

# ULC Evaluation Report

## ULC ER-R40695

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**UL Category Code:**  
ULEY7 – Weather Barriers for Canada

**CSI MasterFormat®**  
06 16 36 Wood Panel Product Sheathing

### COMPANY:

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### 1. SUBJECT

**ZIP System® Wall (ZIP System® Wall Sheathing and ZIP System™ Flexible Flashing Tape)**

### 2. SCOPE OF EVALUATION

2015 National Building Code of Canada, NBCC (Sept. 28, 2018)  
Division A, Part 1 Compliance

Clause 1.2.1.1.(1)(a) Compliance with this Code (Acceptable Solution from Division B)  
Table 9.23.17.2.-B Rating for Wall Sheathing when Applying CSA O325, Forming Part of  
Sentence 9.23.17.2.(1)

Clause 1.2.1.1.(1)(b) Compliance with this Code (Alternante Solutions that achieves at least the  
minimum performance required by Division B objectives and functional  
statements)

Subsection 9.25.5 Properties and Position of Materials in the Building Envelope, see  
Sentence 9.25.5.1.(3)

Article 9.27.3.2 Sheathing Membrane Material Standard

Article 9.27.3.3 Required Sheathing Membrane and Installation

Clause 9.27.3.8 (4)(a) Flashing Installation

These products were evaluated for the following properties:

**ZIP System® Wall Sheathing**

- Water Vapour Permeance (ASTM E96)
- Water Absorption (ISO 15148)
- Wall System Durability (ICC-ES AC310 and CSA S478)
- Hygrothermal Assessment (WUFI)
- Hygrothermal Performance (Engineering Field Site Study)

**ZIP System™ Flexible Flashing**

- Tensile Breaking Strength (ASTM D3006)
- Elongation (ASTM D3006)
- Peel Adhesion Performance (ASTM D3330)
- Peel Adhesion at -10°C (ASTM D2860)
- Shear Strength Performance (ASTM D1000)
- Nail Sealability (ASTM D1970)

**3.0 REFERENCED DOCUMENTS**

**ASTM:**

ASTM D1000	Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM D2860	Standard Test Method for Adhesion of Pressure-Sensitive tape to Fiberboard at 90° Angle and Constant Stress
ASTM D3006	Standard Specification for Polyethylene Plastic Pressure-Sensitive Electrical Insulating Tape
ASTM D3330	Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D5651	Surface Bond Strength of Wood Based Fiber and Particle Panel
ASTM D1970	Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM E96	Standard Test Method for Water Vapor Transmission of Material

**CGSB:**

CAN/CGSB 51.32	Sheathing Membrane, Breather Type
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**CSA:**

CSA O325	Construction Sheathing
CSA S478	Durability in Buildings

**ICC-ES:**

ICC-ES AC148	Acceptance Criteria for Flexible Flashing Materials
ICC-ES AC310	Acceptance Criteria for Water-resistive Membranes Factory-bonded to Wood-based Structural Sheathing, Used as Water-resistive Barriers

**ISO:**

ISO 15148	Hygrothermal Performance of Building material and Products – Determination of Water Absorption Coefficient by Partial Immersion
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**WUFI**

Computer Software Pro 6.2
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#### 4.0. USES

The installed **ZIP System® Wall** is an assembly which comprises of **ZIP System® Wall Sheathing** and **ZIP System™ Flexible Flashing Tape**, which provides a secondary plane of protection against water infiltration behind exterior cladding, when installed as per manufacturer’s installation instructions. The proprietary sheathing membrane is laminated to an OSB (oriented strand board) wood structural panel meeting the requirements of CSA O325 for use as an exterior wall sheathing.

This Report does not address air tightness, assembly fire performance, sealing of openings and penetrations. Additional evaluations and testing are required to meet these and other applications.

#### 5.0 PRODUCT DESCRIPTION

The **ZIP System® Wall**, consists of a proprietary sheathing membrane laminated in-plant to an OSB substrate which creates **ZIP System® Wall Sheathing**. On-site installation includes sealing of all joints between the panels and flashing of all penetrations with a proprietary **ZIP System™ Flexible Flashing Tape** to provide continuity of the sheathing membrane.

The proprietary membrane lamination is a phenolic impregnated polymer-modified sheet overlay which is applied and hot pressed as part of the OSB manufacturing process. The OSB substrate is available in 11 and 12.5mm (7/16” and 1/2”) thickness and manufactured in compliance with CSA O325 Construction Sheathing.

