SENEZREEDCALDER
FIRE ENGINEERING INC

REVIEW OF PROPOSED BUILDING CODE CHANGES TO PERMIT 5/6 STOREY WOOD-FRAME CONSTRUCTION

OUR FILE NO: 908027
DATE OF REPORT: November 24, 2008

THIS REPORT HAS BEEN PREPARED FOR:

BUILDING AND SAFETY POLICY BRANCH
OFFICE OF HOUSING AND CONSTRUCTION STANDARDS
4TH FLOOR, 609 BROUGHTON STREET
VICTORIA, BC
V8W 1C8

SENEZ REED CALDER FIRE ENGINEERING INC.

Peter L. Senez, M.Eng., P.Eng.

Keith D. Calder, M.Eng., P.Eng.

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1.0 SCOPE AND CONTEXT OF REVIEW

This report has been prepared at the request of the Building and Safety Policy Branch of the Office of Housing and Construction Standards in British Columbia, and is intended to:

- Comment on the proposed changes to the code as outlined in the Stage 2 Report **DRAFT** Recommended Building Code Changes to Permit 5 and 6 Storey Wood-frame Buildings of Residential Occupancy, prepared jointly by GHL Consultants Ltd. and Read Jones Christoffersen Consulting Engineers.
- Summarize our fire loss experience with respect to building construction and make recommendations that could supplement the proposed changes. The scope of this report is relative to completed buildings with all fire protection systems in place, and not buildings under construction.
- Provide commentary on the risk versus the cost/benefit in implementing the different requirements.

Further, and as requested, RKTG Consulting Engineers and Busque Engineering Ltd. were retained to provide comments on the proposed changes to structural and building envelope aspects, respectively. Their reports are included in **Appendices A** and **B** to this report.

2.0 PROPOSED CHANGES AND COMMENTARY

The GHL Stage 2 report developed 14 proposed Part 3 and Appendix reference changes and 2 corresponding amendments to Appendix D of the British Columbia Building Code (BCBC).

The primary recommendations of the GHL report are to:

- Permit up to six storeys in building height while reducing to building area for each additional storey;
- Increase the reliability for floor and wall fire separations by including a second layer of gypsum board;
- Incorporate noncombustible cladding with exceptions for vinyl siding and fire-retardant treated wood shakes;
- Allow greater use of horizontal exits and the use of hold-open devices;
- Provide additional technical review to verify the integrity of compartmentalization.

The approach to building area and height is consistent with the evolution of the current BCBC requirements that permit the use of combustible construction. As outlined in the GHL report, accepting the proposed changes the government acknowledges and accepts all risks associated with the Code changes.

2.1 BUILDING CODE RISK CONTEXT FOR FIRE AND LIFE SAFETY

As outlined in our report dated October 15, 2008, the context of the building area and height requirements to permit combustible construction in the BCBC is not reflective of modern technology, knowledge, or construction methods. Over time, the National Building Code of Canada (NBC) was revised to adapt to its different formats, and only in the later editions of the code was it modified based on fire research. However, the modifications were incremental and today's BCBC still coincides with the premise from early 1900's relative to allowable building height and area.

The current BCBC is legally adopted into practice and therefore constitutes the accepted minimum level of risk. However, there is currently no measurable method applied in the industry to quantify the cost/benefit relative to the overall risk within Part 3 of the BCBC. Therefore, a qualitative approach is required which is more prone to interpretation than a quantitative approach. The framework for the current building code could better be described as a perceived risk as even in a qualitative context, the context to which fire behaviour is considered will be dependent on the knowledge and experience of fire behaviour relative to building construction.

In the development of the building code requirements for combustible construction in the BCBC, there is no reference to a risk based approach through the entire history of the code originating from the 1941 NBC. Further, there is no basis upon which to determine the basis for gauging the perceived risk as code changes were made. Consequently, there is currently no measurable method applied in the industry to quantify the risk/cost/benefit of a code change to increase storey height or building area in broadening the use of combustible construction.

It follows that increasing the height of combustible buildings can achieve the intended level of fire and life safety if it can be shown that the level of risk is either reduced or remains consistent with that expected by the current code.

