

other collieries having still better conditions. For these reasons wage rates and steadiness of employment will vary with localities.

The one factor that has been outstanding in fostering the Maritime coal-trade since 1928, and saved it from disaster in 1932-1933, is the Federal coal transportation subvention.

In Canada the coalfields are at either end of our vast country. The railways and the population are in between. The central portion of Canada has the greatest density of population and the bulk of coal-consuming industries, but is furthest removed from the western and eastern coalfields, an elementary fact with an important bearing on our national economy. If we want to use Canadian coal and give work to Canadian miners, the transportation costs must be minimised,

which is the *raison d'être* of the coal transportation subventions. So far as Nova Scotia is concerned all that is required is the apportionment, out of 12 million tons of bituminous coal imported annually into Central Canada, of two million tons to the Nova Scotia collieries which will secure the soundness and permanence of the Nova Scotia coal-mining industry.

In 1936 the Maritime Provinces contributed 46 per cent of the total Canadian coal output of that year, but this is equivalent to less than one-quarter of the consumption of coal in Canada.

The measure of the importance of the coal production of the Maritimes in respect to our national fuel independence is so great as to require no emphasis beyond the citation of these figures.

How To Build Cheaply And Efficiently

By S. D. RITCHIE

TO build cheaply yet efficiently is no mean accomplishment, because the two rarely go together. Cheapness usually means the reverse of efficiency. The problem is complicated and involved.

Everyone about to build wants to have a comfortable and attractive looking house. To achieve this, the house must be warm in winter, cool in summer, dry at all times and having as convenient an arrangement of rooms as possible.

The kitchen should be fitted with labor saving equipment and be well planned, so that steps can be saved in the preparation of food.

The following is an attempt to describe the design and construction of such a house.

Certain designs and plans of houses can be built at less cost than others of equal size. This is owing to the fact that the house has a type of construction

familiar to the builders and a straightforward clean cut plan free from costly shapes, corners, etc., and where partitions on one floor are placed over the partitions on the floor below.

A house that has well proportioned doors, windows, wall surfaces, roofs, etc., and therefore looks well and attractive can be built at less cost than one badly designed and having unnecessary features to achieve interest.

Color and texture are vital to the appearance of a low cost house. Fortunately these two do not add to the cost in proportion to their contribution. For example, whitewashed common brick or sound cull bricks look well in houses of good design. These bricks are of uneven shape which adds to their desirability for whitewash finish.

Houses of decided charm can be built with the help of very inexpensive materials providing they are incorporated into the building with understanding and skill.

EDITOR'S NOTE) Mr. Ritchie is an architect living in Montreal. He has enjoyed particular experience in the construction of low cost houses.

The shape and section of the house affects the cost. Houses of simple and direct forms are naturally easier and quicker to build. Broken roof surfaces and lines or other complicated features must be avoided if cost is to be kept down. They should be simple in design and of a dignified and quiet color.

The Site

In locating the house advantage shall be taken of any feature of contour in order to reduce cost of removing excess material from the excavations.

Careful study is required to have all rooms in the house correctly orientated and related to the garden and view, should there be one.

Some saving can be effected by using this earth to form a grass or flagstone terrace across the front of the house. This helps to get a lawn terrace for the house on the site and permits setting the basement higher out of the ground than would look well otherwise.

Basement walls showing high above the lawn ruins the look of the house especially with basement windows showing, so that every care must be taken to get as low an effect as possible.

Foundations

At this point we will begin the study of actual construction methods and materials to be used.

This will be of interest only to one about to build as it must necessarily take somewhat the form of a specification.

Concrete for this part of the work is probably the best material for this purpose, and should be mixed with as little water as is workable, as an excess of water makes for porous concrete. Good practice in the mixing and proportion of materials should be followed.

The foundation walls could be built on large flat boulders instead of the usual concrete formed footings. The boulders should extend throughout the entire area of the basement floor. This permits water following the walls down on the exterior face of the foundations to pass under the wall and cement floor, into

drains and on out to pit or to sewer if running trap is provided.

If the site is exceptionally dry this method would not apply and the usual footing could be used.

In no case should the concrete for the basement floor be laid directly on the earth. Farm tiles placed outside the footings and below the basement floor level are advisable in many localities. These drains should be carried out to a pit or through a running trap into sewer connection. These unglazed tiles should lie on a cinder or broken stone bed.

Waterproofing the basement walls is of great importance in house construction. There are several ways of doing this, such as by the use of integrally waterproofed concrete, or by covering the exterior face of the foundations with a tar or asphalt membrane.

Should the site be wet, the floor should be waterproofed as well.

