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TECHNICAL NOTE

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SUBJECT

Experimental Painting Studies: Central Mortgage and Housing Corporation Rental Projects in Cornwall and Montreal - Preliminary Assessment of Project.

Central Mortgage and Housing Corporation has reported that painting is the most costly maintenance expense in their rental units. It would, therefore, be very beneficial if this cost could be reduced by extending the life of various coatings used.

The Division of Building Research is interested in having field tests carried out to confirm results of laboratory research. As some of the coating systems or surface preparations that laboratory tests indicate should give superior performance represent marked departures from established practice, it is difficult to arrange for practical tests. In addition, because of natural variations in the substrates, orientation of the surfaces, and living conditions within buildings, a large sample size is needed to establish a significant difference between coatings. The Corporation is one of the few organizations that has the required number of building units as well as control over paint application.

Because of the community of interest, meetings between Central Mortgage and Housing Corporation and Division of Building Research personnel were held to determine if experimental painting programs of mutual benefit could be initiated. As a result several CMHC projects were suggested as possible sites for the DBR field

tests. At a meeting held 17 December 1965 it was agreed that two projects in Cornwall and three in the Montreal area would be examined for suitability. This report records the results of visits to these sites with special reference to the condition of the paint work.

The proposed sites were visited on 19 and 20 January by Messrs. S. J. Murphy of CMHC and H. E. Ashton and G. A. O'Doherty of DBR/NRC. Brookdale Terrace and Cumberland Court in Cornwall were examined during the morning of 19 January in the company of Mr. A. W. MacIntyre, CMHC Ottawa Branch engineer. That afternoon the Cloverdale Park Apartments in Pierrefonds were inspected; Place St. Louis in Boucherville and Boulevard Pie IX Apartments in Montreal were visited on 20 January.

At each site notes were made on the appearance of the exterior painted surfaces, particularly those where failures had occurred. Photographs were taken to record the condition of each project. It was, of course, impossible to observe closely the condition of the paint on the upper portion of 3- and 4-storey units.

OBSERVATIONS

Brookdale Terrace, Cornwall

This project consists of six to eight 2-storey row houses. The majority of the blocks generally contains eight units; the blocks are oriented in all directions. The front and rear of the buildings are faced with brick veneer to the bottom of the second-storey windows. Vertical wood siding is set above the brick to the roof line; the windows and doors are all wood. The ends of each block have large panels of vertical siding.

Paint was generally in good condition at this project (Figure 1) except for the storm windows and doors which showed excessive peeling. Although the soffits were plywood there was no visible peeling. There were some fresh paint patches on the vertical siding on the face of some blocks but these were the result of installation of new galvanized flashing at the brick line. Apparently there had not been time to repaint all the siding before the onset of winter. There was some cracking and peeling on the bottom 6 inches of the large end panels because of moisture retention at the water table (Figure 2). The end panel of one block was in poor condition but this was because of the inferior grade of lumber used in its construction (Figure 3). The panel should be repaired probably by recovering it with overlay plywood. Caulking was in poor condition around windows and doors.

Cumberland Court, Cornwall

This project consists of three blocks each containing 10 apartments. The blocks are $2\frac{1}{2}$ storeys above ground level. The exterior finish is brick with wood panels between the windows of each floor. Each panel is about 3 by 6 ft and is made of vertical 3-in. tongue and groove boards. There are 24 such panels on each building. The soffits are plywood.

Although the units were painted in 1963, the wood panels needed repainting by 1966. There was severe paint cracking and some checking of the wood near the lower ends (Figure 4). Cracking was less severe over the rest of the panels but nevertheless the paint had failed. There was some peeling from the soffits perhaps because there are fewer ventilators here than at Brookdale Terrace and the slope of the roof is lower. Soffit peeling was as prevalent over the windows as over the brickwork. The plywood ceilings of the door canopies had cracks and peeling at the outer edges (Figure 5) that may have been caused by a constructional defect. The caulking was in better condition here than at Brookdale and there was no peeling on the window sash or storm windows. The accumulation of dirt on the exterior paint seemed excessive.

