The Role of the Building Envelope Professional in the Aftermath of Vancouver's Leaky Condominium Crisis

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ABSTRACT

Between 1993 and 2000, the Lower Mainland of British Columbia's west coast faced a rash of water infiltration problems in multi-family, wood-frame buildings. The situation has come to be known as the "Leaky Condo Crisis" and the value of the damage is currently estimated to be as much as one billion Canadian dollars.

In response to the developing crisis, the City of Vancouver mandated that a certified Building Envelope Specialist firm must be involved in all new residential developments. This requirement was adopted by many of the municipalities in this region. In 1999, a Joint Committee of the Architectural Institute of British Columbia and the Association of Professional Engineers and Geoscientists of British Columbia took over the process of managing a list of "Building Envelope Professionals" (BEP).

What is a BEP and why did the various stakeholders feel that this was the answer to this crisis? This paper will discuss the role of the Building Envelope Professional in the changes in residential design and construction that resulted from the Leaky Condo Crisis.

INTRODUCTION

Weather

The Lower Mainland of British Columbia's southwestern coast is surrounded by the coastal mountains to the east and north and the Georgia Strait of the Pacific Ocean to the west. The over two million inhabitants of the Lower Mainland live primarily on the flat lands of the Fraser River floodplain and delta, most not far from sea level. This west coast wonderland is blessed with the moderating influence of the Pacific Ocean, giving reasonable temperatures throughout the year. The British Columbia Building Code indicates design temperature highs and lows (2.5% probability) at 78°F (26°C) and 19°F (–7°C), respectively (BCBC 1998).

The mountains of this coastal range trap the warm, humid air masses carried eastward by Pacific currents and then cool and condense them into significant rainfalls. Total annual precipitation ranges between 55 and 83 inches (1,400 and 2,100 mm) per year, which is almost entirely in the form of rain. These large rainfalls occur predominantly between November and June, where it is common to experience wet weather for 30 or more consecutive days between November and February. In effect, parts of the Lower Mainland have a temperate rainforest climate.

Design

In the early to mid 1980s the Lower Mainland experienced a dramatic increase in housing construction and a similarly dramatic increase in land prices. This left developers searching for cost-effective housing solutions for the market. Developers became influenced by the glamour of "lifestyle marketing" and the freedom of new directions in exterior design. Architectural influences started to change in the low-rise, multi-unit, residential housing market, and design began to reflect the southwestern United States trend toward clean, sunny, and articulated condominium buildings with between 10 and 100 units on three or four levels. Designers wanted more contact with the outdoor environment through the use of

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expansive glazing areas, large balconies, and outside walkways for individual access.

Specific municipal building bylaws for calculating floor area coupled with the desire to maximize space/land use (and therefore profits) led to designs that minimized wall thickness, limited or eliminated overhangs, and, unfortunately, largely ignored the great differences in climate between the sunny (and drier) south and the rainforest of the Lower Mainland. The architecture changed to reflect non-local characteristics, overlooking the fact that many of the design features incorporated into traditional local design were included in response to particular climatic requirements. There was also an erosion of good construction practice and dilution of trade skills as the demand for labor outstripped the supply in the booming market.

THE "LEAKY CONDO CRISIS"

In the early 1990s, building failures began to occur at an alarming rate. Failures peaked in the late 1990s, with the entire disaster now commonly referred to as the "Leaky Condo Crisis." Common features of these failures were water penetration, damage to cladding systems, and severe and widespread rotting and decay of wood components. Early media attention was galvanized by dramatic photographs of severely degraded buildings that were less than five years old and stories of developers and contractors having disappeared behind numbered and/or project specific companies. Homeowners became very vocal in their frustration when burdened with huge repair bills, often in the range of $25,000 to $35,000 per unit or more, without a clear understanding of the cause of the problem and no one to turn to for compensation.

In April of 1998, the provincial government established a Commission of Inquiry into the quality of condominium construction in British Columbia, which was headed by a former Premier of the province, David Barrett. Termed a *Renewal of Trust in Residential Construction*, the Barrett Commission was tasked with determining the causes of the Leaky Condo Crisis and "…the adequacy of protection for, and accountability to, consumers for faulty condominium construction" (Barrett 1998). Extensive public hearings and submissions to the commission were consolidated into a report published in June of 1998. The commission was reappointed in August of 1999 to focus attention on some of the key issues identified in the first report. Part II was published in January and March of 2000.

