Research to understand gaps in the BC Building Code as applied to high performance building design and construction

Prepared by: Shiva Zargar, UBC Sustainability Scholar, 2023

Prepared for: Kevin Ramlu, CEM | Green Buildings Manager. Permit, License & Inspection Services | Community Development, Township of Langley

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Cover photo by Scott Blake on Unsplash

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Executive Summary

This comprehensive report aims to identify gaps within the knowledge of the Alternative Solutions Pathways of the British Columbia Building Code (BCBC), with the goal of minimizing risks from using non-approved or unfamiliar construction materials. These materials are often employed by builders aiming to meet the higher requirements of the BC Energy Step Code. Our research focuses on above-ground wall assemblies, categorizing these into two groups for comparison with the BCBC: those aligning with Acceptable Solutions, and those requiring evaluation through the Alternative Solutions pathway. We strive to streamline the construction process, reduce uncertainties, and enhance compliance with safety standards and best practices.

In response to numerous inquiries received by the Township of Langley regarding compliance regulations, we have tackled several challenges surrounding compliance expectations, material approvals and standards, and the emergence of new products. Our research questions aim to explore efficient access to compliance requirements, the BCBC's requirements, manufacturing and packaging standards regarding material approvals, evaluating emerging products for compliance, and the criteria for alternative materials or approaches to meet equivalent performance standards.

The methodology of this report consists of detailed conversations with the knowledgeable staff at the Township of Langley and employed a structured survey approach to assess the utilization of new materials. The survey results, combined with an in-depth analysis of the technical and manufacturing specifications of these materials, inform the recommendations presented in this report.

In an effort to enhance builders' understanding of BCBC compliance, we suggest implementing educational programs, raising awareness among builders about readily available resources, and engaging with industry specialists and consultants, and as a last resort, seek support from Township authorities. A comprehensive step-by-step guide is also provided to help builders assess the compliance of construction products with the BCBC. Ultimately, this report provides valuable insights to stakeholders in the construction industry, contributing to the enhancement of construction practices within the jurisdiction of the Township of Langley. In conclusion, if you are contemplating using materials categorized as alternative solutions, ensure you allocate adequate time and budget accordingly.

Introduction

Background and Context

The Building Code, implemented and overseen by municipalities through building inspections and professional oversight, was designed with a paramount objective- to safeguard public health, ensure safety, prevent fire hazards, guarantee structural integrity, promote accessibility, and comply with energy and water regulations. Simultaneously, it provides the building industry with a well-defined set of expectations and requirements, fostering a level playing field that encourages fair competition among builders and professionals. By upholding these principles, the Building Code serves as a cornerstone for constructing safe, efficient, and inclusive buildings that benefit our communities (Theckethil, 2006).

The BC Energy Step Code (Energy Step Code) implemented in April 2017, is a provincial standard in British Columbia designed to promote energy-efficient buildings beyond the basic BC Building Code (BCBC) requirements. It sets a series of incremental, performance-based energy efficiency standards that builders must adhere to during construction. As of May 1, 2023, Step 3 has become the new baseline requirement (BCBC, 2018c).

The BC Zero Carbon Step Code (Zero Carbon Step Code) which was introduced in 2021 as part of the CleanBC Roadmap to 2030 climate plan, reflects the province's commitment to ensuring all new buildings have zero greenhouse gas emissions from their operations by 2030. This regulation provides a pathway to achieve this goal and allows local governments to incorporate the Zero Carbon Step Code into their building bylaws starting May 1, 2023. Throughout this report, the term "Step Code" refers collectively to both the BC Energy Step Code and the Zero Carbon Step Code (BCBC, 2018c).

In the realm of the building industry, the adoption of a performance-based compliance framework has led to substantial advancements and advantages. Nevertheless, there arises a pertinent inquiry concerning the British Columbia Building Code (BCBC) as to whether it possesses inherent constraints or potential limitations amid the emergence of innovative strategies. This query is primarily driven by the restrictions imposed by the Acceptable Solutions sections of the BCBC, dictating the acceptable employment of materials, methods, and other facets and the necessity to contemplate alternative pathways for the potential adoption of novel approaches. Such examination seeks to shed light on the adaptability and adaptivity of the BCBC in accommodating progressive building practices.

In recent times, building practices across the province have revealed an interesting trend. Builders who strive to meet the higher standards of the Step Code or similar programs often opt for materials that are not officially recognized or approved by the BCBC, as specified in the Acceptable Solutions sections. In the realm of building regulations, there exist two distinct pathways: the Performance Path and the Prescriptive Pathway (9.36.2 to 9.36.4). Unlike the Prescriptive Pathway, which sets minimum standards, the Performance Path grants builders the flexibility to determine the energy performance of specific building components.

However, this flexibility comes with a responsibility to ensure that the selected materials align with compatibility, safety, durability, and long-term performance standards. This task falls under the jurisdiction of the Authority Having Jurisdiction (AHJ), which is responsible for overseeing compliance with all aspects of the BCBC. An essential aspect of this process involves understanding and evaluating materials that are not listed in the Acceptable Solutions sections of the BCBC, particularly beyond the Energy Step Code section. Such evaluations can sometimes lead to delays in inspection and building permit issuance.

To address these potential gaps and contribute to the enhancement of the Acceptable and Alternative Solutions Pathway within the BCBC, our research endeavours to shed light on these matters. By doing so, we aim to facilitate smoother and more efficient building practices while ensuring adherence to safety and performance standards. The project focuses on above ground wall assembly material components such as sealants, tapes, and air / moisture / vapor barrier membranes only) that are currently used or intended to be used to achieve Step 3 and up.

Research Objectives

The primary objective of this research is to identify possible gaps and actively enhance the knowledge of Alternative Solutions Pathway within the BCBC. By doing so, we strive to minimize the risk of unintended consequences arising from proposing the unknown or non-compliant materials, particularly when aiming to meet the higher standards of the Step Code. Our efforts seek to promote a safer and more reliable approach to construction while achieving the desired energy efficiency targets.

These identified measures, confined to above-ground wall environmental separators, will serve as the foundation for our comparison with the BCBC. Our aim is to categorize these measures into two groups: those that align with the Acceptable Solutions, consisting of materials officially recognized and approved by the BCBC, and those that necessitate assessment through the Alternative Solutions pathway in the BCBC. Alternative Solutions pathway necessitates a detailed

assessment by the applicants, industry experts, and consultants. They are responsible for evaluating the material's performance in line with Canadian Standards and BCBC requirements, then producing a report that highlights the material's attributes. AHJ then reviews this report and verify the documentation for compliance to determine the appropriateness of the material for the specific context. Questions may be asked for clarification. Such procedures can lead to potential delays in permits and inspections, increasing compliance and liability risks for both the AHJ and builders. Through this analysis, our goal is to simplify comprehension of material compliance, diminish uncertainties, and bolster adherence to safety standards and best practices.

Research Approach

This report addresses the challenges and research questions that have been brought to our attention through numerous inquiries received by the Township of Langley. Specifically, the focus is on the compliance requirements of the 2018 BCBC. As a local government responsible for enforcing the BCBC, the Township of Langley plays a vital role in ensuring the safety, efficiency, and sustainability of building construction within its jurisdiction. The increasing number of inquiries regarding compliance regulations highlights the need for a comprehensive exploration of the challenges faced in meeting these requirements. This report aims to delve into the complexities surrounding compliance requirements, material approvals and standards, the emergence of new products, and the interplay between the BCBC and the Provincial Energy Step Code. By addressing these challenges and investigating into relevant research questions, this report endeavours to provide valuable insights and guidance to stakeholders in the construction industry, as well as researchers and policymakers involved in building code regulations and energy efficiency standards.

The challenges include:

Understanding of Compliance: Understanding of compliance is vital for builders and professionals in the construction industry, as they need to know whom to consult for accurate information regarding the compliance requirements for the specific sections of the BCBC. Two primary options emerge in this context: First option is consulting industry experts and professionals. After exhausting this option, or for more overarching questions, the second approach involves directly engaging with the Township of Langley authorities. The AHJ's role is to enforce the building code and provides support in terms of industry education; but not through individual consultation.