2.2 REVIEW OF PROPOSED BCBC CODE CHANGES IN THE GHL REPORT

The GHL report proposed a series of code changes summarized in **Table 1**.

Our approach to analyzing the proposed changes considers the added value of each code change relative to its maintaining or decreasing the level of fire protection and life safety risk present within the current code requirements. The risk is then considered relative to magnitude of its potential increased costs, in order to realize whether the change is a cost-benefit.

In order to qualitatively measure risk, each change is evaluated relative to the potential to limit fire spread, limit the growth of fire, or facilitate evacuation and exiting. This is considered in conjunction with our experience addressing building code issues in actual fire loss applications. This approach considers each of the changes relative to their potential qualitative value to reduce the propensity for large loss fires. When

considered in this context, a different approach can be used to quantify the potential cost/benefit and risk factors in making code changes.

The outcome of the analysis is supportive of the initiative to increase storey height as certain mechanisms that facilitate large loss fires are addressed. A summary of our perspective on the changes is included in **Table 1**. The following is a synopsis with respect to the major code changes:

1. The proposal for increased height will provide a greater level of fire protection and life safety to that currently afforded in existing four storey buildings where exterior fire spread is addressed through
    a. limitation on cladding systems, and
    b. sprinkler protection of large concealed spaces such as roof and crawl spaces.
2. The proposal for use of vinyl siding and fire retardant treated cedar shakes would require that the following be addressed:
    a. Part 3 of the BCBC does not define vinyl siding. There is a reference to CAN/CGSB-41.24 in both Part 5 of the code and Part 9 of the BCBC. This standard requires compliance with ASTM D635, "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position." This test method was developed for polymeric materials used for parts in devices and appliances. As outlined within,

        > [the ASTM D635] *standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazards or fire risk assessment of materials, products, or assemblies under actual fire conditions.*

        The potential variability of vinyl products and their fire performance would likely require further consideration prior to incorporating a general allowance for vinyl siding, when compliance with ULC-S134 is a performance solution.
3. The GHL proposal follows a pattern of limiting building area that is consistent with the current code methodology. The proposed reduction in areas for 5 and 6 storey wood frame buildings would be disadvantageous from a cost/benefit standpoint. Further consideration of building area limitations is warranted, as outlined later in this report.
4. Fire protection rated membranes are a secondary line of defense for fires developing from floor areas of sprinklered buildings. Our loss experience suggests that a single layer of gypsum board is sufficient to contain a floor area fire to the compartment of origin. A second layer would add a substantial cost increase (2 layers of board as opposed to one) to achieve a minor potential incremental benefit.

Other aspects of the proposed changes are discussed in the sections that follow. A discussion on our loss experience resulting from the investigation of fires in existing 3 and 4 storey buildings both sprinklered and unsprinklered is provided in **Section 3.0**. A more detailed discussion on risk/cost/benefit relative to the proposed changes is provided in **Section 4.0**.

