

thirty keys to good house construction

An explanation of some basic principles for the guidance of prospective home-owners. Because of the variation in methods of construction in different municipalities across the country, the information in this series should be looked upon only as a general guide.

CENTRAL MORTGAGE AND HOUSING
CORPORATION

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Part 1 - BEFORE YOU BUILD OR BUY

SUCCESSFUL HOME-OWNERSHIP
BASED ON SOUND FINANCING

When you plan to build or buy a house, there are two things you must take into consideration at the outset, the down payment you can afford and the expenses of month-to-month ownership.



The savings you have in cash, bonds or other securities will, of course, govern the amount you can spend as a down payment. To find out just how much you can afford in the monthly upkeep of the house make out a family budget. In the first column, total your gross monthly income. In column two, list all your living expenses other than present housing costs such as rent, heating, maintenance and repair, and any special municipal taxes such as water tax. Subtract the total in column two from column one and you will have the monthly amount available for heated home-ownership. Then inquire into the approximate monthly costs of taxes and fire insurance in the area in which you intend to build and estimate the cost of maintenance and repair, and heating. Maintenance and repair of the house should be considered as one of the monthly costs of home-ownership from the beginning.

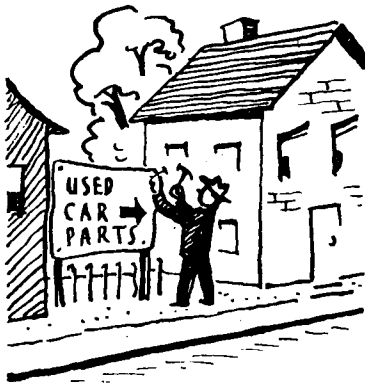
With these estimates you will be able to determine the amount available for principal and interest payments on a mortgage loan, remembering that payments, plus taxes and insurance, should not exceed 23 per cent of your monthly income.

The advice often given to prospective home-owners intending to build is to set aside a sum equal to twice your monthly income as an emergency fund. This will help defray any additional costs which may be incurred during construction.

In most new houses, there are expenses related to the actual "settling down". Some pieces of furniture or equipment, such as a stove or refrigerator, may be required immediately. New drapes and floor coverings may also be necessary. Funds kept in reserve may mean the difference between getting off on the right foot or facing possible financial difficulty.

COMMUNITY PLAN AND ZONING LAWS
HELP PROTECT PROPERTY VALUES

The character and appearance of the community in which you build or buy will have considerable effect on the value of your property. Where adequate zoning by-laws and an official community plan have been adopted, your investment is protected.



Before you buy a lot on which to build be sure you obtain all information on existing building restrictions and plans for future community development. It is easy to understand what would happen to the value of your house if construction of a factory, garage or warehouse was allowed on adjoining property. This could happen if your community did not have restrictions to control non-residential building.

Most cities and towns have zoning by-laws but it is good policy to check them to see that they are not too rigid to meet new needs, or too loose to prevent industrial encroachment on a purely residential district.

With a master plan, a community can properly arrange its expansion or re-development to provide adequate recreation and playground areas, to locate shopping, commercial and amusement centers in their proper place in relation to the residential areas, and to plan the streets with an eye to beauty, safety and economy.

Through the organization of the Community Planning Association of Canada, interested citizens are working more closely with civic authorities and planning experts to achieve a better layout for living in their communities. Your local branch members can offer advice which will assist you in attaining successful home-ownership.

NEIGHBORHOOD FOR NEW HOUSE
SHOULD BE SELECTED WITH CARE

Many factors make or mar the happiness and security of a home. The selection of the neighborhood in which the house is built is one of them. Too often, in the enthusiasm of home-planning, people overlook the fact that they may also be selecting their surroundings and environment for many years to come. Think long and well before you invest your future in a community.



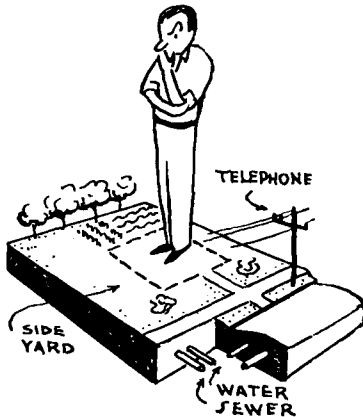
The location of your house determines the accessibility of work and play, and fixes the conditions of light, air and sunshine. It also provides neighborhood associates and activities. A walk around a residential district is a good way to judge its general appearance and character, and in this way you will be able to tell whether it fits in with your living habits. You will be able to see how far the schools, shopping centers, churches, recreation and amusement centers are located from the property you buy.

A talk with your future neighbors will often reveal hidden nuisances not readily seen at first glance. If there are children in the family you will not want to locate on a street used as a traffic thoroughfare or as a motorists' short-cut. You should also remember to check on such items as tax rates, the availability of police and fire protection, and whether there will be sewer and water connections for your house.

A neighborhood with a high percentage of homes occupied by owners generally means better care of buildings and grounds, and greater stability of property values.

SITE SELECTION WILL INFLUENCE
COST AND APPEARANCE OF HOUSE

The men and women who pioneered this country gave much thought to the proper selection of their homesite. It was often their margin of survival.



Today the building of a home has become a more specialized undertaking. But the choice of a lot still requires careful thought on the part of the people who will own and live in the house. The decisions they make will influence the cost, appearance and convenience of their home. Before choosing a lot you should have a definite idea of

the type of house your family needs. For instance, a long, narrow lot would not be suitable if you were planning on a low, rambling style home.

When you are looking over a building site first attention will probably be given to the surface features. See that there are no outcroppings of rock, because this will mean expensive excavation. On the other hand, check the land to make sure that it is in its original state, and not just a gully or swamp filled in with loose earth. If this were the case your house might settle far more than is ordinarily expected. A tree or two on the property is a good sign that it is in its natural condition.

The lot that slopes gently up from the street has many advantages from the standpoint of appearance and drainage. The one that slopes down from the street will mean less excavation work, but fill will be needed to bring it up to a satisfactory level. This type of lot also raises a number of drainage problems. The level site often requires terracing.

LOCAL STANDARDS OF CONSTRUCTION
MAINTAINED BY BUILDING CODES

Building codes are essentially local ordinances designed to maintain standards of construction approved by the municipality and the province. They are intended to protect the public in regard to safety in building with special reference to health, structural soundness and fire hazards.



Some municipalities have adopted the National Building Code as a basis for their local codes. A responsibility of the National Research Council, the code is intended to assist municipal and provincial authorities and is a result of years of study and constant review. The National Building Code specifies minimum room sizes and window areas, besides laying down rules of construction for foundation walls, basement floors, exterior walls and roofs, fire protection, and all other phases of building.

Minimum requirements for planning, construction, and materials for buildings upon which loans are made under the National Housing Act have been published by Central Mortgage and Housing Corporation in a booklet entitled "Building Standards". These standards are intended to apply in all cases except where provincial or municipal codes are more exacting. In such cases the provincial or municipal codes apply.

The Central Mortgage building standards require the use of materials that are structurally sound for the purpose for which they are to be used. Nothing is required that will cause a house builder to spend a dollar extra that is not amply justified from the standpoint of health, safety and convenience.

SPACE REQUIREMENTS AND COSTS
KEY TO SELECTION OF HOUSE TYPE

The popularity of the $1\frac{1}{2}$ -storey house in Canada is closely associated with the search for a type of house which will give the greatest amount of livable floor space for the money available.



