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LEED v5 REFERENCE GUIDE

BUILDING DESIGN AND CONSTRUCTION

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The LEED v5 rating systems were developed by the USGBC volunteer community and formally ratified by our broader membership. The reference guide suite is the product of the dedicated efforts of USGBC and Green Business Certification Inc. (GBCI) staff and consultants, designed to support the industry’s understanding and implementation of the rating systems.

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IN REMEMBRANCE

The USGBC community lost two volunteers in 2024. We honor their memory and dedication to creating a more sustainable world through green building.

Ganesh Nayak
USGBC volunteer from 2023–2024

As the chair of our Equity Working Group at the USGBC, Ganesh was a long-standing leader, mentor, and champion of sustainable and inclusive design. His dedication to LEED certification and sustainable architecture transformed over four million square feet of space, leaving a lasting legacy of environmental stewardship.

Stewart Comstock
USGBC volunteer from 2020–2024

Stewart donated his time as the vice chair of the Sustainable Sites Technical Advisory Group, bringing decades of deep expertise in stormwater management to our work. His influence helped shape some of the most critical aspects of LEED as it evolved over the years. Stewart helped lay the foundation on which many of today’s green infrastructure principles and best practices are built.

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PREFACE

THE CASE FOR GREEN BUILDING

Green buildings are an integral part of the solution to the environmental challenges facing the planet.

The impetus behind development of the Leadership in Energy and Environmental Design (LEED) rating systems was recognition that the design, construction building management industry has the expertise, tools, and technology to transform buildings and make significant advances toward a sustainable planet. LEED projects throughout the world have demonstrated the benefits of taking a green design and operations approach that reduces the environmental harms of buildings and restores the balance of natural systems.

Buildings have a major role to play in sustainability through their construction, the lifetime of their operation, and patterns of development.

What we build today, how we build it, and where we build it are profoundly important.

ABOUT LEED

LEED is a concise framework for identifying and implementing practical and measurable green building, design, construction, operations, and maintenance strategies and solutions. A voluntary, market-driven, consensus-based tool, LEED serves as a guideline and assessment mechanism.

Within the appropriate rating system, projects that meet the prerequisites and earn enough credits to achieve the certification threshold have demonstrated performance that spans the goals in an integrated way. The organization awards certification at four levels: LEED Certified, LEED Silver, LEED Gold, and LEED Platinum. These levels incentivize higher achievement and, in turn, faster progress toward the goals.

Since its launch, LEED has evolved to address new markets and building types, advances in practice and technology, and greater understanding of the environmental and human health effects of the built environment. The Foundations of LEED detail the principles of transparency, openness, and inclusiveness that guide this evolutionary process. Learn more by exploring the Foundations of LEED at usgbc.org/resources/foundations-leed.

LEED does not certify, endorse, or promote any products, services, or companies.

LEED'S GOALS

LEED seeks to optimize the use of natural resources, promote regenerative and restorative strategies, maximize the positive and minimize the negative environmental and human health consequences of the construction industry, and provide high-quality indoor environments for building occupants. Emphasizing integrative design, integration of existing technology, and state-of-the-art strategies, LEED advances expertise in green building and transforms professional practice. The technical basis for LEED strikes a balance between requiring today's best practices and encouraging leadership strategies. LEED sets a challenging yet achievable set of benchmarks that define green building for interiors, buildings, and cities and communities.

LEED v5 was developed around three central areas of impact:

- Decarbonization
- Quality of life
- Ecological conservation and restoration

Every credit and prerequisite in LEED v5 links to decarbonization, quality of life, and/or ecological conservation and restoration. The rating system annotates this connection, enabling project teams to easily shape and communicate their sustainability stories.

BENEFITS OF USING LEED

LEED is designed to address environmental challenges while responding to the needs of a competitive market. LEED-certified buildings are designed to deliver many benefits, including:

- Lower operating costs and increased asset value
- Reductions in waste sent to landfills
- Energy and water conservation
- Conserved and restored habitat for improved ecosystem function and biodiversity
- Increased market transparency and expanded access to industry-leading green products and materials
- More healthful and productive environments for occupants
- Reductions in greenhouse gas (GHG) emissions
- Qualification for tax rebates, zoning allowances, and other incentives in many cities

By participating in LEED, owners, operators, designers, and builders make a meaningful contribution to the green building industry. By documenting and tracking buildings' resource use, they contribute to a growing body of knowledge that will advance research in this rapidly evolving field. This will allow future projects to build on the successes of today’s designs and bring innovations to the market.

GBCI independently verifies sustainability performance against LEED, ensuring the integrity of outcomes and strengthening market confidence in sustainability investment and innovation.

LEED CERTIFICATION PROCESS

A LEED project begins when the team determines scope, selects the appropriate rating system, confirms alignment with the minimum program requirements, and registers the project on the Arc platform. The team designs the project to meet the requirements for all prerequisites and for the credits they have chosen to pursue, in coordination with their sustainability goals. The required documentation is compiled and submitted to GBCI for review. GBCI provides feedback on the documentation received, which gives project teams the chance to make any needed design and construction changes or take additional steps to improve an existing project’s performance and/or provide additional clarification needed for GBCI to determine compliance. Additional rounds of review follow, as needed and allowed, to earn certification of the project.

For a more in-depth understanding of the certification process, see the Guides to Certification.

GETTING STARTED

ABOUT THIS GUIDE

This guide explains the requirements of the LEED v5 Building Design and Construction (BD+C) rating system, offering essential background information for contractors, engineers (mechanical, structural, and civil), architects, designers (interior and landscape), architects, designers, building operators, and LEED consultants. Early attention to rating system selection, minimum program requirements, and project boundaries ensure a smoother path to certification.

This guide is the first in a series of detailed resources for project teams pursuing LEED v5. It builds on the rating system requirements, providing background on each LEED category and a detailed explanation of the technical requirements for each credit.

WHAT'S INSIDE

This guide builds on the requirements listed in the rating system to provide background on each LEED category and an in-depth explanation of the technical requirements of each credit.

This guide contains:

- LEED v5 rating system requirements
- Rating system requirements explained
- Documentation requirements
- Referenced standards

As teams review each credit and prerequisite, they should carefully evaluate the options and pathways available, ensuring they align with the project's specific goals, constraints, and characteristics.

When preparing documentation to submit for review, these materials may consist of contract documents (plans, specifications, elevations, sections, construction details, etc.) calculations, reports, manufacturer product information, photographs, and/or descriptive narratives.

The USGBC glossary is an additional resource: usgbc.org/glossary/v5

CREDIT CATEGORIES

This LEED rating system organizes the prerequisites and credits into eight categories, each addressing a fundamental aspect of sustainable, high-performance designs and construction practices:

- *Integrative Process, Planning, and Assessments (IP)*
- *Location and Transportation (LT)*
- *Sustainable Sites (SS)*
- *Water Efficiency (WE)*
- *Energy and Atmosphere (EA)*
- *Materials and Resources (MR)*
- *Indoor Environmental Quality (EQ)*
- *Project Priorities (PR)*

RATING SYSTEM SELECTION

LEED offers rating systems designed for specific project types. Projects must register under the most appropriate LEED rating system and use the guide appropriate to the project's registration. In cases where the most appropriate rating system is unclear, additional guidance is provided in the USGBC Help Center: support.usgbc.org/hc/en-us. The project team may also raise a request to consult with GBCI: support.usgbc.org/hc/en-us/requests/new. The consultation should occur prior to registration to avoid the risk of GBCI determining, during the Preliminary Review, that an inappropriate rating system has been selected.

LEED FOR BUILDING DESIGN AND CONSTRUCTION (BD+C)

New Construction and Major Renovations

Applicable to whole buildings, and whole additions to buildings, of various use types that are either new construction or undergoing major renovations and where at least 60% of the gross floor area is complete.

Major renovations are buildings with extensive interior alteration work in addition to work on the exterior shell of the building and/or primary structural components and/or the core and peripheral MEP (mechanical, electrical, plumbing) and service systems and/or site work. Typically, the extent and nature of the work prevent the primary function space from being used for its intended purpose while the work is in progress, and the project team must obtain a new certificate of occupancy before reoccupying the work area.

Core and Shell Development
Applicable to whole buildings of various use types that are either new construction or undergoing major renovations and at least 40% of the gross floor area is incomplete. Incomplete: does not have its basic floor, wall, and/or ceiling finishes installed, or essential mechanical, electrical, plumbing systems (or fixtures) necessary to occupy the space for its intended use, within the contracted scope of work.

LEED FOR INTERIOR DESIGN AND CONSTRUCTION (ID+C)

Commercial Interiors

Applicable to interior renovation projects of commercial spaces (that have no scope for the exterior shell of the building and/or site work). The team installs movable furnishings, fixtures, and equipment (FF&E) to support the intended regular operations of the space.

LEED FOR BUILDING OPERATIONS AND MAINTENANCE (O+M)

Existing Buildings

Applicable to existing buildings projects focused on operational improvement. This rating system focuses on whole buildings that have been fully operational and occupied for at least one year. Focusing on performance-driven strategies and outcomes allows buildings in use to achieve greater efficiency.

PROJECT TYPE REQUIREMENTS

A LEED project must have its entire gross floor area certified under a single rating system (LEED BD+C: New Construction or LEED BD+C: Core and Shell; LEED ID+C: Commercial Interiors; or LEED O+M: Existing Buildings) and is subject to all prerequisites and attempted credits in that rating system, regardless of mixed construction or space usage type.

However, in some prerequisites and credits, there may be requirements identified for specific project types such as schools, warehouse and distribution centers, healthcare, or residential. If 60% or more of the project’s gross floor area consists of a specific project type, the project must meet the requirements for that type. For example, if a project is 75% residential and 25% retail, that project must follow the residential requirements in the rating system. In the Core and Shell Rating System or in a New Construction/Major Renovation project with incomplete space, the use type of the incomplete space must be based on the expected future use.

PROJECTS WITH INCOMPLETE SPACE

Projects that have incomplete space (future fit-out) can still pursue certification as long as the following criteria are met:

- Incomplete space comprises no more than 40% of the gross floor area for New Construction and no less than 40% of the gross floor area for Core and Shell.
- The team counts occupancy for the incomplete space by using projected values or, if unknown, the LEED Default Occupancy.
- A letter of commitment from the owner is provided attesting that the incomplete spaces will satisfy the requirements of each prerequisite and credit achieved by the project.
- The team provides a description of the incomplete space, identifying the remaining scope, the entity responsible for the remaining scope, and the reason the building is incomplete at the time of the final application.
- Prerequisite calculations must include the completed scope only. Credit calculations must include the completed and incomplete scope, and the incomplete scope must be held equivalent to the baseline.
- Contact USGBC, prior to application submission, for any attempted credits in which an adaptation for the incomplete space is not clear.

PROJECT OCCUPANCY

It is important to establish occupancy that will be used consistently throughout the application and share them with the whole project team. Whenever possible, use actual or predicted occupancies. LEED requires the assessment and reporting of occupancy in two ways: regular building occupants and visitors.

REGULAR BUILDING OCCUPANTS

Regular building occupants are routine users of a project (full- and part- time) such as:

- Employees, daily volunteers, support staff (e.g., janitors).
- Residents (dormitory, apartment, condo), overnight hotel guests, medical inpatients.
- K–12 students.

VISITORS

Visitors are intermittent users of a project, such as:

- Retail customers
- Medical outpatients

- Volunteers who only periodically use a building (e.g., once per week)
- Higher-education classroom students

DEFAULT OCCUPANCY COUNTS

If the occupancy is unknown and cannot be reasonably projected, use one of the following resources to estimate occupancy:

- Default occupant density from *ASHRAE 62.1-2022, Table 6-1*[1]

Table 1. Default occupancy counts based on gross floor area, excluding structured parking

	Gross square feet per occupant		**Gross square meters per occupant**	
	Regular	**Visitors**	**Regular**	**Visitors**
General office	250	0	23	0
Retail, restaurant	435	95	40	9
Retail, grocery store	550	115	51	11
Retail, general	550	130	51	12
Retail, service	600	130	56	12
Medical office	225	330	21	31
R&D or laboratory	400	0	37	0
Warehouse, distribution	2,500	0	232	0
Warehouse, storage	20,000	0	1860	0
Educational, daycare	630	105	59	10
Educational, K–12	1,300	140	121	13
Educational, postsecondary	2,100	150	195	14

NOTE: For residential (i.e., apartment or condo), use the number of bedrooms in the dwelling unit plus one, multiplied by the number of such dwelling units.

NOTE: For a hotel or motel, use 1.5 occupants per guest room multiplied by the total number of guest rooms. Then multiply the resulting total by 60%.

AVERAGE VS. PEAK OCCUPANCY

In prerequisite/credit calculations, different methods may calculate occupancy:

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[1] "The Standards for Ventilation and Indoor Air Quality", ASRAE, last accessed March 21, 2025, https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2.

- **Daily average**. The value representative of all the regular building occupants for a typical 24-hour day of operation. If numbers vary seasonally, use occupancy numbers that are a representative daily average over the entire operating season of the building.
- **Peak total**. The value that represents the highest number of occupants expected in the project at one time (e.g., shift overlap, events). Sometimes the building code generates the value for fire-safety; but if justified, a lower number can be used.

If default occupancy counts from Table 1 are used, they must be applied as the daily average and peak occupancy values.

Peak outpatients are the highest number of outpatients at a given point in a typical 24-hour period.

EQUIVALENCIES

The LEED rating system is written based on the most up to date and widely available standards. However, alternative standards or compliance paths may also be available to project teams. The project priority library includes a list of equivalencies and alternative compliance paths available by credit, project types, or region.

If there is no guidance available allowing an equivalency or alternative compliance path, project teams may submit a request for USGBC to determine equivalency.

LEED PLATINUM REQUIREMENTS

To earn LEED Platinum in LEED v5, projects must complete all prerequisites, earn a minimum of 80 points and achieve decarbonization requirements in the following credits:

LEED BD+C

- *EAc1 Electrification*
- *EAc3 Enhanced Energy Efficiency*
- *EAc4 Renewable Energy*
- *MRc2 Reduce Embodied Carbon*

LEED ID+C

- *EAc1 Electrification*
- *EAc2 Enhanced Energy Efficiency*
- *EAc3 Renewable Energy*
- *MRc2 Reduce Embodied Carbon*

LEED O+M

- *EAc1 Greenhouse Gas Emissions Reduction Performance*
- *EAc2 Optimized Energy Performance*
- *EAc5 Decarbonization and Efficiency Plans*

See Appendix I for the full list of LEED Platinum requirements.

MINIMUM PROGRAM REQUIREMENTS (MPR)

The minimum program requirements (MPRs) are the minimum characteristics or conditions that make a project appropriate to pursue LEED certification. These requirements serve as the foundation for all LEED projects and define the types of buildings, spaces, and neighborhoods that the LEED rating system evaluates.

MPR 1. MUST BE IN A PERMANENT LOCATION ON EXISTING LAND

INTENT

LEED evaluates buildings, spaces, neighborhoods, communities, and cities in the context of their surroundings. A significant portion of LEED requirements depends on the project's location; therefore, it is important that LEED projects are evaluated as permanent structures. Locating projects on existing land is important to avoid artificial land masses that have the potential to displace and disrupt ecosystems.

REQUIREMENTS

All LEED projects must have construction and operations at a permanent location on existing land. No project that is designed to move at any point in its lifetime may pursue LEED certification. This requirement applies to all land within the LEED project.

MPR 2. MUST USE REASONABLE LEED BOUNDARIES

INTENT

LEED evaluates buildings, spaces, neighborhoods, communities, cities, and all environmental impacts associated with those projects. Defining a reasonable LEED boundary ensures the project is accurately evaluated.

REQUIREMENTS

The project team must include all contiguous land that is associated with the LEED project boundary and supports its typical operations. This includes land altered as a result of construction and features used primarily by the project's occupants, such as hardscape (parking and sidewalks), septic or stormwater treatment equipment, and landscaping. The LEED boundary may not unreasonably exclude portions of the building, space, or site to give the project an advantage in complying with credit requirements. The LEED project must accurately communicate the scope of the certifying project in all promotional and descriptive materials and distinguish it from any non-certifying space.

MPR 3. MUST COMPLY WITH PROJECT SIZE REQUIREMENTS

INTENT

LEED evaluates buildings, spaces, or neighborhoods of a certain size. The LEED requirements do not accurately assess the performance of projects outside of these size requirements.

REQUIREMENTS

All LEED projects must meet the size requirements listed below.

LEED BD+C and LEED O+M
The LEED project must include a minimum of 1,000 square feet (93 square meters) of gross floor area.

LEED ID+C
The LEED project must include a minimum of 250 square feet (22 square meters) of gross floor area.

Further guidance on the MPRs can be found here:
usgbc.org/credits?MinimumProgramRequirements

RATING SYSTEM SCORECARDS

CREDIT CATEGORY VIEW

		New Construction	Core and Shell
Integrative Process, Planning and Assessments (IP)		**1**	**7**
IPp1	Climate Resilience Assessment	Required	Required
IPp2	Human Impact Assessment	Required	Required
IPp3	Carbon Assessment	Required	Required
IPp4	Tenant Guidelines	–	Required
IPc1	Integrative Design Process	1	1
IPc2	Green Leases	–	6
Location and Transportation (LT)		**15**	**16**
LTc1	Sensitive Land Protection	1	1
LTc2	Equitable Development	2	2
LTc3	Compact and Connected Development	6	6
LTc4	Transportation Demand Management	4	4
LTc5	Electric Vehicles	2	2
Sustainable Sites (SS)		**11**	**11**
SSp1	Minimized Site Disturbance	Required	Required
SSc1	Biodiverse Habitat	2	2
SSc2	Accessible Outdoor Space	1	1
SSc3	Rainwater Management	3	3
SSc4	Enhanced Resilient Site Design	2	2
SSc5	Heat Island Reduction	2	2
SSc6	Light Pollution Reduction	1	1
Water Efficiency (WE)		**9**	**8**
WEp1	Water Metering and Reporting	Required	Required
WEp2	Minimum Water Efficiency	Required	Required
WEc1	Water Metering and Leak Detection	1	1
WEc2	Enhanced Water Efficiency	8	7

		New Construction	Core and Shell
Energy and Atmosphere (EA)		**33**	**27**
EAp1	Operational Carbon Projection and Decarbonization Plan	Required	Required
EAp2	Minimum Energy Efficiency	Required	Required
EAp3	Fundamental Commissioning	Required	Required
EAp4	Energy Metering and Reporting	Required	Required
EAp5	Fundamental Refrigerant Management	Required	Required
EAc1	Electrification	5	4
EAc2	Reduce Peak Thermal Loads	5	5
EAc3	Enhanced Energy Efficiency	10	7
EAc4	Renewable Energy	5	4
EAc5	Enhanced Commissioning	4	3
EAc6	Grid Interactive	2	2
EAc7	Enhanced Refrigerant Management	2	2
Materials and Resources (MR)		**18**	**21**
MRp1	Planning for Zero Waste Operations	Required	Required
MRp2	Quantify and Assess Embodied Carbon	Required	Required
MRc1	Building and Materials Reuse	3	5
MRc2	Reduce Embodied Carbon	6	8
MRc3	Low-Emitting Materials	2	1
MRc4	Building Product Selection and Procurement	5	5
MRc5	Construction and Demolition Waste Diversion	2	2
Indoor Environmental Quality (EQ)		**13**	**11**
EQp1	Construction Management	Required	Required
EQp2	Fundamental Air Quality	Required	Required
EQp3	No Smoking or Vehicle Idling	Required	Required
EQc1	Enhanced Air Quality	1	1
EQc2	Occupant Experience	7	7
EQc3	Accessibility and Inclusion	1	1
EQc4	Resilient Spaces	2	2
EQc5	Air Quality Testing and Monitoring	2	–
Project Priorities (PR)		**10**	**10**
PRc1	Project Priorities	9	9
PRc2	LEED AP	1	1
Total	**Possible Points**	**110**	**110**

IMPACT AREA VIEW

Decarbonization		New Construction	Core and Shell
IP Prerequisite	Carbon Assessment	Required	Required
IP Prerequisite	Tenant Guidelines	–	Required
IP Credit	Integrative Design Process	1	1
IP Credit	Green Leases	–	6
LT Credit	Compact and Connected Development	6	6
LT Credit	Transportation Demand Management	4	4
LT Credit	Electric Vehicles	2	2
SS Credit	Heat Island Reduction	2	2
WE Prerequisite	Minimum Water Efficiency	Required	Required
WE Credit	Water Metering and Leak Detection	1	1
WE Credit	Enhanced Water Efficiency	8	7
EA Prerequisite	Operational Carbon Projection and Decarbonization Plan	Required	Required
EA Prerequisite	Minimum Energy Efficiency	Required	Required
EA Prerequisite	Fundamental Commissioning	Required	Required
EA Prerequisite	Energy Metering and Reporting	Required	Required
EA Prerequisite	Fundamental Refrigerant Management	Required	Required
EA Credit	Electrification	5	4
EA Credit	Reduce Peak Thermal Loads	5	5
EA Credit	Enhanced Energy Efficiency	10	7
EA Credit	Renewable Energy	5	4
EA Credit	Enhanced Commissioning	4	3
EA Credit	Grid Interactive	2	2
EA Credit	Enhanced Refrigerant Management	2	2
MR Prerequisite	Planning for Zero Waste Operations	Required	Required

Decarbonization		**New Construction**	**Core and Shell**
MR Prerequisite	Quantify and Assess Embodied Carbon	Required	Required
MR Credit	Building and Materials Reuse	3	5
MR Credit	Reduce Embodied Carbon	6	8
MR Credit	Building Product Selection and Procurement	5	5
MR Credit	Construction and Demolition Waste Diversion	2	2

Quality of life		**New Construction**	**Core and Shell**
IP Prerequisite	Climate Resilience Assessment	Required	Required
IP Prerequisite	Tenant Guidelines	–	Required
IP Prerequisite	Human Impact Assessment	Required	Required
IP Credit	Integrative Design Process	1	1
IP Credit	Green Leases	–	6
LT Credit	Equitable Development	2	2
LT Credit	Compact and Connected Development	6	6
LT Credit	Transportation Demand Management	4	4
SS Credit	Accessible Outdoor Space	1	1
SS Credit	Enhanced Resilient Site Design	2	2
SS Credit	Heat Island Reduction	2	2
WE Credit	Water Metering and Leak Detection	1	1
MR Credit	Low Emitting Materials	2	1
MR Credit	Building Product Selection and Procurement	5	5
EQ Prerequisite	Construction Management	Required	Required
EQ Prerequisite	Fundamental Air Quality	Required	Required
EQ Prerequisite	No Smoking or Vehicle Idling	Required	Required
EQ Credit	Enhanced Air Quality	1	1
EQ Credit	Occupant Experience	7	7

Quality of life		New Construction	Core and Shell
EQ Credit	Accessibility and Inclusion	1	1
EQ Credit	Resilient Spaces	2	2
EQ Credit	Air Quality Testing and Monitoring	2	–

Ecological conservation and restoration		New Construction	Core and Shell
IP Prerequisite	Tenant Guidelines	–	Required
IP Credit	Integrative Design Process	1	1
IP Credit	Green Leases	–	6
LT Credit	Sensitive Land Protection	1	1
LT Credit	Compact and Connected Development	6	6
SS Prerequisite	Minimized Site Disturbance	Required	Required
SS Credit	Biodiverse Habitat	2	2
SS Credit	Accessible Outdoor Space	1	1
SS Credit	Rainwater Management	3	3
SS Credit	Enhanced Resilient Site Design	2	2
SS Credit	Heat Island Reduction	2	2
SS Credit	Light Pollution Reduction	1	1
WE Prerequisite	Water Metering and Reporting	Required	Required
WE Prerequisite	Minimum Water Efficiency	Required	Required
WE Credit	Water Metering and Leak Detection	1	1
WE Credit	Enhanced Water Efficiency	8	7
MR Prerequisite	Planning for Zero Waste Operations	Required	Required
MR Credit	Building and Materials Reuse	3	5
MR Credit	Building Product Selection and Procurement	5	5
MR Credit	Construction and Demolition Waste Diversion	2	2
EQ Prerequisite	No Smoking or Vehicle Idling	Required	Required

INTEGRATIVE PROCESS, PLANNING, AND ASSESSMENTS (IP)

OVERVIEW

As an industry, the built environment has evolved to prioritize whole-building performance and impact over isolated systems. The *Integrative Process, Planning, and Assessments* (IP) credit category builds on this approach in LEED v5 by emphasizing the importance of early-stage interdisciplinary collaboration and holistic, iterative planning to arrive at interrelated solutions. By using systems thinking to identify synergies among building systems and components before the design phase begins, projects prioritize the value of intentionally integrated design processes.

This holistic approach promotes the proactive consideration of how each project addresses decarbonization, quality of life — including equity and resilience — and ecosystem conservation and restoration from the outset. The strategies within the IP category help shape projects that are environmentally responsible, resilient, and equitable, benefiting both occupants and the broader community. Key aspects of this category include:

- **Timing**. Initiating analysis in the early stages of the project (pre-design).
- **Engagement**. Involving the right people.
- **Interdisciplinary collaboration**. Leveraging synergies across credit categories to maximize efficiencies and inform decision-making.
- **Assessment-based understanding**. Discovery that provides insights into natural hazards, carbon emissions, and human impacts.

Decarbonization
The built environment contributes significantly to global GHG emissions, accounting for 21% of total GHG emissions and 31% of global carbon emissions in 2019 for operational carbon emissions alone.[2] The IP category's 25-year carbon assessment addresses energy use, refrigerants, embodied carbon, and transportation impacts (*IPp3: Carbon Assessment*). This assessment promotes carbon literacy and equips project teams with knowledge to apply to future projects, fostering industry-wide progress.

This assessment pulls from other sections of the rating system to support consistent and meaningful carbon reduction (*MRp2: Quantify and Assess Embodied Carbon*, *MRc2: Reduce Embodied Carbon*, *MRc4: Building Product Selection and Procurement*).

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[2] "Chapter 9": *Buildings*. (n.d.). IPCC. https://www.ipcc.ch/report/ar6/wg3/chapter/chapter-9//

Quality of life

Environmental justice and similar movements highlight the importance of understanding a community's social context. Additionally, there is greater emphasis on practitioners' need to prioritize the health, safety, and welfare of building occupants. The American Institute of Architects *Code of Ethics and Professional Conduct* outlines their view of the obligation of designers, stating, "Members should employ their professional knowledge and skill to design buildings and spaces that will enhance and facilitate human dignity and the health, safety, and welfare of the individual and the public."[3] The IP category addresses equity by requiring an understanding of the local community, workforce, and supply chain, which encourages teams to confront inequities and positively impact their communities (*IPp2: Human Impact Assessment*).

Site-level resilience is a key topic throughout *LEED BD+C: New Construction* and *LEED BD+C: Core and Shell*. Munich Reinsurance America reported that global disaster losses in 2023 totaled $250 billion, highlighting the significant financial impact that natural disasters have worldwide.[4] The assessment aims to evaluate observed, projected, and future natural hazards for climate resilience and is meant to enhance awareness, increase transparency, reduce vulnerabilities, and ensure long-term safety and sustainability (*IPp1: Climate Resilience Assessment*).

Ecological conservation and restoration

With a focus on ensuring the applicable expertise is in the room at the earliest stages (pre-design), the IP category specifically highlights identifying goals that impact ecosystems (*IPc1: Integrative Design Process*). Strategies such as restorative site design, responsible product selection, and light pollution reduction all help improve a building's impact on the local environment (Sustainable Sites credit category and *MRc4: Building Product Selection and Procurement*). This approach encourages project teams to assess site conditions holistically, incorporating strategies that enhance biodiversity, protect natural resources, and support long-term ecological resilience.

By fostering early collaboration, holistic assessments, and interdisciplinary planning, the IP category helps project teams develop the foundation for resilient, equitable, and environmentally responsible buildings. These strategies ensure that projects not only meet immediate performance goals, but also contribute to a sustainable, long-term future for both people and the planet.

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[3] *AIA Code of Ethics and Professional Conduct, Canon 1, ES1.5 'Design for Human Dignity and the Health, Safety, and Welfare of the Public' https://www.aia.org/code-ethics-professional-conduct*

[4] "Uncounted Costs - Data Gaps Hide the True Human Impacts of Disasters in 2023." 2024. UNDRR. Jan. 17, 2024. https://www.undrr.org/explainer/uncounted-costs-of-disasters-2023.

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Integrative Process, Planning, and Assessments Prerequisite

CLIMATE RESILIENCE ASSESSMENT

IPp1

REQUIRED

New Construction
Core and Shell

INTENT

To promote the comprehensive assessment of observed, projected, and future natural hazards for climate resilience with an aim to enhance awareness of hazards, increase transparency of risks, reduce vulnerabilities, and ensure long-term safety and sustainability.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Climate and Natural Hazard Assessment	

Complete a climate and natural hazard assessment.

As part of the assessment, identify observed, projected, and future natural hazards that could potentially affect the project site and building function. Address site-specific natural hazards, including, but not limited to, drought, extreme heat, extreme cold, flooding, hurricanes and high winds, hail, landslides, sea level rise and storm surge, tornadoes, tsunamis, wildfires and smoke, winter storms, and other relevant hazards (specify).

Identify two priority hazards, at minimum, to address through proposed design strategies. For each priority hazard, the project team must assess and specify the following:

- Intergovernmental Panel on Climate Change emissions scenario used, specifying the shared socioeconomic pathways.
- Projected service life of the LEED project (e.g., fiscal year 2050 or 100 years).
- Hazard level.
- Hazard risk rating.
- Exposure, sensitivity, adaptive capacity, vulnerability, and overall risk levels.
- Potential impact on the project site and building function.
- Potential impact on the project site during construction.

Where possible, use the information from the assessment to inform the planning, design, and operations and maintenance of the project and describe how project-specific strategies were considered.

REQUIREMENTS EXPLAINED

Incorporating climate resilience into the design and development of new construction projects helps mitigate the impacts of climate change and enhances the long-term durability of buildings against key vulnerabilities. A climate resilience assessment supports project teams in identifying and evaluating site-specific climate hazards that could threaten the performance, safety, and longevity of a building. This process provides a framework for embedding data-driven, forward-looking strategies that align with regional climate adaptation plans, building codes, and sustainability objectives.

Addressing climate risks during the design and construction phases not only improves a building's ability to withstand extreme weather events but also supports broader goals of public safety, economic stability, cultural preservation, and community resilience. By integrating these considerations, new development projects can better adapt to changing conditions. This ensures long-term functionality, reduced lifecycle costs, and a more sustainable environment.

This prerequisite requires project teams to conduct a comprehensive climate and natural hazard assessment, identifying current and projected hazards that may impact the project site and building operations. The assessment must address site-specific hazards such as drought, heat, flooding, hurricanes, wildfires, tornadoes, and other relevant risks. Teams must prioritize at least two hazards and analyze them using the emissions scenarios from the *Intergovernmental Panel on Climate Change's* (*IPCC) Shared Socioeconomic Pathways*[5] (SSPs), specifying the project's service life and assessing hazard levels, risks, vulnerability, and potential impacts on site operations and construction. In addition to the safety and welfare of occupants, the findings should be used to inform the project's planning, design, construction, operations, and maintenance and remain in alignment with the critical need to design for asset longevity.

Conducting a climate and natural hazard assessment is required to identify key vulnerabilities and guide operational decisions to improve project resilience over its lifespan. For many teams, especially those new to risk assessments, this will be an educational and goal-setting process. In identifying risks and vulnerabilities, teams can begin to integrate project-specific resilience strategies aimed at mitigating the impacts of natural hazards and enhancing the project's adaptation capacity.

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[5] Iturbide, M., Fernández, J., Gutiérrez, J.M. et al. "Implementation of FAIR principles in the IPCC: the WGI AR6 Atlas repository." Sci Data 9, 629 (2022). https://doi.org/10.1038/s41597-022-01739-y.

Climate and Natural Hazard Risk Assessment

A climate and natural hazard assessment is a systematic process to identify, evaluate, and understand the potential risks that climate change and natural hazards pose to a specific project and its functionality. This assessment considers observed and projected hazards, including extreme weather events such as droughts, floods, wildfires, tornadoes, and hurricanes, as well as long-term phenomena such as sea level rise. The analysis involves gathering data on the likelihood, severity, and timing of these hazards, using the IPCC's emissions scenarios. Key elements of the assessment include evaluating the project's exposure, sensitivity, adaptive capacity, and vulnerability to these risks, as well as identifying the overall hazard risk levels. Climate risk emerges from the interaction of hazard, exposure, and vulnerability. Hazards include climate-related physical events or trends that can cause damage or loss, while exposure encompasses the presence of assets, services, resources, and infrastructure that may be affected. For the purposes of this credit, natural hazards include drought, extreme heat or cold, flooding, hurricanes and high winds, hailstorms, landslides, sea level rise, storm surge, tornadoes, tsunamis, wildfires and smoke, and winter storms. For each identified hazard, the team must complete the climate resilience assessment template or an equivalent, documenting exposure, risk levels, and potential mitigation strategies.

Vulnerability is the tendency or predisposition to experience negative effects. It can include land use, public infrastructure, the burden of disease in the population, and previous exposure to hazards. A climate and natural hazard assessment evaluates the potential risks climate change and natural hazards pose to a project, helping to identify, analyze, and plan for these risks to protect the long-term safety, functionality, and resilience of infrastructure, communities, and ecological systems.

Identification of priority hazards

Based on the assessment, project teams must identify at least two priority hazards by evaluating site-specific climate conditions, historical hazard data, projected future risks, and the building's exposure, sensitivity, and adaptive capacity. The assessment should incorporate regional climate models, hazard mitigation plans, and available climate risk databases to determine the likelihood and severity of each potential hazard. Teams should also consider how local infrastructure, soil conditions, and water management systems may exacerbate or mitigate risks.

To support this evaluation, project teams can use tools such as the *FEMA National Risk Index*[6], *NOAA Climate Explorer*[7], or state and municipal hazard mitigation and adaptation plans to identify patterns of past and projected hazard events. Stakeholder engagement with local authorities, utilities, and community resilience groups can further inform risk prioritization. For example, if a site is in a flood-prone area with increasing extreme precipitation events, flooding may be identified as a priority hazard due to its potential to damage flooring, walls, and electrical systems. Similarly, in regions experiencing rising temperatures, extreme heat may be prioritized due to its impact on material degradation and increased cooling loads.

Once teams identify priority hazards, teams must document findings in the climate resilience assessment template or submit an equivalent assessment using an external tool. This process allows for climate risks to be systematically analyzed and integrated into the project's planning, design, and operational strategies.

Assessing hazards

After two priority hazards have been identified, evaluate the impact by specifying the *IPCC* emissions scenario used in the assessment, which outlines possible future atmospheric GHG concentrations. Teams should define scenarios that are both acceptable and appropriate for the project's geographic location, taking into account local climate action plans to guide their selection. For instance, projects aiming to align with ambitious global climate mitigation goals or for those with shorter lifespans (20-30 years) should use *Shared Socioeconomic Pathways (SSP) 1–2.6 (Low Emissions Scenario)*[8], where less severe climate impacts are expected. Conversely, projects in high-risk areas, those with longer lifespans (50+ years), or where significant climate impacts are anticipated due to limited mitigation measures or regional vulnerabilities find *SSP5-8.5 (High Emissions Scenario)* more suitable.

Next, teams define the projected service life of the project. For LEED projects, the projected service life refers to the project's expected lifespan, which could extend to fiscal year 2050 or up to 100 years, during which the assessment of hazard risks remains applicable. Project teams must also evaluate the hazard level and assign a hazard risk rating based on the potential severity and impact. The hazard level reflects the intensity of a specific hazard event, categorized as low, medium, or high. Project teams should report and identify the level of each potential hazard using historical data and future projections. Teams can refer to the *IPCC* climate projections for historical data or climate projections. The hazard risk rating typically

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[6] "The National Risk Index", FEMA, accessed on April 2, 2025, https://hazards.fema.gov/nri/.

[7] "The Climate Explorer", NOAA, accessed April 2, 2025, https://crt-climate-explorer.nemac.org/.

[8] Iturbide, M., Fernández, J., Gutiérrez, J.M. et al. "Implementation of FAIR principles in the IPCC: the WGI AR6 Atlas repository." Sci Data 9, 629 (2022). https://doi.org/10.1038/s41597-022-01739-y.

comes from local or regional hazard mitigation plans, and it assesses the likelihood of a hazard occurring. Teams must provide a risk rating for each identified hazard.

Project teams must assess the project's susceptibility to each hazard and consider multiple factors, including exposure, sensitivity, adaptive capacity, vulnerability, and overall risk levels. Exposure refers to the degree to which the project is vulnerable to hazards, such as its proximity to water bodies or seismic zones. Sensitivity indicates how significantly these hazards may affect the project, based on factors like materials, structural design, and infrastructure. Adaptive capacity is the project's ability to adapt, withstand, or recover from the impacts of hazards through resilient design, contingency planning, or technology. A project with backup generators and multiple water supply systems has a higher adaptive capacity compared to one without.

Vulnerability reflects the project's overall susceptibility, considering both its sensitivity and adaptive capacity. The overall risk level is a combined assessment of hazard severity, exposure, sensitivity, adaptive capacity, and vulnerability, categorized as low, medium, or high.

Teams must assess the potential impacts of each hazard on the project. Project hazards can disrupt essential services, damage structures, cause long-term operational challenges, and impact project operations. In the operations phase, the assessment must consider how these hazards affect facility management, occupant safety, and service continuity. This includes potential disruptions to building systems, energy and water supply, indoor air quality, emergency preparedness, workforce safety, and the long-term performance of structural and mechanical components. Hazards may also affect maintenance schedules, operational costs, and the ability to provide critical services during extreme weather events.

Integration into project planning and design
As part of the climate resilience assessment, use the findings from the hazard assessment to guide the project's planning, design, operations, and maintenance phases. For instance, in the planning and design phase, teams can select less vulnerable areas on site and implement resilient site design strategies such as elevated foundations. The team must describe how the climate resilience assessment shaped design strategies, particularly to mitigate priority hazards, while also demonstrating alignment with specific LEED credits.

For example, if flooding is identified as a priority hazard, strategies could involve raising a building's foundation, using permeable paving, or incorporating drought-resistant landscape features, which also support LEED credits such as *SSc3: Rainwater Management* and *SSc4: Enhanced Resilient Site Design*.

Another example is when operations teams optimize HVAC performance (supporting EA credits) and implement adaptive occupant comfort strategies (supporting EQ credits) if is extreme heat is a concern.

Where possible, integrate resilience considerations into project planning, design, and construction to ensure the building is adaptable to changing climate conditions. Incorporating risk-informed strategies early in the process allows teams to design for long-term durability, occupant safety, and operational continuity. Identifying site-specific hazards and vulnerabilities enables the development of design solutions that mitigate natural hazards, enhance resilience, and minimize future disruptions. This approach supports building performance, occupant well-being, and lifecycle sustainability by embedding resilience measures into structural, mechanical, and site design strategies. Through proactive planning and design, teams can better sustain functionality, occupant well-being, and asset longevity and ensure resilience measures remain effective throughout the project's lifespan. This process facilitates adaptation to evolving threats and preserves the building's functionality and safety throughout its expected lifespan, contingent on effective strategy implementation.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	The project's climate and natural hazard assessment (using the *USGBC* Climate Resilience Assessment Template or equivalent)

REFERENCED STANDARDS

- Intergovernmental Panel on Climate Change, Working Group I, Sixth Assessment Report (interactive-atlas.ipcc.ch/)
- FEMA National Risk Index (hazards.fema.gov/nri/hazards.fema.gov/nri)
- NOAA Climate Explorer (crt-climate-explorer.nemac.org/crt-climate-explorer.nemac.org)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Integrative Process, Planning, and Assessments Prerequisite

HUMAN IMPACT ASSESSMENT

IPp2

REQUIRED

New Construction
Core and Shell

INTENT

To ensure that project development is guided by a thorough understanding of the social context of the local community, workforce, and supply chain, helping to address potential social inequities.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Human Impact Assessment	

Human Impact Assessment

Complete a human impact assessment that draws on relevant information from the following four specified categories, as applicable:

- **Demographics**. This may include race and ethnicity, gender, age, income, employment rate, population density, education levels, household types, and identification of nearby vulnerable populations.
- **Local infrastructure and land use**. This may include adjacent transportation and pedestrian infrastructure, adjacent diverse uses, relevant local or regional sustainability goals/commitments, and applicable accessibility codes.
- **Human use and health impacts**. This may include housing affordability and availability, availability of social services (e.g., healthcare, education, and social support networks), community safety and local community groups, and supply chain and construction workforce protections.
- **Occupant experience**. This may include an opportunity for daylight, views, and operable windows; environmental conditions of air and water; and adjacent soundscapes, lighting, and wind patterns within the context of the surrounding buildings (e.g., a microclimate, a solar scape, neighboring structures).
- **Other**. (specify)

Where possible, use the information from the assessment to inform the planning, design, and operations and maintenance of the project and describe how project-specific strategies were considered.

REQUIREMENTS EXPLAINED

This prerequisite requires that the project team comprehensively evaluate and understand the social, economic, and environmental context of the local community, workforce, and supply chain before developing the project. To support this, teams should use methods such as site analysis, community outreach, census reports, GIS mapping, and partnerships with local organizations. This will help ensure the project aligns with community needs and promotes equitable outcomes. Teams must select key characteristics to evaluate within the categories of demographics, local infrastructure and land use, human use and health impacts, and occupant experience. These analyses and findings will guide the project's planning, design, operations, and maintenance strategies.

Ultimately, this assessment balances environmental goals with the needs and aspirations of the people affected, fostering projects that are both ecologically and socially responsible. It supports frameworks for how designers ensure the health, safety, and welfare of those they design for. This will be an educational process for teams, especially for those who have not conducted similar assessments previously. With intentional planning, teams can integrate project-specific strategies by identifying potential disparities and work collectively toward creating a more inclusive and equitable community.

Human Impact Assessment

A human impact assessment is a process in which quantitative and qualitative data for a proposed project are collected through identifying characteristics unique to the project site and its surrounding community. Projects are required to consider the sociopolitical context of the site. The means looking at the cultural makeup of neighboring residents or average income rates. Additionally, it asks for projects to identify relevant infrastructure and policy such as zoning restrictions or accessibility codes. The assessment also requires taking stock of what resources may be accessible to the residents or potential end-users. This includes transit availability or healthcare. Lastly, it evaluates impacts on occupant experience, such as air and water quality. Project teams must consider how these elements interact with and impact each other to ensure that they guide project development with a comprehensive understanding of its social context.

Defining community

Project teams must first establish the scope of their assessment by identifying who the community is. Communities have both geographic and functional definitions. Geographic communities start with the project's neighborhood. This includes the people who live and work in and near the project and interact with it by proximity. Geographic communities can also extend beyond to include towns, cities, or counties. Functional communities include all occupants, construction workers, and visitors who come to the building. These people may or may not live nearby. Teams can shape community through various affinities or commonalities, such as age, ethnicity, income level, housing status, or educational background. The community may extend to include project team members such as architects, engineers, contractors, and designers who oversee the planning, design, and construction phases. Community in the supply chain includes material suppliers, manufacturers, distributors. It also involves the workforce involved in production and transportation. This highlights the importance of local engagement and fair labor practices.

Address the core categories of human impact

Teams must complete a thorough assessment that evaluates the potential impact of the project on people, including living conditions, health, food security, education, and access to other resources. The assessment must include data collection and analysis of core human impact categories such as demographic, infrastructure, health, and occupant experience factors, as well as any other relevant social impacts identified, providing a comprehensive overview of the human impacts of project development. Project teams encourage engagement with community members and other relevant groups to gather insights, understand local needs, and validate data.

