Some field observations of paint performance on wood sidings and trim

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SUBJECT SOME FIELD OBSERVATIONS OF PAINT PERFORMANCE ON WOOD SIDINGS AND TRIM

In April 1961 the writer examined in detail the exteriors of 278 frame dwellings in the Maritimes. These houses were located in Pictou and Cumberland Counties in Nova Scotia and in Fredericton, New Brunswick. The examination was made primarily to determine the surface preparation and paint system required prior to preparation of specifications for painting during the summer of 1961.

Detailed specifications will be prepared for each house and in some instances for particular walls depending on the existing condition. In addition to the detailed specifications there are certain general observations that can be made based on a statistical accounting of conditions and details.

The writer is not familiar with paint technology but realizes that the more obvious causes of poor paint performance are generally understood. The performance evidence provided by a survey of this size, however, indicates a number of possible contributing factors to peeling that cannot be entirely discounted.

Field evidence from this survey appears to give more weight to the idea of exterior causes of deterioration than to the more popular theory of condensation of water vapour behind the film. If high inside humidities are the chief cause of failure, the evidence from this survey indicates that a less popular theory might be explored. Certain studies in more southerly climes where condensation is not normally a problem indicate that the ability of sidings to dry from the back when wetted by rain is an important consideration. If high inside moisture conditions exist, it may be that sufficient pressure difference exists to retard or prevent drying from the back. Also, high humidities may increase the moisture content of the frame and the relative humidity in stud spaces so as to restrict the drying potential by stud space dispersement or water absorption by wood.

In the Maritimes failures evidenced in early summer months may be due to the normally wet springs with heavy rain and accompanying high wind velocities. The popular theory appears to be that this timing of failure is due to completion of the winter condensation cycle. A companion survey of painted wood dwellings in the Arctic where winter condensation conditions exist but where spring weather brings less rainfall than on the coast may provide additional evidence.

The survey also indicates the usefulness of early inspections following painting and a continuation of these at least annually to determine more specifically where failure actually starts. It is difficult after a four-year period in an area where failures are often complete in that time to pinpoint the exact starting point of the failure. Local failures spread fairly rapidly and paint hanging in strips over an entire wall surface does not explain a great deal.

In addition to visual examination over 500 moisture meter readings were taken and a number of photos for future comparison were obtained. The moisture readings were quite interesting in that most of them were lower than the 12 to 18 per cent range normally recommended for paintable wood surfaces. The most common readings were in the 8 to 9 per cent range with the vast majority falling below 15 per cent. Moisture contents under paint films were normally higher than for exposed wood even though the first two days of the survey were cold and rainy with some wet snow. Generally moisture readings taken a few inches from corner boards, window details, etc. were 10 to 12 per cent higher than anywhere else on the wall. This means that some readings were in the order of 24 per cent.

A number of comments based on this survey can be listed as follows:

(1) Similar failure occurred on pine siding as on cedar siding.
(2) In all areas the north walls were in better condition than the other three independent of house type or room orientation.
(3) South and east walls were generally in the poorest condition.
(4) In Nova Scotia roof overhands apparently protect five to nine courses of clapboard from eave line downwards, depending on general elevation.
(5) In Fredericton, areas of siding immediately below roof overhang were badly peeled due to ice damming prevalant in that area.
(6) One wall known to be backprimed, new siding painted in 1958 was in excellent condition.
(7) Flashing and caulking details are generally poor and contribute to the problem.
(8) Water table should be eliminated.
(9) Roof overhangs on all four sides should be provided in this climate.
(10) Wood moisture contents are higher under heavy coats of paint.
(11) Houses with fewer coats or thinner coats of paint were in better condition than those with accumulated heavy coats.
(12) Soffits on bungalows were generally in better condition than on $1\frac{1}{2}$-story houses.

(13) Occupants are very proficient at sealing off eave and gable vents.
(14) Better grade caulking compounds should be used.
(15) Dark paints appear to perform better than lighter shades possibly due to alkyd reinforcement.

In deciding whether paint peeling is attributable to condensation or to exterior weather conditions, there may be some merit in a check list for field observations as follows:

Precipitation is likely to be the cause if peeling occurs:

(1) Following spring rains.
(2) Mostly on walls exposed to wind-driven rain.
(3) On walls of unheated buildings -- garages, sheds etc.
(4) On unprotected areas of walls only -- not under overhangs, stoops, etc.
(5) On split or poorly fitted siding.
(6) Near corner boards, water tables, skirts, trim around doors and windows, and faulty architectural detail.
(7) Where grouping study indicates no relationship between bathroom and kitchen locations and site orientation.
(8) On properly insulated and ventilated buildings having a good vapour barrier.

Conclusion

Useful information on paint performance on wood siding can be obtained in the field if enough buildings are included in a survey. Most informative surveys would be those done on an annual basis for the same units to determine where deterioration starts. In addition to the recognized causes of peeling, such as wet siding and painting under adverse conditions, it appears that some failures are brought about by poor architectural detail and the misuse of materials. Peeling on clapboard appears to start near corner and window trim and at the butts of vertical siding. External factors may have a greater deteriorating effect than condensation as evidenced by the condition of walls for various exposures.

Something can be learned about paint failure on wood buildings in the field to guide laboratory programs.

Comparative field surveys in other geographical areas of Canada should be a useful contribution to the theories on the little understood problem of paint peeling.