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# NATIONAL RESEARCH COUNCIL OF CANADA

## DIVISION OF BUILDING RESEARCH

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# TECHNICAL NOTE

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*✓ RFL*

SUBJECT BUILDING HOUSES IN WINTER

(Radio talk given by HBD in "Canada at Work" series of the Federal Department of Labour, 10 December 1961.)

Each year an increasing number of Canadian builders are finding it advantageous to continue building houses throughout the winter. By avoiding shutdowns in cold weather, the builder can retain the services of his key men, schedule completions more closely to market demand and generally improve his ability to make long range plans.

Despite this, records show that houses under construction at mid-winter in Canada are still some 45 per cent less than in the peak building months of the summer. Increased house building activity in winter can be of major benefit to the entire community. It reduces seasonal unemployment. It levels out the demand for mortgage money and provides a steadier flow of new houses to meet market requirements. By enabling the builder to spread his overhead throughout a twelve month building season instead of the present eight to ten months, such house building can be carried out at only a small increase in cost.

Why then are more houses not built in winter? There are probably two main reasons. One is the somewhat natural assumption that all winter construction is difficult and unduly expensive. The other is the belief that successful winter building techniques are only possible on large construction projects. There is perhaps a third reason too, and this is the tendency on the part of some potential home owners to

assume that houses built in winter are lower in quality than those built in summer. There is no evidence to support such views. The quality of a house is much more dependent on the contractor's skill and reputation than on the season in which it is built. In fact, if winter building has any effect at all on quality, it will probably be a beneficial one due to the improved job conditions arising from the protection required to combat cold weather. There is mounting evidence from many areas of Canada that the techniques of winter building can be applied successfully to all types of housing projects and applied with relative ease and economy, providing the work is carefully planned. Indeed, if there is one single item that holds the key to successful winter building, it is this vital question of planning.

The object of such planning is to schedule each phase of the job so that the least possible inconvenience is suffered due to the weather. A knowledge of local weather conditions is therefore an essential requirement. A glance at the climate records for Canada indicates a wide range of winter conditions. Average minimum temperatures, for example, vary from +15°F in British Columbia to -40°F in the Prairie Provinces. It is interesting to note the effect of these regional differences on the attitudes of builders. Whereas temperatures only slightly below freezing may stop work on Vancouver projects, Edmonton builders are likely to continue working with temperatures as low as -40°F. Other climate factors can affect winter building too - - rain is probably as important a consideration in Vancouver as are low temperatures and snow in other parts of the country. The five months of winter experienced in the Prairie Provinces have made the builders there much more conscious of the need to avoid winter shutdowns. This has led many of them, despite the severity of their weather, to pioneer the adoption of winter building techniques.

The experiences of these Prairie builders have clearly demonstrated the importance of careful planning before actual work begins. Wherever possible, the winter-sensitive operations of a project are completed before the onset of intense frost or heavy snowfall. The provision of access roads, drainage, water and sewer services and completion of lot layout are all jobs that can be done much more cheaply in mild weather.

The ideal situation results when the excavation and foundation are also completed before winter. Where this is not possible, techniques have been developed that permit such work to be continued under winter



conditions even when the ground is frozen. If the frost has only penetrated a few inches, normal excavation methods can be used, often with greater ease than in spring or fall when rain and soft ground may seriously hinder the movement of construction machines. With greater depths of frost, the ground must be broken by construction machines equipped with special ripper or frost breaker attachments. Heating the ground prior to digging, by burning a layer of straw and coal was once a common method of preparing frozen soil for excavation. It is still used where some pre-thawing is necessary because of particularly deep frost penetration. Regardless of the method, it is good practice to keep all machinery and personnel off the site until excavation begins, because the snow and vegetative cover are excellent insulators and will retard frost penetration.

Winter concreting no longer poses serious problems for the builder. It is now common practice to use heated concrete delivered by ready-mix trucks. The fresh concrete requires protection during freezing weather but this need not be elaborate or costly.

Footings can often be protected sufficiently with a layer of straw over the newly placed concrete. Basement walls, because of their greater exposed area, generally require some additional heat to keep the concrete warm during the curing period. One technique is to build the wood subfloor first, supporting the joists on the basement wall forms, thus creating an enclosed space which can be heated with portable oil or gas heaters. Another method consists of partial shelters formed with tarpaulins which are simply hung over the wall forms and portable heaters placed beneath. Some builders provide additional protection by using insulated foundation forms which slow down the loss of heat from the warm concrete. Most people are aware that fresh concrete needs protection from the cold but it is not generally realized that high temperatures in summer can also reduce the quality of concrete work. In fact, well controlled winter concreting provides greater assurance of top quality concrete than when the material is placed in summer and exposed to wide fluctuations in the weather.