Subscriptions and enforcement: It's important to note that the BCBC can be accessed freely and easily on bccodes.ca. Local governments, including the Township of Langley, adhere strictly to the BCBC in its entirety.

Material approvals and standards: Exploring the requirements and standards listed in the BCBC and understanding how they should be adhered to is crucial for compliance.

Emerging products: The appearance of new products in the local market that may not have been tested, manufactured and packaged as per BCBC, or integrated into the BCBC as acceptable solutions. Researching these emerging materials, their performance, and potential limitations can help in evaluating their compliance with the code.

Performance-based compliance: Alternative materials or approaches may be allowed if they can provide equivalent performance. Investigating the specific performance requirements for products and the process for obtaining approval for alternative solutions is an important step that needs to be taken through consultants or experts.

In accordance with the identified challenges, this report will address the following questions to shed light on various aspects of compliance within the construction industry and the British Columbia Building Code (BCBC). Through comprehensive research, the report aims to provide answers to these critical inquiries.

1. How can builders and professionals in the construction industry efficiently access and comprehend compliance requirements for specific sections of the BCBC? What are the best approaches to ensure accurate information dissemination and accessibility to compliance-related resources?
2. To what extent does the local government enforce the code?
3. What are the explicit requirements and standards outlined in the BCBC concerning material approvals, and how should these be adhered to by builders and professionals? Are there any challenges or ambiguities in interpreting and implementing these standards in practice?
4. How can the local market's emerging products, which may lack established testing, approval, or integration into the BCBC's acceptable solutions, be effectively researched and evaluated for compliance? What performance parameters and limitations should be considered in assessing the compliance of such materials?
5. Regarding performance-based compliance, what are the specific criteria for alternative materials or approaches to meet equivalent performance standards? How can the

approval process for alternative solutions be streamlined to facilitate compliance without compromising safety and code requirements?

The methodology for obtaining answers to these questions is detailed in the following methodology section, while the answers themselves are provided in the findings section.

Methodology

To address the first and second research questions, we engaged in productive conversations and discussions with the knowledgeable staff at the Township of Langley. Their valuable insights and expertise provided essential information regarding compliance understanding and enforcement practices.

For the third to fifth research questions, we employed a structured survey approach to comprehensively assess the availability and utilization of new materials within the province of British Columbia, with a particular focus on their integration into construction projects adhering to the upper Steps of the BC Energy Step Code. Furthermore, we conducted an in-depth analysis to evaluate the compliance of these new materials with the BC Building Code. The evaluation process involved assessing the new materials against two essential criteria: technical specifications and manufacturing specifications.

Technical specifications encompassed detailed information derived from websites, technical sheets, and materials provided documentation. By comparing this data against the required compliances stipulated in the BC Building Code, we assessed the degree of alignment with regulatory standards. On the other hand, manufacturing specifications referred to the compliance-related information provided on the packaging of the materials. This data enabled us to ascertain whether the materials adhered to the relevant compliances. In the assessment process, materials are classified into three categories based on their compliance with the BCBC and required standards. If a material completely adheres to the BCBC and required standards, it is deemed an “acceptable solution”. If a material meets certain criteria, like adhering to the technical standard, but fails to meet others, such as the manufacturing standard, it is considered to have partial compliance and may be categorized as an “alternative solution.” On the other hand, if there's insufficient information available to determine the material’s adherence to any of the standards, it is provisionally labelled as “unknown” until more comprehensive data is obtained.

Survey Design

Designing the survey questionnaire was a meticulous process that incorporated multiple components. First, we conducted an extensive literature review to gather insights from suitable research methodology (Lietz, 2010; Martin, 2004; Roopa & Rani, 2012; Taherdoost, 2016). This literature review provided a solid foundation for formulating relevant and informed survey questions. Additionally, internal discussions with stakeholders within our research team further refined and validated the survey questions, ensuring their relevance, clarity, and effectiveness in gathering the necessary data.

The survey format and questions are provided below:

This survey aims to gather information about products you are using or thinking of using in the construction of BC Energy Step Code, or other high-performance Part 9 homes. We are focused specifically on above-ground envelope assembly products.

The information collected is anonymous and will help us better understand if the products being used or considered can cause delays in Building Permit issuance. In partnership with the UBC Sustainability Scholar Program, our Scholar will create a report and share results with you and other stakeholders across the province.

This survey will take approximately 5-10 minutes to complete.

1. What is your profession? (If you prefer not to disclose, select “Not applicable”)

☐ Builder

☐ Developer

☐ Tradesperson

☐ Contractor

☐ Consultant

☐ Other (please specify)

☐ Not applicable

2. How many Step Code or other high-performance homes have you built?

☐ Less than 10

☐ 10-30

☐ 31-100

☐ 100+

3. Which of the following products do you use in your Part 9 Step Code or other high-performance residential construction projects? (Select all that apply)

☐ Sealant

☐ Tape

☐ Air barrier membrane

☐ Moisture barrier membrane

☐ Vapor barrier membrane

☐ Insulation

4. Please provide the following details for the products:

Exact name: _____

Brand: _____

Model: _____

Product link (optional): _____

5. Would you like to add any more above-ground assembly products that you used or you are planning to use in the construction of BC Energy Step Code, or other high-performance Part 9 homes?

☐ Yes

☐ No

If yes, questions 4 repeats; if No:

If you have any further comments, please feel free to include them below.

_____

Findings and Analysis

Compliance Understanding for Builders in the Construction Industry

Compliance understanding is a vital aspect for builders and professionals in the construction industry, as it ensures adherence to safety standards and regulatory requirements. Accurate knowledge of compliance requirements for specific sections of the BCBC is essential to guarantee the construction of safe and compliant buildings. In this report, we address the challenges faced by builders in understanding compliance and provide solutions to improve their compliance knowledge.

1. Recommendations for Enhancing Compliance Understanding

To help builders better understand compliance, we recommend not only referring to the BCBC but also utilizing available resources, consulting with experts, and participating in educational programs and workshops. Additionally, it's beneficial to contact the AHJ in advance, allowing ample time to address complicated and specific questions. These initiatives will empower builders with the necessary knowledge to navigate the code effectively. Developing easily accessible resources, such as online guides or handbooks, that outline compliance requirements for various sections of the BCBC. These resources will serve as valuable references for builders during the construction process. If builders are considering using a material and are uncertain if it's an acceptable solution, they should plan ahead. It's advisable to consult with an expert and reach out to the AHJ for additional guidance, if required. Township authorities can provide valuable support in interpreting and complying with the BCBC.

2. Point of Contact:

All AHJs provide the contact details for their respective departments on their websites. You can browse their site to gather the necessary contact information. For the Township of Langley, you can find contact information on the Township of Langley website (www.tol.ca). Navigate to

'Connect', then 'Contact Us', and select the relevant department, such as 'Building Permit Inquiries'.

Subscriptions and Enforcement

The BC Building Code (BCBC) does not require a subscription for access. The BCBC is publicly available and can be accessed online through the British Columbia government's website www.bccodes.ca or other official channels. Users can view and download the code, which includes regulations and standards related to building design, construction, and safety in British Columbia. The enforcement of the BC Building Code (BCBC) by the Township of Langley is carried out diligently to ensure the safety, integrity, and compliance of building projects within its jurisdiction. Township authorities play a pivotal role in overseeing construction activities and verifying that they adhere to the standards set forth in the BCBC. Building officials, with their expertise and knowledge of the code, conduct thorough inspections and assessments during various stages of construction. They support builders, developers, architects, and other stakeholders to provide guidance, resolve compliance queries, and ensure that all necessary permits are obtained before construction commences. The Township of Langley's commitment to support the creation of resilient and safe structures that align with the requirements of the BCBC, fostering a built environment that prioritizes the well-being of its residents and visitors.