Eighty-two recommendations were made in the three volumes of the commission reports, many of which have been implemented. Of particular interest to this paper is recommendation number 15 (Barrett 1998):

> Any architect or engineer involved in Letters of Assurance and the field review process must have the qualifications, or sub-contract the building envelope design and review to a qualified Building Envelope Specialist…

The commission clearly recognized that the building envelope was a specialized component of the building design and required specialized knowledge for proper design and construction to meet the requirements of the local climate.

It was realized early in the crisis that resolution would only be possible once a full understanding of the modes of failure was established. A study funded by the Building Envelope Research Consortium entitled a *Survey of Building Envelope Failures in the Coastal Climate of British Columbia* (CMHC 1996) concluded that exterior water, i.e., rain, was the main moisture source for the problems and that interface details were the predominant culprits that allowed this water to get to moisture-sensitive materials. For example, windows, vents, and other penetrations of the wall allowed much more water to enter the building envelope than did direct transfer through the main field of the wall. Poor as-built details were most often caused by inadequate attention to details during design and poor construction practices.

Municipalities and Codes

In Canada, the responsibility for management and enforcement of building construction is typically borne by each municipality. Most often, the applicable building code used by the authority having jurisdiction is provided by the provincial government, either by adopting the Canadian National Building Code or providing an independent provincial code. British Columbia has developed a British Columbia

Building Code based upon the national code, with amendments to reflect specific requirements of this province.

The City of Vancouver has its own charter and its own building code, called the Vancouver Building By-law. It is based upon the provincial code with specific amendments to meet local requirements. The other municipal governments in the Lower Mainland follow the provisions of the provincial British Columbia Building Code. The National, Provincial, and City of Vancouver codes all have provisions for the design of environmental separations within Part 5 of the respective code. Included are performance-based provisions for the management of heat flow, air leakage, vapor diffusion, and precipitation. The intent of Part 5 is to ensure that adequate allowances are made in the design of a building envelope for the climatic conditions expected.

The crisis in residential construction led to many demands for protection of the public, including greater emphasis on accountability in the design of the building envelope to meet the demands of the local climate. In 1995, the City of Vancouver established a list of "Building Envelope Specialists" (BES), composed of firms that the city deemed qualified to provide independent inspection and review of building envelope components. Engineers or architects, deemed to have the appropriate training and knowledge to deal with the envelope-related aspects of construction, were required to provide "letters of assurance." These letters state that proper precautions have been taken on new and rehabilitation building envelope construction projects. The creation of this list was based upon the city's perception of the firm's qualifications and past experience in the Lower Mainland. The city required that a Letter of Assurance for design and field review be submitted with the building permit, along with schedules that identified the BES along with the architect of record and other engineering team members. At the end of construction, a final schedule was required to identify that all the requirements for the envelope were met.

As the crisis continued, many of the other municipalities adopted the City of Vancouver's BES list and required that qualified specialists be used for building envelope construction and rehabilitation. The city's leadership role helped spur the development of a professional recognition of the specialty expertise related to the building envelope.

A list of specialists created and managed by a municipality raised many concerns, three of which are as follows:

- The city had undertaken a significant step toward protecting the public from inadequate design and construction. However, it had also undertaken a significant liability by dictating who was and was not qualified to provide these services. For example, if one of these BES firms were identified to have done inadequate work, would the city be liable for having "qualified" the firm's expertise? The city had determined that this exposure was beyond its normal core competency and was too much risk.
- By accepting engineering firms and professional engineers as specialists in the design of the building envelope and as prime consultants on rehabilitation projects, the city was allowing engineering firms to provide services that were traditionally within an architect's scope. This was temporarily accepted because the development of the building science specialty had been primarily by engineers and qualified services in this field were largely available only through engineering firms. The demand for these services was too high to justify refusing specialist participation just because he or she was an engineer. Nevertheless, this acceptance did interfere with the normal functions of the two professional governing bodies.
- By dictating qualification and, thereby, excluding certain practitioners from providing services, the city was encroaching on the mandate of the professional governing bodies that were created to oversee the respective professions. The Architects' Institute and Engineers' Association are tasked with accreditation and administration for the purpose of protecting the public welfare and ensuring that sufficient qualifications are maintained by their members.

