

DuPont™ Tyvek® Contributes to Green Building Design

WORKING WITH U.S. GREEN BUILDING COUNCIL AND LEED®



U.S. Green Building Council (USGBC) is a nonprofit coalition of leaders from across the building industry dedicated to promoting environmentally responsible, profitable and healthy places to live and work. USGBC developed LEED® (Leadership in Energy and Environmental Design) to establish a common standard of measurement and promote integrated, whole-building design practices. LEED[®] is a voluntary, consensus-based national standard for developing high-

performance, sustainable buildings. The rating system awards points for performance in green design categories including: integrative process (IP); location and transportation (LT); sustainable sites (SS); water efficiency (WE); energy and atmosphere (EA); materials and resources (MR); indoor environmental quality (EQ); awareness and education (AE); innovation (IN); and Regional Priority (RP).

LEED® is not a product certification, but products could contribute points towards LEED® building certification.

Using Tyvek® Air & Water Barrier Systems in your commercial building design can help contribute toward LEED® credits in several categories. A description of each of the LEED® credits toward which Tyvek® Air & Water Barrier Systems can contribute are listed below.

ENERGY AND ATMOSPHERE (EA)

EA Prerequisite Fundamental Commissioning and Verification

Design Intent: To support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

This prerequisite requires commissioning (Cx) for mechanical, electrical, plumbing, and renewable energy systems and assemblies, as they relate to energy, water, indoor environmental quality, and durability. Full envelope commissioning is not required unless the project team pursues EA Credit Enhanced Commissioning, Option 2. However, building envelope may be added to the Cx scope at the owner's request. If envelope commissioning is added to the scope, Tyvek® Air & Water Barrier Systems would help meet the energy, IEQ and durability requirements towards this prerequisite.

EA Prerequisite Minimum Energy Performance

Design Intent: To reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

This prerequisite requires compliance with the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010. A *continuous air barrier* on the entire building envelope is a mandatory requirement in ASHRAE 90.1-2010, while previous versions had no specific air barrier requirements. Tyvek® Air & Water Barrier Systems could satisfy the *continuous air barrier* requirement and contribute towards this prerequisite.

EA Credit Enhanced Commissioning (2-6 points)

Design Intent: To further support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

Option 2 in this credit, building envelope commissioning (BECx), requires testing and verifying the building's thermal envelope to achieve better building performance and less energy expenditure over its lifetime. Tyvek® Air & Water Barrier Systems, installed per DuPont installation guidelines, will help meet the energy performance, air infiltration, water infiltration and building envelope airtightness requirements for envelope commissioning in Option 2.

EA Credit Optimize Energy Performance (1-20 points)

Design Intent: To achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

Keeping drafts and wind out of wall cavities protects the installed R-value of thermal insulation and reduces heat loss through air leakage, leading to reduced HVAC energy consumption in addition to greater comfort. DuPont™ Tyvek® air barrier systems installed per DuPont installation guidelines will help achieve HVAC energy savings due to envelope airtightness and contribute towards EA credits in this category.

MATERIALS AND RESOURCES (MR)

MR Credit: Building Product Disclosure and Optimization – Material Ingredients (1-2 points)

Design Intent: To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

Option 1 in this credit is for projects that have at least 20 permanently installed products consisting of materials that have disclosed their ingredient inventory to at least 0.1% (1000 ppm), in one of the listed formats – *e.g.* Manufacturer Inventory; Health Product Declaration; Cradle to Cradle; USGBC approved program. Calculation is done by number of products.

DuPont™ Tyvek® wraps have a **Manufacturer Inventory** reporting and satisfy the LEED® v4 Materials and Resources, Building Product Disclosure and Optimization – Material Ingredients for Option 1, and contribute toward LEED® v4 in this category.

INDOOR ENVIRONMENTAL QUALITY (EQ)

EQ Credit Low-Emitting Materials (1-3 Points)

Design Intent: To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

This credit includes requirements for volatile organic compound (VOC) emissions into indoor air and the VOC content of materials. The Healthcare and Schools projects have additional requirements for VOC limits of *exterior* applied products, which include the WRB category. Tyvek® Air & Water Barrier Systems meet/exceed the required VOC limits for building exterior for Healthcare and Schools Projects and could contribute to EQ credits in this category.

EQ Credit Construction Indoor Air Quality Management Plan (1 Point)

Design Intent: To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.

All projects are required to protect absorptive materials stored on-site and installed from *moisture damage*. Healthcare Projects also require to limit the *outdoor emissions*. For renovation projects involving waterproofing or other outdoor activities that generate high VOC emissions, the project team must develop a plan to manage fumes and avoid infiltration to occupied spaces.