Table 1 : GHL Proposed Code Changes and SRC Commentary

Item	Issue	Solution Proposed by the Code Change	Division B Reference	SRC Comment
1	Building height	Permit 5 and 6 storeys.	3.2.2.45.(1)	Agree-in-principle
2	Building area	Limit building area to 5 storey at 1440 m^2 and 6 storey at 1200 m^2.	3.2.2.45.(1)	Agree-in-principle – consider cost/benefit/risk assessment to allow increased building areas
3	Building shrinkage	An appendix note reminding designers that design of 5 and 6 storey wood-frame buildings shall include consideration for shrinkage.	A-3.2.2.45.(1)	Agree-in-principle – move to Part 4 Structural
4	Qualification of designers	An appendix note stating the need for qualified professionals and Best Practices Guides.	A-3.2.2.45.(1)	Consider further review – code and specialist expertise may not be available in all jurisdictions
5	Fire rated floor assembly	Increase reliability of floor FRR	3.2.2.45.(5)	Consider further review - see discussion on risk/cost benefit
6	Fire rated floor assembly	An appendix note explaining the intent of item 5.	A-.2.2.45.(5)	Consider further review - see discussion on risk/cost benefit
7	Limitation on building physical height	Uppermost storey shall not exceed 18 m.	3.2.2.45.(6)	Agree-in-principle
8	Exterior cladding	Noncombustible exterior cladding. Combustible cladding permitted only if it meets CAN/ULC-S134, or vinyl on GWB cladding. Also explicitly permit use of wood nailing elements when conditions are met.	3.1.4.1.(1), (3), (4), (5), and (6)	Agree-in-principle - see SRC loss experience. Disagree on provision of requirements for exterior vinyl siding or fire retardant shakes.
9	Use of horizontal exit	Permit the required exits in a floor area to be entirely consists of horizontal exits, if the exits lead to a floor area that has exit stairs.	3.4.1.6.(1) and (3)	Neutral – see discussion on egress
10	Use of hold-open device	Permit use of hold open devices for horizontal exits.	3.1.8.12.(1)	Neutral – see discussion on egress
11	Balcony sprinkler	Sprinklers in balconies exceeding 600 mm in depth.	3.2.5.13.(9)	Consider further review – see discussion on risk/cost benefit
12	Vertical concealed spaces	Address fire spread in vertical concealed spaces.	3.1.11.5.(3)	Consider further review as to necessity of requirement
13	Exit fire separation	Increase reliability of exit fire separation.	3.4.4.1.(4)	Consider further review – see discussion on risk/cost benefit
14	Exit fire separation	Appendix A note explaining the intent of Item 14.	A-3.4.4.1.(4)	Consider further review – see discussion on risk/cost benefit
15	Limited ULC tested designs	Permit in Appendix D-2.3.3. the use of double layer designs when supported by appropriate fire test data.	D-2.3.3.(4)	Consider further review – see discussion on risk/cost benefit
16	Reference to NRC documents	Add to the current list of fire test reports in D-6.1. the NRC fire tests on floor and wall assemblies.	D-6.1	Consider further review – see discussion on risk/cost benefit

3.0 SUMMARY OF SRC LOSS EXPERIENCE

Senez Reed Calder Forensic Engineering Ltd., a sister firm to Senez Reed Calder Fire Engineering Inc., is engaged in the practice of investigating fires and analyzing building construction relative to fire growth and spread. The company actively investigates hundreds of mostly large loss fires each year, and has directly examined fire growth/spread mechanisms and other issues relative to combustible construction.

In analyzing large loss fires in completed buildings of combustible construction, we note the following experience:

Floor Area Fires (Sprinklers)

- The spread of fires in sprinklered buildings of combustible construction has been controlled by sprinklers where the fire is initiating inside the floor area of the building. The primary form of control in sprinklered buildings is by means of active suppression and therefore the secondary fire-rated membranes are only challenged when the sprinkler system fails. During the course of a sprinkler-controlled fire, the fire rated membranes act primarily for smoke control.
- In unsprinklered buildings, point source floor areas fires are generally controlled to the suite or compartment of origin, unless aided on the exterior by combustible cladding. Limiting the spread of these fires internal to the building has been achieved through the current passive measures of the code in requiring compartmentalization.

Concealed Spaces Fires

- Fires developing in concealed wall and ceiling spaces have spread where there are deficiencies in the fire stopping/blocking within the cavities.
- Fires developing in concealed wall and ceiling spaces that have been properly fire blocked are generally contained to the concealed space.
- Large fires can develop in crawl spaces and roof cavities and impact the entire building structure either due to collapse, drop down, water damage, or the complications of the subsequent repair.

Exterior Fires

- Large fires can develop up a combustible façade of a building, whether originating from within the floor area in an unsprinklered building or on the exterior of a building such as on a patio or balcony.
- Fires that develop on the exterior of the building, whether sprinklered (to NFPA 13R) or unsprinklered, can propagate into the roof concealed space (which is unsprinklered) and result in extensive damage to the building well beyond the suite or area of origin of the fire.
- Fires originating from the exterior of the building can go undetected for long periods of time allowing for greater fire development before detection.