DEMOGRAPHICS

The first category evaluates the local demographics of the area surrounding the project site, which is critical to understanding how the development may influence the social fabric of the surrounding community. This process involves analyzing key demographic characteristics, including factors such as race and ethnicity, gender, age distribution, income levels, employment rates, population density, education levels, and household types. Additionally, the project includes identification nearby vulnerable populations to consider how their needs can be addressed its development. It is suggested that teams collaborate with nonprofit organizations that work directly with the people of the community.

LOCAL INFRASTRUCTURE AND LAND USE

The second category examines the project's impact on local infrastructure and land use, as well as identifying existing infrastructure that provides an opportunity to connect to the project. Teams must assess the adjacent public transit systems, such as walkways, bike lanes, and road networks, to ensure the project integrates well with existing mobility options and promotes sustainable transportation. The evaluation requires an analysis of diverse land uses in the vicinity, such as residential, commercial, industrial, and recreational spaces. This will help determine how the project might influence the functional balance of the area.

The assessment highlights the importance of reviewing the local community's sustainability commitments. These include city-wide goals to reduce GHG emissions or promote energy efficiency, highlighting that the project can support broader efforts to create a more sustainable future. Identifying and complying with relevant accessibility codes and standards is crucial. This helps the project strengthen the project's adherence to legal requirements regarding access for people with disabilities, while following best practices for creating inclusive, barrier-free environments.

HUMAN USE AND HEALTH IMPACTS

The third category evaluates the project's effects on human use and its impact on public health and well-being. This involves a thorough assessment of the community's current access to essential resources and assess the overall quality of life for residents. It is important to assess whether the project will address or alleviate these challenges, particularly regarding the availability of affordable housing. The assessment must also consider the community's access or proximity to social services, such as healthcare facilities, educational opportunities, and support networks.

Community safety is another important factor for public health and well-being. Projects that incorporate features such as public spaces, adequate lighting, and pedestrian-friendly designs can foster a sense of safety and belonging. Projects must also consider the protections and working conditions for the local supply chain and construction workforce. This ensures ethical practices and fair treatment. Within the scope of reason, this includes prioritizing local procurement and employment to support the local economy, providing fair wages and benefits to workers, establishing safe jobsite conditions, and implementing transparent labor practices to prevent exploitation and unjust treatment.

OCCUPANT EXPERIENCE

The fourth category considers the project's impact on the overall occupant experience. The goal is to thoroughly examine how the design and construction of the project can influence the health, comfort, and well-being of its occupants. This includes an analysis of key environmental factors such as the availability of natural daylight, the quality and orientation of views, the opportunity to provide operable windows for fresh air circulation, as well as air and water quality. Additionally, it considers how external elements – such as the surrounding soundscapes, the quality of artificial and natural lighting, and the impact of wind patterns on the building and adjacent structures – affect the indoor environment and the overall experience of those inhabiting the space. This assessment encourages projects to create a positive and health-conscious environment for their occupants.

OTHER

Project teams may include any additional relevant social factors in the human impact assessment.

Integration into Project Planning and Design

Project teams should use the human impact assessment findings. These insights help inform the project's planning, design, operations, and maintenance phases. Things to consider include how the identified social factors inform project-specific decisions, such as changes to design features, operational practices, or community engagement strategies. Implementing strategies such as these promotes inclusivity, fair labor practices, and equitable access to opportunities, while supporting the community's economic and social wellbeing. This integration is a tool to drive meaningful change within the design as well as the community, thereby creating a more resilient and sustainable project outcome.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	The project's human impact assessment (using the USGBC Human Impact Assessment Template or equivalent)

REFERENCED STANDARDS

- None

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Integrative Process, Planning, and Assessments Prerequisite

CARBON ASSESSMENT

IPp3

REQUIRED

New Construction
Core and Shell

INTENT

To understand and reduce long-term direct and indirect carbon emissions, including on-site combustion, grid-supplied electricity, refrigerants, and embodied carbon.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Carbon Assessment	

Carbon Assessment

USGBC will provide the project team with a 25-year projection of the project's emissions from operations, refrigerants, and embodied carbon. The assessment will use the data from the following:

- *EAp1: Operational Carbon Projection and Decarbonization Plan*
- *EAp5: Fundamental Refrigerant Management*
- *MRp2: Quantify and Assess Embodied Carbon*
- *LTc4: Transportation Demand Management* (optional)

REQUIREMENTS EXPLAINED

This prerequisite requires the project team to conduct a 25-year carbon assessment of all emissions within the project boundary but does not require any additional data to be entered beyond what is already required by the three related prerequisites and the optional credit, if pursued.

Until recently, most projects only considered GHG emissions from operational energy use, if emissions were considered at all. However, as it has become increasingly clear that emissions from construction ("embodied carbon") and refrigerants can also be quite considerable, LEED v5 has introduced prerequisites which assess carbon emissions from all three sources as well as this unifying prerequisite which enables project teams to compare their sources of emissions and see which are significant. This prerequisite takes the data from *EAp1: Operational Carbon Projection and Decarbonization Plan, EAp5: Fundamental Refrigerant Management, MRp2: Quantify and Assess Embodied Carbon*; as well as *LTc4: Transportation Demand Management*, if that credit has been pursued. It then provides project teams with a report and visualization showing how their different sources of emissions will compare over a 25-year time horizon. The goal is to promote more informed carbon-related decision-making.

Carbon Assessment

USGBC will develop a 25-year *carbon assessment* of the estimated emissions from energy use, refrigerants, embodied carbon, and for some projects, transportation from the data in the prerequisites and optional credit. It includes:

- Annual carbon emissions from each source for 25 years.
- Cumulative emissions from each source each year for 25 years.
- Cumulative emissions over 25 years in total and from each source and the percentage of the total from each source.

> **Additional considerations**
> The information in this carbon assessment provides an overview of the various sources of carbon emissions and can help owners make informed decisions to reduce the project's emissions. Although not required for compliance, sharing the 25-year carbon projection with the owner can be beneficial. From the report, owners can extract insights on how to reduce emissions over time.
>
> This prerequisite does not require comprehensive carbon accounting, whole-building life cycle analyses, nor is it meant to be a substitute for more in-depth analysis. Rather, LEED v5 requires this basic cross-categorical carbon assessment to enable a broad understanding of how project emissions across sources will add up over time, using data all LEED v5 projects must be submitted under other prerequisites and applying reasonable assumptions.

Assumptions Behind the Assessment

While project teams do not need to compile any calculations to complete this credit, the following section outlines the assumptions behind the USGBC-supplied carbon assessment for full transparency. Project teams should conduct their own analysis in addition to this carbon assessment to produce more customized results.

Analysis period
A 25-year period was selected because it captures a significant enough timeframe for projects to see the impacts of their operational carbon emissions from energy and refrigerants and from regular cycles of renovations, in comparison with initial carbon embodied. It does not extend further, unlike some industry projections. This is because future uncertainties grow increasingly dominant over time (e.g., grid decarbonization and advancements in building technologies).

Operational carbon emissions
The *EAp1: Operational Carbon Projection and Decarbonization Plan* calculates the business as usual (BAU) carbon projection from operational emissions from energy over 25 years. The BAU assumes that emissions from fuel use will remain constant, and that emissions from electricity will decline by 95% over 25 years from the base year. See *EAp1: Operational Carbon Projection and Decarbonization Plan* for more information.

Refrigerant emissions
EAp5: Fundamental Refrigerant Management calculates the annual refrigerant emissions. Use a default annual leakage rate of 2% OR an annual leakage rate of 1% for projects pursuing Option 2: *Limit Refrigerant Leakage of EAc7: Enhanced Refrigerant Management.*

Embodied carbon emissions
MRp2: Quantify and Assess Embodied Carbon calculates the embodied carbon in GWP (kgCO_2e) of the structure, enclosure, and hardscape. To calculate the embodied carbon, refer to the assumptions found in *MRp2: Quantify and Assess Embodied Carbon*.

To find the upfront embodied carbon emissions, multiply the *MRp2: Quantify and Assess Embodied Carbon* embodied carbon values by 1.5 to account for interiors and MEP products, A4, and A5 emissions. Recurring embodied carbon assumes the project undergoes renovations every 10 years. To account for the recurring embodied carbon, multiply the *MRp2: Quantify and Assess Embodied* Carbon embodied carbon values by 0.25.

These timeframes are estimates based on common renovation cycles and serve illustrative purposes only.

Transportation emissions
Teams may only calculate the emissions projection from transportation when the project pursues *LTc4: Transportation Demand Management*. The projections assume no change in vehicle miles traveled (VMT) over the 25-year period, and a linear 95% decarbonization of the grid.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Completed documentation of *EAp1: Operational Carbon Projection and Decarbonization Plan*, *EAp5: Fundamental Refrigerant Management*, *MRp2: Quantify and Assess Embodied Carbon*, and if attempted *LTc4: Transportation Demand Management*.

REFERENCED STANDARDS

- None

Impact Area Alignment

- ☑ Decarbonization
- ☑ Quality of Life
- ☑ Ecological Conservation and Restoration

Integrative Process, Planning, and Assessments Prerequisite

TENANT GUIDELINES

IPp4

REQUIRED

Core and Shell

INTENT

To communicate and coordinate the sustainable design and construction features of a base building with the tenants and facilitate tenant LEED certification so that the completed space more comprehensively addresses the rating system requirements.

REQUIREMENTS

Achievement pathways	Points
Core and Shell	N/A
Tenant Guidelines	

Tenant Guidelines

Create tenant guidelines, to be shared with all tenants before signing the lease, including the following content:

- A description of the sustainable design and construction features incorporated in the core and shell project and the project's sustainability goals and objectives, including those for tenant spaces.
- Guidance and recommendations for incorporating sustainable strategies, products, materials, and services in the tenant spaces. Refer to the attempted LEED prerequisites and credits of the base building for content requirements.
- A point of contact, from the base building team or new owner, for further coordination of base building design and construction documentation.

REQUIREMENTS EXPLAINED

This prerequisite requires that the base building project provides clear and detailed guidelines for tenants to integrate sustainability into their spaces. These guidelines serve as a roadmap for tenants to align their build-outs with the building's sustainability objectives, fostering collaboration between the base building team and tenants. It involves creating and distributing a comprehensive set of guidelines that communicate the base building's sustainable features and provide actionable recommendations for tenants. To maximize their impact, it is important that all tenants receive the tenant guidelines document before they sign the lease, ensuring that they consider sustainability during their design and build-out phases.

The guidelines must cover the following areas to ensure a comprehensive approach to sustainability.

Description of the sustainable design and construction features of the base building
Sustainable design and construction features should emphasize the systems and strategies that enhance energy efficiency, water conservation, materials sustainability, and indoor air quality. Examples include:

- **Energy efficiency**. Includes LED lighting, high-efficiency HVAC systems, and renewable energy integration.
- **Water efficiency**. Low-flow fixtures, water reuse systems, and high-efficiency plumbing fixtures.
- **Sustainable materials**. Use of recycled-content materials, low-VOC paints, and finishes that reduce environmental impact.
- **Indoor air quality**. Advanced ventilation systems, enhanced air filtration technologies, and materials selection to minimize pollutants.

Clear sustainability goals for tenant spaces, aligned with the base building’s LEED certification efforts
Set specific and measurable sustainability goals for tenant spaces, ensuring alignment with the base building’s LEED prerequisites and credits. These goals should help tenants:

- Reduce energy and water use through submetering, efficient fixtures, and regular performance tracking.
- Enhance waste diversion by implementing robust recycling and composting programs.
- Improve indoor environmental quality through strategies such as low-emitting materials and proper ventilation design.

Providing tenants with measurable targets and examples–such as installing sub-meters or submitting annual sustainability performance reports–helps them support the base building’s progress toward LEED certification.

Practical guidance on sustainable strategies for tenants to implement in their spaces, tailored to meet the base building's sustainability targets

Offer practical, actionable recommendations for tenants to align their spaces with the base building's sustainability goals. Strategies should include:

- **Water conservation**. Using low-flow fixtures and water-efficient appliances.
- **Energy efficiency**. Selecting energy-efficient lighting, appliances, and HVAC systems.
- **Material selection**. Prioritizing low-emitting and sustainable materials to improve indoor air quality.
- **Waste reduction**. Incorporating recycling programs and minimizing construction waste.

These strategies must align with the LEED prerequisites and credits pursued by the base building. Providing tailored guidance ensures tenants understand how their choices can enhance the overall sustainability of the building.

Some prerequisites and credits in the rating system highlight specific information that must be included in the tenant guidelines, at a minimum.

Aligning tenants' operations with the building's sustainability targets can play a vital role in supporting future LEED certification or recertification efforts. This alignment encourages tenants to consider sustainability in their daily operations and decision-making processes, reinforcing a culture of environmental responsibility.

Point of contact

Designate a specific point of contact, either from the base building team or the building's owner. This individual is responsible for:

- Coordinating communication about the base building's sustainable design and construction documentation.
- Providing tenants with resources and support to align their spaces with the building's sustainability objectives.
- Delivering tenant training sessions, sharing regular updates, and addressing questions.

This role ensures tenants have access to the expertise and guidance needed to implement the strategies outlined in the guidelines effectively.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	The project’s tenant guidelines

REFERENCED STANDARDS

- None

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Integrative Process, Planning, and Assessments Credit

INTEGRATIVE DESIGN PROCESS

IPc1

New Construction (1 point)
Core and Shell (1 point)

INTENT

To support high-performance, cost-effective, and cross-functional project outcomes through an early analysis and planning of the interrelationships among systems. To provide a holistic framework for project teams to collaboratively address decarbonization, quality of life, and ecosystem conservation and restoration across the entire LEED rating system.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Integrative Design Process	1

Integrative Design Process (1 point)

Beginning in predesign and continuing throughout early occupancy, identify and apply opportunities to achieve synergies across disciplines and building systems through the following initiatives:

- **Integrated team**: Assemble and convene an interdisciplinary project team with diverse perspectives. Ensure the process is an equitable team effort through organized facilitation.
- **Design charette**: During predesign or early in design, conduct a charette with the owner or owner’s representative and participants representing at least four key perspectives (e.g., architect, contractor, energy modeler, and community engagement representatives).
- **LEED goal setting**: Work as a team to define a set of specific and measurable project goals that address the LEED v5 impact areas of decarbonization, quality of life, and ecosystem conservation and restoration. Incorporate these goals into the owner’s project requirements.

REQUIREMENTS EXPLAINED

This credit requires a different approach to design than the conventional, linear architectural process. Conventionally, the design and construction disciplines work separately, leading to fragmented solutions for design and construction challenges. These solutions often create unintended consequences — some positive, but mostly negative. Integrating different areas of practice helps project teams identify opportunities to significantly improve building performance and achieve synergies that yield economic, environmental, and human health benefits.

Integrative Design Process

In an integrative design process (IDP), an entire team (client, designers, builders, and operators) identifies overlapping relationships, services, and redundancies among systems so that interdependencies and benefits that would have otherwise gone unnoticed, to increase performance and reduce costs. This approach requires project teams to have representatives from various disciplines sharing their knowledge, analyses, and ideas to inform and connect each other's work. Following this model LEED credits become aspects of a whole rather than separate components, and the entire design and construction team can identify the interrelationships and linked benefits across multiple LEED credits.

Approaching certification using an integrative process gives the project team the greatest chance of success. The process includes three phases:

- **Discovery**. This is the most important phase of the integrative process and is an extensive expansion of pre-design. Without this phase, it can be a challenge for projects to meet environmental goals in a cost-effective way. Discovery work should take place before schematic design begins.
- **Design and construction (implementation)**. This phase begins with schematic design. It resembles conventional practice but integrates all the work and collective understanding of system interactions reached during the discovery phase.
- **Occupancy, operations, and performance feedback**. This phase focuses on preparing to measure performance and creating feedback mechanisms. Assessing performance against targets is critical for informing building operations and identifying the need for any corrective actions.

To achieve economic and environmental performance, every issue and all essential voices (community, clients, designers, engineers, constructors, operators) should be brought into the project at the earliest point and before anything is designed.

Conduct this holistic process of research, analysis, and workshops in an iterative cycle that refines the design solutions. In the best scenario, teams will continue the research and workshops until the project systems are optimized, all reasonable synergies are identified, and the related strategies associated with all LEED credits are documented and implemented.

Integrated Team

The first step involves assembling an interdisciplinary design team with relevant and impacted parties, including owners, building users, architects, engineers, contractors, and community representatives. Participants are to consider all project phases — from early design to construction and operations — to collaboratively set goals, refine strategies, and balance performance, feasibility, and costs.

During construction and procurement, contractors and builders offer insights on constructability, materials, and life-cycle impacts, while collaboration during occupancy ensures that the design intent is upheld, energy strategies are implemented effectively, and performance is monitored for continuous improvement.

Design Charette

The first charrette with interdisciplinary members is crucial for collective agreement on goals, priorities, and a shared project vision. Teams must proactively address major concerns early to avoid re-design delays and inefficiencies later in the project lifecycle. Leveraging tools such as energy and daylight modeling, Building Information Modeling, and life-cycle assessments (LCA) during the conceptual design phase ensures a data-driven approach to identifying conflicts and optimizing performance.

To foster engagement and collaboration, project teams must implement equitable processes by facilitating well-structured meetings, workshops, and charrettes. Resources such as the U.S. Department of Energy's Handbook for Planning and Conducting Charrettes[9] provide practical checklists and agendas to guide these efforts.

LEED Goal Setting: Decarbonization, Quality of Life, and Ecosystem Conservation and Restoration Goals

Project teams must establish measurable goals aligned with LEED v5's core impact areas: decarbonization, quality of life, and ecological conservation and restoration. It is an opportunity for project teams to further connect assessment findings to project outcomes. Experts recommend clear metrics to guide decisions, such as carbon reduction percentages, well-being outcomes, or ecosystem restoration targets.

- **Decarbonization**. Strategies include reducing operational and embodied carbon emissions. Teams can replace fossil fuel systems with renewable or electric solutions,

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[9] "A Handbook for Planning and Conducting Charettes", U.S. Department of Energy, https://www.nrel.gov/docs/fy09osti/44051.pdf.

upgrade to energy-efficient equipment, and specify low-carbon materials such as high-performance glazing and supplementary cementitious materials (SCMs) in concrete.
- **Quality of life**. A human-centered approach incorporates health, well-being, resilience, and equity into the design. Strategies such as inclusive design and biophilic design, which connect occupants to nature, reduce stress, improve air quality, and enhance cognitive performance. Selecting non-toxic and hazard-resilient materials promotes healthier indoor environments, benefiting occupants' physical and mental health as well as long-term sustainability.
- **Ecological conservation and restoration**. Sustainable practices such as minimizing soil erosion, planting native vegetation, and integrating green infrastructure (GI) (e.g., permeable pavement, green roofs) reduce environmental impact and restore ecological functions.

Teams must use this thorough research and analysis during the pre-design phase to inform LEED documentation requirements, including the owner's project requirements (OPR), basis of design (BOD), and construction documents. These documents are expected to clearly articulate how project goals align with integrative design principles.

Narratives should comprehensively outline strategies and analyses, such as site assessments, energy and water modeling, and LCAs, to demonstrate how the project meets sustainability objectives. Teams should include robust justifications for their design decisions to ensure clarity and accountability throughout the project lifecycle.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Evidence of the design charette date, the participants and their roles, and the name and company of the facilitator (e.g., the meeting notes for the design charettes).
		All	The OPR defines the goals for synergy across building systems that address decarbonization, quality of life, and ecosystem conservation and restoration, including how success of each goal will be measured.

REFERENCED STANDARDS

- Integrative Process (IP) *ANSI Consensus National Standard Guide*© 2.0 for Design and Construction of Sustainable Buildings and Communities (2012) (usgbc.org/resources/integrative-process-ip-ansi-consensus-national-standard-guide-20-design-and-construction)

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Integrative Process, Planning, and Assessments Credit

GREEN LEASES

IPc2

Core and Shell (1–6 points)

INTENT

To ensure the tenants complete the sustainable design and construction features started by the base building so that the completed space comprehensively addresses the rating system requirements.

REQUIREMENTS

Achievement pathways	Points
Core and Shell	1–6
Option 1. Standard Green Lease	1–6
AND/OR	
Option 2. Executed Standard Green Lease	1
AND/OR	
Option 3. Green Lease Leaders Recognition	1–6

Comply with a combination of the following options for a maximum of six points.

Option 1. Standard Green Lease (1–6 points)

Develop a standard green lease document that establishes tenant fit-out standards and incorporates tenant requirements, as described below. Commit to incorporating the green lease documentation in each future tenant lease.

For any spaces or systems intended to be fit out by the project owner, identify the standards for the future fit-out, incorporate the criteria referenced in the standard green lease document, and commit to performing the fit-out(s) in accordance with these standards.

Tenant requirements shall include standards to ensure compliance with the following prerequisites for any tenant-installed systems:

- *IPp1: Climate Resilience Assessment*
- *IPp2: Human Impact Assessment*
- *IPp3: Carbon Assessment*
- *WEp2: Minimum Water Efficiency*
- *EAp2: Minimum Energy Efficiency*

- *EAp3: Fundamental Commissioning*
- *EAp4: Energy Metering and Reporting*
- *MRp1: Planning for Zero Waste Operations*
- *EQp2: Fundamental Air Quality*

Points are earned by incorporating a combination of the listed best practices into the green lease (see Table 1).

- Require tenant to pay for their electric and nonelectric energy and water use.
- Implement cost-recovery clause for energy-efficiency upgrades benefiting the tenant.
- Disclose tracked common area energy use, peak demand, peak thermal demand, and on-site combustion emissions to tenants.
- Disclose whole-building ENERGY STAR® or locally applicable equivalent score to tenants.
- Ensure brokers or leasing agents have energy training.
- Implement energy management best practices.
- Request annual tenant energy disclosure.
- Require energy efficiency fit-out for tenants that improves upon *EAp2: Minimum Energy Efficiency* requirement.
- Establish a tenant energy efficiency engagement and training plan.
- Meter or submeter additional tenant energy use beyond that required in *EAp4: Energy Metering and Reporting*.
- Limit on-site combustion emissions.
- Disclose tracked common area water use to tenants.
- Require water efficiency fit-out for tenants that improves upon *WEp2: Minimum Water Efficiency.*
- Meter or submeter additional tenant water use beyond that required in *WEp1: Water Metering and Reporting.*
- Implement water management best practices.
- Implement indoor air quality best practices.
- Implement thermal comfort best practices.
- Demonstrate innovation in leasing.

Table 1. Points for incorporating best practices

Number of additional best practices Incorporated into the lease	**Points**
Fewer than 3	1
4–6	2
7–9	3
10–12	4

Number of additional best practices Incorporated into the lease	Points
13–15	5
16 or more	6

AND/OR

Option 2. Executed Standard Green Lease (1 point)

One additional point is awarded by providing documentation of an executed tenant green lease or tenant letter of attestation meeting the criteria in Option 1.

AND/OR

Option 3. Green Lease Leaders Recognition (1–6 points)

Earn Green Lease Leaders recognition:

- At the Silver level (1 point)
- At the Gold level (3 points)
- At the Platinum level (6 points)

REQUIREMENTS EXPLAINED

This credit requires owners to develop a green lease document that establishes clear standards and best practices for tenants and their operations, aligned with LEED goals. The green lease functions as a framework for sustainability, incorporating key clauses and operational procedures to ensure tenants and building owners actively promote sustainable practices, such as energy and water efficiency, carbon emissions reduction, indoor air quality, and waste management. A green lease ensures that both owners and tenants commit to achieving high-performance building standards. Additional recognition is available for executing the green lease or achieving certification through the *Green Lease Leaders program*[10].

Pursuing green lease agreements fosters collaboration between property owners and tenants, ensuring that sustainability goals remain a priority throughout the occupancy phase. Green leases address the split incentive issue, aligning the costs and benefits of energy and water efficiency investments to create equitable and successful agreements for both parties.

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[10] Green Lease Leaders. (n.d.), “Green Lease Leaders - Green Leasing Recognition Program”, https://www.greenleaseleaders.com/.

Option 1. Develop a Standard Green Lease

Option 1 requires the development of a standard green lease that establishes tenant fit-out standards incorporating tenant requirements, aligned with the identified LEED prerequisites. For any spaces or systems intended to be fit-out by the project owner, teams must identify the standards for the future fit-out for any tenant-installed systems or spaces. Tenant fit-outs must comply with the following prerequisites:

- *IPp1: Climate Resilience Assessment*
- *IPp2: Human Impact Assessment*
- *IPp3: Carbon Assessment*
- *WEp2: Minimum Water Efficiency*
- *EAp2: Minimum Energy Efficiency*
- *EAp3: Fundamental Commissioning*
- *EAp4: Energy Metering and Reporting*
- *MRp1: Planning for Zero Waste Operations*
- *EQp2: Fundamental Air Quality*

Meeting these prerequisites is a critical first step toward achieving LEED certification, as they establish minimum performance levels that must be met. It also ensures that the needs identified in the assessments are carried out through operational strategies. Once you have addressed prerequisites, teams can exceed minimum requirements by incorporating additional best practices and innovative design strategies, thereby enhancing overall building sustainability.

Incorporate green lease documentation in future leases

Owners must incorporate the green lease documentation into future tenant leases, including the criteria outlined in the standard green lease. Resources such as *the Institute for Market Transformation (IMT)* 2020 document[11] and the *BOMA International Green Lease Guide*[12], offer detailed language examples and guidance for incorporating green clauses, operational procedures, and best practices.

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[11] Institute for Market Transformation (IMT), (2020), *Green Lease language examples*, imt.org/wp-content/uploads/2020/02/IMT-Green-Lease-Language-Examples-January-2020.pdf.

[12] Noonan, K. M., BOMA International, Teitelbaum, S. A., Boutwell, M. N., Brodsky, S., Conrad, E. A., Engstrom, S. E., Gill, M., Gin, F. K., Holcomb, C., Jonas, J. M., Mobilio, F., Moebius, W., Neff, S., O'Murray, C., Santamaria, C., Teitelbaum, S., Thalheimer, M., Wardle, G., . . . Zoccola, B. (2018), GREEN LEASE GUIDE, In D. Cloutier, L. M. Prats, & B. S. Walraven (Eds.), *BOMA International*, sustainablejersey.com/fileadmin/media/Actions_and_Certification/Actions/Energy/BOMA_2018_Green_Lease_Guide.pdf.

Incorporate best practices into the green lease

Owners and landlords must include a tailored combination of best practices in the green lease to go beyond minimum LEED prerequisites. A few of the best practices include:

- Require tenants to pay for their energy and water usage.
- Implement cost recovery clauses for energy efficiency upgrades that benefit tenants.
- Disclose tracked energy and water usage metrics (e.g., ENERGY STAR® scores, peak demand).
- Ensure brokers or leasing agents receive energy training.
- Require tenant energy efficiency fit-outs that exceed LEED EA prerequisites.
- Include water and indoor air quality best practices (e.g., sub-metering, low-emitting materials).
- Establish tenant training and engagement programs for sustainable practices.
- Limit on-site combustion emissions and implement renewable energy strategies.
- Demonstrate innovation in leasing.

Points are awarded based on the number of best practices incorporated (1–6 points). Incorporating additional practices improves resource management and creates healthier, more sustainable tenant spaces.

Option 2. Executed Standard Green Lease

Teams may earn one point for projects that provide documentation of an executed tenant green lease or a letter of attestation meeting the criteria outlined in Option 1. Both parties must provide a copy of the green lease agreement signed by them. If the tenant has not yet finalized the green lease, they must submit a signed and dated letter as an alternative. The letter must confirm the tenant's commitment to meeting the specific sustainability criteria outlined in the green lease, including compliance with LEED prerequisites and best practices as detailed in Option 1. Key components of the letter of attestation may include tenant information, landlord and tenant acknowledgment, commitment to sustainability requirements, specific best practices, commitment to documentation and reporting procedures, and the tenant's signature and date.

Executing a tenant green lease demonstrates a commitment to foster collaboration between landlords and tenants. This collaboration can lead to improved energy efficiency, reduced operating costs, and a more sustainable environment. The documentation serves as a tangible acknowledgment of the efforts made toward sustainability, enhancing the credibility of both the landlord and the tenant. It can also positively impact corporate reputations and align with broader Environmental, Social, and Governance (ESG) goals. Providing this documentation is a proactive step toward a sustainable future while securing additional recognition for the project team's initiatives.

Option 3. Green Lease Leaders Recognition

Option 3 rewards teams that join the *Green Lease Leaders Program*, an initiative developed by the IMT with support from the U.S. Department of Energy. Open to the U.S. and international companies including those in Canada, Europe, Australia, the United Kingdom, Japan, Costa Rica, and Mexico, this three-year program offers valuable guidance to practitioners and teams on best leasing practices to foster mutually beneficial landlord-tenant relationships. To help create more sustainable buildings and energy efficient spaces, the program focuses on providing resources that address four key steps to achieving long-term high-performance buildings: site selection, lease negotiations, tenant fit-out, and tenant operations.

Participants benefit from established guidelines and free support while developing their green leases, as well as peer leadership recognition and substantial energy savings when leases have been implemented.[13] The program also serves as an essential avenue to demonstrate commitment to corporate ESG objectives and net-zero goals. Participating organizations enhance their reputation and contribute to broader sustainability initiatives within the community. Green Lease Leaders awards recognition through a tiered system, which includes three levels of achievement: Silver, Gold, and Platinum.[14] The recognition criteria align with the U.S. EPA's *ENERGY STAR® Tenant Space recognition program*.[15] The points awarded at each level correspond to the complexity and scope of the actions taken to implement green leasing practices.

- **Silver level**. Recognizes the establishment of foundational policies and business practices (e.g., a standard lease form that incorporates green lease language) that encourages reduced energy and water consumption in leased spaces. For instance, the prerequisite of the program minimum efficiency fit-out requires bests practices, such as *ENERGY STAR*®-certified appliances and equipment, meter/submeter tenant energy, use only low/no VOC paints, finishes, and adhesives.
- **Gold level**. Builds on silver level achievements and recognizes execution of green leases and utility-efficient tenant fit-outs. For instance, this level may require performance goal clauses within an executed lease.

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[13] "ENERGY STAR® Tenant Space", ENERGY STAR®, (n.d.), https://www.energystar.gov/buildings/building_recognition/tenant_space_recognition.

[14] "Program Requirements - Green Lease Leaders", Green Lease Leaders, (n.d.), https://www.greenleaseleaders.com/green-leasing/program-requirements/#silver.

[15] "ENERGY STAR® Tenant Space," ENERGY STAR®.

- **Platinum level**. Exemplifies achievements by both the landlord and tenant to integrate environmental and social priorities into the lease and best practices. This level includes Gold requirements and additional requirements, such as documentation that verifies the implementation of the performance goal and action plan.

For all recognition levels, tenants must provide evidence that the standard lease form or corporate policy meets these two prerequisites:

- Provide sustainability contacts to landlords.
- Require minimum efficiency standards for leased space fit-outs.[16]

Landlords must establish a standard lease form or corporate policy that Prerequisite 1 and, depending on the property type, either Prerequisite 2a or Prerequisite 2b.

- **Prerequisite 1**. Provide sustainability contact and/or information.
- **Prerequisite 2a**. Implement cost recovery clause for energy efficiency upgrades benefiting the tenant.
- **Prerequisite 2b**. For multifamily properties, implement energy efficiency improvements during unit turns.[17]

This LEED credit option awards points based on recognition levels. The Silver level carries 1 point, as it represents a first step toward sustainability, focusing on establishing basic green leasing practices. LEED Gold carries three points, as it is more restrictive and acknowledges a higher level of commitment. LEED Platinum carries six points, as it exemplifies the highest level of achievement, where both landlords and tenants fully integrate advanced environmental and social priorities into the green lease, demonstrating leadership in sustainability.

Landlords and tenants must consult the Green Lease Leaders[18] website and the LEED v5 reference guides for comprehensive information on program requirements, detailed guidance on clauses, and the application process. Additionally, they must use the interactive Microsoft Excel workbook[19] or contact a program team member, who can help through the application process.

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[16] "Green Lease Leaders Reference Guide for Tenants", Institute for Market Transformation & U.S. Department of Energy, (2021), https://www.greenleaseleaders.com/wp-content/uploads/2023/07/Tenant-Reference-Guide.pdf.

[17] Green Lease Leaders Reference Guide for Landlords, (2021), In *Green Lease Leaders Reference Guide for Landlords* [Report], greenleaseleaders.com/wp-content/uploads/2023/07/Landlord-Reference-Guide.pdf.

[18] *Program Requirements - Green Lease Leaders,* (n.d.), Green Lease Leaders, greenleaseleaders.com/green-leasing/program-requirements/#silver.

[19] IMTComms, (2024, September 27), *Teams Application Workbook - Green Lease Leaders,* Green Lease Leaders, greenleaseleaders.com/resource/teams-application-workbook/.

DOCUMENTATION

Project types	Options/ Paths	Paths	Documentation
All	Option 1. Standard Green Lease	All	The project’s standard green lease.
		All	Evidence of the Core and Shell project owner‘s commitment to incorporating the green lease documentation in each future tenant lease (e.g., a digital signature by the Core and Shell Project Owner in LEED Online).
	Option 2. Executed Standard Green Lease	All	For any spaces or systems intended to be fit-out by the project owner: identification of the standards for the future fit-out, incorporating the criteria referenced in the standard green lease document and the commitment to performing the fit-out(s) in accordance with these standards (e.g., a letter of commitment).
	Option 3. Green Lease Leaders Recognition	All	Evidence of the Green Lease Leaders recognition, including level (e.g., a screenshot of the listing in the Green Lease Leaders database showing recognition level).

REFERENCED STANDARDS

- Green Lease Leaders Program (greenleaseleaders.com)

LOCATION AND TRANSPORTATION (LT)

OVERVIEW

Location and transportation decisions play a crucial role in determining a project's long-term sustainability potential. The project's chosen location significantly influences the surrounding environment and community, affecting how people access the site, who can use it, and what impact it has on local resources. By prioritizing strategies at the intersection of resource access, land use patterns, and transportation, the Location and Transportation (LT) category guides projects toward an efficient, equitable, and low-carbon future.

Given this significance, the LT category offers the third-largest number of potential points in LEED v5. It prioritizes location-efficient sites that use existing infrastructure to promote land conservation and support compact, connected communities. Increasing urban density has manifold benefits: preserving natural habitats outside of major corridors, advancing equitable development through transportation access and community connection, and improving infrastructure efficiency.[20] Emphasizing transportation demand management (TDM) further promotes connected alternatives for mobility and equitable development. These benefits could also generate trillions of dollars in economic savings for cities before 2050.[21] One estimate suggests that a more compact approach to urban growth could reduce infrastructure capital requirements by more than $3 trillion USD between 2015 and 2030.[22]

Next, the LT category recognizes electric vehicle (EV) adoption to further reduce GHG emissions and cultivate a transition to more sustainable mobility solutions.

Decarbonization

Transportation is responsible for nearly one-quarter of global energy-related carbon emissions.[23] Recognizing the enormous momentum in the transportation sector, LEED v5 introduces measures that anticipate a decarbonized future state. Strategies like transportation demand assessment, enhanced EV incentives, and support for low-carbon and micromobility alternatives, such as public transit, scooters, and bikeshares, can significantly reduce associated project emissions. Public transport like buses and trains can reduce emissions by up

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[20] Haddaoui, Catlyne, "Cities Can Save $17 Trillion by Preventing Urban Sprawl", World Resources Institute, (n.d.), https://www.wri.org/insights/cities-can-save-17-trillion-preventing-urban-sprawl.

[21] Haddaoui, Catlyne, "Cities Can Save $17 Trillion by Preventing Urban Sprawl", World Resources Institute, (n.d.), https://www.wri.org/insights/cities-can-save-17-trillion-preventing-urban-sprawl.

[22] "New Climate Economy Technical Note: Infrastructure Investment Needs of a Low-Carbon Scenario", Global Commission on the Economy and Climate and New Climate Economy, (2014), https://www.newclimateeconomy.net.

[23] "Transport - Energy System – IEA", IEA, (n.d.), https://www.iea.org/energy-system/transport.

to two-thirds per passenger, per kilometer compared to private vehicles.[24] Projects should rethink the dominance of traditional transportation approaches, encouraging a fundamental mode shift away from SOVs to low-carbon alternatives (*LTc4: Transportation Demand Management, LTc5: Electric Vehicles).*

Quality of life

By promoting more equitable and healthy communities through compact and connected growth, the LT category provides pathways to affordable housing, local jobs, and sustainable transportation in the surrounding community (*LTc2: Equitable Development, LTc3: Compact and Connected Development).* This holistic approach fosters more inclusive, resilient, and economically vibrant neighborhoods. By encouraging projects to embed these principles, the category helps create communities where people can thrive.

Ecological conservation and restoration

Implementing low-carbon transportation and compact development options reduces emissions and mitigates urban sprawl, which disrupts ecosystems and natural habitats.[25] Researchers estimate that about one-third of all terrestrial species will experience habitat loss, with some species losing at least a tenth of their remaining habitat if global urbanization continues at its current rate through 2050.[26] Safeguarding sensitive lands such as wetlands, prime farmland, floodplains, and steep slopes enables projects to protect biodiversity, preserve natural carbon sinks, and bolster community resilience (*LTc1: Sensitive Land Protection, LTc3: Compact and Connected Development*).

Through these strategies, the LT category aims to support a transformative increase in understanding land use choices, accelerate the adoption of EV infrastructure, foster the transition to low-carbon transportation, and enable project teams to see the enormous potential to use location choice to support not only their own buildings, but also their surrounding community.

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[24] Welle, Ben, “Post-Pandemic, Public Transport Needs to Get Back on Track to Meet Global Climate Goals”, World Resources Institute, (n.d.), https://www.wri.org/insights/current-state-of-public-transport-climate-goals.

[25] Haddaoui, Catlyne. n.d. “Cities Can Save $17 Trillion by Preventing Urban Sprawl.” World Resources Institute. https://www.wri.org/insights/cities-can-save-17-trillion-preventing-urban-sprawl.

[26] Laurance, William F., and Jayden Engert. 2022a. “Sprawling Cities Are Rapidly Encroaching on Earth’s Biodiversity.” *Proceedings of the National Academy of Sciences* 119 (16). https://doi.org/10.1073/pnas.2202244119.

Impact Area Alignment

— Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Location and Transportation Credit

SENSITIVE LAND PROTECTION

LTc1

New Construction (1 point)
Core and Shell (1 point)

INTENT

To cultivate community resilience by avoiding the development of environmentally sensitive lands that provide critical ecosystem services and reduce the environmental impact from the location of a building on a site.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Option 1. Previously Developed Sites	1
OR	
Option 2. Previously Undeveloped Sites	1

Option 1. Previously Developed Sites (1 point)

Locate the development footprint on land that has been previously developed.

OR

Option 2: Previously Undeveloped Sites (1 point)

Locate the development footprint on land that does not meet the following criteria for sensitive land:

- **Prime farmland**: Prime farmland, unique farmland, or farmland of statewide or local importance as defined by the U.S. Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (or local equivalent for projects outside the U.S.) and identified in a state Natural Resources Conservation Service soil survey (or local equivalent for projects outside the U.S.).
- **Floodplains**: A flood hazard area shown on a legally adopted flood hazard map or otherwise legally designated by the local jurisdiction or the state. For projects in places without legally adopted flood hazard maps or legal designations, locate on a site that is entirely outside any floodplain subject to a 1% or greater chance of flooding in any given year (100-year floodplain).
- **Notable habitat**: Land identified as habitat for one or more of the following:

    - Species listed as threatened or endangered under the U.S. Endangered Species Act or the state’s endangered species act.
    - Species or ecological communities classified by NatureServe as GH (possibly extinct), G1 (critically imperiled), or G2 (imperiled).
    - Species listed as threatened or endangered species under local equivalent standards (for projects outside the U.S.) that are not covered by NatureServe data.
- **Water bodies**: Areas on or within 100 feet (30 meters) of a water body, except for minor improvements.
- **Wetlands**: Areas on or within 50 feet (15 meters) of a wetland, except for minor improvements.
- **Steep slopes**: Protect 40% of the steep slope area on the site (if such areas exist) from all development and construction activity.
    - For unstable, undeveloped slopes between 15% and 25%, protect 40% from all development.
    - For unstable, undeveloped slopes steeper than 25%, protect from all development and construction activity 60% of the steep slope area on the site.

REQUIREMENTS EXPLAINED

This credit rewards teams for considering their project’s impact on the local community and ecosystems by selecting sites that minimize disruption and protect sensitive areas, such as previously developed locations. Teams pursuing this credit can still achieve points for building on locations not previously developed; however, that location must not be on prime farmland, floodplains, habitat with threatened or endangered species, waterbodies, wetlands, or steep slopes.

Option 1: Previously Developed Sites

Previously developed land is any land where infrastructure has been constructed and buildings on the site do not further disrupt sensitive land. Building on previously developed sites helps to conserve undeveloped land from development and construction activity within the project boundary and is essential for maintaining a diverse ecosystem and compact land development patterns, maintaining biodiversity and sustaining ecosystems that provide services such as water filtration and soil stabilization, and keeping existing ecosystems intact and preserving their ecological resilience. This supports ecosystems that are more resilient against future environmental changes and disturbances.

Option 2: Previously Undeveloped Sites

If developing entirely on previously developed land is not feasible, a project must preserve and protect 40% of the greenfield area on the site from all development and construction activity and must not locate the development footprint on sensitive land types, including prime farmland, flood hazard zones, imperiled species habitat, wetlands or water bodies, and their surrounding buffers or steep slopes. These types of sensitive lands have been identified as critical to biodiversity, ecosystem services, and the safety and well-being of people.

The project must be designed so that the development footprint does not encroach on sensitive areas.

Prime farmland

Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops and is of major importance in meeting the needs of food and fiber. It has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few to no rocks. Researchers use these lands with very rich soil are used for crop testing farms, and local or state regulations protect them.

Unique farmland refers to land used for producing high-value food and fiber crops such as citrus, tree nuts, olives, cranberries, as well as various fruits and vegetables. It possesses a unique combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect, allowing for the economical and sustainable production of high yields when properly managed. [27]

In some regions, farmers classify land that does not qualify as prime or unique farmland of statewide or local importance because it produces food, feed, fiber, forage, and oilseed crops. The appropriate state of local agencies establishes the defined criteria for this type of farmland and typically include soils that closely meet the requirements for prime farmland, capable of producing high crop yields when managed using proper farming practices. In favorable conditions, some of these areas may yield crops comparable to prime farmland.[28]

Projects must avoid development on prime farmland, unique farmland, or farmland of statewide or local importance.

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[27] Natural Resources Conservation Service, (n.d.), Soil Data Access, nrcs.usda.gov/publications/Legend%20and%20Prime%20Farmland%20-%20Query%20by%20Soil%20Survey%20Area.html.

[28] Natural Resources Conservation Service, (n.d.), Soil Data Access, nrcs.usda.gov/publications/Legend%20and%20Prime%20Farmland%20-%20Query%20by%20Soil%20Survey%20Area.html.

Floodplains

New developments must not be located on floodplains. The project team must determine the extent of flood hazard areas and identify them on a flood hazard map. Local governments, flood management agencies, and other local entities such as the Federal Emergency Management Agency (FEMA)[29], may assist teams in using GIS or geospatial data to identify the location of floodplain area.[30] Projects with the development footprint of the site must be located entirely outside any floodplain that has 1% or more of a chance of flooding for locations that are both addressed and not addressed by a flood hazard map. A 1% annual-chance flooding, also known as 100-year floodplain, means that there is a 1% chance that flood water will reach or surpass base flood elevation in any given year, and that structures built within this area are at a high risk of flooding. Building outside this zone reduces the likelihood of flood damage.