Cloverdale Park, Pierrefonds

This complex consists of 50 to 55 blocks with varying numbers of apartments in each. The total number of individual units is 748. The project is divided into three sections that were constructed at different times to somewhat different plans. The older buildings are usually row type while the newer ones are almost square blocks. In the first section they are 3 storeys and in the other sections $3\frac{1}{2}$ storeys above ground level. The finish is brick veneer with large plywood panels between the windows above the entrances. In the first section the lower plywood panel is not protected by the entrance canopy (Figure 6). The soffits are also made of plywood. At the rear, the apartments have open balconies with wooden decks.

In the first section, which had been repainted in 1962 and was due for repainting in 1966, there was considerable peeling on the fascia and soffits, in some cases right down to bare wood. The failure was less severe along the sides of the building than at both ends which are ventilated (Figure 7). The vents are 1-in. holes drilled in strips of wood placed over slots that were probably the original vents. The peeling did not seem to be as bad on those blocks that were painted grey as on those painted white.

In the first section there was also considerable cracking and flaking on the plywood panels. There was grain raising where water had penetrated the cracks. Panels painted light green showed a two-tone effect from the wet and dry areas (Figure 6). Generally the upper panel failed more than the lower panel.

The second section was the one that had been repainted most recently using alkyd enamel in place of oil paint. The finish was in very good condition with a high gloss still remaining on the soffits and plywood panels. The latter, however, had been coated with deep colours which would aid gloss retention. There was still some peeling on a few plywood panels which may have been due to inadequate preparation. It was noted that the ventilation in this section differed from that in the first in that there were uncovered slots along the front and back rather than covered slots at the ends of the buildings.

The third section, made up of square buildings with vents on all four sides, had been repainted in 1963, also with alkyd enamel. The plywood panels appeared to be in good shape. As it was starting to get dark only a cursory examination was made from the car.

In all three sections occasional peeling from galvanized flashing was noted. It had been reported that the balcony decks in this project had to be replaced frequently. The decks examined showed considerable rotting of wood and peeling of paint on the underside. The balconies are constructed with a steel frame and a wooden deck that is slightly sloped away from the building. At the time of the visit it was reported that the wood was untreated but at a subsequent meeting in Ottawa it was stated that the wood was treated to prevent rot. Numerous cracks and splits resulting from nailing the boards were noted. Because these were not filled before painting water entered the wood thus allowing rotting to begin.

Place St. Louis, Boucherville

This project consists of three long 2-storey units where the deck for the upper apartments acts as part of the roof for the lower ones. The upper deck is reached by outside staircases at each end of the unit. The staircases are shielded by slatted screens. The face on the lower part of the unit is brick, that on the upper part wood. The latter is well protected by the wide roof over the deck (Figure 8). There are three or four large panels of vertical boards on the back of each unit.

The paint on the fronts of the buildings was in good condition except for slight fading. The porch ceilings were very glossy. The wood in the screens was rotting badly at the bottom of each half where snow accumulates (Figure 8). This wood should be replaced with treated wood.

Paint on the large rear panels was generally in good condition except for the bottom 6 inches and on the panels at the ends of the buildings opposite from the furnaces. On these ends peeling started at the fascia and followed the line between apartments across the soffits and down the centre of the panel (Figure 9). As a crawl space is reported to be at this end the peeling is probably caused by moisture migration. There was also some peeling from the soffits at the back over the bathrooms and marked peeling on most of the storm sashes.

The biggest problem at this project is the ceiling space over the porch. Apparently condensation freezes in this space and when melting occurs the water runs back toward the building because of the slope. The plywood sheets are severely buckled in many places and the paint is peeling back from the panel edges (Figure 10). Some modification of the structure will be required to overcome this defect.