Our experience in reviewing the growth and spread of fires in combustible frame buildings indicates that the weak points within the context of the current building code requirements is not relative to the floor area but on the exterior and within concealed spaces of the building. These fires are more likely to propagate well beyond the localized origin, resulting in a much greater fire and water damage. Therefore, instead of having a localized fire confined to one suite with smoke and water damage on the periphery, it is not uncommon to see entire sections of the wood-frame building fire damaged, with the roof destroyed, and water damage throughout.

4.0 RISK/COST-BENEFIT OF PROPOSED CHANGE IMPLEMENTATION

The framework for gathering statistical data in British Columbia does not correlate with the individual requirements in the building code. Therefore, although it may be possible to filter the data in an approximate fashion to consider fire damage in combustible buildings, this information will not identify aspects of combustible construction that may be more prone to allowing for large loss fires.

If we consider the loss experience described in the previous section of this report, an alternative strategy would be to regulate mechanisms that would facilitate the development of fire propagation within wood-frame buildings in order to optimize the existing compartmentalization requirements.

These concepts can further allow considerations on a cost-benefit basis in order to incorporate changes to the code that add the most value in limiting risk, while forgoing other more onerous changes that have only marginal value. This approach would therefore consider the proposed changes in a different light and provide for other changes that allow for overall risk reduction over the current basis of the code.

4.1 COMPARTMENTALIZATION

The BC Building code addresses fire spread internal to the building through the provision of fire separations between residential units, public corridors, service rooms, floor areas and shafts.

The GHL code changes propose maintaining the current concept of maximum gross floor area that would reduce the overall building area to 1220 m^2 for a six storey building from the current 1800 m^2 for a combustible sprinklered 4 storey building. In this concept, the overall fuel load between firewalls or spatially separated buildings would not change, and correspondingly there is no qualitative increase in risk.

However, this risk concept is based on a total failure of the building and the subsequent involvement of all of the building framing and contents. In isolation to the other changes proposed, increasing the building height would facilitate fire spread and subsequent water damage. This increase is alleviated through the code change proposal for noncombustible exterior cladding; however, the greater risk to water damage to multiple storeys of the building would still remain.

It is unclear how the proposal would offer a significant advantage to the construction industry as it would have the same or a reduced number of suites within the same volumetric space. This may increase the flexibility of building configurations on small lots, but will not allow greater floor area available for occupancy. Therefore, the extent to which the proposal would achieve value may need to be considered further from an economic perspective.

In today's gypsum board protected, significantly compartmentalized, completed wood frame buildings, the potential for involvement of the entire structure is significantly reduced from the era that the height and area limitations were developed (the 1910's).

In considering the loss experience described in the previous section, the potential for large loss fires in buildings can be significantly reduced through:

1. Controlling fire spread on the exterior of buildings in the form of noncombustible or fire spread limiting materials. Exterior cladding is the most significant mechanism for large loss fires spreading beyond the compartment of origin.

   In this regard, the proposal in the GHL recommendations for noncombustible cladding would achieve this objective. However, until further study is completed to support the other proposed systems, it would be prudent to limit the scope to noncombustible construction (including ULC S134 systems).

2. Eliminating crawl spaces and open roof spaces that are not sprinklered.

3. Providing roof venting from the top and eliminating open soffits above openings.

The implementation of the above recommendations would substantially reduce the potential for multiple fire compartments within a building becoming involved in fire, and in turn, substantially reduce the qualitative risk associated with existing wood-frame construction. Therefore, a five and six storey wood-frame building would be less risk than current 3 and 4 storey wood-frame buildings.

In doing so,

4. Consideration could be given to increasing, or maintaining the building area for a 4 storey combustible building (1800 m^2) in the 5 and 6 storey applications.

This methodology would be consistent with that adopted by some European countries which limit construction requirements through compartmentalization.

It is advantageous to have commercial space on a main level in today's neighborhood housing and increased building density. However, when several combustible buildings are constructed above noncombustible slabs, issues with continuity of firewalls impede the ease at which these buildings can be developed within the current code. The use of commercial space on the lower level generally eliminates the need for crawl spaces and would consequently reduce the need for a large open area beneath multiple residential suites.