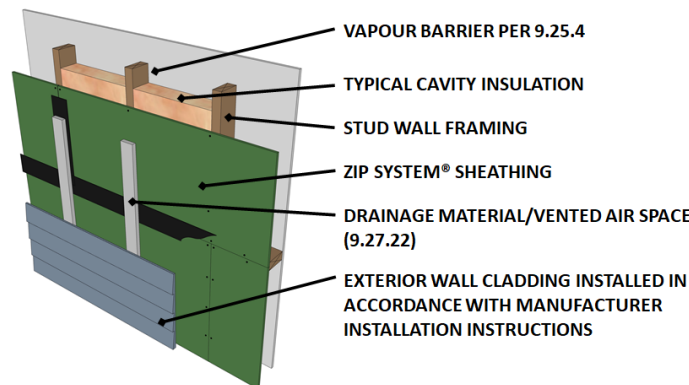


FIGURE 1: TYPICAL ZIP SYSTEM® WALL ASSEMBLY

#### 6.0 PERFORMANCE CHARACTERISTICS

##### 6.1 ZIP System® Wall Sheathing

The **ZIP System® Wall Sheathing** product was evaluated for the performance characteristics as reported in Table 1 **ZIP System® Wall Sheathing** Performance Characteristics:

Table 1: ZIP System® Wall Sheathing Performance Characteristics		
Properties	Requirements	Results
Water Vapour Permeance	Report value Desiccant Method Water Method	36 ng/Pa·s·m <sup>2</sup> 122 ng/Pa·s·m <sup>2</sup>



Properties	Requirements	Results
Coefficient of water absorption @ 72 hrs	<0.0040 kg/(m <sup>2</sup> ·s <sup>1/2</sup> )	0.0024 kg/(m <sup>2</sup> ·s <sup>1/2</sup> )
Laminate adhesion to OSB As received After UV exposure After UV and heat aging	≥ 0.3 MPa ≥ 0.3 MPa ≥ 0.3 MPa	1.10 MPa 1.04 MPa 0.72 MPa
Wall System Durability (ICC-ES AC310) Structural (transverse load) Racking Restrained Environmental Conditioning Water Penetration	No cracking or delamination of laminate  No visible water penetration at sheathing joints or fastener penetrations	Pass Pass Pass Pass

### 6.2 ZIP System™ Flexible Flashing Tape

The ZIP System™ Flexible Flashing Tape product was evaluated for the performance characteristics as reported in Table 2 ZIP System™ Flexible Flashing Tape Performance Characteristics:

Table 2: ZIP System™ Flexible Flashing Tape Performance Characteristics		
Properties	Requirements	Results
Tensile breaking strength	≥ 2.8 kN/m	3.2 kN/m
Elongation	≥ 150%	873%
Peel adhesion to laminated ZIP System Wall Sheathing As installed After accelerated weathering After heat aging	≥ 0.26 N/mm ≥ 0.26 N/mm ≥ 0.26 N/mm	0.58 N/mm 0.79 N/mm 1.03 N/mm
Peel adhesion to galvanized steel As installed After accelerated weathering After heat aging	≥ 0.26 N/mm ≥ 0.26 N/mm ≥ 0.26 N/mm	1.34 N/mm 1.35 N/mm 1.47 N/mm
Peel adhesion to clear anodized aluminum As installed After accelerated weathering After heat aging	≥ 0.26 N/mm ≥ 0.26 N/mm ≥ 0.26 N/mm	1.59 N/mm 1.42 N/mm 1.53 N/mm
Peel adhesion to ZIP System Wall Sheathing at -10°C	≥ 200g for a min. 24 hrs.	Pass
Peel adhesion to painted metal OSB at -10°C	≥ 200g for a min. 24 hrs.	Pass
Shear strength of tape to ZIP System Wall Sheathing After water immersion After UV exposure After heat aging	≥ 1.2 N/mm ± 25% of original strength ± 25% of original strength ± 25% of original strength	2.04 N/mm 2.09 N/mm 2.00 N/mm 2.43 N/mm
Nail Sealability	No sign of water under sample, on nail shanks, or on underside of sheathing	Pass
Shelf Life (heat aging)	≥ 0.15 N/mm	0.92 N/mm

### 6.3 WUFI Hygrothermal Assessment

WUFI Hygrothermal modelling of the **ZIP System® Wall Sheathing** was undertaken to compare the predicted hygrothermal performance of wood framed wall assemblies constructed with the **ZIP System® Wall** against those constructed with standard OSB sheathing and a weather barrier membrane (spun-bonded polyolefin). The following parameters were utilized to evaluate the assemblies:

- WUFI Pro 6.2
- Conventional code compliant assembly with R24 fiberglass batt insulation with 12.5mm interior gypsum board and 6mil poly vapour barrier. No outboard insulation was included in any of the models.
- Four (4) climate zones including Vancouver (zone 4), Edmonton (zone 7A), Toronto (zone 5), Quebec City (zone 7A), St. Johns (zone 6)
- Interior climate conditions ranging from 21°C to 24°C with relative humidity levels varying from 30% (winter) to 50% (summer).
- Two (2) orientations: direction of prevailing wind-driven rain and minimal solar radiation exposure
- Simulation period of 9 years

In all computer models, both the **ZIP System® Wall Sheathing** and OSB sheathings remained below a 19% moisture content, typical peak sheathing moisture content was less than 12%. Maintaining a moisture content in sheathing below a conservative 19% moisture content minimizes the risk of fungal growth and decay (Canadian Wood Council 2021 and Guide for On-Site Moisture Management of Wood Construction by FPIInnovations).