Material approvals, Standards, and Emerging Products

Understanding the requirements and standards outlined in the BC Building Code (BCBC) and ensuring their proper adherence are essential aspects of achieving compliance in construction projects. Researching emerging products in the local market, which might not have undergone testing, approval, or integration into the BCBC's acceptable solutions, is a critical endeavor. Such research enables the evaluation of their compliance with the code and identification of potential gaps in existing standards. Moreover, innovative products or approaches offering equivalent performance to acceptable solutions may be considered. In the upcoming section, we will delve into the investigation of the properties of these emerging products and their alignment with the BCBC.

Survey Results

The responses to our recent survey offer a unique insight into the current state of high-performance building design and construction within British Columbia. The survey, which targeted members of prominent associations like the Mechanical Contractors Association BC and

Home Builders Association Vancouver, garnered a total of 34 responses. These participants encompassed various key roles within the industry: developers (8 respondents), builders (13 respondents), consultants (7 respondents), contractors (1 respondent), and residential designers (1 respondent). Interestingly, some participants chose to exercise their option of nondisclosure in terms of professional identity.

When questioned on their experience with the Step Code or other high-performance homes, the bulk of respondents (19 out of 34) indicated they had built fewer than ten such structures (Figure 1). This highlights a potential knowledge and experience gap within the industry in relation to high-performance construction. Only one participant had completed between 10 to 30 high-performance projects, while seven had managed between 31 to 100. The most experienced segment, those reporting 100 or more such projects, accounted for six respondents. This highlights a possible disparity in industry experience, which may inform training and educational opportunities to encourage more widespread high-performance building. In addition to these data, respondents were generous in providing detailed information on construction products, including exact names, brands, models, and product links. This data will form the foundation of our comprehensive analysis, which aims to compare these products against the relevant requirements in the BCBC.

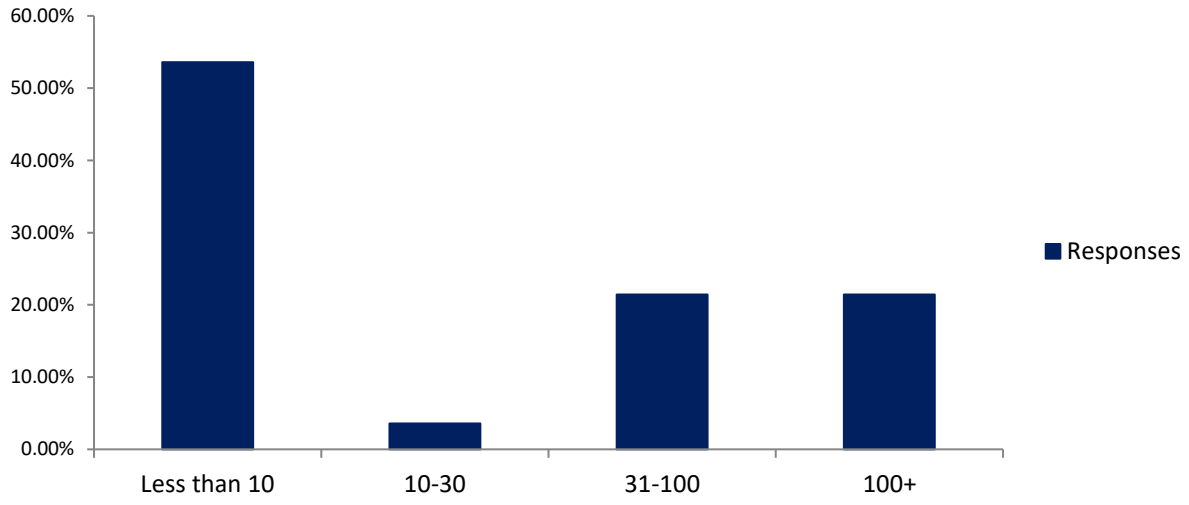

Figure 1 Distribution of Survey Respondents According to Number of High-Performance Homes Built. This chart illustrates the varying levels of experience within our respondent pool in the construction of Step Code or other high-performance homes.

Findings and Cross Reference Against BCBC

In this section, we present the findings of our comprehensive analysis, where we compared various construction products found via the survey against the relevant requirements specified in

the BC Building Code (BCBC). The following sections provide an assessment for each emerging product and tables with a detailed cross reference of the products against the corresponding BCBC information, highlighting instances of compliance with the code's criteria for construction and safety standards.

CertainTeed Membrane "Smart Poly"

CertainTeed Membrane "Smart Poly" underwent evaluation based on two essential criteria: technical specification and manufacturing specification. Given its classification as a vapour barrier, our cross-referencing analysis focused on BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to ascertain its compliance with the specified standards.

Table 1 Compliance Assessment for Air Barrier Systems - BCBC Section 9.25.3

9.25.3.	AIR BARRIER SYSTEMS
9.25.3.1.	Required Barrier to Air Leakage
	1) Wall, ceiling and floor assemblies separating conditioned space from unconditioned space or from the ground shall be constructed so as to include an air barrier system that will provide a continuous barrier to air leakage a) from the interior of the building into wall, floor, attic or roof spaces, sufficient to prevent excessive moisture condensation in such spaces during the winter, and b) from the exterior or the ground inward sufficient to i) prevent moisture condensation on the room side during winter, ii) ensure comfortable conditions for the occupants, and iii) minimize the ingress of soil gas. (See Note A-9.25.3.1.(1).)
9.25.3.2.	Air Barrier System Properties
	See Note A-9.25.5.1.(1).) 1) Air barrier systems shall possess the characteristics necessary to provide an effective barrier to air infiltration and exfiltration under differential air pressure due to stack effect, mechanical systems or wind.
	2) Where polyethylene sheet is used to provide airtightness in the air barrier system, it shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."
9.25.3.3.	Continuity of the Air Barrier System
	1) Where the air barrier system consists of an air-impermeable panel-type material, all joints shall be sealed to prevent air leakage.

	2) Except as provided in Sentence 9.25.3.6.(3), where the air barrier system consists of flexible sheet material, all joints shall be a) sealed, or b) lapped not less than 100 mm and clamped, such as between framing members, furring or blocking, and rigid panels.
	3) Where an interior wall meets an exterior wall, ceiling, floor or roof required to be provided with air barrier protection, the air barrier system shall extend across the intersection.
	4) Where an interior wall projects through a ceiling or extends to become an exterior wall, spaces in the wall shall be blocked to provide continuity across those spaces with the air barrier system in the abutting walls or ceiling.
	5) Where an interior floor projects through an exterior wall or extends to become an exterior floor, continuity of the air barrier system shall be maintained from the abutting walls across the floor assembly.
	6) Penetrations of the air barrier system, such as those created by the installation of doors, windows, electrical wiring, electrical boxes, piping or ductwork, shall be sealed to maintain the integrity of the air barrier system over the entire surface.
	7) Where access hatches and sump pit covers are installed through assemblies constructed with an air barrier system, they shall be weather stripped around their perimeters to prevent air leakage.
	8) Clearances between chimneys or gas vents and the surrounding construction that would permit air leakage from within the building into a wall or attic or roof space shall be sealed by noncombustible material to prevent such leakage.

Table 2 Compliance Assessment for Vapour Barriers - BCBC Section 9.25.4

9.25.4.	VAPOUR BARRIERS
9.25.4.1.	Required Barrier to Vapour Diffusion
	1) Thermally insulated wall, ceiling and floor assemblies shall be constructed with a vapour barrier so as to provide a barrier to diffusion of water vapour from the interior into wall spaces, floor spaces or attic or roof spaces.
9.25.4.2.	Vapour Barrier Materials
	1) Vapour barriers shall have a permeance not greater than 60 ng/(Pa·s·m2) measured in accordance with ASTM E 96/E 96M, “Water Vapor Transmission of Materials,” using the desiccant method (dry cup).

