Investigation of "Floating" Concrete Floor Slabs for Basementless Houses

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Publisher's version / Version de l'éditeur:
https://doi.org/10.4224/20359056
Technical Note (National Research Council of Canada. Division of Building Research), 1951-12-01

NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No. 111

TECHNICAL NOTE

NOT FOR PUBLICATION — FOR INTERNAL USE

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PREPARED FOR Special Circulation DATE Dec. 1, 1951.

SUBJECT Investigation of "Floating" Concrete Floor Slabs for Basementless Houses.

Progress Report No. 1

1. Response to Technical Note 101

During the past summer this Division circulated to interested parties throughout the world about 40 copies of Technical Note 101 "Proposed Project to Investigate 'Floating' Concrete Floor Slabs for Basementless Houses" for the purpose of describing the proposed "floating" slab project in detail and inviting critical comments. It was gratifying to note that the majority of replies received expressed interest and agreement.

2. Changes in Procedure

Many valuable comments were received, and after reviewing these, the following changes were made to the program described in T.N. 101.

(1) It was decided to proceed at present only with the two unreinforced slabs (one on grade and the other on a crushed stone base 18 inches deep) and to use experience gained from them in completing the reinforced slabs next spring;

(2) It was decided also that the two slabs to be built this year should be completely flat, that is, without perimeter beams;

(3) Superstructures are to be made up of prefabricated wall and roof panels so that they may be readily removed and re-used elsewhere whenever observations on particular slabs are completed;

(4) The following instrumentation will be employed in addition to that described in T.N. 101:

(a) Strain gauge measurement.- A number of strain readings will be taken periodically on the surface of the concrete, by means of an 8-inch Metzger extensometer and stainless steel plugs cast in the concrete. Four plugs will be installed at each of the points of measurement, so that

the principal strains may be established from readings in three directions.

Measurements will be taken in four places on each of the slabs: at the centre, near the middle of two sides, and on a diagonal halfway between the centre and a corner.

(b) Measurement of soil thermal conductivity.- An indication of changes in soil thermoconductivity will be determined from readings of two thermal conductivity probes (18 inches and 6 inches long respectively) located under each of the two slabs at a depth of 12 inches below grade. It is hoped to relate these readings to soil moisture content as determined from direct sampling.

(c) Moisture measurement under the slab.- For the purpose of measuring relative humidity under that slab which rests on a crushed stone fill, two small metallic tubes are to be inserted through the concrete and extend to the mid-depth of the stone fill.

3. Construction Progress

Both slabs have been completed and the superstructures erected. Instruments are in place, and full operation has begun.

Construction of the slabs was begun October 2, the work being undertaken by the Council's Plant Engineering Division. The lower three inches of concrete for each of the slabs were placed October 15, and the surface left roughened. Electrical heating cable was carefully located on top of this concrete during the next few days. Finally, on October 22, the upper three inches of concrete were placed for each of the slabs. The slabs were allowed to cure for seven days, after which time erection of the superstructures was started. The prefabricated components fitted together very readily, and by November 6 work on the superstructures had been completed. Instruments were subsequently put in place, and on November 23 electric current was turned on for the heating cable and for those instruments requiring electricity.

4. Concrete

The concrete was supplied by a local ready-mix plant, which was requested to meet the following specifications:

(1) Strength in compression at 28 days: minimum, 2000 p.s.i.; maximum, 2500 p.s.i.;

(2) Sand to be clean and of good quality and to comply with A.S.T.M. grading requirements and organic test;

(3) Stone to be crushed stone, 1" maximum graded down to $\frac{1}{4}$";

(4) Mixing time: 10 minutes, and agitation during the 30-minute delivery time;

TABLE I: Schedule for Reading of Instruments (Continued)

	Measurement	Instruments	Starting Date	Interval Thereafter
10.	Strain readings on surface of concrete	8" Metzger extensometers and stainless steel plugs cast in the concrete	October 25	Weekly, at first. Intervals subsequently increasing depending on rate of changes
11.	Elevations on slab surfaces	Level and rod	October 30	Every two weeks, at first. Intervals subsequently increasing depending on rate of changes
12.	Weather	(Complete weather records are supplied by a meteorological station, located a half-mile from the site)	Predating start of project	Daily

6. Bibliography

The following references have been found useful in the Division's preliminary study of "floating" slabs for basementless houses and in the preparation of the present program.

The Division would appreciate being notified of other pertinent references which may have been overlooked.

(1) Portland Cement Association. Structural bureau no. S.T. 51 "Concrete Floors on Ground". Chicago, 1942. 6 p.

(2) U.S. Department of Commerce. National Bureau of Standards Report B.M.S. 103. "Measurements of Heat Losses from Slab Floors", by Richard S. Dill, William C. Robinson, and Henry E. Robinson. Washington, 1944. 21 p.

(3) Housing and Home Finance Agency. Technical Bulletin No. 1, P. 18. "Insulation of Concrete Floors in Dwellings", by Lawrence Shuman, Washington, November, 1947. 8 p.

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(6) University of Illinois, Small Homes Council Circular Series F 4.3. "Concrete Floors for Basementless Houses". Urbana, Illinois, 1948. 4 p.

(7) Small Homes Council and the Department of Mechanical Engineering at the University of Illinois, in co-operation with the U.S. Department of Commerce, Office of Technical Services. "Temperature and Heat Loss Characteristics of Concrete Floors Laid on the Ground" by H.D. Bareither, A.N. Fleming and B.E. Alberty. August, 1948. 50 p.

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(9) John B. Pierce Foundation, "A Study of Foundations for Small Buildings, Part 1", by L.C. Read. Raritan, New Jersey, December 16, 1949. 7 p.

(10) National Research Council of Canada. Division of Building Research. DBR No. 21. "Soil Temperature Studies, a Progress Report", by R.F. Legget and F.L. Peckover. Reprinted from Proceedings of the Twenty-Ninth Annual Meeting of the Highway Research Board, December 1949. 12 p.

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(12) National Building Research Institute of South Africa. "Foundations for Buildings in the Orange Free State Goldfields", by J.E. Jennings. Pretoria, South Africa, October, 1950. 55 p.

(13) National Research Council of Canada. Division of Building Research. "Soil Temperatures - A Review of Published Records", by C.B. Crawford. Preprint of a Paper presented to the Thirtieth Annual Meeting of the Highway Research Board in Washington, D.C., January, 1951, Ottawa, November, 1950. 46 p.