### 6.4 Field Hygrothermal Performance

A full-scale field test program was conducted over a one-year (four season) period to compare the hygrothermal performance of wood framed residential wall assemblies constructed with **ZIP System® Wall** versus conventional OSB sheathing. The study was conducted in an Ontario Zone 6 (4300 HDD). Test wall assemblies were instrumented with a series of temperature, relative humidity and wood moisture content sensors, exterior and interior climatic conditions were also recorded throughout the test period. The following variables were utilized to evaluate the assemblies:

- Two (2) orientations: North and South
- Sheathing membranes of #15 felt paper, no membrane and a synthetic membrane
- Intentional wetting (340g of water) over a 4-day period to simulate a small water leak

Test data showed no significant performance differences in the sheathing moisture content measurements or cavity RH levels between the OSB walls and the **ZIP System® Wall Sheathing** wall assemblies before the intentional wetting. Intentional wetting events results in peak OSB moisture content of 29% and the ZIP System panel reaching a peak 22%, both materials dried at similar rates to a value typically less than 15% within 2 weeks.

The site research suggested that there were no significant moisture-related performance differences as a result of using the **ZIP System® Wall Sheathing** taped with the **ZIP System™ Flexible Flashing Tape** or OSB with a sheathing membrane. No external insulation was included in the program.

### 6.5 Engineering Durability Study

A durability engineering study was undertaken to predict the service life of the **ZIP System® Wall**, according to the requirements outlined in CSA S478-19 which defines a minimum predicted service

life of 50 years in a residential application. A conventional wall assembly consisting of exterior cladding with ventilation gap, **ZIP System® Wall** on 2" x 6" wood framing filled with insulation, 6-mil poly vapour barrier and interior gypsum served as the bases for the study.

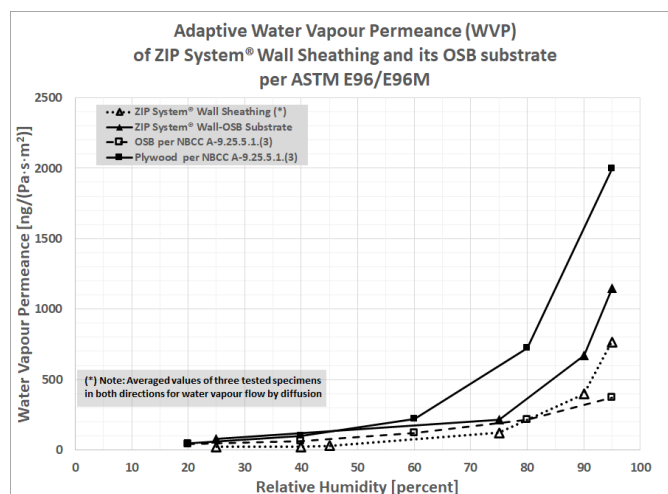
Numerous environmental exposure factors that influenced the service life of the **ZIP System® Wall** were evaluated including structural environment; microenvironment; moisture / absorbed moisture, condensed water and bulk water; air / humidity; biological agents / annual fluctuations in moisture content; temperature / annual temperature and relative humidity fluctuations at the surface and through the product. Additional considerations included quality management procedures, maintenance and replacement procedures, and consequences of failure.

The performance of the **ZIP System® Wall** is nearly identical to that of standard OSB sheathing and a spun-bonded polyolefin water-resistive barrier membrane. Although it can experience failure due to fungal decay and mold growth, it is expected to have a minimum design service life of 50 years where a residential structure is built to code with adequate water management details, designed to minimize the risk of condensation and prolonged exposure to high relative humidity and prolonged exposure to sources of liquid water.

### 6.6 Water Vapour Permeance Study

A study of the water vapour permeance of standard 12.5 mm OSB and the ZIP System® sheathing was undertaken to evaluate the code requirement, Article 9.25.5.1, requiring outboard insulation of sheet and panel type materials having low air leakage and water vapour permeance characteristics. NBCC Sentence 9.25.5.1.(3) provides an exemption for wood and wood-based products due to woods adaptive vapour permeance characteristics (see Note A-9.25.5.1.(3)).

