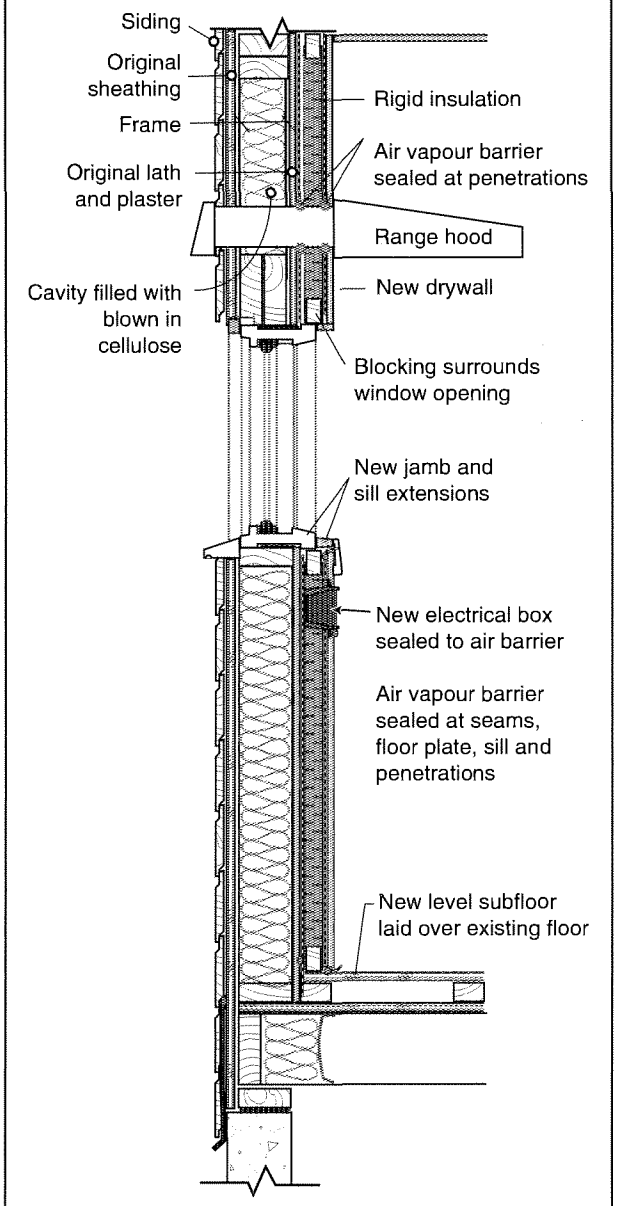
With old cabinets removed and exterior walls exposed, it's the ideal time to make the room more comfortable by upgrading insulation. If the original plaster is in good condition, insulation may be blown into the walls and the walls simply touched up. Where the plaster needs replacing, rigid insulation may be installed directly over the old plaster and the wall finished with new drywall. Whichever approach is used, the wall must have a vapour barrier and a continuous air barrier. This can be done in three ways.

- Polyethylene sheet material can serve both functions, provided it is 6 mil thickness and sealed at all joints and edges. Caulk or install gaskets on penetrations of the outside wall such as vent openings and electrical outlets.

- Let the drywall serve as the air barrier, provided the edges and all penetrations are sealed. The vapour barrier may be provided by a polyethylene sheet underneath the drywall (it does not have to be caulked) or by vapour barrier-type paint applied to the drywall.

- Where insulation is blown into the walls, the existing plaster or drywall can serve as the air barrier, provided it is sealed at all openings, baseboards, outlets, etc. Vapour protection may be provided by vapour-barrier paint.

Figure 30:
Construction Details
Kitchen Remodelling



Ventilation

Pay attention to ventilation even for minor kitchen remodelling. Always vent stove tops directly to the outside. Choose an exhaust fan which can operate at two or three speeds, and which has a low noise rating. Range hoods that extend

toward the front of the stove and are close to the cooking surface capture the most moisture and the combustion products from a gas stove. However, ease of cooking will also play a large part in the selection of an appropriate range hood. Where a whole house ventilation system has been installed, do not vent the stove to the exhaust air stream. Take extra care when installing range top barbecue exhausts. These appliances expel very large quantities of air and can create conditions where furnace chimneys will backdraft. When installing this type of system, have the air pressure in the house tested and install an air supply to the house if necessary.

Windows

Kitchens are areas of high humidity, and condensation is often a problem on kitchen windows. Upgrading the windows to a higher insulating value will create a warmer window surface and minimize condensation.

Plumbing

Moving the sink or removing walls will require changes to the plumbing; new drain and vent connections and water supply pipes will be required.

Heating

Heating is often forgotten in kitchen projects. Changes to kitchen layout may require relocating the heating outlet or radiator. Do not cover the heat vents or take the short cut of distributing heat through the kick plate of the base cabinets. This will not result in comfortable temperatures.

Electrical

Electrical codes have changed significantly since post-war houses were built. Kitchens now require eight dedicated circuits for counter outlets, appliances, general outlets, lighting and an exhaust fan. If the main electrical panel is not large enough for eight more circuits, a subpanel may be required. Include both central overhead fixtures and task lighting along the counters in the lighting plan.

FlexHousing

When new cabinets and kitchen layout are in order, consider features which will make the kitchen more accessible to a person with limited mobility. Sufficient floor space to manoeuvre a wheelchair, pull-out work boards and electrical outlets at the front of some cabinets will not add significantly to costs if these elements are built in from the beginning. Some features can be roughed in for possible use at a later date. For example, plumbing and counter tops can be installed so the sink and stove top can easily be dropped to table height if required (see the section on renovating for accessibility for more details).

Healthy Housing

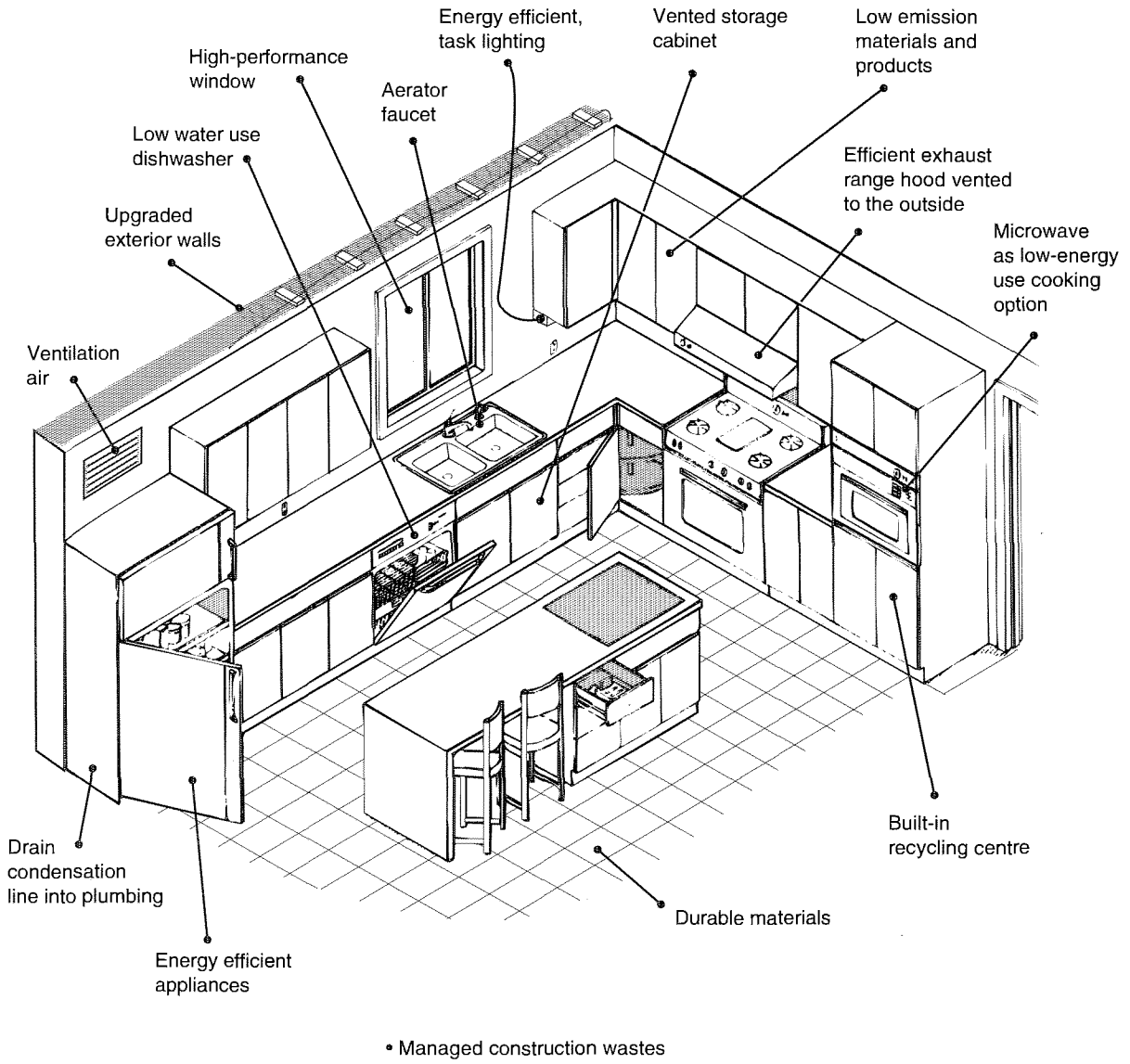
Because so much activity occurs in the kitchen, there are many opportunities to improve indoor air quality, upgrade energy and water efficiency, and use new materials wisely. An efficient ventilation system is a must to remove excessive moisture, odours and fumes. (Ventilation options are described in the section on construction.)

The choice of materials for kitchen cabinets, flooring, paints, glues and caulking affects indoor air quality. Avoid cabinets of particleboard or seal all exposed surfaces and edges to prevent off-gassing of formaldehyde. Choose low emission paints, glues and caulking.