In a $1\frac{1}{2}$ -storey house the roof space, which is often unused in a bungalow or two-storey house, is utilized to provide one or two bedrooms. If a similar amount of space is provided in a bungalow, increased foundation, roof and exterior wall construction is necessary and building costs are substantially increased. However, single dwellings up to 900 square feet can best be provided in the one-storey plan. The economy of the $1\frac{1}{2}$ -storey house is of particular benefit to young couples since it can be designed to provide complete living accommodation on the first floor,

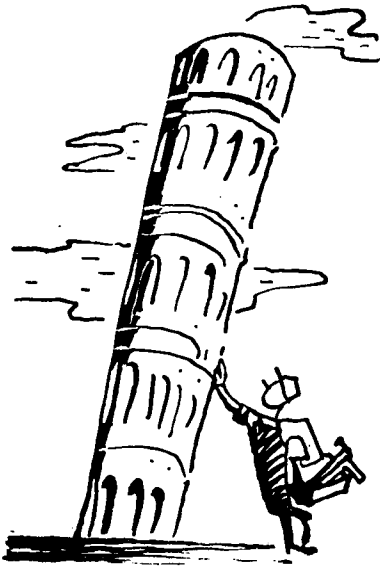
leaving the upstairs unfinished. This reduces initial costs and, as additional funds are available, extra bedrooms can easily be provided by completing the second floor. A ground floor bedroom can then be used as a dining room.

In comparison with a two-storey dwelling, a $1\frac{1}{2}$ -storey house will prove less expensive providing the owner does not attempt to utilize in the second floor more than 75% of the ground floor area. When the percentage is greater, construction costs soon exceed the cost of a two-storey dwelling having the same area because expensive dormers and a general breaking up of the roof will be necessary.

No matter which type of house is built, the prospective home-owner should consider the economy of a design which is as close to a square as possible. This is easily explained by comparing a square and a rectangle which enclose the same area. The latter will have a greater perimeter and will therefore require greater excavation, foundation and roof construction.

SIMPLICITY IN DESIGN ENSURES
PLEASING EXTERIOR APPEARANCE

An interior plan which meets the family's living requirements is of first importance in designing a new house but the plan arrangement should lend itself to a pleasing exterior appearance.



For the small house particularly, simplicity is the keynote to exterior design while the appearance should also reflect harmony and good taste. An unpretentious, well-balanced exterior finished with a few carefully selected materials which harmonize in color and texture will ensure "eye appeal". The width, length and height of the house should be in good proportion one to another. Doors and windows must be well placed and of proper size to suit the wall space in which they are built.

Balance is also obtained by setting the house as low to the ground as possible.

Unbroken roof and eave lines are especially important for small houses as they will give the house the appearance of maximum size. Emphasis can also be placed on size by treating the house as one large color area and avoiding the use of materials which contrast with one another and break up the exterior into small areas.

Unnecessary gables, dormers and other features which are over-ornamental will mean added expense and are often in poor taste and can spoil the appearance of a house.

Even the simple rectangular house can be attractively finished to achieve character and variation from houses of similar design in the neighborhood. A wide variety of exterior materials are available today and the appearance of the house may also be enhanced by a well-designed porch, bay window or other useful addition.

LEGAL ASSISTANCE NECESSARY
TO PROTECT OWNER'S INTERESTS

Building or buying a house is a complex financial and real estate transaction. No prospective home-owner should overlook the necessity of engaging legal advice to protect his investment.



Whether or not a document is read to a layman, he sometimes signs it even though the implications of all the clauses are not fully understood. It is only by having recourse to a competent legal mind that a prospective home-owner can sign contracts and mortgage deeds with full knowledge of his rights and ob-

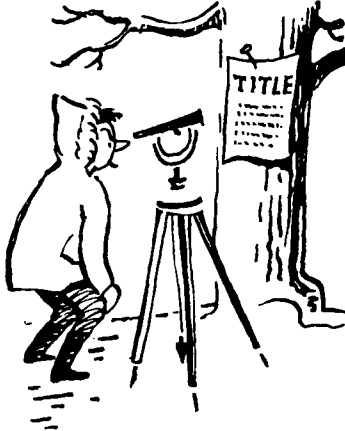
ligations.

Legal assistance will first be of value in acquiring the land, investigating and interpreting local by-laws and preparing or checking the building contract. The solicitor will ensure that all work anticipated by the owner is specified in the contract. He also protects his client's interests by explaining the necessity for insuring the property, both during and after construction, and by making certain that no claims will be registered against the property for bills incurred by the contractor or sub-contractors.

After construction has been completed the lawyer will handle the mortgage deed and serve as an interpreter to the purchaser to ensure that he understands fully the entire transaction and his obligations.

CLEAR TITLE TO LOT ESSENTIAL
WHEN BUILDING OR BUYING

Unless clear title to the building lot is obtained by the prospective home-owner, he may be faced with added expenses and possibly court action arising from hidden encumbrances against the property or improperly defined land boundaries.



The buyer should never take for granted the assertion of the seller in a real estate transaction. Mistakes may have been made in the title and repeated many times because a search was never carried out by a solicitor or notary. At the outset the purchaser should obtain a surveyor's certificate which provides a proper description of the lot to be included in the mortgage deed and title. If the land has never been surveyed, the purchaser should have this work done at his own expense. The surveyor may require descriptions of the property as contained in previous deeds for reference purposes and these should be procured by a solicitor.

The services of the surveyor will also be of value in staking out the location of the house for excavation of the foundation. This will ensure that local requirements concerning the amount of setback of the house from the street and the side boundaries of the lot are properly observed.

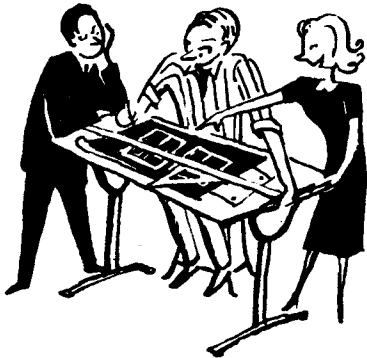
Legal advice is most important in acquiring property. The lawyer will draft the technical description of the lot, examine the title of the vendor, register the deed at the local registry office and study all documents to assure the purchaser of clear title to the land. He will inform the purchaser of any existing easements or financial encumbrances such as tax liens or other outstanding debts.

If the prospective home-owner wishes to take an option on a lot before buying, he should have this document drafted with legal assistance since it should contain all the stipulations of the deed of sale.

Part 2 - THIRTY KEYS TO GOOD HOUSE CONSTRUCTION

HOUSE DESIGNED BY ARCHITECT
CAN MEET NEEDS WITHIN BUDGET

Whether you plan to build a large or small house, the services of an architect will prove a sound and wise investment. His fee ranges from approximately six to 10 per cent of the cost of a house, depending on the extent of the work he does.



Basically, the architect designs your house according to the amount of money available and the needs and desires of the family. Should your ideas be too ambitious for your pocketbook, he can suggest savings by eliminating unnecessary features. The architect is essentially an artist and therefore he must be familiar with every detail of the lot on which you intend to build. If the house does not blend with its natural setting, it will tend to look unattractive no matter how well it has been designed.

When the architect has a clear picture of your requirements he makes rough sketches of the house. If these are satisfactory to you he proceeds with the working drawings and specifications. The specifications are the written details of construction which supplement the drawings.

If requested, the architect will arrange competitive bidding for construction and also draw up the building contract based on the plans and specifications. Generally, architects use standard contract documents approved by the Royal Architectural Institute of Canada.

The architect will check all bills for materials and labor and approve them for payment and will also supervise construction if retained to do so. He will make a final inspection of the completed house and obtain the necessary guarantees from the contractor for the roof, heating system and other mechanical equipment.