Notable habitats

Notable habitats refer to areas with threatened or endangered and imperiled species. These areas are home to diverse plants, animals, and organisms with high ecological value and are vulnerable to human actions, such as forests and coastal regions. These biodiversity-rich zones provide human beings with what they eat, from the microorganisms that enrich the soil where crops grow, to the pollinators that provide fruits and nuts, and the fish that serve as the main sources of animal protein for billions of people.[31] These habitats play an essential role in maintaining ecological balance and supporting biodiversity, so projects must take action to protect them.

> **Threatened or endangered species**
>
> Teams must avoid locating development footprints on land that contain species listed as endangered or threatened that are listed under the U.S. Endangered Species Act or local equivalent.
>
> Projects must also avoid land identified as a habitat for species or ecological communities classified by NatureServe.

Water bodies and wetlands

The development footprint cannot be within 100 feet of a water body or 50 feet of a wetland. The only exception is if there are minor improvements within the buffer area that allow human interaction, and the improvements do not significantly alter the existing vegetation and hydrology of the area. Avoiding development on water bodies and wetlands is essential for

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[29] “Home page”, Federal Emergency Management Agency (FEMA), accessed March 31, 2025, https://www.fema.gov.

[30] “Flood Maps”, Federal Emergency Management Agency (FEMA), accessed March 31, 2025, https://fema.gov/flood-maps.

[31] “Why is biodiversity important - with Sir David Attenborough”, The Royal Society, (2021, October 11), https://youtube.com/watch?v=GlWNuzrqe7U.

mitigating flooding and managing rainwater runoff, as wetlands naturally absorb excess water and reduce the impacts of heavy rainfall. Human-made water bodies or wetlands do not meet the requirements.

Projects that include water bodies and/or wetlands within the boundary, must provide a map identifying the locations of any wetland or water bodies.

Steep slopes

Projects must avoid any unstable and undeveloped steep slopes. Building on steep slopes presents risks that can affect the safety and stability of the building and pose environmental risks to the area.

All project teams must identify unstable, undeveloped steep slope area on the site. An unstable slope is susceptible to collapse or landslides, creating significant risks to human safety and infrastructure. For unstable and undeveloped slopes between 15% and 25% steepness, the project team must protect 40% of the steep slope area from all development and construction activity. For slopes steeper than 25% steepness, teams must allocate 60% of this area as protected zones where no development or construction activities will occur.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Previously Developed Sites	All	Description shows the previous development of the site.
			Vicinity map or aerial images shows the approximate areas of previous development on the site.
	Option 2. Previously Undeveloped Sites	All	Site map(s) showing project boundary, development footprint, any previous development, any sensitive areas, topography, and any minor improvements in required buffers.
			The project team that the criteria for prime farmland, flood hazard, notable habitat, waterbodies, wetlands, and steep slopes criteria were satisfied.
			Estimated area of sensitive land avoided
		Steep Slopes	Percentage of slopes by classification that have been developed or protected
			Description on the protection of steep slope area according to classification or legal documents protecting slopes steeper than 15%.
			Site survey or topographic map showing steep slope areas relative to project site

REFERENCED STANDARDS

- Natural Resources Conservation Service (NRCS) (nrcs.usda.gov)
- NatureServe (natureserve.org)
- U.S. Endangered Species Act (fws.gov/law/endangered-species-act)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Location and Transportation Credit

EQUITABLE DEVELOPMENT

LTc2

New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To support the economic and social vitality of communities, provide opportunities for community members to live and work in close proximity, encourage project locations in areas with developmental challenges and promote the ecology, culture, and health of the surrounding area.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1. Priority Sites	1–2
Path 1. Brownfield Remediation	2
OR	
Path 2. Historic Location	1
AND/OR	
Option 2. Housing and Jobs Proximity	1–2
Path 1. Support Local Economy	1
OR	
Path 2. Location-Efficient Affordable Housing	2
OR	
Option 3. Equitable Construction	2
Schools	1–2
Options 1, 2, and/or 3	1–2
OR	
Option 4. Equitable Access to Resources	2
Path 1. Public Use Spaces	1
AND/OR	
Path 2. Community Partnership	1
Data Centers, Warehouses, and Distribution Centers	1–2
Options 1, 2, and/or 3	1–2
AND	
Option 5. Sensitive Project Location	

Option 1. Priority Sites (1–2 points)

PATH 1. BROWNFIELD REMEDIATION (2 POINTS)

Locate the project on a brownfield where soil or groundwater contamination has been identified and where the local, state, or national authority (whichever has jurisdiction) requires its remediation. In cases of voluntary remediation by the project team, provide confirmation by the local, state, or national authority (whichever has jurisdiction), verifying that the site is a brownfield. Perform remediation to the satisfaction of the relevant authority.

OR

PATH 2. HISTORIC LOCATION (1 POINT)

Locate the project in a historic district, identified by the local government, based on a growth management plan or policy.

AND/OR

Option 2. Housing and Jobs Proximity (1–2 points)

PATH 1. SUPPORT LOCAL ECONOMY (1 POINT)

Employ individuals that live within the administrative district of the project site for 15% of the construction jobs created by the LEED project.

OR

PATH 2. LOCATION-EFFICIENT AFFORDABLE HOUSING (2 POINTS)

For residential or mixed-use projects, include a proportion of new, affordable rental and/or for-sale dwelling units priced for households earning less than the area median income (AMI). Rental units must be maintained at affordable levels for a minimum of 15 years. Existing dwelling units are exempt from requirement calculations. Meet or exceed the minimum thresholds in Table 1. Projects must meet or exceed the requirements mandated through inclusionary zoning by their local jurisdictions. Additionally, the project must achieve one of the requirements below:

- Meet the requirements of *LTc3: Compact and Connected Development, Option 2, Access to Transit*, for 2 points.
- Meet the requirements of *LTc3: Compact and Connected Development, Option 3, Walkable Location*, for 2 points.
- Locate the project in a community where the jobs-to-housing ratio exceeds 1:2 within 0.5 miles (800 meters) of walking distance.

Table 1. Minimum affordable units

Unit type	**Requirements**
Rental dwelling units	Rental units, at least 10% of the project's total residential floor area, priced for up to 60% AMI.
For-sale dwelling units	For-sale units, at least 10% of the project's total residential floor area, priced for up to 80% AMI.

OR

Option 3. Equitable Construction (2 points)

Provide access to workforce development training for construction workers through one of the following:

- **Job-related skills training**: This is achieved through on-the-job training in a Department of Labor-registered apprenticeship program (or local equivalent for projects located outside the U.S.), demonstrating that 15% or more of total project construction hours were performed by participants enrolled in registered apprenticeship programs.
- **Life-skills training**: These are programs for construction workers, conducted by an organization or government entity on the construction site, covering topics such as financial literacy, debt management, first-time home buying, or entrepreneurship training, demonstrating scheduling of one course per month for the duration of construction.

Schools (1–2 points)

- Meet Options 1, 2, and/or 3 above. (1–2 points)

OR

Option 4. Equitable Access to Resources (2 points)

PATH 1. PUBLIC USE SPACES (1 POINT)

In collaboration with school authorities, ensure that at least three of the following types of spaces in the school are accessible to and available for shared use by the public:

- Auditorium
- Gymnasium
- Cafeteria
- One or more classrooms
- Playing fields and stadiums
- Joint parking

Provide access to toilets in joint-use areas after normal school hours.

AND/OR

PATH 2. COMMUNITY PARTNERSHIP (1 POINT)

In collaboration with the school authorities, contract with the community or other organizations to provide at least two types of dedicated-use spaces in the building, such as the following:

- Commercial office
- Health clinic

- Community service centers (provided by state or local offices)
- Library or media center
- Parking lot
- One or more commercial businesses

Provide access to toilets in joint-use areas after normal school hours.

Data Centers, Warehouses, and Distribution Centers (1–2 points)

- Meet Options 1, 2, and/or 3 above. (1–2 points)

AND

Option 5. Sensitive Project Location

Locate the project building a minimum of 300 feet (90 meters) away from the property lines of the nearest sensitive receptors (e.g., residential areas, schools, daycare centers, places of worship, hospitals, community centers, and public parks).

REQUIREMENTS EXPLAINED

This credit integrates equitable outcomes, community engagement, and community health as fundamental considerations for achieving equitable development outcomes. Multiple options and pathways are available to reward projects that show a measurable positive impact on the surrounding community and adopt innovative approaches to equitable outcomes in physical development.

Option 1. Priority Sites

Many communities and governments prioritize certain redevelopment sites to address critical human equity issues. Building these sites can revitalize neighborhoods and bring social and economic benefits directly to residents, such as improved access to jobs, housing, and services. This approach helps transform underused or neglected areas into productive spaces that serve the community. Additionally, redeveloping priority sites rather than greenfield or sensitive ecological areas offers substantial environmental benefits, helping to conserve natural landscapes while supporting sustainable urban growth.

PATH 1. BROWNFIELD REMEDIATION

The U.S. Environmental Protection Agency (EPA) defines a brownfield as “a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."[32] This path promotes the redevelopment of contaminated sites, where developers remove hazardous materials from a site's soil or groundwater, thereby reducing human and wildlife exposure to environmental pollution and improving environmental health. Redeveloping contaminated sites often reduces the footprint of the project's elements, with a redevelopment site using an average of 78% less land than the same project would use if it were built on a greenfield.[33]

PATH 2. HISTORIC LOCATION

This path rewards investing in historic areas, a proven strategy for maintaining and enhancing community character. Underutilized properties within historic districts can have a rich history that can contribute to both architectural and cultural preservation when incorporated into redevelopment. The redevelopment of sites in historic districts can also reduce urban sprawl through adaptive reuse. These areas were often originally designed as walkable communities before the dominance of automobiles, with compact layouts that support pedestrian access to amenities.

Option 2. Housing and Jobs Proximity

Many metropolitan areas within the U.S. exhibited robust job growth in the favorable economic conditions that prevailed from 2010 up to the pandemic-induced recession of 2020.[34] However, not all of those areas matched job growth with housing growth. Some of the nation's most successful and productive metropolitan areas failed to meet housing demand, largely because of restrictions on land use.

Projects employing individuals who reside within the administrative district help support the local economy and foster a stronger connection between the community and the project. Additionally, prioritizing the development of location-efficient affordable housing ensures that housing options are both affordable and conveniently located near essential services, public transportation, and employment opportunities. This not only reduces commuting time and environmental impact but also enhances access to resources for residents. Furthermore, projects that invest in workforce development training programs for construction workers can equip them with valuable skills that promote career growth and economic mobility.

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[32] "Brownfields", United States Environmental Protection Agency, last updated March 27, 2025, https://www.epa.gov/brownfields.

[33] Deason, J. P., Sherk, G. W., & Carroll, G. A. "Public policies and private decisions affecting the redevelopment of brownfields", Environmental and Energy Management Program, George Washington University, (2001), https://www.researchgate.net/publication/276292802_Public_Policies_and_Private_Decisions_Affecting_the_Redevelopment_of_Brownfields_An_Analysis_of_Critical_Factors_Relative_Weights_and_Areal_Differentials.

[34] Kober, Eric. "The Jobs-Housing Mismatch: What It Means for U.S. Metropolitan Areas", Manhattan Institute, (July 7, 2021), https://manhattan.institute/article/the-jobs-housing-mismatch-what-it-means-for-u-s-metropolitan-areas.

PATH 1. SUPPORT LOCAL ECONOMY

Building projects are key drivers of economic growth and development in local communities. They generate employment, boost local economies, and enhance the overall well-being of the regions they impact. The construction industry offers jobs across a wide range of skill levels, creating opportunities within the community. In 2022 in Canada, over 1.5 million people worked in the construction sector, which had nearly 95,000 additional jobs available.[35] Construction projects can also positively impact local businesses, such as suppliers of construction materials, who may see increased demand, sales, and revenue.

Project teams pursuing this path must assess and report on the number of construction jobs generated by the project as part of its contribution to local economic development. A minimum of 15% of the construction jobs created by the LEED project must employ individuals that live within the administrative district, defined as a division of local government such as a municipality, county, parish, or equivalent.

PATH 2. LOCATION EFFICIENT AFFORDABLE HOUSING

Addressing the housing to jobs mismatch is essential to ensure that developers locate affordable housing near employment opportunities, reducing burdens on low-income households. This mismatch occurs when housing availability is geographically disconnected from job centers, forcing workers, particularly low-income individuals, to endure long commutes, increased transportation costs, and limited access to employment. Rising rents and property prices are making it harder for people to find homes they can afford, with low-income residents disproportionately affected by high utility costs and service shutoffs. Affordable housing in the right places, along with rental assistance, can reduce financial strain and support long-term stability for these communities. Also, land use regulations are a significant barrier to affordable housing in urban communities. Zoning restrictions, density limits, and lengthy permitting processes often create challenges for builders trying to build affordable housing in high-demand areas where jobs are concentrated.

Project teams must begin by considering the location of the development and identifying the AMI for the project location. The AMI is a crucial benchmark used to determine affordability, as it represents the midpoint of household incomes in the area, with half of the households earning more and half earning less. Once teams determine AMI, they need to calculate pricing that would qualify as an affordable rental or for-sale unit based on household income levels. The square footage dedicated to said units must comprise a minimum of 10% of the project’s total residential floor and meet the AMI requirements of the rating system. Teams must comply with *LTc3: Compact and Connected Development* by meeting either *Option 2: Access to Transit* or

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[35] Bush, O. , “Construction Industry Statistics in Canada", Made in CA, updated January 3, 2025, https://madeinca.ca/construction-industry-statistics-canada/.

Option 3: Walkable Location to ensure that they locate projects near amenities and public transportation. Additionally, they must meet a jobs-to-housing ratio, which must exceed 1:2 within a 0.5 miles (800 meters) walking distance if pursuing the third option. A ratio exceeding 1:2 means there are more than 4.8 jobs for every four housing units within the 0.5 miles (800 meters) walking distance. A jobs-to-housing ratio of 1:2 or greater ensures jobs and housing are located together, which can shorten commuting distances and improve access to employment.

Option 3. Equitable Construction

Providing workforce training is a key factor in maintaining an equitable, healthier, and supportive environment for construction workers. Training enhances the technical skills of workers, allowing them to work more efficiently, produce higher-quality results, and receive progressive wage increases. The 94% of apprentices who complete a *Department of Labor* registered apprenticeship program retain employment, with an average annual salary of $80,000 USD.[36] Conducting training programs also makes construction workers feel valued and invested in. Research has shown that this can lead to higher job satisfaction, lower turnover rates, and reduced costs for recruiting and training new employees.[37]

Projects must develop and implement a strategy for providing workforce development training for construction workers, focusing on either job-related skills training in a formal apprenticeship program approved and validated by a local government agency, accredited school, labor union, or other training programs conducted by an organization or government entity.

Schools

- Refer to Options 1, 2 and/or 3 above.

Option 4. Equitable Access to Resources

Sharing amenity spaces in the school with the public, organizations, and businesses will bring social benefits to the local community. Shared spaces also help to reduce the need for new development, thereby preserving previously undeveloped land and avoiding the financial costs and environmental consequences of new construction. Schools that typically go unused during after-school operating hours can offer to host community programs, thereby maximizing the useful life of the building. In addition, communities may enjoy new or more convenient services.

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[36] “Explore Registered Apprenticeship”, Apprenticeship USA, updated April 2024, https://www.apprenticeship.gov/sites/default/files/DOLIndFSApprent101-043024-508.pdf.

[37] Rockwood, K. “How Learning and Development Can Attract and Retain Talent”, (January 14, 2022), https://www.shrm.org/topics-tools/news/all-things-work/how-learning-development-can-attract-and-retain-talent.

PATH 1. EQUITABLE ACCESS TO RESOURCES

Teams must collaborate with school authorities to identify and allocate at least three types of eligible shared spaces for public use, discuss public needs to determine which spaces will be available, and obtain written confirmation specifying the selected spaces. These spaces may be in another school building within 0.25 miles (400m) walking distance, as long as it is part of the same campus, and they must include toilet access to shared-space users after school hours.

PATH 2. COMMUNITY PARTNERSHIP

Project teams must collaborate with school authorities to identify and allocate at least two types of eligible dedicated-use spaces within the project that will be made available to specific outside organizations and with the school authorities and the chosen outside organization(s) to determine which spaces in the project will be shared. Teams are encouraged to conduct a local community needs assessment to identify high-priority services and guide outreach to relevant organizations. Spaces must have designated toilet access to shared-space users after normal school hours.

Data Centers, Warehouses, and Distribution Centers

- Meet Options 1, 2, and/or 3 above and Sensitive Project Location.

Data centers and warehouses situated near residential areas or other sensitive sites such as schools and daycare centers, can subject the community to issues including air and sound pollution, environmental impacts, traffic, safety, and other community disruptions. For example, data centers produce constant noise and vibrations because they require extensive amounts of heating, ventilation, and cooling systems to maintain electronics operations.[38]

Projects must be at least 300 feet (90 meters) away from the property lines of the closest sensitive receptors. To protect the health, safety, and well-being of vulnerable populations and reduce the negative impacts of construction activities, project teams must identify and map all sensitive receptors in the surrounding area to ensure compliance and minimize disruption.

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[38] Fischer, K. “Noise and vibration considerations for data centers and IT facilities”, FMJ / IFMA, (n.d.), https://fmj.ifma.org/articles/noise-and-vibration-considerations-for-data-centers-and-it-facilities.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Priority Sites	Path 1. Brownfield Remediation	Documentation from authority having jurisdiction (AHJ) declaring existence of specific contamination and confirming that remediation has been completed to its satisfaction.
		Path 2. Historic Location	Site map and vicinity map showing the project is within a historic district.
			Documentation from AHJ over historic district demonstrating the existence of the historic district (e.g., ordinance, growth management plan, government website with corresponding map, etc.).
	Option 2. Housing and Jobs Proximity	Path 1. Support Local Economy	Description of types of jobs created by the project.
			Total number of construction jobs created by the project.
			Number of local construction jobs created by the project.
			Evidence of the contributing employed individuals live within the administrative district of the project site.
		Path 2. Location Efficient Affordable Housing	Evidence of AMI thresholds (60% and 80%) using data from a governmental entity.
			Copy of legal documentation to maintain affordable rates for at least 15 years.
			Project’s total residential floor area.
			Confirmation of target gross floor area of rental dwelling units priced for up to 60% and/or 80% AMI.
			Number of affordable units created (rent and sale combined).
			Confirmation showing project meets Compact & Connected Development Options 2 or 3. OR Documentation demonstrating project is in a community where the jobs-housing ratio exceeds 1.2 within a 0.5 mile (800-meter) walking distance.
	Option 3. Equitable Construction	All	Description of strategies to provide job-related skills training or life-skills training programs for construction workers and who is conducting the training.
Schools	Option 4. Equitable Access to Resources	Path 1. Public Use Spaces	Description of strategies to support accessibility to at least three school spaces and accessibility to toilets for public use.
			Floor plan and/or site plan to show where the uses occur and access to toilets.
		Path 2. Community Partnership	Description of strategies to support provision of at least two dedicated-use spaces and accessibility to toilets in the building for the community.
			Floor plan and/or site plan to show where the uses occur and access to toilets.

Project types	Options	Paths	Documentation
Data Centers, Warehouses, and Distribution Centers	All	All	Vicinity map locating the project building and sensitive receptors with property lines.

REFERENCED STANDARDS

- None

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Location and Transportation Credit

COMPACT AND CONNECTED DEVELOPMENT

LTc3
New Construction (1–6 points)
Core and Shell (1–6 points)

INTENT

To conserve land and ecosystem resources by encouraging development in areas with existing infrastructure. To promote livability, walkability, and transportation efficiency, including reduced vehicle distance traveled and associated emissions.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–6
Option 1. Surrounding Density	1–2
AND/OR	
Option 2. Access to Transit	1–4
Path 1. Public Transit Service	1–4
OR	
Path 2. Project-Sponsored Transit Service	1–2
AND/OR	
Option 3. Walkable Location	1–3
Schools	1–6
Options 1, 2, and/or 3	1–6
AND/OR	
Option 4. Surrounding Density and Development	1–2
Path 1. Surrounding Density	1–2
AND/OR	
Path 2. Connected Site	1–2
AND/OR	
Option 5. Access to Transit or Pedestrian Access	1–4
Path 1. Access to Transit	1–4
OR	
Path 2. Pedestrian Access	1–2
Data Centers, Warehouses, and Distribution Centers	1–6
Options 1, 2, and/or 3	1–6
AND/OR	
Option 6. Surrounding Development and Resources	1–2
Path 1. Development and Adjacency	1–2
AND/OR	
Path 2. Transportation Resources	1–2
Healthcare	1–6
Options 1, 2, and/or 3	1–6
AND/OR	

Achievement pathways	Points
Option 7. Surrounding Density	1

Option 1. Surrounding Density (1–2 points)

Located on a site where the surrounding existing density within 0.25 miles (400 meters) offset of the project boundary meets the values in Table 1. Use either the "separate residential and nonresidential densities" or the "combined density" values in Table 1.

Table 1. Points for average existing density within 0.25 miles (400 Meters)

Combined density		Separate density			Points
Square feet per acre of buildable land	Square meters per hectare of buildable land	Residential density (DU/acre)	Residential density (DU/hectare)	Nonresidential density (FAR)	
22,000	5,050	7	17.5	0.5	1
35,000	8,035	12	30	0.8	2

NOTE: DU = dwelling unit; FAR = floor-area ratio

AND/OR

Option 2. Access to Transit (1–4 points)

PATH 1. PUBLIC TRANSIT SERVICE (1–4 POINTS)

Locate any functional entry of the project within either:

- 0.25 miles (400 meters) walking distance of existing or planned bus, streetcar, or informal transit stops.

OR

- 0.5 miles (800 meters) walking distance of existing or planned bus rapid transit stops, passenger rail stations (e.g., light, heavy, or commuter rail), or commuter ferry terminals.

The transit service at these stops and stations in aggregate must meet the minimums listed in Table 2.

Both weekday and weekend trip minimums must be met.

- For each qualifying transit route, only trips in one direction are counted toward the threshold.
- If service varies by day:
  - For weekday trips, count the weekday with the lowest number of trips.

    - For weekend trips, only count the weekend day with the highest number of trips.
- If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted toward the threshold.
- Planned stops and stations may count if they are sited, funded, and under construction by the date of the certificate of occupancy and are complete within 24 months of that date.

Table 2. Minimum daily public transit service

Weekday trips	Weekend trips	Points
72	30	1
132	78	2
160	120	3
360	216	4

OR

PATH 2. PROJECT-SPONSORED TRANSIT SERVICE (1–2 POINTS)

Commit to providing year-round transit service (e.g., vans, shuttles, or buses) for regular occupants and visitors that meets the minimums listed in Table 3. Service must provide transportation between the project site and external destinations, such as residential areas and public transportation stations, and be guaranteed for at least three years from the project's certificate of occupancy.

Provide at least one accessible transit stop shelter within 0.25 miles (400 meters) walking distance from a functional entry of the project.

- For each qualifying transit route, total trips (inbound and outbound) are counted toward the threshold.
- If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted toward the threshold.

Table 3. Minimum daily project-sponsored transit service

Total daily trips	Points
Providing shuttles	1
30	2

AND/OR

Option 3. Walkable Location (1–3 points)

Locate on a site that meets the location efficiency requirements in Table 4 via Walk Score® or has proximity to existing and publicly available uses within 0.5 miles (800 meters) walking distance from any functional entry.

Table 4. Points for location efficiency

Walk Score®	Proximity to uses	Points
60–69	4–7	1
70–79	8–10	2
80 or more	≥ 11	3

The following restrictions apply:

- A use may be counted as only one-use type (e.g., a retail store may be counted only once even if it sells products in several categories).
- No more than two uses in each type of use may be counted (e.g., if five restaurants are within walking distance, only two may be counted).
- The counted uses must represent at least three of the five categories.

Schools (1–6 points)

- Meet Options 1, 2, and/or 3 above. (1–6 points)

AND/OR

Option 4. Surrounding Density and Development (1–2 points)

PATH 1. SURROUNDING DENSITY (1–2 POINTS)

Meet Option 1, Surrounding Density, requirements in New Construction.

AND/OR

PATH 2. CONNECTED SITE (1–2 POINTS)

Locate the project on a previously developed site that also meets one of the connected site conditions listed below:

- **Adjacent site.** At least a contiguous 25% of the project boundary must border parcels that are previously developed sites.
- **Infill site.** At least 75% of the project boundary must border parcels that are previously developed sites.

Bordering rights-of-way do not constitute previously developed land; it is the status of the property on the other side of the right-of-way that contributes to the calculation. Any part of the boundary that borders a water body is excluded from the calculation.

Table 5. Points for connected site

Type of site	Points
Adjacent	1
Infill	2

AND/OR

Option 5. Access to Transit or Pedestrian Access (1–4 points)

PATH 1. ACCESS TO TRANSIT (1–4 POINTS)

Meet Option 2, Access to Transit, listed above.

OR

PATH 2. PEDESTRIAN ACCESS (1–2 POINTS)

Locate the project with an attendance boundary where dwelling units are:

- Within 0.75 miles (1,200 meters) walking distance of a functional entry of a school building for students in eighth grade or below or ages 14 and below.
- Within 1.5 miles (2,400 meters) walking distance of a functional entry of a school building for students in ninth grade or above or ages 15 and above.

Provide pedestrian access to the site from all residential areas in the attendance boundary. Points are awarded according to Table 6.

Table 6. Points for dwelling units within walking distance

Percentage of dwelling units in attendance boundary	Points
50%	1
60%	2

Data Centers, Warehouses, and Distribution Centers (1–6 points)

- Meet Options 1, 2, and/or 3 above. (1–6 points)

AND/OR

Option 6. Surrounding Development and Resources (1–2 points)

PATH 1. DEVELOPMENT AND ADJACENCY (1–2 POINTS)

Locate the project on a site that meets one of the site conditions listed in Table 7.

- To qualify as an adjacent site, at least a contiguous 25% of the project boundary must border parcels that are previously developed sites.
- Bordering rights-of-way do not constitute previously developed land; it is the status of the property on the other side of the right-of-way that contributes to the calculation. Any part of the boundary that borders a water body is excluded from the calculation.

Table 7. Points for development and adjacency

Type of site	Points
Previously developed site that was used for industrial or commercial purposes.	1
Previously developed and adjacent site with bordering parcels currently used for industrial or commercial purposes.	2

AND/OR

PATH 2. TRANSPORTATION RESOURCES (1–2 POINTS)

Locate the project on a site that has two of the following transportation resources for 1 point or all four of the following transportation resources for 2 points:

- The site is within a 10-mile (16-kilometer) driving distance of a main logistics hub.
- The site is within a one-mile (1600-meter) driving distance of an on-off ramp to a highway.
- The site is within a one-mile (1600-meter) driving distance of an access point to an active freight rail line.
- The site is served by an active freight rail spur.

A planned transportation resource must be sited, funded, and under construction by the date of the certificate of occupancy and complete within 24 months of that date.

Healthcare (1–6 points)

- Meet Options 1, 2, and/or 3 above.

AND/OR

Option 7. Surrounding Density (1 point)

Locate on a site where the surrounding existing density within 0.25 miles (400 meters) offset of the project boundary meets one of the following:

- At least seven dwelling units per acre (17.5 DU per hectare) with a 0.5 floor-area ratio. The counted density must be existing density, not zone density.
- At least 22,000 square feet per acre (5,050 square meters per hectare) of buildable land.

For previously developed existing rural healthcare campus sites, achieve a minimum development density of 30,000 square feet per acre (6,890 square meters per hectare).

REQUIREMENTS EXPLAINED

This credit awards project sites near essential services and in densely built locations with existing infrastructure. There are multiple paths to achieving credit compliance. Project teams should review the site location and the urban context of the project, including building density, community amenities, and public transportation routes, to optimize the options selected for the project.

Option 1. Surrounding Density

Projects in a high-density area are likely to be more walkable and have greater amenities. Additionally, a denser and more compact neighborhood increases efficiency and reduces the time getting from one location to another. It provides easier access to basic services including supermarkets, pharmacies, banks, medical clinics, and offices. People can actively choose a means of travel when amenities are closely located. More importantly, high surrounding density promotes more efficient land use and achieves more sustainable growth patterns that protect natural habitats, farmland, and open spaces, ultimately leading to more resilient and livable communities.

Projects must meet minimum thresholds for residential, nonresidential, or combined density. Planners choose these minimum density requirements have been chosen because they are the levels necessary to support public transit and reduce urban sprawl. Residential density is measured in dwelling units per acre. Non-residential density is measured in floor-area-ratio (FAR), which is the ratio of the gross floor area to the size of the lot. FAR measures the density of the lot according to a building’s gross floor area, and a low FAR indicates low density while a high FAR indicates higher density. The “combined density” thresholds are measured in square feet per acre (or square meters per hectare) of buildable land, and they correspond directly to the FAR for nonresidential density.

Option 2. Access to Transit

PATH 1. PUBLIC TRANSIT SERVICE

A project located in a densely built environment with a compact and connected transportation and infrastructure network, reduces environmental impact and enhances the quality of life for regular occupants. When people take public transportation, there are fewer private vehicles on the road, which reduces VMTs and associated GHG emissions and air pollution. In addition, buildings close to public transportation can significantly promote equity by providing various benefits to communities, particularly those that are underserved or disadvantaged. Accessible public transportation provides accessibility and mobility to people who do not have access to private vehicles and fosters social interaction by connecting different neighborhoods.

Projects must be located within 0.25 miles (400 meters) distance of existing lower capacity transit facilities (e.g., bus, streetcar, informal transit stops) or 0.5 miles (400 meters) of high-capacity transit facilities (e.g., bus rapid transit, rail stations). These distances correspond to roughly a five-minute and 10-minute walking time. Additionally, minimum transit frequency has been set to ensure a minimum viable level of service. The weekday trip thresholds in the rating system roughly correspond to leading interval times of 1–2 hours (72 trips per weekday) to 10–20 minutes (360 trips per weekday). Together, the distance and frequency work together to ensure that regular building occupants have a viable transit option for daily travel.

PATH 2. PROJECT-SPONSORED TRANSIT SERVICE

A sponsored transit service, such as vans, shuttles, or buses, for regular occupants and visitors provides direct and convenient transit options for work, and access to amenities for day-to-day needs. Offering a sponsored transit service can reduce the number of private vehicles, which lessens pollution, eases traffic congestion in neighborhoods, and enhances the commuting experience for regular occupants. Additionally, project-sponsored transit services can significantly reduce the need for parking infrastructure. Land that would have been used for parking can be repurposed for other uses, including buildings, green spaces, pollinator habitats, and recreational areas.

Adapting to new routines can take time, which is why a three-year commitment is required for the project-sponsored transit service. This can allow the project adequate time to promote the service and encourage ridership. Also, 0.25 miles (400 meters) walking distance from a functional entry of the project is required because it corresponds roughly to a five-minute walking time, which is convenient for most people.

Option 3. Walkable Location

Walk Score®

Knowing the Walk Score® of the project site provides a better understanding of how the building location can encourage physical activity, reduce GHG emissions, and foster social interactions.[39] Walk Score® data is categorized as either supported or unsupported. A supported Walk Score® is based on verified, publicly available data and can be used to demonstrate compliance with walkability requirements for credit achievement. An unsupported Walk Score®, however, relies on incomplete data and cannot be used to achieve this credit.

A high Walk Score® means that the location is highly walkable, and that area is likely to have many amenities and services within a short walking distance. A location with a low Walk Score® indicates that the location is not as walkable, or building users would rely heavily on public or private transit for daily activities.

Projects must be located on a site with a Walk Score® of at least 60 to earn a point.

Location efficiency

Locating a project close to existing and publicly available uses can significantly improve the neighborhoods' quality of life and achieve multiple social benefits including easy access to basic amenities such as parks, restaurants, supermarkets, medical clinics, and educational facilities, which promote a vibrant and interconnected community. Increased walkability encourages building users to walk or bike to their destinations, promoting healthier, active lifestyles. A reduced dependence on cars directly results in reduced VMTs, reduced GHG emissions, and improved outdoor air quality.

A walking distance of 0.5 miles (800 meters) from the project is required because it corresponds roughly to a 10-minute walking time, which most people find reasonable to access the publicly available uses. The goal is to make the number of required publicly available uses is intended to be equivalent to the corresponding Walk Score® ranking. Use Table 8 to determine the types and numbers of uses.

Table 8. Use types and categories[40]

Category	**Use type**
Food retail	Supermarket
	Grocery with produce section

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[39] *Get your Walk Score®*, (n.d.), Walk Score®, walkscore.com/.

[40] "Community Resources", U.S. Green Building Council, last accessed April 2, 2025, https://www.usgbc.org/credits/homes-higharise/v4-draft/ltc4.

Category	Use type
Community-serving retail	Convenience store
	Farmers market
	Hardware store
	Pharmacy
	Other retail
Services	Bank
	Family entertainment venue (e.g., theater, sports)
	Gym, health club, exercise studio
	Hair care
	Laundry, dry cleaner
	Restaurant, café, diner (excluding those with only drive-thru service)
Civic and community facilities	Adult or senior care (licensed)
	Childcare (licensed)
	Community or recreation center
	Cultural arts facility (e.g., museum, performing arts)
	Education facility (e.g., K–12 school, university, adult education center, vocational school, community college)
	Government office that serves public on-site
	Medical clinic or office that treats patients
	Place of worship
	Police or fire station
	Post office
	Public library
	Public park
	Social services center
Community anchor uses (BD+C and ID+C only)	Commercial office (e.g., 100 or more full-time equivalent jobs)

Schools

- Meet Options 1, 2, and/or 3 above.

Option 4. Surrounding Density and Development

PATH 1. SURROUNDING DENSITY

Same as Option 1, Surrounding Density above.

PATH 2. CONNECTED SITE

When selecting a project location, it is important to consider whether the parcels directly adjacent or on the other side of the road are previously developed sites. The more previously developed land that exists along the border of the project parcel means that existing infrastructure is reused, and the need for new construction materials is reduced, decreasing greenhouse emissions and reducing the environmental impacts from new construction.

The project team must identify parcels adjacent to the project's perimeter on a map and determine whether the project meets the criteria for an adjacent site or infill site. Teams must measure the project's entire perimeter, the length of perimeter segments adjacent to the waterfront (if any) and the longest continuous perimeter segments adjacent to qualifying parcels.

Use Equation 1 to determine the percentage of the project boundary that is continuously adjacent to previously developed parcels. The site qualifies as an adjacent site if the total meets or exceeds 25%, excluding any waterfront adjacency.

Equation 1. Percentage of adjacent boundary for adjacent sites

$$\% \, adjacent \; boundary = \frac{Continuous \; perimeter \; adjacent \; to \; previously \; developed \; parcels}{(Total \; perimeter - Any \; waterfront \; perimeter)} \times 100$$

Equation 2 can be used to determine if the site qualifies as an infill site. If at least 75% of the project's boundary is adjacent to previously developed parcels, excluding any waterfront perimeter, the site qualifies as an infill site.

Equation 2. Percentage of adjacent boundary for infill sites

$$\% \, adjacent \; boundary = \frac{Any \; perimeter \; length \; adjacent \; to \; previously \; developed \; parcels}{(Total \; perimeter - Any \; waterfront \; perimeter)} \times 100$$

Option 5. Access to Transit or Pedestrian Access

PATH 1. ACCESS TO TRANSIT

Same as Option 2, Access to Transit above. Transit access to schools ensures that workers, students, and families can access the school facility.

PATH 2. PEDESTRIAN ACCESS

Locating a school within an attendance boundary is important to ensure a safe and accessible environment for students of various grades and ages.

Data centers, warehouses, and distribution centers

- Meet Options 1, 2, and/or 3 above.

Option 6. Surrounding Development and Resources

PATH 1. DEVELOPMENT AND ADJACENCY

Data centers and warehouses are encouraged to select sites previously developed and adjacent to parcels currently used for industrial or commercial purposes. This helps preserve undeveloped land and conserves natural habitats. Developing on a site next to existing industrial or commercial buildings also means existing infrastructure is in place, which may result in lower greenhouse emissions from future infrastructure development.

The project team must identify parcels adjacent to the project's perimeter on a map and determine whether the project is an adjacent site by measuring the project's entire perimeter, the length of perimeter segments adjacent to the waterfront (if any), and the longest continuous perimeter segments adjacent to qualifying parcels. Use Equation 3 to determine the percentage of the project boundary adjacent to previously developed parcels.

Equation 3. Percentage of adjacent boundary for adjacent sites

$$\%\ adjacent\ boundary = \frac{Continuous\ perimeter\ adjacent\ to\ previously\ developed\ parcels}{(Total\ perimeter - Any\ waterfront\ perimeter)} \times 100$$

PATH 2. TRANSPORTATION RESOURCES

Locating data centers and warehouses near various transportation resources provides multiple opportunities to transport goods and services. Proximity to the main logistics hub, an on-off ramp to a highway, and access points to an active freight rail line would facilitate efficient movement of people, boosting the overall economy by attracting businesses and residents.

Mapping must show the driving routes and distances from the project to any applicable transportation resources. The team must also verify that any transportation resources are completed. Resources that are funded, under construction by the date of certificate of occupancy and completed within 24 months of that date will also count toward credit compliance.

Healthcare

- Meet Options 1, 2, and/or 3 above.

Option 7. Surrounding Density

Healthcare facilities can be significantly sized developments and should contribute to compact and connected development. This is achieved by locating a project in an area that meets surrounding density thresholds in the rating system. However, not all healthcare facilities are in dense areas, especially when they need to serve rural communities. This option also allows flexibility for previously developed existing healthcare facilities by meeting campus development density thresholds instead.

Project teams must identify the building site and buildable land within 0.25 miles (400 meters) offset of the project boundary on a map. Collect information on the surrounding residential and nonresidential building densities, including number of dwelling units and building floor area for all properties within the offset of the boundary, and confirm residential densities and FAR meet or exceed the residential density of 7 DU/acre (17.5 DU/hectare) and nonresidential density (FAR) of 0.5 using separate density. Projects must meet the 22,000 sf/acre of buildable land for combined density. For previously developed rural healthcare campus sites, achieve a minimum development density of 30,000 sf/acre.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Surrounding Density	Combined Density	Vicinity map showing buildable land, any non-buildable land excluded, project site, and footprints of existing buildings within 0.25 miles (400 meters) offset of project site.
			LEED v5 Surrounding Density calculator, completed for Combined Density.
			Combined density (in square feet, per acre, or square meters per hectare).
		Separate Density	Vicinity map showing buildable land, any non-buildable land excluded, project site, and footprints of existing residential and non-residential buildings within 0.25 miles (400 meters) offset of project site.
			LEED v5 Surrounding Density calculator, completed for Separate Density.
			Non-residential commercial density (in floor area ratio).
			Residential density (in dwelling units per acre or per hectare).
	Option 2. Access to Transit	Path 1. Public Transit Service	Vicinity map indicating the project location, location of the transit stop(s), routes serving each stop, and the walking routes (with walking distance noted) between

Project types	Options	Paths	Documentation
			the location of the project functional entry and the stop(s).
			Weekday and weekend route schedules showing the frequency of trips and service.
			For any planned transit service, documentation of planned transit stops and stations sited, funded, and under construction by the date of the project's certificate of occupancy and scheduled for completion within 24 months of that date.
		Path 2. Project-Sponsored Transit Service	Description of project-sponsored service and shelters meeting credit criteria.
			Vicinity map indicating the project location, location of the transit stop(s), route(s) serving each stop, and the walking routes (with walking distance noted) between the location of the project functional entry and the stop(s).
			Weekday and weekend route schedules showing the frequency of trips and service.
			Verification (e.g., letter of assurance or agreement, etc.) that transit service will be provided for at least three years from the project's certificate of occupancy.
	Option 3. Walkable Location	Location Efficiency	Walk Score® document (e.g., screenshot) showing the score for the project's address.
			Project's Walk Score®.
		Public Uses	Vicinity map and table of uses identified by type of uses accessible within 0.5 miles (800 meters) walking distances.
Schools	Option 4. Surrounding Density and Development	Path 1. Surrounding Density	Same as Option 1.
		Path 2. Connected Site	Documentation confirming previous developed status of the site.
			Percent of contiguous project perimeter or boundary bordering previously developed parcels (must be at least 25% for adjacent site status).
			Percent of project perimeter or boundary bordering previously developed parcels (must be at least 75% for infill status).
			Site plan or vicinity map showing previously developed parcels adjacent to the project boundary with notes confirming adjacent or infill site status.
	Option 5. Access to Transit or Pedestrian Access	Path 1. Access to Transit	Same as Option 2.
		Path 2. Pedestrian Access	Vicinity map showing walkshed boundary for each grade/age level, functional entry of school building and estimated calculations of dwelling units (%) within each walkshed boundary.
			Confirmation of pedestrian access to the site from all residential areas in the attendance boundary.

Project types	Options	Paths	Documentation
Data Centers, Warehouses and Distribution Centers	Option 6. Surrounding Development and Resources	Path 1. Development and Adjacency	Site plan or vicinity map showing project, its previous development, and use.
			Documentation confirming adjacent site status.
			Calculation showing the percentage of contiguous project perimeter or boundary bordering previously developed parcels (must be at least 25% for adjacent site status).
		Path 2. Transportation Resources	Site plan or vicinity map showing project site, location and type of transportation resources, and driving distance to each.
			If planned transportation resources are counted, verification that they will be sited, funded and under construction by date of project's certificate of occupancy and complete within 24 months of that date.
Healthcare	Option 7. Surrounding Density	All	Documentation in accordance with Option 1. with rural healthcare campus sites demonstrating achievement of minimum development density of 30,000 square feet per acre (6,890 square meters per hectare).

REFERENCED STANDARDS

- Walk Score® (walkscore.com)

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Location and Transportation Credit

TRANSPORTATION DEMAND MANAGEMENT

LTc4

New Construction (1–4 points)
Core and Shell (1–4 points)

INTENT

To reduce pollution and land development effects from automobile use through encouraging alternative transportation networks. To promote more livable and healthy communities through reduced vehicle distance traveled and associated emissions.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–4
Transportation Demand Assessment	
AND	
Option 1. Parking	1–3
Path 1. Reduce Parking	1–3
AND/OR	
Path 2. Parking Fee	2
AND/OR	
Option 2. Active Travel Facilities	1–3
Path 1. Bicycle Network and Storage	1
AND/OR	
Path 2. Shower and Changing Facilities	1
AND/OR	
Path 3. Bicycle Maintenance	1

Transportation Demand Assessment

Assess the number of vehicle miles traveled (VMT) and carbon emissions associated with the regular building occupants' travel to and from the project building as based on the following:

- Estimate the annual VMT.
- Estimate annual baseline case for carbon emissions.
- Assess low-carbon transportation options.
- Estimate annual proposed case for carbon emissions.
- Estimate the total reduction of carbon emissions between annual baseline case and annual proposed case.

Projects that participate in a local or regional government-mandated transportation demand management (TDM) program satisfy the Transportation Demand Assessment requirement. Residential affordable housing projects in an infill location, or office, mixed-use, residential, or retail projects located within a transit priority area, or within a walking distance of 0.5 miles (800 meters) to an existing or planned major transit stop, are exempt from the above requirements.

AND

Implement one or more of the following for up to a total of four points.

Option 1. Parking (1–3 points)

PATH 1. REDUCE PARKING (1–3 POINTS)

Provide a reduction in parking capacity, using the base ratios for parking spaces found in the *Institute of Transportation Engineers Parking Generation Manual*, sixth edition, or a comparable resource applied by a qualified transportation engineer or planner or in supplementary LEED guidance. Points are awarded according to Table 1.

Table 1. Points for percentage of reduced parking capacity

Reduced parking percentage	Points
30% reduction from base ratios	1
60% reduction from base ratios	2
100% reduction from base ratios (no parking)	3

AND/OR

PATH 2. PARKING FEE (2 POINTS)

Implement a daily, monthly, or annual parking fee at a cost equal to or greater than the local market rate for public or private parking.