If outside walls will be exposed during the renovation, consider upgrading them with insulation and effective air and vapour barriers. The kitchen will be warmer in winter and cooler in summer as a result. If new appliances are in order, use the Energuide rating to choose the most energy-efficient models. Compact fluorescent and halogen lighting offers warm light with low-energy use.

Careful choice and management of materials will result in less waste during the renovation and a more durable end result. Recycle used cabinets and fixtures through a local building re-use centre. Choose durable, repairable materials to ensure that the renovation will be attractive for many

Figure 31:
Healthy House Options



years to come, e.g., solid wood cabinets over particleboard or medium-density fibreboard (MDF).

Financial Implications

Kitchen remodelling has the highest rate of cost recovery of any renovation activity. On average, 68 to 73 per cent of the costs are recovered at resale.

BATHROOM REMODELLING

Overview

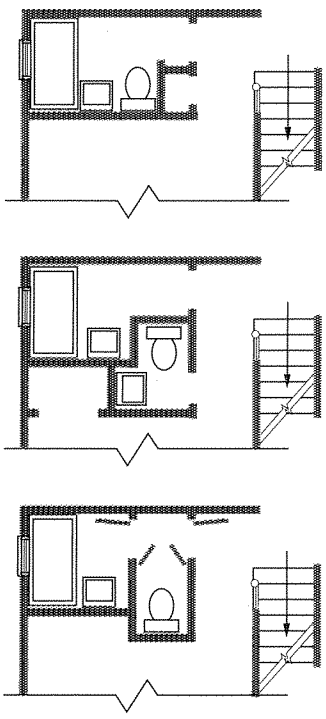
Unless a bathroom has suffered severe moisture damage, the main motivation for bathroom remodelling is comfort and appearance. Post-war bathrooms were generally small and utilitarian. Worn out finishes and outdated fixtures call for a facelift. Where additional space can be found, it's possible to add amenities such as a whirlpool, bidet or sauna.

Design Considerations

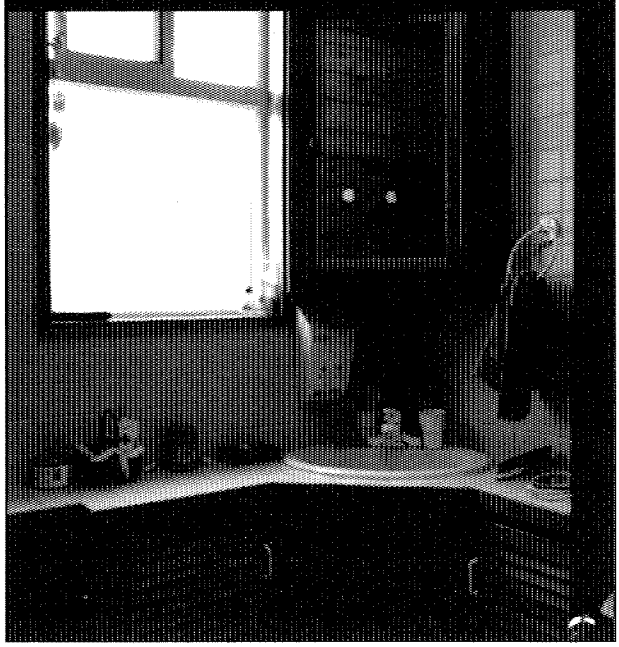
Scope

As with kitchens, the scope of the project is the first consideration. Is it simply a matter of replacing older fixtures and giving a facelift to wall and floor finishes? Or is a complete remodelling required—expanding the bathroom and adding additional fixtures? Changing the layout will involve moving walls and fixtures with associated plumbing costs.

Figure 32:
Options for Enlarging the Bathroom



Remodelled bathroom
Photo: Brent Applegate, Alberta



Where moisture damage has occurred, it is important to check the condition of structural members, particularly those next to the tub and shower enclosure. They may need to be replaced before the wall is concealed behind new finish materials.

Layout

If a second bathroom is desired because of family size, but space is at a premium, one solution is to locate the toilet and a small sink in a water closet. The main bathroom would contain tub and shower and a vanity sink.

Leaving the floor plan alone will require less work but, if a larger bathroom is desired, it may be necessary to move walls. One solution is to steal some space from an adjoining bedroom. It doesn't take much additional space to make a big difference in the placement of fixtures and convenience in the bathroom. Some popular bathroom amenities take up very little space, e.g., a heated towel rack, a heat lamp or a glass shower enclosure.

Style

Duplicating the quality of original materials is often difficult within a budget. Before discarding worn fixtures or ripping out the original fixtures or ceramic tile wall or floor, check with a restoration specialist. Enamel resurfacing is an option for the fixtures and it may be possible to bring the tiles back to nearly new condition. Retaining some vintage features can provide a focal point for the redecorating scheme.

Construction

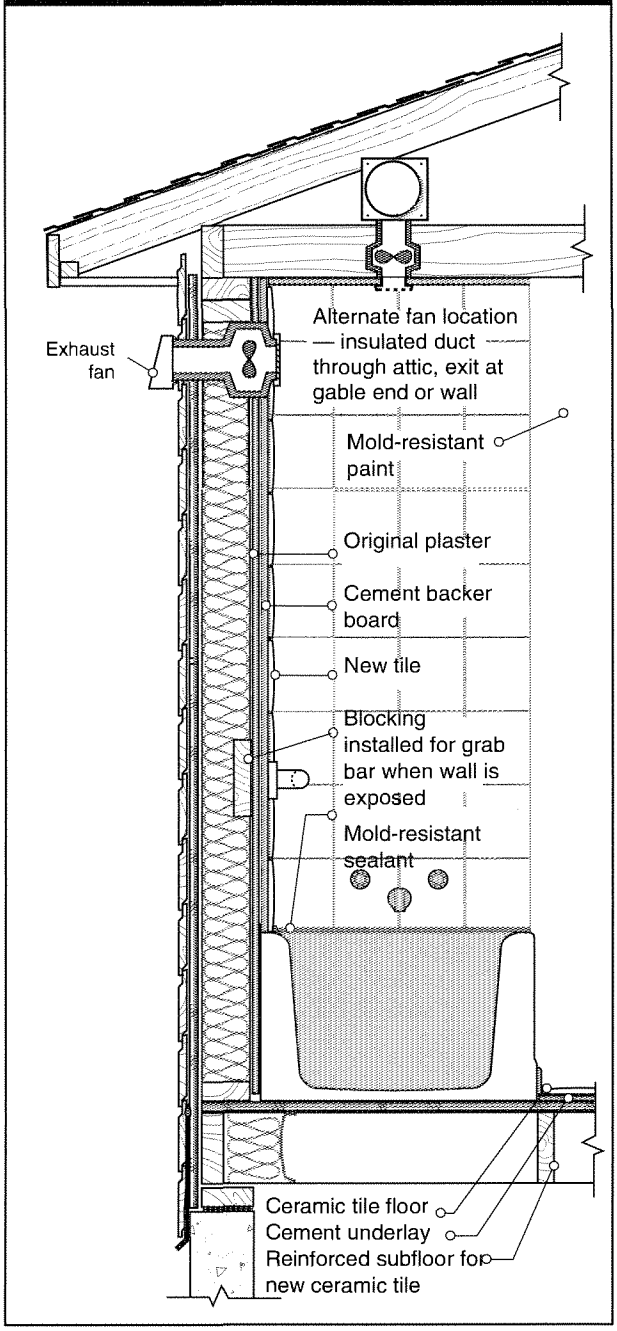
Moisture control

Water in all its forms is the enemy of buildings. Bathrooms are particularly vulnerable to damage from water leaks and from water vapour. Failed ceramic tile and shower enclosures are the most common and costly failure in bathrooms. Leaks around tub enclosures can damage finishes and weaken the building structure. If replacing the interior wall around the shower or tub, do not install tile on drywall, even water resistant drywall. Cement backer board is recommended. Alternately, one-piece shower/tub enclosures minimize water-related problems. Whichever method is used, make sure the tub enclosure is well sealed and do not install a window in the shower enclosure.

Openings to the outside must be well sealed to prevent water vapour escaping into the wall cavity or attic where it can condense and cause damage. Make sure the opening for the bathroom fan is well sealed and that baseboards and window trim are caulked as well.

Mold growth is one unhealthy result of excessive moisture. After correcting the source, make sure that all mold is destroyed by soaking the surface in a bleach solution. When redecorating, mold-resistant paints and sealants are now available for bathrooms and other high-humidity areas.

Figure 33:
Construction Details
Bathroom Remodelling



Ventilation

Many older homes do not have a bathroom fan, yet effective ventilation is essential to control moisture. Where fans are present, they are often ineffective and noisy. Look for a fan with a capacity rating of 25 litres per second (50 cubic

feet per minute) at 50 Pa of air pressure and a low noise factor (one sone rating or less). Take care to install the fan with a minimum of ductwork, ideally through the bathroom wall. If the duct runs through the attic space, make sure the opening into the attic is well sealed, the duct run is as short and direct as possible, and is well insulated.

The fan can be controlled by a (quiet) timer or by a dehumidistat. The occupant should be able to override the control for continuous ventilation, if needed.

Plumbing

Where practical, replace older cast iron waste pipe and galvanized supply piping with ABS waste pipe and copper supply piping. To prevent low water pressure in the bathroom, run feed lines directly from the basement, not off the kitchen lines. In some urban centres, water pressure is a neighbourhood problem. This can be alleviated by installing a separate pressure tank in the basement or installing a new main link.

Fixtures

When sourcing new fixtures, ensure that they will fit the existing plumbing layout, or be prepared for modifications. Some toilet models are available which can fit into tighter spaces than the standard clearance. Look for water-efficient toilets which use six litres or less per flush. These are now required by code in some provinces. Tanks with good insulation are less likely to sweat. Low-flow showerheads are also good water savers.

