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TECHNICAL NOTE

LIMITED DISTRIBUTION

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SUBJECT

Experimental Painting Studies: Central Mortgage and Housing Corporation Rental Projects in Montreal - First Progress Report.

Experimental painting projects were undertaken by the Division of Building Research at the request of the Property Management Department of Central Mortgage and Housing Corporation in the hope of gaining information which may help to determine the causes of early deterioration and failure of paint films in service. Representatives of the Corporation and the Division held several meetings to discuss typical problems and to organize a program that would prove mutually beneficial.

Sites in Ottawa, Montreal, and Cornwall were visited in January 1966 to examine the condition of the existing coatings and to determine acceptable test areas. (The results of this assessment are reported in DBR Technical Note No. 483.) Apartment buildings at Boulevard Pie IX and Pierrefonds in the Montreal region and Cumberland Court Apartments at Cornwall, Ontario, were selected. The experiments at Montreal began in July 1966. The project in Cornwall had to be postponed because other renovations to the building could not be completed in time.

The test program was devised to evaluate the relationship between various methods of surface preparation and improved performance of conventional and newer type coating systems. The Division of Building Research suggested the guidelines for coating selection and surface preparation to be incorporated into the job specification by the Corporation.

OBSERVATIONS ON SURFACE PREPARATION AND COATING PROCEDURES

Central Mortgage and Housing Corporation arranged the experimental painting on a cost-plus basis. The painting contractor agreed to supply the personnel to carry out the work as detailed in the Corporation specifications. Mr. L. Lappi, the engineer in charge of maintenance for the Montreal Area, acted as liaison between the firm of Vallieres and Cusson Inc., painting contractors, and the Division of Building Research. Mr. Cusson was present during most of the inspections to offer his appraisal of the coatings used and the preparation methods employed.

Boulevard Pie IX, Montreal

The experiments on this project were designed to study surface preparations and recoating of exterior metal stairways. Six stairways had been chosen on the north side of the buildings along Boulevard Pie IX. Three were to be prepared by conventional scraping and hand sanding and the remainder were to be mechanically wire brushed. Three different priming paints were to be applied under a common finishing material.

After a preliminary wash with cleaning agent and water the first three stairways, starting at the south end, were prepared by normal methods of manual scraping and sanding of the rusted or blistered areas. The washing did not remove all the dirt adequately because it was done rapidly and because the tight corners and crevices of the steel work did not allow the brush to reach all the accumulated dirt. With or without the cleaning agent a single wash using a hose equipped with a high pressure nozzle might have been better.

The painters seemed to prefer scraping and hand sanding the rusted areas where old coatings had peeled off because this prepared the surface more thoroughly for repainting. They found suggestions made by DBR/NRC for surface preparation rather extreme especially with regard to power wire brushing. The equipment used was the normal dome-type wire brush with the spindle fixed to the top and the bristles extending downward in a circle from the metal cap. This brush was not practical for use on intricate parts of the stairways such as the inside portions of the I-shaped members of the undercarriage or supports. As a result this portion of the experiment may not yield any useful results.

The workmen left areas difficult to reach untouched. The flat surfaces of the stringers, treads, and walkways were readily available and were thoroughly wire brushed. The men seemed to be trying to remove all of the previous coating regardless of condition. The wire brush, however, will only remove or catch raised or loosened paint and rust scale. On flat well-adhered paint the brush only burnishes the surfaces and leaves circular marks on the paint. Had the workmen done only the rusted and blistered areas the method might have been more successful. Hand sanding with coarse garnet paper completed the preparatory work. Three sections had been designated for power wire brushing but only units Nos. 8221 and 8231 were completed as requested. No. 8241 was prepared by scraping and hand sanding. It is evident that a method not liked by or unfamiliar to tradesmen will not be given a fair trial.

Two extra staircases were considered for coating with zinc-type primers. These coatings require complete removal of previous coats. The power wire brushing equipment used on the other portion of the project did not appear thorough enough and flame priming was unknown to the contractor. Sandblasting two complete units was considered too expensive so a compromise of sandblasting just the lower stair of No. 8261 Boulevard Pie IX was accepted. This lower section was reported to have been sandblasted to white metal on a Friday afternoon and was then covered overnight with tarpaulins to protect it from excessive moisture. Priming was completed the following day. The organic zinc-rich 1-GP-181 material was applied to the top four steps and adjoining stringers, hand rail, and supports. The remaining section was coated with inorganic zinc-rich 1-GP-171. Two coats of 1-GP-73 completed the painting.

Apart from other difficulties, the cost of sandblasting is very high because the sand or grit must be purchased by the ton. Approximately half a ton was used for this blasting operation with about 500 pounds being reclaimed and 500 pounds not used. It took 6 men 3 hours to sandblast only one staircase. After the workmen become familiar with the equipment and if several stairways were done at the same time, the time per unit could probably be reduced. It is not known whether any attempt was made to have an experienced sandblaster or building cleaning specialist do the job.