AND/OR

Option 2. Active Travel Facilities (1–3 points)

PATH 1. BICYCLE NETWORK AND STORAGE (1 POINT)

Bicycle network
Design or locate the project such that a functional entry and/or bicycle storage is within a 600-foot (180-meter) walking distance or bicycling distance of a bicycle network that meets the following criteria:

- It provides a contiguous network that spans a distance of at least three miles (4,800 meters).
- It consists of bicycle paths, lanes, multiuse trails, or streets with a maximum speed limit of 25 mph (40 kph). Sidewalks where local code permits bicycles are acceptable.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within three years of that date.

Schools

- Provide dedicated bicycle lanes that extend from the student bike-parking location to at least the end of the school property without any barriers (e.g., fences on school property).

AND

Bicycle storage

Provide short-term bicycle storage within 600 feet (180 meters) walking distance to any main entrance, but no fewer than four storage spaces per building.

Provide long-term bicycle storage within 300 feet (90 meters) walking distance from any functional entry, but no fewer than four storage spaces per building, in addition to the short-term bicycle storage spaces.

Points are awarded according to Table 2. Shared micromobility storage, bicycle-sharing stations, and/or publicly available bicycle parking may be counted for up to 50% of the required short-term and long-term storage space if:

- It meets the maximum allowable walking distance.
- It is not double counted (e.g., The short-term and the long-term storage spaces are counted separately).
- The storage location is communicated to the building occupants and visitors.

Table 2. Number of spaces required for short- and long-term bicycle storage

	Commercial, institutional, schools, healthcare	**Residential**	**Mixed use**	**Retail**
Short-term storage	At least 2.5% of all peak visitors but no fewer than four spaces per building.		Meet the storage requirements for the nonresidential and residential portions of the project separately.	At least two short-term bicycle storage spaces for every 5,000 square feet (465 square meters) but no fewer than two storage spaces per building.
Long-term storage	At least 5% of all regular building occupants but no fewer than four storage spaces per building, in addition to short-term storage.	At least 15% of all regular building occupants but no fewer than one storage space per three dwelling units, in addition to short term storage spaces.		At least 5% of regular building occupants but no fewer than two storage spaces per building in addition to the short-term bicycle storage spaces.

NOTE: For New Construction only: School projects can exclude students in third grade and younger from the regular building occupant count for long-term storage. Healthcare projects can exclude patients from the regular building occupant count for long-term storage.

AND/OR

PATH 2. SHOWER AND CHANGING FACILITIES (1 POINT)

Provide access to on-site showers with changing facilities for 1% of all regular building occupants. Off-site showers and changing facilities are acceptable if they meet the needs of all occupants and are within 0.25 miles (400 meters) walking distance.

Large occupancy projects

Provide at least one on-site shower with a changing facility for the first 100 regular building occupants and one additional shower for every 150 regular building occupants thereafter, up to 999 regular building occupants. After that, provide the following:

- One additional shower for every 500 regular building occupants, for an additional 1,000–4,999 regular building occupants.
- One additional shower for every 1,000 regular building occupants, for the additional 5,000+ regular building occupants.

AND/OR

PATH 3. BICYCLE MAINTENANCE (1 POINT)

Provide a permanent and secure bicycle repair station that includes a complete set of tools and an air pump securely fastened to the repair stand in the area dedicated to long-term bicycle storage.

REQUIREMENTS EXPLAINED

This credit provides a holistic approach to reducing transportation impacts and supporting projects' decarbonization efforts by enhancing transportation options. TDM includes both facility-related and behavioral strategies to encourage sustainable transportation choices. TDM strategies may target facilities specifically related to the project, such as bicycle maintenance stations, secure bicycle storage, and access to connected bicycle networks (paths, trails, designated bicycle lanes). These strategies align with behavioral approaches that offer travel incentives or disincentives, such as bus passes and carpooling. TDM helps reduce VMTs, lower parking demand, support ridesharing, and encourage public transit use by addressing the project occupants' current and projected transportation demands. The credit examines commuting patterns and behaviors of the occupants by estimating VMT and assessing alternative mode choices, making TDM a comprehensive framework for sustainable transportation planning.

Transportation Demand Assessment

Sustainable transportation measures require assessing the number of VMT and carbon emissions associated with the regular building occupants' travel to and from the project building. VMT and carbon emissions are important metrics in evaluating the impacts of efforts toward creating a more sustainable transportation system. It provides critical data for creating effective TDM strategies and insights in designing projects that aim to reduce travel distances, encourage alternative transportation modes, and lead to more sustainable and resilient communities. The USGBC TDM assessment calculator will help to complete the calculations in the following equations.

Projects that participate in a local or regional government-mandated TDM program are considered to have met the Transportation Demand Assessment requirement because these programs are typically designed to achieve the same goals of reducing traffic congestion, lowering emissions, and supporting more sustainable transportation systems. Residential affordable housing projects in infill locations, as well as office, mixed-use, residential, or retail projects located within a transit priority area or within 0.5 miles (800 meters) walking distance of an existing or planned major transit stop, are exempt from the TDM assessment requirements because their location inherently promotes sustainable transportation options.

Estimate the annual VMT

Project teams must estimate the annual VMT as part of assessing transportation demand. This process involves determining the number of days the building will be occupied, identifying the number of regular project occupants commuting to and from the site and calculating the VMT. This equation assumes the worst-case scenario of all regular building occupants driving SOVs.

Equation 1. Calculating the annual VMT

$$Annual\ VMT = Regular\ \mathrm{building}\ occupants\ \times\ Estimated\ \mathrm{number}\ of\ \mathrm{work}\ \mathrm{d}ays\ within\ a\ year \times\ Daily\ VMT$$

Estimate annual baseline case for carbon emissions

Project teams must estimate the annual baseline case for carbon emissions. This baseline emissions estimate assumes the worst-case scenario of all regular building occupants driving SOVs with the same emissions factor.

Equation 2. Calculating annual baseline case for transportation emissions

$$Annual\ baseline\ case\ for\ \mathrm{t}ransportation\ \mathrm{emissions} = Total\ annual\ VMT\ \times\ emission\ factor$$

Assess low-carbon transportation options

After the baseline for annual transportation emissions has been established, teams must assess the potential for reducing transportation-related emissions by using transportation behavior data from national census, metropolitan planning organizations, and transportation departments at local or state governments. If local or state data cannot be found, teams should use other relevant data sources to estimate actual travel patterns. Based on the findings, teams must also estimate the portion of regular building occupants likely to use these alternative and active transportation options for their daily commutes to and from the building. Teams are strongly encouraged to prioritize *Option 1. Parking* and *Option 2. Active Travel Facilities*, as these options support the promotion of low-carbon transportation strategies. Teams should also account for unique conditions at the project site and assess whether the travel estimates are realistic. Key guiding questions include:

- Are there bicycle routes leading to the project?
- Is there sufficient sidewalk connectivity?
- Is the project within walking distance of residential neighborhoods?

Walking and biking trips, which assume zero emissions, can significantly offset the overall transportation carbon footprint of the project.

Estimate annual proposed case for carbon emissions

After assessing the low-carbon transportation option, project teams must determine the anticipated number of regular building occupants who will commute using SOVs, based on a realistic assessment of travel patterns to and from the site. The team should consider work-at-home arrangements too, as this can reduce VMTs directly related to the building. This analysis must also account for various commuting methods, such as walking, cycling, public transit, or carpooling, and estimate the remaining number of individuals who are likely to rely on SOVs. For example, if 50 employees are expected to regularly walk to and from work, these individuals would produce zero vehicle emissions for the year.

Equation 3. Calculating the annual proposed case for carbon emissions

$$\mathit{Annual\ transportation\ emissions} \ = (\mathit{Proposed}\ \mathrm{case}\ \mathit{regular}\ \mathrm{building}\ \mathrm{occupants} \times \mathit{Estimated}\ \mathrm{number}\ \mathit{of}\ \mathrm{work}\ \mathrm{d}\mathit{ays}\ \mathit{within\ a\ year} \times \mathit{Daily\ VMT}) \times \mathit{Emission\ factor}$$

Estimate the total reduction of carbon emissions

Project teams are required to calculate the difference in emissions to get the total estimated reduction of carbon emissions between the annual baseline and proposed case.

AND

Option 1. Parking

TDM strategies, like reducing parking spaces and implementing parking fees, address broader land use and cost challenges tied to parking. TDM conserves valuable land and reduces infrastructure and maintenance expenses by decreasing the need for large parking facilities and promoting more sustainable transportation options that align with project efficiency and environmental goals.

Limiting parking availability also helps curb induced demand, as fewer parking spaces discourage single-occupancy vehicle (SOV) trips and encourage alternative transportation modes. Another effective approach is unbundling parking, which separates the cost of parking from building rentals or leases. For example, a mixed-use office building leases commercial spaces to businesses. Instead of including parking spaces as part of the standard lease package, the building owner offers parking spaces as a separate, optional service.

PATH 1. REDUCE PARKING

Limiting parking availability also helps curb induced demand, as fewer parking spaces discourage SOV trips and encourage alternative transportation modes. This path uses a parking baseline against which reductions in parking supply can be compared. The baseline should be calculated using industry standards on parking demand, such as the *Institute of Transportation*

Engineers Parking Generation Manual[41] or comparable resource. The significant environmental benefit of less parking has been recognized in LEED v5 by increasing the point allocation from 1 point in LEED v4.1 BD+C: New Construction and LEED v4.1 BD+C: Core and Shell (*LTc4: Reduced Parking Footprint*, Option 1. No Parking or Reduce Parking) to three points. Parking capacity must include all existing and new off-street parking spaces that are leased or owned by the project, including parking that is outside the project boundary but is used by the project. On-street parking in public rights-of-way is excluded from these calculations:

Equation 4. Percentage of parking capacity reduction

$$Parking\ reduction = \frac{(Total\ baseline\ capacity - Total\ provided\ capacity)}{Total\ baseline\ capacity} \times 100$$

PATH 2. PARKING FEE

Implementing a parking fee for public or private parking is a common TDM strategy which aims to reduce the demand for parking spaces and encourage alternative and more sustainable transportation options, such as public transit, biking, walking, or carpooling. More importantly, it helps to address the true cost of parking, which not only includes the construction cost but also takes into account the land use, maintenance, environmental, social and economic impacts for building parking facilities.

Project teams must assess the daily, monthly, or annual market rates for parking in the local area, whether for public or private facilities. Teams are suggested to consider facilities of the same type, (e.g., surface lot, deck, underground deck, or covered parking). Teams must provide justification for the parking fee and set it at a rate that meets or exceeds these local market values. The project promotes fair market competition and encourages more sustainable transportation options by establishing parking fees at or above the market rate.

Option 2. Active Travel Facilities

Active travel facilities promote sustainable, healthy, and efficient alternatives to car-based transportation by providing comprehensive facilities that support cycling, e-bicycles, scooters, and other eco-friendly travel modes. Essential components include secure storage for bikes, well-designed on-road facilities such as dedicated lanes and paths, access to showers and changing areas, and bike maintenance stations. Together, these elements create an integrated system that enables convenient, active travel options for daily commuting and short trips. In recent years, these modes have surged in popularity and as of 2017, there were around 1,250

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[41] *Parking Generation*, 6th Edition (Institute of Transportation Engineers, ITE, 2023), https://www.ite.org/ite.org.

bicycle-sharing systems globally with over 10 million bicycles globally.[42] Active transportation not only reduces carbon emissions and improves public health through increased physical activity but also helps manage transportation demand by reducing traffic congestion and lessening the need for vehicle parking infrastructure.

PATH 1. BICYCLE NETWORK AND STORAGE

To promote bicycle-friendly design, this path rewards two items: the provision of long- and short-term bicycle storage and access to a bicycle network, including paths, trails, designated bicycle lanes, and slow-speed roadways. Short-term and long-term bicycle storage capacity is considered separately because visitors and regular project occupants have different bicycle storage needs. Being adjacent to a bicycle network means that project occupants can more easily bicycle to and from the project building.

Bicycle network

Project teams are required to identify bicycle network within 600 feet (180 meters) walking distance or bicycling distance of a functional entry and/or bicycle storage in the project and gather information and specifications on distance from the project site and street speed limit for the bicycle network. A bicycle network must be a contiguous network that spans a distance of three miles (4,800 meters). The three-mile contiguous path refers to the total length and does not need to span three miles in a single direction. For example, it could consist of one mile to the north and two miles to the south, totaling three miles. The bicycle network must also consist of bicycle paths, lanes, or trails that are at least eight feet (2.5 meters) wide for a two-way path and at least four feet (1.2 meters) wide for a one-way path. Also, any on-street bicycle facilities are to be on streets with a maximum speed limit of 25 mph (40 km/h). Both bicycle lanes and bicycle trails must meet the credit's width requirements. Sidewalks where bicycles are allowed by local code are also acceptable.

Teams must locate the project close to an existing or planned bicycle network that meets credit requirements for use within the specified distance from the project boundary. For planned bicycle trails or lanes, confirm the schedule for funding and completion.

Schools

- This option for schools is in lieu of connecting to a bicycle network. Project teams must ensure safe access to school buildings by providing on-site bike lane or multi-modal path that are either on-road or off-road that safely connect the edge of school property to school buildings without any barriers.

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[42] United Nations, (2021), Sustainable Transport, Sustainable Development, sdgs.un.org/sites/default/files/2021-10/Transportation%20Report%202021_FullReport_Digital.pdf.

Bicycle storage

Teams are required to determine the number of expected occupants in the building and determine the number of bicycle storage spaces, shared mobility storage, and stations required. Once the number of bicycle storage spaces is determined, install the short-term and long-term bicycle storage within 600 feet (180 meters) and 300 feet (90 meters) walking distance from any main entrance and functional entry, respectively. Shared micromobility storage facilities, such as those for e-scooters and e-bicycles, as well as bicycle sharing stations and publicly accessible bicycle parking, can account for up to 50% of the required short-term and long-term bicycle storage needs. This encourages the use of communal, readily available transportation solutions and reduces the need for dedicated on-site storage infrastructure.

For commercial, institutional, schools, and healthcare projects, use Equation 5 to determine the number of short- and long-term bicycle storage. School projects can exclude students in third grade or younger from regular occupant count for long-term storage. Healthcare projects can exclude patients from regular project occupant count for long-term storage.

Equation 5. Calculating bicycle storage for commercial, institutional, schools, and healthcare projects

$$Short\text{-}term\ storage = (Peak\ visitor\ \times\ 0.025)\ \geq 4$$
$$Long\text{-}term\ storage = (Regular\ project\ occupants\ \times\ 0.05)\ \geq 4$$

For retail projects, use Equation 6 to determine the number of short- and long-term bicycle storage:

Equation 6. Calculating bicycle storage for retail projects

$$Short\text{-}term\ storage = \left(\frac{[Building\ gross\ floor\ area\ (sf\ or\ m2))}{5000\ or\ 465}\right] \geq 2$$

$$Long\text{-}term\ storage = (Regular\ project\ occupants\ \times\ 0.05) \geq 2$$

Equation 7. Calculating bicycle storage for residential projects

$$Short\text{-}term\ storage = (Peak\ visitor\ \times\ 0.025)\ \geq 4$$

$$Long\text{-}term\ storage = (Regular\ project\ occupants\ \times\ 0.15) \geq 1\ space\ per\ three\ dwelling\ units$$

PATH 2. SHOWER AND CHANGING FACILITIES

Providing adequate infrastructure for active commuting, such as lockers and changing/shower facilities, plays a key role in promoting physical activity for all building occupants, not just cyclists. These amenities are especially beneficial for those who may engage in exercise or other physical activities before work. Buildings with these facilities allow occupants to adopt active lifestyles, including active commuting, fostering a culture that values health and wellness.

Project teams are required to gather occupant information and determine the number of showers and changing facilities required using the below equation. Off-site showers and changing facilities are acceptable if they meet the needs of all occupants and are within 0.25-miles (400 meters) walking distance. Teams must provide a vicinity or area map indicating off-site shower and changing facilities.

Equation 8. Calculating the number of showers and changing facilities

$$Number\ of\ shower\ and\ changing\ facilities = Regular\ project\ occupants\ \times\ 0.01$$

For large-occupancy projects with regular building occupants up to 999, use Equation 9 to determine the number of showers and changing facilities required.

Equation 9. Calculating the number of shower and changing facilities for large occupancy up to 999

$$If\ regular\ project\ occupants \leq 100, Shower\ \mathrm{facilities} = 1$$

$$If\ regular\ project\ occupants > 100, Shower\ facilities = 1 + \frac{Regular\ project\ occupants - 100}{150}$$

For large-occupancy projects with an additional 1,000–4,999 regular building occupants, use Equation 10 to determine the number of showers and changing facilities required.

Equation 10. Calculating the number of showers and changing facilities for large occupancy 1000 or more

$$If\ regular\ building\ occupants\ > 1000, Shower\ \mathrm{facilities} = 1 + \frac{Regular\ project\ occupants - 1000}{500}$$

$$If\ regular\ building\ occupants\ > 5000, Shower\ \mathrm{facilities} = 1 + \frac{Regular\ project\ occupants - 5000}{1000}$$

PATH 3. BICYCLE MAINTENANCE

Offering on-site bicycle maintenance services is a strategy to promote active commuting. Projects can make cycling a more convenient and reliable option for commuters by providing access to basic bicycle repair tools and air-pump stations. This proactive support ensures that bicycles remain in good working condition and encourages more individuals to adopt active commuting as part of their daily routine.

The maintenance facility must be permanently secured and should remain in the same place, so users know where to find it when needed. Repairs are often needed at unexpected and inconvenient times, so predictability is key. The tools should accommodate typical repairs and be securely fastened so they do not go missing. Locating the repair facility in the area dedicated to long-term bicycle storage ensures it is conveniently located.

Project teams are required to provide a description of the available bicycle services and facilities, along with a map or site plan indicating the location of the bicycle repair station within the designated long-term bicycle storage area to ensure that occupants are aware of where to access these resources, making it easier for them to maintain their bicycles, and promote a cycling-supportive environment.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	Not Claiming TDA Exemption	USGBC TDM assessment calculator.
			Baseline VMT.
			Proposed VMT.
			Baseline emissions from VMT.
			Proposed emissions from VMT.
			Description of availability of alternative low-carbon and active travel options.
		Claiming TDA Exemption	Documentation showing participation in a local or regional government mandated TDM program.
			Documentation showing project is an affordable housing project in an infill location.
			Documentation showing project (office, mixed-use, residential, or retail) is located within a Transit Priority Area or within 0.5 miles (800 meters) walking distance of an existing or planned major transit stop.
	Option 1. Parking	Path 1. Reduce Parking	Calculations demonstrating the percent reduction in parking capacity from baseline.
			Parking Plan or Site Plan showing the LEED boundary and the parking used by the project.
		Path 2. Parking Fee	Narrative identifying the parking fees and explaining how the rate charged is equal to or greater than the local market rate for parking.
			Documentation confirming local market parking rate.

Project types	Options	Paths	Documentation
	Option 2. Active Travel Facilities	Path 1. Bicycle Network and Storage	Vicinity map showing bicycle network meeting the required criteria and walking/bicycling distance of functional building entrance and/or bicycle storage to existing or planned bicycle network.
			Evidence that any sidewalks contributing as part of the bicycle network are permitted for bicycle use by local code (e.g., excerpt of the code).
			Site Plan showing main and functional building entrances, short-term bicycle storage and long-term bicycle storage and shared micromobility storage (if applicable), walking distance from short-term storage to the main entrance and from long-term storage to a functional entrance.
			Calculations documenting the percentage of occupants for which short-term bike storage is provided.
			Calculations documenting the percentage of occupants for which long-term bike storage is provided.
		Path 2. Shower and Changing Facilities	Site plan showing shower and changing facilities location and walking distance within 0.25 miles (400 meters) for off-site facilities.
			Calculation documenting the percentage of regular building occupants with access provided to showers with changing facilities.
			For large occupancy projects, the number of project occupants to determine the number of on-site showers required.
			For large occupancy projects, the number of on-site showers with changing facilities provided.
		Path 3. Bicycle Maintenance	Evidence of a permanent, secure bicycle maintenance facility demonstrating complete set of tools and air pump securely fastened to the repair stand (e.g., product information from the manufacturer, photographs, contract specification).
			Evidence of location of the bicycle maintenance facility in the area dedicated to long-term bicycle storage (e.g., contract documents).
Retail		Path 1. Bicycle Network and Storage	Number of short-term bike storage spaces provided.
Schools		Path 1. Bicycle Network and Storage	Evidence demonstrating dedicated bicycle lanes or sidewalks, if applicable, that extend from the student bike parking location to the end of the school property, at minimum, without any barriers.

REFERENCED STANDARDS

- Institute of Transportation Engineers (ITE) Parking Generation Manual, 6th Edition (ite.org)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Location and Transportation Credit

ELECTRIC VEHICLES

LTc5
New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To encourage the use of *electric vehicles (EVs*) and infrastructure. To help reduce the negative health effects on communities by lowering greenhouse gas emissions and other pollutants emitted from conventionally fueled cars and trucks.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1: Electric Vehicle Supply Equipment	1–2
AND/OR	
Option 2: Electric Vehicle Readiness	1

Option 1. Electric Vehicle Supply Equipment (1–2 points)

Install electric vehicle supply equipment (EVSE) meeting the thresholds listed in Table 1. EVSE must meet the following criteria:

- Provide Level 2 or Level 3 charging capacity per the manufacturer's requirements and the requirements of the *National Electrical Code* (*NFPA 70*).
- Provide 208–240 volts or greater for each required space.
- Meet the connected functionality criteria for ENERGY STAR® -certified EVSE and be capable of responding to time-of-use market signals (e.g., price).
- At least one EV charging station has an accessible parking space at least 9 feet (2.5 meters) wide with a 5-foot (1.5-meter) access aisle and have accessibility features for use by people with mobility, ambulatory, and visual limitations.

Table 1. Points for installed EVSE (% of total parking spaces)

Commercial minimum EVSE parking	**Points**
5% or at least two spaces, whichever is greater	1
10% or at least four spaces, whichever is greater	2
Residential minimum EVSE parking	**Points**
10% or at least five spaces, whichever is greater	1
15% or at least 10 spaces, whichever is greater	2

AND/OR

Option 2. Electric Vehicle Readiness (1 point)

Make the minimum number of total parking spaces used by the project EV ready as specified in Table 2. EV-ready parking spaces must provide a full-circuit installation, including 208–240 volts, have a 40-amp panel capacity, and a conduit (raceway) with wiring that terminates in a junction box or charging outlet.

Any space with an installed EVSE counted for credit under Option 1 may not be counted for credit as an EV-ready space under Option 2.

Table 2. Points for EV-ready parking (% of total parking spaces)

Commercial	Residential	Points
At least 10% or at least 10 spaces, whichever is greater.	At least 20% or at least 20 spaces, whichever is greater.	1

REQUIREMENTS EXPLAINED

This credit addresses the advancement of EVSE, or charging stations, which is a significant impediment to the broad scale adoption of EVs. Option 1 rewards projects that implement EVSE for a minimum number of spaces. Option 2 provides an achievement path for projects that install EV-ready spaces. Projects that do not own or lease parking are not eligible for this credit. Teams may combine Options 1 and 2 for up to two points. Projects must meet the requirement for each option and may not use weighted averages or double count spaces to prove compliance with each option.

Option 1. Electric Vehicle Supply Equipment (EVSE)

New construction projects offer significant opportunities to expand EV charging solutions for communities. By designing and installing electrical infrastructure during initial construction, projects can ensure adequate electrical capacity for the EVSEs, provide building occupants with EVSE on the first day of occupancy, and eliminate future capital costs from digging up parking lots and replacing electrical panels.

EVSE minimum requirements

All EVSE must have a Level or Level 3 charging capacity, with dedicated services of 208–240 volts for each required space.

ENERGY STAR® -certified EVSE are verified to meet performance claims by manufacturers and fully tested for safety and energy use.[43] EVSE are not required to be ENERGY STAR® -certified; however, all installed EVSE must meet the ENERGY STAR® -connected functionality criteria, including capabilities of responding to time-of-use market signals.

Ensure the equipment has the capability to integrate with industry networks and connect to other devices. Devices may include wi-fi routers and electric utility energy management and price signals.

For projects integrating EVSE with demand response programs or load flexibility and management strategies, use guidance in *EAc6: Grid Interactive*.

Minimum number of spaces and accessible parking requirements
Commercial projects must install EVSE for at least 5% of the total vehicle parking capacity and no fewer than two spaces. Parking capacity must include all existing and new off-street parking spaces that are leased or owned by the project, including parking that is outside the project boundary but is used by the project. On-street parking in public rights-of-way is excluded from these calculations.

Use Equation 1 to determine the number of spaces required to meet the 5% threshold. If the equation does not result in a whole number, round up to the next whole number.

Projects must install EVSE for the minimum number of parking spaces, per Table 1. Percentage thresholds only apply if the minimum number of installed spaces meets or exceeds those listed in Table 1.

Equation 1. Commercial minimum EVSE parking

$$Min.\#\ of\ EVSE\ \mathrm{parking}\ (Commercial) = Total\ \#\ of\ parking\ spaces\ \times\ 0.05 \geq 2\ spaces$$

Residential projects must install EVSE for at least 10% and no fewer than five spaces. Determine the minimum number of spaces using Equation 2.

Equation 2. Residential minimum EVSE parking

$$Min.\#\ of\ EVSE\ \mathrm{parking}\ (\mathrm{r}esidential) = Total\ \#\ of\ parking\ spaces\ \times\ 0.10 \geq 5\ spaces$$

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[43] ENERGY STAR®, (n.d.), EV chargers, Retrieved from energystar.gov/products/ev_chargers.

For all projects, provide at least one EV charging station in an accessible parking space. The charging station must have accessibility features that enable equal access to EVSE for a person with mobility, ambulatory, and/or visual limitations.

> **Example 1**
> A new office building includes a surface parking lot with 125 spaces. The project targets 1 point, requiring 5% of the total spaces install EVSE. Using Equation 1, the project needs to install one charging station in an accessible parking space and six additional stations within the parking lot.
>
> The design documents confirm charging stations for one accessible parking space and six additional spaces. The project achieves 1 point. Refer to Calculation 1.
>
> However, if the design includes charging stations for seven parking spaces but does not include charging at an accessible parking space, the project would earn zero points. The project installs the minimum total number of EVSE but does not meet the accessible parking requirement.
>
> Calculation 1: $125 \times 0.05 = 6.25$ spaces = 7 total required spaces, including one space for accessible parking

Option 2. Electric Vehicle Readiness

Projects that do not install EVSE during the initial construction phase may still achieve compliance with this credit using Option 2. By designing parking spaces for EV readiness, the building operators ensure the availability of infrastructure for future EVSE. Installing circuits, conduits, and wiring to each space, prior to pouring concrete or finishing pavement in a parking lot equates to less future work to install the equipment. In this design, projects can easily install EVSE with minimal construction efforts.

Projects must install all infrastructure to be eligible for this option. The intent is that only the EVSE would require installation when the project purchases the equipment.

EV readiness minimum requirements

Identify the EV-ready spaces and confirm that the design incorporates sufficient infrastructure for the EV-ready spaces, which includes, at minimum, a dedicated electric circuit for each space and conduit and wiring sufficient to provide Level 2 charging (or greater). All infrastructure must terminate at an electrical box or enclosure near each required space.

Minimum number of spaces

Projects must design EV-ready parking for the minimum number of spaces, per Table 2. Percentage thresholds only apply if the minimum number of EV-ready spaces meets or exceeds those listed in Table 2.

Commercial projects require EV-ready spaces for at least 10% of the total parking spaces and no fewer than 10 spaces. Parking capacity must include all existing and new off-street parking spaces that are leased or owned by the project, including parking that is outside the project boundary but is used by the project. On-street parking in public rights-of-way is excluded from these calculations. Use Equation 3 to determine the number of spaces required to meet the 10% threshold. If the equation does not result in a whole number, round up to the next whole number.

Equation 3. Commercial minimum EV-ready parking

$$Min.\# \ of \ EV\text{-ready} \ (commercial) = Total \ \# \ of \ parking \ spaces \ x \ 0.10 \geq 10 \ spaces$$

Residential projects require EV-ready spaces for at least 20% of the total parking spaces and no fewer than 20 spaces. Determine the minimum number of spaces using Equation 4.

Equation 4. Residential minimum EV-ready parking

$$Min.\# \ of \ EV\text{-}ready \ \mathrm{parking} \ (\mathrm{residential}) = Total \ \# \ of \ parking \ spaces \ \times \ 0.20 \geq 20 \ spaces$$

Combining Options 1 and 2

LTc5: Electric Vehicles only rewards teams up to two points. Therefore, when combining options, projects must meet one point for Option 1 and one point for Option 2.

Projects cannot double count spaces with installed EVSE as an EV-ready space. Each parking space must meet the characteristics of an EV-ready space or a space with an available EVSE.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Electric Vehicle Supply Equipment	All	Site plan identifying all parking spaces the project, and all parking spaces with EVSE.
			Confirmation that the accessible parking space is at least 9 feet (2.5-meters) wide, has a five-foot (1.5-meters) access aisle, and has charging station accessibility features for use by people with mobility, ambulatory, and/or visual limitations.
			Calculation documenting the percentage of parking spaces with EVSE (including break-out for accessible parking spaces).
			Evidence that the EVSE meet all criteria identified in the credit requirements (e.g., product information from manufacturer or contract specification).
	Option 2. Electric Vehicle Readiness	All	Site plan identifying all parking spaces used by the project and the total number of EV-ready spaces, including clear identification of at least 1 EVSE in an accessible parking space.
			Calculation documenting the percentage of parking spaces that are EV-Ready.
			Evidence that each EV-Ready parking space has the necessary electrical infrastructure to support the installation of an EV charger including a 40-amp panel capacity, dedicated 208/240V branch circuit, and conduit (raceway) with electrical wiring terminating at a receptacle or junction box for the parking space (e.g., contract documents).

REFERENCED STANDARDS

- SAE Surface Vehicle Recommended Practice J1772 (sae.org)
- SAE Electric Vehicle Conductive Charge Coupler (sae.org)
- IEC 62196 of the International Electrotechnical Commission (iec.ch)
- ENERGY STAR® (energystar.gov)
- National Electrical Code (NFPA 70) (nfpa.org)

SUSTAINABLE SITES (SS)

OVERVIEW

LEED v5 prioritizes biodiversity and resilience through credits that highlight not only conservation, but the restoration of ecosystems and natural water cycles. This updated framework encourages projects to actively benefit the surrounding ecosystems and create green spaces that enable pollinators and wildlife to thrive (*SSc1: Biodiverse Habitat*).
The *Sustainable Sites (SS)* category acknowledges the powerful impact of healthy ecological infrastructure, such as rich soil, functioning water cycles, and native vegetation, on a project's long-term resilience.[44] In fact, this category contains half of the credits in LEED v5 that address resilience. Moreover, nature-based solutions are consistently a cost-effective approach to mitigating hazards because of their low-maintenance strategies.[45]

With a more holistic and future-oriented approach to the intersections between the building, the site, and their larger ecological context, projects can design spaces that anticipate and reduce heat island effect, withstand and more quickly recover from the impacts of extreme weather, and take a proactive approach to adapting to the challenges posed by our changing climate.

Decarbonization
A more resilient future means a decarbonized future. Urban areas may have up to 50–90% dark, non-reflective surfaces that absorb and retain heat, creating heat islands that significantly warm the surrounding areas driving up energy consumption as buildings work to maintain comfortable temperatures, which increases their carbon emissions.[46]

To reduce buildings' contribution to these effects, the SS category tackles local temperature increases through shading, increased tree canopy cover and vegetation, and reflective or green roofs (*SSc5: Heat Island Reduction*). These strategies in turn decrease reliance on energy-intensive systems like HVAC to maintain indoor temperatures, improving resilience, and mitigating urban heat for the larger community.

Quality of life

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[44] National Oceanic and Atmospheric Administration (NOAA), "Resilience 101: How Science Helps America Withstand Wild Weather". https://www.noaa.gov/resilience-101-science-helps-america-withstand-wild-weather.

[45] Marta Vicarelli, Karen Sudmeier-Rieux, Ali Alsadadi, Aryen Shrestha, Simon Schütze, Michael M. Kang, Madeline Leue, David Wasielewski, and Jaroslav Mysiak, "On the Cost-Effectiveness of Nature-Based Solutions for Reducing Disaster Risk," *Science of the Total Environment*, October 15, 2024, https://doi.org/10.1016/j.scitotenv.2024.142677.

[46] Olsson, Lennart, Humberto Barbosa, Suruchi Bhadwal, Annette Cowie, Kenel Delusca, Dulce Flores-Renteria, Kathleen Hermans, et al. 2019. "Land Degradation." In *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, by Aliyu Salisu Barau, edited by José Manuel Moreno and Carolina Vera, 345–405. https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Chapter_4.pdf.

These same strategies mitigate the rising temperatures that threaten worker safety and public health. Simply planting trees on city streets would give 77 million people a 1°C reprieve on hot days.[47] By prioritizing the equitable use of shaded, green, and accessible outdoor spaces, projects can become safe havens during rising temperatures and foster community connection and inclusion (*SSc2: Accessible Outdoor Space*). The human health and well-being benefits from access to urban green space are well-documented, underscoring this category's far-reaching impacts.[48]

Ecological conservation and restoration

As the credit category most directly tied to ecological health, all seven SS credits offer strategies to minimize impacts on land and wildlife, restore natural habitats that bolster resilience and biodiversity, and steward natural resources for prolonged and responsible use. Low-impact development (LID) practices and GI help prevent flooding, reduce erosion, and improve water quality, while soil restoration, native and adaptive plant use, and bird-friendly glass support healthy ecosystems (*SSc3: Rainwater Management, SSc1: Biodiverse Habitat*).

With global commitments to protect and restore at least 30% of the world's land and seas by 2030, LEED projects are well-positioned to contribute meaningfully to this initiative while planning for long-term resilience.[49]

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[47] "Beating the Heat: A Sustainable Cooling Handbook for Cities." n.d. UNEP - UN Environment Programme. https://www.unep.org/resources/report/beating-heat-sustainable-cooling-handbook-cities.

[48] White, Mathew P., Lewis R. Elliott, James Grellier, Theo Economou, Simon Bell, Gregory N. Bratman, Marta Cirach, et al. 2021. "Associations Between Green/Blue Spaces and Mental Health Across 18 Countries." *Scientific Reports* 11 (1). https://doi.org/10.1038/s41598-021-87675-0.

[49] Secretariat of the Convention on Biological Diversity. n.d. "Kunming-Montreal Global Biodiversity Framework." https://www.cbd.int/gbf.

Impact Area Alignment

— Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Prerequisite

MINIMIZED SITE DISTURBANCE

SSp1

REQUIRED

New Construction
Core and Shell

INTENT

To limit site disturbance from construction activities and preserve existing native vegetation, healthy soils, and wildlife habitats.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Erosion and Sedimentation Control Plan	
AND	
Site Assessment	

Minimize site disturbance by designing and constructing the project site to meet the following requirements:

Erosion and Sedimentation Control Plan

Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the *2022 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP); EU Taxonomy: DNSH, Pollution Prevention, Item 4 Noise and Dust;* or the local equivalent. Projects must apply the CGP regardless of size.

The erosion and sedimentation control plan must also include implementation of the following measures:

- Establishment of construction-exclusion zones demarcated by physical barriers and stormwater controls to protect any identified critical habitat for threatened or endangered species from discharges and discharge-related activities.
- Site inspections for all controls and management practices at least once every seven calendar days, or once every 14 calendar days and within 24 hours of the occurrence of a storm event that produces 0.25 inches (6 millimeters) or more of rain within a 24-hour

period. Dewatering inspections must occur once per day on which the discharge of dewatering occurs.

- Immediate corrective actions to repair or replace the controls when failing.

AND

Site Assessment

Collect information about the site in a preconstruction survey or assessment that informs design of the site to address the following items, as applicable to the project. The survey or assessment should demonstrate the relationships between the site features and topics listed below and how these features influenced the project design.

- **Special-status vegetation**. Conserve 100% of special-status vegetation located on-site as defined by local, state, or federal entities.
- **Healthy habitat**. Identify healthy plant communities and implement strategies to minimize damage to these areas during construction and ongoing project activities. Establish exclusion zones demarcated by physical barriers to minimize intrusion or disturbance of identified healthy plant communities during construction activities.
- **Invasive vegetation**. Indicate locations of existing invasive vegetation species on-site and address removal and control of invasive species before and during construction. Include only native and adapted vegetation that is not currently listed as invasive.

REQUIREMENTS EXPLAINED

This prerequisite requires projects to focus on protecting and preserving healthy and mature site elements and habitats while promoting environmental protection measures that minimize project construction disturbances. Project teams must preserve special status vegetation and healthy habitats, manage invasive vegetation, and implement an erosion and sedimentation control (ESC) plan to minimize soil, rainwater systems, and neighboring property disturbance.

Erosion and Sedimentation Control Plan

Construction activities can greatly impact the local environment and can speed up natural erosion and sedimentation processes by removing vegetation and leaving soil exposed.

Consequently, stormwater runoff from these sites carries high levels of sediment and associated contaminants. This not only affects water quality, but also negatively affects aquatic habitats and wildlife. Soil compaction deteriorates soil structure and fertility, precluding optimal root system development which leads to long-term degradation of the land.

Each project team must create and implement an ESC plan for all construction activities and then develop the plan based on the unique needs of the project site. The purpose of an ESC Plan is to prevent soil erosion and sediment runoff, protect natural resources, ensure regulatory compliance, and promote responsible construction through tailored, site-specific measures and ongoing management. All projects within the U.S., regardless of size, must apply the CGP. A local equivalent may be used if it is equally or more stringent than the CGP, if located in the U.S.*, or the EU Taxonomy: DNSH, Pollution Prevention, Item 4 Noise and Dust*, for international projects.

Key CGP requirements for ESC plans

The CGP requires ESC plans to include a detailed site description outlining potential erosion risks, implementation of both temporary and permanent control measures to manage runoff, and a construction sequence that aligns ESC practices with project phases. It mandates regular inspections, maintenance protocols, and corrective actions for failing measures, as well as proper documentation and recordkeeping. Training for construction personnel on ESC responsibilities is essential, alongside plans for stabilizing disturbed areas during and after construction. Projects outside the U.S. do not have to comply with the permitting aspects of the CGP. Each project site is unique, and not all ESC measures identified in the CGP may be applicable or necessary.

Site Assessment

A site assessment examines environmental characteristics that can influence the design of a sustainable site and building. It identifies special-status vegetation, healthy habitats, and invasive species. Conducting a site assessment is a key part of an integrative design process, guiding informed design choices when completed before or during the conceptual design phase.

Project teams must conduct a pre-construction survey or assessment to gather essential site information. To complete the assessment, project teams must collect data including a detailed inventory of plant species, habitat characterization, soil and hydrology analysis, and mapping of critical areas. A site plan incorporating all necessary details from the site inventory and the site assessment worksheet are both required.

Special status vegetation

Special status vegetation includes plants listed as endangered, threatened, or rare under local, state, or federal acts. These plants provide critical functions, such as maintaining soil stability, which is vital for preventing erosion and supporting environmental health.

Projects must conserve 100% of special status vegetation. This means that all vegetation classified as special-status due to its rarity, ecological importance, or legal protection must remain intact.

Healthy habitat

A healthy habitat supports a diverse community of plants, animals, and microorganisms while protecting soil health and structure, which are essential for thriving ecosystems. Well-preserved habitats minimize resource use by naturally controlling erosion, stabilizing soils, and reducing the need for replanting or extensive maintenance. Healthy ecosystems also mitigate climate change by acting as carbon sinks, absorbing billions of metric tons of CO2 annually.[50] They manage water flow, reduce runoff impact, and trap harmful substances before they cause damage. Vegetation slows rainwater, allowing it to infiltrate the soil and reduce runoff. Additionally, healthy soil with well-structured porosity filters out nutrients and pollutants before they reach rivers, lakes, or groundwater, and helps retain natural fertility, reducing the need for chemical fertilizers.

Project teams must establish an exclusion zone around healthy habitats to protect them from construction activities and other disturbances. It is also recommended to include special status vegetation within the exclusion zone. Teams must establish clear construction boundaries to minimize disturbances to ecosystems.

Invasive vegetation

Preserving vegetation biodiversity enhances a site’s ecological value. It is essential to plant adapted and native vegetation to support the health and functionality of ecological systems. Projects must remove invasive species, as these species can prevent ecological systems from recovering and thriving, and they compete with and harm native flora and fauna, crops, fisheries, and forests. Invasive species can be difficult to eliminate and can have severe consequences for natural areas once established. Effective control and management are essential to reduce the spread of established invasive species. The most effective method for managing an invasive species is to prevent its arrival.

Project teams must identify invasive species on a site and only include native and adapted vegetation and ensure that no planted vegetation is classified as an invasive species at the time of installation. It must be native or adapted to the project’s EPA Level III ecoregion, or local equivalent for projects outside of the U.S.[51] Teams must determine their presence by conducting a thorough site survey, paying attention to areas with special status vegetation and healthy habitats. If protected areas contain invasive species, teams must remove and control them

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[50] United Nations Development Programme, (2023, October 25), Forests can help us limit climate change – here is how, climatepromise.undp.org/news-and-stories/forests-can-help-us-limit-climate-change-here-how.

[51] *Level III and IV Ecoregions by state | US EPA,* (2024, January 2), US EPA, epa.gov/eco-research/level-iii-and-iv-ecoregions-state.

using strategies that minimize disruptive activities and ensure removal efforts do not harm sensitive ecosystems. It is highly encouraged to consult with the local regulatory agency on best management practices (BMPs) for removal and control.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	Compliance by permit	Confirmation of whether the project site is at least one acre and located in an area where the EPA is the NPDES permitting authority (or EU Taxonomy).
		Compliance by local equivalent	Confirmation that the local standard/code is equivalent to or more stringent than the *2022 U.S. EPA CGP* or *EU Taxonomy: DNSH, Pollution Prevention, Item 4 Noise and Dust*.
			Name of the local standard/code being applied (if applicable)
		All	The project's ESC plan.
			The project's site assessment identifying any special-status vegetation, healthy habitat, exclusion zones demarcated by physical barriers, and invasive vegetation, invasive vegetation removal/control plans.
			Evidence that the project includes only native and adapted vegetation that is not currently listed as invasive (e.g., landscape plan).
			Confirmation that 100% of Special-Status vegetation located on-site, as defined by local, state, or federal entities, is/will be conserved.

REFERENCED STANDARDS

- 2022 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) (epa.gov/npdes/2022-construction-general-permit-cgp)
- National Pollutant Discharge Elimination System (NPDES) (epa.gov/npdes)
- EU Taxonomy: DNSH, Pollution Prevention, Item 4 Noise and Dust (finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en)
- US National Invasive Species Information Center (NISIC) (invasivespeciesinfo.gov)
- US National Invasive Species Council (doi.gov/invasivespecies)
- USDA PLANTS Database (plants.usda.gov)
- The Xerces Society for Invertebrate Conservation (xerces.org)

Impact Area Alignment

— Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Credit

BIODIVERSE HABITAT

SSc1

New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To conserve existing natural areas, enhance biodiversity, restore damaged areas, and provide thriving habitats for local wildlife.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1. Preserve and Restore Habitat	1–2
Path 1. Greenfield Sites	1
OR	
Path 2. Previously Disturbed Sites	1–2
AND/OR	
Option 2. Bird-friendly Glass	1

Option 1. Preserve and Restore Habitat (1–2 points)

PATH 1. GREENFIELD SITES (1 POINT)

Preserve 40% of the greenfield area on the site by protecting these areas from all development and construction activity.