CAREFUL PLANNING ESSENTIAL
FOR SMALL HOUSE LIVABILITY

Tailoring a house to suit a family's needs and financial abilities is a task which can best be accomplished with expert assistance. But even without this help the suitability of a house plan can be judged by the prospective homeowner himself through close assessment of the family's present and future requirements.



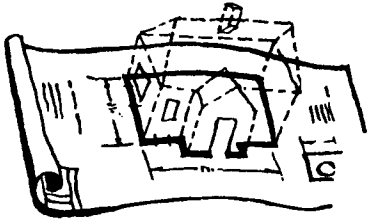
The growing trend toward small house construction, resulting from constantly increasing building costs, has emphasized the importance of intelligent house planning to obtain a maximum amount of livable space and as much comfort and convenience as possible. Basically, provision should be made for privacy for the bedrooms, a living room of suitable size and a conveniently located kitchen. The bathroom should be easily accessible from all rooms. Whether the dining area is contained in a separate room or not will depend on the floor area the budget will allow and the wishes of the family. Likewise, the size of the kitchen and all other rooms will be dependent on the relative importance placed on each.

The circulation of traffic within and between the rooms, the relationship of the rooms to one another and the importance of light and ventilation must also be considered. Care must also be taken to prevent the living or dining room from becoming an unsatisfactory traffic lane. The dining room should be convenient to the kitchen and adequate cross-ventilation is desirable for the bedrooms.

Economic and intelligent house planning requires the elimination or reduction of waste space such as halls and, in a small house, can be achieved most readily if some of the rooms are used for more than one activity.

DRAWINGS AND SPECIFICATIONS
DETAIL HOUSE CONSTRUCTION

Working drawings are the pattern from which your house is built. They must be sufficiently detailed to illustrate clearly the type of construction intended. They should be dimensioned to show overall exterior measurements, room sizes, ceiling heights, and other factors which combine to establish the physical size and shape of the completed dwelling.



Whether you intend to use stock plans or have the house "drawn to order" the drawings should include the plot plan which will show the property dimensions, sideyard dimensions, North point, adjacent streets and lanes, and municipal or private sewer and water facilities. Plans of each floor, including the basement, should show plumbing and heating systems, and electrical outlets. In addition, drawings are required of all exterior elevations and a section through at least one exterior wall from the highest point of the roof to the basement footings. Plans should be drawn to a scale of not less than $\frac{1}{4}$ -inch to one foot.

It is worth noting that stock plans can be altered to suit individual tastes. If such changes are minor the contractor can merely indicate them on the drawings, but if major structural changes are desired, an architect should be engaged to revise the drawings.

Specifications are written documents which stipulate the kind, quality, and sometimes the quantity of materials and workmanship required for construction. They complete the contractor's instructions by showing all materials, finishes, equipment and other details which are not indicated on the drawings.

**BUILDING CONTRACT REQUIRED
TO PREVENT MISUNDERSTANDINGS**

A building contract is of equal importance to the prospective home-owner and his contractor. This document, which sets forth the responsibilities of each and prevents any misunderstanding, should be prepared with legal assistance.



A properly completed contract contains four parts: the agreement, general conditions, working drawings and the specifications. All sections should be clearly understood by the prospective home-owner.

The agreement names the parties concerned, the scope of work to be completed and the amount and method of payment. It also states that the working drawings, the specifications and the general conditions form a part of the contract.

The general conditions detail the rights and responsibilities of both the owner and the contractor and provide for arbitration of disputes. They also outline the responsibilities for all liabilities, including claims under the Workmen's Compensation Act, and the method of settlement of mechanics' liens or similar claims which might be filed against the property for unpaid bills. Specific mention is also made in the general conditions of the responsibilities of the contractor in regard to work performed by a sub-contractor.

Working drawings outline in detail the construction of the house while the specifications describe the size and quality of materials to be used. They should be carefully checked and signed by both parties to prevent any possible misunderstanding or misinterpretation.

SOUND LUMBER SHOULD BE USED
FOR GOOD HOUSE CONSTRUCTION

The finest workmanship will be of little avail unless sound material is used in the construction of a house. The lumber in the framework should be chosen for strength, dryness and ability to hold nails. Woodwork exposed to ground moisture should be treated to resist decay.

The choice of material to be used for finish is largely dependent on its ability to take paint or other protective coatings, the locality in which the house is to be built and the ever-present factor of cost.

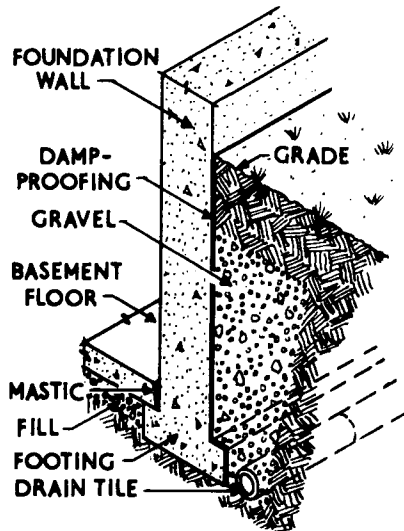
Contrary to general opinion, lumber shrinks across the grain and not lengthwise. This is a cause of warping. Consequently, it is important that the lumber be well seasoned and protected from rain and snow before and during installation.

Knots and defects are the basis upon which lumber is graded. For natural exterior finishes, lumber that is free from defects is preferable. On the other hand, poorer grade materials may be suitable for painting.

Framing grades allow for small knots and other slight defects. Poorer grades, having larger knots and more defects, are usually acceptable for sheathing. First grade materials usually go into the millwork, such as doors and sashes. A reputable lumber dealer has a thorough understanding of grading and will gladly help with the choice of materials.

POORLY BUILT FOUNDATIONS CAN
RUIN WELL-CONSTRUCTED HOUSES

The foundation walls of a house are of prime importance. A poor foundation wall can result in wet basements, uneven floors, broken plaster and general settlement. All types of foundation walls should be



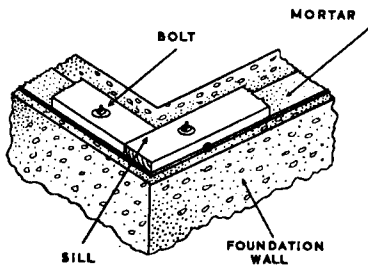
of first grade materials. They must be thick enough to withstand the combined attacks of weight and frost. Generally, solid concrete or masonry walls under a bungalow should not be less than eight inches wide. Two-storey dwellings usually require a minimum thickness of 10 inches. Foundation walls should extend at least 12 inches above the outside grading.

Unless the house is to be built on solid rock the foundation walls should rest on footings. These are concrete pads which form a bearing surface against the soil and help prevent settling. The depth of the footings should be at least six inches. This, however, depends on the bearing capacity of the soil and the thickness of the foundation wall. They should extend below soft or sandy soil to a firm bearing.

Besides footings, bearing posts in the basement help support the weight of the house. If there is no basement, piers or inside walls may be required beneath the house. A guide for foundation walls and footings may be found in the Central Mortgage and Housing Corporation building standards.

SILLS SUPPORT THE WALLS AND JOISTS IN HOUSE CONSTRUCTION

Foundation sills are planks or timbers which rest upon the foundation. They are the base for the walls and first-floor joists. Sills are sometimes omitted to allow the floor-joists to rest directly



on the foundation. This is not recommended as it is difficult to obtain a level surface for the joists. For light frame construction the sills are usually two by six inches.

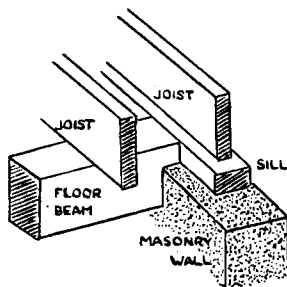
Sills should be embedded in mortar to make a more satisfactory bearing surface. Where the sill is bolted into the foundation, as in sections of the country that have high winds, the bolts should be three-quarters of an inch thick. They are spaced at intervals of from five to eight feet, extending into the basement wall about 18 inches.