Boulevard Pie IX, Montreal

This project is comprised of many 12-unit all-brick apartment blocks, some fronting on the busy boulevard. The blocks are basically H-shaped and most have a wooden balcony at the back between the wings. On many of the buildings there is no roof overhang other than the balcony roof. At each end there is an exterior steel stairway used mainly for storage and as a children's play area.

The only parts of the buildings that could be painted are the exterior metal stairways and balconies. The material on the latter appeared to be 1-GP-41 judging by the low gloss. Difficulties that had been experienced on the balcony fronts were probably caused by poor quality wood and poor surface preparation before repainting. In Figure 11 it can be seen that only part of the old paint had been removed and that cracking is starting at the edges of these areas. Two balconies that had recently been repainted after burning off the old paint were in good condition.

There was some rusting on different parts of the exterior stairways (Figure 12). The stringers, undercarriage and treads which were painted grey appeared to be in worse condition than the guard rails which were red iron oxide in colour. On closer inspection,

however, it was found that all parts were in about the same condition but that the light grey colour made the rust more evident by contrast. The exterior stairs at the north ends of the buildings generally appeared to be a little worse than those at the south ends. The degree of rusting did not appear to be related to the location of the electric clothes-drier vents. The failure was considered to be more severe on the buildings fronting on the boulevard and was thought to be associated with the large amount of salt used on that main thoroughfare during the winter.

SUGGESTED PAINTING PROGRAM

As a result of the examinations an assessment of the possibilities of using the different projects as sites for experimental painting was submitted by H.E. Ashton to a joint meeting of CMHC and DBR representatives on 3 March 1966. During discussion at the meeting a program of work for 1966 was selected. Both the original suggestions and the final selection are given below.

Brookdale Terrace, Cornwall

The storm windows and doors were considered the only paint problem here. A comparison of alkyd enamel with oil paint for these surfaces was proposed because of the good service provided by 1-GP-59 at Cloverdale Park. The upper portions of the row houses would be ideal for future large-scale tests because they consist of large areas of wood subjected to various living conditions. The difference in interior conditions was evidenced by windows in some apartments being frosted while those in adjacent apartments were clear.

Because the paint was generally in good condition it was agreed not to undertake any experimental painting at this site in 1966.

Cumberland Court, Cornwall

It was suggested that because failure extended into the wood substrate a comparison of methods of surface preparation be made. Methods proposed were disc sanding, burning, and soft sandblasting compared with normal scraping. The use of fillers on badly checked wood was also suggested. For repainting, alkyd and latex finishes would be compared with oil paints.

It was agreed to have the upper wood panels prepared by the contractor in his usual manner and the lower ones treated by three different preparatory methods excluding burning off. The suggestion of two fillers and three topcoats was accepted.

Cloverdale Park, Pierrefonds

Since the first section had been scheduled for repainting in 1966, the suggestions for this project were restricted to that section. A program for testing procedures for repainting over failures on plywood was suggested for the panels over the doors. Different methods for surface preparation, filling, priming and topcoating were recommended. Alkyd enamel had given good service on the soffits of the second and third sections so it was proposed to compare repainting with that material with replacement of ordinary plywood with overlaid plywood in the most troublesome areas. For the balconies an experiment of pre-treating the wood before installation versus treating in place was suggested. Three or four porch finishes could be tested for improved wear resistance.

It was agreed to reserve 8 plywood panels for tests to compare power wire-brushing with disc sanding for removal of old paint. Latex filler and paste wood filler would be included to determine their effectiveness in filling cracks in the plywood. The finishing systems selected were 1-GP-59 over aluminum primer and two coats of acrylic latex. It was decided, at the request of CMHC representatives, to compare one- and two-coat applications of topcoats on the soffits. Thus on the overlaid plywood, half would have one coat of 1-GP-59 and half two coats applied directly to the overlay. To determine whether improvements in sections 2 and 3 were due to use of alkyd enamel or to better ventilation, it was decided to compare enamel versus paint systems. Again the areas would be divided into one- and two-coat applications of 1-GP-28 and -59 over their respective primers. The treatment studies on the balconies were deleted from the program because it was reported that all wood is pretreated. It was agreed to test 4 different finishes on 8 balconies half of which would face south and half north so that snow accumulation would differ markedly.