OR

PATH 2. PREVIOUSLY DISTURBED SITES (1–2 POINTS)

Meet the requirements of Path 1, Greenfield Sites, if such areas exist.

AND

Restore previously disturbed areas of the site (if such areas exist) and follow the soil restoration and vegetation restoration requirements below. Dedicated athletic fields that are solely for athletic use are exempted from counting toward the total site area. These areas may not count toward the protected greenfield or restored habitat areas.

Points are awarded according to Table 1.

Table 1. Points for percentage of area restored

Restored area	Zero lot line	Points
20% of previously disturbed area	10%	1
40% of previously disturbed area	20%	2

Soil restoration

Restore all on-site soils disturbed by previous development and soils disturbed by current construction activities that will serve as a final vegetated area. Any imported soils must be reused in a way comparable to their original function and may not include the following:

- Soils defined regionally by the Natural Resources Conservation Service web soil survey (or local equivalent for projects outside the U.S.) as prime farmland, unique farmland, or farmland of statewide or local importance.
- Soils from other greenfield sites.
- Sphagnum peat moss or organic amendments that contain sphagnum peat.

Engineered growing medium for vegetated roofs are exempt from the soil restoration requirements.

Vegetation restoration

Plant native and adapted vegetation that is not currently listed as invasive and includes the following:

- At least 10 species native or adapted to the project’s *EPA Level III* ecoregion (or local equivalent for projects outside of the U.S.).
- Minimum of two of the following categories: trees, shrubs, and ground cover. Zero lot line projects are exempt from this requirement.
- At least 110 square feet (10 square meters) consisting of native flowering plants appropriate for local pollinators. Plants must be in groupings of at least 10 square feet (one square meter). Designate the pollinator habitat area with signage.

AND/OR

Option 2. Bird-friendly Glass (1 point)

Glass used below specified heights on the exterior of the building and site must have a maximum threat factor of 30, as defined in the American Bird Conservancy’s Threat Factor Database.

This applies to all glass, including spandrel glass, when located:

- From grade up to 50 feet (15 meters) measured at all points.
- Up to 20 feet (six meters) measured from the finished grade of a green roof.
- At any distance from grade or roof for glass in guardrails and windshields.

REQUIREMENTS EXPLAINED

This credit requires the protection of healthy greenfield areas, restoring disturbed vegetation and soils with non-invasive native and adapted plants, and providing a designated zone for pollinator habitat. This credit also emphasizes integrating bird-friendly design to protect avian species by incorporating bird-friendly materials and design strategies.

Option 1. Preserve and Restore Habitat

PATH 1. GREENFIELD SITES

Greenfield areas are important for environmental conservation because they maintain biodiversity and protect the natural habitats for plants, animals, and insects. Greenfield areas have not been previously developed, graded, or disturbed and support open space, habitat, or natural hydrology. Preserving and protecting greenfield areas from development and construction activity within the project boundary is essential for maintaining a diverse ecosystem.

Forty percent of all greenfield areas on the site must be protected from all development and construction activity.

PATH 2. PREVIOUSLY DISTURBED SITES

Restoring previously disturbed sites is crucial to both the ecosystem and building occupants. Projects that re-establish natural conditions and bring back ecosystem life help rebuild degraded areas, protect soils, and enhance biodiversity and local ecosystems. Thoughtfully designed landscapes with greenery and trees also provide building occupants access to nature, which can positively affect mental health and productivity.

Choose areas that are best suited for restoration. Prioritize restoration strategies in areas with significant environmental damage, including areas with previous grading, compacted soils, equipment storage areas, and parking lots. Restoration strategies can include adding natural site elements, such as ponds, waterbodies, native or adapted vegetation, and other natural features, such as soil and rocks, supporting a site’s biodiversity. The project must restore at least 20% (for one point), or 40% (for two points), of previously disturbed areas to minimize environmental impacts and maintain biodiversity preservation for a significant portion of the site.

If the project site includes a greenfield area, the project must protect 40% of that greenfield area from all development and construction activity.

Athletic fields solely for athletic use are exempt from the protected greenfield or restored habitat areas. Athletic fields support human health and well-being by providing physical activity and social interaction.

Soil restoration

Recognizing the importance of healthy soil conditions and integrating restoration into a project is vital for maintaining overall ecological balance. Soil restoration focuses on areas that will undergo revegetation and require restoration of the characteristics necessary to support the selected vegetation. Designated areas for rainwater infiltration may be excluded from vegetation or soil restoration requirements.

Additionally, it is important to carefully select and use materials that do not come from or contain soils defined regionally as prime farmland, unique farmland, or farmland of statewide or local importance by the Natural Resources Conservation Service web soil survey (or local/regional equivalent).[52] Prime farmland soil must not be used because of its excellent fertility and suitability for food production. Using prime farmland soil for restoration can also lead to disruption of soil structure and loss of soil health as this soil has well-developed soil layers. Moving and relocating these soils can interrupt the natural structure and reduce its ability to support ecosystem functions.

Imported soils cannot be sourced from greenfield sites, and they must not contain sphagnum peat moss or organic amendments that contain sphagnum peat. Greenfield sites often have rich biodiversity. Removing soil from a greenfield site can disturb the local ecological system and lead to loss of plant and animal species. Using soil containing sphagnum peat moss is problematic for building construction. Peat soils are characterized by high water table, absence of oxygen, reducing condition, low bulk density and bearing capacity, soft spongy substratum, low fertility, and high acidity. Such soils are not strong enough to support heavy loads and can affect the stability and integrity of the foundations.

Vegetation restoration

Maintaining vegetation biodiversity enhances the ecological value of the site. Planting native and climate-adapted vegetation is crucial for sustaining the health and functionality of ecosystems. When planting species on-site, invasive species must be avoided to prevent threatening native biodiversity.

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[52] Nrcs, (n.d.), *Web Soil Survey – home*, websoilsurvey.nrcs.usda.gov/app/.

Planting diverse vegetation species helps to maintain and improve biodiversity and enhances the aesthetic value of natural spaces, bringing greater biophilic impacts. Visual preference studies have shown that people find it more pleasing when several different plant species are visible instead of a single planting, or monoculture.

Teams must include at least 10 species that are native or adapted to the project's *EPA Level III* ecoregion, or local equivalent for any project outside of the U.S. The team must identify species from at least two of the following categories: tree, shrubs, and ground cover. Native species are crucial in maintaining ecological balance, and including the required amount ensures that construction projects can contribute to ecological health and support of local wildlife.

Pollinators such as birds, butterflies, and bees play a significant role in the pollination of many crops, climate resilience, and creating spaces that provide support for declining pollinator populations. They are also essential for the reproduction of many wild plants. Dedicating an area within the project boundary for native flowering plants appropriate for local pollinators helps create a pollinator-friendly habitat to promote plant reproduction.

Projects must dedicate at least 110 square feet (10 square meters) of habitat, consisting of native flowering plants appropriate for local pollinators. Signage must include information and education about the habitat's purpose and the native species planted.

AND/OR

Option 2. Bird-friendly Glass

The project team must use elevation plans and section plans to assess all façade materials (glazing, opaque envelope, etc.) above grade or a green roof within the project boundary.

The American Bird Conservancy (ABC) has developed a system to evaluate and rate materials based on their potential threat to birds, known as the Material Threat Factor (TF). This system assigns scores to materials, providing a relative measure of how well they deter bird collisions. The scores help architects and designers select bird-friendly materials for buildings. The façade material distances analyzed must consist of the first 50 feet (15 meters) above grade, or up to 20 feet (6 meters) from the finished grade of a green roof. All glass, including spandrel glass, must have a maximum threat factor of 30 under the ABC Data Base if it is located within these distances.[53] These guidelines consider materials with a Threat Factor of 30 or below are considered to significantly reduce the risk of bird collisions, estimating at least a 50% reduction

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[53] American Bird Conservancy, (2011, October), Bird collision deterrence: Summary of material threat factors, abcbirds.org/wp-content/uploads/2015/05/Docs10397.pdf.

in occurrences. This is particularly important for areas like glazed corners and fly-through conditions, where birds are more likely to collide with glass due to reflections or transparency.[54]

Experts consider the material threat factor a prescriptive criteria for designing bird-friendly buildings. Therefore, no tradeoffs are allowed when assessing the façade materials.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Preserve and Restore Habitat	Path 1. Greenfield Sites	Greenfield area calculation.
			Contract document(s) highlighting the location and size of the greenfield area within the LEED project boundary and demonstrating how the site preserves and protects the greenfield area. Identify the location and size of any dedicated athletic fields exempted from the total site area.
		Path 2. Previously Disturbed Sites	Identification of zero lot line project, if applicable.
			Contract document(s) highlighting the location and size of the greenfield area within the LEED project boundary and demonstrates how the site preserves and protects the greenfield area. Identify the location and size of any dedicated athletic fields exempted from the total site area.
			Restored Previously Disturbed Area calculation.
			Evidence of the original function and content of any imported soils (e.g., the contract document or specification).
	Option 2. Bird-friendly Glass	All	Contract documents identifying all glass used below specified heights on the exterior of the building and site, the relevant grade points, and relevant elevation markers (e.g., exterior elevations, window specifications).
			List of exterior glass types used in the project, and their installed height from its relevant grade, identified by type according to the American Bird Conservancy's (ABC) Threat Factor Database.

REFERENCED STANDARDS

- Natural Resources Conservation Service web soil survey (websoilsurvey.nrcs.usda.gov/app/)
- EPA Level III ecoregion (epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states)
- American Bird Conservancy's Threat Factor Database (abcbirds.org/wp-content/uploads/2023/01/What-is-a-Material-Threat-Factor-1_23.pdf)

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[54] American Bird Conservancy. (2023, January), About the ABC rating system, abcbirds.org/What-is-a-Material-Threat-Factor-1_23.pdf.

Impact Area Alignment

— Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Credit

ACCESSIBLE OUTDOOR SPACE

SSc2

New Construction (1 point)
Core and Shell (1 point)

INTENT

To create outdoor open space that encourages interaction with the environment, social and physical activities, and passive recreation, and to incorporate elements that celebrate the community served.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Sufficient Outdoor Space Area	1
AND	
Urban Outdoor Space	
AND	
Community Outdoor Space	

Comply with the following requirements for 1 point:

Sufficient Outdoor Space Area

Provide barrier-free and physically accessible outdoor space for people with limited mobility — space that is greater than or equal to 30% of the total site area (including building footprint). At least 25% of the required outdoor space must be vegetated and planted with two or more types of vegetation or have an overhead vegetated canopy.

AND

Urban Outdoor Space

Include one or more of the following elements:

- **Biophilic space**. An area that meets the vegetation restoration requirements of *SSc1: Biodiverse Habitat* and includes elements of human interaction, such as observation platforms or paths.
- **Garden**. Space dedicated to community gardens or urban food production.
- **Recreational area**. Recreation-oriented paving or landscape area that encourages physical activity, such as courts, fields, track, play space, or swimming pools.

- **Social area**. Pedestrian-oriented paving or landscape area that accommodates outdoor social activities and includes seating for 5% of occupants.

AND

Community Outdoor Space

Include one or more of the following elements:

- **Community**. Publicly accessible during daylight hours and open to all members of the community.
- **Cultural**. Include at least two art installations or sculptures by local artists.
- **Acoustics**. Include elements that provide positive soundscapes if located within 0.24 miles (400 meters) of a significant noise source, such as, but not limited to, a roadway, airport, or rail line.

REQUIREMENTS EXPLAINED

This credit awards projects that include vegetated and paved areas and other green spaces that encourage social interactions and recreational activities. Teams must include targeted elements for accessibility and emphasize deliberate attention to enhancing outdoor spaces for community engagement.

Sufficient Outdoor Space Area

Outdoor spaces provide building users with opportunities to connect to the outdoors. These spaces play an essential role in enhancing the health and well-being of building users, providing many positive environmental benefits, such as improving air quality, supporting biodiversity, managing stormwater, reducing urban heat island effects, and fostering social interaction.

All projects must provide outdoor spaces that are barrier-free and physically accessible, covering at least 30% of the total site area, including the building footprint. At least 25% of this outdoor space must feature two or more types of vegetation or include an overhead vegetated canopy, such as a continuous layer of trees or shrubs that create shaded areas. To maintain the ecological function of sensitive areas, such as waterbodies or vegetation zones, full accessibility is not required; however, features like boardwalks designed to meet accessibility standards can provide inclusive access.

The outdoor space design must incorporate features that make it accessible to people with disabilities and service animals. This may include providing wheelchair ramps, tactile surfaces, wide pathways, and signage to ensure that everyone, regardless of physical ability, can navigate and use the space comfortably.

Urban Outdoor Spaces

Urban outdoor spaces are pedestrian-oriented paving or landscape areas that facilitate social activities. They also offer users recreational areas where designs incorporate walking paths, playgrounds, and fitness equipment. Additionally, outdoor spaces with vegetation are crucial for the environment. Vegetated outdoor areas help reduce the urban heat island effect, improve air and water quality, and support biodiversity by providing habitats for various species.
Teams pursuing this credit should include multiple, diverse outdoor spaces, which allow for the inclusion of people of all ages and activity levels. At a minimum, the outdoor space must include at least one of the following: biophilic space, garden, recreational area, or social area.

Biophilic space

Biophilic space integrates natural elements into building designs and can connect individuals with nature to enhance health, well-being, and productivity. Restoring vegetation in biophilic spaces by planting diverse species helps to sustain and enhance biodiversity while boosting the aesthetic appeal of natural areas, resulting in stronger biophilic effects.

Areas that meet the vegetation restoration requirements of *SSc1: Biodiverse Habitat* and include elements of human interaction meet the biophilic space criteria of this credit. These spaces must integrate features that invite engagement, such as seating, walking paths, shaded areas, and educational signage about the local ecological system.

Garden

Community gardens and urban food production spaces offer residents an opportunity to connect with nature and practice environmental stewardship. These areas enable building occupants and neighbors to grow fruits and vegetables while fostering interaction with the environment and building connections within the community.

Project teams that incorporate extensive or intensive vegetated roofs in the design may use these areas to comply with the garden element, if they are physically accessible and include areas dedicated to food production. Maintenance is necessary for the vegetated roof system to keep plants healthy and the supporting structure in good condition.

Recreational area

The design of recreation-focused paved and landscaped areas such as sports courts, fields, tracks, playgrounds, and swimming pools encourage active engagement with the environment. These spaces promote physical activity, social interaction, and active and passive recreation opportunities. Recreational spaces support health and fitness and celebrates and strengthen community connections.

Project may count turf areas in the total outdoor space calculation if these areas contain physical site elements that support and accommodate outdoor social activities. However, turf is not required to qualify as this space type. Turf areas cannot apply toward meeting the credit's 25% vegetated area requirement under the *Sufficient Outdoor Space Area* requirement. Projects may also include ponds or wetlands that occur naturally or are designed to function similarly to natural site hydrology and land cover as outdoor spaces if the average side slope gradients are 1:4 or less and are vegetated.

Social area

Pedestrian-oriented paving or landscape areas qualify as social spaces when intentionally designed to include seating and foster outdoor activities, social interaction, and engagement with nature. They must be accessible to users of all abilities, flexible for diverse activities, and conveniently located near building entrances or amenities.

The space must include sufficient seating to accommodate at least 5% of the daily average occupants, including visitors, to ensure adequate resting space.

Community Outdoor Space

Projects must incorporate one or more elements that enhance community outdoor spaces, focusing on aspects such as social gathering, cultural expression, and acoustic quality. These elements might include designated community gathering areas and components that improve the auditory environment, such as natural sound buffers. By integrating these features, projects foster a sense of community, reflect cultural values, and create welcoming, enjoyable outdoor spaces for all users.

Community

Projects that pursue these criteria must include outdoor spaces accessible that the public can access during daylight hours, ensuring all community members can enjoy and use the space. However, facilities that are not open to the public for security reasons (e.g., data centers) are exempt from this requirement. This exemption also applies to international projects with gated apartment complexes, office parks, military bases, manufacturing complexes, research and development campuses, private hotels, resorts, and similar facilities. This approach is designed to promote inclusivity, allowing people of all ages and backgrounds to gather and engage in recreational and social activities in a welcoming environment.

Cultural

These outdoor spaces should be designed to represent the community's cultural and social diversity. Project teams can achieve this by incorporating art and sculptures that celebrate and recognize the area’s unique cultural identity and demographics. Projects must include at least two art installations, such as paintings on walls, interactive light installations, kinetic art that moves with wind, or sculptures created by local artists. These additions help to foster a sense of community pride, create meaningful connections to the place, and enhance the overall experience for all users.

Acoustics

Projects located within 0.25 miles (400 meters) of a significant noise source must incorporate design elements that enhance the soundscape and address unwanted or disruptive sounds that negatively impact building occupants’ comfort, health, or productivity. A significant noise source is any noise-generating entity or activity that consistently produces sound levels above recognized comfort or safety thresholds according to local regulations. These soundscape enhancements may include sound barriers, strategically positioned vegetation, and water features such as fountains, all designed to mitigate noise pollution. Their effectiveness can be evaluated through metrics such as interior noise levels, Noise Reduction Coefficients (NRC), and Sound Transmission Class (STC) ratings. By dampening external noise, these features contribute to a more pleasant and acoustically balanced environment, which enhances comfort and well-being for building users.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Landscaping plan(s) that include the vegetation key/schedule and the LEED project boundary and highlights the locations and sizes of the barrier-free and physically accessible outdoor space, the vegetated outdoor space, the urban outdoor space, and the community outdoor space. Identify/tag each urban outdoor area as biophilic, garden, recreational, or social area; show and note the project-specific elements that qualify the space (e.g., observational platform, seating, etc.). Identify/tag each community outdoor space as community, cultural, or acoustics; show and note the project-specific elements that qualify the space (e.g., sculpture by X), and the source and general direction of any roadway, airport, or rail line.
			Outdoor space calculation.
			Vegetated outdoor space calculation.
			Social area seating calculation.
			Evidence that any outdoor community space is publicly accessible during operating hours and open to all members of the community (e.g., shop drawings showing location and details for publicly posted signage, website content).

Project types	Options	Paths	Documentation
			Evidence of any art installations or sculptures by local artists for the project site (e.g., contract documents and/or purchase orders).
			Evidence of any positive soundscapes provided for the project (e.g., contract documents and/or purchase orders, product information from manufacturer).

REFERENCED STANDARDS

- None

Impact Area Alignment

— Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Credit

RAINWATER MANAGEMENT

SSc3

New Construction (1–3 points)
Core and Shell (1–3 points)

INTENT

To reduce runoff volume and improve water quality by replicating the natural hydrology and water balance of the site, based on historical conditions and undeveloped ecosystems in the region, to avoid contributing to flooding downstream in frontline communities.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–3
Option 1. Percentile of Rainfall Events	1–3
OR	
Option 2. Natural Land Cover Conditions	3

Option 1. Percentile of Rainfall Events (1–3 points)

In a manner best replicating natural site hydrology processes, retain the runoff from the associated percentile of regional or local rainfall events on-site. The percentile event volume must be retained (e.g., infiltrated, evapotranspired, or collected and reused) using low-impact development (LID) and green infrastructure (GI) practices. GI and LID strategies can be either structural or non-structural.

For projects that collect and reuse a portion of the chosen percentile event volume to meet the needs of one or more end uses for the building and grounds, 1 additional point can be earned. Eligible end uses include irrigation; flush fixtures; makeup water systems, such as cooling towers or boilers; or other process water demands. Collecting and reusing rainwater within the project can also contribute to points earned in the Water Efficiency credit category. Points are awarded according to Table 1.

Table 1. Points for percentile of regional or local rainfall events retained

All projects	Zero lot line projects	Points	Total points for water reuse
80th percentile	70th percentile	1	2
85th percentile	75th percentile	2	3
90th percentile	80th percentile	3	–

OR

Option 2. Natural Land Cover Conditions (3 points)

Calculate the difference between the projected runoff volume under the proposed design conditions and the runoff volume under natural land cover conditions that existed prior to any disturbance. Retain (e.g., infiltrate, evapotranspire, or collect and reuse) on-site the increase in runoff volume using LID and GI practices.

For zero lot line projects only
Project teams may combine on-site and off-site strategies to retain runoff from the associated percentile regional or local rainfall event for points, according to Table 1. Engage with local or regional authorities to coordinate off-site rainwater management strategies that meet the credit's intent, such as participating in community-wide rainwater management programs.

REQUIREMENTS EXPLAINED

This credit rewards projects that manage water runoff from the site, using methods that most closely replicate a natural site hydrology process. The system awards points based on increasing thresholds for the percentage of runoff managed on-site, with additional points given if someone collects and reuses rainwater. Projects may also earn points for retaining any excess runoff anticipated due to the new development conditions.

Option 1. Percentile of Rainfall Events

Data from the percentile rainfall event allows design professionals to study changes in precipitation patterns over time, helping owners and designers understand the impacts of climate change. Using this information, projects can successfully implement strategies to mitigate these impacts.

This option requires that teams gather historical rainfall data for the project area. This data must include the amounts of daily rainfall over a minimum 30-year period. With the data collected, project teams must calculate the rainfall amount (depth) corresponding to the desired percentile of rainfall event and the runoff volume. Using the results of the runoff calculations, the project must implement appropriate stormwater management practices with LID and/or GI measures to maintain the runoff on site.

For projects encompassing larger watershed boundaries, it is crucial to ensure that stormwater management requirements comply with the chosen percentile event across the entire watershed. All development within the boundary must meet the same stormwater performance standards, ensuring consistent and effective management of runoff. This approach extends beyond the immediate building site boundary and encompasses the entire watershed area associated with the project.

Managing runoff

Projects using this option must retain or manage runoff per the regional/local rainfall percentiles. Percentile calculations help determine how rare or common a particular rainfall event is by comparing it to historical data. By analyzing rainfall percentiles, projects can implement appropriate strategies for water storage, distribution, and retainment.

Table 2 provides a sample list of options that meet the requirements for LID and GI measures.[55]

Table 2. LID/GI measures

LID/GI measure	Description and additional details
Rain gardens and Bioretention gardens	These are decorative gardens which have plants and soil that filter runoff water and encourage infiltration. This practice is ideal for collecting runoff from rooftops, sidewalks, roads, and small parking lots.
Green roofs	Green roofs include plants and soil media that capture and filter water that would have previously been considered runoff.
Rainwater harvesting	Ideal for collecting rooftop runoff, a rainwater cistern captures and stores (e.g., harvests) runoff for later use. Common uses of collected rainwater are for irrigation or for indoor plumbing fixture flushing. Project teams that use any rainwater harvesting strategies with the intent of reuse will earn additional points.
Vegetated swales	The shallow, open channels are ideal for collecting sheet flow runoff from roads, highways, and from subdivisions.
Permeable pavement	Permeable pavement allows stormwater to pass through and into gravel layers, allowing stormwater to soak into the soil. This practice is ideal for developed areas, such as parking lots and driveways.
Exfiltration trenches	Surface runoff collected through drainage inlets and directed into the trench via subsurface perforated pipes. The runoff infiltrates into the ground through the trench's gravel bed, which filters the pollutants.

Rainfall event calculations

The percentile of rainfall events measures the precipitation depth accumulated over 24 hours, typically defined as 12:00:00 a.m. to 11:59:59 p.m., and it relies on the range of all daily event occurrences during the period of record.

Projects in the U.S. may use percentile rainfall events as determined by the National Climatic Data Center. International projects can use the Global Precipitation Climatology Project (GPCP) Daily Precipitation Analysis, provided by the National Centers for Environmental Information (NCEI).[56]

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[55] Martin-Mikle, C. J., de Beurs, K. M., Julian, J. P., & Mayer, P. M. (2015), Identifying Priority Sites for Low Impact Development (LID) in a Mixed-use Watershed, sciencedirect.com/science/article/pii/S016920461500078X.

[56] National Centers for Environmental Information, (n.d.), Climate Data Records: Global Precipitation Climatology Project (GPCP) – Daily.

Using the data from these resources for the project's location, the selected timeline, and other relevant information on the rainfall event from the selected resource, teams must calculate the percentile of the rainfall event by using the USGBC-approved calculator or provide an additional calculator including the necessary information for credit compliance.[57]

Runoff calculations

Teams must calculate the runoff volume using the modified rational method, *the Technical Release 55 (TR-55), Natural Resources Conservation Service* method, the *U.S. EPA Rainwater Management Model* (SWMM), or other runoff methodologies most appropriate for the project.[58,59,60,61] Equation 1 shows an example of a simplified version of the runoff calculation. The runoff calculations must include the watershed boundary, such as buildings, parking lots, landscaping, pervious surfaces, and all other impervious surfaces. This approach ensures a comprehensive method to managing stormwater.

Equation 1. Runoff volume calculation

$$Runoff\ \mathrm{vol}ume\ = Rainfall\ \mathrm{d}epth\ \times Area\ \times Runoff\ Coefficient$$

where:

Rainfall depth = Measure the rainfall in inches (or meters) as determined by the percentile rainfall calculator.

Area = Measure the area of both impervious and pervious surfaces within the watershed boundary in square feet (or square meters).

Runoff coefficient = This is an aggregated factor that represents the percentage of rainfall that becomes runoff. For impervious surfaces like concrete or asphalt, this is typically close to 1 (e.g., 0.95).

Rainwater harvesting

Rainwater harvesting contributes to rainwater management. Rainwater harvesting is a sustainable practice that captures and stores rainwater to allow for water reuse within the project site. Projects that collect and reuse rainwater from the chosen percentile event volume for one of the eligible end-uses can earn one additional point.

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[57] "LEED v4.1 Rainfall Events Calculator", U.S. Green Building Council, updated April 10, 2020, https://www.usgbc.org/resources/leed-v41-rainfall-events-calculator.

[58] "Modified Rational Method", Bentley SewerCAD SS5, Bentley Systems, (n.d.), https://docs.bentley.com/LiveContent/web/Bentley%20SewerCAD%20SS5-v1/en/GUID-85A442CDB33D4B1684EE9E795BA6BABE.html.

[59] "WinTR-55 Small Watershed Hydrology", United States Department of Agriculture, Agricultural Research Service, (n.d.), https://www.ars.usda.gov/research/software/download/?softwareid=8&modecode=80-42-05-10.

[60] "Conservation Planning", Natural Resources Conservation Service, United States Department of Agriculture, (n.d.), https://www.nrcs.usda.gov/getting-assistance/conservation-technical-assistance/conservation-planning.

[61] "Storm Water Management Model (SWMM)", United States Environmental Protection Agency, (n.d.), https://www.epa.gov/water-research/storm-water-management-model-swmm.

Eligible end-uses

- **Irrigation**. Use rainwater to water gardens, lawns, and agricultural fields, reducing the demand on municipal water supplies.
- **Flush fixtures**. Conserve potable water for drinking and cooking when used in toilets and urinals.
- **Makeup water systems**. Use rainwater can serve as makeup water for cooling towers and boilers, which require large volumes of water for operation.
- **Process water demand**. Industries can use harvested rainwater for processes that do not require potable water, such as washing, cooling, and other operational needs.

> **Additional considerations**
> Project teams considering rainwater reuse may also earn points under the WE Credit Category. Consider using rainwater for toilet flushing or irrigation to earn additional points for *WEc2: Enhanced Water Efficiency* to pursue these additional points.

Option 2. Natural Land Cover Conditions

Option 2 requires that the proposed design retain the increase in runoff compared to the natural land hydrology of the project site. Under this option, projects must maintain runoff on-site and design the site to mimic natural hydrology. This strategy provides absorption and filtration, supporting diverse ecosystems by maintaining a balance of water levels in wetlands, rivers, and lakes. Natural land covers, such as forests and grasslands, often allow more water to infiltrate the ground, recharging groundwater supplies and reducing the volume and speed of runoff.

Natural land hydrology

Natural land hydrology reflects the natural land cover function of water occurrence, distribution, movement, and balance. Teams must determine how quickly water can seep into the existing conditions or soil, which influences groundwater recharge and surface runoff. Site features like topography, soil, and surface water bodies, along with pre-design connections to nearby ecosystems, help maintain natural land hydrology.

Rainfall event

Document historical rainfall data for the project boundary; however, unlike Option 1, specific percentile events are not required for this option. Project teams must use a full range of hydrologic rainfall events over a 10-year period or develop an average representative rainfall year, then use the following process to determine the average runoff volume under natural land cover conditions:

- **Average rainfall calculation**. Calculate the average annual rainfall based on historical data. This can be done using methods like arithmetic means.
- **Monthly distribution**. Distribute the average annual rainfall across months to create a representative year. This helps in understanding seasonal variations and planning for water management.
- **Runoff estimation**. Use the average monthly rainfall data to estimate runoff for each month. This approach provides a simplified view of runoff patterns over a typical year.

By considering both the full range of hydrologic events and an average representative year, teams can develop a comprehensive understanding of stormwater runoff patterns and design an effective management system.

Runoff calculations

Determine runoff volume using the rainfall event as calculated using Equation 1. Natural land hydrology, for this option, is the natural land cover present prior to any development on the site. Project teams must use the project's natural land hydrology and land use to determine the runoff coefficient. For natural conditions, the runoff coefficient will be lower due to higher infiltration and vegetation cover.

Natural land cover refers to the original vegetation and soil conditions that existed in an area before any development or human activities altered the landscape.

By preserving or restoring natural land cover, projects can help to maintain ecological balance, support biodiversity, and enhance the sustainability of our environment.

Using the proposed design, calculate the design runoff, using the runoff coefficients for the design conditions as indicated in Option 1, Equation 1.

Retention requirements

Projects must retain any increase in runoff within the project site. The retention design strategies in Table 2, LID/GI Measures, must mimic natural land hydrology.

Zero Lot Line Projects

For zero lot line projects, coordinate with regional authorities regarding off-site rainwater management strategies, which may be combined with on-site strategies to retain runoff for the required percentile. Off-site strategies must meet the credit intent of the LID/GI practices.

Given the limited space, it's crucial to maximize the infiltration of stormwater on-site. This can be achieved through permeable pavements, green roofs, and rain gardens. Use underground infiltration systems to store and gradually release stormwater. These features help to reduce runoff and promote natural groundwater recharge prior to consideration of offsite strategies.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Identification of zero lot line project.
			LEED v5 Rainwater Management calculator.
	Option 1. Percentile of Rainfall Event	All	Percentile of rainfall events retained.
			Identify any end-uses that the project meets through collection and reuse of rainwater.
			The documents depict and explain the site's design conditions, including the overland flow paths of rainwater, the topography, and the soil conditions. They will also outline how the rainwater will be managed through infiltration, evapotranspiration, capture, reuse, and overflow outlets (e.g., topography plans, landscape plans, plant lists, construction details, cross sections, specifications, product information from manufacturers, and narratives).
	Option 2. Natural Land Cover Conditions	All	The difference between the projected runoff volume under the proposed design conditions and the runoff volume under natural land cover conditions that existed prior to any disturbance.
			Evidence of the site's natural land cover conditions that existed prior to any disturbance (e.g., historical maps, environmental impact assessments).
			The documents depict and explain the site's design conditions, including the overland flow paths of rainwater, the topography, and the soil conditions. The team will also outline how the increase in runoff will be managed by infiltration, evapotranspiration, capture and reuse (e.g., topography plans, landscape plans, plant lists, construction details, cross sections, specifications, product information from manufacturers, and narratives).

REFERENCED STANDARDS

- Technical Release 55 (T-55) Urban Hydrology for Small Watersheds (ars.usda.gov/research/software/download/?softwareid=8&modecode=80-42-05-10)
- Natural Resources Conservation Service (NRCS) (nrcs.usda.gov)
- U.S. EPA Rainwater Management Model (SWMM) (epa.gov/water-research/storm-water-management-model-swmm)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Credit

ENHANCED RESILIENT SITE DESIGN

SSc4
New Construction (2 points)
Core and Shell (2 points)

INTENT

Reduce the risk of catastrophic impacts from natural and climate events on-site and in adjacent landscapes by designing, building, and maintaining sites to be more resilient to observed, projected, and future climate and natural hazards.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	2
Integrate Requirements for Two High-priority Hazards	2

Design and construct the site and site structures to meet the following best practices for at least two of the highest-priority hazards identified for compliance with *IPp1: Climate Resilience Assessment*.

Drought

Comply with *WEc2: Enhanced Water Efficiency* requirements. Specify native and/or drought-tolerant adapted/appropriate plantings. Water makeup for any created water features must comply with SITES C3.4 or local equivalent.

> **Core and Shell only**
> Water makeup for any created water features must not exceed 5,000 gallons (18,927 liters) of potable water per year, or 75% of annual water makeup must come from alternative water sources.

AND/OR

Extreme heat

Integrate two or more additional elements from the following list:

- Provide shaded external spaces adjacent to buildings for use during extreme heat events.
- Provide evaporative cooling solutions (e.g., fountains, misters, water features, etc.).
- Orient buildings and massing to self-shade in summer and extreme heat conditions.

- Provide outdoor cooling stations with emergency backup power.
- Demonstrate proximity to an emergency cooling station within 0.25 miles (400 meters).
- Use paving materials with an initial solar reflectance (SR) value of at least 0.33.
- Use an open-grid pavement system (at least 50% unbound).

AND/OR

Flooding
Integrate two or more of the following strategies, in accordance with *ASCE 24* and *FEMA 543* standards or local equivalent:

- Critical utilities
    - Locate critical utilities in new construction above the design flood elevation (DFE), plus freeboard as recommended.
    - In retrofits, locate critical utilities inside protective, floodproofed enclosures to prevent water intrusion.
    - Design new potable water systems to resist flood damage, infiltration of floodwaters, and discharge of effluent.
    - Elevate on-site wellheads above surrounding landscape to allow contaminated surface water to drain away.
    - Design new sewage systems to avoid infiltration and backup from rising floodwaters.
    - Design and anchor plumbing conduits, water supply lines, gas lines, and electric cables that must extend below DFE to resist the effects of flooding.
    - Design and anchor rainwater storage tanks to resist flood forces.
- Ensure that all structural materials, finish materials, and connectors used below DFE are flood resistant.
- Certify the project under a qualifying flood-resilient design standard(s)

AND/OR

Hail
Design and construct the site and site structures according to *FORTIFIED Commercial High Wind and Hail Specific Design Requirements for Hail*, or local equivalent.

AND/OR

Hurricanes and high winds
For projects in hurricane-prone areas, design and construct the site and site structures according to *FORTIFIED Commercial Wind* standards, or local equivalent. For projects in high-wind areas, design and construct the site and site structures to comply with wind design

measures per *ASCE/SEI 7-10* in specified Federal Emergency Management Agency (FEMA) zones or local equivalent.

- Install backup power systems in hurricane-prone regions.
- Install electrical connections with a transfer switch or docking station (storm switch) to support connection of backup power for critical mechanical and electrical systems.
- Create windbreaks using landscape forms, vegetation, and other locally appropriate natural systems.

AND/OR

Sea level rise
Design and construct the site to accommodate flooding based on sea level rise and storm surge projections for the design service life of the project. In addition, meet two or more of the following:

- Incorporate elevated foundations to minimize projected flood damage to buildings.
- Use materials resistant to projected water damage for construction.
- Apply sealants and coatings to prevent projected water infiltration into structures.
- Install flood barriers to block projected floodwaters from entering buildings.
- Design green infrastructure solutions to manage projected storm surge and stormwater runoff effectively.
- Ensure backup power systems are in place to maintain critical functions during projected flooding events.
- Develop integrated drainage systems to manage projected excess flooding efficiently.
- Engage in community-level planning, partnerships, and/or design workshops to coordinate flood mitigation efforts to effectively and equitably address the needs of populations vulnerable to projected flooding.
- Retrofit existing structures to enhance their resilience to future flood risks.

AND/OR

Tsunamis
Mitigate the impact of tsunamis through site-planning strategies as described in *Designing for Tsunamis* (U.S. National Tsunami Hazard Mitigation Program), or local equivalent. Additionally, incorporate the following elements from the *TsunamiReady® Guidelines*[62], or local equivalent:

- Install tsunami danger area and evacuation route signage.

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[62] "TsunamiReady® Guidelines", National Weather Service, (2015), https://www.weather.gov/media/tsunamiready/resources/2015TRguidelines.pdf.

- Install public-alert-notified NOAA Weather Radio receivers in critical facilities and public venues, or local equivalent.

AND/OR

Wildfires
Follow wildfire management practices pertaining to wildland–urban interface design, vegetation management, debris disposal, and fire safety for equipment referenced in the National Wildfire Coordinating Group Standards for Mitigation 2023, or local equivalent. Design and construct the site and site structures in compliance with the *SITES v2 rating system credit 4.11: Reduce the risk of catastrophic wildfire*, or local equivalent. Reduce fuel using the zone concept (firewise.org, “Safer from the Start,” Appendix E), or local equivalent.

AND/OR

Winter storms
Meet two or more of the following:

- Provide adequate ingress/egress for vehicles and snow removal equipment.
- Provide a snow-removal plan, including compatible road materials, areas for accumulated snow, and roof snow removal.
- Ensure safe walking surfaces to exterior parking areas by considering installing heated sidewalks with renewable energy sources.
- Specify native or adapted planting with a capacity for heavy snow loads.

REQUIREMENTS EXPLAINED

This credit requires the design and construction of sustainable and resilient site and site structures based on best practices for at least two of the highest priority hazards identified in the *IPp1: Climate Resilience Assessment*. Addressing additional hazards is highly recommended to create added resilience within the project.

Drought

Climate projections indicate a higher likelihood of more intense droughts in the future. As a slow-onset hazard, droughts can last for months or even years, leading to significant consequences such as increased erosion, water scarcity, and a heightened risk of wildfires.[63] Implementing sustainable practices ensures projects significantly reduce their dependency on freshwater resources, safeguard against water shortages, and contribute to the broader goals of water conservation and climate resilience.

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[63] *Chapter 4: Water*, (n.d.), IPCC, ipcc.ch/report/ar6/wg2/chapter/chapter-4/.

Reduced water use for irrigation

To mitigate the impacts of drought, projects must comply with *WEc2: Enhanced Water Efficiency* requirements to reduce outdoor water use.

Drought-tolerant plant species

Projects must incorporate native and/or drought-tolerant plant species that adapt to the site's conditions and local climate to reduce water demand. Native or drought-tolerant plants help conserve water and reduce soil erosion. They require less water, fertilizer, and maintenance, making them a key component of water-efficient design.

Makeup water strategies for water features

Projects must minimize or eliminate potable water, natural surface water, and groundwater withdrawals that are used in water features to reduce short and long-term water use. Designs must also comply with water feature makeup water requirements, as outlined in *SITES Credit 3.4 Reduce outdoor water use*.[64] This means ensuring that the design of water features, including fountains or ponds, minimizes water loss through evaporation or leaks, and efficiently replenishes water, ideally using non-potable sources such as greywater or harvested rainwater.

LEED BD+C: Core and Shell projects must limit makeup water for any newly created water features to 5,000 gallons (18,927 liters) of potable water annually, or at least 75% of the annual makeup water must come from alternative water sources.

Extreme Heat

Improving thermal comfort and reducing extreme heat-related risks in a project is essential for safeguarding public health, enhancing occupant well-being, and ensuring the long-term resilience and sustainability of built environments in the face of rising temperatures. Nature-based solutions are key to achieving these goals, as they leverage natural processes to create cooler, more comfortable spaces while also promoting biodiversity.

Shaded outdoor spaces

Shaded outdoor spaces that use shade from appropriate trees, large shrubs, vegetated trellises, walls, or other exterior structures help cool the surrounding environment and offer protection from direct sunlight. Shaded areas adjacent to buildings can significantly reduce evaporation rates in soil and promote habitats for various species, thereby supporting biodiversity and maintaining the balance of local ecosystems. Providing cooler environments helps decrease the

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[64] Sustainable Sites Initiative, https://www.sustainablesites.org/

incidences of heat exhaustion and dehydration, particularly among vulnerable populations such as children, the elderly, and those with pre-existing health conditions.

Evaporative and outdoor cooling solutions

Projects may also incorporate evaporative and outdoor cooling solutions, such as fountains, misters, and water features. These can significantly enhance outdoor thermal comfort by reducing ambient temperatures through the evaporation of water, creating a more pleasant microclimate in outdoor spaces.

Providing outdoor cooling stations equipped with emergency backup power is essential for offering rest and relief during high-temperature events. These stations can include shaded seating and misting systems to create comfortable environments. The backup power ensures that cooling stations remain operational during outages, enhancing community resilience and safety by preventing heat-related illnesses.

Locate emergency cooling stations within 0.25 miles (400 meters) of the building for easy access.

Passive cooling strategies

Orienting buildings for passive cooling is a key strategy for enhancing energy efficiency and occupant comfort in sustainable design. Positioning site structures to take advantage of natural airflow and local wind patterns significantly reduces the need for mechanical cooling systems in buildings. The thoughtful placement of windows, doors, and shading devices plays a crucial role in minimizing heat gain from direct sunlight, thereby keeping interior spaces cooler during extreme heat events.

Reducing heat island effects

Using paving materials with high SR can reduce the absorption of heat from the sun and reduce urban heat island effects for site paving and structures (including roads, sidewalks, playgrounds, shelters, and parking lots). Paving materials must have an initial SR value of at least 0.33, as measured in accordance with *ANSI/CRRC S100*[65]. Using vegetated surfaces and planted areas, such as an open-grid pavement system, are important strategies to reduce the use of impervious surfaces that can also contribute to heat island effects.

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[65] "ANSI/CRRC S100", Cool Roof Rating Council (CRRC), accessed https://coolroofs.org/resources/ansi-crrc-s100

Flooding

Flooding can lead to significant property damage, infrastructure disruption, and public health risks, resulting in loss of life and economic hardship for affected communities. Additionally, it causes ecosystem damage, soil erosion, and long-term recovery challenges, underscoring the importance of effective flood management strategies to enhance resilience.

To mitigate the impacts of flooding, projects under flood-resilient design must implement at least two of the indicated flood mitigation strategies, in accordance with *FEMA 543*[66] and *ASCE 24*[67], or their local equivalents. These standards provide minimum requirements and offer critical guidelines that enhance the safety and structural integrity of vulnerable sites and buildings located in flood-hazard areas. Projects can choose from any of the strategies listed under Critical Utilities, as well as flood resistant materials or certifying under a qualifying design standard.

Critical utilities

It is essential to elevate critical utilities above the design or base flood Elevation (DFE/BFE) as well as include additional freeboard to prevent water intrusion. This elevation protects essential services such as water supply systems, sewage treatment facilities, communication systems, and electrical infrastructure from submergence, which could lead to costly repairs and service disruptions. Adding freeboard serves as a buffer and an additional safety measure, further enhancing the resilience of critical infrastructure. Positioning utilities above the DFE/BFE significantly reduces the risk of damage from floodwater, ensuring that communities have continued access to critical services during and after a disaster. This reliability is vital for public health and safety, as well as for emergency response operations.

Design new potable water and sewage systems to withstand flood conditions, ensuring uncontaminated drinking water and preventing sewage overflow during flood events. Elevating on-site wellheads above the surrounding landscape is essential to allow contaminated surface water to drain away effectively.

Plumbing conduits, water supply lines, gas lines, and electric cables extending below the DFE must be carefully designed and anchored to withstand flooding. In addition, rainwater storage tanks must be designed and secured to resist flood forces, ensuring they remain functional and protected during flood events. These measures help minimize damage to critical utilities and enhance flood resilience.

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[66] "Design Guide for Improving Critical Facility Safety from Flooding and High Winds", FEMA 543, (2007), Federal Emergency Management Agency (FEMA), accessed April 4, 2025, https://www.fema.gov/sites/default/files/2020-08/fema543_design_guide_complete.pdf.

