COMPARATIVE ANALYSIS OF RESIDENTIAL CONSTRUCTION IN SEATTLE, WA. AND VANCOUVER, B.C.

Introduction

In the environ of Vancouver, The Lower Mainland of British Columbia has experienced a residential building boom over the past ten years. Construction types have included single family residential, high rise non-combustible construction, and low-rise multi-unit wood frame construction. While some envelope performance problems have been experienced within all of these types of construction, these problems have been more prevalent, more severe, and have appeared earlier in low-rise multi-unit wood frame construction. Water penetration, damage to cladding systems, and rotting and decay of wood components (siding framing members and sheathing) have been amongst the problems.

This study was undertaken to identify the potential causal factors for these building envelope problems. By comparing wood frame residential buildings located in the Lower Mainland and Seattle, a clearer picture of possible construction deficiencies can be formed by examining differing construction techniques, materials and codes/regulations.

Research Program

The comparison consisted of an examination of four buildings: two "problem" buildings (one in the Lower Mainland and one in Seattle), and two "control" buildings (also divided between the two cities). The main focus of the research was to determine possible explanations (construction techniques, materials, and building codes/regulations) for differences between "problem" and "control" buildings in both cities. The buildings selected had three or four storey wood frames, stucco cladding, and were built in the last ten years as market residential buildings.

Findings

Seattle's building industry was found to be more heavily regulated than the Lower Mainland. This is mainly due to more restrictive insurance and bonding legislation. For example, all Washington contractors are required to carry $120,000 of liability insurance. Washington contractors must also register with the State and post a $6,000 bond for their work, and sub-contractors must post a $4,000 bond. These regulations combined with Seattle's slower economic activity, may have been a factor in improving the quality of residential construction. However, no data that could provide comparable data of envelope performance problems, or percentage of incidence to number of residential units was available.

The following table outlines the details of wall assemblies found in both locales:

Table 1: Exterior Wall Assemblies

Lower Mainland (problem & control buildings)	**Seattle Washington** (problem building)
3 coat Stucco and lathe	3/4" Stucco and lathe
Building paper	1 layer 15# Building Paper
1/2" exterior wood (OSB) sheathing	1/2" gypsum sheathing
2x6 wood studs at max 16" o.c.	2x6 wood studs at max. 16" o.c.
Batt insulation	R19 Batt insulation
Polyethylene vapour barrier	
5/8" gypsum board	5/8" type 'X' gypsum board

As shown in Table 1, the study found differences in construction materials and envelope assemblies. The Lower Mainland buildings had wood (OSB) sheathing instead of gypsum sheathing; and polyethylene vapour barriers were present in the Lower Mainland buildings. Regardless of these differences, causal factors leading to moisture related building envelope failures were the same. Both

problem buildings exhibited the same problematic features with respect to water management principles and failed to effectively balance moisture ingress, drainage, and drying mechanisms. In both locales, the weather barrier could not inhibit the entry of water, and the sheathing could not protect the building from exterior wetting.

The main differences between "control" and "problem" buildings can be summarized as follows:

- The wind exposure of the "control" buildings is on average lower than that of the "problem" buildings. This indicates that the local environment around many new buildings has some correlation with the problems experiences.

- Roof overhangs are significantly larger on the control buildings than on the problem buildings. Also, the control buildings have fewer flat roofs with parapets over the exterior walls than the problem buildings.

- In general, there are fewer architectural features and details on the control building walls, and a greater percentage of the details are flashed on the control walls.

- An evaluation of quality of design, construction, and materials indicates that there are certain details that are often poorly-designed on the control buildings as well as the problem buildings. The difference between a performing detail and one which causes problems is the contractor's knowledge and experience of what might work in each situation, and the sensitivity of the assembly performance to a particular detail.

It is important to note that the main findings of this study are not necessarily representative of the general population of buildings constructed in the Lower Mainland or in the locale of Seattle over the past ten years. The four buildings studied were chosen as representative of a random sample of "problem" buildings which experienced envelope performance problems and were previously examined by the study team.

Conclusion

The study findings indicate that face sealed design strategies are very sensitive to climatic, exposure and construction variables and therefore the reliance on concealed barrier systems is unlikely to achieve acceptable performance. The study also determined that Rainscreen wall assemblies offer the best means of achieving positive building envelope performance.

Project Manager: Jacques Rousseau/Mark Salerno

Research Report: Comparative Analysis of Residential Construction In Seattle, Wa. And Vancouver, B.C.

Research Consultants: Morrison Hershfield Ltd.

A full report on this project is available from the Canadian Housing Information Centre at the address below.

Housing Research at CMHC

Under Part IX of the National Housing Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research.

This fact sheet is one of a series intended to inform you of the nature and scope of CMHC's research report.

The **Research Highlights** fact sheet is one of a wide variety of housing related publications produced by CMHC.

For a complete list of **Research Highlights**, or for more information on CMHC housing research and information, please contact:

The Canadian Housing Information Centre
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, ON K1A 0P7

Telephone: (613) 748-2367
FAX: (613) 748-2098

OUR WEB SITE ADDRESS: http://www.cmhc-schl.gc.ca/Research

NHA 2266