Mortar is first spread on the foundation wall. The sill is laid while the mortar is still fresh. Care should be taken to ensure an even and airtight bearing. The nuts and bolts are not tightened by a wrench until the mortar has set.

Material for sills may be of almost any wood. No.1 common grade is preferable for standard construction. Because one of the principal requirements of a sill is to withstand decay, many builders use sills which have been chemically treated to withstand rot.

FLOOR BEAMS HELP SUPPORT THE
INNER ENDS OF FLOOR JOISTING

Following the installation of the foundation sills, a girder or floor beam, laid crosswise and embedded in the foundation walls, is used to support the inner ends of the floor joists. This is either a



large timber or several planks nailed together and set on edge. It takes the place of an interior foundation wall and eliminates bearing partitions in the basement.

Bearing posts or columns, set at equal intervals, support the girder and prevent sagging. These may be of steel, wood or masonry. The bottom ends of wood posts should be set a few inches above the basement floor to reduce the possibility of decay.

The spacing of beams depends on the size and length of the floor joists. The usual is from eight to 14 feet. If they are too far apart, the joists must be larger and the beams stronger. This increases cost.

As it is desirable to place the beam directly under wall partitions, room arrangement usually determines the location. The size of the beam depends on its length and the total load to be placed on it. It also varies with the species and grade of wood used. In $1\frac{1}{2}$ -storey or 2-storey houses, the size should be determined from standard engineering formula. This is usually stated in the local Building By-Laws. If not, then the National Building Code applies. A general guide for bungalows is to be found in the Central Mortgage and Housing Corporation building standards. The beam should be long enough to rest not less than four inches on each foundation wall.

DEPTH OF JOIST IS IMPORTANT
IN SOUND HOUSE CONSTRUCTION

Joists are planks that carry the weight of the floors and ceiling. They are the base to which the sub-flooring is applied. The usual spacing is 16 inches.

Strength and rigidity are the prime factors in choosing the type of joist to be used. This is even more important than the grade of material. Stiffness in a joist, which prevents bending or vibration, depends upon the actual depth of the joist. A lower-grade material with a greater depth will give a better floor than a higher-grade material with a lesser depth. Both would cost about the same.

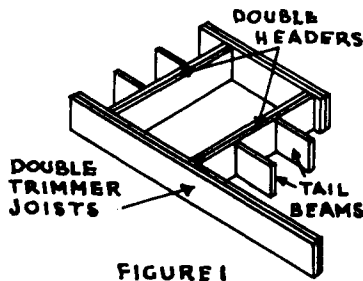


FIGURE 1

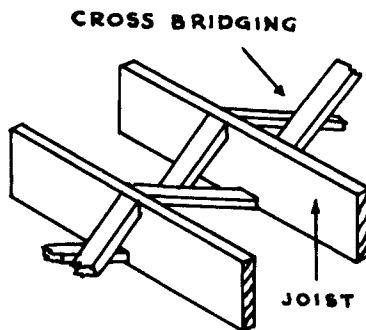


FIGURE 2

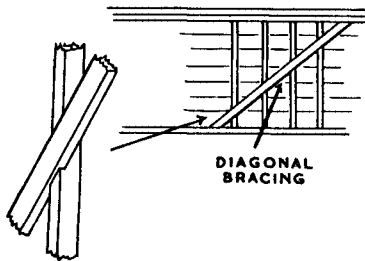
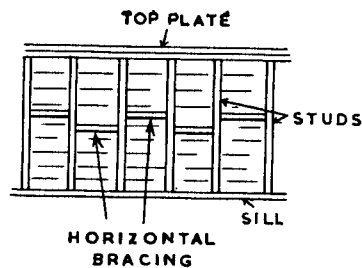
The joist rests on the girder and should have a four-inch bearing at either end. As with the floor beam, the size of the joist depends upon its length and the species and grade of material used. A chart for judging spans may be found in the National Housing Act building standards.

When regular joists are cut to provide openings for stairs or chimneys, auxiliary joists are installed. These are called Headers and are placed at right angles to joists that have been cut. Headers should be the same size as joists. Both headers and joists around openings are usually doubled regardless of the strength.

All joists should be stiffened with cross-bridging (Figure 2) usually two-by-two's nailed to form an X pattern between the joists. Bridging helps to stiffen the floor. Each piece is nailed by two or three nails at the top. The lower ends are not nailed until the sub-flooring is in place.

STUDDING PROVIDES FRAMEWORK
FOR FINISH IN YOUR NEW HOME

The wall skeleton of a frame house is composed of verticle two-by four's called studs. Their main purpose is to provide a framework for the wall sheathing and to support the weight of the upper floors.



As for joists, the standard spacing between the studs is 16 inches. The grade and species of material is ordinarily the same as that used in the joists and rafters. The lumber should be straight to avoid bulges and hollows in partitions and walls. Studs should not be cut more than half their depth to receive piping or other installations.

Studding should be in one continuous length from the floor to the ceiling. The usual practice is to use one two-by-four brace between each two studs. These should run either horizontally or diagonally throughout the length of the wall as shown in the sketch. Each brace should be nailed with two nails to each stud. Dry lumber must be used to prevent warping and pulling out the nails.

In erecting the studs, they may be braced temporarily then toenailed to the sill. This is awkward. A more convenient method is to space the studs on the ground and nail on the sills and top plates. When the studs have been spiked together they can then be raised into place in one unit. This saves time and does a better job.

TOP PLATES SHOULD BE DOUBLED
IN SOUND HOUSE CONSTRUCTION

In small frame construction, the vertical studs are capped by a top plate. As shown in Figure 1, the top plate runs across the studs for the entire length of the building. The size of the top plate should not

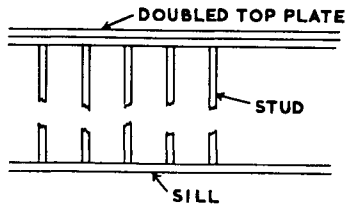


FIGURE 1

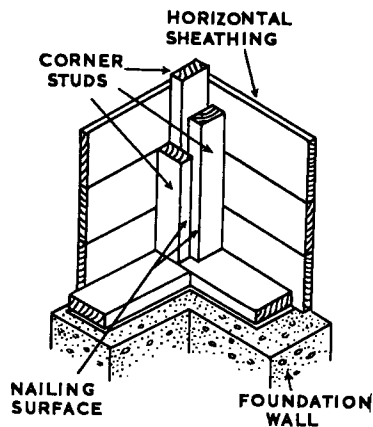


FIGURE 2

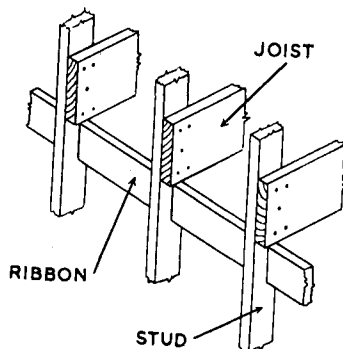


FIGURE 3

be less than doubled 2" material. It should be the same width as studs, lapped at all corners and intersecting partitions. Laps should be securely spiked. End joints should be made over a stud. The grade and species of the wood is the same as that used in the studs. Top plates should be nailed firmly to each stud with two nails. Corner studs are used at an intersection of two walls. As a single stud does not have sufficient nailing surface for inside finish at the corners, three two-by-four's are joined together as shown in Figure 2. This is simple to assemble, and adds strength to the walls. The corner studs should be framed and assembled along with the regular studs. In certain types of construction, a ribbon is used to support the joists above the first floor. The ribbon, shown in Figure 3, is spiked and notched to the studs. A one-by-four is sufficient. Any grade of lumber may be used but the harder woods are preferable. It should be free from defects such as cracks or large knots. The length should be continuous but if this is not possible the joint

should be at the centre of a stud. There should be two nails at each stud. When the studs are framed before raising, the ribbon should be fitted into place during the assembly.