The BCBC currently has a similar framework for the construction of buildings above parking structures under the requirements of 3.2.1.2. in Division B, Part 3 of the BCBC. Extending this rationale to above grade commercial levels would facilitate the provision of assembly, shops, and retail facilities.

Conceptually, this would allow for one or two levels of commercial with a 2 hour slab separating combustible components. The main advantage would be to:

5. Allow firewalls separating combustible buildings to terminate at a 2 hour concrete or masonry horizontal slab at either the first or second storey. This would offset the need to extend the firewall through the lower levels of the building. This delineates the building area of combustible construction and greatly increases flexibility on the lower levels.

The above would eliminate the risks associated with concealed crawl spaces, while allowing construction of lower levels in accordance with the requirements for noncombustible construction. This would lower the overall risk to the presence of combustible construction on the project with any risks associated with a commercial level being addressed by other parts of the BCBC. The risk/cost-benefit associated with these changes would likely realize good value and meet the objectives of the current BCBC.

4.2 FIRE-RATED MEMBRANES

Our experience relative to the performance of a single layer of gypsum board in fire compartment exposed to floor area fires would not support the costs associated with additional layers of gypsum board as proposed in the GHL recommendations. In unsprinklered wood-frame building fires, the fire-rated membranes have generally limited the propagation of fire to the compartment of origin. In sprinklered buildings, floor area fires are generally contained by the sprinkler system. Therefore, the fire-rated membrane in sprinklered buildings serves as a redundant passive system to the primary active system.

The GHL proposal would add significant cost to the construction of a project, reduce accessibility within the floors for fire departments to attack concealed space fires, and increase the costs of overhaul and repair following a fire.

Given limited loss experience to correlate a significant risk to fire spread, the proposal would offer reduced cost/benefit with a minor decrease in risk.

4.3 ACTIVE FIRE SUPPRESSION

The GHL proposal recommends adopting the NFPA 13 standard for sprinklers along with a proposal from the City of Vancouver with respect to balconies. Since NFPA 13R is limited to four storey buildings, this change will be automatic.

The City of Vancouver requirement for sprinklers on balconies over 600 mm was derived based on the presence of combustible cladding in buildings following experience of Vancouver Fire & Rescue Services with barbeques on balconies. It was intended to address buildings sprinklered according to NFPA 13R. No technical basis could be determined for the 600 mm criteria.

The potential for fire propagation from a balcony is proposed to be controlled through the use of noncombustible cladding materials. Since the City of Vancouver requirement was derived for purposes of addressing balconies with combustible cladding the cost/benefit of adopting a change to balcony sprinkler

protection beyond the requirements of NFPA 13 is unlikely to add a measurable improvement to the overall life safety risk.

4.4 FIRE ALARM AND EGRESS

The concepts on fire alarming contained within the BCBC have not been altered in many years. However, the technology of modern addressable systems allow for greater knowledge and interpretation of data than has previously existed. Egress and exiting is generally addressed in the BCBC by regulating travel distance and allowing areas that provide temporary protection from the fire and smoke. The underlying presumption is that people will leave when the alarm sounds.

Buildings are often designed and separated for purposes of determining construction requirements but are interactively dependent from a fire alarm standpoint. Addressing evacuation concepts and movement of people to increasing zones of safety through horizontal exiting and/or movement to increasing levels of protection allows the fire department better facility to source the fire and facilitate evacuation on a priority basis. The GHL proposal to allow for horizontal exits is a global issue and should be considered for all applications, and not just five and six storey applications.

The human behavioural response to fire alarms has been researched in recent years, and the value of delivering information to occupants during a fire alarm condition provides a formidable way to effect a controlled evacuation and address behaviour response issues. These concepts are unaddressed in the current prescriptive framework of the code.

Applying a global approach incorporating horizontal movement would be advantageous in directing evacuation to those that may be reluctant to use or access stairs, such as persons with disabilities and seniors.