The site permitting, a saving occurs if the garage is placed in the basement or at a point half way down with a room or rooms above.

Where the cost of a reinforced concrete slab over the furnace room is prohibitive, ceiling protection can be helped by the use of two thicknesses of plaster board one inch apart.

If at all possible, the partitions in the basement should be of cement or tile blocks or of concrete.

The garage, if attached to the house or if in the basement, must be of fireproof material, especially the ceiling or walls between the garage and any part of the house.

Should there be a door leading directly into the house it would be of standard fire door construction.

Exterior Walls

For the walls and framing of the house, wood will be considered here.

Wood being plentiful in this country, still remains the logical and economical material for house construction. The fireproof house is still beyond the reach of all but the wealthy.

The walls of a frame house would be tongued and grooved spruce sheathing of a suitable quality (3rd or better) nailed to either side of the stud framing. If costs permit this space (4") could be filled with an insulating material.

On the outside and inside face would be placed a layer of fifteen pound asphalt felt to form a wind break.

The walls of the solid plank construction consist of either one thickness of 3" plank on edge, having upright members at corners and around openings or of two thicknesses of wood.

One of 2 inch plank and one of one inch tongued and grooved nailed together and having a layer of fifteen pound asphalt felt between. For greater rigidity, the sheathing is applied diagonally.

Furring strips two by one are then nailed over this and on the outside the finishing material could be applied.

This might be one of the various types of sheathing shiplap or clapboarding and stained, painted or whitewashed. Or the finish may be a 4" brick veneer properly attached to the wood sheathing.

On the inside over the furring strips would be placed the lath for plaster. This lath could be of an insulating type such as wood pulp lath or other fibre board make. Some of these lath boards have reflecting aluminum foil mounted on the back.

A finished wall board without plaster could be used. Some of them have insulating qualities and thus serve a dual purpose.

The same applies to the finish for ceilings.

Plaster on good quality wood lath is still the best finish for walls and ceilings in the opinion of the writer. Two coat plaster finished with a fine sand finish, wood floated, produces a very satisfactory effect, as also does a putty coat painted.

The construction and finish of a house should always be along lines familiar to builders in the district in which the house is to be built. Materials easily obtainable and in general use would be preferable.

Roofs

Here it is important to use a material that adequately holds down the building.

Heavy materials such as tile, slate or hand split cedar shingles have the necessary weight for this effect. Unfortunately they are too costly for the great majority of houses.

Several types of roofing material are usually available. Slate surfaced asphalt shingles make a satisfactory roof.

The same material can be used for flashing the roof or metal as for other roofing materials. The writer prefers a good grade of cedar shingles "clears" or better at least 16" long. These shingles should be pre-dipped in a colored creosote shingle stain or given two brush coats.

The appearance can be further improved by placing the butts slightly uneven, producing a broken effect. A mechanical look must be carefully avoided in doing this.

Sheet metal flashings could be of 26 gauge galvanized copper bearing sheet steel or 16 oz. copper. Where possible these flashings could be concealed. At chimneys and brickwork or masonry the metal must be turned into the joints. At all points where water could penetrate the roofing such as at chimneys, dormers, valleys and ridges, flashing must be provided.

The construction of the roof itself would be of ample sized rafters, properly framed and tied to prevent movement.

The rafters resting on a suitable wall plate and tied by collars.

Recommended spacing for roof rafters is 20". These should be doubled at dormers or other large openings in the roof. Also at hips and valleys the size should be slightly increased.

The construction of the floors in wood joists of suitable size and spacing and firmly bridged takes care of this phase of the work.

The rough or underflooring would consist of one inch boards finished one face and about 6" wide. These should not be tongued and grooved. The boards should be placed with a small space between to eliminate danger of squeaks.

16 oz. carpet felt or 15 oz. asphalt felt will make a good lining between the rough and finished floors.

Windows

The subject of windows calls for careful consideration.

Casement sashes are essential to some types of residential design and double hung sashes to others. Double hung sashes provide less of a problem on the inside should Venetian blinds be required. They are more weather-tight than casement.

Casements, held in place by suitable holders, provide more air and unobstructed view and placed in horizontal rows look very well. Should the house be near others and on a street, high narrow windows are more fitting.

Casement windows need a good quality interlocking weatherstrip.

If the climate demands winter sash one of the new type double glazed sash can be used eliminating the use of outside or separate sets of sashes which have to be taken down and stored when not in use. The dead air space between the two glasses also insulates the house in summer as well as in winter. Another good method is by the use of a small metal sash glazed and hinged to the permanent sash.

When beating rain storms are encountered the bottom rail of the double hung sash should be double checked and the sill cut down slightly and well sloped.

