Concrete slabs for basementless houses

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TECHNICAL NOTE

NOT FOR PUBLICATION — FOR INTERNAL USE

PREPARED BY W.H.B. CHECKED BY I.E.A., F.L.P., A.G.W. APPROVED BY R.F.L.

PREPARED FOR Summary of Meeting DATE Nov. 3, 195

SUBJECT Concrete Slabs for Basementless Houses

A discussion of the various factors affecting the design of "concrete slabs" for basementless houses was held at the Division of Building Research, N.R.C., on Wednesday, October 8, 1952. Mr. R.W.G. Card, Mr. Ira Ashfield, Mr. F.L. Peckover, Mr. A.G. Wilson, Mr. A.D. Kent and Mr. W.H. Ball took part. This note has been prepared to record the scope of the talks, and also may be useful as a guide in the assessment of a particular proposal for the construction of a concrete slab for a basementless house.

Mr. Card suggested that in his experience builders often wished to build basementless houses on sites which were low and generally unsuitable for any type of ordinary construction. It was the feeling of the group that such an approach was unsatisfactory and that the selection of a suitable site, as regards to drainage at least, was an important item in assessing the suitability of concrete slab construction.

Base for Slab

Discussion of the necessity for a compacted base of crushed rock or other suitable material for the slab led to the following assumption:

> That on well-drained granular locations no additional base would be necessary provided that the relative height between slab and surrounding ground or streets was suitable. It was, however, considered desirable to have the slab above adjacent ground level to provide protection against a temporary accumulation of water from melting snow, as well as splash clearance.
>
> In summary it would appear that a base of compacted crushed rock or other suitable material is desirable in all but "hilltop" locations. A minimum thickness of 6 inches is suggested for such base. Where additional thickness of base is required to raise the slab to a suitable height, with respect to street levels or adjacent ground, it should be provided.

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Waterproofing Between Base and Slab

The provision of suitable waterproofing was discussed and the need for a waterproof membrane between the slabs and its base was recognized. This membrane to have the function of preventing the passage of water (either liquid or vapour) into the slab so as to protect insulation and floor surfacing materials.

Suitable materials and methods of installation were considered. It was agreed that lightweight saturated felts would not be acceptable. The provision of an asphaltic membrane applied on a thin concrete base was also considered. It was suggested that a single layer of heavy roll-roofing would provide adequate protection. Joints between strips to be well-lapped (perhaps 6 inches) and sealed with asphalt. In order that such a membrane might be applied without being damaged, it would probably be necessary to cover the compacted base with a thin layer of sand (1 inch).

Section of the Slab

It was generally agreed that, while a slab of uniform section would have merit, the "grade-beam" type of slab had several practical advantages. It provides a means of retaining the compacted base, provides a firm surface against which insulation can be placed, and a means of maintaining strength in the slab at the edge where perimeter heating ducts are included in the slab. A slab of 6-inch minimum thickness was proposed.

Reinforcement of the Slab

The matter of slab reinforcement received considerable discussion without any overall recommendation being made. It was decided that the writer should look into the matter further in conjunction with the Building Design Section and that he should subsequently make a report on this aspect of the problem.

Several assumptions were discussed which are noted as follows:

1. It was agreed that it is reasonable to assume that frost action on the slab would not be a direct factor in the design since sufficient insulation and heat would be specified to insure that freezing temperatures would not exist under the slab. The validity of this assumption can, of course, only be recognized in cases where the building is heated in such a manner as to keep the slab warm. It would not be appropriate where it was proposed to heat a building with a space heater.

2. It was suggested that in locations where sand or gravel occurred naturally it would not, under ordinary circumstances, be necessary to reinforce the slab, other than

to provide temperature steel.

3. The problem of reinforcement for slabs built over soils which were likely to swell or shrink with change in moisture content was discussed at some length. The requirements of the Winnipeg building code were cited as one extreme in this respect. The proposition was made that for a situation such as this the slab could be expected to rise in the centre due to the accumulation of moisture under the slab. Should drying occur at the edges of the slab, a similar distortion might affect the slab. Therefore, reinforcement of such slabs might usefully be based on this assumption.

Insulation of the Slab

The discussion of insulation for the slab centred mainly on how much insulation should be used, and the types of insulation suitable for such use. It was suggested that no type of fibreboard be considered as suitable. One to 2 inches of insulation having a "k" value of 0.30, or better, is desirable. Such insulation to be applied to the edge of the slab and to extend below a flat slab for at least six inches. Where a grade beam is used, the insulation should cover, at least, the depth of the grade beam and be not less than 12 inches in depth. Greater depth may be desirable. Where heat is supplied to the slab, as in the panel system, insulation of the underside of the slab should be considered.

Fibreglas board coated with asphalt in such a manner as to exclude moisture was considered to be adequate for this type of application. Materials such as Onazote, Aero-Jablex, and Foamglas were considered to be generally superior for this purpose due to their high resistance to the entry or passage of moisture. However, little is known about their performance under severe conditions.

The need for a protective finish for the insulation was mentioned, and the need for protection of the insulation during construction was also emphasized.

Building Services

Some of the difficulties which might arise as a result of the entry of sewer and water services to the building were mentioned. It was suggested that plans be so prepared that a minimum amount of disturbance to the support of the slab would result. Kitchen and bathroom services back-to-back near the service side of the building would be of advantage, both from the viewpoint of installation and repair if necessary. Reinforcing of the slab over service trenches might be considered.

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