Electrical

Bathrooms from the 1940s often had no outlets at all. Building codes now require an outlet near the sink, but it must have a ground fault interrupt or the circuit must be equipped with an interrupt at the main electrical panel. Light switches must be located out of reach of the tub, and shower light fixtures must be moisture proof. When redoing the lighting, consider energy-efficient, compact fluorescent or halogen lamps. Any ceiling-mounted fixtures in a top floor bathroom must be airtight and insulation ready. A combination of overhead and vanity lighting is most effective.

To minimize hassles, install new flooring before reinstalling the fixtures. If you are considering ceramic tile flooring, the subfloor may require additional support to take the added weight of the tiles and cement underlay and to prevent tile breakage.

FlexHousing

With some foresight during the renovation, the bathroom may be easily adapted to the needs of an elderly or frail person at a later date. For example, where walls will be exposed, blocking can be installed at the tub to provide support for grab bars which may be added later. Similarly, if the layout and entrance are changed, a wider doorway and more floor space will make it possible for a person with a walker to manoeuvre in the space. Non-slip flooring and bathtub would be appreciated by all members of the family, whatever their age. If wheelchair access is a consideration, you may wish to enlarge or add a bathroom on the main floor.

Healthy Housing

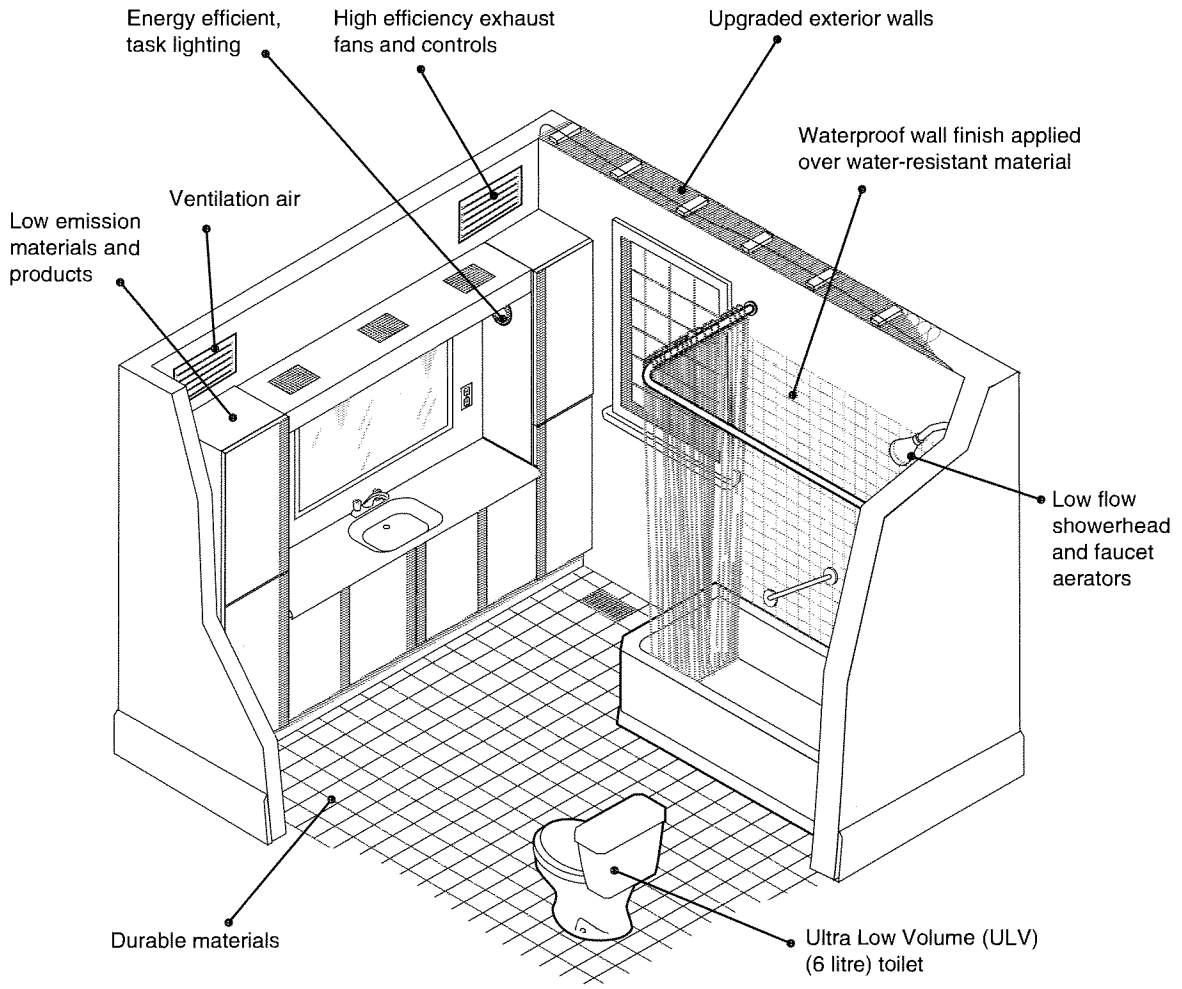
Careful attention to controlling moisture will eliminate the growth of harmful molds and keep the house humidity at healthy levels. Where outside walls are exposed, they should be insulated and provided with air and vapour barriers. A low-flow toilet will reduce water use.

To secure water savings, put the old toilet out for garbage collection; do not reuse it at the cottage. As with the kitchen, make use of energy-efficient lighting and, for improved air quality, use low emission cabinetry, paints and finishes.

Financial Implications

Bathroom remodelling is one of the most favourable renovation projects, returning 64 to 71 per cent of the cost outlay on resale.

Figure 34:
Healthy House Options

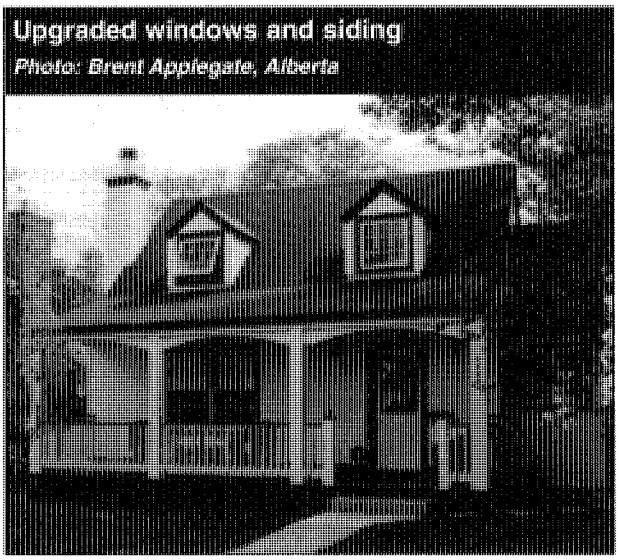


• Managed construction wastes

RE-SIDING AND NEW WINDOWS

Overview

The appeal of new siding and windows can't be denied. Today's materials make exterior painting a thing of the past—less ladder time, more leisure time. And who can regret losing the semi-annual ritual of hanging storm windows in the fall and removing them in the spring. However, re-siding is not as simple a job as it may seem. Nothing will change the appearance of the house as much as re-siding and replacing windows. If done with care, a siding and window retrofit can significantly improve comfort and energy efficiency. As well, siding and windows must be installed properly or they will contribute to moisture problems and deterioration.

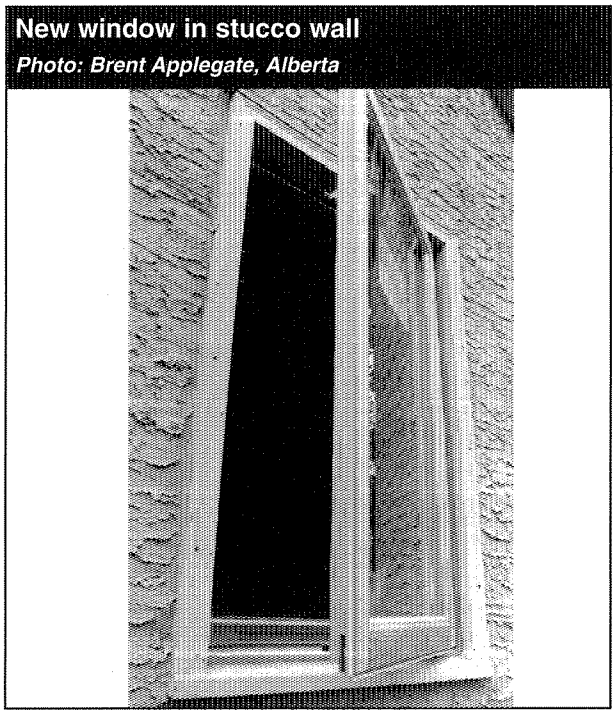


Upgraded windows and siding
Photo: Brent Applegate, Alberta

Design Considerations

Appearance

The first question is whether the goal of re-siding is to change the total look of the house or to find a look-alike material that will require less maintenance. If a totally new look is desired, there are a host of choices including wood, stucco, brick or stone. Some options are more costly than others and some, such as brick, may require additional structural support.



New window in stucco wall
Photo: Brent Applegate, Alberta

If low maintenance is the issue, today's vinyl and aluminum sidings replicate the look of horizontal wood siding.

However, when installing the siding, there is the temptation to save on labour costs by reducing or eliminating exterior trim around doors, windows, soffit wall junctions, etc. This gives the house a flat, industrial look that is out of keeping with the traditional 1-1/2 storey shape. It also results in joints that are vulnerable to water penetration.

Similar design problems arise when upgrading windows. In some renovation projects, it may be desirable to enlarge windows to provide increased daylighting. When choosing window sizes and styles, consider how the installed window will look from the exterior and whether it suits the age, style and proportions of the house.

In general, beware of fads that detract from the appearance of the house and, ultimately, from its value. Don't try to make the house look like something it's not. The best design solutions focus on retaining and enhancing the integrity of the house.