Some simple measures that would add value at relatively low cost include:

- The provision of a voice communication system,
- The use of at least one horizontal exit within a floor area (through a firewall) or the provision of a subdivided public corridor into two zones,
- Using staged alarming between fire alarmed buildings.

The above would be a high value offsetting measure in lieu of placing further restrictions on building area and would address the specific issues associated with increased building area - evacuation.

4.5 FIRE DEPARTMENT RESPONSE

The GHL report indicates that the primary fire department response, given a sprinklered building would be entry into the building to suppress the fire.

This is consistent with our observations of fire department response in 3 and 4 storey existing wood-frame buildings, including unsprinklered buildings. However, when fires have extended beyond the compartment of origin due to fire spread in concealed spaces, there has been a need for aerial ladders to assist in fire suppression.

Additional design features that would support fire suppression could include:

- The provision of fire walls to separate building components – allows one building to be used as a staging area for evacuation and suppression activities,
- The provision of access to attic spaces from any stairs.

Further, consideration could be given to:

- Reach and availability of aerial ladders to portions of the building perimeter,
- Water supply availability in the event of a sprinkler system failure.

5.0 SUMMARY

This report reviews the proposed building code changes to permit 5 and 6 storey residential buildings. These changes are being evaluated in the context of the BC Government's mandate to consider 5 and 6 storey buildings as a means to achieve more cost-effective housing.

The proposed Part 3 changes to the building code are technically supportable within the context of the current code requirements. The approach developed in this report provides a qualitative rationale to support 5 and 6 storey wood-frame buildings. The approach:

- Provides a basis to allow for greater building areas than proposed in the changes where wood-framing, combustible construction is used.
- Supports changes that limit wood-frame construction conditions that facilitate the potential for large loss fires in combustible buildings.
- Weighs the benefit of adding layers of gypsum board to increase redundancy on secondary passive fire membranes where experience has shown that single layered membranes have been effective.
- Improves safety and reduces risk with modern fire alarm technology and strategize compartmentalization.
- Recognizes the available resources of modern fire departments.

This approach offers a better cost-benefit balance in weighing the potential value in the context of fire life safety that each change requires in combustible buildings constructed under the current BCBC combustible construction requirements. Applying a risk/cost-benefit approach could allow for increased building areas of combustible construction.

Our research into the conceptualization of building area and height requirements indicates that the technical formulation in defining the limits is lacking foundation, and does not address the potential that can be realized with today's knowledge of fire science, modern construction materials and methods, decades of improvements to fire alarm technology, and today's understanding of human response to fires and alarm. This is outside the limited scope of the current proposed changes; however, it could be addressed.

APPENDIX A

Letter from RKTG Associates Ltd. on Structural Aspects of Proposed Code Changes

RKTG
ROBERTSON KOLBEINS TEEVAN GALLAHER ASSOCIATES LTD
CONSULTING ENGINEERS

November 1, 2008

Senez Reed Calder Forensic Engineering Ltd
Unit 520 – 5600 Parkwood Way
Richmond, B.C. V6V 2M2

Attention: Mr. Peter Senez

Dear Sir:

Re: Stage 2 Report (Draft) for 5 and 6 Storey Wood-Frame Buildings Group C

I am pleased to provide a few comments with respect to the proposed code changes based on an initial reading of the draft last week with respect to issues of structural integrity.

Pg 8 of 37 The structural engineer is required to identify building movement due to shrinkage *and compression of multiple wood assemblies* to the design team .....

Pg 12 of 37 ... 18m criteria to the *roof* of the 6th storey ... would be consistent with Appendix A and the general guide of 3m per floor.

Pg 15 and 18 of 37 rationale ... rated structural capacity of attachments such as exterior cladding may not be available for wood furring strips and combustible wood cladding which are subject to deterioration. Durable non-combustible cladding above 12 m height is preferred at this time. This may be subject to a structural review of increased wind and seismic design loads and proposed cladding details in these areas of increased building exposure to assure a lifespan that is a reasonable fraction of the proposed lifespan of the core building.