THE BUILDING ENVELOPE PROFESSIONAL

It was recognized that the city's BES list was a temporary bridging function made necessary until a more permanent process could be developed with the appropriate authorities. In 1999, the Joint Building Envelope Qualifications Committee of the Architectural Institute of British Columbia and the Association of Professional Engineers and Geoscientists of British Columbia developed a formal designation, called the Building Envelope Professional (BEP). The two governing bodies created a jointly administered process for accreditation and a procedures manual outlining the role and scope of services to be provided by the BEP. They also developed a draft amendment to the Memorandum of Agreement (MOA), which outlined the acceptable boundaries for engineering involvement in this traditionally architectural sphere. As the BEP designation became formally recognized, the BES lists were discarded and the municipalities transferred recognition to the BEP list. As of October 2000, there were 47 qualified professionals on the AIBC/APEGBC Building Envelope Professional list, approximately two-thirds of whom were engineers.

The accreditation process includes a detailed assessment of the past experience of the applicant, which must cover a minimum of five years as a registered professional, at least one of which must be in the province of British Columbia. One of the key components of the process is the four-course Building Envelope Education Program. This program was developed to provide an overview of the responsibilities of the BEP as well as some education on the problems, materials and components, and underlying building physics related to the building envelope. These courses are offered by the Architectural Insti-

tute under the continuing education program and include segments on building science principles, design of details, construction practices, field review, and legal issues.

Roles of the BEP

The roles of the BEP are now formally defined to provide:

> Review of the building envelope design to the project architect or coordinating registered professional with respect to environmental separation and the performance of materials, components, and assemblies of the building envelope. The responsibility for the design and field review of the construction of new buildings rests with the project Architect, except when a professional engineer is providing architectural services under the AIBC/APEGBC Memorandum of Agreement (AIBC/APEGBC 1999).

Building Envelope Professionals provide design assistance and enhanced levels of field review of the building envelope elements. The scope of services that mandate the involvement of a BEP is limited by the municipalities, in consultation with the associations, to:

- Residential buildings that contain more than two dwelling units, are more than two storys in height, or more than 600 m^2 (6450 ft^2) in building area.
- All buildings with a cladding system over wood framing or light steel framing (AIBC/APEGBC 1999).

The above scope of services for BEP involvement recognizes the most severely affected buildings in the Leaky Condo Crisis, as noted in the Barrett Commission reports.

The BEP is expected to be involved from the concept design phase through design development to contract documents, tender, and construction phases. In all phases, the BEP provides advice and input to the coordinating registered professional (CRP), who is an architect in most cases but may be an engineer, if so selected by the client or, on projects allowed under the MOA. There is a clear separation of the delivery of these services between those for new construction activities and those for rehabilitation work.

In most cases with new construction, the BEP provides distinct services to an overseeing CRP, usually the architect of record. The critical concern was ensuring that the primary responsibility for the entire project remained in the hands of the prime consultant, who is normally the only party with a direct contract to the owner or developer. The BEP functions in much the same manner as other design professionals on the architect's team, including mechanical, civil, electrical engineers, etc.

In most "Leaky Condo" rehabilitation projects, the owners contract directly to a consulting firm with specialized knowledge in the building envelope field, since the primary reason for the work is the repair of a single failed system (the building envelope). In these cases, the BEP also acts as the CRP and prime consultant. Other design professional involvement is required when the BEP encounters situations where he or she recognizes his or her lack of knowledge, e.g., architectural, structural, mechanical, and electrical issues, changes to the original architectural intent, etc.

The management of heat, vapor, and air movement and water leakage through the building envelope is rarely a matter of life safety for a building design. Instead, the main impact of these issues is the financial risk to the owner. Mitigation of this risk is therefore the primary professional responsibility of the BEP for the anticipated design life of the envelope. Where it does become a life safety concern is when envelope failure occurs, leading to structural deterioration and mold growth.

