

NRC Publications Archive Archives des publications du CNRC

Damage by spalling of painted brickwork of former C.M.H.C. houses in Kingston Ritchie, T.

For the publisher's version, please access the DOI link below. / Pour consulter la version de l'éditeur, utilisez le lien DOI ci-dessous.

Publisher's version / Version de l'éditeur:

<https://doi.org/10.4224/20338398>

Technical Note (National Research Council of Canada. Division of Building Research); no. TN-133, 1952-11-21

NRC Publications Archive Record / Notice des Archives des publications du CNRC :

<https://nrc-publications.canada.ca/eng/view/object/?id=4f6243bd-4e1f-453a-a2bf-9a65116f7680>

<https://publications-cnrc.canada.ca/fra/voir/objet/?id=4f6243bd-4e1f-453a-a2bf-9a65116f7680>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

<https://nrc-publications.canada.ca/eng/copyright>

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

<https://publications-cnrc.canada.ca/fra/droits>

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

Questions? Contact the NRC Publications Archive team at

PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca. If you wish to email the authors directly, please see the first page of the publication for their contact information.

Vous avez des questions? Nous pouvons vous aider. Pour communiquer directement avec un auteur, consultez la première page de la revue dans laquelle son article a été publié afin de trouver ses coordonnées. Si vous n'arrivez pas à les repérer, communiquez avec nous à PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca.

NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No.

133

TECHNICAL NOTE

NOT FOR PUBLICATION

FOR INTERNAL USE

PREPARED BY T.R.

CHECKED BY E.V.G.

APPROVED BY R.F.L.

PREPARED FOR Central Mortgage and Housing Corp.

DATE 21 Nov./52

SUBJECT Damage by Spalling of Painted Brickwork of Former C.M.H.C. Houses in Kingston

In accordance with your request, the writer investigated on August 15th, 1952, reported damage to brickwork of former C.M.H.C. houses in Kingston; the information obtained in this visit to Kingston and examination of the houses is given below:

The writer discussed the damage with Mr. D.G. McDonald, the C.M.H.C. representative in Kingston, and was accompanied by Mr. McDonald in examining the houses.

According to Mr. McDonald the houses now giving trouble had been built in 1947 by Housing Enterprises Limited, being eight houses in a development of about 88 houses. The 8 houses are brick-veneer, of sand-lime brick. Mr. McDonald said they were painted, shortly after construction, with a cement-base paint, but he did not know any reason for the painting, other than for appearance.

In 1950, Mr. McDonald said, the houses were taken over by C.M.H.C., and were sold to the occupants. Just previous to their sale, the houses were repainted by C.M.H.C. In one case, however, C.M.H.C. painted a house a few days after it had been sold. C.M.H.C. specifications for the painting called for the use of a cement-base type of paint; however, Mr. McDonald is of the opinion that the painting contractor used an oil-base type paint. The painting was done in the Fall of 1950.

In the spring of 1951, according to Mr. McDonald, several of these houses showed deterioration in the nature of spalling and flaking of the painted surface of the brickwork.

Since, in one case, the painting, which seemed to be related to the occurrence of the damage, was done after the sale of the house, and apparently without the expressed consent of the owner, Mr. McDonald thought that the owner may claim that C.M.H.C. is responsible for the damage.

Examination of the Houses

The houses are situated on Alamein Drive and Palace Road, Kingston.

Of the houses which have been damaged, that at 325 Palace Road is considered typical. This house, the residence of Mr. Symons and family, is the one which C.M.H.C. painted after it had been sold. It is $1\frac{1}{2}$ storey, the brickwork of which is painted cream. Others in the development are painted in various shades of cream, blue and green.

The south wall of 325 Palace Road has been extensively disfigured by flaking and spalling of paint and masonry at the surface of the wall. This is shown by the photographs in Fig. 1 and Fig. 2. In almost all cases, a piece of brick or mortar has been removed with the flake of paint. Most of the exposed areas of brick have a slight film of greyish white salt deposit.

The spalled surface is shown in greater detail in the photograph of Fig. 3.

There is much cracking in the walls of this house, especially at the corners, where "step-cracking" has occurred. A relatively small amount of spalling has occurred on the west wall near the corner and close to the foundation.

Mr. Symons, the present owner and occupant, was present during part of the examination of the house. He said he had lived in it since it was built. It had been painted in November of 1950 after he bought the house; he said that the previous paint had flaked off very slightly in places. According to Mr. Symons, the latest painting was done one day after a very heavy rain, with the wall still damp. The trouble of spalling started in the Spring of 1951, and he feels that it is due to the dampness of the wall when painted, and also due to the type of paint used, which, he said, sealed in the moisture in the wall.