	2) Where the intended use of the interior space will result in high moisture generation, the assembly shall be designed according to Part 5. (See Note A-9.25.4.2.(2).)
	3) Where polyethylene is installed to serve only as the vapour barrier, it shall comply with Clause 4.4, Thermal Stability, and Clause 5.7, Oxidative Induction Time, of CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."
	4) Membrane-type vapour barriers other than polyethylene shall conform to the requirements of CAN/CGSB-51.33-M, "Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction."
	5) Where a coating is applied to gypsum board to function as the vapour barrier, the permeance of the coating shall be determined in accordance with CAN/CGSB-1.501-M, "Method for Permeance of Coated Wallboard."
	6) Where foamed plastic insulation functions as the vapour barrier, it shall be sufficiently thick so as to meet the requirement of Sentence (1).

Table 3 Compliance Assessment for Airtightness - BCBC Section 9.36.2

9.36.2.9.	AIRTIGHTNESS
	1)The leakage of air into and out of conditioned spaces shall be controlled by constructing a) a continuous air barrier system in accordance with Sentences (2) to (6), Subsection 9.25.3. and Article 9.36.2.10., b) a continuous air barrier system in accordance with Sentences (2) to (6) and Subsection 9.25.3. and a building assembly having an air leakage rate not greater than 0.20 L/(s·m2) (Type A4) when tested in accordance with CAN/ULC-S742, "Air Barrier Assemblies – Specification," at a pressure differential of 75 Pa, or c) a continuous air barrier system in accordance with Sentences (2) to (6) and Subsection 9.25.3. and a building assembly having an air leakage rate not greater than 0.20 L/(s·m2) when tested in accordance with ASTM E 2357, "Determining Air Leakage of Air Barrier Assemblies," where i) the building will not be subjected to sustained wind loads calculated based on a 1-in-50 hourly wind pressure that exceed 0.65 kPa, and ii) the air barrier assembly is installed on the warm side of the thermal

	insulation of theopaque building assembly. (See Note A-9.36.2.9.(1).)
	2)An air barrier system installed to meet the requirements of Sentence (1) shall be continuous a) across construction, control and expansion joints, b) across junctions between different building materials and assemblies, and c) around penetrations through all building assemblies.
	3) Windows, doors and skylights and their components shall comply with the minimum air leakage requirements stated in a) AAMA/WDMA/CSA 101/I.S.2/A440, “NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights” (Harmonized Standard), and b) CSA A440S1, “Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS –North American Fenestration Standard/Specification for Windows, Doors, and Skylights.”
	4) Vehicular access doors that separate heated garages from unconditioned spaces or the exterior shall be weather stripped around their perimeter to prevent air leakage.
	5) Fireplaces shall be equipped with doors, enclosures or devices to restrict air movement through the chimney when the fireplace is not in use. (See Note A-9.36.2.9.(5).)
	6)Where the airtight material used in the air barrier system is installed toward the exterior of the building envelope, its location and properties shall conform to Subsection 9.25.5. (See Note A-9.36.2.9.(6).)

According to the information available, including RDH Building Science Laboratories Report for CertainTeed MemBrain and ULC Evaluation Report for MemBrainTM Continuous Air Barrier & Smart Vapor Retarder, CertainTeed Membrain complies with CAN/CGSB 51.33-M89 based on its technical specification. The following information has been found for CertainTeed MemBrain that follows BCBC:

1. The air and vapour membrane demonstrates the ability to provide vapour diffusion tested in accordance to ASTM E96/E96M, desiccant method (Method A), with water vapour permeance of less than 45 ng/(Pa·s·m2).
2. The UL evaluation report states that CertainTeed MemBrain has been tested in accordance with CAN/CGSB 51.33-M89, and references specific test results such as

tensile strength, pliability, and membrane material properties. The air and vapour membrane shows the material has the ability to remain pliable without cracks when tested in accordance with CAN/CGSB 51.33-M89, Section 6.3.

3. When air leakage can occur into and out of conditioned space, the air leakage shall be controlled by a continuous air barrier. Any service penetration shall be additionally sealed with manufacturer approved sheathing tape, acoustical and silicone-based sealant.
4. The air and vapour membrane complies and meets the air leakage characteristics of no greater than 0.20 L/(s·m2) when tested in accordance to CAN/ULC S742. When tested in accordance with ASTM E2357, the air leakage characteristics is no greater than 0.20 L/(s·m2) where air barrier is installed on the warm side of the thermal insulation (interior side) and the building shall not be subjected to 1-in-50 hourly wind pressure exceeding +/- 0.65 kPa.

However, no information could be found regarding the manufacturing specification, which would demonstrate if the material is produced in accordance with Canadian standards. Hence, the reviewer recommends considering an **alternative solution** for CertainTeed Membrain “Smart Poly”.

SIGA Majrex "Smart Vapour Barrier", Vapour retarder

SIGA Majrex “Smart Vapour Barrier”, underwent evaluation based on two essential criteria: technical specification and manufacturing specification. Given its classification as a vapour barrier, our cross-referencing analysis focused on BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to ascertain its compliance with the specified standards (Table 1 to 3). According to the information available, including RDH Building Science Laboratories Report for SIGA Majrex, which conducted a review of the current 2015 National Building Code of Canada (NBC), 2018 British Columbia Building Code (BCBC), and the 2019 Vancouver Building Bylaw (VBBL) for requirements related to the prescriptive and functional use of SIGA-Majrex, it partially complies with CAN/CGSB 51.33-M89 based on its technical specification. The following information has been found for SIGA Majrex that follows BCBC:

1. The water vapour permeance values, which are determined based on the ambient relative humidity and the direction of the vapour flow, provide important insights into the material’s performance. It’s important to note that 1 US Perm equates to 57 ng/Pa.s.m2. When tested under standard direction using the ASTM E96/E96M (Dry Cup) method, the material recorded a water vapour permeance of 7.7 ng/Pa.s.m2, or 0.1 US Perms. In

contrast, under reverse direction testing using the same method, the material exhibited a water vapour permeance of .0 ng/Pa.s.m2, which also corresponds to 0.1 US Perms. This suggests that the material's ability to permit the passage of water vapour is consistent regardless of the direction of vapour flow, under the conditions tested.

2. The air leakage rate of the material, even after conditioning, was assessed based on the CAN/ULC-S741- Air Barrier Material- Specification. The requirement of this test is less than 0.02 L/s.m' at 75Pa. Notably, the SIGA-Majrex material outperformed this requirement with a result of less than 0.0001 L/s.m' at 75Pa, demonstrating its exceptional air leakage resistance.
3. Owing to the reinforced design of SIGA-Majrex, the tensile strength and elongation requirements specified in the CAN/CGSB-51.33-M89 standard are not applicable. Instead, the tensile strength was evaluated based on the EN 12311-1 standard for Tensile Properties for Plastic and Rubber Waterproofing Sheets, modified as per EN 13984/ENl 3859-1. While the recommended minimum tensile strength value is 100 N/50mm, SIGA-Majrex far surpassed this benchmark in testing, yielding results of 295 N/50mm in the machine direction (MD) and 255 N/50mm in the cross direction (CD).

Unfortunately, no information could be found regarding the manufacturing specification, which would demonstrate if the material is produced in accordance with Canadian standards. Hence, I recommend considering an alternative solution for SIGA Majrex "smart vapour barrier".

SIGA Wetguard® 200 SA Membrane

SIGA's Wetguard is a sturdy, non-slip membrane that provides semi-impermeable protection for wooden components throughout the construction process. It underwent evaluation based on two essential criteria: technical specification and manufacturing specification. Given its classification as a membrane, our cross-referencing analysis focused on BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to ascertain its compliance with the specified standards (Table 1 to 3). The following information has been found for SIGA's Wetguard that follows BCBC:

1. The water vapour transmission rate of the material, as tested according to ASTM E96 Method A (dry cup method), was found to be greater than or equal to 0.5 US Perms or 28 ($Ng/Pa.m^2.s$), indicating its capacity to resist moisture penetration.

2. In terms of air permeance, as evaluated under ASTM E2178, the material achieved a result of less than 0.02 L/(s.m^2) at 75Pa, thus successfully meeting the performance criteria for this standard.

Based on available data, the Siga Wetguard® 200 SA appears to marginally meet the criteria outlined in CAN/CGSB 51.33-M89, as per its technical specifications. However, the lack of information about its manufacturing process leaves compliance with Canadian production standards unverified. In light of this uncertainty, exploring alternative solutions to the Siga Wetguard® 200 SA is recommended for ensuring full adherence to standards.