Numerous water vapour transmission tests were conducted in accordance with ASTM E96/E96M, for various relative humidity levels. Material evaluated included **ZIP System® Wall Sheathing**, OSB substrate used in manufacturing of **ZIP System® Wall Sheathing**, and **ZIP System® Wall Sheathing** green overlay (Sheathing membrane). The performed tests demonstrated adaptive behavior of the water vapour permeance properties for ZIP System® Wall Sheathing and its constituents which conforms to requirements in NBCC Sentence 9.25.5.1(3). The graph below depicts the trend of increasing WVP values for all tested materials at higher relative humidity levels which are consistent with curves provided in the NBCC Note A-9.25.5.1(3) and Figure A-9.25.5.1(3) for common OSB and plywood materials.



## 7.0 INSTALLATION

Installation of the **ZIP System® Wall** must comply with this report and the manufacturer's published installation instructions. The manufacturer's published installation instructions shall be available at the jobsite at all times during installation.

- A. The system must be installed in accordance with the manufacturer's installation instructions, see Huber Engineered Woods document *ZIP System® Sheathing and Tape Installation Manual – Canada*, revised September 2021
- B. **ZIP System® Wall** fasteners and fastener spacing to comply with NBCC Section 9.23.3.5.
- C. All installed panel joints must be sealed with **ZIP System™ Flexible Flashing Tape** in order for the proprietary sheathing to function as the secondary plane of protection.
- D. Exterior cladding to be attached as per NBCC Article 9.27.5

## 8.0 CONDITIONS OF USE

The **ZIP System® Wall Sheathing** material described in this report has been evaluated in accordance with code sections listed in Section 2.0, subject to the following conditions:

- A. The OSB thickness/span rating must be for the intended stud spacing.
- B. Secondary plane of protection is typically completed with the installation of flashing materials as specified in Articles 9.27.3.7 Flashing Materials and 9.27.3.8 Flashing Installations. ZIP System™ Flexible Flashing Tape is utilized as an alternate to Clause 9.27.3.8 (4)(a) to extend the ZIP System® Wall Sheathing secondary plane of protection to flashing materials including galvanized steel and anodized aluminum.
- C. Installed exterior cladding systems to include a capillary break meeting Article 9.27.2.2.
- D. Exterior insulation must be installed with this product in Canadian climatic zone areas 7B (6000-6999 HDD) and Zone 8 ( $\geq 7000$  HDD), the outboard insulation ratio to comply with NBCC Table 9.25.5.2.
- E. This product must be clad and protected from ultraviolet (UV) within 60 days of installation.
- F. This product is not intended for areas of high humidity such as indoor pools or saunas, as per NBCC Sentence 9.25.2.1.(2).
- G. This product is manufactured in six manufacturing locations including: Crystal Hill, VA.; Commerce GA., Broken Bow OK., Easton ME., Spring City TN. & Shawinigan QC., each under UL's audit of quality elements.
- H. The ZIP System® Wall Sheathing material remains in compliance with CSA O325, under continuous surveillance by an accredited ISO/IEC 17065 accreditation body.

## 9.0 SUPPORTING EVIDENCE

**Huber Engineered Woods LLC** has submitted technical documentation for ULC's review. The test and evaluation data submitted for this product is summarized below.

- A. Sample Selection of ZIP System® Wall Sheathing products for testing by an ISO/IEC 17025 accredited testing body.
- B. Test data in accordance with ICC ES-AC310 (cyclic loading, racking shear stress and restrained environmental conditioning), compliant test reports from an ISO/IEC 17025 accredited test laboratory.
- C. Tape test data in accordance with ULC EC-R40695, compliant test reports from an ISO/IEC 17025 accredited test laboratory.



- D. ZIP Panel test data in accordance with ULC EC- R40695, compliant test reports from an ISO/IEC 17025 accredited test laboratory.
- E. ZIP Panel test data in accordance with ISO 15148 (water absorption), test reports from NRC Construction.
- F. Engineering WUFI Hygrothermal Modelling report (July 2021), conducted by RDH Building Science Laboratories.
- G. Engineering CSA S478 Durability Study (Aug, 2021), conducted by RDH Building Science Laboratories.
- H. Full-scale, one year field test program (July 2021), conducted by RDH Building Science Laboratories.
- I. Engineering water vapour permeance study report (Aug. 2021), conducted by RDH Building Science Laboratories.
- J. Quality Control manual indicating manufacturing compliance with CSA-O325 Construction Sheathing (March 2020 Version 2.4).

## **10.0 IDENTIFICATION**

**ZIP System® Wall Sheathing** and **ZIP System™ Flexible Flashing Tape** described in this evaluation report are identified by a marking bearing the report holder's name (**Huber Engineered Woods LLC**) and the evaluation report number **ULC ER-R40695**. The validity of the evaluation report is contingent upon this identification appearing on the OSB and tape.

## **11.0 CLIENT LOCATION / CONTACT**

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