National Shelter Water Resistive Barriers for Use in *NFPA 285* Tested Assemblies

TER No. 1704-02

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Section: 07 21 00 – Thermal Insulation

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1. Products Evaluated:

- **1.1.** DRYLine® W
- **1.2.** DRYLine® HP
- **1.3.** DRYLine® LP
- **1.4.** DRYLine® CP
- **1.5.** DRYLine® RainDrain
- **1.6.** For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
- **1.7.** This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found here) and covered by an IAF MLA Evaluation per the Purpose of the MLA (as an example, see letter to ANSI from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other IAF MLA Signatory Countries and have their products readily approved by authorities having jurisdiction using DrJ's ANSI accreditation.

DrJ is a Professional Engineering Approved Source

Learn more about DrJ's Accreditation

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.
- DrJ is fully compliant with *IBC* Section 1703.

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1.8. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in *IBC* Section 1703. Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's website. For more information, see drjcertification.org.

1.9. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.

1.10. DrJ's code compliance work:

1.10.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.

1.10.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:[1]

2.1. *2012*, *2015* and *2018 International Building Code* (*IBC*)

2.2. *2012*, *2015* and *2018 International Residential Code* (*IRC*)

2.3. *ASTM E1354 – Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*

2.4. *NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components*

3. Performance Evaluation:

3.1. National Shelter products were evaluated to determine:

3.1.1. Performance for use of combustible products in wall assemblies that meet the requirements of *NFPA 285* in accordance with *IBC* Section 2603.5.5.

3.2. Performance for use as a WRB is outside the scope of this TER.

3.3. Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

4. Product Description and Materials:

4.1. National Shelter WRBs are proprietary products produced in rolls of various sizes as follows:

4.1.1. DRYLine® W

4.1.1.1. Consists of a woven, micro-perforated, polyolefin fabric with an additional polyolefin coating with a nominal weight of 65 grams per square meter (gsm).

4.1.2. DRYLine® HP and LP

4.1.2.1. Consists of a non-woven, microporous, polyolefin fabric and membrane with a nominal weight of 80 gsm. Available in low-perm (LP) and high-perm (HP) versions.

4.1.3. DRYLine® CP

4.1.3.1. Consists of a cross-woven, polypropylene fabric and non-perforated, breathable air barrier layer, including stabilizing agents for ultraviolet light and thermal cycling with a nominal weight of 90 gsm.

4.1.4. DRYLine® RainDrain

4.1.4.1. Consists of a polyethylene non-woven fabric laminated to a polyethylene microporous film with a three-dimensional surface for drainage efficiency and nominal weight of 72 gsm.

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[1] Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, *ASCE 7*, *SDPWS* and *WFCM*. This product also complies with the 2000-2015 versions of the *IBC* and *IRC* and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see Section 8.

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5. Applications:

5.1. General

5.1.1. National Shelter WRBs are used in buildings of Type I-V construction in accordance with *IRC* Section R703.2 and *IBC* Section 1404.2.

5.2. Fire Safety Performance

5.2.1. Testing was conducted to assess the performance of wall assemblies with regard to vertical and lateral fire propagation in accordance with *IBC* Section 1403.5.

5.2.1.1. Engineering analysis has also been conducted to assess substitution of other products within the approved wall assemblies.