Underlying problems

If old siding has failed, it is important to understand why and to correct the problem before concealing it with new siding. This is particularly important with moisture-related problems. Signs of moisture problems on old wood siding include blistered or peeling paint, warped or cupped siding and wood decay. On masonry siding, moisture problems show up as efflorescence or spalling.

Replacing older, leaky windows with new tighter units will make the house less drafty, but it will also reduce the amount of dry winter air leaking into the house. As a result, the moisture levels in the house may increase.

For a house with too much humidity to begin with, new windows can be the last straw, resulting in condensation, dampness and mold growth. As a general rule, whenever a measure significantly tightens up the house, controlled ventilation should be added.

Thermal upgrade

Replacing siding and windows offers an excellent opportunity to make the house easier to heat and more comfortable. The incremental cost of adding insulation is small compared to the overall cost of the job.

Insulated siding has a thin layer of insulation (often polyurethane foam) sprayed on the back of the siding. But this offers only a minimal improvement in insulation level. Instead, consider installing insulation separately. This can be done with little additional expense, and it allows for much higher insulation values.

Installing new, permanent storm windows will eliminate the maintenance factor and somewhat improve the thermal performance of the windows.

To further improve comfort as well as convenience, replacing older single-paned windows with new double- or triple-glazed units is always an option. Where the original window is sound, there are other retrofit options as well.

- Upgrade the thermal performance of the original windows by installing new weatherstripping and ensuring that the joint between the window frame and wall is well sealed.

- Improve performance even further by retrofitting existing windows with custom double-glazed units in the original sash.

- Install removable interior plastic storm windows.

Properly cared for, wooden windows will last for decades. However, if window sills and sash have been allowed to deteriorate, replacement may be in order. The simplest, least expensive approach is to have identical wood replacement windows custom made to fit the openings, but this will not improve thermal performance.

New, double-pane windows with low emissivity coating and insulated spacers, and filled with inert gases, such as argon or krypton, represent a real breakthrough in window technology, achieving very high insulating values. Besides making the house easier to heat, energy-efficient windows can expand usable space, since the area near the windows will no longer be drafty and cold.

Construction

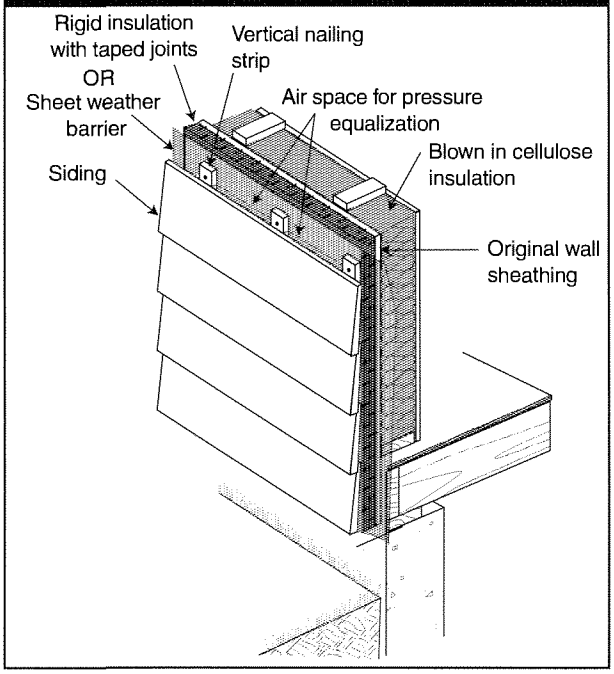
Moisture

Controlling unwanted moisture in walls is important to maintain the structural integrity of the building and ensure a long service life for the siding. To achieve dry, sound walls a three-part strategy is required.

- Prevent moisture from inside the house leaking through the walls by installing a vapour barrier and a continuous air barrier on the inside of the wall.

- Protect the wall from water penetration from the outside by providing eavestroughs, generous roof overhangs and properly installed siding. Pay special attention to

Figure 35:
Using the Rain Screen Principle



how the siding sheds water, especially at horizontal joints of dissimilar materials.

- Provide a means of escape for any water that does penetrate the siding by installing siding using the rain screen principle. This allows for an air space and drainage behind the siding. The air space also reduces heat buildup behind the siding and prevents buckling.

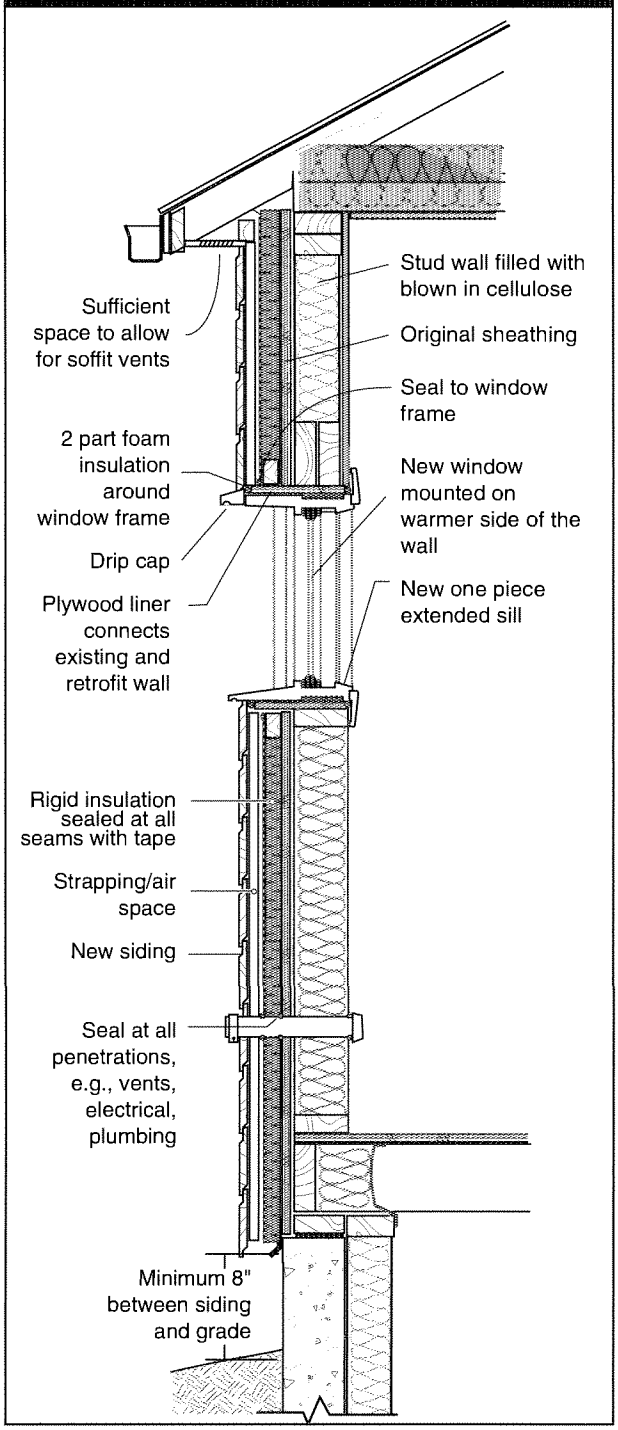
Installing exterior insulation

The simplest method to provide upgraded insulation from the exterior is to fasten rigid insulation directly to the existing walls of the house. When furring strips are fastened over the insulation, they provide a nailing surface for the siding and the necessary air space behind the siding.

There are some points to keep in mind when insulating from the exterior.

- If the original siding is not removed, make sure there is not an air space behind it that will allow cold air to circulate behind the new insulation, rendering it ineffective.

Figure 36:
Construction Details
New Siding and Windows



- Provide vapour and air barriers. This is usually done from the interior, using a vapour barrier paint and caulking all openings to provide the air barrier. This includes penetrations for electrical service,

gas and oil pipes, electrical outlets and fan openings.

- To provide a continuous weather barrier, seal the rigid insulation at all seams, at the window and door frames and all penetrations.

- Make sure the eaves are wide enough to prevent water from getting behind the siding. Add flashing at the top of the exterior insulation, above windows and doors, and at any other joints.

When installing new windows, make sure to insulate and air seal the space between the window frame and the wall. This is usually done using low-expanding polyurethane foam. It is important to connect the window frame to the new air barrier. Also, consider the location of the window in the opening. For thermal performance, it is best to position the window pane closest to the warm side of the wall.

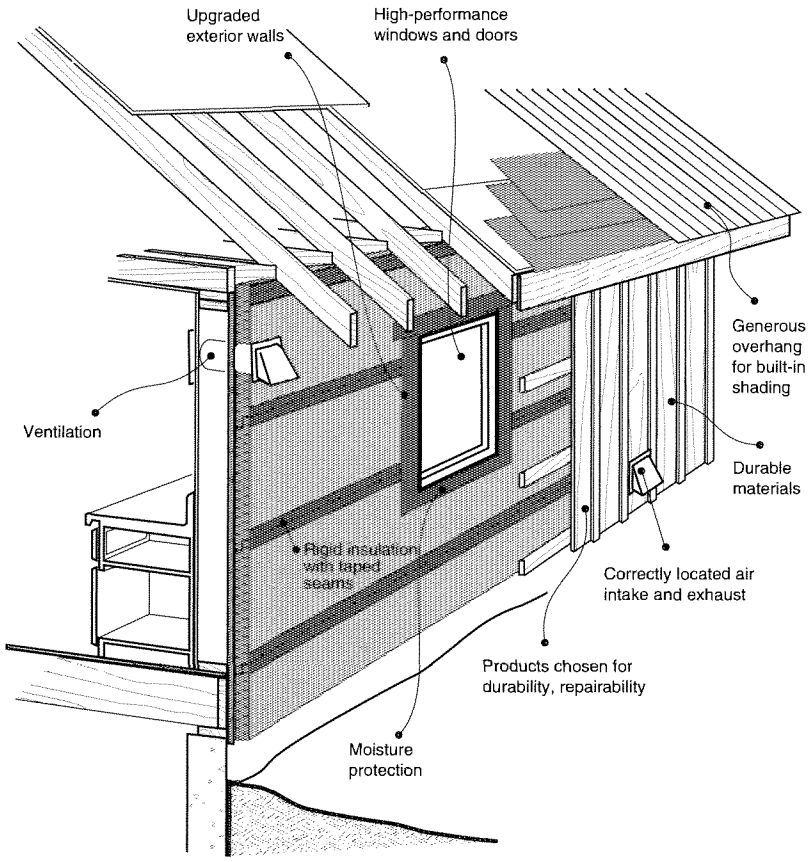
FlexHousing

Changing window size and location affects the interior space as well as the exterior appearance of the house. If changing windows, consider installing windows with a lower sill height. Taller, narrow windows let in more light and allow people to see out from a seated position.

