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NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No. 121

TECHNICAL NOTE

NOT FOR PUBLICATION — FOR INTERNAL USE

PREPARED BY K.R. Solvason — CHECKED BY — APPROVED BY R.F. Legget

PREPARED FOR Part of Report on Mr. Solvason's visit to Churchill, 1 Aug. to 13 Aug. 1951. — DATE 24 January, 1952.

SUBJECT **Building Problems at Fort Churchill**

Several discussions were had with Major Reeves, the Camp Engineer at Fort Churchill, regarding the performance of their buildings. The new buildings built according to the plans which we studied some time ago appear to function very satisfactorily. They had the odd case of localized condensation, presumably on the inside wall surface but this was traced to careless workmanship, such as omitting a rock wool batt. One block of Married Quarters had considerable condensation on the sheathing. This block, however, was unheated until well into January so that it is likely that the moisture content of the wall components was very high when first heated. Thus the condensation observed was probably the result of migration of the moisture already in the walls and not of vapour flow through the vapour barriers.

The older quarters continued to give trouble. Major Reeves was very much concerned over the problem of reinsulating the E block Married Quarters. Some time ago he submitted a proposal that one inch Donaconna board be nailed on the outside of the sheathing and covered with a layer of waterproof sheathing paper and the asbestos shingles. In reply he was told that his suggestion had been studied and that it had been decided the Donaconna Board would not be effective as insulation if applied on the outside. (Reasons not given). He, therefore, awaited an alternative suggestion but at the time of my visit none had been made. I told him of the way C.M.H.C. had re-insulated their Alfol houses by blowing rock wool behind the Alfol. The rock wool presumably would contribute approximately $\frac{3.625}{0.30}$ or 12 units of thermal resistance, whereas the Donaconna board would add some $\frac{1}{0.34}$ or almost 3 units. The addition of three units of thermal resistance would probably provide sufficient insulation, assuming of course that the Alfol is partly effective. The main advantage of placing the Donaconna outside the sheathing would perhaps be to cut out air infiltration during high winds, which is probably a prime consideration in Churchill. On the other hand, this arrangement leaves the air

spaces in the wall which might produce large vertical temperature gradients on the inside surface. Also to be considered is the chance that condensation might increase the moisture content of the board sufficiently to cause deterioration. However, this seems unlikely since the Alfol should provide sufficient vapour protection. On the other hand, rock wool blown at a fairly high density would probably be very adequate both with regard to conduction and air infiltration. Thus, my suggestion was that the method used should be governed by the relative costs.

Major Reeves asked that I give him in writing my opinion on the matter but I explained to him that I should not even express a verbal opinion and asked that he send a written request to you asking for your comments. This request would probably have had to be sent from army headquarters and considerable time would have elapsed before your answer reached him. He, therefore, wrote to headquarters stating, "after discussing this problem with a NRC representative I recommend that Donaconna board be placed on two rock wool batt insulated "E" blocks and that rock wool be blown behind the Alfol in the remainder of the "E" blocks". It was rather urgent to get started on the project since outside work can be done only with difficulty after about October 1st.

The window frames on these blocks were being re-caulked and new weatherstrip was being installed on the windows. The old storm sash which was hinged on top to permit the whole sash to open caused considerable grief. The tenants would open them on warmer days and ice would form on the frames at various places. Then on forcing them closed again the sashes would be warped producing large cracks. The storm sash was, therefore, being changed so that only a small section on the bottom was hinged and in order to close it the ice would have to be removed.

A more difficult problem to deal with effectively is that of the roofs with Alfol insulation and no ventilation. In one block the highest temperature recorded in the upstairs rooms last winter was about 55°. They were satisfied that the heating system was functioning properly so could only assume that the roof heat loss had become terrific. They suspect that the Alfol has collapsed and also that the resistance was greatly reduced. When spring came they had the usual problem of water dripping from the electrical fixtures. New built-up roofs were being applied on some of the blocks incorporating "Ten Test" for insulation. This would appear to be only a temporary solution and in any case would probably not relieve the condensation problem. Major Reeves wondered about blowing rock wool over the Alfol. My suggestion was that this would in all probability aggravate the condensation problem unless ventilation was provided over the rock wool. Ventilating the present roofs would be nearly impossible. To properly remedy the situation would perhaps entail building an entire new roof. This course would probably be the least expensive in the long run.

Another totally different but nevertheless interesting problem is that of the subsidence of a footing and part of the floor of the RCEME workshop. One of the footings and the concrete floor for a radius of about twenty-five feet around the footing settled some thirteen to fifteen inches. Apparently the footing was not placed on bedrock and as the heat from the building thawed out the ground, which then formed a watery slurry, the floor and the footing settled. At the time of my visit they were just making ready to remove the old floor and footing and to excavate if possible down to rock, place a new footing, fill with gravel and place a new concrete floor. An investigation of the above was carried out by a Mr. Magill of the University of Manitoba, so it is possible that you have heard of it from him.

Major Reeves is most anxious that we be allowed to study the various problems connected with building up north. He suggested that one of us should endeavour to visit Churchill for a few days during the winter, say about the last week in January for perhaps just a visual inspection of the buildings. He also suggested a visit at the start of the first spring thaw. The timing of such a visit would, however, be most difficult to arrange. If any such visits were undertaken we could be sure of the utmost co-operation of Major Reeves and his staff.