Place St. Louis, Boucherville

It was unanimously agreed that all the problems here were connected with moisture migration and that little would be gained from painting experiments.

Boulevard Pie IX, Montreal

On the wood balcony fronts it was proposed to compare burning and disc sander surface preparation with replacement using

good wood. Comparison of 1-GP-59 enamels with 1-GP-41 oil paints in deep colors was also proposed. It was recommended that flame priming, power wire-brushing, and normal preparation be tried on the partially rusted exterior steel stairways. Grit blasting was not included because it would not be practical on the narrow pieces of steel. Three metal primers which differ in their tolerance for poor surface preparation were suggested together with a choice of topcoats. It was also mentioned that zinc-rich coatings that were of special interest to some CMHC personnel could be included but would require removal of all surface contamination.

It was decided that the answer to satisfactory service on the balcony fronts - adequate surface preparation - was already known and the proposed tests were deleted from the 1966 program. It was also thought that flame priming of the steel would be too unfamiliar to contractors to include in the tests. The final program selected for the metal stairways comprised two methods of surface preparation and three primers. A common topcoat to either 1-GP-73 or -61 would then be applied to all six stairways. The decision whether to include zinc-rich coatings was left to CMHC.

CONCLUSIONS

The final recommendations were submitted to Central Mortgage and Housing Corporation in a letter dated 29 March 1966. They are shown in Tables I, II, and III.

TABLE I

CUMBERLAND COURT, CORNWALL

36 wood panels

Finishing Systems	Normal contractor preparation, 9 panels			Hand scraping, brushing and sanding, 9 panels		
	Latex block filler, 3 panels	Wood filler 1-GP-103, 3 panels	Unfilled, 3 panels	Latex block filler, 3 panels	Wood filler 1-GP-103, 3 panels	Unfilled, 3 panels
1-GP-55 and 1-GP-28	1 panel	1 panel	1 panel	1 panel	1 panel	1 panel
1-GP-84 and 1-GP-59	1 panel	1 panel	1 panel	1 panel	1 panel	1 panel
1-GP-138 acrylic two coats	1 panel	1 panel	1 panel	1 panel	1 panel	1 panel
	Power disc sanding, 9 panels			Low pressure sand blasting, 9 panels		
	Filling and finishing as above			Filling and finishing as above		

TABLE II

CLOVERDALE PARK, PIERREFONDS1. Soffits on one building where peeling severe:

Replace two side and two end plywood panels with overlaid plywood.

Finishing System	Panel Location	
	Side	End
1-GP-59 one coat	1 panel	1 panel
1-GP-59 two coats	1 panel	1 panel

Remaining plywood = remove old peeling paint with power wire-brushing and wash sound areas.

One half area Prime with 1-GP-55		One half area Prime with 1-GP-84	
$\frac{1}{4}$ Area	$\frac{1}{4}$ Area	$\frac{1}{4}$ Area	$\frac{1}{4}$ Area
One coat	Two coats	One coat	Two coats
1-GP-28	1-GP-28	1-GP-59	1-GP-59

2. Eight plywood entrance panels

Finishing System	Power wire brush, 6 panels			Power disc sand, 2 panels
	Latex block filler, 2 panels	Paste wood filler 1-GP-103, 2 panels	Unfilled, 2 panels	Unfilled, 2 panels
1-GP-93 1-GP-59	1 panel	1 panel	1 panel	1 panel
1-GP-138 Acrylic two coats	1 panel	1 panel	1 panel	1 panel

3. Eight balcony decks

Oil-Modified Urethane: 1-GP-175 Pigmented	Two Component Urethane: 1-GP-180 Type II	Alkyd Enamel to 1-GP-73	Phenolic Enamel to 1-GP-73
For each system one balcony should face north and one face south.			