DuPont™ Tyvek® Water Resistive Barriers (WRBs) protect installed absorptive materials from *moisture damage* during construction phase, while allowing drying of incidental moisture.

DuPont™ Tyvek® Wraps, Fluid Applied WBs and all sealants used with Tyvek® systems meet VOC limits, and would meet the *outdoor emissions* requirements for healthcare projects.



HOW DUPONT™ TYVEK® WEATHERIZATION SYSTEMS* CONTRIBUTE TO SUSTAINABLE DESIGN COMMERCIAL APPLICATION: LEED®-NC RATING SYSTEM, VERSION 4

Key Attributes of DuPont™ Tyvek® Weatherization Systems, essential for energy efficient and durable building envelope, thermal comfort and indoor environmental quality (IEQ): (1) Air Infiltration Resistance; (2) Water Resistance; (3) Water vapor permeability; (4) Durability; (5) Compatible system components; (6) Environmental Stewardship; (7) Low-VOC emissions

LEED® Credits and points to which DuPont™ Tyvek® may contribute	Changes from LEED® 2009	How may DuPont™ Tyvek® contribute?	How to Verify (Required Documentation)
EA: Energy & Atmosphere EA Prerequisite: Fundamental Commissioning and Verification	Requires the CxA to be engaged before the design development phase is complete. The electrical and plumbing scopes have been expanded. Elements of envelope commissioning are now included in OPR and BOD. One design review and one operations and maintenance plan are now required.	Elements of envelope commissioning are now incorporated in the OPR (Owner's Project Requirements) and BOD (Basis of Design). The building envelope must include a continuous air barrier to satisfy the OPR and BOD. Full envelope commissioning is not required unless the project team pursues EA Credit Enhanced Commissioning, Option 2. However, building envelope may be added to the Cx scope at the owner's request. DuPont Tyvek® air barrier systems installed per DuPont installation guidelines will satisfy the OPR and BOD and help meet envelope performance requirements if BECx is added to the Cx scope.	CxA previous experience Confirmation of OPR and BOD contents — The building envelope must include a continuous air barrier to satisfy the OPR and BOD. List of systems to be commissioned — Envelope may be added to the Cx scope at owner's request Documentation of testing and verification — Envelope testing and verification may include air and water penetration. A continuous Tyvek® air and water barrier will help meet these performance requirements Cx Plan, Cx Report, Others
EA: Energy & Atmosphere EA Prerequisite: Minimum Energy Performance Option 1: Whole-Building Energy Simulation (Performance Path) Option 2: Comply with ASHRAE 50% Advanced Energy Design Guide (Prescriptive Path) Option 3: Comply with Advanced Buildings™ Core Performance™ Guide (Prescriptive Path)	ASHRAE 90.1 -2010 replaces ASHRAE 90.1 -2007 for all options. For Option 2, the standard for compliance with the prerequisite has been changed to 50% expected savings over ASHRAE 90.1 -2004 (previously 30%). For Prescriptive Options 2 and 3, the project must comply with mandatory and prescriptive requirements of ASHRAE 90.1 -2010.	Option 1: available to all projects. Recommended for projects pursuing EA Credit Optimize Energy Performance, since energy modeling makes the project eligible to earn more points. Option 2: for projects that have minimal opportunity or no need for unique designs and systems, beyond the simple upgrades Option 3: for projects that are less than 100,000 square feet (9,290 square meters) and not a school, healthcare, warehouse, or laboratory. All Options must meet ASHRAE 90.1—2010 mandatory requirements, which include a continuous air barrier. DuPont "Tyvek® air barrier systems installed per DuPont installation guidelines, will satisfy the mandatory requirements in section 5.4.3.1.2 of ASHRAE 90.1–2010 with regard to a continuous air barrier.	Option 1: Appendix G energy modeling inputs For baseline and proposed building according to ASHRAE 90.1 -2010, Appendix G and LEED® v4 Guidelines Input-output reports from energy modeling Demonstrate required energy savings in the proposed building compared with the baseline building. Prerequisite compliance must be achieved without accounting for the cost offset by site-generated renewable energy Option 2: AEDG compliance tables All ASHRAE 90.1 -2010 mandatory and prescriptive requirements must be met, including building envelope (e.g. mandatory continuous air barrier). Option 3: Documentation required include: All ASHRAE 90.1 -2010 mandatory & prescriptive requirements must be met, including building envelope (e.g. mandatory continuous air barrier)
EA: Energy & Atmosphere EA Credit: Enhanced Commissioning (2-6 points) Option 1: Enhanced Systems Commissioning (3-4 points) Option 2: Envelope Commissioning (2 points)	This credit now includes monitoring- based commissioning and building envelope commissioning options	Option 1 does not include envelope commissioning Option 2 includes envelope commissioning and it's beneficial for most projects but especially for those that are envelope dominated, located in an extreme climate or microclimate, or subject to potential leakage or infiltration of contaminants. DuPont™ Tyvek® air and water barrier systems, installed per DuPont installation guidelines, will help meet the air infiltration, water infiltration and building envelope airtightness requirements for envelope commissioning in Option 2.	Option 1: Complete commissioning process (CxP) activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies. Does not require envelope commissioning. Option 2: List of all tasks completed as part of Cx activities — Include envelope in Cx plan. Incorporate BECx into the Cx plan and complete the tasks required to meet the intent of EA Prerequisite Fundamental Commissioning and Verification, EA Credit Enhanced Commissioning. The envelope commissioning includes modeling, observing, testing, documenting, and verifying materials, components, assemblies, and systems to validate that both their use and installation meet the owner's requirements. Examples of envelope systems tests include air infiltration, water infiltration and building envelope air leakage.