HEADERS AND TRUSSES ASSIST
IN STRENGTHENING THE HOUSE

When studs have to be cut for windows or doors, a header must be installed over the opening to support the ends of the studs that have been cut. In the case of a window, a lower brace is needed and this is

called a Rough Sill.

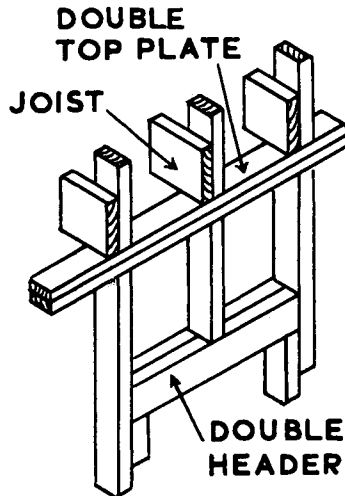


FIGURE 1

Whether the header should be single or double depends upon the weight it must carry. For example, a single header would be satisfactory in an interior wall which is parallel to the joists of the floor above as it carries only the weight of the framing. Where a header must carry the weight of the ends of the floor joists that are immediately above the opening (Figure 1) it should be doubled.

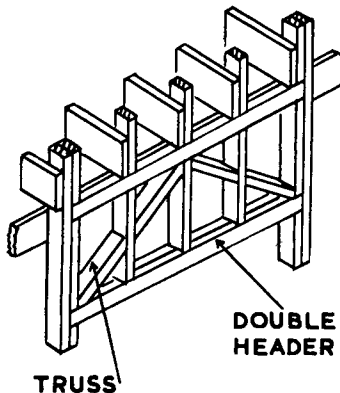


FIGURE 2

A greater strength results if double headers are placed side by side rather than one on top of the other. They should be thoroughly spiked together. Headers are generally of the same size and species of wood as that used in the studs.

When there is a great deal of weight over an opening a triangular arrangement of two-by-four's, called a truss, is installed. This forms a rigid bolster to support the weight. A variety of truss arrangements may be used, but the one shown in Figure 2 is the most widely

accepted for average widths. A good fit is necessary and every piece should be securely nailed in place.

FIRE STOPS ARE A REQUISITE
IN GOOD HOUSE CONSTRUCTION

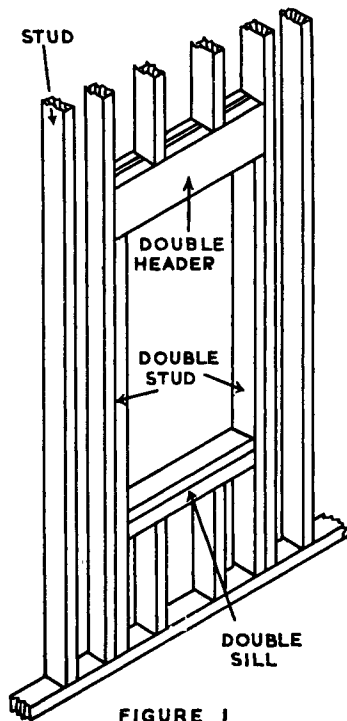


FIGURE 1

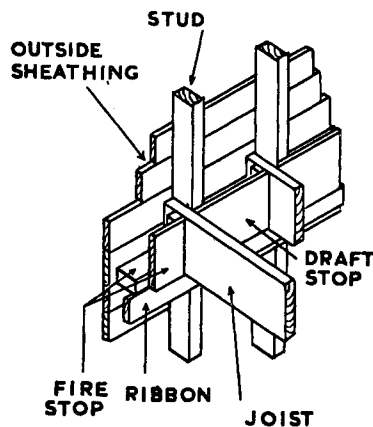


FIGURE 2

When studs have been cut to provide an opening, the studs on either side of the opening should be doubled. It is good practice to cut the additional stud so that the top comes under the header as shown in Figure 1.

One of the reasons for doubling studs at openings is to provide ample nailing surface for sheathing and finishing materials. As in the case of a doorway, doubling would also offer a more solid support when the door is slammed.

It should be remembered, however, that in all types of construction, cost is a very important factor.

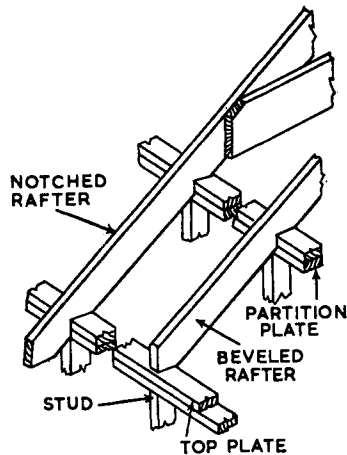
The method that produces the best results at a minimum of cost is the one that should be used.

Because of the long flue-like spaces between the studs, fire stops are necessary to prevent the rapid spread of flames in case of fire. Fire stops are obstructions placed at and midway between each floor level to prevent the spread of fire from one floor to another. They are also provided over partitions to prevent fire from passing through the floors and across the building.

The obstructions are usually made of 2-inch lumber as shown in Figure 2. Although masonry is sometimes used, it is practicable only in certain places.

RAFTERS ACT AS BASE FOR ROOF
FINISH IN HOUSE CONSTRUCTION

In one sense, rafters bear the same relation to the roof as joists to the floors. They serve as a base for sheathing and roofing materials. In flat roofs the rafters should be designed in the same



way as floor joists. Although there are different types of auxiliary rafters, regular rafters are the ones that run directly from the eave to the ridge.

Spacing varies from 16 to 24 inches. For ordinary one-inch roof sheathing, 20 inches is satisfactory. Generally, wider spacing is not advisable. Conversely, closer spacing than 20 inches is unnecessary except where roofing materials are heavier than normal. If the attic is to be finished and the undersides of the roof rafters plastered, then 16-inch spacing should be used.

The size of regular rafters depends on the weight of the roofing material, the snow loads and the span of the rafter. A general guide for allowable loads and spans may be found in the Central Mortgage and Housing Corporation building standards. The span of the rafter is the distance between the point of the roof and the wall. Any overlap past the wall is not counted in the span.

The length should be sufficient to allow for the projection at the eave and the joint at the ridge. This should not be confused with the span. If the rafters run in line with the attic floor joists they should be securely spiked at the joint. In any event they should be notched over the top plate that supports the joists.