5.2.1.2. The wall assemblies listed in Table 1 are approved for use in buildings of Type I-IV construction.

NFPA 285 Approved Wall Assemblies[1]	
Wall Component	Materials
Base Wall System Use either 1, 2 or 3	1. 1" minimum Concrete Wall 2. 1" minimum Concrete Masonry Wall 3. 20-gauge (min.) 3⅝" (min.) steel studs with ⅝"-thick Type X gypsum wallboard on interior
Floor line Fire stopping Use 1 or 2	1. None 2. 4 lb./cu ft. mineral wool (e.g., Thermafiber) in each stud cavity at each floor line – attached with Z-clips or equivalent
Cavity Insulation Use either 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 or 15 Note: Cavity Insulations 5-15 must use Floor line Fire stopping, Item 2 and ⅝" exterior gypsum sheathing.	1. None 2. Any noncombustible insulation per *ASTM E136* 3. Any mineral fiber (Board type Class A *ASTM E84* faced or un-faced) 4. Any Fiberglass (Batt type Class A *ASTM E84* faced or un-faced) 5. 5½" (max.) Icynene LD-C-50 spray foam in 6" deep studs (max.) full fill without an air gap 6. 5½" (max.) Icynene MD-C-200, 2 pcf spray foam in 6" deep studs (max.) full fill without an air gap 7. 5½" (max.) Icynene MD-R-210, 2 pcf spray foam in 6" deep studs (max.) full fill without an air gap 8. 6" (max.) SWD Urethane QS 112, 2 pcf spray foam in 6" deep studs (max.) or partial fill with a maximum 2½" air gap 9. 3½" (max.) Gaco Western 183M spray foam in 3⅝" deep studs (max.) 10. 3½" (max) Gaco Western F1850 with ⅝" exterior sheathing in 3⅝" deep studs (max) 11. 3⅝" (max) Demilec SEALECTION 500 with ⅝" exterior sheathing in 3⅝" deep studs (max) 12. 3.4" (max) Demilec HeatLok Soy 200 Plus with ⅝" exterior sheathing in 3⅝" deep studs (max) 13. 3" (max) Bayer Bayseal with ⅝" exterior sheathing 14. 3" (max) Lapolla FoamLok FL 2000 with ⅝" exterior sheathing in 3⅝" deep studs (max) 15. 3⅝" (max) BASF SprayTite 81206 or WallTite (US & US-N) with ⅝" exterior sheathing in 3⅝" deep studs (max)
Exterior Sheathing Use either 1, 2, 3 or 4. Must be used when SPF is used. See sheathing thickness specified above.	1. ½" or thicker exterior type gypsum sheathing 2. None, when cavity SPF insulation is not used 3. 2" precast concrete panels attached to structural elements of building 4. ½" or thicker GP DensElement sheathing with integrated WRB.
Water Resistive Barrier (WRB) Applied to Exterior Sheathing Use any of these options	1. DRYLine® W 2. DRYLine® HP 3. DRYLine® LP 4. DRYLine® CP 5. DRYLine® RainDrain
Exterior Insulation Use either 1, 2, 3, 4 or 5	1. None 2. 4" (max) Atlas EnergyShield® Pro (or Pro2) 3. 4" (max) RBoard Pro (or EnergyShield® CGF Pro) 4. 4¾" (max) EnergyShield® Ply Pro (4" EnergyShield® CGF Pro with ⅝" or ¾" FRT Plywood) 5. Any exterior insulation that has been tested per *ASTM E1354* (at a minimum of 20 kW/m² heat flux) and shown by analysis to be less flammable (improved T_{ign}, Pk. HRR) than those listed above

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NFPA 285 Approved Wall Assemblies[1]	
Wall Component	Materials
WRB Over Exterior Insulation Use any item 1-6	1. None, 2. DRYLine® W 3. DRYLine® HP 4. DRYLine® LP 5. DRYLine® CP 6. DRYLine® RainDrain
Exterior Cladding Use any of these options Cladding 8 Zinc may only be used with EnergyShield Pro or Pro2.	1. Brick a. Standard nominal 4"-thick clay brick or veneer b. Brick veneer anchors – standard types – installed maximum 24" o.c. (max.) vertically on each stud c. Maximum 2" air gap between exterior insulation and brick 2. Stucco – Minimum ¾"-thick, exterior cement plaster and lath. A secondary WRB can be installed between the exterior insulation and the lath. The secondary WRB shall not be full-coverage asphalt or butyl-based self-adhered membranes 3. Limestone – minimum 2" thick 4. Natural stone veneer – minimum 2" thick 5. Cast artificial stone – minimum 1.5" thick complying with *ICC-ES AC 51* 6. Terracotta Cladding – Use any terracotta cladding system in which terracotta is minimum 1 1/4" thick. Any standard installation technique can be used 7. Any ACM that has passed *NFPA 285* 8. Uninsulated sheet metal building panels including aluminum, steel, copper or zinc 9. Uninsulated fiber-cement cladding siding or panels minimum ¼" thick 10. Stone/Aluminum honeycomb composite building panels that have successfully passed *NFPA 285* criteria 11. Autoclaved-aerated-concrete (AAC) panels (minimum 1½" thick) 12. Reynobond ZCM Zinc metal composite panel 13. Terreal Zephir Evolution Rainscreen System (terra cotta), minimum 9/16" thick
1. The assemblies' combinations created herein and the various substitutions of products are based on testing and professional thermal engineering analysis by Priest and Associates. 2. Acceptance criteria for *ASTM E1354* testing have not been well established in the referenced building codes and foam sheathing related sections. The criteria stated here for substitution of products is based on testing and professional thermal engineering analysis by Priest and Associates. 3. T_{ign} is the time to ignition from the start of the test until the sheathing ignites. Pk. HRR is the peak heat release rate during the test. 4. Tested panel joint locations appear to meet the proposed 2018 *NFPA 285* changes pertaining to panel joint locations in the test assembly.	

Table 1: Approved *NFPA 285* Wall Assemblies

6. Installation:

6.1. General

6.1.1. Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.