LEED® Credits and points to which				
DuPont ³⁴ Tyvek® may contribute EA: Energy & Atmosphere EA Credit: Optimize Energy Performance (1-20 Points*) Option 1: Performance Whole-Building Energy Simulation* (1-18 points except Schools and Healthcare, 1 -16 points Schools, 1 -20 points Healthcare) Option 2: Prescriptive ASHRAE 50% Advanced Energy Design Guides — AEDGs (1-6 points)	Changes from LEED® 2009 See EA Prerequisite Minimum Energy Performance, Changes from LEED® 2009.	How may DuPont™ Tyvek® contribute? Option 1: To be eligible for Option 1, projects must follow the criteria in EA Prerequisite Minimum Energy Performance. The project must demonstrate a percentage energy cost savings for the proposed building compared to the baseline building. Points are awarded according to % improvement based on Whole Building Energy simulations. In order to estimate energy savings due to continuous air barriers (envelope airtightness) the energy simulations must input air leakage. The guidelines for how to input air leakage into energy models for "baseline building" and "proposed building" have been published for the first time in ASHRAE 90.1-2013 Appendix G. Option 2: To be eligible for Option 2, projects must	How to Verify (Required Documentation) Option 1: Performance Pathway • Appendix G energy modeling inputs; The guidelines for inputting air leakage into energy simulations have been published for the first time in ASHRAE-90.1 2013. • Input and output reports from modeling software; Whole Building Energy Simulations must be performed using ASHRAE 90.1 — 2010 Appendix G guidelines (ASHRAE 90.1 — 2013 for air leakage input). • Energy consumption and demand for each building end use and fuel type • Others — Points are awarded according to %	
		follow the criteria in EA Prerequisite Minimum Energy Performance. A continuous air barrier could directly contribute towards the credit, through compliance with the applicable recommendations and standards in Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate ASHRAE 50% Advanced Energy Design Guide and climate zone DuPont [™] Tyvek® air barrier systems installed per DuPont installation guidelines, will help achieve HVAC energy savings due to envelope airtightness and contribute towards EA credits in both Option 1 and Option 2.	improvement based on Whole Building Energy simulations. Option 2: Prescriptive Pathway AEDG compliance tables — A continuous air barrier could directly contribute towards the credit.	
MR: Materials & Resources MR Credit: Building Product Disclosure and Optimization - Material Ingredients (1-2 points) Option 1: Material Ingredient Reporting (1 point) Option 2: Material Ingredient Optimization (1 point) Option 3: Product Manufacturer Supply Chain Optimization (1 point)	This is a new credit	Option 1 is for projects that have at least 20 permanently installed products consisting of materials that have disclosed their ingredient inventory to at least 0.1% (1000 ppm), in one of the listed formats, as indicated in the credit requirements — e.g. Manufacturer Inventory; Health Product Declaration; Cradle to Cradle; USGBC approved program. Calculation is done by number of products. DuPont Tyvek air barriers have a Manufacturer Inventory reporting and can contribute to Option 1. Option 2 is for projects with 25% permanently installed products that meet at least one of the material ingredient optimization paths listed in the credit requirements - GreenScreen v1.2 Benchmark; Cradle to Cradle Certified; International Alternative Compliance Path — REACH Optimization; USGBC approved program. Option 3 requires that products are sourced from manufacturers who engage in validated and robust safety, health, hazard, and risk programs with independent third party verification of their supply chain. Calculations for Options 2 & 3 are done by cost of the total value.	 Option 1: MR building product disclosure & optimization calculator or equivalent tracking tool Documentation of chemical inventory through Health Product Declaration, Cradle to Cradle certification labels, manufacturers' lists of ingredients with GreenScreen assessment reports for confidential ingredients, or USGBC-approved programs DuPont™ Tyvek® wraps satisfy the LEED® v4 MR Credit, Building Product Disclosure and Optimization — Material Ingredients, Option 1 — Material Ingredient Reporting and contribute toward LEED® v4 in this category. Option 2: MR building product disclosure & optimization calculator or equivalent tracking tool Verification of ingredient optimization through one of the listed formats, as indicated in the credit requirements (GreenScreen v1.2 Benchmark; Cradle to Cradle Certified; International Alternative Compliance Path - REACH Optimization; USGBC approved program). Option 3: Documentation of supply chain optimization, by cost of the total value. 	
EQ: Indoor Environmental Quality EQ Credit: Low-Emitting Materials (1-3 points) Option 1: Product Category Calculations (Achieve the threshold level of compliance with emissions and content standards for the number of product categories listed in this option). Option 2: Budget Calculation Method (If some products in a category do not meet the criteria, project teams may use the budget calculation method).	Emissions for on-site, wet-applied, full-spread products are now included. VOC content limits for on-site, wet-applied products are still required. Former individual credit paths have been combined into one credit, with a scaled point system New referenced standards have been added to address international projects and new product requirements. Ceilings are now included in the requirements. Emissions from insulation are now included.	Option 1 & 2: The emission requirements in this credit refer to interior materials only. The building interior is defined as everything inside the waterproofing membrane. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system, such as waterproofing membranes and air- and water-resistive barrier materials. Additional Requirements for Healthcare and Schools only: Exterior applied products. Adhesives, sealants, coatings, roofing, and waterproofing materials applied on site must meet the VOC limits of California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, and South Coast Air Quality Management District (SCAQMD), Rule 1168, effective July 1, 2005. DuPont™ Tyvek® Systems meet the required standards for building exterior, (Option 1 & 2) for Healthcare and Schools Projects.	Options 1 & 2: • USGBC low-emitting materials calculator • Product information (e.g., MSDS, third-party certifications, testing reports) DuPont™ Tyvek® Wraps and Fluid Applied Systems meet or exceed emissions guidelines for volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). DuPont™ Tyvek® wraps and DuPont™ Tyvek® Fluid Applied complies with California Department of Public Health (CDPH) Standard. DuPont adhesives and sealants wet-applied on site meet/exceed VOC content requirements for wet applied products Comply with SCAQMD Rule #1168 DuPont Flashing systems meet SCAQMD rule #1168 on VOC limits Comply with SCAQMD Rule #1168	