SIGA Majvest 200 Air Barrier Membrane

The SIGA Majvest 200 is a diffusion-open facade membrane that offers persistent protection for exterior walls while preserving the effectiveness of thermal insulation. It is resistant to wind and rain, ensuring durability and longevity. The membrane is specifically crafted for use on above-ground, vertical wall surfaces, which could be composed of a variety of materials such as exterior gypsum sheathing, exterior plywood sheathing, oriented strand board (OSB) sheathing, stud walls without sheathing, and masonry. The assessment of the product was carried out on the basis of two critical factors: the technical and manufacturing specifications. As the product is categorized as a membrane, our comparative analysis emphasized BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to determine its adherence to the established standards (as outlined in Tables 1 to 3). RDH Building Science Laboratories Report for SIGA Majvest 200 provide a review of the current 2020 National Building Code of Canada (NBC), 2018 British Columbia Building Code (BCBC), and the 2019 Vancouver Building Bylaw (VBBL) for requirements related to the prescriptive and functional use of SIGA Majvest® 200 as an air barrier material and as a water resistive barrier (WRB). RDH noted that “as SIGA Majvest® 200 satisfies the physical property criteria set by ASTM E2556/E2556M (Type II), and satisfies both the unconditioned ASTM E2556/E2556M and conditioned CCMC evaluation criteria for water vapour permeance; it is in our opinion that SIGA Majvest® 200 meets and exceeds the functional requirements of the NBC 2020, BCBC 2018, VBBL 2019 for use as a sheathing membrane.”

The following information has been found for SIGA Majvest 200 that follows BCBC:

1. The water vapour permeance of the material, as measured by the ASTM E96/E96M (Dry Cup) method, showed that the minimum required standard was significantly surpassed. While the requirement was a minimum of 290 ng/(Pa·s·m2) or 5 US Perms, the test results revealed a much higher permeance value of 4293 ng/(Pa·s·m2), which equates to 75.2 US Perms.

2. When assessed using the ASTM E96/E96M – Desiccant Method, the material's water vapour permeance significantly exceeded the standard, registering a value greater than 4000 ng/(Pa·s·m2), which is equivalent to over 70 US Perms.
3. The material underwent multiple tests to evaluate its air leakage properties. Under ASTM E2178, the air leakage at 75 Pa was measured for both infiltration and exfiltration, resulting in 0.0037 L/(s·m2) and 0.0038 L/(s·m2), respectively. Following conditioning, these values slightly increased to 0.0046 L/(s·m2) for infiltration and 0.0042 L/(s·m2) for exfiltration. When assessed as per the CAN/ULC-S742-11 "Standard for Air Barrier Assemblies – Specification", the air barrier assembly air leakage was tested under ASTM E2357 with a cold temperature chamber at -20°C and after air pressure loading, recording an A1 value of 0.031 L/(s·m2). Additionally, the material successfully passed the wind pressure loading test under ASTM E2357.

Based on the data at hand, SIGA Majvest 200 appears to meet the standards outlined in CAN/ULC-S742, as reflected by its technical specifications. However, it's noteworthy that there is no explicit declaration stating its compliance with CAN/CGSB-51.33-M. Moreover, the manufacturing specifications do not directly indicate that SIGA aligns with Canadian standards. Given these uncertainties, it is advisable to explore alternative solutions to SIGA Majvest 200 to ensure full compliance with standards.

DuPont™ Tyvek® Water Resistive Barrier (WRB)

The DuPont™ Tyvek® Water Resistive Barrier (WRB) product line, which includes Tyvek HomeWrap, StuccoWrap, DrainWrap, ThermaWrap LE, CommercialWrap, and CommercialWrap D, is specifically designed for buildings less than five stories high and low-rise multifamily residential buildings that are less than six stories high. These WRB products provide essential protection and performance for these specific construction applications. The assessment of the product was carried out on the basis of two critical factors: the technical and manufacturing specifications. As the product is categorized as a barrier, our comparative analysis emphasized BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to determine its adherence to the established standards (as outlined in Tables 1 to 3).

As per the installation requirements, DuPont Tyvek Water Resistive Barriers (WRBs) have been rigorously tested in compliance with several critical standards. These include ASTM E 1677, which specifies requirements for air retarder materials or systems for low-rise framed building walls; ASTM E 2178, a standard test method for determining air permeance of building materials; ASTM

E96-05, which measures water vapour transmission; AATCC 127, assessing water penetration resistance; and ASTM E 84, a standard test method for determining the surface burning characteristics of building materials. In relation to SIGA Majvest 200's adherence to BCBC, it was observed that the material demonstrated a water vapour transmission rate of 400 g/m2 per 24 hours, according to ASTM E96-05 Method A. Additionally, under ASTM E96-05 Method B, the product registered a permeability of 54 perms.

The data currently available suggests that the DuPont™ Tyvek Water Resistive Barrier (WRB) somewhat aligns with the specifications defined in CAN/CGSB 51.33-M89, based on its technical attributes. However, without detailed manufacturing specifications, it's impossible to ascertain whether this product conforms to Canadian production standards. As such, due to this informational gap, it's recommended to explore alternative solutions that guarantee compliance with national standards in place of the DuPont™ Tyvek WRB.

Bakor Blueskin VP100 Membrane

Blueskin® VP100, designed for residential and multifamily applications, is a self-adhered, vapour permeable, water-resistive air barrier membrane. This advanced membrane is composed of a scientifically engineered film coupled with a patented, permeable adhesive technology and a split-back poly-release film. For installation, Blueskin® VP100 seamlessly adheres to the wall substrate following a 'weatherboard' technique, eliminating the need for any mechanical attachments.

The assessment of the product was carried out on the basis of two critical factors: the technical and manufacturing specifications. As the product is categorized as a membrane, our comparative analysis emphasized BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to determine its adherence to the established standards (as outlined in Tables 1 to 3). Regarding the compliance of Bakor Blueskin VP100 Membrane with the BCBC, a crucial attribute to consider is its water vapour permeance. When the material was put to the test under the ASTM E96, Method A, it displayed a substantial water vapour permeance value of 1914 ng/Pa.m²s. This value, equating to 33 Perms, is indicative of the material's significant ability to allow the passage of water vapour, a key aspect of its performance in line with BCBC requirements. This finding contributes to our understanding of how the Bakor Blueskin VP100 Membrane adheres to critical standards set forth in the BCBC.

The accessible information indicates that the Bakor Blueskin VP100 marginally aligns with the criteria outlined in CAN/CGSB 51.33-M89, as per its technical specifications. However, in the

absence of details pertaining to the manufacturing process, it remains unclear whether the product adheres to Canadian production standards. Due to this uncertainty, it would be advisable to consider alternative solutions to Bakor Blueskin VP100 that assuredly comply with these national standards.

DuPont™ Styrofoam™ Brand CM20 Extruded Polystyrene (XPS) Foam

DuPont™ Styrofoam™ Brand CM20 Extruded Polystyrene (XPS) Foam, with its resilience against moisture, lightweight nature, and durability, is an ideal extruded polystyrene foam board for a variety of applications. These include interior frame wall sheathing and insulation for both exterior and interior masonry walls in new constructions or renovation projects, as well as insulation for residential basement floor slabs.

In the process of assessing the product, two essential factors were taken into consideration: the technical and manufacturing specifications. Since this product falls under the category of a membrane, our comparative analysis predominantly centred on BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness). This was done with the aim of accurately determining its compliance with the stipulated standards, as further elucidated in Tables 1 to 3.

In the case of SIGA Majvest 200, certain key findings were made in alignment with BCBC. Firstly, when assessed for water vapour permeance under ASTM E96, the material exhibited a permeance value of 1.2 (64) perm (ng/Pa.s.m2), with the maximum value being 2. Secondly, its thermal resistance per inch at a mean temperature of 75°F (24°C) was measured under ASTM C518. The material achieved a minimum value of 5.0 (0.88) Btu.in/ft2.hr.°F, thereby showcasing its capacity to resist heat flow, a crucial feature for insulation materials. These findings contribute significantly to our understanding of how the SIGA Majvest 200 aligns with BCBC requirements.