Healthy Housing

Adding more insulation and upgrading windows will not only make the house more comfortable, it will reduce demand on energy resources. By admitting winter sunshine, windows can provide passive solar heating and reduce the demand for purchased energy. Position the largest window area on the south side of the house and keep blinds or curtains open on bright sunny winter days.

Figure 37:
Healthy House Options



UPGRADING HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS

Overview

Putting in a new furnace isn't usually at the top of peoples' wish list for their home renovation. More likely, an upgrade to the heating, ventilation or cooling system is triggered by one of several reasons: other renovation work, the system is old and needs replacing, the house is too hot in summer or too cold in winter, the homeowner wants to change the distribution system or fuel source, or there is a concern about indoor air quality.

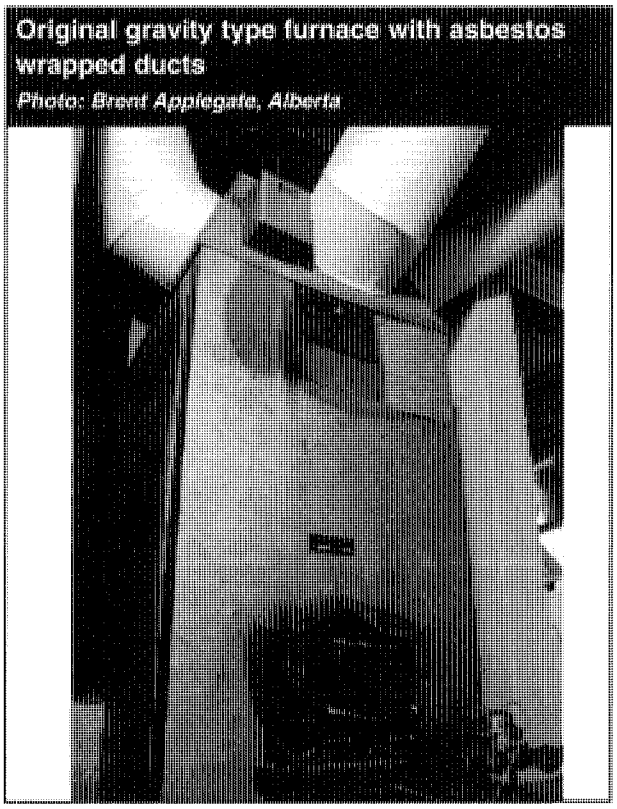
Whatever the reason, there are far more heating and cooling options available today than in the post-war period. As well, there is a better understanding of the need for ventilation in the home and the factors that can lead to increased ventilation requirements. The challenge is to apply today's products and knowledge to an older home in an appropriate way.

Design Considerations

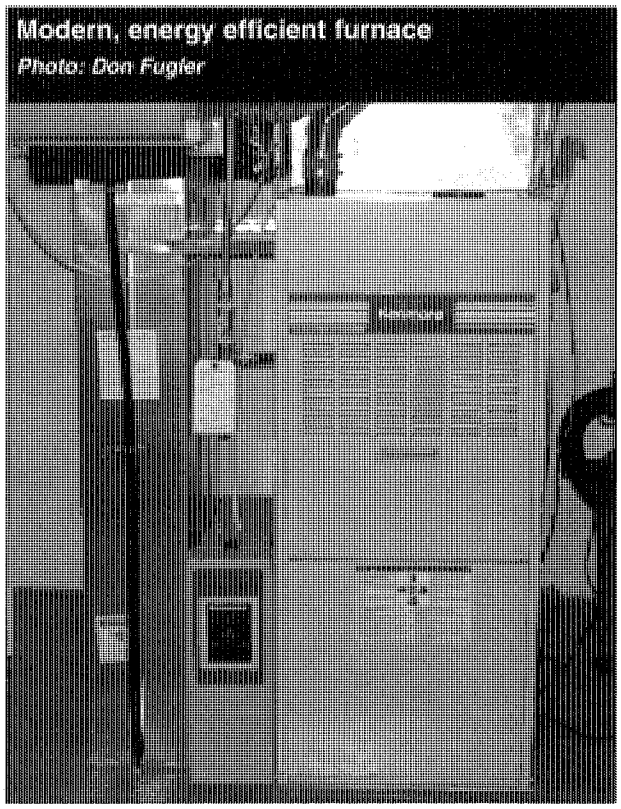
Heating

Upgrading the heating system could involve anything from a simple tune-up to replacing the furnace or even changing the distribution system or energy source. This is one area where it definitely pays to have a professional assess the existing system (including the chimney) before proceeding.

One of the first considerations is the size of system. The size of the house and the energy efficiency of its envelope affect the size of the heating system. If a new addition is energy efficient and the furnace is not too old, it may not need to be upgraded to meet the additional load. If the house is uncomfortable, it is more effective to first make it more energy efficient by draft proofing and insulating than to increase the capacity of the furnace.



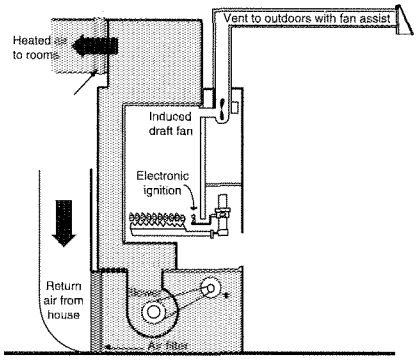
Original gravity type furnace with asbestos wrapped ducts
Photo: Brent Applegate, Alberta



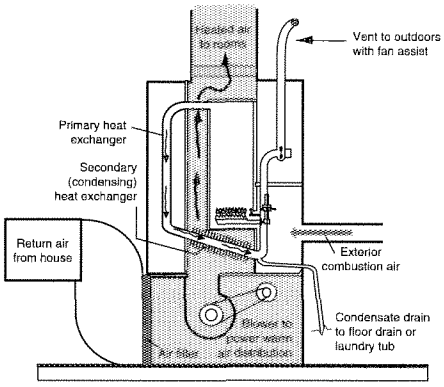
Modern, energy efficient furnace
Photo: Don Fugler

Figure 38:
Developments in Gas Heating

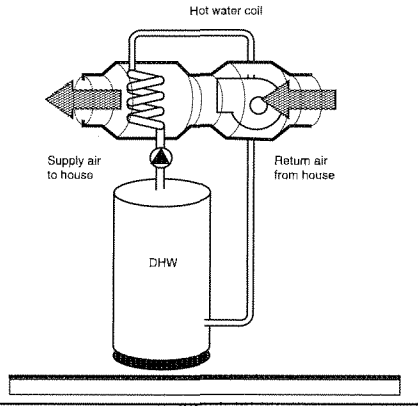
Mid-efficiency,
induced draft furnace



High-efficiency,
condensing furnace



Integrated space heat and
hot water heating system



There are two approaches to improving heating system performance. The first involves tuning up the existing system. Older furnaces which still have a long service life can be upgraded with a simple tune-up, replacement of the burner, and addition of a thermostat with setback controls. Gravity-type distribution systems can be made more responsive to changes in outside temperature by adding an electric fan or pump to distribute the heat through the house more quickly.

The second approach involves replacing equipment. New systems range from induced draft mid-efficiency furnaces to high-efficiency condensing units which do not require a chimney. Integrated systems have also been developed for houses where the building envelope is very energy efficient. These systems basically use the burner in the hot water tank to heat the house as well as to heat the domestic hot water. Whether you choose an integrated or separate system, it is wise to consider efficiency improvements to the hot water supply as well as to space heating.

Besides replacing the heating equipment, changing the fuel source or the distribution system is also an option. Homeowners may change the fuel source because of operating costs or health considerations. This will be costly if switching from electric baseboards to a forced air system as new ductwork will be required. However, savings in fuel costs may justify the expense over the long term. Retrofitting a home with a hydronic distribution system will require the installation of new piping. This will be less costly if the walls have to be opened up as part of the other renovation work.

Supplementary heating

Sometimes, the least expensive option is to provide supplementary heating to a hard-to-heat area of the house. There are many options here including wood burning stoves, gas or electric baseboard heaters, and portable electric radiant heaters. Where available, a natural gas direct vent fireplace is often the least expensive form of supplementary heating. Caution: Do not use unvented propane or oil space heaters for supplementary heating as they release dangerous carbon monoxide fumes into the home and this can create life-threatening situations.

Cooling

Older gravity-type duct systems are not compatible with central cooling. For these houses and houses with hot water radiators, there are other cooling options including individual room units and through-the-wall units which pour cool air down the stairwell where it dissipates to other rooms.

Ventilation

All houses require ventilation to provide fresh air for occupants, combustion air for gas appliances, furnaces, wood stoves and fireplaces, and to remove stale air, odours and excess moisture. In summer, the post-war house relied on windows to provide ventilation. In winter, air leakage through the building shell introduced fresh air at the lower level and allowed stale air to leak out at the upper levels.

Any change to the house envelope, such as air sealing or replacing siding or windows, will affect air leakage and the ventilation system. Similarly, any change to the heating system such as conversion to electric baseboard heating, or the addition of exhaust appliances, such as a central vacuum or an indoor grill with exhaust, will affect house ventilation.

Mechanical ventilation is now required in all new houses. Strategies for upgrading ventilation in older houses range from installation of exhaust fans to central systems with heat recovery.