LEED® Credits and points to which DuPont™ Tyvek® may contribute	Changes from LEED® 2009	How may DuPont™ Tyvek® contribute?	How to Verify (Required Documentation)
EQ: Indoor Environmental Quality EQ Credit : Construction Indoor Air Quality Management Plan (1 Point)	No changes for moisture protection and outdoor emissions, only changes on use of tobacco products during construction: The use of tobacco products during construction is now explicitly probibited inside the building and within 25 feet (7.5 meters) (or greater, if required by the local jurisdiction) of the building entrance.	Moisture Damage — All Projects: One of the requirements for this credit is to protect absorptive materials stored on-site and installed from moisture damage. Install WRB over exterior sheathing & document in the Air Quality Management plan to meet the moisture protection requirements. Outdoor emissions: Healthcare Projects (Additional requirements): For Healthcare renovation projects involving waterproofing or other outdoor activities that generate high VOC emissions, develop a plan to manage fumes and avoid infiltration to occupied spaces. DuPont™ Tyvek® Water Resistive Barriers (WRBs) protect installed absorptive materials from moisture damage during construction phase, while allowing drying of incidental moisture. DuPont™ Tyvek® Wraps, Fluid Applied WRBs and all sealants used with Tyvek® systems meet VOC limits, and would meet the outdoor emissions requirements for healthcare projects.	All Projects: Narrative describing protection measures for absorbent materials Moisture: Develop and implement a moisture control plan to protect stored on-site and installed absorptive materials from moisture damage, protect the building from moisture intrusion and prevent occupants' exposure to mold spores. Document these measures in the Air Quality Management plan. Healthcare (Additional requirements) Outdoor emissions: Document compliance with procedures in National Institute for Occupational Safety and Health, NIOSH Publication 2003-112, Asphalt Fume Exposures During the Application of Hot Asphalt to Roofs, Sections 4 and 5. Include details for compliance in the project EQMP to manage fumes and avoid infiltration to occupied spaces.