As per the product information sheet, Styrofoam™ Brand CM20 Insulation meets the standards set forth by CCMC 11420-L and CAN/ULC S701 Type 3. Nevertheless, the lack of explicit confirmation of its adherence to CAN/CGSB-51.33-M, as well as the absence of clear indications in its manufacturing specifications regarding compliance with Canadian standards, raises certain concerns. As a result of these uncertainties, it would be prudent to consider other alternative solutions to Styrofoam™ Brand CM20 Insulation that assure complete conformity with the required standards.

Soprema SOPRASEAL Xpress G

Soprema SOPRASEAL Xpress G is a superior exterior grade gypsum board featuring an inorganic facing and a factory-applied air and vapor barrier on the exterior surface. For secure fastening to the structure, Soprema SOPRASEAL Xpress G boards utilize corrosion-resistant SOPRASEAL Xpress Screws. Soprema SOPRASEAL Xpress G underwent evaluation based on two essential criteria: technical specification and manufacturing specification. Given its classification as a barrier, our cross-referencing analysis focused on BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour barriers), and 9.36.2.9 (airtightness) to ascertain its compliance with the specified standards (Table 1 to 3). The following information has found for Soprema SOPRASEAL Xpress G that follows BCBC:

1. Upon evaluation of its water vapour permeance under ASTM E96, the material was found to possess a significant permeance value of 0.019 (1.1) perm (ng/Pa•s•m2), demonstrating its capacity to control moisture passage.
2. When tested under ASTM C518 for its R-value, a measure of thermal resistance, the material recorded a value of 0.4, indicating its ability to resist heat flow.
3. As per the ASTM E2357 standard for air leakage resistance, the material successfully met the criteria, underlining its effectiveness in preventing air penetration.

The available data indicate that Soprema SOPRASEAL Xpress G marginally aligns with the standards outlined in CAN/CGSB 51.33-M89, as per its technical specifications. However, there is a significant lack of information pertaining to the manufacturing process, which prevents us from verifying whether the product is produced in accordance with Canadian standards. Due to this existing uncertainty, it is recommended to explore alternative solutions to Soprema SOPRASEAL Xpress G that can assure full compliance with national standards.

DELTA-MS (Membrane System)

DELTA®-MS is a powerful waterproofing system, distinguished by its uniquely constructed air-gap membrane. The primary element of DELTA®-MS is a dimple-patterned plastic (HDPE) membrane devised to establish an air-gap along the foundation wall. The innovative design ensures that any water surpassing the dimpled sheet is directed freely toward the footer drain. The membrane exhibits remarkable resistance to both water and water vapour, along with a robust immunity to acids and other substances. Constructed from resilient and tough HDPE, DELTA®-MS boasts an anticipated lifespan of over 50 years. Given its classification as a membrane, our cross-referencing analysis focused on BCBC sections 9.25.3 (air barrier systems), 9.25.4 (vapour

barriers), and 9.36.2.9 (airtightness) to ascertain its compliance with the specified standards. The following information has been found for DELTA®-MS that follows BCBC:

1. When the water vapour permeance of the material was evaluated under ASTM E96, it displayed a value of less than 22 ng/(Pa.s.m²), demonstrating its effective resistance to moisture transmission.
2. The material's vapour permeance, as evaluated under the ASTM E96 standard, exhibited a value of fewer than 0.3 perms [grains/h/ft²/in Hg], indicating its notable resistance to the passage of vapour.

The evaluation of DELTA®-MS was conducted on two primary fronts: technical specification and manufacturing specification. Existing information indicates a marginal compliance of DELTA®-MS with the standards stipulated in CAN/CGSB 51.33-M89, based on its technical specifications. However, there is a conspicuous absence of information about its manufacturing specifications, which leaves the product's conformity with Canadian manufacturing standards unclear. Therefore, due to these uncertainties, it would be prudent to contemplate alternative solutions that can ensure full compliance with Canadian standards in place of DELTA®-MS.

PINK NEXT GEN™ Fiberglass Insulation

Owens Corning® PINK NEXT GEN™ FIBERGLAS® Insulation, a flexible, preformed, and unfaced blanket insulation, is specifically designed for a snug, friction-fit installation in cavities of either wood or steel frames. It offers a wide array of RSI (R-values), ranging from 2.1 (R-12) to 9.5 (R-54), with thicknesses extending from 89 mm (3-1/2 inches) to 406 mm (16 inches). According to its product information sheet, this insulation complies with CCMC, CAN/ULC-S702, and ASTM C665 standards. However, it's worth noting that there is no explicit statement confirming its compliance with CAN/CGSB-51.33-M. Furthermore, the manufacturing specifications do not clearly indicate whether the product aligns with Canadian standards. There is also an absence of provided experimental or report data to substantiate the claim that PINK NEXT GEN™ FIBERGLAS Insulation meets the standard requirements. In light of these uncertainties, it's recommended to investigate alternative solutions that provide unambiguous confirmation of full compliance with all necessary standards instead of relying solely on PINK NEXT GEN™ FIBERGLAS Insulation.

SIGA Rissan Tape

SIGA Rissan, known for being a high-performance, non-drying acrylic tape, primarily functions as a continuity provider for interior air barrier systems, including taped sheathing boards and sheets/membranes. The versatility of SIGA-Rissan® is exhibited in its capacity to effectively seal

polyethylene type vapour barriers. When a polyethylene type sheet is the designated primary air barrier layer, SIGA-Rissan® conveniently performs both sealing and continuity functions.

Information available, including a report from RDH Building Science Laboratories, highlights an assessment of SIGA Rissan against the 2015 National Building Code of Canada (NBC), 2012 British Columbia Building Code (BCBC), and the 2014 Vancouver Building Bylaw (VBBL). These assessments utilized the Canadian Construction Materials Centre (CCMC) as a reference to help evaluate other identified functional requirements. The evaluation of SIGA Rissan was based on two criteria: technical specification and manufacturing specification. Existing data suggests SIGA Rissan aligns partially with CAN/CGSB 51.33-M89 based on its technical specifications. However, it's worth noting that the RDH review was based on outdated codes (2012 BCBC and 2014 VBBL). Consequently, an update based on current building codes is recommended. In the absence of clear manufacturing specifications that confirm adherence to Canadian standards, it is suggested to consider alternative solutions for SIGA Rissan.

In line with the BCBC, the following details were established for SIGA Rissan tape:

1. A water vapour permeance value of 5.04 ng/(Pa·s·m2), equivalent to 0.088 US Perms, was recorded under the ASTM E96/E96M – Desiccant Method, indicating an efficient control of moisture transmission.
2. As per CAN/CGSB-51.34-M86, a minimum tensile strength of 12MPa in the machine direction is required. Assuming a 6-mil or 0.1524mm polyethylene barrier, this corresponds to a load/width measurement of 1.83 N/mm for the polyethylene sheet, which is similar to the 1.89 N/mm for SIGA-Rissan® tape. As such, RDH confirms that the tensile strength and elongation of SIGA-Rissan® tape meet the building code's functional requirements.
3. In an air leakage test at 75Pa as per ASTM E2178, the tape surpassed the minimum requirement of less than 0.02 L/s·m2 @75 Pa, with a result of 0.0000 L/(s m2), demonstrating its high performance standard.

SIGA Wigluv Tape

SIGA-Wigluv® is a white tape with SIGA-Wigluv® labelling on the non-adhesive side. It consists of a reinforced mesh polyolefin (PO) film backing and an acrylic pressure-sensitive adhesive. Primarily, it is used in exterior applications as an air barrier accessory, sheathing tape, and a self-adhered flashing membrane. RDH Building Science Laboratories conducted a review of SIGA-Wigluv® using the 2015 National Building Code of Canada (NBC), the 2018 British Columbia Building Code (BCBC), and the 2014 Vancouver Building Bylaw (VBBL) to evaluate its suitability as

a sheathing tape, an air barrier accessory, and a self-adhered flashing membrane. Furthermore, SIGA-Wigluv® meets the requirements of AAMA-711, “Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products”.