TABLE III

BOULEVARD PIE IX, MONTREAL

Six exterior metal stairways all on north end of buildings

Normal scraping and hand wire brushing, 3 metal stairways			Power wire-brushing with machine feathering, 3 metal stairways		
1-GP-14	1-GP-140	1-GP-48	1-GP-14	1-GP-140	1-GP-48
1	1	1	1	1	1
Topcoat all primers with same alkyd enamel to 1-GP-73 or 1-GP-61					

Zinc-rich, two metal stairways

Flame prime (instruction available from oxygen suppliers)	Power wire brush to bare metal
Coat with Inorganic zinc-rich 1-GP-171 Type A or with Organic ready-mixed zinc-rich 1-GP-181	



Figure 1 Row housing at Brookdale Terrace, Cornwall



Figure 2 End panels of buildings at Brookdale Terrace, Cornwall, showing cracking and peeling of paint at bottom of panel



Figure 3 End panels of buildings at Brookdale Terrace, Cornwall, showing poor wood used in construction

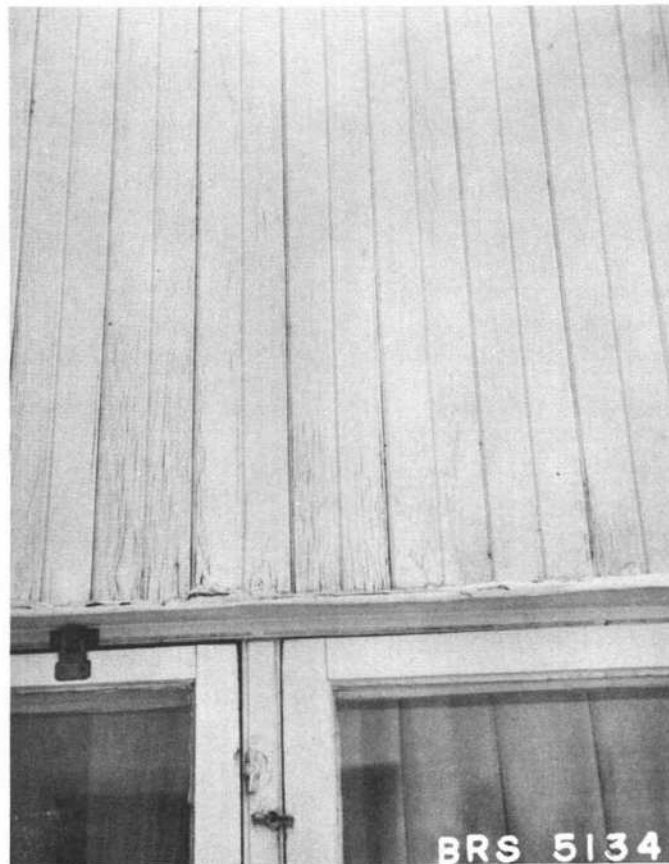


Figure 4 Wood panels at Cumberland Court, Cornwall, showing cracking and checking of paint and wood



Figure 5 Plywood ceiling of door canopy at Cumberland Court,
Cornwall, showing cracks and peeling at outer
edges



Figure 6 Exposed plywood panels at Cloverdale Park,
Pierrefonds



Figure 7 Paint peeling on vented soffits at Cloverdale Park,
Pierrefonds



Figure 8 Protected facing on row housing at Place St. Louis,
Boucherville



Figure 9 Rear of buildings at Place St. Louis, Boucherville,
showing paint peeling at centre of panel and
on sash



Figure 10 Porch ceiling at Place St. Louis, Boucherville,
showing buckled plywood and peeling paint



Figure 11 Irregular removal of old paint on balcony at
Boulevard Pie IX, Montreal



Figure 12 Exterior metal stairways at Boulevard Pie IX,
Montreal, showing rusting