[67] "Highlights of ASCE 24-14: Flood Resistant Design and Construction", Federal Emergency Management Agency (FEMA), accessed April 4, 2025, https://www.fema.gov/sites/default/files/2020-07/asce24-14_highlights_jan2015.pdf.

Flood-resistant materials

Additionally, projects using this strategy must ensure that all structural materials, finish materials, and connectors used below DFE are flood resistant. Using flood-resistant structural materials that can withstand water pressure, corrosion, and potential debris impacts during floods, such as reinforced concrete or high-density polyethylene, helps to further enhance a building's resilience to flooding.

Hail

Hail strikes can cause significant damage to site infrastructure, outdoor storage, and building components such as roofs, siding, equipment, and windows, which can lead to costly repairs. Hail can also impact landscaping, particularly trees, by shredding leaves, breaking branches, and damaging bark, which leaves trees vulnerable to disease, pests, and slower growth. Teams must design and construct the site and site structures according to *FORTIFIED Commercial High Wind and Hail Specific Design Requirements*[68] for hail, or local equivalent. For instance, teams may choose hail guards for air conditioning units and impact-resistant materials for the roofs. Since hail typically occurs during thunderstorms, compromised roofing can allow water infiltration. Ensuring watertightness and hail resistance reduces the risks of hail damage and protects both the structure and occupants.

Hurricanes and High Winds

Hurricanes and high winds can cause severe damage to site infrastructure, buildings, landscaping, and safety. High winds can tear off roofs, break windows, and damage siding. Landscaping can also be affected when storms uproot trees or severely damage plants. Additionally, flying debris heightens the risk of injury or even death. Implementing wind-resistant design measures, such as reinforced structures and impact-resistant materials, can reduce these risks and enhance the site's resilience against such extreme events.

To enhance the resilience of a site against hurricanes and high winds, the project site and site structures must be constructed according to the *FORTIFIED Commercial Wind* standards or a local equivalent.[69] Apply *FORTIFIED Commercial* standards along with federal, state, and local codes, ordinances, and regulations. If there are conflicts between provisions, use the more stringent regulation. Additionally, projects in high-wind areas must comply with the design and

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[68] "FORTIFIED Commercial High Wind and Hail Specific Design Requirements", FORTIFIED, a program of the Insurance Institute for Business & Home Safety, (2023), https://fortifiedhome.org/commercial-levels/.

[69] "FORTIFIED Commercial™ – Wind Standards", FORTIFIED, a program of the Insurance Institute for Business & Home Safety, (2020), https://fortifiedcommercial.org/wp-content/uploads/Fortified_Commercial_Wind_Standards_2020.pdf.

construction requirements for site structures as outlined by *ASCE/SEI 7 Standards*[70] in specified FEMA zones or local equivalent.

Backup power systems

Projects must install backup power systems in hurricane-prone regions to ensure that critical operations can continue during power outages. Critical operations refer to essential functions, such as HVAC systems, lighting, and communications, which must remain operational continuously to ensure the safety, stability, and proper functioning of the building. Install electrical connections with a transfer switch or docking station (storm switch) to support the connection of backup power must be installed for critical mechanical and electrical systems. Backup generators or solar-powered systems with battery storage provide an emergency power supply ensuring the continuation of critical operations during power interruptions.

Windbreaks

A windbreak will reduce wind speed for as much as 30 times the windbreak's height.[71] A windbreak involves strategically planting trees, shrubs, and other vegetation, and using landscape forms and other locally appropriate natural systems to reduce wind speed around buildings and open spaces. Using vegetation also helps prevent topsoil erosion, which is essential for maintaining the structural integrity of buildings and infrastructure.

Sea Level Rise

Sea level rise poses significant threats to buildings, particularly in coastal areas. As global temperatures increase, melting ice caps and expanding ocean waters are causing sea levels to rise, leading to more frequent and severe flooding events. These changes put pressure on existing buildings, increasing the risk of water infiltration, foundation damage, and structural instability.

To effectively enhance flood resilience, it is essential to design and construct the site to accommodate flooding based on sea level rise and storm surge projections for the design service life of the project. In addition, projects must incorporate at least two measures to limit the impacts of flooding. First, projects may elevate foundations, at least four feet (1.2 meters) above sea level rise projections. Elevating foundations can significantly reduce potential flood damage to buildings, ensuring they remain secure in the face of rising waters.

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[70] ASCE/SEI 7 Standards, American Spciety of Civil Engineers (ASCE), (2024), https://www.asce.org/publications-and-news/asce-7.

[71] U.S. Department of Energy, (n.d.), Landscaping for Wind Control, Energy Saver, energy.gov/energysaver/landscaping-windbreaks.

Projects may ensure that backup power systems are in place to maintain critical functions, such as communications, security, and fire safety systems, during projecting flooding events.

Additionally, developing integrated drainage systems to efficiently manage projected excess flooding is a solution. These systems must be designed to work holistically with the landscape and built environment, ensuring that floodwaters are managed in ways that minimize damage. An integrated drainage system can combine both traditional and innovative solutions, such as upgrading or expanding existing stormwater systems, like gutters, drains, and culverts, to accommodate larger volumes of water. Other measures include installing permeable pavements and porous materials, as well as integrating sump pumps in basements or lower levels of buildings to prevent water accumulation.

Retrofitting existing structures is another key strategy to enhance building resilience to future flood risks. This process may involve reinforcing foundations, installing flood barriers, and incorporating water-resistant materials to protect critical equipment and prevent water infiltration.

Flood-resistant materials

Using flood-resistant materials according to FEMA standards or local equivalent, such as fasteners, connectors, and products designed to withstand moisture, minimizes damage from water intrusion by preventing rotting and corrosion.[72] The application of sealants and coatings to prevent projected water infiltration into structures is essential.

Flood barriers

Flood barriers around buildings, including permanent walls, portable barriers, or automated systems that activate when floodwaters are detected, can effectively redirect water away from vulnerable areas, thereby protecting properties and ensuring public safety. Additionally, restoring or preserving natural landscapes such as wetlands and mangroves can enhance the resilience of communities. These ecosystems act as natural buffers, provide habitat for wildlife, and contribute to biodiversity.

Green infrastructure

Designing and incorporating GI solutions is vital for effectively managing storm surge and runoff. GI, which includes features like rain gardens, permeable pavements, green roofs, and wetlands, plays a crucial role in mitigating these risks.

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[72] Federal Emergency Management Agency, (2025, January), Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program, https://www.fema.gov/sites/default/files/documents/fema_tb_2_flood_damage-resistant_materials_requirements_01–22-2025.pdf.

Community engagement

The project team may actively engage in community-level planning, partnerships, and/or design workshops to coordinate flood mitigation efforts effectively and to address the needs of populations vulnerable to projected flooding. Involving community members in the planning process allows the team to gain valuable insights into local conditions, vulnerabilities, and concerns, which leads to more effective and inclusive solutions. Forming partnerships with local organizations, government agencies, and stakeholders further strengthens these efforts, fostering a shared commitment to enhance flood resilience and safeguard the well-being of all community members.

Tsunamis

Tsunamis can cause severe damage, especially in coastal areas where the risks are highest. They can lead to soil erosion, undermine foundations, result in loss of life and mass injuries, and damage or destroy homes, businesses, ports, harbors, cultural resources, and critical infrastructure and facilities. Tsunamis can also overwhelm critical services such as water and electricity, and contaminate land with saltwater, leading to long-term damage to communities, ecosystems, and agricultural areas.

TsunamiReady® guidelines

To mitigate these impacts, projects must integrate site planning strategies described in Designing for Tsunamis (National Tsunami Hazard Mitigation Program[73]), or local equivalent. Projects must also incorporate elements from the TsunamiReady® guidelines, or local equivalent, including installing danger area and evacuation route signage and Public Alert-notified NOAA Weather Radio (NWR) receivers in critical facilities and public venues.[74] Signage must be implemented according to state and local policies and as determined to be appropriate by local authorities.

Wildfires

Designing, constructing, and maintaining sites and structures, in compliance with the *SITES v2 Rating System Credit 4.11: Reduce the risk of catastrophic wildfire*[75], or local equivalent, reduces the risk of catastrophic wildfires on-site and in surrounding landscapes. The project team must also implement wildfire-resistant techniques referenced in the *NWCG Standards for*

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[73] "National Tsunami Hazard Mitigation Program", National Weather Service, last accessed April 2, 2025, https://www.weather.gov/nthmp/.

[74] "Final Approved TSUNAMIREADY® Guidelines", National Weather Service, (2015), https://www.weather.gov/media/tsunamiready/resources/2015TRguidelines.pdf.

[75] "Home page", Sustainable Sites Initiative, last accessed April 2, 2025, https://www.sustainablesites.org/.

Mitigation 2023[76], or local equivalent, and apply the Zone Concept as outlined in the *Firewise Landscaping Checklist*, which is Appendix E of “Safer from the Start: A Guide to Firewise-Friendly Developments”.[77]

The *NWGG Standards for Mitigation 2023.* Specify proper debris disposal and fire safety protocols for equipment. Proper debris disposal helps eliminate flammable material, while fire safety measures for equipment reduce the risk of accidental ignition during construction or maintenance activities. These integrated strategies enhance the site’s resilience to wildfires, safeguarding both the environment and the structures built.

It is crucial for projects in wildfire areas to take proactive wildfire management measures, including strategies for managing vegetative biomass, dead plant materials, and fuel loads to safe levels. Clearing flammable vegetation and other fuel sources within a specific distance to create buffer zones around structures reduces wildfire risks. Additionally, conducting prescribed burns or other fuel management techniques at frequencies and intensities similar to the natural fire regime for the ecosystem is essential. This proactive approach helps limit the spread and intensity of wildfires, protecting both the built environment and the surrounding ecosystem.

Winter Storms

Winter storms feature heavy snowfall, blowing snow, cold temperatures, and strong winds, and they can also include blizzards and ice storms. When winter precipitation falls as freezing rain or drizzle, it can lead to significant ice accumulation, which may cause considerable damage, especially when accompanied by high winds. Heavy snow or ice may damage plants, break branches, and disrupt growth which can affect landscaping. Snow and ice accumulation can create dangerous conditions for pedestrians and vehicles, increasing the risk of accidents and injuries. Projects in areas prone to winter storms must implement at least two of the indicated strategies.

Adequate ingress/egress

Providing safe access and egress for vehicles and snow removal equipment during winter storms is crucial. This includes conducting regular maintenance and inspections of access points, such as entrances, sidewalks, and roads, to ensure they are clear of snow and ice for vehicles and snow removal equipment. Ensuring safe walking surfaces in exterior parking areas is vital to prevent hazardous walking conditions and related injuries during winter. Using heated sidewalks powered by renewable energy sources can further enhance safety by preventing snow and ice buildup.

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[76] “Home page” National Wildfire Coordinating Group (NWCG), last accessed April 2, 2025, https://www.nwcg.gov/.

[77] “Firewise USA®”, National Fire Protection Association (NFPA), last accessed April 2, 2025, https://www.nfpa.org/Education-and-Research/Wildfire/Firewise-USA.

Snow removal plan and safe walking surfaces
Developing a snow removal plan is important for establishing protocols before storms hit. Effective planning enhances safety and minimizes disruption to daily activities and infrastructure. Using appropriate road materials can significantly impact snow removal efficiency. Choosing materials that improve traction, such as sand, can reduce the risk of accidents during winter storms. Designating specific areas for the accumulation of snow and roof snow removal is essential. These areas should be strategically located to prevent the obstruction of roadways, sidewalks, and emergency access points and limit damage to trees and people. The plan can include scheduling regular inspections during winter months, providing guidelines for safely removing snow, and identifying qualified personnel or contractors to conduct the work.

Landscaping considerations
Projects may include adapted plants and native species capable of withstanding significant weight, such as heavy snow loads, which may vary by location.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Identification of the two hazards the site and site structures are designed and constructed to meet.
	Drought	All	Confirmation of whether the project includes any created water features.
		Projects with Water Features	Evidence that the makeup water for the created water features complies with *SITES C3.4* (e.g., SITES certification and scorecard or evidence that 50% of annual make-up water for site water features comes from non-potable water sources or that site water features only require a total of 10,000 gallons or fewer, 37,854.12 liters or fewer, of potable water annually).
	Extreme heat	All	Evidence of the two qualifying extreme heat resilience elements included in the project (e.g., contract documents, massing and orientation studies of the building, map to emergency cooling station, product information from paving manufacturers or SR values or open-grid pavement permeability).
	Flooding	All	Evidence that the project is certified under a qualifying flood-resilient design standard (e.g., certificate/stamped drawings) and/or evidence that critical utilities meet the design criteria and/or confirm that all structural materials, finish materials, and connectors used below DFE are flood resistant (e.g., contract documents).
	Hail	All	Evidence that the project site and site structures are designed and constructed according to *FORTIFIED Commercial High Wind and Hail Specific Design Requirements for Hail* (for example, evidence of the *FORTIFIED* + Hail certification).

Project types	Options	Paths	Documentation
	Hurricanes and high winds	All	Evidence that the project site and site structures are designed and constructed according to *FORTIFIED Commercial Wind* standards (e.g., evidence of the *FORTIFIED* certification).
	Sea level rise	All	Evidence of the two qualifying sea level rise resilience elements included in the project (e.g., contract documents, product information from manufacturers; meeting notes documenting engagement in relevant community-level planning, partnerships, and/or design workshops).
	Tsunami	All	Evidence the project has designated a tsunami danger area on site and installed evacuation route signage and public Alert-notified NOAA Weather Radio (NWR) receivers.
	Wildfire	All	Evidence that the site and site structures are designed and constructed in compliance with *SITES v2 Rating System Credit 4.11: Reduce the risk of catastrophic wildfire* (e.g., SITES certification and scorecard or contract documents demonstrating landscaping design practices in alignment with Firewise – Safer from the Start: A Guide to Firewise-Friendly Developments, Appendix E).
	Winter Storms	All	Evidence of the two qualifying winter storm resilience elements included in the project (e.g., contract documents, snow-removal operations and maintenance plan, product documentation from manufacturers, planting information).

REFERENCED STANDARDS

- SITES v2 Rating System (sustainablesites.org)
- ASCE 24 (asce.org)
- FEMA 543 (fema.gov)
- Intergovernmental Panel on Climate Change (IPCC) (ipcc.ch)
- FORTIFIED (Commercial High Wind and Hail Specific Design Requirements) (fortifiedhome.org)
- ASCE/SEI 7 (asce.org)
- Tsunami-Ready Guidelines (weather.gov/tsunamiready/guidelines)
- NWCG Standards for Mitigation 2023 (nwcg.gov)

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Credit

HEAT ISLAND REDUCTION

SSc5

New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To mitigate disparate impacts on microclimates and habitats caused by heat islands and extreme heat events.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1. Nonroof and Roof	1
AND/OR	
Option 2. Parking Under Cover	1
AND/OR	
Option 3. Tree Equity	1

Choose one of the following options:

Option 1. Nonroof and Roof (1 point)

Meet the following criteria for the nonroof and roof weighted average approach:

Equation 1. Weighted nonroof and roof calculation

$$\frac{Area\ of\ nonroof\ measures}{0.5}+\frac{Area\ of\ high\text{-}reflectance\ roof}{0.75}+\frac{Area\ of\ vegetated\ roof}{0.75}$$
$$\geq Total\ site\ paved\ area+Total\ roof\ area$$

Use any combination of nonroof, high-reflectance roof, and vegetative roof strategies so that the weighted sum of site design strategies is greater than or equal to the sum of the total pavement and roof areas. Each surface may only be counted once, even if it is addressed through multiple strategies.

Nonroof measures

- Shade over pavement areas, measured in plain view at noon, with existing or new plants, assuming 10-year canopy width, or vegetated structures. Planting or vegetated structures must be in place at the time of occupancy permit.

- Structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.
- Architectural devices or structures. If the device or structure is a roof, it shall have an aged solar reflectance (SR) value of at least 0.28 as measured in accordance with *ANSI/CRRC S100*. If the device or structure is not a roof, or if aged SR information is not available, at installation it must have an initial SR of at least 0.33 as measured in accordance with *ANSI/CRRC S100.*
- Paving materials with an initial SR value of at least 0.33.
- An open-grid pavement system (at least 50% unbound).

High-reflectance roof

Use roofing materials that have an aged solar reflectance index (SRI) value equal to or greater than the values in Table 1. If aged SRI is not available, the roofing material shall have an initial SRI equal to or greater than the values in Table 1.

Table 1. Minimum SRI value, by roof slope

	Slope	Initial SRI	Aged SRI
Low-Sloped Roof	≤ 2:12	82	64
Steep-Sloped Roof	> 2:12	39	32

A roof area that consists of functional, usable spaces (e.g., helipads, recreation courts, swimming pools, and similar amenity areas) may meet the requirements of nonroof measures. Applicable roof area excludes roof area covered by mechanical equipment, solar energy panels, skylights, and any other appurtenances.

Vegetated roof

Install a vegetated roof using native or adapted plant species.

AND/OR

Option 2. Parking Under Cover (1 point)

Place 100% of parking spaces under cover. Any roof used to shade or cover parking must meet at least one of the following criteria:

- Have an aged SRI of at least 32. If aged value information is not available, use materials with an initial SRI of at least 39 at installation.
- Be a vegetated roof.
- Be covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.

The credit calculations must include all existing and new off-street parking spaces that are subsidized, leased, or owned by the project, including parking that is outside the project boundary but is used by the project. On-street parking in public rights-of-way is excluded from these calculations.

AND/OR

Option 3. Tree Equity (1 point)

For all U.S. projects only, evaluate the American Forests Tree Equity score for the site location. For projects in areas ranked “high priority” and “highest priority,” use the results of the evaluation to inform an increase in on-site canopy cover from the existing condition.

For international projects, refer to *IPp2: Human Impact Assessment* and evaluate the tree cover on-site and in the surrounding community, either by using a local tree census or conducting a site assessment. Analyze the project’s local community composition to identify any neighboring underserved and/or disadvantaged populations with lower tree canopy presence. Use the results of the evaluation to inform an increase in on-site canopy cover from the existing condition to provide shade to neighboring underserved and/or disadvantaged areas. Projects with no exterior work are exempt from this requirement.

REQUIREMENTS EXPLAINED

This credit encourages the use of strategies that minimize a project’s overall contribution to the heat island effect. Option 1 addresses nonroof and roof measures including reducing hardscapes, incorporating high SRI or high SR materials, increasing tree cover, and implementing vegetation across the site. SRI measures a roofing material’s ability to reject solar heat, while SR measures the solar heat rejection of hardscape materials.

Unshaded parking lots become mini-heat islands, absorbing the sun’s warmth, and radiating heat. Option 2 encourages project teams to place parking spaces under cover that have low SRI roofing materials, solar canopies, or are located underground or within a building.

When considering Option 2, projects must account any existing or new off-street parking that the project leases or owns. If these spaces are not in direct control of the project team, coordinate with additional stakeholders to confirm covered parking is a viable option for these spaces.

Option 1. Nonroof and Roof

Implementing both nonroof and roof measures are essential in mitigating heat island effects, with each providing significant environmental benefits to the building, site, and occupants. Using a combination of nonroof and roof strategies can create a more sustainable and resilient urban environment.

Nonroof measures

Nonroof measures include shading with new or existing plant material or shading structures, specifying high reflectance paving and open-grid paving, and including vegetated planters across the site. Using a variety of plant species allows for biodiversity, while tree canopies and shading structures create areas of respite on a hot, sunny day.

Roof measures

Roof measures, including the use of vegetated and high reflectance roofs, can improve energy efficiency and thermal comfort and can reduce carbon emissions associated with building energy use.

Projects pursuing this option must consider the slope of the roof, and both the initial and aged SRI value when selecting compliant materials. For low-sloped roofs, the roofing material must meet the minimum value of an initial SRI of 82 or aged value of 64. For steep-sloped roofs, the minimum required values are an initial SRI of 39 or aged SRI of 32. These specific SRI values are indicative of a material that performs well in reducing heat absorption both when it is new and after it has aged.

Vegetated roof

When incorporating a vegetated roof into the design, projects must prioritize the use of native or adapted plant species. These species are well-adapted to the local environment and typically require less maintenance and support local biodiversity.[78]

Nonroof and roof measures calculation

Projects pursuing this option must confirm compliance with the combined roof and nonroof strategies by calculating the total area associated with each measure (e.g., nonroof, high reflectance roof, and vegetated roof areas) and dividing it by its weighted value. The total value of implemented strategies must meet or exceed the total site paving area plus the total roof area within the project's boundary.

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[78] Why native plants matter, (n.d.), Audubon, audubon.org/content/why-native-plants-matter#:~:text=Because%20native%20plants%20are%20adapted%20to%20local%20environmental,and%20perhaps%20the%20most%20valuable%20natural%20resource%2C%20water.

Equation 1. Weighted nonroof or roof calculation

$$\frac{Area\ of\ nonroof\ measures}{0.5}+\frac{Area\ of\ high\text{-}reflectance\ roof}{0.75}+\frac{Area\ of\ vegetated\ roof}{0.75}$$
$$\geq Total\ site\ paved\ area+Total\ roof\ area$$

Projects should evaluate and achieve compliance using Equation 1. If the project does not achieve the standard nonroof or roof calculations, teams may use an SRI and SR weighted average approach to calculate compliance. The weighted nonroof or roof equation weighs the SR and SRI for total hardscape and roof area, showing its overall consequence on heat island effect. This equation is useful for projects that have multiple roof angles, and nonroof or roof materials that fall both above and below the required SR and SRI values.

Equation 2. Weighted nonroof or roof calculation

$$\left(\frac{Area\ of\ high\ reflectance\ nonroof\ A\ \times\frac{SR\ of\ high\ reflectance\ nonroof\ A}{Required\ SR}}{0.5}\right)1$$
$$+\frac{Area\ of\ other\ nonroof\ measures}{0.5}$$
$$+\left(\frac{Area\ of\ high\ reflectance\ roof\ \times\frac{SRI\ of\ high\ reflectance\ roof\ A}{Required\ SR}}{0.75}\right)2$$
$$+\frac{(Area\ of\ vegetated\ roof)}{0.75}\geq\ Total\ site\ paving\ area+\ Total\ roof\ area$$

where:

1. Summed for all high reflectance nonroof areas
2. Summed for all high reflectance roof areas

Option 2. Parking Under Cover

Unshaded parking areas have become small urban heat islands as most outdoor parking lots use dark colored impervious surfaces, such as asphalt or concrete pavements with low SR value. When parking is under cover, it significantly reduces the exposed hardscape area and minimizes the heat island effect. Covered parking strategies include placing parking underground, underdeck, under roof, or under the building.

Projects pursuing this option must place 100% of the total vehicle parking spaces under cover. Include all new parking in the calculation. Factor existing and new off-street parking spaces that leased or owned by the project into the calculations.

Option 3. Tree Equity

The most effective measure in mitigating the climate change effects generated by heat islands is to minimize the hardscape on the project site and increase on-site tree canopy. Given the important role trees play in slowing climate change, American Forests created the Tree Equity Score to focus on addressing the inequity in tree coverage in neighborhoods in the U.S. and the UK. A “high priority” or “highest priority” area identified in the Tree Equity Score map means an area where the community trees the most. Incorporating site landscaping can help contribute to a greener and cooler environment.

All projects should aim to increase the on-site tree canopy. Projects identified as “high priority” or “highest priority” must further evaluate the planned tree canopy and increase on-site tree canopy coverage.

Projects in other countries, or in areas that don’t have a Tree Equity Score, can use platforms such as Global Forest Watch to help understand tree coverage in the project neighborhood.[79] These projects are required to refer to *IPp2: Human Impact Assessment* during evaluation, and should consider development in areas where the local tree census or site assessment identifies neighboring underserved and/or disadvantaged communities with lower tree canopy. Projects must evaluate the tree cover on-site and in nearby areas and use this evaluation to inform an increase in on-site tree coverage.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Nonroof and Roof	All	Weighted average nonroof and roof calculation.
			LEED v5 Heat Island Reduction calculator.
			The project’s hardscape plan identifying all site paving types, any structures covered by energy generation systems, any architectural devices or structures, and the relevant area measurements within the LEED project boundary.
			Evidence of the SR value for each nonroofing material, architectural device, or structure (e.g., default values, or product information from the manufacturer).

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[79] “*Forest Monitoring, Land Use & Deforestation Trends*”, Global Forest Watch, last accessed April 2, 2025, https://www.globalforestwatch.org/.

Project types	Options	Paths	Documentation
			Evidence of the paving permeability for any contributing open-grid pavement (e.g., product information from the manufacturer).
			Shadow plan for any planting or vegetated structures contributing shade over pavement areas in the calculation.
			Evidence of the ten-year canopy width for any planting contributing shade over pavements areas in the calculation (e.g., plant growth guide).
			The project's roof plan(s) identifying all vegetated roof area, helipads, amenity areas, mechanical equipment, solar energy panels, skylights, other roof appurtenances, roofing materials with area measurements, and roof slope(s)
			Evidence of each roofing materials' SRI value (e.g., default values or product information from the manufacturer).
			The plant species list for the vegetated roof.
	Option 2. Parking Under Cover	All	Evidence of the location of all existing and new off-street parking spaces that are subsidized, leased, or owned by the project, including parking that is outside the project boundary but is used by the project (e.g., contract documents).
			Evidence that any roof used to shade or cover parking meets the required criteria (e.g., roofing material product information from the manufacturer highlighting SRI, photographs or contract documents depicting the vegetated roof or energy generation systems).
	Option 3. Tree Equity	All	Areas of existing condition and design/post-construction tree canopy cover on-site.
			Evidence of increase in tree canopy cover (e.g., pre-design site survey and contract landscape plan).
		Projects in the U.S.	Evidence of the project's Tree Equity Score and ranking (e.g., a screenshot).
		International Projects	Analysis of the project's local community composition, identifying any neighboring underserved and/or disadvantaged populations with lower tree canopy presence (e.g., census data from *IPp2: Human Impact Assessment*).
			Evidence of the tree canopy presence in the surrounding community (e.g., a local tree census or a surrounding community site assessment), and identification of any neighboring underserved and/or disadvantaged populations with lower tree canopy presence.

REFERENCED STANDARDS

- ANSI/CRRC S100, Standard Test Methods for Determining Radiative Properties of Material (coolroofs.org/documents/ANSI-CRRC-S100-2021_Final_Archived.pdf)

- ASTM E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces (astm.org/e1980-11r19.html)
- Cool Roof Ratings Council, Rated Products Directory (coolroofs.org/directory)
- US Environmental Protection Agency (epa.gov/heatislands/learn-about-heat-islands)

Impact Area Alignment

— Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Sustainable Sites Credit

LIGHT POLLUTION REDUCTION

SSc6

New Construction (1 point)
Core and Shell (1 point)

INTENT

To increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Uplight	1
AND	
Light Trespass	
AND	
Internally Illuminated Exterior Signage	

Meet the following uplight, light trespass, and internally illuminated exterior signage requirements for exterior luminaires located inside the project boundary.

Uplight

Do not exceed the following uplight ratings, based on the specific light source installed in the luminaire, as defined in Table 1.

Table 1. Maximum uplight ratings for luminaires

Model Lighting Ordinance (MLO) lighting zone	Luminaire uplight rating
LZ0	U0
LZ1	U0
LZ2	U2
LZ3	U3
LZ4	U4

AND

Light Trespass

Do not exceed the following luminaire backlight and glare ratings (based on the specific light source installed in the luminaire), as defined in *IES TM-15-11, Addendum A*, based on the mounting location and distance from the lighting boundary.

Table 2. Maximum backlight and glare ratings

	MLO lighting zone				
Luminaire mounting	LZ0	LZ1	LZ2	LZ3	LZ4
	Allowed backlight ratings				
> 2 mounting heights from lighting boundary	B1	B3	B4	B5	B5
1 to 2 mounting heights from lighting boundary and properly oriented	B1	B2	B3	B4	B4
0.5 to 1 mounting height to lighting boundary and properly oriented	B0	B1	B2	B3	B3
< 0.5 mounting height to lighting boundary and properly oriented	B0	B0	B0	B1	B2
	Allowed glare ratings				
Building mounted > 2 mounting heights from any lighting boundary	G0	G1	G2	G3	G4
Building mounted = 1–2 mounting heights from any lighting boundary	G0	G0	G1	G1	G2
Building mounted = 0.5–1 mounting heights from any lighting boundary	G0	G0	G0	G1	G1
Building mounted < 0.5 mounting heights from any lighting boundary	G0	G0	G0	G0	G1
All other luminaires	G0	G1	G2	G3	G4

AND

Internally Illuminated Exterior Signage

Do not exceed the maximum luminance level of internally illuminated signage during nighttime hours according to Table 3.

Table 3. Maximum sign luminance

MLO lighting zone	**Signage light output**
LZ0	50 cd/m^2
LZ1	50 cd/m^2
LZ2	100 cd/m^2
LZ3	200 cd/m^2
LZ4	350 cd/m^2

Exemptions to uplight and light trespass requirements

The following exterior lighting is exempt from the requirements, provided it is controlled separately from the nonexempt lighting:

- Specialized signal, directional, and marker lighting for transportation.
- Lighting used solely for façade and landscape lighting in MLO lighting zones 3 and 4, and is automatically turned off from midnight until 6 a.m.
- Lighting for theatrical purposes for stage, film, and video performances.
- Government-mandated roadway lighting.
- Lighting for hospital emergency departments, including associated helipads.
- Lighting for the national flag in lighting zones 2, 3, or 4.
- Internally illuminated exterior signage.

REQUIREMENTS EXPLAINED

This credit rewards projects which meet the requirements of uplight, light trespass (backlight and glare), and internally illuminated exterior signage for exterior luminaires within the project boundary. Minimizing light pollution is essential for preserving our night skies, protecting wildlife, and improving human health. Strategies include the use of light shielding, where fixtures direct light downward, reducing glare and light trespass. Using dimmers, motion sensors, and timers ensure lights are only on when needed.

Luminaires

This credit requires an assessment of all new and existing exterior luminaires within the project boundary, including any building-mounted fixtures. When performing calculations, the photometric characteristics of each luminaire must reflect the design conditions, including mounting orientation and tilt.

Determining the Lighting Zone

Classify projects under a single lighting zone, as identified in the *Illuminating Engineering Society and DarkSky International (IES/IDA) Model Lighting Ordinance (MLO) User Guide*[80]. Teams shall determine the project's lighting zone based on the property classification, at the time construction begins or in accordance with MLO guidance.

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[80] Illuminating Engineering Society and DarkSky International (IES/IDA) Model Lighting Ordinance (MLO) User Guide, https://store.ies.org/product/ida-ies-mlo-11-model-lighting-ordinance-mlo-with-users-guide/?v=0b3b97fa6688

Determining the Lighting Boundary

Assess credit compliance using a lighting boundary. Using a lighting boundary ensures that projects assess the light trespass from the lighting installed within the project and how it impacts the surrounding areas.

> **Additional considerations for defining the lighting boundary**
> Project must consider the following when developing the lighting boundary for public areas, roadways, and campus properties:
>
> - **Lighting boundary**. The lighting boundary is typically based on the project's property lines and surrounding areas but may not directly align with the project's LEED boundary. Under certain conditions, the lighting boundary may extend beyond the property line.
>
> - **Public areas**. When a public area, including but not limited to a walkway, bikeway, plaza, or parking lot, abuts the property line, the property owner may move the lighting boundary to five feet (1.5 meters) beyond the property line.
>
> - **Roadways and transit corridors**. When a property line abuts a public street, alley, or transit corridor, the lighting boundary may move to the center line of that street, alley, or corridor.
>
> - **Campus properties**. For buildings on campuses or shared properties, the lighting boundary can use the campus property line to meet light trespass requirements. Additional properties owned by the same entity must be contiguous on the property. They cannot use off-site properties.

Uplight Requirements

Avoiding uplight is an effective strategy to reduce light pollution. Uplighting occurs from site fixtures that direct light upwards. Prevent excess light pollution for site luminaires by selecting fully shielded fixtures that direct light downwards.

Uplight Ratings

An uplight rating of U0 indicates that the fixture emits zero light upwards into the night sky and meets credit intent. This is particularly important for projects aiming to minimize light pollution and comply with Dark Sky standards. A U0 rating ensures that all light directs downwards, preventing it from contributing to sky glow.

For projects located in MLO Lighting Zones LZ0 or LZ1, teams must use luminaires with an uplight rating of U0.

For projects in MLO Lighting Zones LZ2, LZ3, or LZ4, luminaire uplight ratings cannot exceed U2, U3, and U4, respectively.

Light Trespass Requirements

Light trespass is a form of light pollution where unwanted artificial light spills over into areas where it is not intended or needed, often causing disturbances. This can happen when outdoor lighting, such as floodlights or streetlights, illuminate neighboring properties or shine into other property windows.

Fixture Location and Mounting Heights

A common reason for light trespass typically includes poorly shielded lighting located too close to property lines. To minimize lighting trespass, examine luminaire spillage along with the location of the exterior luminaire. This requires a review of the location and mounting height for each luminaire.

Identify the location of all exterior lights on a site lighting plan and measure the horizontal distance from the lighting boundary. Then, determine the mounting height of each luminaire. The mounting height of the exterior luminaire is the vertical distance from the reference plane (i.e., the ground surface).

Determining the Maximum Backlight and Glare Requirements

Table 2 defines the maximum allowed backlight and glare ratings, per lighting zone. The team determines backlight and glare ratings per luminaire by using the mounting height and the distance from the lighting boundary. The closer the luminaire is to the boundary, the stricter the requirements.

Exemptions for Uplight and Light Trespass

Specific fixtures are exempt from the light trespass requirements due to their critical functions and unique needs. Identify fixtures that meet these exemptions. Control any exempt fixtures separately from non-exempt fixtures.

Transportation and roadways

Specialized signal, directional, and marker lighting for transportation fixtures ensure safety and proper navigation for vehicles, aircraft, and ships. Government-mandated roadway lighting provides necessary illumination for public safety on roads and highways.

Theatrical lighting
Lighting for theatrical purposes is essential for stage, film, and video performances, and precise lighting is crucial for production quality.

Healthcare
Lighting for hospital emergency departments and helipads are critical for emergency services, ensuring visibility for medical personnel and aircraft.

National and state flag lighting
Lighting for the national flag is symbolic and often requires illumination at night, especially in higher lighting zones (2, 3, or 4). When state flags are flown with federal or national flags, they exempt lighting.

Internally Illuminated Exterior Signage

Exterior signage can be a significant source of light pollution, contributing to issues like light trespass, skyglow, and glare. Table 3 provides maximum nighttime luminance levels for any exterior signage. Using photometric calculations, verify that the signage light output does not exceed the luminance levels (cd/m^2) during nighttime hours.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	MLO Lighting Zone.
			Justification of MLO Lighting Zone classification (e.g., aerial image of site and bordering parcels/community).
			Site lighting plan showing all exterior light fixtures within the lighting boundary, measuring the distance from the furthest of each light fixture type to the lighting boundary; include a key/schedule.
			Contract documents showing all the project's internally illuminated signage details.
			LEED v5 Light Pollution Reduction calculator.
			Product information from the exterior lighting manufacturers, highlighting the BUG ratings for each fixture
			Evidence of the maximum nighttime luminance levels of any internally illuminated signage (e.g., product information from the manufacturer or test results).
			Evidence that all installed exterior lighting in Model Lighting Ordinance (MLO) Lighting Zones 3 and 4 are automatically turned off when daylight is available (e.g., contract documents or commissioning reports showing the programmed settings).

Project types	Options	Paths	Documentation
			Evidence that any exterior lighting claiming an exemption from the requirements is controlled separately from the nonexempt lighting (e.g., contract documents).

REFERENCED STANDARDS

- Illuminating Engineering Society and DarkSky International (IES/IDA) Model Lighting Ordinance (MLO) User Guide (store.ies.org/product/ida-ies-mlo-11-model-lighting-ordinance-mlo-with-users-guide)
- Illuminating Engineering Society (IES) TM-15-11, Addendum A (ies.org)

WATER EFFICIENCY (WE)

OVERVIEW

LEED v5 integrates water efficiency with new stewardship strategies, redefining water as a valuable and limited resource. The WE category encourages projects to conserve potable to safeguard ecosystems, reduce energy use, and boost resilience on-site and in the wider community.

New construction projects can design highly efficient water systems by combining LEED's proven efficiency strategies with innovative water stewardship approaches. While global water efficiency has improved, water stress and scarcity remain pressing challenges, with approximately 2.4 billion people living in water-stressed regions as of 2020.[81] Climate change and population growth intensify these issues, underscoring the need for adaptable, forward-thinking resource management plans.

The connections between efficiency and stewardship show up clearly in the whole project water use strategy (*WEc2: Enhanced Water Efficiency*). Rather than isolating individual components, this approach encourages comprehensive site-wide water consumption assessments. Originally piloted in LEED v4.1, this strategy has become a permanent feature in LEED v5.

This stewardship approach aligns with growing market interest in alternative water use, seen in water-limited regions like California.[82] By incorporating alternative water sources, projects can reduce reliance on potable supplies, alleviating the strain on overburdened systems (*WEc2: Enhanced Water Efficiency*).

Decarbonization

Water efficiency can significantly reduce energy use and carbon emissions. For example, running a faucet for five minutes uses about as much energy as letting a 60-watt light bulb run for 14 hours.[83] LEED v5 advances decarbonization efforts by reducing the energy use linked to inefficiencies within water treatment, transportation, distribution, and heating (*WEp2: Minimum Water Efficiency, WEc1: Water Metering and Leak Detection*). Additionally, new appliances must

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[81] Martin. 2023. "Water and Sanitation - United Nations Sustainable Development." United Nations Sustainable Development. October 19, 2023. https://www.un.org/sustainabledevelopment/water-and-sanitation/#:~:text=Investments%20in%20infrastructure%20and%20sanitation%20facilities%3B%20protection%20and,efficiency%20is%20one%20key%20to%20reducing%20water%20stress.

[82] "Water Reuse Case Study: Los Angeles County, California | US EPA." 2025a. US EPA. January 31, 2025. https://www.epa.gov/waterreuse/water-reuse-case-study-los-angeles-county-california.

[83] "Why Water Efficiency | WaterSense | US EPA." n.d. https://19january2017snapshot.epa.gov/www3/watersense/our_water/why_water_efficiency.html.

meet high-performance requirements. This ensures that future water use hits ambitious performance targets (*WEc2: Enhanced Water Efficiency*).

Quality of life

Conserving potable water enables it to go further for broader community use. Projects can prepare for a resilient future by tracking water consumption indoors and outdoors, identifying opportunities for savings (*WEc1: Water Metering and Leak Detection*).

Ecological conservation and restoration

Through water reduction and optimization strategies, projects ease the strain on ecosystems and preserve vital resources. Submetering and leak detection sensors reduce water waste from leaks or system inefficiencies. Through early leak identification, projects can avoid potential water damage and ensure conservation efforts are on track (*WEp1: Water Metering and Reporting*). Building managers and tenants can take immediate action to ensure they meet conservation goals (*WEc1: Water Metering and Leak Detection*).

By embracing the strategies in the WE category, projects not only protect one of the planet's most essential resources but also set the foundation for a more resilient, sustainable, and equitable future for all.

Impact Area Alignment

— Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Water Efficiency Prerequisite

WATER METERING AND REPORTING

WEp1

REQUIRED

New Construction
Core and Shell

INTENT

To conserve potable water resources, support water management, and identify opportunities for additional water savings by tracking water consumption.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Water Metering	

Install or use existing permanent water meters to monitor, record, and report the total water consumption for potable and alternative water sources for the building and associated grounds. Report whole-project use for each type of water source supplied to the building and associated grounds, with the following additional provisions:

- The facility manager and/or tenant(s) must be able to access the meter data.
- Meter alternative water sources separately from municipally supplied potable water.
- Commit to sharing with USGBC the resulting whole-project water usage data at least annually. This commitment must carry forward for 5 years or until the building changes ownership or lessee.

The requirements may be applied to the project scope of work and exclude future tenant utility services and submeters that will be installed in the tenant scope of work.

REQUIREMENTS EXPLAINED

This prerequisite requires that projects install or use existing meters and collect water consumption data in gallons or liters from all water sources within the project boundary. This includes potable water sources and alternative water sources. Projects must also provide data access to facility managers, operations managers, tenants, and/or another appropriate people. In addition, projects must commit to reporting the total water consumption to USGBC at least annually. Share the data for five years, or until the building changes ownership or lessee.

Tracking and reviewing data monthly allow the facility manager and/or tenants ongoing opportunities to identify inefficiencies or anomalies in consumption and immediately address problems, such as leaks and failed valves, before larger issues or excess consumption occur. Projects in a campus environment must only report usage from within the project boundary.

Identifying all Water Sources and Water End-Uses

Project teams must identify all water end uses in the building and on the project site. Teams should continuously analyze water consumption from each source to identify potential leaks or operational issues. Common end uses include plumbing fixtures, cooling towers, laundry facilities, dishwashers, indoor and outdoor water features, irrigation, and other building and site processes.

For each end use, identify the water source. Potable water sources include public water supply, on-site wells, and on-site potable water treatment systems. Alternative water sources include gray water, rainwater, recycled water, and reclaimed water. When using alternative water sources, meter them separately from municipally supplied potable water.

Meters and Types of Meters

Install meters only for systems within the scope of work. The prerequisite does not require meters for future tenant utility services and/or submeters not installed within the new construction scope of work.

Specify permanent meter(s) that provide water consumption data in gallons or liters. A utility-owned meter that provides the required data meets the prerequisite requirements. Utility providers often read and bill total water consumption monthly.

Tracking and reporting

Demonstrate that the key person(s) responsible for tracking and reporting water consumption data can access the utility-owned meter. If the location is not accessible, providing access to monthly utility bill(s) achieves the same goal. If projects cannot demonstrate access through direct, visual readings or monthly utility bills, teams must install additional meter(s) to meet the prerequisite.

Multiple sources of potable or alternative water in a project boundary

Teams must identify whether the project boundary uses multiple sources of potable water or alternative water. A single meter per water source can meet the requirement if the design allows for the proper placement of the meter. Projects with campus-level irrigation metering must submit an engineering calculation that accurately reflects the water consumption of the project boundary's landscaped area. Projects can also prorate irrigation data for the project boundary from the campus meter.

> **Additional considerations**
> Projects that pursue *WEc1: Water Metering and Leak Detection*, Option 1 Submeters should consider strategies that meet both the prerequisite and credit. For example, using a single utility-owned meter for the project's total potable water use meets the prerequisite; however, it does not comply with the credit requirements. For *WEc1: Water Metering and Leak Detection*, Option 1 Submeters, teams must install additional meters to capture each potable water end-use, as outlined in the credit.

Commitment to Sharing Data with USGBC

USGBC aims to collect data on water usage from all LEED buildings. Having this data allows USGBC to identify similarities between high-performing projects and recommend solutions with proven results.

Projects must commit to sharing whole-project water usage data with USGBC annually for at least five years, or until the building changes ownership or lessee. Share data using a USGBC-approved data template or an approved third-party data source, such as ENERGY STAR® Portfolio Manager.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Documentation showing that all water meters are permanently installed.
			Confirmation that the facility manager and/or tenant(s) can access the meter data.
			Confirmation that alternative water sources are metered separately from municipally supplied potable water.
			Commitment from the Project Owner to share with USGBC the resulting whole-project water usage data at least annually.
			Method of data sharing.

REFERENCED STANDARDS

- None

Impact Area Alignment

☑ Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Water Efficiency Prerequisite

MINIMUM WATER EFFICIENCY

WEp2

REQUIRED

New Construction
Core and Shell

INTENT

To reduce potable water consumption and the associated energy consumption and carbon emissions required to treat and distribute water, and to preserve potable water resources through an efficiency-first approach.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Minimum Fixture and Fittings Efficiency	
Option 1. Prescriptive Path–Maximum Flush and Flow Rates	
OR	
Option 2. Performance Path–Calculated Reduction	
AND	
Minimum Equipment Water Efficiency	
AND	
Minimum Outdoor Water Use Efficiency	
Option 1. No Irrigation	
OR	
Option 2. Efficient Irrigation	

Meet all minimum water efficiency requirements outlined below.