6.1.2. For the most current installation guidelines please contact National Shelter Products, Inc.

6.1.3. Always verify the intended application is compliant with local building codes. In the event of existing moisture related wall problems, corrective measures need to be taken prior to installing National Shelter building wrap products. Contact a building envelope professional for detection and appropriate action.

6.1.4. WRBs must be covered by an exterior wall finish complying with the requirements of the applicable code.

6.1.5. Install cladding materials in accordance with the cladding manufacturer's installation instructions.

6.2. Step-by-step Instructions

6.2.1. National Shelter building wrap should be installed after framing is complete and before windows and doors are installed.

6.2.2. Ensure that wall substrate is flat and free of damage and foreign debris before the National Shelter building wrap is applied.

6.2.3. Install National Shelter building wrap with the print facing out.

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6.2.4. Secure National Shelter building wrap with non-corrosive roofing nails or staples spaced approximately 8" o.c. along the top and bottom plates and 24" o.c. in the field. Fasteners should be of sufficient length to penetrate framing or fastening substrate.

6.2.4.1. Ensure that fasteners are properly driven; over and/or under-driven fasteners may cause pulling around the fastener and damage to the building wrap material.

6.2.5. Joint Treatment

6.2.5.1. Approved sheathing tape should be applied at the joints of National Shelter building wrap using constant and adequate pressure to maximize adhesion.

6.2.5.2. National Shelter building wrap must be covered with a code-compliant exterior wall covering within 180 days of first application. For integration with openings and flashing materials, National Shelter building wrap should conform to industry standards including *ASTM E2112-01* and *AAMA 711-05*.

7. Test and Engineering Substantiating Data:

7.1. Engineering analysis assessing the substitution of products within the approved *NFPA 285* tested wall assemblies by Priest & Associates, Project No. 10432, Revision 2.

7.2. Manufacturer technical data sheets and installation instructions.

7.3. Manufacturer quality control manual and evidence of approved agency inspections.

7.4. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.

7.5. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

7.6. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.

7.7. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms with DrJ's procedure for acceptance of data from approved sources.

7.8. DrJ's responsibility for data provided by approved sources conforms with *IBC* Section 1703 and any relevant professional engineering law.

7.9. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS, NDS, ACI, AISI, PS-20, PS-2*, etc.). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g. lumber, steel, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings:

8.1. National Shelter WRBs detailed in Section 4 are approved for use in wall assemblies meeting the requirements of *NFPA 285* testing when constructed in accordance with Table 1.

8.2. *IBC* Section 104.11 and *IRC* Section R104.11 (*IFC* Section 104.9 is similar) state:

> 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code. … Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.

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8.3. This product has been evaluated with the codes listed in Section 2, and is compliant with all known state and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:

8.3.1. No known variations

8.4. This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ's professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.

9. Conditions of Use:

9.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.

9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.

9.3. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.

9.4. When the WRBs are used on exterior walls of buildings of Type I, II, III or IV, and walls are required to be tested in accordance with *NFPA 285*, construction must be as described in Table 1.

9.5. The wall assemblies listed in Table 1 are based on compliance to the fire provisions of the codes listed in Section 2. Consideration of wall assembly performance with regard to other attributes, such as water vapor control, condensation, energy code requirements, etc. are outside the scope of this TER.

9.6. National Shelter building wrap products must be protected against high heat or other ignition sources during shipment, storage and application

9.7. When storing, take care to protect National Shelter building wrap products from exposure to direct sunlight. It is recommended that building wrap be stored inside or under cover

9.8. Design

9.8.1. Building Designer Responsibility

9.8.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with *IRC* Section R106 and *IBC* Section 107.

9.8.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with *IRC* Section R301 and *IBC* Section 1603.

9.8.2. Construction Documents

9.8.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.

9.9. Responsibilities

9.9.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.

9.9.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.

9.9.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.

9.9.4. This product is manufactured under a third-party quality control program in accordance with *IRC* Section R104.4 and R109.2 and *IBC* Section 104.4 and 110.4.

9.9.5. The actual design, suitability and use of this TER, for any particular building, is the responsibility of the Owner or the Owner's authorized agent, and the TER shall be reviewed for code compliance by the Building Official.

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9.9.6. The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10. Identification:

10.1. The building wraps described in this TER are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.

10.2. Additional technical information can be found at nationalshelter.com.

11. Review Schedule:

11.1. This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjengineering.org.

11.2. For information on the current status of this TER, contact DrJ Engineering.

- Mission and Professional Responsibilities
- Product Evaluation Policies
- Product Approval – Building Code, Administrative Law and P.E. Law

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