RIDGE BOARD JOINS RAFTERS AT THE ROOF PEAK OF YOUR HOUSE

The Ridge Board is located at the peak of the roof to help line up the rafter ends. In small frame construction, one-inch lumber is sufficient. The depth should be at least the same as the depth of the

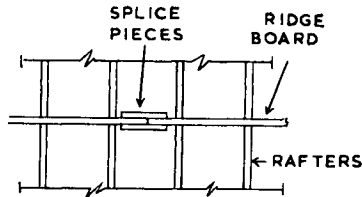


FIGURE 1

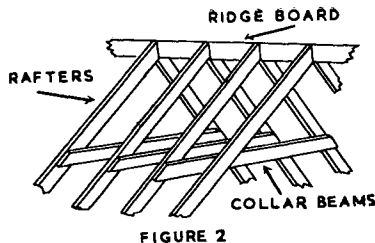


FIGURE 2

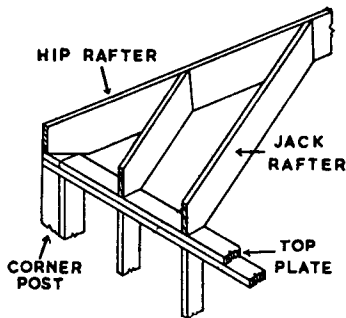
rafters on the angle out. The wood should be selected for straightness rather than strength. As the ridge board runs the entire length of the house, a splice may be necessary. The joint of the splice should be halfway between two rafters. Splice pieces should be nailed on both sides of the joint as shown in Figure 1. Collar Beams or Collar Ties are used to tie together the regular rafters to prevent the ends from spreading. As shown in Figure 2, the most effective location is at the midpoint of the raft-

ers. One collar beam to each pair of rafters should be installed. Collar beams should be securely nailed to the rafters. This ensures the transmission of pressure from one rafter to the other. The size depends upon the weight of the roof, but two-by-four's are usually adequate.

When roof rafters are cut to provide an opening for a dormer window, headers must be installed to support the cut ends. The principles for installing rafter headers are the same as applies to installing joist headers. It is advisable to double the rafters on either side of the opening.

HIP RAFTERS ACT AS A SUPPORT
TO THE ROOF IN YOUR NEW HOME

Some roofs are built like a pyramid with four slopes instead of the more conventional two slopes. In this case a Hip Rafter is needed where two slopes meet. It acts as a support for the ends of the jack



rafters. Hip rafters may be the same size as regular rafters, when they are short and come together at the ridge board. Conversely, when they are longer or where the hip rafter has a vertical support from below, the size must be increased. For example, a hip rafter with a

span up to 12 feet should be one inch wider or two inches deeper than a regular rafter. If the span is over 12 feet the hip rafter should be doubled in width. Hip rafters must be securely spiked to the top plates and ridge board. The roof sheathing is joined at the hip rafter.

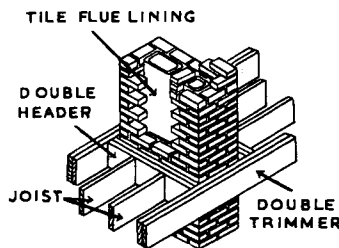
Jack Rafters are shorter than regular rafters and extend from the top plate to the hip rafters as shown in the sketch. The spacing, size and species of material should be the same as for regular rafters. Good grain, straightness and ability to withstand decay are prime factors in the choice of material.

Roof sheathing, usually consisting of one-inch boards, is laid across the rafters. It acts as a base for the finish roofing and to strengthen the structure. The species depends upon the wood available in the locality but softwood is usually employed. All sheathing should be thoroughly seasoned and the boards nailed at least twice at each rafter.

CHIMNEY SHOULD BE TWO INCHES
FROM THE FRAMEWORK IN HOUSE

The performance of your heating unit will be governed largely by the adequacy of the chimney to provide draft and to carry off smoke and gases.

Of basic importance is the size of the flue - the open shaft inside the chimney. The flue must be of sufficient size to meet the



draft requirements of your furnace. Advice of your heating contractor is therefore necessary in determining its dimensions. Flues should never be less than eight and a half inches square or seven inches in diameter.

Flues lined with glazed clay tile permit smoke to escape easily. If the lining is omitted and the sides of the flue are rough, the flow of gas and smoke from the furnace will be impeded. This could hamper the efficiency of the heating unit.

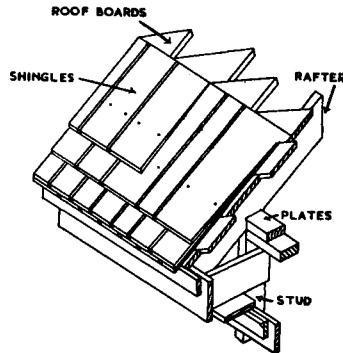
Unlined chimneys should be built with brick or solid masonry eight inches in thickness. Cement and lime mortar are used with joints made as smooth as possible. Four inches of masonry is sufficient for lined flues. Care must be taken to break all horizontal joints between the tile and brickwork.

A clean-out door, at least three feet below the smoke inlet at the bottom of the flue, is required to facilitate removal of soot.

Fire prevention demands that no wood joists or beams be built into or rest on the brickwork of the chimney. Framing should not be within two inches of the masonry. The chimney must extend at least two feet above the highest point of the roof unless it is at least 12 feet away from the ridge.

SHINGLES SHOULD BE DOUBLED AT
THE EAVES IN YOUR NEW HOUSE

Wood shingles make an excellent roof finish providing high quality shingles are used and they are properly applied. Roof sheathing boards should be spaced slightly apart to permit ventilation to the



underside of the shingles and prevent rotting. The "pitch" or slope of the roof must be considered. For wood shingles the pitch should never be less than a six-inch vertical rise for each foot measured horizontally. If the slope is less, rain or melting snow might sweep under the shingles and damage the wood framing.

Shingles are available in 16, 18 and 24-inch lengths. The first two sizes should be laid with a maximum exposure of five and a half inches. The 24-inch shingles, which are thicker, may have an exposure of seven and a half inches. If the exposure is any greater the result will be a thinner and short-lived roof.

Shingles should be doubled on the first course at the eaves and throughout the job care should be taken to ensure that nowhere are joints directly above one another. There should be a space of at least an eighth of an inch between the shingles. Use of rustproof nails is important. These should be limited to two to a shingle and placed so that they will be covered by the next course.

Edge-grain shingles are most satisfactory for roof finishing while a coat of stain will add years to their serviceability.

DIFFERENT TYPES OF ROOFING
USED IN SOUND CONSTRUCTION

Unless a roof is to be finished with wood shingles, sheathing boards should be laid tightly together and covered with a layer of roofing felt. This is necessary for the application of sheet metal roofing, asphalted felt shingles, slate and asbestos shingles.

Metal roofing is used mostly on roofs which have only a slight pitch as the flat surface of the material permits excellent drainage. Sheet metal should be galvanized copper-bearing sheet steel, copper or aluminum. The sheets should be overlapped at least four inches and all joints "locked" to allow for expansion. It is important that nails used be of the same material as the metal sheathing.

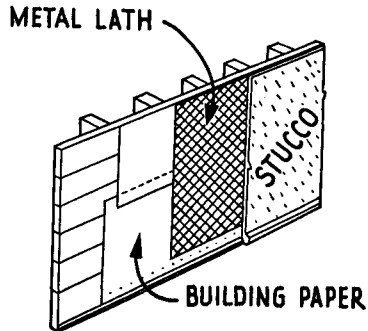
Asphalt shingles must be laid and nailed in accordance with the manufacturer's directions. If applied correctly, asphalt shingles should give adequate service. They are available in a variety of colors. As the shingles are flexible, care should be taken to ensure that none are torn while being laid.

Roofing slate, which may be of hard burned tile or other suitable material, is an expensive type of finish but will give a lifetime of service. If slate shingles are used they must be laid over a heavy roofing felt.

Rigid asbestos shingles are available in a wide range of colors. As they are composed of asbestos fibre and Portland cement they give added fire protection to the house in addition to long-lasting service. The manufacturer's specifications for laying the shingles must be carefully followed.

THREE COATS OF STUCCO NEEDED
FOR SOUND HOUSE CONSTRUCTION

Stucco is a suitable house finish when properly mixed and applied. Good results can be achieved by running the stucco directly over a concrete surface or galvanized metal lath. It should not



be applied directly to brick. If the base is concrete, the surface must be cleaned of all loose particles.

Waterproof paper is necessary over the sheathing of a wood wall. At least three-eighth inch furring strips should be applied one foot apart to receive heavy galvanized metal lath. These furring strips may be omitted if self-furring rib lath is used.