*DuPont™ Tyvek® Weatherization Systems include:

- Primary membranes (Building Wraps and Fluid Applied): DuPont[™] Tyvek[®] CommercialWrap[®], DuPont[™] Tyvek[®] ThermaWrap[®], DuPont[™] Tyvek[®] StuccoWrap[®], DuPont[™] Tyvek[®] DrainWrap[®], DuPont[™] Tyvek[®] Housewrap[®] and DuPont Tyvek[®] Fluid Applied
- Installation and continuity accessories for Tyvek® Building Wraps and Fluid Applied (FA) membranes: Self-Adhered flashing, Fluid Applied Flashing and Joint Compound, tapes, caulks and sealants

KEY POINTS: LEED® GREEN BUILDING RATING SYSTEM™ LEED® FOR NEW CONSTRUCTION & MAJOR RENOVATIONS IN COMMERCIAL APPLICATIONS (VERSION 3, 2009 VS. VERSION 4, 2013)

	LEED® – NC New Construction and Major Renovation				
What is LEED®?	The Leadership in Energy and Environmental Design (LEED®) Green Building Rating System™ is a third party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings.				
Who developed LEED®?	LEED® is a registered trademark of the U.S. Green Building Council (USGBC).				
Does LEED® certify products?	No. This Green Building Rating System [™] is for the design, construction and operation of high performance green buildings as well as sustainable <i>design</i> and construction in bomes nationwide. DuPont [™] Tyvek [®] Weatherization Systems may contribute to obtain LEED [®] credits towards a building or bome certification.				
What is the scope of LEED®-NC?	LEED®—NC (The LEED® Green Building Rating Systems for New Construction and Major Renovation) provides a set of performance standards for certifying the design and construction phases of commercial, institutional buildings, and high rise residential buildings.				
What type of Rating Systems does LEED [®] have?	LEED® Rating System Portfolio includes: LEED®-NC (New Construction) LEED®-EB (Existing Buildings) LEED® for Commercial Interiors LEED® Core & Shell LEED® for Schools, Healthcare, Hospitality, Retail, Warehouses, Data Centers, LEED® for Homes LEED® for Neighborhood development				
	Credit Category	Max. Points LEED-NC v3	Max. Points LEED-NC v4		
	Integrative Process (IP)	0	1		
	Location and Transportation (LT)	0	16		
	Sustainable Sites (SS)	26	10		
Credit Category & Maximum Points for	Water Efficiency (WE)	10	11		
LEED® New Construction & Major	Energy & Atmosphere (EA)	35	33		
Renovations (v3 vs. v4, bold text indicates a new	Materials & Resources (MR)	14	13		
category)	Indoor Environmental Quality (EQ)	15	16		
	Awareness & Education (AE)	6	0		
	Innovation (IN)	0	6		
	Regional Priority	4	4		
	Maximum points	110	110		
	LEED®—NC has four levels of certification:				
		LEED-NC Version 3	LEED-NC Version 4		
How many points does one need to get	Certified:	40-49 points	40-49 points		
LEED® certification?	Silver	50-59 points	50-59 points		
	Gold	60-79 points	60-79 points		
	Platinum	80 points and above	80 points and above		
How does the rating system for LEED®-NC work?	Project teams interested in obtaining LEED® Certification for their project must first register with USGBC (www.usgbc.org) in the LEED® section, under Register Your Project. As of January 2006, project teams pursuing LEED-NC certification under Version 2.2 are required to use LEED-Online.				
	All projects will need to comply with the version of LEED-NC that is current at the time of project registration.				
LEED®-NC credits to which DuPont Tyvek® Weatherization Systems may contribute	 EA: Energy & Atmosphere (Contribution towards prerequisites and credits in this category) MR: Materials and Resources (MR: Building Product Disclosure and Optimization - Material Ingredients requirements for Option 1) EQ: Indoor Environmental Quality (Indirect contribution) Please review previous table to learn about how Tyvek® Weatherization Systems may contribute in each credit category 				

OUR COMMITMENT TO SUSTAINABLE BUILDING SOLUTIONS

DuPont is at the forefront of the search for new sustainable building solutions that improve comfort, enhance life around the world and have zero impact on the environment. We will continue to work closely with the U.S. Green Building Council and other nonprofit and government agencies to produce increasingly environmentally sustainable building solutions for a healthy future.

Learn more about DuPont[™] Tyvek[®] and sustainable green design:

DuPont Protection Solutions: 1-800-44-TYVEK www.Weatherization.Tyvek.com

U.S. Green Building Council: www.usgbc.org



For more information, please call 1-800-44-Tyvek or visit www.weatherization.tyvek.com