Mrs. Symons said that the south wall of the basement has been damp after heavy rains.

Similar damage to that at 325 Palace Road has occurred at 30 Alamein Drive, on a part of the south wall. The wall of this house is divided into two parts by a red brick chimney which extends about a foot out from the wall. The part of the wall west of the chimney is badly spalled and flaked; the other part, however, shows no sign of trouble.

The houses at 333 and 335 Palace Road have been damaged, but not as extensively as the Symons' house. Only the south walls have been affected.

Slight damage was seen on the south walls of the painted brickwork houses at 21, 23 and 29 Alamein Drive. No apparent trouble was seen on similar houses at 22, 24 and 31 Alamein Drive.

Discussion of Possible Causes of the Trouble

The damage has occurred only on the south walls of the buildings. These walls face Lake Ontario, and may be subjected to greater rain than the other walls (Mrs. Symons pointed out that the south wall of her basement and not the others showed dampness in heavy rains). Also, the south walls probably undergo a greater number of temperature fluctuations above and below freezing.

The painting of the wall surfaces with what was probably an oil-base type paint, which would probably effectively seal the surface, undoubtedly is related to the damage.

It has been shown in work carried out by W. H. Thomas at the Building Research Station of Great Britain (*) that by painting or otherwise sealing the surfaces of masonry materials, more severe damage through frost action may result, than for the untreated material. In freezing the material, ice crystals start to form; if these crystals are free to be extruded through the surface of the material, some relief from stresses which are produced by the ice formation is afforded. However, by sealing the surfaces, the extrusion process is prevented and destructive stresses may be set up in the material.

As a result of his extensive investigations, Dr. Thomas wrote "..... it would seem that surface coatings, whether artificially applied or naturally developed through accumulations of salts, etc., might have a decided influence upon the amount of damage caused by frost.

"On the one hand, such coatings would tend to prevent the material becoming saturated by access of water through the face, and so tend to limit the damage liable to be caused when frost occurred. On the other hand, if the material became wetted from other faces, and a high degree of saturation was reached, then as the result of (1) the prevention or restriction of extrusion, and (2) the differential strains between the face and the backing, the material might suffer badly from frost."

Dr. Thomas has concluded that, "Since extrusion is such an important factor in providing relief, it follows that any conditions which tend to limit or prevent extrusion will be detrimental to the frost resistance of the material. Thus, the choking of pores near or at the surface, either by the deposition of salts due to natural weathering actions, or due to the application of preservatives such as waxes, paints, etc., may increase the liability to damage through frost action, if the material can become saturated through the ingress of water at other faces".

Another explanation of this damage may be found in the slight efflorescence noted in areas where spalling had taken place, the possibility being that a formation of salts beneath the surface has exerted enough pressure to flake off the surface. It is felt, however, that the salt formation probably took place after the flaking of the surface.

Analysis of Paint Samples

Two samples of paint flakes obtained from houses at 30 Alemain Drive and 325 Palace Road in Kingston were examined and it was concluded that the paints used in both cases were of the oil bearing type. This conclusion is based on the observations that:

* W. H. Thomas "Experiments on the Freezing of Certain Building Materials", Dept. Scientific and Industrial Research, Building Research Technical Paper 17. H.M.S.O. 1938.

- (1) The loss in weight on ignition at 450°C is 10%.
- (2) On heating the flakes, blistering occurs and decomposition produces an odour typical of oil degraded under similar conditions.

These observations suffice to distinguish the coatings as oil-bearing rather than inorganic cement based types.

Possible Remedies for this Damage

The disfigurement of the houses through the spalling or flaking at the surface probably requires that some repair programme will be carried out. Removal of the paint would seem to be desirable to guard against a continuation of the trouble. This could be done by sand-blasting or other abrasive methods or possibly by the application of heat.

If the surface is re-painted it would seem advisable to use a porous, non-sealing type of paint (cement-base type).

After removal of the old paint there is a possibility that stucco may be successfully applied to the surface.

The damage which has been done to these houses in Kingston appears to be related to the type of paint applied, and also probably to the conditions under which it was applied. Although no definite conclusions can be made from the information available, it would seem advisable to apply paint to masonry only when absolutely necessary, and then of a type that will exert a minimum "sealing" effect on the surface.

Photographs of Damaged Brickwork



Fig. 1 South Wall of 325 Palace Road, Kingston



Fig. 2 South Wall of 325 Palace Road, Kingston



Fig. 3 South Wall of 325 Palace Road, Kingston