All the priming materials were applied by spraying. The liquid zinc materials are heavy and should not be applied with the normal spray guns with attached cups used by the contractor. He remarked that two hands were needed to hold the spray gun at shoulder height.

Cloverdale Park, Pierrefonds

The experiments at Cloverdale were divided into three parts. One was designed to evaluate different types of wood priming paint and topcoating materials on the soffit portion of one building. Another carried out on a similar building in the same complex was to evaluate methods of repainting plywood panels that showed paint and wood failures. The third endeavoured to assess four different exterior floor coatings for the balcony decks.

The soffit experiment may not provide all the desired information because:

- (a) wire brushing was specified but the painters burned and scraped all the painted surfaces,
- (b) a portion of the soffit was to be replaced with overlay plywood but regular plywood was installed,
- (c) one coating applied as a priming coat was a varnish material instead of the pigmented primer specified; the label on the container was marked as specified but the material in the can was obviously a mistake.

The plywood was replaced with specified material on three of four sections and recoated as directed. The portion with the varnish applied was reported to have been thoroughly sanded back to bare wood and recoated with proper 1-GP-84.

The coating portion of the soffit program was carried out correctly as it was ordinary painting with conventional materials. Although the different experimental areas were well identified a close examination could not be made because of the height of the soffits.

The test areas selected for the plywood panel experiments were located on a building that had a slightly different panel arrangement than the buildings for which the experiment was designed. There are two styles of buildings in the complex. One has two plywood panels, one above the other, above the entrance and separated by a window. The door canopy is below the lower panel. These panels are almost flush with the building face. The second style has a plywood panel immediately above the entrance with the canopy situated above this panel. The other panel is above the window. These two panels are recessed approximately 15 in. from the building face. The eight panels under test are on a building of the latter style.

Because of the canopy location as well as the recessed surface, the upper and lower panels do not receive the same amount of exposure nor have they had equal surface degradation. Comparative results will be kept within the top group of panels or the lower ones but no comparison can be made between the two sets.

The surface preparation was not completed as specified. Power wire brushing was designated for six of the panels but vibrator sanding was carried out instead. The remaining two panels that were to be disc sanded were burnt and scraped. The washing procedure was carried out before the sanding or burning, consequently nothing was achieved by this process. Paste wood filler was applied to only one panel instead of two.

Arrangements were made with the contractor to apply wood paste filler to another entrance panel. The drying stage between the application and wiping off of the paste is critical and requires some experience with the material. Latex block filler was applied to the small top right-hand section of the sanded panel No. 8617. A finish coat is required to show the effectiveness of the filling operation. All the upper panels are to be primed with aluminum paint topcoated with 1-GP-59; the lower ones are to have two coats of acrylic latex paint.

The paint contractor had another method of surface preparation for badly cracked and checked plywood doors using Polyfilla compound. The surface was sanded thoroughly and the compound was thinly glazed over the cracked areas. A door prepared in this manner was examined and appeared to have an excellent crack-free surface.

The balconies selected for this study were situated so that four faced south and four faced east with an equal number of upper and lower platforms in each group. The lumber was new and was predipped in a preservative sealer before installation. Erection took place about one month prior to coating. The wood contained a great many knots of all sizes which may ultimately have an effect on the life of the coatings. The ends of the wood abutting the brickwork were well caulked.

Originally four different coatings had been suggested but the limited availability of materials reduced the number to only one - the two-component urethane. Two alternative coatings were substituted, a 1-GP-73 epoxy ester coating and a 1-GP-61

alkyd enamel. The 1-GP-61, while not primarily intended for wood floors, may serve adequately. The painters thinned both the first and second coats of each of the floor enamels, as is their standard practice, because they firmly believe that thinned material produces a better bond between paint and wood. The general instructions stated that materials should be applied in the consistency supplied by the manufacturer and that thinning should be carried out only after obtaining approval. The written instructions also said that the manufacturers directions should be followed. In some cases the labels of paint containers suggest thinning the first coat but the containers used here were not seen by the writer. The 1-GP-73 epoxy ester coating and the 1-GP-61 alkyd enamel had also been used on the metal stairways where they had much better gloss and build.

OBSERVATIONS ON GENERAL APPEARANCE AND INITIAL PERFORMANCE

Boulevard Pie IX, Montreal

When generally appraised all coating on the metal stairways appeared satisfactory and in good condition. On closer examination, however, some failures were found.