Minimum Fixture and Fittings Efficiency

Meet the following minimum water efficiency requirements for fixtures and fittings.

> **Core and Shell only**
> These requirements must be met for the base building fixtures and fittings, appliances, equipment, process water, and outdoor water use. For tenant spaces, include manufacturer documentation for the base building's fixtures and fittings, appliances, and equipment in *IPp4: Tenant Guidelines*.

Projects located where standard supply pressure is different than the LEED baseline supply pressure may calculate the water consumption of flow fixtures and fittings at the local standard supply pressure.

OPTION 1. PRESCRIPTIVE PATH — MAXIMUM FLUSH AND FLOW RATES

For all new and existing fixtures and fittings within the project boundary, do not exceed the maximum flush and flow rates listed in Table 1.

Table 1. Maximum installed flush or flow rates for prescriptive path

Fixture or fitting	**Maximum installed flush or flow rate (IP)**	**Maximum installed flush or Ffow rate (SI)**
Toilet (water closet)*	1.28 gpf*	4.8 lpf*
Urinal*	0.50 gpf	1.9 lpf
Public lavatory (restroom) faucet	0.50 gpm	1.9 lpm
Private lavatory faucets*	1.50 gpm	5.7 lpm
Kitchen faucet	1.8 gpm	6.8 lpm
Showerhead*	2.00 gpm	7.6 lpm

NOTE: The WaterSense label is available for this fixture type. WaterSense-labeled fixtures are recommended for projects located in the U.S. and Canada.

*For dual-flush toilets, the full-flush volume shall be equal to or fewer than 1.28 gpf/4.8 lpf; a weighted average cannot be used.

OR

OPTION 2. PERFORMANCE PATH — CALCULATED REDUCTION

For all new and existing fixtures and fittings within the project boundary, reduce aggregate water consumption by 20% from the baseline listed in Table 2.

Table 2. Baseline water consumption of fixtures and fittings

Fixture or fitting	**Baseline installed flush or flow rate (IP)**	**Baseline installed flush or flow rate (SI)**
Toilet (water closet)*	1.6 gpf*	6.0 lpf*
Urinal*	1.0 gpf	3.8 lpf
Public lavatory (restroom) faucet	0.50 gpm at 60 psi	1.9 lpm at 415 kPa
Private lavatory faucets*	2.2 gpm at 60 psi	8.3 lpm at 415 kPa
Kitchen faucet	2.2 gpm at 60 psi	8.3 lpm at 415 kPa
Showerhead*	2.5 gpm at 80 psi per shower stall	9.5 lpm at 550 kPa per shower stall

NOTE: The WaterSense label is available for this fixture type. WaterSense-labeled fixtures are recommended for projects located in the U.S. and Canada.

*For dual-flush toilets, the full-flush volume shall be equal to or fewer than 1.28 gpf/4.8 lpf; a weighted average cannot be used.

AND

Minimum Equipment Water Efficiency

Newly installed appliances, equipment, and processes within the project boundary must meet the requirements listed in Tables 3 and 4. Existing appliances and equipment can be excluded.

Table 3. Standards for appliances

<table>
<tr><th colspan="2">Appliance</th><th colspan="2">Requirement</th></tr>
<tr><td colspan="2">Residential clothes washers</td><td colspan="2">ENERGY STAR® or performance equivalent</td></tr>
<tr><td colspan="2">Commercial clothes washers</td><td colspan="2">ENERGY STAR® for commercial clothes washers with ≤ 8.0 cubic feet (227 liters) capacity or performance equivalent</td></tr>
<tr><td colspan="2">Residential dishwashers (standard and compact)</td><td colspan="2">ENERGY STAR® or performance equivalent</td></tr>
<tr><td colspan="2">Prerinse spray valves</td><td colspan="2">≤ 1.3 gpm (4.9 lpm)</td></tr>
<tr><td colspan="2">Ice machine</td><td colspan="2">ENERGY STAR® or performance equivalent and use either air-cooled or closed-loop cooling, such as chilled or condenser water system</td></tr>
<tr><th colspan="2">Commercial kitchen equipment</th><th>Requirement (IP)</th><th>Requirement (SI)</th></tr>
<tr><td rowspan="5">Dishwasher</td><td>Undercounter</td><td>≤ 1.6 gal/rack</td><td>≤ 6.0 liters/rack</td></tr>
<tr><td>Stationary, single tank, door</td><td>≤ 1.4 gal/rack</td><td>≤ 5.3 liters/rack</td></tr>
<tr><td>Single tank, conveyor</td><td>≤ 1.0 gal/rack</td><td>≤ 3.8 liters/rack</td></tr>
<tr><td>Multiple tank, conveyor</td><td>≤ 0.9 gal/rack</td><td>≤ 3.4 liters/rack</td></tr>
<tr><td>Flight machine</td><td>≤ 180 gal/hour</td><td>≤ 680 liters/hour</td></tr>
<tr><td rowspan="2">Food steamer</td><td>Boilerless/ connectionless</td><td>≤ 2 gal/hr/pan</td><td>≤ 7.5 liters/hr/pan</td></tr>
<tr><td>Steam generator</td><td>≤ 5 gal/hr/pan</td><td>≤ 19 liters/hr/pan</td></tr>
<tr><td rowspan="2">Combination oven</td><td>Countertop or stand</td><td>≤ 1.5 gal/pan</td><td>≤ 5.7 liters/pan</td></tr>
<tr><td>Roll-in</td><td>≤ 1.5 gal/pan</td><td>≤ 5.7 liters/pan</td></tr>
</table>

Table 4. Standards for processes

Process	Requirement
Heat rejection and cooling	No once-through cooling with potable water for any equipment or appliances that reject heat.
Cooling towers and evaporative condensers	Equip with all the following: • Makeup water meters • Conductivity controllers and overflow alarms • Efficient drift eliminators that reduce drift to max of 0.001% of recirculated water volume for counterflow towers and 0.002% of recirculated water flow for cross-flow towers
Discharge water temperature tempering	Where local requirements limit the discharge temperature of fluids into drainage system, use a tempering device that runs water only when the equipment discharges hot water.

Process	Requirement
	OR Provide thermal recovery heat exchanger that cools drained discharge water below code-required maximum discharge temperatures while simultaneously preheating inlet makeup water. OR If fluid is steam condensate, return it to boiler.
Venturi-type flow-through vacuum generators or aspirators	Use no device that generates vacuum by means of water flow through device into drain.

AND

Minimum Outdoor Water Efficiency

OPTION 1. NO IRRIGATION

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OR

OPTION 2. EFFICIENT IRRIGATION

Reduce the project's irrigation water requirement by at least 30% from the calculated baseline for the site's annual theoretical irrigation requirement (TIR). Reductions must be achieved through plant species selection and irrigation system efficiency, as calculated by the TIR methodology outlined by the U.S. Environmental Protection Agency.

REQUIREMENTS EXPLAINED

The prerequisite sets minimum water efficiency requirements for fixtures, fittings, appliances, process water, and irrigation systems. There are two compliance options for fixture and fitting efficiency and two for outdoor water use efficiency.

Minimum Fixture and Fitting Efficiency

Reducing potable water use for fixtures and fittings begins with conservation efforts. Selecting high-efficiency fixtures reduces both water consumption and demand. This can lead to savings from reductions in pump energy and water heating requirements. For example, selecting high-efficiency fixtures for lavatories, faucets, and showerheads reduces the electric load required for water heating.

For LEED BD+C: Core and Shell projects, the requirements are only for the following items: base building fixtures and fittings, appliances, equipment, process water, and outdoor water use. For tenant spaces, project teams must include manufacturer documentation for the base building's fixtures and fittings, appliances, and equipment, which must be part of *IPp4: Tenant Guidelines*.

Choose either a prescriptive or performance pathway to demonstrate compliance for fixture and fitting efficiencies.

OPTION 1. PRESCRIPTIVE PATH — MAXIMUM FLUSH AND FLOW RATES

The prescriptive path offers a streamlined approach for the prerequisite. Table 1 outlines the maximum allowable flush or flow rate for fixtures and fittings within the project boundary. All fixtures and fittings installed must not exceed these maximum values.

For projects that install dual-flush toilets, the volume of the full-flush must be used when calculating the flush rate. The full-flush rate must not exceed 1.28 gpf (4.8 lpf). A weighted average that demonstrates that the average flow is 1.28 gpf (4.8 lpf) may not be used.

Projects in the U.S. and Canada should use WaterSense-labeled toilets (water closets), urinals, private lavatory faucets, and showerheads. WaterSense-labeled products require testing and verification for efficiency by third-party vendors. These products comply with the U.S. Environmental Protection Agency[84] (U.S. EPA) specifications.

OPTION 2. PERFORMANCE PATH — CALCULATED REDUCTION

Using the performance-based approach, teams can maximize water conservation across all applicable fixtures and fittings within the project boundary. Teams pursuing points under *WEc2: Enhanced Water Efficiency* should consider Option 2. Performance Path – Calculated Reduction to show prerequisite compliance. Compliance with *WEp2: Minimum Water Efficiency*, Option 2. Performance Path – Calculated Reduction and *WEc2: Enhanced Water Efficiency*, Option 2. Fixtures and Fittings – Calculated Reduction requires documented compliance through the *USGBC*-approved calculator.

Teams must prove a reduction of 20% from the baseline water use to meet the minimum prerequisite requirements.

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[84] U.S. Environmental Protection Agency, https://www.epa.gov/watersense

Determining the baseline and design-case water use

Teams must determine the project's baseline water consumption. Total annual consumption depends on project-specific data, including fitting and fixture types, flush and flow rates, the number of full-time equivalents and visitors, annual days of operation, and gender ratios. This data must remain consistent across all LEED BD+C: New Construction and LEED BD+C: Core and Shell credits to maintain the integrity of the submission.

The total number of uses for each fixture and fitting remains the same in the baseline and design case calculations. The baseline flush and flow rates must use values from Table 2, which represent the maximum allowed flush and flow rates. The design case must use designed values that represent the fixtures and fittings installed in the project. For projects that have dual-flush toilets, use the full-flush volume in the design case calculations. Do not use the weighted average.

Develop calculations using the USGBC-approved calculator for this option to determine the percentage reduction.

AND

Minimum Equipment Water Efficiency

During design, teams must identify appliances, kitchen equipment, and processes within the project boundary and specify products that meet the requirements of Tables 3 and 4. Projects in the U.S. and Canada must use ENERGY STAR®-labeled equipment. For international projects, a performance-based equivalent meets the requirements.

ENERGY STAR® qualified appliances perform better than conventional appliances. For example, ENERGY STAR® washing machines and dishwashers use 30% and 18% less water, respectively, than their conventional counterparts. These appliances also consume 10% to 50% less energy than conventional appliances.[85] Commercial kitchens employ processes that use high levels of energy and water, such as dishwashing and food preparation.

AND

Minimum Outdoor Water Efficiency

OPTION 1. NO IRRIGATION

For projects that do not install permanent irrigation, Option 1 offers a streamlined path to compliance. Teams may use irrigation during the first two years of the initial establishment period but must remove irrigation after that period.

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[85] U.S. Department of Energy, (n.d.), Guide to home water efficiency, energy.gov/sites/prod/files/guide_to_home_water_efficiency.pdf.

Projects that use alternative water sources for irrigation do not automatically comply with this option. Projects must still prove reductions using *WEp2: Minimum Water Efficiency, Option 2. Efficient Irrigation*.

OPTION 2. EFFICIENT IRRIGATION

For projects with permanent irrigation, teams must design efficient irrigation systems.

For projects with permanent irrigation, teams must demonstrate that the installed irrigation system uses at least 30% less water than the baseline. Calculate the baseline water consumption using the site's TIR. Projects may use irrigation system efficiencies, plant species selection, or a combination of strategies to achieve the 30% reduction.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Contract document(s) specifying the project's plumbing fixtures and fittings, including performance specifications.
			Contract document(s) specifying the project's appliances, equipment, and process water equipment, including performance specifications.
			Contract document(s) specifying the project's commercial kitchen equipment water use, including performance specifications.
			Contract document(s) specifying the project's water equipment process, including performance specifications.
			LEED v5 Fixture and Fittings Efficiency calculator.
			LEED v5 Minimum Outdoor Water Use Efficiency calculator.
		No Irrigation	Documentation confirming that an irrigation system is not installed.
		Irrigation System	Evidence that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period (e.g., a contract document detailing the temporary irrigation methods).

REFERENCED STANDARDS

- ENERGY STAR® (appliance standards) (energystar.gov/products)
- US Environmental Protection Agency (EPA) Theoretical Irrigation Requirement (TIR) calculation methodology (epa.gov/sites/default/files/2021-02/documents/watersense_final_technical_evaluation_process_for_home_certification_v1.0.pdf)

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Water Efficiency Credit

WATER METERING AND LEAK DETECTION

WEc1

1 POINT

New Construction (1 point)
Core and Shell(1 point)

INTENT

To conserve potable water resources, support water management, limit potential material waste due to water leak damages, and identify opportunities for additional water savings by tracking water consumption.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Option 1. Submeters	1
OR	
Option 2. Leak Detection Sensors	1

Option 1. Submeters (1 point)

Install permanent water meters for each applicable subsystem defined below:

- Indoor plumbing fixtures and fittings. Meter systems serving at least 80% of indoor fixtures and fittings as described in *WEp2: Minimum Water Efficiency.* Fixtures and fittings not addressed in the prerequisite, including janitor sinks, water coolers, and bottle fillers, may be included or excluded from the indoor plumbing fixtures' subsystem at the project team's discretion.
- Irrigation system.
- Each makeup water system (e.g., cold water inlet for domestic hot water, swimming pools, chilled water systems, process water systems).
- Commercial kitchen (if the kitchen serves at least 100 meals per day of operation).
- Laundry (if the project includes commercial laundry equipment that processes at least 120,000 lbs. [57,606 kg] of laundry per year or if the project includes a public laundry room).

The facility manager and/or tenant(s) must be able to access the submeter data in real time via local network, building management system, cloud service, app, or online database. All submeters must be capable of recording data at least hourly.

> **Core and Shell only**
> In addition to the requirement above, meters must be installed for future tenant spaces so that tenants will be capable of independently metering water consumption in their spaces. Provide a sufficient number of meters to capture total potable water use with a minimum of one per floor.

Healthcare only

In addition to the requirements above, install water meters in any five of the following:

- Purified water systems (reverse-osmosis, deionized)
- Filter backwash water
- Water use in the dietary department
- Water use in laundry
- Water use in laboratory
- Water use in central sterile and processing department
- Water use in physiotherapy and hydrotherapy and treatment areas
- Water use in surgical suite
- Closed-loop hydronic system makeup water
- Cold-water makeup for domestic hot water systems

If a healthcare project does not include five of the additional subsystems listed above within the project scope, the project may alternatively submeter all water subsystems that are applicable to the project scope.

Residential only

Install a permanent water meter for each residential dwelling unit that measures the total potable water use for the unit. These meters need not be utility owned or utility grade.

OR

Option 2. Leak Detection Sensors (1 point)

Install permanent water flow meter or sensors for each applicable subsystem defined below:

- Project irrigation system at the point of entry, if irrigation is included in the project scope.
- At least 50% of the project flush fixtures. Water sensors can be installed on each flush fixture or for a group of flush fixtures (e.g., one per restroom facility). For LEED BD+C:

Core and Shell projects, this only applies to flush fixtures within the project's scope of work.
- Each makeup water system (e.g., cold water inlet for domestic hot water, swimming pools, chilled water systems, and process water systems).

The leak detection system should be able to identify a leak triggered by abnormal flow rate above normal range, or physically detect a water leak, and initiate an alarm upon a leak detection.

The facility manager and/or tenant(s) must be able to access the sensor data in real time via local network, BMS, cloud service, app, or online database.

Develop an action plan that addresses how the building manager or tenant will have access to data in real time and how the building manager and/or tenant(s) will address and remedy any detected leak.

REQUIREMENTS EXPLAINED

This credit encourages projects to further develop water submetering beyond the *WEp1: Water Metering and Reporting* requirements. Projects pursuing this credit must permanently install submeters and sensors. These tools are necessary to report and track water use for applicable subsystems. Option 1 requires submeters on all water-using systems within the project boundary. Healthcare and residential projects have project-specific requirements to meet the Option 1 requirements. Option 2 requires leak detection sensors and data integration with the BMS, or something similar.

Projects can only achieve one point for choosing either Option 1 or Option 2 of this credit.

Submetering and leak detection strategies, when developed early in the design, provide significant benefits to the owner and design team. Teams can identify all water-using systems and prioritize submeters for major systems.

Option 1. Submeters

Teams must install submeters for all of the following water-using subsystems, as applicable to the project: indoor plumbing fixtures and fittings, irrigation systems, make-up water systems, commercial kitchen water use, and laundry water use. *WEp2: Minimum Water Efficiency* addresses cooling tower submeters.

Core and Shell projects must also install meters for future tenant spaces so that tenants will be capable of independently metering water consumption in their spaces. These projects must also install a sufficient number of meters to capture total potable water use with a minimum of one per floor.

Facility managers and/or tenants must have access to the real-time data via the project's local network, BMS, cloud service, web-based application, or an online database.

Indoor plumbing fixtures and fittings

Most projects have indoor plumbing fixtures and fittings. Water use from water closets and lavatories represents a significant amount of a building's total water consumption for many project types. Additionally, leaks from indoor fixtures and fittings often go unnoticed until water damage occurs on walls, ceilings, or floors.

Projects must submeter at least 80% of the total indoor fixtures and fittings, as identified in *WEp2: Minimum Water Efficiency*.

Depending on the distribution piping and the metering strategy, projects can directly meter water consumption from indoor plumbing fixtures and fittings or calculate the consumption by subtracting all other subsystems from the total water consumption of the building and the grounds.

Irrigation systems

Projects that include permanently installed irrigation systems must meter the irrigation water use. This includes any potable or alternative water sources used for the project.

In many cases, irrigation systems require additional submeters to meet the data recording requirements. While a utility-owned irrigation meter captures the total consumption of the system, hourly recording and reporting to BMS, cloud service, or online database is not typical. Teams must confirm meter capabilities and include additional devices when necessary.

Tracking the water used by irrigation systems allows operators to identify leaking or inefficient sprinkler heads. It can also identify underground pipe leaks, which are often unresolved until visual inspections observe damp areas on the site.

Make-up water systems

Make-up water requirements vary by system and project. Systems that require make-up may include cold water inlets for the domestic hot water system, swimming pools, chilled water systems, or other processes.

Confirm the number of make-up water systems within the project boundary, and meter each system individually. Provide infrastructure capable of reporting and recording hourly consumption.

A single meter that reports total make-up water to a building or site does not meet the credit requirements.

Commercial kitchens

Typical commercial kitchen systems such as dishwashers, food steamers, and combination ovens require large quantities of potable water. Even when using water-efficient equipment, it is critical that projects track consumption from these appliances to ensure efficient operations and identify water supply failures.

The requirement for metering water use in a commercial kitchen depends on the number of daily meals served. Kitchens designed to serve 100 or more daily meals must meter and report all water use from the kitchen operations.

Public laundry facilities

Typical commercial laundry systems include large top- or front-load washing machines used to process thousands of pounds (lbs) or kilograms (kg) of laundry annually. Front-load washers use less water and energy than top-load washers; however, even when using ENERGY STAR® (or performance equivalent) equipment, it is critical that projects track water consumption from these machines to ensure efficient operations and identify water supply failures.

The requirement for metering water use in a commercial laundry depends on the pounds (lbs) or kilograms (kg) of laundry processed annually. Laundry facilities designed to process 120,000 lbs. (57,606 kg) of laundry annually must meter and report all water use from the laundry operations.

Option 2. Leak Detection Sensors

Water lost through leaks strains capital and natural resources while creating health and safety risks.[86] Lower system pressures can draw pollutants in from the surroundings, leading to foul drinking water.[87] Capital losses can result from labor costs to identify the location of the leak and

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[86] Pacific Northwest National Laboratory, (2019) Overview of Available Leak Detection Technologies, Retrieved from pnnl.gov/main/publications/external/technical_reports/PNNL-28885.pdf.

[87] R. Collins, J. Boxall, M. Besner, S. Beck and B. Karney, (2011) “Intrusion Modelling and the Effect of Ground Water Conditions,” Water Distribution Systems Analysis 2010.

the labor hours and material costs necessary to repair major damage. Leaks that are not addressed commonly cause higher bills.

Projects pursuing this option must install permanent water flow meters or sensors on each applicable subsystem (irrigation, flush fixtures, makeup water systems) within the project boundary. The devices must report abnormalities and generate an alarm at a local network, BMS, cloud service, app, or online database accessible by the facility manager and tenants.

Data access and action plan

Providing access to and regularly performing reviews of the data optimizes an operator’s ability to address water leaks. Develop an action plan that addresses, at minimum, data access for operators and tenants, the approach for resolving detected leaks, and a communication plan to alert building occupants when repairs impact the building and the site.

Irrigation leak detection requirements

Install devices at the point of entry to the site for permanently installed irrigation systems. This allows for the earliest possible detection of any leaks within the system.

Flush fixture leak detection requirements

For the flush fixtures, install sensors or meters for at least 50% of the flush fixtures identified in *WEp2: Minimum Water Efficiency*. Install the device at the flush fixture for an individual toilet room, such as a unisex or family restroom. A single device that monitors all flush fixtures for group restrooms is acceptable.

Make-up water system leak detection requirements

All makeup water systems must have permanent sensors or meters for leak detection. Leak detection must occur at each system. A sensor or meter that collectively monitors leaks for a single makeup line serving multiple systems does not meet the credit requirement.

Healthcare

OPTION 1. SUBMETERS

Healthcare projects require additional submeters. Many processes typical of healthcare operations, such as sterilization, water use in surgical suites, and purified water systems, require significant amounts of water.

The credit requires that healthcare projects meter an additional five subsystems, as outlined in the Rating System. For projects that do not have at least five additional subsystems within the project scope, provide meters for all applicable water subsystems included in the project.

OPTION 2. LEAK DETECTION SENSORS

Same as Option 2, Leak Detection Sensors above.

Residential

OPTION 1. SUBMETERS

In addition to any applicable systems in common areas, measure each residential unit’s total potable water usage.

Designing a system that tracks and reports water use from each residence meets the intent of the credit.

Meters must report data to the facility manager. Tenants must also have access to the data. Monthly reporting allows facility managers and tenants the opportunity to address excessive water use within living spaces.

OPTION 2. LEAK DETECTION SENSORS

Same as Option 2, Leak Detection Sensors above.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Submeters	All	Identification of the permanent water meters installed on the project.
			Metered indoor fixture/fittings calculation.
			Contract documents highlighting the locations and types of the project's permanent water meters for each applicable subsystem (e.g., water supply system drawings).
			Contract documents or narratives demonstrating that the facility manager and/or tenant(s) will be able to access the submeter data in real-time via local network, BMS, cloud service, app, or online database.
			Confirmation that all submeters are capable of recording data at least hourly (e.g., product information from the manufacturer and/or contract documents).
Healthcare			Identification of the water systems that are within the project scope and the additional permanent water meters installed on the project.
All	Option 2. Leak Detection Sensors	All	Contract documents or narratives demonstrating that the facility manager and/or tenant(s) will be able to access the sensor data in real-time via local network, BMS, cloud service, app, or online database.
			Identification of the applicable subsystems (irrigation, flush fixtures, makeup water) included in the project.
			Contract documents highlighting the locations and types of the project's permanent water flow meters and/or sensors for each applicable subsystem (e.g., water supply system drawings).
			Narrative or documents detailing the leak detection system specifications for when and how an alarm is triggered (e.g., the Owner's Project Requirements, BOD, or Contract Documents, product information from the manufacturer).
			The project's action plan addresses how the building manager or tenant will have access to data in real-time and how the building manager and/or tenant(s) will address and remedy any detected leak.
			Leak Detection for Flush Fixtures Calculation.

REFERENCED STANDARDS

- None

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Water Efficiency Credit

ENHANCED WATER EFFICIENCY

WEc2

New Construction (1–8 points)
Core and Shell (1–7 points)

INTENT

To reduce potable water consumption and the associated energy consumption and carbon emissions required to treat and distribute water, and to reward use of alternative water sources that preserve potable water resources.

REQUIREMENTS: NEW CONSTRUCTION

Achievement pathways	Points
New Construction	1–8
Option 1. Whole-Project Water Use	1–8
OR	
Option 2. Fixture and Fittings–Calculated Reduction	1–3
AND/OR	
Option 3. Appliance and Process Water	1–2
AND/OR	
Option 4. Outdoor Water Use	1–2
Path 1. No Irrigation	2
OR	
Path 2. Efficient Irrigation	1–2
AND/OR	
Option 5. Optimize Process Water Use	1–2
Path 1. Limit Cooling Tower Cycles	1–2
OR	
Path 2. Optimize Water Use for Cooling	1–2
OR	
Path 3. Process Water Use	1–2
AND/OR	
Option 6. Water Reuse	1–2
Path 1. Reuse-Ready System	1
OR	
Path 2. Alternative Water Sources	2

Implement a combination of the strategies below for a maximum of 8 points. Projects may either attempt Option 1 or any combination of Options 2–6 below.

Option 1. Whole-project Water Use (1–8 points)

To pursue this pathway, project teams must develop a water use baseline and create a proposed use model. Points are achieved based on reductions from the baseline in Table 1.

Table 1. Points for reducing overall project water use

Percent reduction	Points	Total points for alternative water
30%	1	2
35%	2	3
40%	3	4
45%	4	5
50%	5	6
55%	6	7
60%	7	8
65%	8	Exemplary performance

OR

Option 2. Fixture and Fittings — Calculated Reduction (1–3 points)

Further reduce fixture and fitting water use from the calculated baseline in *WEp2: Minimum Water Efficiency, Minimum Fixture and Fittings Efficiency*, Path 2, Performance Path — Calculated Reduction. Additional potable water savings can be earned above the prerequisite level using alternative water sources. Points are awarded according to Table 2.

Table 2. Points for reducing indoor water use

Percentage reduction	Points
30%	1
35%	2
40%	3

AND/OR

Option 3. Appliance and Process Water (1–2 points)

Newly installed equipment within the project boundary must meet the minimum requirements in Tables 3, 4, 5, and/or 6. 1 point is awarded for meeting all applicable requirements in any 1 table for a maximum of 2 points. All applicable, newly installed equipment listed in each table must meet the standard. Existing appliances and equipment can be excluded.

To use Table 3, the project must process at least 120,000 lbs. (57,606 kg) of laundry per year.

Table 3. Compliant commercial washing machines

Washing machine	Requirement (IP units)	Requirement (SI units)
On premise, minimum capacity 2,400 lbs. (10,886 kg) per 8-hour shift	Maximum 1.8 gal per pound*	Maximum 7 liters per 0.45 kg*

NOTE: Based on equal quantities of heavily, medium, and lightly soiled laundry.

To use Table 4, the project must serve at least 100 meals per day of operation.

Table 4. Standards for compliant commercial kitchen equipment

Commercial kitchen equipment		Requirement (IP)	Requirement (SI)
Dishwasher	Undercounter	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Stationary, single tank, door	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Single tank, conveyor	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Multiple tank, conveyor	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Flight machine	ENERGY STAR®	ENERGY STAR® or performance equivalent
Food steamer	Boilerless/ connectionless	≤ 1.7 gal/hr/pan including condensate cooling water	≤ 6.4 liters/hr/pan including condensate cooling water
	Steam generator	≤ 2.2 gal/hr/pan including condensate cooling water	≤ 8.3 liters/hr/pan including condensate cooling water
Combination oven	Countertop or stand	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Roll-in	ENERGY STAR®	ENERGY STAR® or performance equivalent
Food waste disposer	Disposer	3–8 gpm, full load condition; 10-minute automatic shutoff or 1 gpm, no-load condition	11–30 lpm, full load condition; 10-minute automatic shutoff or 3.8 lpm, no-load condition
	Scrap collector	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Pulper	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Strainer basket	No additional water usage	No additional water usage

Table 5. Compliant laboratory and medical equipment

Lab equipment	Requirement (IP)	Requirement (SI)
Reverse-osmosis water purifier	75% recovery	
Steam sterilizer	For 60 in sterilizer: 6.3 gal/U.S. tray For 48 in sterilizer: 7.5 gal/U.S. tray	For 1,520 mm sterilizer: 28.5 liters/DIN tray For 1,220 mm sterilizer: 28.35 liters/DIN tray

Lab equipment	Requirement (IP)	Requirement (SI)
Sterile process washer	0.35 gal/U.S. tray	1.3 liters/DIN tray
X-ray processor, 150 mm or more in any dimension	Film processor water-recycling unit	
Digital imager, all sizes	No water use	

To use Table 6, the project must be connected to a municipal or district steam system that does not allow the return of steam condensate.

Table 6. Compliant municipal steam systems

Steam system	Requirement
Steam condensate disposal	Cool municipally supplied steam condensate (no return) to drainage system with heat recovery system or reclaimed water
OR	
Reclaim and use steam condensate	100% recovery and reuse

AND/OR

Option 4. Outdoor Water Use (1–2 points)

PATH 1. NO IRRIGATION (2 POINTS)

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OR

PATH 2. EFFICIENT IRRIGATION (1–2 POINTS)

Reduce the project's theoretical irrigation requirement (TIR) by at least 50% from the calculated baseline. Points are awarded according to Table 7.

Table 7. Points for reducing outdoor water use

Percentage reduction	Points
50%	1
100%	2

AND/OR

Option 5. Optimize Process Water Use (1–2 points)

PATH 1. LIMIT COOLING TOWER CYCLES (1–2 POINTS)

For cooling towers and evaporative condensers, conduct a one-time potable water analysis, measuring at least the five control parameters listed in Table 8.

Table 8. Maximum concentrations for parameters in condenser water

Parameter	Maximum level
Ca (as CaCO3)	600 ppm*
Total alkalinity	500 ppm

Parameter	Maximum level
SiO2	150 ppm
Cl–	300 ppm
Conductivity	3300 µS/cm**

*ppm = parts per million

**µS/cm = micro siemens per centimeter

Calculate the maximum number of cooling tower cycles by dividing the maximum allowed concentration level of each parameter by the actual concentration level of each parameter found in the potable makeup water analysis. Limit cooling tower cycles to avoid exceeding maximum values for any of these parameters.

The materials of construction for the water system that contact the cooling tower water must be of the type that can operate and be maintained within the cycles established in Table 9. Points are awarded according to Table 9.

Table 9. Points for cooling tower cycles

Cooling tower cycles	Points
Maximum number of cycles achieved without exceeding any maximum concentration levels or affecting operation of condenser water system.	1
Meet the maximum calculated number of cycles to earn 1 point and increase the number of cycles by a minimum of 25% by increasing the level of treatment and/or maintenance in condenser or makeup water systems. OR Meet the maximum calculated number of cycles to earn 1 point and use a minimum 20% alternative water.	2

Projects whose cooling is provided by district cooling systems are eligible to achieve Path 1 if the district cooling system complies with the above requirements.

OR

PATH 2. OPTIMIZE WATER USE FOR COOLING (1–2 POINTS)

To be eligible for Option 2, the baseline system designated for the building using *ASHRAE 90.1-2019 or 90.1-2022*, Appendix G, Table G3.1.1-3, must include a cooling tower (systems 7, 8, 11, 12, and 13).

Achieve increasing levels of cooling tower water efficiency beyond a water-cooled chiller system with axial variable-speed fan cooling towers having a maximum drift of 0.002% of recirculated water volume and three cooling tower cycles. Points are awarded according to Table 10.

Table 10. Points for reducing annual water use compared to water-cooled chiller system

Percentage reduction	Points
25%	1
50%	2

Projects whose cooling is provided by district cooling systems are eligible to achieve Path 2 if the district cooling system complies with the above requirements.

OR

PATH 3. PROCESS WATER USE (1–2 POINTS)

Demonstrate that the project is using a minimum of 20% alternative water to meet the process water demand for 1 point or that the project is using a minimum of 30% alternative water to meet process water demand for 2 points. Ensure that alternative water is of sufficient quality for its intended end use.

Process water uses eligible for achievement of Path 3 must represent at least 10% of total building regulated water use and may not include water used for cooling.

AND/OR

Option 6. Water Reuse (1–2 points)

PATH 1. REUSE-READY SYSTEM (1 POINT)

Install a water supply system to allow the supply of reclaimed or alternative water to reach one or more of the following end uses. Space shall be provided for treatment equipment as applicable to end uses.

OR

PATH 2. ALTERNATIVE WATER SOURCES (2 POINTS)

Incorporate one of the following water reuse strategies for indoor, outdoor, and/or process water that meets the needs of one or more end uses for the building and grounds:

- On-site water reuse system
- Municipally supplied reclaimed water

Eligible end uses for Paths 1 and 2 include irrigation; flush fixtures; makeup water systems, such as cooling towers or boilers; or other process water systems.

REQUIREMENTS: CORE AND SHELL

Achievement pathways	Points
Core and Shell	1–7
Option 1. Whole-Project Water Use	1–7
OR	
Option 2. Fixtures and Fittings–Calculated Reduction	1–3
AND/OR	
Option 3. Appliances and Process Water	1–2
AND/OR	
Option 4. Outdoor Water Use	1–3
Path 1. No Irrigation	3
OR	
Path 2. Efficient Irrigation	1–3
AND/OR	
Option 5. Optimize Process Water Use	1–3
Path 1. Limit Cooling Tower Cycles	1–3
OR	
Path 2. Optimize Water Use for Cooling	1–3
OR	
Path 3. Process Water Use	1–2
AND/OR	
Option 6. Water Reuse	1–2
Path 1. Reuse-Ready System	1
OR	
Path 2. Alternative Water Sources	2

Implement a combination of the strategies below for a maximum of 7 points. Projects may either attempt Option 1 or any combination of Options 2–6 below.

Option 1. Whole-project Water Use (1–7 points)

To pursue this pathway, project teams must develop a water use baseline and create a proposed use model. Points are achieved based on reductions from the baseline in Table 11.

Table 11. Points for reducing overall project water use

Percent reduction	Points	Total points for alternative water
30%	1	2
35%	2	3
40%	3	4
45%	4	5
50%	5	6
55%	6	7
60%	7	–

OR

Option 2. Fixtures and Fittings — Calculated Reduction (1–3 points)

Further reduce fixture and fitting water use from the calculated baseline in *WEp2: Minimum Water Efficiency, Minimum Fixture and Fittings Efficiency, Path 2, Performance Path — Calculated Reductio*n. Additional potable water savings can be earned above the prerequisite level using alternative water sources. Points are awarded according to Table 12.

Table 12. Points for reducing indoor water use

Percentage reduction	Points
30%	1
35%	2
40%	3

AND/OR

Option 3. Appliances and Process Water (1–2 points)

Newly installed equipment within the project boundary must meet the minimum requirements in Tables 13, 14, 15, and/or 16. 1 point is awarded for meeting all applicable requirements in any one table for a maximum of 2 points. All applicable, newly installed equipment listed in each table must meet the standard. Existing appliances and equipment can be excluded.

To use Table 13, the project must process at least 120,000 lbs. (57,606 kg) of laundry per year.

Table 13. Compliant commercial washing machines

Washing machine	Requirement (IP)	Requirement (SI)
On-premise, minimum capacity 2,400 lbs. (10,886 kg) per 8-hour shift	Maximum 1.8 gal per pound*	Maximum 7 liters per 0.45 kg*

*Based on equal quantities of heavily, medium, and lightly soiled laundry.

To use Table 14, the project must serve at least 100 meals per day of operation.

Table 14. Standards for compliant commercial kitchen equipment

Commercial kitchen equipment		Requirement (IP)	Requirement (SI)
Dishwasher	Undercounter	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Stationary, single tank, door	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Single tank, conveyor	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Multiple tank, conveyor	ENERGY STAR®	ENERGY STAR® or performance equivalent

Commercial kitchen equipment		Requirement (IP)	Requirement (SI)
	Flight machine	ENERGY STAR®	ENERGY STAR® or performance equivalent
Food steamer	Boilerless/ connectionless	≤ 1.7 gal/hr/pan, including condensate cooling water	≤ 6.4 liters/hr/pan including condensate cooling water
	Steam generator	≤ 2.2 gal/hr/pan, including condensate cooling water	≤ 8.3 liters/hr/pan including condensate cooling water
Combination oven	Countertop or stand	ENERGY STAR®	ENERGY STAR® or performance equivalent
	Roll-in	ENERGY STAR®	ENERGY STAR® or performance equivalent
Food waste disposer	Disposer	3–8 gpm, full load condition; 10-minute automatic shutoff or 1 gpm, no-load condition	11–30 lpm, full load condition; 10-minute automatic shutoff or 3.8 lpm, no-load condition
	Scrap collector	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Pulper	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Strainer basket	No additional water usage	No additional water usage

Table 15. Compliant laboratory and medical equipment

Lab equipment	Requirement (IP)	Requirement (SI)
Reverse-osmosis water purifier	75% recovery	
Steam sterilizer	For 60 in sterilizer: 6.3 gal/U.S. tray For 48 in sterilizer: 7.5 gal/U.S. tray	For 1,520 mm sterilizer: 28.5 liters/DIN tray For 1,220 mm sterilizer: 28.35 liters/DIN tray
Sterile process washer	0.35 gal/U.S. tray	1.3 liters/DIN tray
X-ray processor, 150 mm or more in any dimension	Film processor water recycling unit	
Digital imager, all sizes	No water use	

To use Table 16, the project must be connected to a municipal or district steam system that does not allow the return of steam condensate.

Table 16. Compliant municipal steam systems

Steam system	Requirement
Steam condensate disposal	Cool municipally supplied steam condensate (no return) to drainage system with heat recovery system or reclaimed water
OR	
Reclaim and use steam condensate	100% recovery and reuse

AND/OR

Option 4. Outdoor Water Use (1–3 points)

PATH 1. NO IRRIGATION (3 POINTS)

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OR

PATH 2. EFFICIENT IRRIGATION (1–3 POINTS)

Reduce the project's theoretical irrigation requirement (TIR) by at least 50% from the calculated baseline. Points are awarded according to Table 17.

Table 17. Points for reducing outdoor water use

Percentage reduction	Points
50%	1
75%	2
100%	3

AND/OR

Option 5. Optimize Process Water Use (1–3 points)

PATH 1. LIMIT COOLING TOWER CYCLES (1–3 POINTS)

For cooling towers and evaporative condensers, conduct a one-time potable water analysis, measuring at least the five control parameters listed in Table 18.

Table 18. Maximum concentrations for parameters in condenser water

Parameter	Maximum level
Ca (as $CaCO_3$)	600 ppm*
Total alkalinity	500 ppm
SiO_2	150 ppm
Cl^-	300 ppm
Conductivity	3300 µS/cm**

*ppm = parts per million

**µS/cm = micro siemens per centimeter

Calculate the maximum number of cooling tower cycles by dividing the maximum allowed concentration level of each parameter by the actual concentration level of each parameter found in the potable makeup water analysis. Limit cooling tower cycles to avoid exceeding maximum values for any of these parameters.

The materials of construction for the water system that come into contact with the cooling tower water shall be of the type that can operate and be maintained within the cycles established in Table 19. Points are awarded according to Table 19.

Table 19. Points for cooling tower cycles

Cooling tower cycles	Points
Maximum number of cycles achieved without exceeding any maximum concentration levels or affecting operation of condenser water system.	1
Meet the maximum calculated number of cycles to earn 1 point and increase the number of cycles by a minimum of 25% by increasing the level of treatment and/or maintenance in condenser or makeup water systems. OR Meet the maximum calculated number of cycles to earn 1 point and use a minimum 20% alternative water.	2
Meet the maximum calculated number of cycles to earn 1 point and increase the number of cycles by a minimum of 30% by increasing the level of treatment and/or maintenance in condenser or makeup water systems. OR Meet the maximum calculated number of cycles to earn 1 point and use a minimum 30% alternative water.	3

Projects whose cooling is provided by district cooling systems are eligible to achieve Path 1 if the district cooling system complies with the above requirements.

OR

PATH 2. OPTIMIZE WATER USE FOR COOLING (1–3 POINTS)

To be eligible for Path 2, the baseline system designated for the building using *ASHRAE 90.1–2019 or 90.1–2022*, Appendix G, Table G3.1.1–3, must include a cooling tower (systems 7, 8, 11, 12, and 13).

Achieve increasing levels of cooling tower water efficiency beyond a water-cooled chiller system with axial variable-speed fan cooling towers having a maximum drift of 0.002% of recirculated water volume and three cooling tower cycles. Points are awarded according to Table 20.

Table 20. Points for reducing annual water use compared to water-cooled chiller system

Percentage reduction	Points
25%	1
50%	2

Percentage reduction	Points
100%	3

Projects whose cooling is provided by district cooling systems are eligible to achieve Path 2 if the district cooling system complies with the above requirements.

OR

PATH 3. PROCESS WATER USE (1–3 POINTS)

Demonstrate that the project is using at minimum 20% alternative water to meet process water demand for 1 point, using at minimum 30% alternative water to meet process water demand for 2 points, or using at minimum 40% alternative water to meet process water demand for 3 points. Ensure that alternative water is of sufficient quality for its intended end use.

Process water uses eligible for achievement of Path 3 must represent at least 10% of total building regulated water use and may not include water used for cooling.

Projects served by district systems are eligible to achieve Path 3 if the district system complies with minimum thresholds for alternative water use.

AND/OR

Option 6. Water Reuse

PATH 1. REUSE-READY SYSTEM (1 POINT)

Install a water supply system to allow the supply of reclaimed or alternative water to reach one or more of the following end uses. Space shall be provided for treatment equipment as applicable to end uses.

OR

PATH 2. ALTERNATIVE WATER SOURCES (2 POINTS)

Incorporate one of the following water reuse strategies for indoor, outdoor, and/or process water that meets the needs of one or more end uses for the building and grounds:

- On-site water reuse system
- Municipally supplied reclaimed water

Eligible end uses for Paths 1 and 2 include irrigation, flush fixtures, makeup water systems such as cooling towers or boilers, or other process water demand.

REQUIREMENTS EXPLAINED

The credit builds on *WEp2: Minimum Water Efficiency* and rewards teams for additional water conservation strategies. New Construction projects that pursue Option 1 can achieve up to eight points for the whole project's water use reductions, and those that pursue Options 2–6 can achieve up to eight points by combining any of the strategies outlined in the Rating System. Core and Shell projects that pursue Option 1 can achieve up to seven points for whole project water use reductions, or up to seven points for any combination of Options 2–6. Projects cannot combine Option 1 with Options 2–6.

Option 1. Whole-project Water Use

Quantifying whole project water use and developing strategies to reduce consumption across the entire project can lead to significant water savings. Analyzing all water sources enables teams to identify large consumers and target both conservation and alternative water strategies.

Projects must demonstrate a minimum of 30% reduction from the project's baseline to earn points. Using alternative water sources earns additional points for the calculated reductions.

Develop a Water Balance Model

Teams must calculate the building's water demand and develop baseline and design case water balance models. Models must account for all end uses within the project's scope of work, including fixtures and fittings, domestic hot water, appliances, commercial kitchen and laundry equipment, laboratory and medical equipment, process water, HVAC systems, and landscape irrigation.

BASELINE REQUIREMENTS

The baseline model reflects the minimum requirements and typical water use for the project type without any additional water-savings measures.