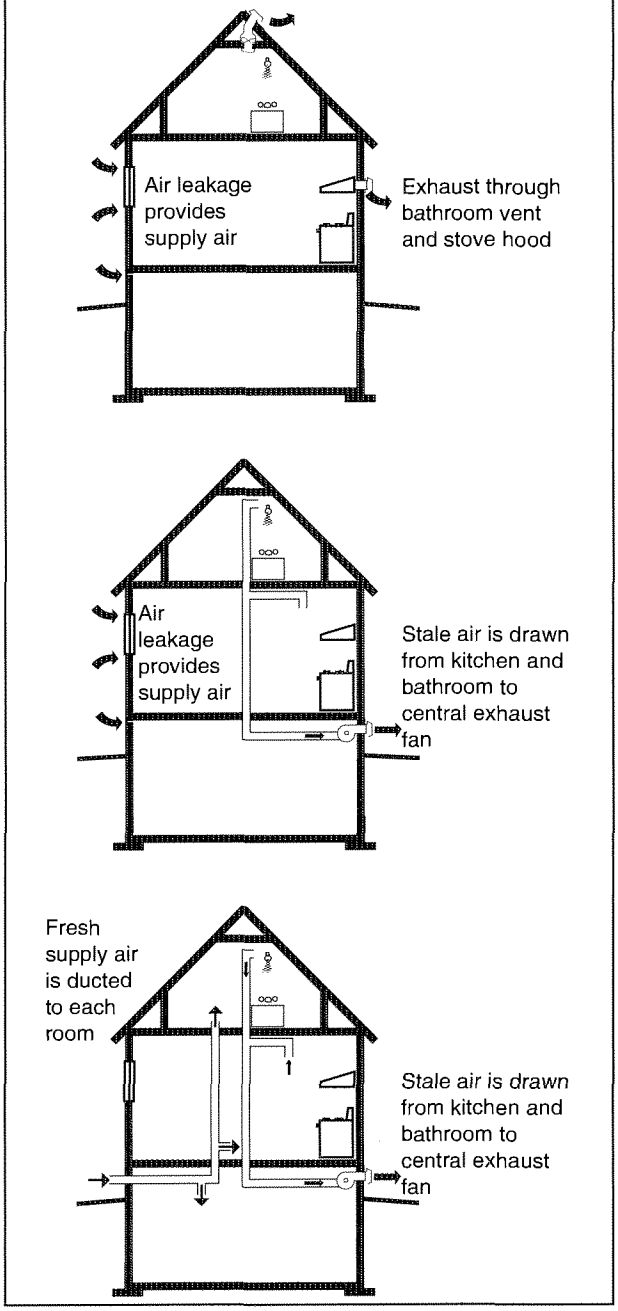
At a minimum, kitchens and bathrooms should be equipped with exhaust fans that will expel stale, moist air to the outside. It is important to circulate fresh air throughout the house. Bedrooms often have high carbon dioxide levels due to inadequate circulation. The simplest solution is to undercut bedroom doors to allow for the free flow of air, even when the door is closed.

Central ventilation systems are a step up from spot ventilation fans. A central exhaust fan can be quiet and effective but may unbalance house pressures. If you have fuel-burning appliances with chimneys (e.g., furnace or fireplace), a balanced ventilation system with an exhaust and supply (e.g., a heat recovery ventilator or HRV) may be a safer, but more expensive alternative.

Construction

When there is any uncertainty about the house requirements for ventilation and combustion air, it is best to have the house tested.

Figure 39:
Ventilation Options



Do not exhaust house air into the attic but through it to the outside. Avoid ductwork in the attic if possible. Any ductwork passing through the attic should be sealed and insulated to prevent condensation. Carefully seal all attic and other exterior penetrations.

Choose higher quality, quieter bathroom fans as they are more likely to be used.

Healthy Housing

Indoor air quality is becoming an increasing source of concern. Avoiding the use of materials and household products with high levels of chemical emissions is the prime strategy. For individuals who are dust sensitive, high-efficiency furnace filters are available which will considerably reduce particulate matter in the air. Improvements to the efficiency of the heating system will reduce the demand for natural resources.

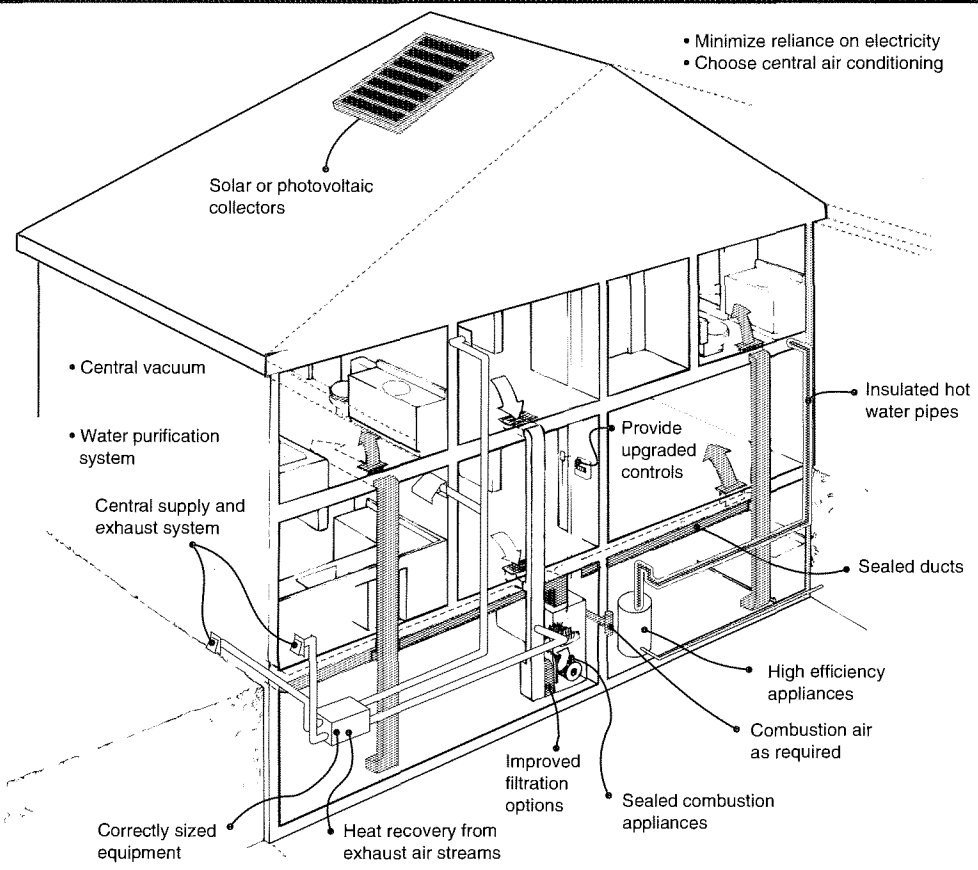
Consider renewable sources of energy for the home. Solar water heating systems are now available for the Canadian climate and can significantly reduce purchased energy requirements for hot water. Make use of south-facing windows to collect heat from the sun in the winter. Use shade trees, awnings and vines to protect the house in the summer and reduce the need for cooling.

See CMHC's "Building Materials for the Environmentally Hypersensitive."

Financial Implications

Upgrading the heating system can provide up to 48 or 50 per cent cost recovery on resale. It may also reduce operating costs.

Figure 40:
Healthy House Options



REROOFING AND ICE DAMMING

Overview

Keeping the roof in good repair is essential. The roof not only shelters the occupants from the weather but it also protects the building structure from damage. Replacing the shingles or reroofing is a common renovation task, required every 15 to 20 years for asphalt shingle roofs. Reroofing presents opportunities to change the appearance of the house and upgrade insulation. However, if the job is not done properly it can cause premature failure of the shingles and damage to the building structure.

Design Considerations

Choice of material

When deciding on a new roof, it is important to choose a material that is appropriate to the age and style of the house. Most post-war houses were originally roofed with asphalt shingles. These are still widely used today and are a logical choice. Other options include wood shingles or shakes and metal roofing, both of which last longer than asphalt shingles.

Whatever the material, colour is an important consideration. Sunlight and summer heat can cause hardening and premature deterioration of the shingles. Lighter colours will reflect the sunlight and prevent heat buildup in the summer months. A lighter coloured roof also leads to lower temperatures on the second floor. This is especially important for 1-1/2 storey houses where the second floor rooms are directly under the sloping roof.

Scope

There is more to reroofing than simply replacing shingles. For example, it is important to check the condition of seals and flashing around any roof penetrations, such as plumbing stacks or chimneys. Also, when reshingling roofs with dormers, the dormer flashing will have to be renewed as well. Removal of the old shingles is the best practice but is optional if there is only one layer on the roof.

Underlying problems

Where the roofing has failed, underlying problems should be addressed as part of the reroofing job. Three common failures on sloped roofed houses are:

- water penetration through the roof because of improper shingle or flashing installation;
- premature deterioration of shingles from wind and weather; and
- water damage to roof structure and ceiling caused by ice damming.

Ice damming

An ice dam is an accumulation of ice at the eaves which prevents melting snow from freely draining off the roof.

Ice dams themselves do not cause building problems, but they do cause water to collect on the roof. If the shingles and sheathing allow the water to penetrate the roof, the resulting water leakage can:

- damage attic and wall insulation;
- damage interior finishes;
- reduce thermal performance of building assemblies because of wetness; and
- promote mold growth and wood rot if wetness persists.

Ice dams form when heat escaping from the house melts snow on the roof. The water drains down the roof but refreezes when it reaches the cold section of the roof over the eaves. After some time, a layer of ice can build up to extend more than a metre beyond the roof's edge. The increasing amount of melt water becomes trapped between the ice slab and the roof. In this circumstance, the water can work its way under the shingles and penetrate the roof sheathing to cause damage to the attic space and rooms below.