Pg 21 of 37 With respect to travel distance and possible seismic damage to exit stairways, the increase in travel distance to 180 m (600 feet) to an alternate vertical exit is considerable. A maximum travel distance of 60m to an exit stairway on each floor is reasonable for residential occupancy and beneficial such that at least one exit stairway exists for each independent building.

Pg 31 of 37 5) For five and six storey wood-frame structures in seismic zones the stairwell woodframe shear walls shall be designed to restrict lateral drifts such that lower exit doors to the building exterior shall remain operational and functional after seismic yielding and permanent set.

Pg 31 of 37 6) For five and six storey wood-frame structures the bottom two floors shall be designed with D-Fir or engineered wood that is better able to adequately carry vertical loads from above stories without crushing when wood sills are wet with reduced load-bearing capacity. This requirement is based on a practical need to endure moisture temporarily and rehabilitate lower floors after fire suppression by removing wall finishes. Original building geometry shall be maintained.

I trust that you will find the above summary acceptable. If you have any questions please call.

Yours very truly,
RKTG ASSOCIATES LTD.

Robert Wills, P. Eng., Struct. Eng.
B.C., Alberta, Yukon

APPENDIX B

Letter from Busque Engineering Ltd. on Environmental Envelope Aspects of Proposed Code Changes

Busque Engineering Ltd.

File: 2008-002
Date: 03. Nov. 2008

Peter L. Senez, P.Eng.
SENEZ REED CALDER FIRE ENGINEERING INC.
520 - 5600 Parkwood Way, Richmond, BC,
V6V 2M2
CANADA

Email: psenez@flashover.ca

RE: Amending the Building Code to Permit Up to and Including 6 Storey Wood-Frame Buildings of Residential Occupancy, Stage 1 and Stage II Reports (the "Reports")

Dear Mr. Senez,

In this document, this proposed amendment, stated above in the reference header, will be referred to as the "Amendment".

As per your request, Busque Engineering Ltd. ("BEL") has reviewed the Reports to provide an opinion on the findings of the Reports with regards to the Amendment's impact on the Building Envelope.

BEL is in substantial agreement with the findings contained in the reports with one exception.

On Page 25 of the Stage 1 Report contains the following statements:
Risk of Failure of Environmental Separator, Leading to Safety Risk –Risk not likely to increase
"Part 5 provisions require the design of environmental separators to include building materials, components and assemblies to accommodate all loads, and resist any deterioration, that may be reasonably expected, given the exposure...."

My review of Part 5 did not uncover a reference to the environmental load represented by construction moisture. Past editions of the Part 5 of the British Columbia Building Code (BCBC), contained a clause that stated that "The design and structural requirements of other Parts of this Code shall apply." This clause permitted the design professional to enforce a Part 9 requirement that limited the moisture content of the wood use in constructing buildings. Part 5 of the 2006 Code does not contain such a statement.

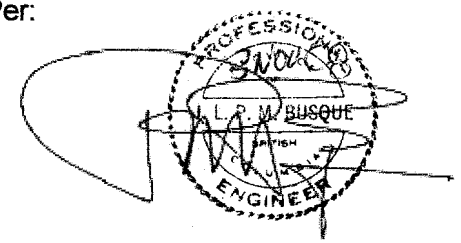
Table 6 P. on Page 24, lists some of the Technical Risk that the 2006 Code addresses. One of these is the ***Structural safety risk due to failure of environmental separator*** corresponding to Code objectives OS 2 Structural Safety and OS 2.3 Damage to or deterioration of building elements.

In my opinion, constructing taller wood frame buildings will extend the exposure of the wood used to construct these buildings to moisture during the construction period. This signifies that wood is likely to be at a higher moisture content at the time that the other elements of the building envelope are installed. This may leave the building envelope more susceptible to damage from shrinkage of the wood frame or to deterioration due to construction moisture.

We recommend adding wording in the Amendment limiting the moisture content of wood in a building structure in order to avoid damage to the building envelope cause by shrinkage or deterioration of the wood frame.

Please do not hesitate to contact me if you wish to discuss.

Busque Engineering Ltd.
Per:



Pierre-Michel Busque, P.Eng.