The involvement throughout the design and construction process requires specific recommendations to ensure that the envelope details and components will function appropriately for the purpose intended. These recommendations are forwarded to the CRP for action, often as detailed drawing markups, technical specifications, and/or suggestions for alternate materials or methods.

Usually, the BEP has a role in the implementation of these recommendations, working with the CRP to assess the cost versus the level of risk mitigation associated with each decision. This is where the level of expertise and knowledge of the BEP is vital to allow for practical, reasonable, and "buildable" judgments. The art of compromise is a key skill when working in this grey area of design. In effect, the BEP must assess the overall impact of different judgments to determine whether the overall integrity of the envelope has been compromised for its intended purpose.

The BEP has authority to ensure the acceptance of this advice through the municipality's provision requiring a BEP "signoff" on the project for the work under review, both at the building permit and occupancy permit stages. Vancouver has two specific schedules for these stages: Schedule D1 identifies the commitment for BEP review of the design and construction of the project and Schedule D2 assures that BEP review has been completed. An occupancy permit will not be provided until the latter schedule is submitted, which enables the BEP to focus attention on the issues identified during construction.

Managing Expectations

The management of expectations is an important role the BEP must master as different stakeholders have different notions of what the BEP will provide. This is especially important given that the BEP is not always the prime consultant.

- The municipalities expect to gain additional public protection and reduce the possibility of future large-scale failure of the housing stock.
- The developer expects to gain an added comfort due to reduced risks of future court actions from dissatisfied buyers. The developer also has an additional marketing tool to identify specific actions taken to improve the functionality of the design. In some instances, the name of the BEP has been used by the developer in the adver-

tising for a particular project. This has become a critical element in the Vancouver area as the buying public educates itself on the crisis and its causes. It is not uncommon to see the terms "leak free" and "full rainscreen" in local marketing.

- The buyer/owner expects to gain greater confidence in their investment and a sense of security that the appropriate measures have been taken to respond to the climatic threats to their home. This is especially important as owners assumed they were getting this level of assurance the first time through.
- The architectural and engineering professions expect to gain greater recognition of the value of the services provided in protecting the public.

SUMMARY

The Lower Mainland of British Columbia has re-shaped its regulatory environment substantially over the past five years in direct response to a man-made public crisis. This is the only region in North America that has specifically identified the building envelope as a specialty worthy of concern during the design and construction of new buildings. Specific requirements have been established to focus attention on the envelope and provide a product worthy of the public trust.

The functions of the BEP have been clearly defined in response to the failures that led to the "Leaky Condo Crisis." The BEP now has an important role in the protection of the public from a repeat of this tragedy.

EPILOGUE

In October 2000, an application for a Judicial Review Procedure successfully identified the lack of specific authority of the two associations to identify and maintain a list of specialists in the building envelope field. This challenge came from one of the members of the engineering association, who was not accredited by the Qualifications Committee and was therefore not permitted to carry the BEP designation and provide BEP services.

The successful challenge was based upon a technicality in the Engineers and Geoscientists Act, which does not allow for the *regulation of the practice* of members. In effect, it was ruled by Justice Melnick of the Supreme Court of British Columbia:

> …that the Association and the Institute lacked the jurisdiction to establish, by resolution, the [Joint Building Envelope Qualifications] Committee.

The judge had determined that the APEGBC statute did not make provision for establishing and regulating a specialty designation. The judge did note in his judgment that the accreditation of individuals for building envelope construction was an excellent concept and "…undoubtedly in the public interest."

Since that time, the list of accredited BEP has been withdrawn, leaving the municipalities without a method of ensuring qualified professional involvement with the design and construction of the building envelope. The two associations are discussing the options available for the reestablishment of this important designation. By-laws to the Act will have to be adopted to allow for such actions, which would require legislative sanction.

As of the writing of this paper, this issue has not been fully resolved. The Architect's Institute is developing an alternative designation that would allow architects to provide specialist design of the building envelope. The Engineer's Association is actively pursuing the issue within its membership and with the current provincial government.

REFERENCES

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