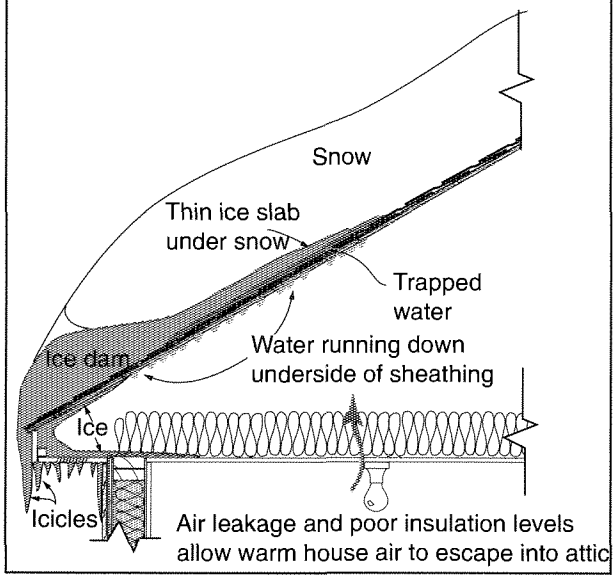
The conditions necessary to cause ice damming are:

- snow accumulation;
- sustained below freezing temperatures;
- a warm roof over the attic space caused by inadequate insulation and leakage of warm air from the house; and
- cold surface temperatures over the eaves.

These conditions are often found in 1-1/2 storey houses where:

- it is difficult to insulate the section of roof at the sloped ceiling portion of the attic; and
- air leakage can carry warm house air into the knee wall attic or the cathedral section of the roof.

Figure 41: Ice Damming



Construction

Mitigation

There are several strategies to mitigate the effects of ice damming and prevent leakage into the building. Two of the most popular are waterproofing and heating cables. Most building codes require eave protection in the form of a minimum 91 cm (36 in.) wide layer of waterproof material laid under the shingles. This does not prevent ice dams but stops water from leaking through the roof sheathing.

Many homeowners install electric heating cables at the eaves to melt channels in the ice and allow the water to drain away. However, this adds to electricity bills and may detract from the appearance of the house. The best solution is to prevent ice dams from forming in the first place.

Prevention

The key to avoiding ice damming is to prevent heat from escaping from the house and warming the roof. This requires sealing and insulating the roof so it presents a uniformly cold surface. This may be done in two ways.

ï Where the shingles are in good condition and reroofing will not be needed for some years, it is possible to seal and upgrade insulation from the inside (see Figure 41).

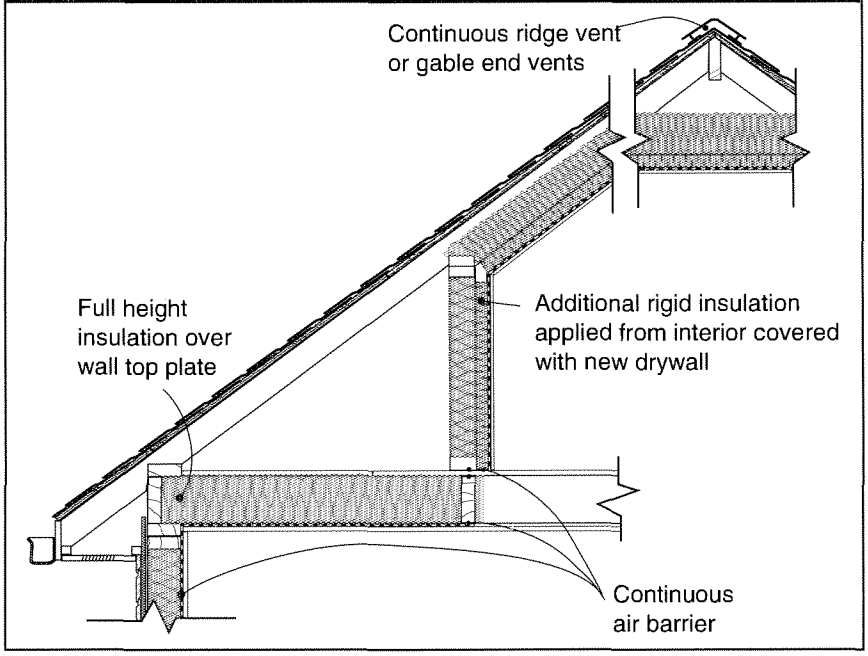
Critical junctions which will need attention are located behind the knee wall. Insulation over the wall top plate at the eaves should be upgraded and a baffle installed to allow air circulation from the soffit vents. The rafter space under the knee wall must be air sealed. This can be done using rigid foam insulation sealed to the rafters and sealing drywall with spray foam.

The stud spaces in the knee wall itself should be insulated and, if desired, additional rigid insulation may be fastened over the studs. Alternatively, rigid insulation may be fastened over the drywall at the knee wall, and the cathedral ceiling section and new drywall applied over top. The same methods can be used to increase the insulation level in the upper attic portion. In either case, the spaces should be air sealed from the interior, paying attention to all junctions and to any penetrations such as electrical outlet boxes.

When air sealing, pay special attention to:

- plumbing stacks or plumbing walls;
- chimney penetrations through the attic;

Figure 42:
Interior Insulation Upgrade



- any light fixtures;
- electric wiring;
- ducting for fans or heating systems;
- perimeter walls;
- the tops of partition walls;
- junction of cathedral ceiling with open attic spaces;
- where additions meet an older section of the house;
- at dormers; and
- balloon frame walls.

Where reroofing is in order, there is an opportunity to upgrade the insulation and seal the roof from the exterior (see Figure 42). With this approach, the whole roof is treated as one cathedral ceiling. This has the added advantage of allowing more flexible use of the space under the knee walls. The exterior approach involves removing the old shingles and the roof decking.

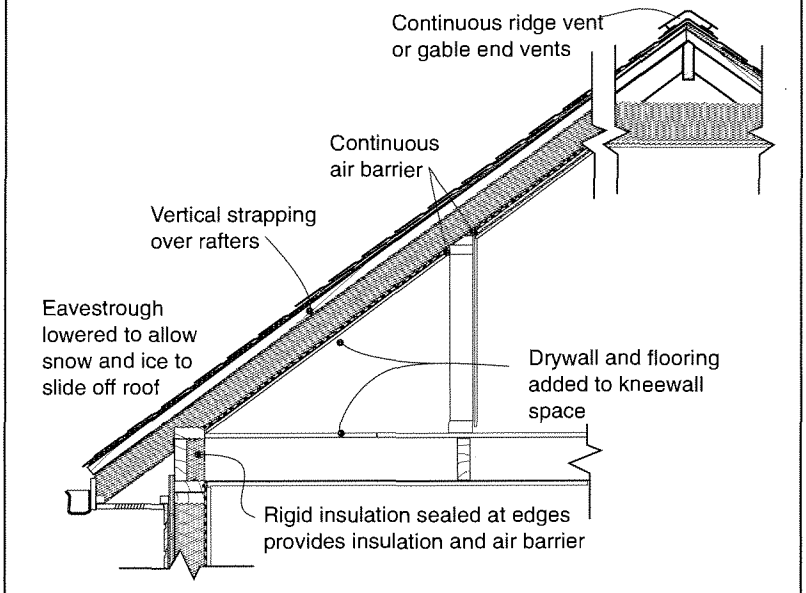
Drywall or other sheathing must be installed on the underside of the rafters in the knee wall and attic spaces. The rafter spaces are then air sealed from above before insulation is installed between the rafters. A weather barrier and strapping are installed on top of the rafters to create a ventilation space before the decking is replaced and new shingles are laid.

An alternative approach involves spraying foam insulation into the rafter spaces. This eliminates the need for any separate air sealing. Since the spray-on foam completely fills the rafter spaces, it is possible to do without the roof ventilation. The decking is installed immediately on top of the rafters.

Healthy Housing

A lighter roof colour will contribute to longer life for the roofing material. It will also help to keep the second storey cooler in the summer months,

Figure 43:
Exterior Insulation Upgrade



thereby saving on energy used for air conditioning. Healthy Housing options also include durable long-life roofing materials such as metal roofing.

If the house has a south-facing roof slope with good exposure, it is a good candidate for a solar domestic hot water heating system. Solar panels are typically installed after any reroofing work is completed.

CHAPTER 7 RESOURCES

A. Federal

Canada Mortgage and Housing Corporation (CMHC)

CMHC provides information on all aspects of housing for both homeowners and the housing industry. CMHC's Guide to Wood Frame House Construction is the definitive manual on standard house construction practices and is a useful reference when planning an addition or second storey bump-up.

CMHC's publications cover every aspect of the renovation process from designing additions and spaces for people with special needs and correcting problems such as poor indoor air quality to hiring a contractor. The catalogue of information materials also includes several instructional videos for the do-it-yourselfer.
To obtain CMHC's catalogue contact:
CMHC Web site: www.cmhc.schl.gc.ca
Canadian Housing Information Centre
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario K1A 0P7
Tel: 1 800 668-2642
E-mail: chic@cmhc-schl.gc.ca

Health Canada

Publications
Health Canada
Ottawa, Ontario K1A 0K9
Tel: 1 800 267-1245

Health Canada's publications focus on the health-related aspects of renovation such as cleaning up asbestos or lead-based paint or safe methods of working with pressure-treated wood.

Canadian Home Builders' Association

The Canadian Home Builders' Association Manual also covers new wood frame house construction but provides details on upgrading standard construction practices to R-2000 highly energy-efficiency standards.

Canadian Home Builders' Association
150 Laurier Avenue West, Suite 500
Ottawa, Ontario K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214
E-mail: chba@chba.ca

Natural Resources Canada (NRCan)

Natural Resources Canada provides information relating to energy efficiency in housing. Their publications include a homeowner's manual on upgrading insulation (*Keeping the Heat In*) and booklets on topics such as various types of heating systems, energy-efficient windows and doors, air leakage control and appliances. For a complete catalogue contact:
Energy Publications
c/o Canada Communication Group
Ottawa, Ontario K1A 0S9
Fax: (819) 994-1498

B. Local and Provincial

Closer to home, many municipalities and most provincial governments have information on some aspects of home renovation. At the municipal level, local planning and building departments, public health departments and electric utilities often have how-to information on renovation. As well, local building departments may have information outlining homeowner and contractor responsibilities and requirements for building permits.