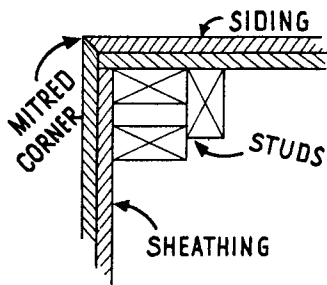
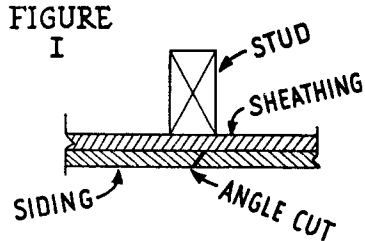
Three coats of stucco are required. First is the "scratch coat" - made of Portland cement, sand and hydrated lime. This coat should be pressed firmly on to the wall to fill the space behind the metal lath. It is important that the first layer of stucco be well scratched and kept moist for two or three days before the "base coat", made of the same composition, is applied.

After the base coat has set sufficiently, it should be moistened before the finish coat is added. A mixture of Portland cement and hydrated lime usually forms the finish coat which may be colored by the use of mortar stain.

Application of the finish coat should be carried out from top to bottom of the surface of the wall and in one general direction. A complete surface should be covered in one continuous operation.

WOOD SIDING IS AN ECONOMICAL
OUTSIDE FINISH FOR YOUR HOME

Outside sheathing is nailed to the framework of the house. It helps strengthen the structure besides adding to the insulating value of the wall. Immediately following application, the sheathing



should be covered with a tarred or asphalted felt or other suitable building paper to prevent moisture from reaching the structural frame and interior finish. This paper must be lapped at least four inches at all joints. The size or type of finish siding used depends upon personal taste, desired architectural affect or economy. Wider siding usually gives a better appearance than narrow siding and for this reason it is generally preferred. A

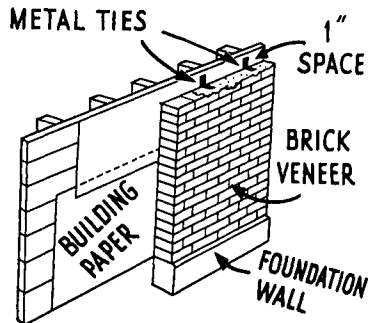
building materials dealer can show you the various styles most suitable for your intended location.

Where two pieces of siding must be joined together, the joint is usually made vertically. The actual cut, when made on an angle as shown in Figure 1, makes a better joint and one which is more easily covered when painted. Good practise requires that the joint be made over a stud.

Special consideration should be given to corner joints to prevent moisture from reaching the back of the siding. A mitred joint, shown in Figure 2, will adequately serve the purpose. An alternative is the use of corner boards - vertical pieces which are nailed at the corners before the siding is applied. The vertical end of the siding is then fitted snugly against the corner boards. Careful workmanship is required around the door and window casings to ensure tight joints.

BRICK VENEER AS A FINISH FOR
THE OUTSIDE OF YOUR NEW HOME

Brick veneer can make a satisfactory and pleasing exterior for your new home if good material is used and properly applied. Second-hand bricks may be used if the finish is to be painted but these should



be of sound quality, with no chipped corners.

Good brickwork requires that sufficient mortar

be used to cover the full surface of the top

and ends of each brick. Meagre use of mortar

or other poor workmanship can reduce strength

and create an easier passage for moisture through

the walls.

Non-corrodible metal ties usually give the wall greater strength.

One end of the tie is embedded in the mortar between the bricks, while the

other end should be nailed securely to the sheathing. Spacing of the ties

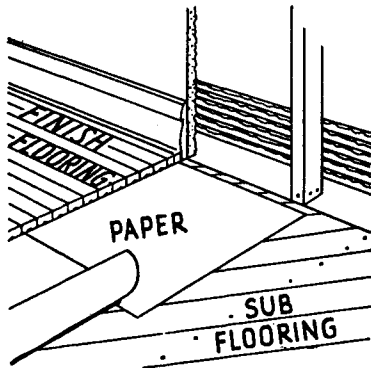
should not be more than 16 inches in any direction. A one-inch air space

is customary between the inside surface of the brick and the building paper.

Construction of a stone veneer wall is basically similar to the procedure set out for brick veneer. An important factor to remember, for either type of finish, is that the veneer should rest on top of the foundation. For this reason, the width of the foundation wall should be designed to accommodate the brick or stone. A general guide explaining minimum requirements for materials and construction may be found in the Central Mortgage and Housing Corporation Building Standards.

SUBFLOORING FORMS A BASE FOR
FINISH FLOORING IN YOUR HOME

The subfloor in a house is laid diagonally over the joists to form a base for the finish floor and to help strengthen the floor framing. It also acts as a working surface during construction. As the subfloor



is laid before the roof is made weathertight, the boards should not be laid too tightly together. This helps prevent buckling caused by expansion.

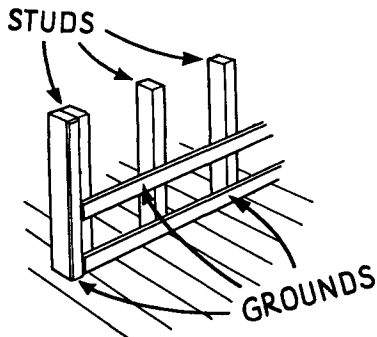
It is considered good practice to apply a layer of moisture resistant paper before the finish flooring is laid.

Hardwood used for the finish flooring should be well seasoned and kiln dried. As excessive exposure to cold or dampness may warp the wood, it should be laid as soon as possible after delivery to the site. Birch, maple and oak are the hardwoods most commonly used. Although No.2 grade is generally acceptable, better grades are preferable where a uniform shade is desired.

The finish floor should not be laid until the plastering and other preliminary work on the house has been completed, thereby preventing unnecessary damage to the floor. Where possible, the flooring should run parallel to the length of the room. It should be carried from room to room without change in direction of laying. The joints should be well distributed - preferably a foot or more apart. They should not be made too tight but must allow for the necessary expansion and contraction which can cause buckling.

GOOD WORKMANSHIP AND CAREFUL
MEASURING MAKE SOUND PLASTER

Good quality plastering requires a proper type of base, careful measuring and mixing of the ingredients and expert workmanship. Metal lath, wood fibre or gypsum base sheets are the most widely accepted bases



for plastering and should be applied in accordance with the manufacturer's directions.

Plastering should be at least three-coat work over masonry walls, wood lath, gypsum plaster board, fibre board base or metal lath.

Plastic quicklime, hydrated lime or calcined gypsum may be used on all interior work but quicklime should not be used in any work unless it has been slaked for at least seven days. Hydrated lime should stand not less than twenty-four hours before mixing and using.

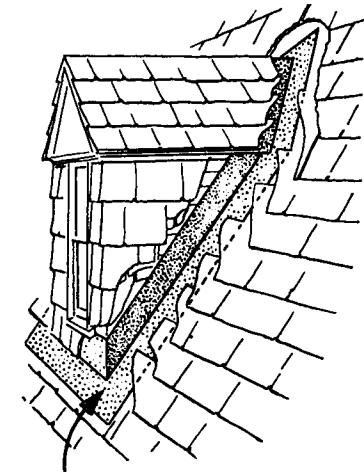
Care should be taken to ensure that the base of "brown coat" is made as smooth as possible and all corners properly squared.

The finish coat should be applied before the brown coat is completely dry or after it has been dampened. This consists of lime-putty or hydrated lime mixed with plaster of paris to produce a hard setting material.