When concrete blocks are used for the foundation walls, it is usual to require that both block and mortar be warm when laid and that the finished wall be protected from freezing for at least forty-eight hours. This often necessitates an enclosure over the entire foundation area.

With the foundations in, the main problems of winter building are solved. Work on the superstructure which, in most cases, is of wood frame offers no difficulties in winter. Once the building frame is up and enclosed, most operations can proceed in much the same way as in summer and often under more desirable working conditions, free from the heat and humidity of the summer months. Prefabrication techniques can assist the builder to close in the structure quickly but even using conventional methods of on-site construction, an average size house can be closed in within five days.

With the protective shell of the house complete, some interior work can begin even before heat is supplied. For those jobs that do require heat, such as plastering and interior painting, the house furnace can be installed on its pad of concrete in the basement or temporarily hung from the floor joists. This also permits the basement concrete slab to be placed under controlled conditions.

Some exterior finishes such as wood and prefinished aluminum siding can be installed without protection from the weather. Asphalt shingle roofing can also be placed without protection, providing the shingles, which tend to become brittle in cold weather, are handled carefully. Even steps and sidewalks can be installed if precast concrete units are used. The application of stucco, or painting of exterior wood-work, cannot be done in winter without some form of protection. But since these operations do not normally delay occupancy of the house, they are often left until the warmer spring weather.

Builders who use brick or stone as a finish generally rely on heated partial shelters to protect their work. These consist of canvas or polyethylene sheets draped from the eaves of the house to the ground and supported on a light framework. Occasionally, builders will plan to take advantage of breaks in the weather and complete their masonry work without protection during periods of relatively mild temperatures.

Another interesting development is the use of large shelters which completely enclose the house during construction. These have received more extensive use in areas such as Toronto where solid masonry walls are used instead of wood frame but they have also been tried with varying success in other locations. In Ottawa a few years ago, a local builder constructed a single story house with basement under a plastic enclosure as part of a winter construction cost study sponsored by the Division of Building Research. Enclosures may be built of various materials and some air inflatable types have been proposed. Recently, plastic tarpaulins which remain flexible at low



temperatures have been introduced. These transparent plastics have the great advantage of trapping solar heat so that the temperature inside such enclosures may be as much as 45° above outside air temperature during sunny weather. This often provides all the heat that is needed during daylight hours. A Toronto builder who has used this type of shelter to complete 200 houses in one winter claims that the cost, when spread over a large project, amounts to only \$150 per house.

Any discussion of winter construction must inevitably consider this important matter of cost since in most cases, the decision to build or not to build in winter is based on this factor. It is a difficult question to resolve. Builders have reported cost increases of \$150 to \$400 per house in carrying out construction in winter but these direct costs will vary with each builder's operation, reflecting, often to a major extent, the degree of planning that has gone into the project. There are clear indications that, in a well planned project, these direct costs can be largely offset by the indirect savings resulting from higher productivity and uninterrupted schedules achieved through improved control of the "weather" on the job. In assessing winter work, it is easy to overlook the time lost on a project in spring and summer caused by rain and the necessity of pumping out excavations, by slowdowns due to high temperatures, and by delays in delivery of materials.

The builder would also do well to consider the cost of not building in winter. By completely shutting down the operation when cold weather arrives, he risks the probable loss of key men and the almost certain loss of potential sales in the early spring market. Undoubtedly the strongest recommendation for winter building comes from the increasing number of Canadian house builders who have tried it and found that a year 'round building program makes the most effective use of their men, materials and capital.

Four such builders representing widely separated areas of Canada are featured in a film on "House Building in Winter" recently prepared by the National Film Board for the Division of Building Research, and now being distributed throughout the country. The film is based on methods of winter building in current use by house builders across Canada, and shows each phase of building from excavation and foundations through to final finishing.

This film, together with an earlier one on large scale commercial building in winter, forms part of the Division's efforts to provide

information on winter building techniques. The Division will continue its studies of this important field because it believes firmly that winter building will eventually become an essential feature of the Canadian economy. In the words of a former president of the National House Builders' Association: "Sooner or later, year 'round house building in Canada will be a general practice and when this happens, the industry will achieve a degree of production stability undreamed of a decade ago."