Testing revealed that SIGA-Wigluv® demonstrated a water vapour permeance of 93.2 ng/(Pa·s·m2) or 1.63 US Perms using the ASTM E96/E96M – Desiccant Method (Dry Cup) and 151.1 ng/(Pa·s·m2) or 2.65 US Perms using the ASTM E96/E96M – Water Method (Wet Cup). Its water penetration rate was recorded at 2032.5 (g·m2)/24 hr based on ASTM D3816. When it comes to air permeance at 75 Pa, according to ASTM E2178, SIGA-Wigluv® testing results were 0.001 L/(s·m2), significantly lower than the maximum acceptable 0.02 L/(s·m2). Moreover, when combined with SIGA-Majvest® in an air barrier assembly, it met the ‘A1’ category requirements of CAN/ULC-S742, with a leakage rate of 0.031 L/(s·m2) @ 75 Pa.

However, SIGA-Wigluv®’s compliance is solely based on its technical specifications, and information regarding manufacturing specifications isn’t readily available. It’s noted that the RDH report compared evaluations with previous CCMC sheathing tape evaluations (CCMC 11362-R & CCMC 14018-R), but CCMC evaluation procedures are not publicly available and do not specify what exact conditioning has been completed. Therefore, while SIGA-Wigluv® appears to meet certain technical standards, due to the lack of manufacturing specifications, it’s recommended to consider an alternative solution that fully complies with Canadian standards.

Siga-Twinet® 20 Tape

SIGA-Wigluv® is a white tape with SIGA-Wigluv® labelling on the non-adhesive side. It consists of a reinforced mesh polyolefin (PO) film backing and an acrylic pressure-sensitive adhesive. Primarily, it is used in exterior applications as an air barrier accessory, sheathing tape, and a self-adhered flashing membrane. RDH Building Science Laboratories conducted a review of SIGA-Wigluv® using the 2015 National Building Code of Canada (NBC), the 2018 British Columbia Building Code (BCBC), and the 2014 Vancouver Building Bylaw (VBBL) to evaluate its suitability as a sheathing tape, an air barrier accessory, and a self-adhered flashing membrane. Furthermore, SIGA-Wigluv® meets the requirements of AAMA-711, “Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products”.

Testing revealed that SIGA-Wigluv® demonstrated a water vapour permeance of 93.2 ng/(Pa·s·m2) or 1.63 US Perms using the ASTM E96/E96M – Desiccant Method (Dry Cup) and 151.1 ng/(Pa·s·m2) or 2.65 US Perms using the ASTM E96/E96M – Water Method (Wet Cup). Its water penetration rate was recorded at 2032.5 (g·m2)/24 hr based on ASTM D3816. According to

BCBC, vapour barriers shall have a permeance not greater than 60 ng/(Pa·s·m2) measured in accordance with ASTM E 96/E 96M, "Water Vapor Transmission of Materials," using the desiccant method (Dry Cup).

When it comes to air permeance at 75 Pa, according to ASTM E2178, SIGA-Wigluv® testing results were 0.001 L/(s·m2), significantly lower than the maximum acceptable 0.02 L/(s·m2). Moreover, when combined with SIGA-Majvest® in an air barrier assembly, it met the 'A1' category requirements of CAN/ULC-S742, with a leakage rate of 0.031 L/(s·m2) @ 75 Pa.

However, SIGA-Wigluv®'s compliance is solely based on its technical specifications, and information regarding manufacturing specifications isn't readily available. It's noted that the RDH report compared evaluations with previous CCMC sheathing tape evaluations (CCMC 11362-R & CCMC 14018-R), but CCMC evaluation procedures are not publicly available and do not specify what exact conditioning has been completed. Therefore, while SIGA-Wigluv® appears to meet certain technical standards, due to the lack of manufacturing specifications, it's recommended to consider an alternative solution that fully complies with Canadian standards.

DuPont™ Tyvek Tape

DuPont™ Tyvek® Tape plays a vital role in establishing a continuous building envelope system, designed to enhance building durability and energy efficiency. This system safeguards against water intrusion and air leakage, which in turn contributes to energy savings through improved air tightness. Tyvek® Tape's construction features an oriented polypropylene film, which is coated with a specially designed permanent acrylic adhesive. This formulation ensures optimal adhesion between the seam tape and DuPont™ Tyvek® weather barriers, rendering it both highly waterproof and easy to use. However, our evaluation of Tyvek® Tape, which considered technical and manufacturing specifications, revealed some inconsistencies. While the technical specifications somewhat align with CAN/CGSB 51.33-M89 standards, there's an absence of information regarding manufacturing specifications. Without this crucial data, it's difficult to determine if the material production aligns with Canadian standards. As such, it's recommended to consider alternative solutions to ensure complete compliance.

Our evaluation did, however, uncover several aspects of DuPont™ Tyvek Tape that align with the BCBC. Notably, the tape performed satisfactorily in various performance tests, including those for DuPont™ StraightFlash™, FlexWrap™ EZ, DuPont™ Flashing Tape, and FlexWrap.

One vital test that DuPont™ Tyvek® Tape underwent was the ASTM E-96 test, which measures water vapour transmission. The tape demonstrated exceptional results with less than 1 perm (less than 60 ng/Pa.sec.m2), allowing systems to meet the requirements of energy efficiency standards such as ASHRAE 90.1 and IECC. Furthermore, when tested in accordance with ASTM E2357, which focuses on air leakage, Tyvek® Tape fulfilled the necessary air leakage requirements. This evidence further substantiates Tyvek® Tape's role in enhancing energy efficiency by reducing air leakage. Despite these promising results, the aforementioned uncertainty around manufacturing specifications urges a consideration of alternative, fully compliant solutions to DuPont™ Tyvek® Tape.

Super Stick Technology Tape

Super Stick Technology Tape represents a high-performance window and door flashing tape system with significant potential. This high tack, peel and stick air/vapour barrier tape is employed primarily for sealing PVC and aluminum fin windows and doors, as well as for use as a comprehensive air vapour barrier membrane. Its design enables application even in frigid temperatures as low as-20°F (-28.88°C), without the need for a primer or mechanical fasteners on most substrates. A notable aspect of this product is its high tack pressure-sensitive adhesive (PSA) combined with a high-performance facer film, allowing a full 12-month UV exposure. Furthermore, it boasts an environmentally friendly profile, free from VOC's, HFCC's, and CFC's, and is non-toxic and non-allergenic, producing no off-gassing during manufacture or installation.

The Super Stick Technology tape successfully complies with the BCBC'S requirement that vapor barriers have a permeance not exceeding 60 ng/(Pa·s·m2), as per the ASTM E 96/E 96M desiccant method (dry cup). The tape achieved a result of 0.12 perms in the Moisture Vapor Transmission test (ASTM E 96 method E), which meets or exceeds AAMA 711-13 requirements. Despite these promising results, certain limitations exist. For instance, the tape is not recommended for use on wet, dirty, uneven, or frozen surfaces or surfaces contaminated with foreign substances such as dirt, dust, mold, release agents, grease, oil, or solvents.

Our analysis of Super Stick Technology tape, focusing on both technical and manufacturing specifications, indicates some potential concerns. While the technical specifications align with AAMA 711 standards, there is no accessible information regarding the manufacturing specification to verify if the material is produced in accordance with Canadian standards. In light of this, an alternative solution for Super Stick Technology tape is advisable.

RT40 BUTYL™ Tape

RT40 BUTYL™ serves as a 40mil self-adhered flashing membrane, featuring an exclusive combination of a reflective aluminum foil facer with a butyl compound. Its primary function is as a waterproof flashing membrane that adheres to a majority of surfaces and seals around punctures. In doing so, it forms a protective barrier that resists air, vapour, and water. Uniquely, it's designed to be self-adhered to most substrates, eliminating the need for a primer.