The total thickness of the plaster from the face of the lath should be not less than one-half inch. Grounds, which should be set for baseboards and door and window trim, serve as a guide to judge the thickness of the plaster. They are also essential for nailing on the trim when the plastering has been completed.

GUTTERS AND FLASHING PREVENT
WATER FROM RUINING YOUR HOME

No matter which type of roof finish is used, flashing must be applied around chimneys, vents, dormers and along "valleys" - the intersection of two roof surfaces. As flashing is expensive to repair or



FLASHING

replace in the event of a leak, it should be constructed of rustproof material. Galvanized steel is used extensively but sheet copper, zinc, lead and aluminum are usually more durable. Building paper or felt should be placed under all flashing. Particular attention should be paid to flashing the valleys which act as drains to carry off water.

The metal sheeting should extend at least seven inches under the shingles on each side of the valley. Flashing should be securely attached to chimneys and vents and where the sill of a dormer window rests on the roof, the flashing should be carried up the roof and under the sill.

Gutters may be constructed of wood or sheet metal similar to that used for flashing. They must be large enough to carry off water quickly and completely without leaving pockets of water standing in them. Gutters should be far enough below the roofing to prevent water from backing up under the shingles.

Downspouts should carry the water either into the sewer or - with a curved elbow at the bottom - on to a flat cement slab or stone which will discharge the water far enough away from the house to keep moisture from the foundation and so prevent soil erosion.

INSULATION ADDS TO THE YEAR
ROUND COMFORT OF YOUR HOUSE

According to construction experts, a house which is properly insulated normally requires less fuel during a heating season than is considered necessary to heat a similar house left uninsulated. In the



summer months, insulation is equally beneficial.

Just as it helps to prevent the escape of warm inside air during the cold weather, insulation tends to halt the admittance of warm air from the outside when the weather is hot.

Although there are several different types of insulation, the most suitable is the one which

best suits your needs from a viewpoint of comfort and economy.

In most buildings the greatest heat loss is through the roof. For this reason our climatic conditions dictate a more efficient insulation for the ceiling than for the walls.

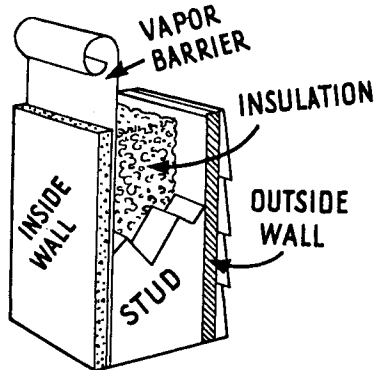
Walls adjacent to porches or unheated garages should receive as careful attention as exposed exterior walls as a high percentage of heat loss can occur in these locations.

Cold floors and high heating expenses, common in many basementless houses, can be eliminated by insulating the floors. Houses with slab-on-ground type of foundation should be properly insulated around the perimeter of the foundation. If the house is constructed with the usual crawl space beneath, the entire floor area above the crawl space should be insulated.

An efficient vapor barrier should be installed on the warm side of all insulations as a precaution against condensation.

PREVENT CONDENSATION IN YOUR
HOME BY USING VAPOR BARRIERS

While insulation, caulking, weatherstripping and similar tight construction methods have undoubtedly contributed much towards the living satisfaction of present-day Canadian homes, they have introduced a new



problem - condensation.

This matter was of little concern to owners of houses built years ago as looser construction, without insulation or caulking, presumably permitted water vapor forming inside the house to reach the outside cooler air before it condensed in the walls or roof. Walls and ceilings of today's houses, however, are more resistant to air passage. Consequently, the results are often ruined paint jobs, damp spots on the ceilings and walls, structural rot. Also, the efficiency of insulation is often greatly reduced by dampness.

Proper application of vapor barriers can overcome this difficulty. These barriers, which usually consist of asphalt-treated felt or other similar materials, must be installed between the insulation and the interior finish.

Where it is impossible to apply vapor barriers of this type, as in the case of an existing house, two coats of high quality oil paint, rubber base paints or aluminum priming paint may be used with good results.

HARDWARE ALLOWANCE SHOULD BE
INCLUDED IN THE COST OF HOME

An allowance for hardware is usually established by the contractor when he builds a house. You, as a home owner, should make a list of the items you desire. Check this with your builder to ensure a mutual understanding of what he will supply in the stated hardware allowance.

Although the hardware must serve its functional purpose, it should also conform to the architectural character of the home. The color, as well as the design, of each fitting should harmonize with the decoration of each room. All hardware for doors, windows and cabinets within one room should be related in design and finish.

The operating parts of hardware are usually of iron or steel, although in some locksets bronze or brass is used. Materials other than metal, such as wood, glass or plastics are often satisfactory for knobs, push plates and cabinet pulls.

To protect the finish, hardware is sometimes covered with a colorless lacquer by the manufacturer. Periodic relacquering can prevent hardware from taking on a spotty, tarnished appearance. Hardware can also be purchased unlacquered, in which case it should be kept polished or painted.

As salt air often tarnishes brass, exterior hardware exposed to it should be made of solid bronze or chromium plated bronze. Coal smoke and certain industrial fumes corrode copper and bronze on exterior surfaces and often stain light paints. Solid brass is best under these conditions. All hardware should be of the type that experience has shown to be the most suitable for your area.

UNIFORMITY IN LIGHTING HELPS
REDUCE ACCIDENTS IN THE HOME

Good lighting in the home helps to prevent accidents, reduces nervousness and fatigue owing to eye strain, and serves to enhance the decoration scheme.

Uniformity in lighting is essential where the task is severe or close as it is in many housekeeping jobs. Repeated adjustments to contrasting degrees of lighting irritate and tire eyes. Well diffused or indirect light should be used for general illumination wherever possible.

Glare, either direct or indirect, is a major source of eye strain. This can usually be eliminated by placing the source of light above the ordinary line of vision, or by diffusing the light with a correctly designed shade or fixture. Glossy objects, such as mirrors, table tops or glass, may reflect light into the eyes. Changing the position of the lamp or the object itself may solve this type of problem.

Shadow free lighting is a requisite for safety in dark halls and stairways. Switches at the top and bottom of stairs and garage lights which can be controlled by switches at both the garage and house are convenient.

Light fixtures should be selected first for the quality of lighting they give and secondly for their decorative appearance. Above all, study carefully the requirements of your family and plan the number of outlets in your home accordingly.

PLANNED LANDSCAPING IMPROVES
VALUE AND BEAUTY OF HOUSE

Landscaping is a necessary part of a new house. It provides an attractive setting for the house, increases the value of the property and makes comfortable and convenient outdoor living possible.



The proper arrangement of flowers and shrubs can lend eye-appeal to a home and garden and express the individual character and tastes of the family owning it. Certain basic plantings are needed on any small property - trees for shade, flowering shrubs for background, seasonal flowers for that extra touch of color, and evergreens for both appearance and protection from winter winds.

Of course, the actual landscaping pattern will depend on cost, individual wishes, and the surface features of the property.

A good, long-term landscaping plan will allow you to develop your property from season to season in keeping with what you can afford. The first step is to decide how much foliage is needed for shade. A large maple will provide protection from the sun in summer, and a dash of color in autumn. The weeping willow and the small-leaf European linden are ideal for moist locations. Evergreens, aside from providing color and wind protection in winter, will also give shade in the summer.

The entrance to your house may be used as the focal point in planning the front area. Neat, low-growing shrubs on each side of the doorway suggest orderliness and they help to break the straight lines of the house.

Open turf areas in front and rear are increasing in popularity owing to their ease of maintenance. Flowering shrubs, such as mock orange, northern bay berry, common purple lilac and spirea are the ideal types to meet border layout problems.