The thoroughness of the surface preparation is reflected in the appearance of the topcoats. The hand-prepared units were, on the average, slightly better than the power brushed parts. The final feathering of the sharp edges of the old paint made the major difference. The red lead primer was very soft and is visible on almost all of the sections where it had been used. The topcoat has skinned off exposing the primer and is quite unsightly but it appears serviceable on stair treads. The only primer that was not exposed through skinned topcoats was the 1-GP-48 coated with 1-GP-73. This may be accidental because most of the defects are caused through abuse by children or others. The area around the bottom of the stairways is almost completely fenced and makes an ideal playground. Most cases showed that only the topcoat was damaged while the primer remained well attached to the surface.

The stairs primed with the zinc materials appeared to be in better shape than those that had been recoated over old coatings. There is, however, a considerable amount of chipping exposing the metal not found with the other conventional coatings. There are a few patches of rust scale on the upper inside handrail under the coatings. The lower handrail support also has a large area of exposed metal where the coating has been removed by a metal chain wrapped around it.

Cloverdale Park, Pierrefonds

The test coatings on the soffits are very good but the 1-GP-59 does not hide the wood completely with one coat. This is obvious on the new plywood and the sections which had the old paint removed by burning and scraping. The overlay plywood accepts the paint very well and is almost completely hidden with 1 coat of 1-GP-59. There is little to choose between the 1-GP-59 and 1-GP-28 in 2-coat systems on old or new surfaces except that the 1-GP-59 is brighter and has a higher gloss.

The plywood panels above the entrances appear excellent. The low sheen finish of the latex presents a better general appearance than the high gloss 1-GP-59 which shows up more of the surface defects left after preparatory treatments. All of the latex-coated panels are located below the canopy which slightly reduces the light reflection. These surfaces have not been as seriously weathered because of this protection. The sanded panels look better than the panels from which the old paint had been removed by burning.

The burning process on plywood appears to char the spring wood easily and leaves the high ridges of late wood bands across the surface. These are much more noticeable after coating, particularly with high gloss enamel. The panels that were mechanically sanded do not show this effect. Neither method can completely remove surface checking of the wood.

The paste wood filler seems slightly better than the block filler under both coating systems. There are some traces of wood filler bleeding through the latex. The fillers will not level any cracks greater than approximately 1/4 in.

The balcony coatings are distinctly different. The polyurethane material is excellent in gloss and film thickness and bridges most surface defects. The two other materials have only a slight sheen. Both are quite thin and do not cover surface irregularities such as raised or fuzzy grain. Splits and grain checks are obvious as well.

It is unfortunate that the total thicknesses of the three test coatings were not equal. Another full coat of the conventional enamels would allow better comparison in performance. Because these balconies are used during the late fall and winter months for storing such things as mats, lawn chairs, boxes, and refuse containers, thicker coatings are necessary to resist the moisture which accumulates under and around these objects. Already there are spots of lifting of the topcoats from the wood on both the 1-GP-73 and the 1-GP-61 coated decks.

SUMMARY

This report covers the inspection of the preparation and coating of the test areas to October 1966. Based on these examinations some general observations can be made on factors that will influence the experimental results. The most obvious item is the lack of knowledge about this type of work by tradesmen. Although it was not required that they do an exceptional job some measure of exactness in following the written specifications was expected. This quality control could best be achieved by having an inspector on the site for the first few days or possibly by having a lengthy discussion with the job foreman prior to starting the work to ensure complete understanding of all facets of the program. A detailed layout or blueprint of the whole experiment would definitely be helpful.

A major portion of these experiments dealt with surface preparation. Some of the methods required special equipment which was not available on short notice. When special equipment is necessary a statement of identification of such tools by manufacturer's catalogue number should be included in the specifications for the work. It would be immediately known then if the requirement could be met and if not other arrangements could be made.

The materials used for these experiments were chosen to fulfil a specific requirement such as corrosion resistance using 1-GP-48 primer or hardness and moisture resistance of polyurethane coatings. All are defined by Canadian Government specifications. The Warranted Materials list used by the Corporation does not contain the complete range of coating specifications. Consequently, some materials were difficult to obtain simply because local suppliers and tradesmen were unfamiliar with the product. Even the major paint companies could not supply 1-GP-84 although C.I.L. No. 1628 is a comparable material. The polyurethane coating, oil-modified variety, could not be found in Montreal but could be purchased in Ottawa. It is evident, therefore, that some direct communication with manufacturers and/or suppliers by either CMHC or DBR representatives would increase the possibility of proper materials being obtained.

It is too soon to appraise fairly the performance of the coatings. One factor that will have a great influence on the service life of the coating is any extraordinary defacement or abuse caused by children and careless adults. Where conditions of this nature exist an acceleration in degradation is to be expected and this must

be taken into account in the final evaluation of the particular coating system. An attempt has been made to assess these conditions, as they now exist, into a numerical system which may be incorporated into each subsequent examination. Further inspections will be made after the first winter and again at the end of the first year after which yearly inspections should be sufficient.