All windows should be well caulked with oakum behind the frame and the outside joint filled with a mastic compound before the stop bead is applied. A strip of metal flashing is sometimes advisable along the head of the window as in some locations rain drives in at this point.

This also applies at the joint between the wood main house sill and top of concrete foundation. Too much care can hardly be taken to keep driving rain and other water from penetrating walls and windows.

Solid concrete, covered with metal, makes a practical chimney cap. Chimneys are advisable in brick. Flue walls at least 8 inches in thickness and finished inside with a cement mortar coat.

Glazed tile flue linings make for cleaner and safer flues. Care must be taken at

the joints so that water carried down the face of the tile shall not penetrate the brickwork at the joints.

No framing wood work should enter chimneys or fireplaces. A two inch clearance at these points is essential.

Fire place hearths should have concrete or brick trimmer arches, no wood forms or other wood framing remaining under the hearths. These hearths are safer if supported directly on the chimney itself by means of corbels or projecting steel members, or cantilevered concrete slab.

The fireplace should be equipped with a suitable damper. The inner hearth sides and back lined with fire brick. The flue must be at least one-tenth the area of the fireplace opening.

To avoid smoke trouble the fireplace must be built to conform with well known rules which call for certain fixed proportions and dimensions, smoke chamber, etc.

The exposed face of the fireplace in rooms of moderate size should be reduced to a minimum. If brick facing is used, not more than 6" at each side and 8 inches at the arch. Massive brick fireplaces in a great many instances have ruined many an otherwise attractive room.

Fireplace heaters are useful adjuncts to the heating system. Fresh air is taken in from outside the house and passed through an air chamber at the back of the fireplace, discharging into the room through ducts leading to grilles in the chimney breast; preferably on the side returns.

Fire stops, as a precaution in frame houses, can be formed in the exterior walls by the insertion of three courses of brick resting on wall plates at floor levels. This acts to retard the passage of fire up the four inch air space. This practice is seldom indulged in these days.

Should sound insulation be desired in some cases, this can be accomplished to a certain extent by the use of fibre board lath as a base for plaster or the space between the studs filled with a material suitable for this purpose.

One of the items where costs can be kept down without serious loss of interest, is in the matter of interior trim. This need be only of such a nature as is essential to permanency. Base boards of less than six inches in height are sufficient as on door and window trim of small sizes. Room wall cornices can be omitted also and picture moulding as well. Woodwork painted in with wall color apparently increases the size of rooms. The reverse is true of dark stained trim and doors in small rooms.

Finished Floors

Wood floors for use in rooms other than bathrooms and kitchens should be at least 13/16" thick, nailed every fourteen inches to the underfloor, which is best laid diagonally.

Birch, oak, maple or beech are satisfactory for floors, No. 2 grade or better.

There are several very good materials for finishing the wood floors, among them asphalt solutions, mineral wax, penetrating and rubbing waxes. All wood floors should be stained to a rich deep tone before other finish is applied.

Dark or medium dark floors go a long way towards getting charm into the house with no extra cost. Light colored wood floors undermine the decorative scheme at the start. Dark floors form a perfect foundation for furniture, rugs and everything else in the room.

For bathroom and kitchen floors, linoleum or asphalt tiles are satisfactory. A perfectly dry and especially prepared wood underfloor must be provided for these materials to be cemented thereto.

Bath Room Walls

Lacquered pressed wood 1/8" thick makes a good wall and ceiling finish for the bathroom. Wall dadoes of a few

feet in height are not as popular as previously. Broad wall surfaces in plain color and colored fixtures make a smart and modern looking bathroom.

Kitchens

The planning and finish of kitchens should be a familiar subject to everybody if one can judge by the amount of attractive advertising.

The floors, walls, woodwork and ceilings will all be of easily cleaned and durable materials. The same applies to counter tops.

The installation of the wiring, plumbing is subject to local rules and regulations.

An ample and well placed supply of electric outlets must be provided.

Heating

Hot water provides a uniform and steady heat free from draughts. Forced hot air installations are cheaper and quite satisfactory in certain instances. Air conditioning systems of a dependable make can also be recommended.

Painting

This is one of the vulnerable spots in house building. Good paint is the cheapest. Honest sandpapering and careful application make for lasting satisfaction.

Short cuts and too cheap materials should be carefully avoided if disheartening upkeep expenses and repairs are to be avoided.

If the house is not beautiful when completed, some at least of the money invested has been lost. A beautiful house is an asset that safeguards the owner's investment. It is surprising that this important fact is so often overlooked.

A last word of advice: Build beautifully, from plans by an architect who knows how to design beautiful houses.