Provincially, utilities and various provincial departments often produce information for homeowners. A few examples are listed below.

Newfoundland

Department of Mines & Energy

P.O. Box 8700
St. John's, Newfoundland A1B 4J6
Tel: (709) 729-5759
The Department has produced a booklet on sunspace additions to existing homes.

Newfoundland Power
Tel: 1 800 663-2802
The provincial utility carries publications on improving home comfort as well as a guide to PowerSmart programs and services.

Newfoundland & Labrador Housing Corporation
P.O. Box 220
St. John's, Newfoundland A1B 3P6
Tel: (709) 737-5600
The provincial housing agency has a fact sheet on helpful hints in home renovation.

Prince Edward Island

Department of Economic Development & Tourism
Energy, Minerals & Technology Branch
P.O. Box 2000
Charlottetown, Prince Edward Island C1A 7N8
The Energy Branch has booklets on energy-related aspects of home performance, including air leakage control, ventilation and heating with oil.

Nova Scotia

Department of Housing & Consumer Affairs
P.O. Box 815
Dartmouth, Nova Scotia B2Y 3Z3
Tel: (902) 424-4483
Consumer Affairs has produced several fact sheets on the legal and financial aspects of home renovation. Topics covered include guarantees, contracts and how to hire a contractor.

Department of Natural Resources
Energy Management Division
P.O. Box 698, 1701 Hollis Street
Halifax, Nova Scotia B3J 2T9
Tel: (902) 424-5019
This department has several fact sheets and booklets on energy-related aspects of renovation and new home construction, including pieces on various types of heating systems, passive solar homes and energy-efficient windows.

Nova Scotia Power
P.O. Box 910
Halifax, Nova Scotia B3J 2W5
Tel: 1 800 428-NSPI
The provincial electric utility has publications on various aspects of energy efficiency including heating systems, lighting and appliances, and basement insulation.

New Brunswick

Department of Natural Resources & Energy
P.O. Box 6000
Fredericton, New Brunswick E3B 5H1
Tel: (506) 453-2206
The Department has produced two pamphlets on energy retrofits.

Québec

Hydro-Québec
Service des communications commerciales
Centre de diffusion
1010 Sainte-Catherine West, 8th Floor
Montréal, Québec H3C 4S7
Tel: (514) 392-8425
The provincial electric utility produces Enermate, a quarterly magazine on energy efficiency. They have also published a book on energy efficiency in the home.

Ministère des Ressources naturelles
Energy Efficiency Directorate
5700 Fourth Avenue West
Charlesbourg, Québec G1H 6R1
Tel: (418) 644-7062
Contact the Ministry for a list of new titles.

Ontario

Ministry of Environment & Energy
135 St. Clair Avenue West
Toronto, Ontario M4V 1P5
Tel: (416) 323-4551

Ontario Association of Architects
111 Moatfield Drive
Don Mills, Ontario M3B 3L6
Tel: (416) 449-6898

The Association has two pamphlets on finding and engaging an architect for a home renovation.

Ontario Home Builders' Association
20 Upjohn Road
North York, Ontario M3B 2V9
Tel: (416) 443-1545
The Home Builders' Association has provided several pamphlets on the business side of renovation, including how to hire a contractor and a standard renovation contract.

Manitoba

Manitoba Energy & Mines
Information Centre
3300 Graham Avenue, Suite 555
Winnipeg, Manitoba R3C 4E3
Tel: (204) 945-4154
The Manitoba government has published several booklets on upgrading the energy performance of housing, including insulating attics and basements, replacing doors and windows, and sealing and caulking the house.

Manitoba Hydro
Head Office, P.O. Box 815
Winnipeg, Manitoba R3C 2P4
Tel: (204) 474-3311
The provincial electric utility has several pamphlets relating to energy use including one on retrofitting a home to the PowerSmart guidelines.

Saskatchewan

SaskEnergy
Marketing
1945 Hamilton Street, Suite 1110
Regina, Saskatchewan S4P 2C7
Tel: (306) 777-9411
SaskEnergy has publications on natural gas heating and water heating.

SaskPower
2025 Victoria Avenue
Regina, Saskatchewan S4P 0S1
Tel: (306) 566-2121
The provincial electrical utility has two booklets on energy-efficient lighting and energy efficiency in the home.

Alberta

Alberta Association of Architects
10515 Saskatchewan Drive
Edmonton, Alberta T6E 4S1
Tel: (403) 432-0224
The Association has several pamphlets on the role of architects in new housing and renovation projects.

Alberta Municipal Affairs
Housing and Consumer Affairs Division
10155 102 Street, 16th Floor
Edmonton, Alberta T5J 4L4
Tel: (403) 427-8862
Publications from the Alberta government address various aspects of housing, including energy efficiency in new construction and renovation.

Canadian Western Natural Gas
909 11th Southwest Avenue
Calgary, Alberta T2R 1L8
Tel: (403) 245-7110
The gas utility publishes booklets on heating with gas and wood burning fireplaces.

Transalta Utilities Corporation
1202 Centre Street SE
Calgary, Alberta T2P 2M1
Tel: 1 800 267-5300
Transalta has produced EnergyMatters, a series of booklets on saving energy. The series includes titles on reinsulating and air sealing, heating systems and energy-efficient windows.

British Columbia

Power Smart
475 West Georgia Street, 3rd Floor
Vancouver, British Columbia, V6B 4M9
Tel: (604) 540-8883 or 1 800 663-0431
B.C. Hydro's Power Smart program has produced a series of over 25 brochures, guides to energy management. They focus on energy-efficient appliances and various aspects of home heating.

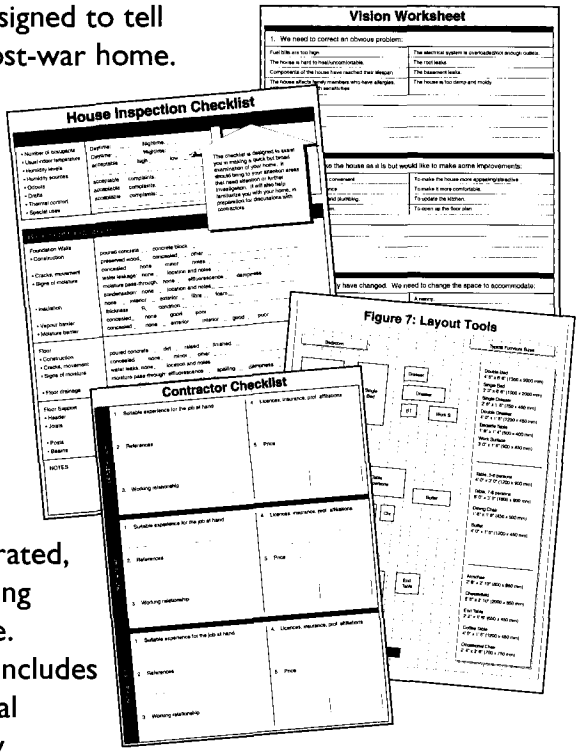
Yukon

Yukon Electrical Co. Ltd.
Box 4190
Whitehorse, Yukon Y1A 3T4
Tel: (403) 633-7000
The utility's publications include an energy audit which homeowners can do themselves and information on operating costs of appliances.

Northwest Territories

Department of Energy, Mines & Petroleum Resources
P.O. Box 1320
Yellowknife, Northwest Territories X1A 2L9
Tel: (403) 873-7203
The Territories government has published several pamphlets on energy efficiency in the home, including information on how to save on energy bills and on caulking and weatherstripping. Some are available in Inuktituk as well as English.

This special Renovating Distinctive Homes edition was specifically designed to tell you everything you need to know about renovating a 1 1/2 storey post-war home. You will learn all about the unique characteristics of these homes, how they were developed, designed and built. It describes the renovation process from concept to completion, with detailed drawings; Renovation Planning Worksheets; Vision Worksheet; House Inspection Checklists; and layout tools to assist you.



Renovating Distinctive Homes guide is just the beginning. CMHC carries these publications to help you with your home renovation/building projects:

Canadian Wood-Frame House Construction

The national best-seller on building wood-frame houses in Canada. A field companion for builders and renovators alike, this richly illustrated, step-by-step guide covers everything from breaking ground to finishing touches. It is a superior learning tool and essential job-site reference. The guide conforms to 1995 National Building Code requirements; includes new illustrations and handy sizing tables; presents metric and imperial measurements; planning ahead and checking back notes; plus Healthy Housing tips. Convenient lay-flat binding. Revised 1998.
Order #5031E $25.95

Healthy Housing Renovation Planner

The *Healthy Housing Renovation Planner* is a practical and interactive guide to planning a renovation project from beginning to end, whether hiring a contractor or doing the work yourself. Relevant for both major and minor projects, the reader can pick and choose information necessary to make decisions. This guide uses a systemic planning approach to renovation projects that contributes to occupant health, reduces energy consumption, conserves natural resources, minimizes environmental effects and balances cost and feasibility.
Order # 2172E $34.95

Glossary of Terms

The A-Z of housing terms! Do you know a beam from a truss? A sash from a sill? This useful housing dictionary lists more than 1,200 up-to-date definitions and provides the French term for each. Revised 1997.
Order # 1165E $8.95

FlexHousing: The Professionals' Guide

Build your market share by building homes that can last a buyer a lifetime. Welcome to the innovative concept of FlexHousing—building homes that meet client demands for adaptability, accessibility, safety and security. Learn how to adapt traditional design and building practices to put space to new and profitable use, from the basement to the attic. Also includes a special chapter on marketing FlexHousing.
Order # 2400E $24.95

Please visit the *About Your House Series* on our Web site for more information on home renovation at:
www.cmhc-schl.gc.ca

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