The BCBC specifies that vapour barriers must have a permeance not exceeding 60 ng/(Pa·s·m2), as measured in accordance with ASTM E 96/E 96M using the desiccant method (dry cup). Testing results reveal that the RT40 BUTYL™ tape shows a permeability value of 0.033 perms (under the ASTM E96 test method), adhering to the BCBC's requirement and aligning with AAMA 711 compliance. However, an analysis of RT40 BUTYL™ tape, based on both technical and manufacturing specifications, unveils some points of concern. While the technical specifications appear to comply with AAMA 711 standards, there's a dearth of information concerning the manufacturing specifications, and whether the material is manufactured in accordance with Canadian standards remains uncertain. As such, it's recommended to explore alternative solutions to RT40 BUTYL™ tape.

Tuck Tape

Tuck Tape is a durable adhesive tape manufactured with a UV-resistant polypropylene film and a high-shear, high-tack solvent-based acrylic adhesive. This product is designed for permanent applications and will leave an adhesive residue upon removal. The tape's technical and manufacturing specifications were scrutinized for compliance with established standards. The review indicates that Tuck Tape not only aligns with the technical specifications set forth by the Canadian Construction Materials Centre (CCMC) but also satisfies the required manufacturing specifications. This implies the material adheres to Canadian production standards. Furthermore, the tape's Moisture Vapor Transmission Rate, measured as 3.9x10-9 g/Pa s m^2, adheres to standards. Given these findings, Tuck Tape presents itself as a viable option that complies with both technical and manufacturing requirements. Consequently, Tuck Tape is recommended for consideration as an acceptable solution in line with the requisite building standards.

3M Tape

The double-sided 3M adhesive tape is primarily intended as a mounting aid to facilitate the swift and reliable installation of vapour control layers on indoor structures. Its Water Vapor Transmission Rate (WVTR), as per ASTM E96, is reported to be 3.4 ng/s.m2.Pa, equivalent to 0.06 perms, as per typical test results. The tape underwent a thorough evaluation based on two key

parameters: technical and manufacturing specifications. The product, manufactured at the Rockland, MA, US plant, has been confirmed to comply with the Canadian code per the Canadian Construction Materials Centre's (CCMC) evaluation. Specifically, 3M™ Construction Sheathing Tape 8088 and 3M™ Venture Tape™ 1585 CW are deemed suitable when used under the conditions and limitations outlined in the CCMC evaluation. The validity of this evaluation is contingent upon the product being used as part of permitted construction, abiding by all stated conditions and limitations, and in compliance with applicable building codes and bylaws.

Though the CCMC document generally suffices for approval by Canadian authorities, ensuring the product is used as part of permitted construction and adheres to all conditions and limitations is critical. I recommend considering an alternative solution for 3M tape to ensure full compliance with all relevant local standards and regulations.

Unknown Products

The following products underwent an assessment based on their respective technical and manufacturing specifications:

1. SIGA Meltell Sealant (Meltell 300, Meltell 310 white, Meltell 320 black, Meltell 330 grey)
2. AeroBarrier Sealant
3. Aeroseal Sealant
4. BASF MasterSeal NP 1 Sealant
5. Proclima Tape (Tescon Vana, Tescon Invis, Duplex, and Uni tape)

Despite our thorough evaluation process, we could not find sufficient relevant information to verify their compliance with Canadian standards.

The lack of pertinent data raises uncertainties about the compliance of these products with the required standards. Consequently, it is advised to explore alternative products that demonstrate full compliance with the standards. Given the circumstances, we have classified these products as 'unknown' until we receive additional information to validate their compliance. This recommendation stands until the Township of Langley is furnished with more comprehensive data to reassess these products.

Guide for Builders

We offer a comprehensive guide to builders, developers, professionals in the construction industry, building designers, architects, planners, building officials, and other stakeholders on the next page. This guide aims to aid them in making informed choices when selecting products and

in understanding whether these products adhere to the required standards. The step-by-step guideline is provided below:

Step 1: Identify Relevant Sections of the BC Building Code

Begin by identifying the relevant sections of the BCBC that pertain to the specific product or construction element you are assessing. For example, if you are evaluating a vapour barrier, focus on sections related to air barrier systems and vapour barriers, such as 9.25.3 and 9.25.4.

Step 2: Understand BCBC Requirements

Thoroughly review the identified sections of the BC Building Code to understand the requirements, standards, and criteria outlined for the product category you are examining. Pay attention to any specific technical specifications, performance thresholds, or test methods mentioned.

Step 3: Gather Product Information

Obtain comprehensive technical and manufacturing specifications for the product under consideration. This information can usually be acquired from the manufacturer's product data sheets, technical reports, and evaluation documents.

Step 4: Cross-Reference with BCBC Standards

Compare the gathered product information with the requirements specified in the BC Building Code sections identified earlier. Look for alignments between the product's characteristics and the code's stipulated standards. Specifically, check for compliance in terms of materials used, performance characteristics, airtightness, fire resistance, and other relevant factors.

Step 5: Seek Independent Evaluations (If Applicable)

In cases where third-party evaluations or certifications are available for the product, consider referencing those as well. Independent evaluations can provide additional assurance of compliance with the BCBC standards.

Step 6: Consult with Experts

If you encounter complexities or uncertainties during the comparison process, consult with building professionals, architects, engineers, or building officials who are knowledgeable about BCBC and product compliance. Their expertise can help clarify any ambiguous points and ensure accurate assessment.

Step 7: Keep Updated with BCBC Revisions

Stay informed about any updates or revisions to the BC Building Code. Compliance requirements may change over time, and it is essential to work with the latest version of the code to ensure accurate comparisons.

Step 8: Document the Compliance Assessment

Maintain detailed records of the compliance assessment process, including the product specifications, BCBC references, cross-referencing results, and any expert consultations. Proper documentation will be valuable for future reference and potential regulatory reviews.

By following this step-by-step guideline, builders, developers, professionals, and other stakeholders can effectively compare products with the BC Building Code and confidently assess compliance with the specified standards.

In case the material is an acceptable solution, it can be used without further evaluation. However, if there is a partial risk that the material might not be an acceptable solution or it is an alternative solution, or it is an unknown product, the following step should be taken:

Step 9: Hire a consultant

If dealing with alternative solutions, or an unknown product, builders or material suppliers should consult a registered expert to assess the material's compliance with Canadian Standards and BCBC requirements.

Recommendations

Proposed Solutions for Addressing Gaps

To address the identified gaps in the BC Building Code as applied to high-performance building design and construction, the following recommendations are proposed:

Establish Performance-Based Criteria: Introducing performance-based criteria for materials and building systems can foster innovation while ensuring compliance with safety and energy efficiency standards. Emphasis should be placed on materials that meet or exceed the performance requirements specified in the BC Building Code, allowing for the integration of cutting-edge technologies and sustainable practices.

Strengthen Education and Training: Education and training programs should be provided to industry professionals, including builders, architects, planners, and building officials. These

programs can enhance their understanding of high-performance building practices and relevant code requirements, with an emphasis on identifying and utilizing materials that meet the prescribed standards.

Foster Collaboration and Knowledge Sharing: Encouraging collaboration between the building industry, government authorities, and research institutions can foster knowledge sharing and exchange of best practices. Such collaboration should prioritize the use of materials that align with the BC Building Code and promote high-performance building strategies.

Regular Code Review and Updates: To keep pace with advancements in construction technologies and best practices, a periodic review process for the BC Building Code is essential. This review should include a specific focus on high-performance building design and construction, with consideration given to materials that conform to the latest standards.

Establish Performance Verification Processes: Developing a robust process for verifying and certifying high-performance buildings is vital. This process would ensure that buildings utilize materials that meet or exceed the prescribed performance criteria and comply with the BC Building Code and energy efficiency targets.

Promote Public Awareness: Public awareness campaigns can be launched to educate homeowners and the general public about the benefits of high-performance building design and construction using materials that adhere to the BC Building Code's standards. Raising awareness can drive demand for sustainable buildings and encourage stakeholders to invest in materials that meet regulatory requirements.

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