For fixtures and fittings, determine the baseline using a *USGBC*-approved calculator, as described in *WEp2: Minimum Water Efficiency, Option 2. Performance Path — Calculated Reduction.*

Baseline values for appliances, kitchen equipment, as well as laboratory and medical equipment must align with Tables 13–15 of this credit.

For cooling towers, the baseline water model represents the water use associated with the minimum number of cooling tower cycles, such that parameters do not exceed the values of Table 18.

For outdoor water use, determine the baseline water consumption by calculating the project's TIR, as outlined in *WEp2: Minimum Water Efficiency*, Minimum Outdoor Water Use Efficiency, Option 2. Efficient Irrigation. Projects that do not use irrigation in the design compare the as-designed condition to a baseline TIR.

DESIGN CASE REQUIREMENTS

The design case water model must use fixtures and fittings, appliances, kitchen equipment, and laboratory and medical equipment as specified within the contract documents. For outdoor water use, determine the actual water used on-site.

Projects with alternative water sources

Use of alternative water sources can be highly effective in reducing potable water demand and utility costs associated with the building and site. Projects that use alternative water sources achieve one additional point for each threshold met under Table 1. For example, a project that reduces potable water consumption by 30% earns one point. A project that reduces potable water consumption by 30% and uses an alternative water source to achieve those reductions earns two points.

Teams should always prioritize water efficiency first to reduce consumption and demand before applying alternative water solutions. For any seasonally dependent sources, such as rainwater, calculations must reflect annual, seasonal totals to confirm the available quantity of the alternative water source.

Projects pursuing Options 2–6

New Construction projects may earn up to eight points by combining strategies from Options 2–6, while Core and Shell projects may earn up to seven points by pursuing Options 2–6. Projects with limited scope, or projects that use targeted reductions by equipment or system type, should review Option 1 and all relevant Options 2–6 to determine the approach that maximizes points for this credit.

Option 2. Fixtures and Fittings — Calculated Reduction

Option 2 focuses on reducing potable water use from fixtures and fittings. Using the baseline and designed water usage calculations determined from *WEp2: Minimum Water Efficiency*, *Minimum Fixture and Fittings Efficiency, Path 2. Performance Path — Calculated Reduction*, projects earn points for additional savings beyond the 20% requirements, based on specific fixture flow and flush rates. You must calculate using a USGBC-approved calculator.

Along with the use of high-efficiency fixtures and fittings, projects that use alternative water sources for these systems can report further savings and achieve additional points under this option.

AND/OR

Option 3. Appliance and Process Water

Option 3 rewards projects that prioritize water-efficient appliances and process equipment. Projects earn one point for meeting prescriptive water use requirements in a single equipment category, for up to 2 total points.

Tables 13–16 outline the prescriptive measures for appliances and process equipment. All newly installed equipment must meet the referenced standards, performance equivalents (outside of the U.S.), and/or water use limits. Exclude existing appliances and equipment.

Projects that do not include any applicable systems in their scope of work, or projects that can document compliance with more than two tables, should review the project's whole water balance model from *WEc2: Enhanced Water Efficiency*, Option 1. Whole Project Water Use, as it may optimize points for this credit.

AND/OR

Option 4. Outdoor Water Use

There are two paths to earn credit for outdoor water use. Path 1 rewards projects that do not use permanent irrigation beyond the initial two-year establishment period. Projects that include irrigation can earn points by reducing water use from the project's baseline requirements using native or adapted plants and vegetation, alternative water, and/or smart irrigation controls.

PATH 1. NO IRRIGATION

Projects complying with *WEp2: Minimum Water Efficiency, Minimum Outdoor Water Use Efficiency*, Option 1. No irrigation automatically earns 2 points.

PATH 2. EFFICIENT IRRIGATION

WEc2: Enhanced Water Efficiency, Path 2. Efficient Irrigation directly links to *WEp2: Minimum Water Efficiency, Minimum Outdoor Water Use Efficiency, Option 2. Efficient Irrigation*. New Construction projects that achieve a 50% or 100% reduction in irrigation earn up to 2 points, while Core and Shell projects that achieve a 50%, 75%, or 100% reduction may earn up to 3 points. Proven solutions include alternative water sources, like reclaimed water or rainwater harvesting, and the use of smart scheduling technology. Calculations completed for *WEp2:*

Minimum Water Efficiency, Minimum Outdoor Water Use Efficiency, Option 2. Efficient Irrigation must prove the reduction from the calculated baseline using the annual TIR.

Include all landscaped areas in the irrigation calculations. However, teams may exclude irrigation for vegetated playgrounds, athletic fields, food gardens, and urban agricultural areas from the calculations.

AND/OR

Option 5. Optimize Process Water Use

Cooling towers and industrial processes use a significant amount of potable water. Projects that include these systems must consider opportunities to reduce concentration cycles or optimize water use for cooling or select alternative water sources.

Process water uses include, but are not limited to, cooling, humidification, sterilization, dishwashers, clothes washers, and pools. This option offers three pathways, which depend on the type of process water use. Path 3 also requires that process water use meets a minimum percentage of the total building water use.

PATH 1. LIMIT COOLING TOWER CYCLES

This path prioritizes water conservation for cooling towers by limiting the cycles of concentration from the equipment. A cycle of concentration is the number of times water can circulate through the system without creating performance or operational problems. A low cycle of concentration means more single-use water passes through the system, resulting in excess water consumption. However, as we reuse water, dissolved solids remain, which increases the concentration levels of calcium, silicon dioxide (SiO_2), and chloride. Higher cycles of concentration may result in scaling and corrosion issues.

The intent of the credit is not to impact system operations, but to inform designers on alternative solutions for reducing water consumption for cooling processes. Finding the correct balance of cooling tower blowdown and chemical treatment maintains system efficiency, reduces maintenance, and conserves potable water.

For each cooling process, conduct a potable water analysis to determine set points for the chemical treatment system and the associated cycles of concentration. Teams must confirm that the systems will operate at the specified cycles of concentration and not exceed parameters outlined in Table 18.

Projects with alternative water sources
Projects using alternative water sources do not require a one-time water analysis. Using a minimum of 20% alternative water can help projects earn two points, as long as the maximum calculated number of cycles is also met.

Projects in a campus environment
Projects in a campus environment, or those supplied by a district cooling system, may comply with Path 1 if the district system conducts a potable water analysis and limits the cycles of concentration for its system. Projects can determine compliance at the district level by working with the utility provider.

PATH 2. OPTIMIZE WATER USE FOR COOLING

Path 2 has minimum eligibility requirements. Using *ASHRAE Standard 90.1–2019* (or later), Appendix G. Performance Rating Method, Table G3.1.1–2, confirm that the project's baseline case includes chilled water for cooling and cooling towers in the baseline design. Table 21 outlines the eligible baseline systems from Appendix G.

Projects pursuing this path do not require an Appendix G energy model. Other tools can help perform water-use calculations.

Table 21. ASHRAE Standard 90.1–2019, Appendix G Compliant Baseline Systems

System number	System description
7	VAV with reheat
8	VAV with parallel fan-powered boxes and reheat.
11	Single-zone VAV system with water-cooled chillers
12	Single-zone constant volume system with water-cooled chillers and a hot-water fossil-fuel boiler
13	Single-zone constant volume system with water-cooled chillers and electric resistance heat.

Projects can demonstrate a 100% reduction from baseline if the Appendix G baseline includes a cooling tower and the final design eliminates the need for a cooling tower.

Projects may benefit from a combination of strategies to reduce water consumption for the cooling system. Strategies include maximizing cycles of concentration, increased levels of chemical treatment, smart controls for monitoring and optimization, drift eliminators, flow meters, and water-level controls.

Projects in a campus environment
For campus environments or projects that receive cooling from a district cooling system, projects meet the requirements of Path 2 if the district system meets the reduction thresholds. Projects should consider working with their utility provider to determine compliance at the district system level.

PATH 3. PROCESS WATER USE

Projects pursuing this path must demonstrate that process water use exceeds 10% of the total building-regulated water use, excluding cooling water.

Using alternative water sources, such as captured condensate from air handling units, reduces reliance on fresh water for process systems. Diversifying the water sources on a project site builds resilience in buildings. This allows projects to divert freshwater for human consumption instead of processes during a water crisis.

When selecting the alternative water source, ensure that the quality of the water is sufficient for its intended use and that the local AHJ allows that alternative water source, per local codes and standards.

AND/OR

Option 6. Water Reuse

Option 6 provides two paths to achieve points for water reuse strategies. Projects must choose a single path and cannot combine these paths for more points.

Path 1 rewards projects that install systems allowing the future supply of reclaimed or alternative water sources to at least one specific end use. Path 2 rewards projects that implement water reuse strategies on-site and/or use reclaimed or alternative water supplied by municipalities.

The project must include water reuse for at least one end use listed below. Implementing alternative or reclaimed water sources for as many systems as possible significantly contributes to potable water conservation efforts.

- Irrigation
- Flush fixtures (urinals, water closets)
- Make-up water systems (including cooling towers and boilers)
- Other process water systems

PATH 1. REUSE-READY SYSTEM

Path 1 rewards a project for preparing for a future transition to water reuse systems. Planning for water reuse systems early in design allows project teams to optimize solutions for the greatest impact. Through this process, teams determine strategies that reduce the demand and consumption of potable water use in the building and on the project site. The use of reclaimed or alternative water sources allows projects to reduce potable water for end uses not intended for human consumption, such as water closet flushing and make-up water for process systems.

Designing for future infrastructure
Including reclaimed or alternative water supply infrastructure allows for an easier transition when sources become available for public use. The inclusion of these systems in new construction projects also results in economic benefits. Planning for future water treatment equipment enables projects to efficiently design the equipment room to allow for future equipment, which reduces long-term costs to integrate alternative water supply infrastructure. Operational savings result from lower utility costs since alternative water sources are often a lower-cost option.

The credit does not require that projects install physical connections to each flush fixture or make-up line. However, creating a plug-and-play system is highly recommended to limit future major renovations.

PATH 2. ALTERNATIVE WATER SOURCES

Option 2 rewards teams for implementing solutions to reduce reliance on potable water by using alternative water for indoor, outdoor, and/or process water systems.

The project must also meet all metering and commissioning requirements as outlined in *WEp1: Water Metering and Reporting*, *EAp3: Fundamental Commissioning*, and *EAc5: Enhanced Commissioning* (if pursued).

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Whole Building Water Use	All	*LEED v5 Whole Project Water Use* calculator.
			Contract documents and manufacturer information support the baseline and proposed water use values in the calculator.
		All	*LEED v5 Fixture and Fittings Efficiency* calculator.

Project types	Options	Paths	Documentation
	Option 2. Fixtures and Fittings		Contract documents showing the project’s alternative water system details, location, and capacity.
	Option 3. Appliance and Process Water	All	Contract document(s) specifying the project’s newly installed commercial washing machines, commercial food waste disposers, commercial laboratory and medical equipment, and/or municipal steam systems and process water equipment, as applicable, including performance specifications.
	Option 5. Optimize Process Water Use	Path 1. Limit Cooling Tower Cycles	Results from the potable water analysis for cooling towers and evaporative condensers. Include the concentration levels for all five parameters listed in Table 8 of the Rating System.
		Path 2. Optimize Process Water Use	Equipment schedule indicating cooling tower type.
			Calculation shows the baseline process water use.
			Calculation shows the design process, water use, including any alternative water savings.
		Path 3. Process Water Use	Total % of processed water use in building.
			Description of systems included in the project that accounts for more than 10% of the total building regulated water use (excluding cooling water).
			Calculation shows the baseline process of water use.
			Calculation showing the design process water use, including any alternative water savings.
	Option 6. Water Reuse	Path 1. Reuse-ready System	Contract documents identify with the space provided for future treatment equipment.
		Path 2. Alternative Water Source	Identification of the alternative water source (onsite water reuse system or municipally supplied reclaimed water).
			Identification of which eligible end-use(s) the water reuse system meets the needs (irrigation, flush fixtures, makeup water systems, such as cooling towers or boilers, or other process water demand).
			Contract documents highlighting the details of the alternative water source system(s) details.

REFERENCED STANDARDS

- ENERGY STAR® (energystar.gov)

ENERGY AND ATMOSPHERE (EA)

OVERVIEW

As of 2025, buildings are responsible for one-third of global energy emissions, accounting for over 34% of energy demand and approximately 37% of energy and process-related carbon emissions.[88] Stabilizing the climate requires the world to decarbonize its new and existing building by 2050.

Many regions have identified zero energy and zero carbon goals, targeting 2030 for new construction and by 2050 for existing buildings.[89] Thankfully, there are now time-tested and cost-effective strategies to reach these goals. The market now knows how to design and construct the low-carbon buildings of the future.

Well-designed, constructed, and operated buildings use less energy, produce fewer emissions, and increase their resilience to disruptions like power outages or extreme weather events. *LEED v5's Energy and Atmosphere (EA)* credit category aims to make low-carbon buildings easy to achieve by increasing carbon literacy and providing a clear framework for all buildings to significantly reduce or eliminate emissions, achieve greater energy independence and security, and lower operational energy costs.

As businesses and regulatory agencies prioritize resilience and sustainability in their financial and social continuity planning, decarbonization is becoming an integral priority for leaders worldwide.

Decarbonization

LEED v5 drives decarbonization. Over half of the LEED v5 credits supporting decarbonization are in the EA category. By capitalizing on technological advances and industry expertise, project teams can use EA prerequisites and credits to create more value for owners, occupants, and communities.

First, LEED v5 helps increase the carbon literacy of design teams. In *EAp1: Operational Carbon Projection and Decarbonization Plan*, project teams develop a visual prediction of future carbon emissions showing annual carbon emissions will reduce over time due to the decarbonization of

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[88] "2022 Global Status Report for Buildings and Construction." UN Environment Programme, November 2022, https://www.unep.org/resources/publication/2022-global-status-report-buildings-and-construction.

[89] Taryn Holowka, "Support the Net Zero Carbon Buildings Commitment", U.S. Green Building Council, August 2022, https://www.usgbc.org/articles/support-net-zero-carbon-buildings-commitment.

most electric grids. This is different from energy use, which stays constant in the no-change scenario. In addition, time doesn’t impact all sources equally. The annual emissions from electricity use will nearly vanish with a fully decarbonized grid, while those from onsite combustion will remain unchanged, an essential distinction for approaching neutrality by 2050.

Then, through the credits of the EA category, LEED v5 provides a simple framework for designing zero carbon-ready buildings. Through the EA category, this framework lays out three critical steps and four additional strategies for decarbonization are inherent to the building itself, such as better envelopes and electrified heating systems, which must be incorporated from the beginning of the project. The four additional strategies build upon the primary strategies while providing significant carbon impacts.

The three critical steps are electrification, reduced peak thermal loads, and energy efficiency. Electrification is a new credit within LEED v5. As electrical grids decarbonize, the carbon emissions from electrical usage will drastically decrease. However, the emissions from fuel-powered systems in buildings — usually for space heating and service hot water — will remain. Replacing those fuel-powered systems with electrically powered equipment, which can provide heat efficiently, will help emissions shrink to near zero by 2050.

The *EAc1: Electrification* credit rewards projects that electrify as many of their systems as possible, while providing compliance options for operations during extreme low temperatures and emergency backup systems.

EAc2: Reduce Peak Thermal Loads is another new credit within LEED v5 and a key step to decarbonization. Grid demand will rise as buildings, vehicles, and industries transition from on-site combustion to electricity. By reducing peak thermal loads, project teams can increase the building’s resilience to extreme temperatures and reduce demand on the electrical grid. This credit incentivizes projects to mitigate these peaks.

The third step is energy efficiency — a cornerstone of LEED and high-performing buildings. All LEED v5 projects start with a baseline of energy efficiency, pairing climate zone-appropriate building envelopes with building systems and management practices (*EAp2: Minimum Energy Efficiency*, *EAp4: Energy Metering and Reporting*, and *EAp3: Fundamental Commissioning*).

Energy efficiency provides critical benefits, including lower operational costs, less damage due to the extraction and transport of fuels, less air pollution and accompanying health issues. Efficiency reduces carbon emissions — even from electricity — because most grids aren’t carbon neutral yet and won’t be soon. For teams that prefer an alternative to energy modeling, LEED v5 offers a new prescriptive option for the full achievement of points. (*EAc3: Enhanced Energy Efficiency*).

The additional decarbonization strategies represent industry-leading best practices, found in *EAc5: Enhanced Commissioning*, *EAc4: Renewable Energy*, and *EAc6: Grid Interactive*, as well as in the prerequisite and credit for Refrigerant Management. Carried over from earlier versions of LEED and refined in LEED v5, these approaches continue to be highly effective in reducing carbon emissions and minimizing energy waste.

LEED v5 Platinum-certified projects will achieve industry best practices for energy efficiency, eliminate on-site combustion (except for emergency and backup needs), use 100% renewable energy, and reduce embodied carbon.

Quality of life

When buildings reduce emissions and energy demand while using technology to communicate with the grid, they'll ensure optimal operations. These measures also enhance the value they serve to the community. Teams are encouraged to work toward reducing air leakage from the envelope and mechanical systems while incentivizing energy storage opportunities (*EAc2: Reduce Peak Thermal Loads, EAc6: Grid Interactive*). Combining these strategies with an energy-efficient design and electrified operations can lead to a more resilient and reliable building.

LEED v5 EA prerequisites and credits provide clear paths to greater efficiency and reduced costs and emissions. These tactics help enhance energy and carbon literacy in the building industries, empowering communities to achieve energy and carbon neutrality by 2050.

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Prerequisite

OPERATIONAL CARBON PROJECTION AND DECARBONIZATION PLAN

EAp1

REQUIRED

New Construction
Core and Shell

INTENT

To enable building stakeholders to visualize how their current design decisions will impact their project’s long-term operational carbon emissions and to ensure that stakeholders are planning for low-carbon outcomes from the project’s inception.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Design Analysis	
AND	
Site Energy Estimate	
AND	
Review Carbon Projection	
AND	
Decarbonization Plan	
Path 1. Design for Electrification	
OR	
Path 2. Plan for Decarbonization	

Comply with the following requirements:

Design Analysis

Analyze efficiency, peak load reduction, and decarbonization measures during the early stages of the design process and account for the results in design decision-making using at least one of the following methodologies:

- Simplified energy modeling
- Analysis from similar projects
- Analysis from published data

AND

Site Energy Estimate

Estimate the amount of each type of energy the project will use annually in terms of site energy and submit the data to USGBC.

AND

Review Carbon Projection

Using the annual energy use data submitted, the project's current grid data, and the project's location, USGBC will generate a business as usual (BAU) projection of the project's carbon emissions from energy use from the present through a 25-year period.

Projects subject to a carbon-based building performance standard (BPS) must create an ordinance-specific BAU with a carbon projection based on the electrical coefficients as defined in the ordinance and with an overlay showing the caps applicable to the project. If applicable, calculate the assessed annual fines or fees that will apply for exceeding the caps, and the cumulative fines or fees over a 25-year period.

The building owner or owner's representative shall attest that they have reviewed the BAU carbon projections and fee projection.

AND

Decarbonization Plan

PATH 1. DESIGN FOR ELECTRIFICATION

Earn 4 or 5 points in *EAc1: Electrification*.

OR

PATH 2. PLAN FOR DECARBONIZATION

Create a plan detailing how decarbonization could be achieved through a 25-year period. The building owner or owner's representative shall attest that they have reviewed the decarbonization plan.

- The plan shall be a narrative no more than two pages in length.
- The narrative shall describe the retrofits to be made, with the approximate timeline and cost of each of the retrofit measures.
- Equipment and/or building materials that will be discarded due to the required retrofits should be described along with new equipment to be purchased.

- Electrification readiness strategies incorporated into the initial design should be described along with a rough estimate of the avoided cost, avoided disruption, and avoided materials waste afforded by each readiness measure. Core and Shell projects should incorporate strategies to support tenant build-out and address future retrofits after tenant build-out. Some common readiness strategies include oversizing electrical panels and/or service or installing conduit for future loads, enhanced envelope, or heating distribution systems that can accommodate the lower temperatures of future heat pumps.

REQUIREMENTS EXPLAINED: NEW CONSTRUCTION

To help design teams understand their carbon emissions over time, USGBC provides each project with a visualization of its projected emissions over the next 25 years in the business as usual (BAU) scenario. BAU is the scenario in which the building's operations don't change. The USGBC projection assumes that every grid will decarbonize by 95% over that period — a directionally correct approximation.

This exercise illustrates that carbon emissions from electricity will diminish to near zero over the next 25 years, emissions from onsite combustion will remain constant, and emissions from electricity are not zero now and won't be for some time, except for a few unique carbon-neutral grids.

This prerequisite has multiple requirements, working together to help project teams design more energy-efficient projects that shouldn't require expensive retrofits to achieve low-carbon outcomes.

Design Analysis

Teams must analyze energy conservation measures and carbon reduction strategies early in design, creating impactful and cost-effective solutions that integrate into the project. Collaborative discussions with architects, engineers, contractors, and owners can lead to a holistic approach to decarbonization.

Analyze design options and develop alternatives that optimize efficiency measures, reduce peak loads, and prioritize decarbonization. Even a simple box energy model, with minimal zoning and basic project details, can generate valuable feedback on building massing, orientation, HVAC system selection, and lighting power density.

Smaller, less complex projects aren't required to have an energy model in hopes of making LEED v5 more accessible. Teams may use prototype models that are specific to the project application. Teams can also use other models for large-scale analysis, such as the publicly available prototype models used to inform ASHRAE energy code development. Another solution would be using data from previous, similar projects. Comparing the project's design to projects of similar size, use, site, and climate zone can provide teams with a target or benchmark for developing a high-performing building.

Site Energy Estimate

Along with the initial design analysis, teams must estimate the project's annual site energy use from each energy source and submit this information to USGBC, which will use the data to create the BAU carbon projection — a fundamental part of this credit.

For teams developing an energy model for *EAp2: Minimum Energy Efficiency* or a simplified energy model, generate the required data from the simulation results. For teams that use similar projects or published data, establish estimates based on the predicted design conditions, including any designed optimization strategies.

Review Carbon Projection

USGBC provides all LEED BD+C: New Construction projects with a BAU projection of the project's operational carbon emissions over the next 25 years based on the site energy data provided and the project's current grid emissions factor. This BAU projection assumes that the grid emissions factor starts with the latest national or regional coefficient — such as the sub-regional eGRID coefficients in the U.S. — and declines in a straight line by 95% over the next 25 years. This step reflects the overall direction of global grid decarbonization and isn't an exact prediction of individual project performance.

The projection should educate owners and designers on the carbon impacts of their design decisions over the next 25 years. Owners must review the data and attest to the review.

Building performance standards

Depending on the project location, it may be subject to a building performance standard (BPS). These standards are carbon-based or EUI-based performance requirements that many U.S. cities and states have adopted. Typically, BPSs set caps on energy use or carbon emissions that decline over time. The project must meet those caps or face fees.

Projects subject to a carbon-based or EUI-based BPS must generate a BPS Carbon BAU or BPS Energy BAU, depending on which is applicable. Teams must overlay the BPS caps on the project's BAU projection and calculate the expected fees if they exceed the caps.

> **Additional requirements**
> Grid emissions factors, which step down over time, are often mandated in carbon-based BPSs. Use these values in the BPS Carbon BAU rather than USGBC's assumed grid emissions factors used in the BAU carbon projection.
>
> Understanding whether the project will meet the BPS requirements and, if not, the fees it may incur over the next 25 years can also impact key decisions during the design phase. The owner's review of this information provides awareness of the exposure to future fees.

Decarbonization Plan

If the current design has not been substantially electrified, projects must create a two-page decarbonization plan. The plan aims to inform design teams and building owners of the future costs and disruption they may incur when retrofits for all-electric equipment occur post-occupancy.

This requirement has two paths for compliance.

PATH 1. DESIGN FOR ELECTRIFICATION

Projects that have been substantially electrified, as documented by achieving four or five points in *EAc1: Electrification*, are exempt from having to create a plan since they have already been designed for the low-carbon future.

PATH 2. DECARBONIZATION PLAN

Projects without substantial electrification must create a plan outlining the future retrofits required to achieve substantial decarbonization as the grid decarbonizes. Developing this plan is meant to show project teams and building owners how much less expensive it would be to build it right the first time than to retrofit it later. The required retrofits would include invasive and expensive envelope improvements. The replacement of new, costly heating equipment and potentially new heating distribution systems might encourage design teams going through this exercise to amend their designs to avoid the worst avoidable future costs on this project or future projects.

The plan must detail a reasonable estimate of the future cost and effort of decarbonization, including engineering, architectural, and structural costs. For example, replacing natural gas heating equipment with electric heating equipment may include costs for power system upgrades and refrigerant and condensate piping in addition to the heat generation equipment.

Electrification readiness

Projects must consider electrification readiness strategies that would reduce costs and could be incorporated in the initial design. Beneficial solutions include adding extra electrical panels or oversizing panels to ensure adequate service for future loads. Installing conduits for the future loads will limit the amount of destructive renovation work.

REQUIREMENTS EXPLAINED: CORE AND SHELL

Design Analysis

Additional considerations for Core and Shell

Teams must analyze design options and develop alternatives to optimize efficiency measures, reduce peak loads, and prioritize decarbonization. For Core and Shell projects, perform the analysis based on anticipated occupancy type and associated energy end uses for the planned future tenant(s). For example, suppose the project is a Core and Shell office building. Teams must perform the analysis assuming office occupancy, and account for all lighting, plug and process equipment, and HVAC and service water heating capacity necessary to meet the tenant’s needs.

While the analysis must consider elements of the future tenant, the primary focus should be on the components and systems within the owner’s or developer’s scope of work. This includes the building envelope, common area HVAC systems, common area domestic hot water, electrical infrastructure, and any base building decisions that can impact the future tenant’s design choices for energy-using systems.

Decarbonization Plan

Additional considerations for Core and Shell

PATH 1. DESIGN FOR ELECTRIFICATION

To qualify for this path, projects must have sufficient systems installed in the base building scope of work. The scope must include enough capacity to meet future HVAC requirements for tenants. It must include systems or power infrastructure that meet service hot water requirements and potential process loads, like kitchen equipment. A project without these systems as part of the Core and Shell scope of work cannot use Path 1.

PATH 2. DECARBONIZATION PLAN

Incorporating assumptions about future tenants into the plan is important, but that's not the plan's main priority. The plan should focus on the base building and equipment elements within the scope of work. It should include some elements of preparing for future equipment electrification and retiring combustion-based equipment. For example, strategies like increased electrical panel capacity, adequate access for future equipment modernization, and identifying retrofit opportunities during tenant buildout/turnover.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All	All	Design analysis during the early project design phase analyzed energy efficiency, peak load reduction, and decarbonization strategies for their impact on long-term operational carbon emissions.
			Estimated total annual energy use of each energy source (electricity, natural gas chilled water, steam, etc.) and the annual energy use for each of the following end-uses: space heating; service hot water; cooking; cooling; refrigeration; ventilation; plug and process loads; other.
			For projects subject to BPS, provide ordinance-specific BAU carbon projection showing energy and/or carbon caps applicable to the project, and, if applicable, annual fines for exceeding caps over a 25-year period (only for projects subject to a building performance standard).
			Attest that design analysis was performed.
			Confirm building owner or owner's rep has reviewed the carbon projection.
			Provide supplied energy types and estimated annual amounts used.
	Decarbonization plan	Path 1	Achieve four or five points for *EAc1: Electrification*.
		Path 2	Evidence of a decarbonization plan with the required elements. Plan summary and excerpts are acceptable if the full plan exceeds two pages.

REFERENCED STANDARDS

- None.

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Prerequisite

MINIMUM ENERGY EFFICIENCY

EAp2

REQUIRED

New Construction
Core and Shell

INTENT

To promote resilience and reduce the environmental and economic harms of excessive energy use and greenhouse gas emissions by achieving a minimum level of energy efficiency.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Option 1. *ASHRAE 90.1-2019*	
OR	
Option 2. *ASHRAE 90.1-2022*	

Projects registering before January 1, 2028, may comply with either Option 1 or Option 2. Projects registering on or after January 1, 2028, must comply with Option 2.

Option 1. *ASHRAE 90.1-2019*

Comply with *ANSI/ASHRAE/IES Standard 90.1-2019* with addendum cr. Use any applicable compliance path in *ASHRAE 90.1*, Section 4.2.

For projects applying the Normative Appendix G, Performance Rating Method compliance path, the future source energy metric may be used in place of cost:

- Replace all references to cost with future source energy. Use an electric site-to-source energy conversion factor of 2.0 based on future projections for the U.S. A lower national average value may be used as applicable for projects outside of the U.S.
- Replace *ASHRAE 90.1-2019, Table 4.2.1.1, Building Performance Factors* (BPFs), with the BPFs derived for the future source energy metric in Table 1.

Table 1. ASHRAE 90.1-2019 — Equivalent building performance factors for a future source energy metric

Building type	**Climate zone**																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.74	0.69	0.73	0.70	0.73	0.70	0.71	0.70	0.63	0.70	0.71	0.69	0.68	0.70	0.70	0.68	0.68	0.68	0.74
Healthcare/hospital	0.72	0.72	0.73	0.73	0.74	0.71	0.72	0.74	0.71	0.72	0.73	0.71	0.74	0.73	0.80	0.73	0.77	0.78	0.79
Hotel/motel	0.72	0.71	0.72	0.71	0.71	0.70	0.71	0.73	0.72	0.71	0.73	0.73	0.71	0.73	0.74	0.70	0.72	0.70	0.70
Office	0.62	0.63	0.61	0.62	0.58	0.60	0.57	0.62	0.55	0.55	0.61	0.57	0.58	0.61	0.59	0.58	0.60	0.54	0.58
Restaurant	0.65	0.62	0.63	0.61	0.62	0.58	0.63	0.63	0.63	0.67	0.66	0.66	0.70	0.70	0.68	0.73	0.72	0.74	0.77
Retail	0.57	0.54	0.53	0.53	0.48	0.47	0.47	0.47	0.47	0.52	0.50	0.56	0.57	0.53	0.59	0.58	0.56	0.53	0.60
School	0.57	0.57	0.58	0.57	0.55	0.54	0.57	0.51	0.49	0.48	0.51	0.52	0.51	0.53	0.51	0.53	0.50	0.51	0.58
Warehouse	0.28	0.30	0.24	0.27	0.23	0.24	0.27	0.23	0.20	0.33	0.26	0.28	0.40	0.32	0.29	0.44	0.38	0.40	0.44
All others	0.65	0.62	0.64	0.62	0.57	0.54	0.57	0.56	0.58	0.59	0.57	0.60	0.60	0.59	0.65	0.62	0.62	0.61	0.64

Option 2. ASHRAE 90.1-2022

Comply with *ANSI/ASHRAE/IES Standard 90.1-2022*. Use any applicable compliance path in *ASHRAE 90.1*, Section 4.2.

For projects applying the Normative Appendix G, “Performance Rating Method compliance path, one of the following metrics may be used in place of “cost:”

- **Future source energy**
    - Replace all references to cost with future source energy. Use an electric site-to-source energy conversion factor of 2.0 based on future projections for the U.S. A lower national average value may be used as applicable for projects outside of the U.S.
    - Replace *ASHRAE 90.1-2022*, Table 4.2.1.1, Building Performance Factors (BPFs), with the BPFs derived for the future source energy metric in Table 2.
- Site energy or source energy documented using *ASHRAE 90.1-2022*, Informative Appendix I.

Table 2. ASHRAE 90.1-2022 — Equivalent building performance factors for a future source energy metric

Building type	**Climate zone**																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.64	0.59	0.62	0.60	0.61	0.59	0.61	0.60	0.49	0.57	0.59	0.56	0.55	0.57	0.57	0.55	0.55	0.55	0.60
Healthcare/hospital	0.64	0.64	0.66	0.65	0.66	0.63	0.64	0.65	0.63	0.64	0.65	0.62	0.64	0.62	0.69	0.63	0.68	0.69	0.70

Building type	Climate zone																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Hotel/motel	0.65	0.63	0.64	0.63	0.62	0.61	0.62	0.63	0.62	0.59	0.60	0.60	0.57	0.58	0.59	0.56	0.58	0.56	0.56
Office	0.54	0.54	0.53	0.54	0.49	0.52	0.49	0.52	0.45	0.46	0.52	0.47	0.48	0.51	0.48	0.48	0.50	0.45	0.49
Restaurant	0.61	0.58	0.58	0.57	0.57	0.54	0.58	0.59	0.57	0.62	0.61	0.61	0.65	0.64	0.63	0.67	0.66	0.69	0.72
Retail	0.47	0.45	0.44	0.44	0.40	0.39	0.37	0.39	0.36	0.40	0.41	0.42	0.45	0.43	0.46	0.44	0.43	0.42	0.46
School	0.52	0.53	0.53	0.53	0.51	0.51	0.53	0.48	0.46	0.43	0.48	0.47	0.45	0.49	0.46	0.46	0.44	0.44	0.48
Warehouse	0.25	0.25	0.21	0.24	0.20	0.21	0.24	0.20	0.17	0.30	0.22	0.25	0.36	0.28	0.25	0.40	0.34	0.36	0.40
All others	0.58	0.56	0.56	0.56	0.50	0.47	0.49	0.48	0.48	0.49	0.49	0.50	0.51	0.50	0.55	0.52	0.52	0.52	0.55

REQUIREMENTS EXPLAINED

Widely referenced in building codes and regulations, *ASHRAE Standard 90.1* determines the minimum energy efficiency required for prerequisite compliance.

Required ASHRAE Standard 90.1 Version

The required efficiency increases for project registrations beginning in 2028, stepping up from the *ASHRAE Standard 90.1-2019* to the more stringent *ASHRAE Standard 90.1-2022*. Compliance with *ASHRAE 90.1-2022* achieves a net average site energy savings of 14% compared to *ASHRAE 90.1-2019* when including savings for prescriptively required renewable energy.

Option 1. *ASHRAE 90.1-2019*

Only projects registered before January 1, 2028, can use *ASHRAE 90.1-2019*. Projects must apply Addendum cr, which requires a building envelope backstop for projects documented using the Energy Cost Budget Method (ECB) or Appendix G, Performance Rating Method. All other *ASHRAE 90.1-2019* addenda are optional.

Option 2. *ASHRAE 90.1-2022*

Projects registered after January 1, 2028, must use *ASHRAE 90.1-2022*.

Projects registered before January 1, 2028, can use the 2022 version of the standard to earn points under *EAc3: Enhanced Energy Efficiency*.

Summary of ASHRAE 90.1 Section 4.2.1 Compliance Paths

Projects must choose from one of the following compliance paths from *ASHRAE 90.1*, Section 4.2.1:

- Prescriptive Method
    - *ASHRAE 90.1-2019*, Section 5–10 (for projects applying Option 1)
    - *ASHRAE 90.1-2022*, Section 5–11 (for projects applying Option 2)
- Energy Cost Budget Method (ECB)
- Appendix G, Performance Rating Method (PRM)

ASHRAE 90.1 further distinguishes these three compliance paths for each type of construction:

- Section 4.2.1.1: New Buildings
- Section 4.2.1.2: Addition to Existing Buildings
- Section 4.2.1.3: Alterations of Existing Buildings (applicable to major renovations)

The path commonly referred to as the prescriptive method requires individual compliance with each referenced 90.1 section (building envelope, HVAC, service water heating, electrical power, lighting, other equipment, and in *ASHRAE 90.1-202*, additional efficiency requirements).

The Energy Cost Budget Method (ECB) and Appendix G, Performance Rating Method (PRM) offer greater flexibility in trading off performance between different systems. These methods rely on whole-building energy modeling, demonstrating that the proposed building performs at least as well as a project meeting the prescriptive requirements. For both methods, the building envelope backstop additionally constrains building envelope performance.

To pursue additional credit for regulated energy efficiency in *EAc3: Enhanced Energy Efficiency*, project teams must apply either the prescriptive method or the Appendix G, Performance Rating Method.

Key Changes in ASHRAE 90.1-2022

The following table briefly summarizes key changes to the *ASHRAE Standard* between the 90.1-2019 and 2022 publications. For a more comprehensive summary, refer to *ASHRAE 90.1-2022 Foreword* and *ASHRAE 90.1-2022*, Informative Appendix M Addenda Description.

Table 1. Key changes in ASHRAE 90.1-2022

Section	Key change
Additional efficiency requirements Section 11	For the prescriptive method of compliance, designers select from a list of 33 energy efficiency measures to satisfy the total required Energy Credits for a given building type and climate zone, resulting in an average of 4% to 5% savings. These additional savings are also accounted for when determining the Energy Cost Budget Method requirements and in the Building Performance Factors referenced for the Appendix G Performance Rating Method.
On-Site Renewable Energy Section 10.5.1.1	On-site renewable energy is required for the prescriptive method, averaging over 4% savings. The Energy Cost Budget Method and Appendix G Performance Rating Method factors in this prescriptive renewable contribution in determining compliance, although other efficiency measures can make up the difference for project designs without renewable energy. **Exceptions to On-Site Renewable Requirements** *ASHRAE 90.1*, Section 10.5.1.1 exempts buildings with inadequate access to solar energy and small buildings with less than 10,000 sq. ft. (929 sq. m.) of conditioned floor area for the three largest floors. The following additional guidance applies to LEED projects: • Where regulatory limitations restrict maximum rooftop solar capacity, use the lesser of the Section 10.5.1.1 criteria or the maximum capacity or area stipulated by regulatory limitations. • Canadian provinces and U.S. eGRID regions aren't required to have on-site renewable. It’s also not required in other countries where current annual electric grid emissions average less than 20 grams/kWh CO2eq. • *ASHRAE 90.1-2022*, Addendum K provides additional alternatives for projects to find off-site renewable energy meeting the prescriptive requirements in lieu of the on-site renewable power.
Thermal Bridges Section 5.5.5	A new prescriptive section addresses thermal bridging in the building envelope. For projects utilizing Section 5.6, Building Envelope Trade-off Compliance Path, the Energy Cost Budget Method, or the Appendix G, Performance Rating Method, the proposed design model must account for thermal bridges that don’t meet prescriptive requirements.

ASHRAE 90.1 Mandatory Provisions

All projects must meet applicable mandatory provisions from the referenced version of *ASHRAE 90.1*, found in Sections 5.4 (Building Envelope), 6.4 (HVAC), 7.4 (Service Water Heating), 8.4 (Power), 9.4 (Lighting), and 10.4 (Other Equipment).

Early in the design process, the project architect, engineer, and lighting designer should review these provisions and ensure they get integrated into the project design.

Exceptions to Mandatory Provisions

Project-specific exceptions or Project Priority Library alternatives to the mandatory provisions may apply to:

- Projects outside the United States where variations in equipment rating methodologies or limited availability of the required equipment or controls preclude compliance.
- Provisions exempted by the local authority having jurisdiction in areas regulated by codes of similar stringency to the referenced version of *ASHRAE 90.1*.
- Provisions available in *ASHRAE 90.1*, Appendix G PRM energy simulation.

Further Description of ASHRAE 90.1, Section 4.2.1 Compliance Paths

PRESCRIPTIVE METHOD

For the prescriptive method, projects must meet all applicable requirements from each referenced *ASHRAE 90.1* section. The provisions of each section don’t permit trade-offs.

- Section 5. Building Envelope
- Section 6. Heating Ventilation and Air Conditioning (HVAC)
- Section 7. Service Water Heating
- Section 8. Power
- Section 9. Lighting
- Section 10. Other Equipment

For ASHRAE 90.1-2022, Section 11. Additional Efficiency Requirements

This method provides a straightforward, easy-to-follow path to compliance, especially for smaller projects or those with less complex designs where flexibility is less of a concern.

The prescriptive method specifies minimum requirements for various building components, such as insulation levels, window performance, lighting power densities, HVAC system efficiencies, and system controls.[90]

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[90] “ASHRAE Standard 90.1 Performance Based Compliance,” U.S. Department of Energy Building Energy Codes Program, https://www.energycodes.gov/performance_based_compliance.

Additional Considerations
EAc3: Enhanced Energy Efficiency, Option 1. Prescriptive Method, Path 1

CASE 1. ASHRAE 90.1-2019

Projects that comply with Option 1 of the prerequisite using the *ASHRAE 90.1-2019* prescriptive method may earn points for additional improvements to regulated systems by documenting achievement of energy credits using the methodology referenced in *ASHRAE 90.1-2022*, Section 11. Additional Efficiency Requirements.

CASE 2. ASHRAE 90.1-2022

Projects that comply with Option 2 of the prerequisite using the *ASHRAE 90.1-2022* prescriptive method are awarded four points under the New Construction rating system, or two points under the Core and Shell rating system.

Additional points may be awarded for incremental energy efficiency credits beyond the minimum required by *ASHRAE 90.1-2022*, Section 11. Additional Efficiency Requirements.

PERMISSIBLE TRADE-OFFS FOR PRESCRIPTIVE METHOD

Some sections provide an option for limited trade-offs within the section:

- Section 5.6 Building Envelope Trade-off Compliance Path assesses the overall envelope performance compared to a prescriptively compliant envelope, permitting trade-offs between building envelope components. For example, improved wall assembly U-factors may compensate for window-to-wall ratios that exceed the 40% prescriptive maximum. The project complies when the proposed envelope performance factor does not exceed the base envelope performance factor determined following the simplified modeling protocol in *ASHRAE 90.1*, Normative Appendix C. Software, such as the freely available COMcheck tool, automates this Appendix C energy simulation, building envelope data entry by the architect or design professional and completing these calculations in a matter of minutes.

- Section 6.6.2 Mechanical System Performance Path (*90.1-2022* only) uses simplified energy modeling to calculate the Total System Performance Ratio (TSPR) for the project’s HVAC systems, typically used for office, retail, hotel/motel, multifamily/dormitory, and school or education buildings. Professional mechanical engineers without building energy modeling experience can calculate the TSPR using a software tool that automates the analysis.

ASHRAE 90.4 for spaces matching the *ASHRAE 90.1* definition of computer room such as data centers or server rooms:

- Section 6.6.1 Computer Room System Path
- Section 8.6.1 Computer Room Systems

OPTION 2. PRESCRIPTIVE METHOD, ASHRAE 90.1-2022, SECTION 11. ADDITIONAL EFFICIENCY REQUIREMENTS

For the *ASHRAE 90.1-2022* prescriptive method, designers must also select from a list of additional efficiency measures in Section 11, Additional Efficiency Requirements to earn the minimum number of Energy Credits required for the project's building type and climate zone per Table 11.5.1-1. This gives the project team more flexibility to select the additional measures that are most feasible and appropriate for their project application.

Each of the efficiency measures referenced in Section 11 is awarded a specific number of base Energy Credits per building type and climate, equating to approximately 0.1% savings per credit (See *ASHRAE 90.1-22*, Tables 11.5.3-1 through 11.5.3-9). Section 11.5.2 outlines opportunities for further adjustments to augment these base credits for certain efficiency measures.

For example, an office project in climate zone 4A earns eight base credits for achieving a 5% reduction in lighting power (L06), but this increases to 16 credits for a 10% reduction based on the adjustment described in the detailed summary of this measure.

Combined credits for renewable and load management measures are limited to 60% of the total required energy credits per *ASHRAE 90.1-2022*, Section 11.5.2*.*

ASHRAE 90.1-2022, Addendum j allows projects to use the Total System Performance Ratio (TSPR) to demonstrate overall improvement in HVAC performance rather than applying individual system efficiency measures.

Additional considerations

For projects with multiple building types, the minimum required credits and credits achieved are weighted by the gross floor area of each building type.

Minimum required Energy Credits are adjusted lower than the default thresholds in Table 11.5.1.1-1 for certain project applications:

Core and Shell projects with central HVAC or service water heating must achieve 50% of the credits from Table 11.5.1.1-1. Other Core and Shell projects must achieve 33% of these credits.

Major renovations, referred to as substantial alterations in *ASHRAE 90.1*, must achieve 50% of the credits referenced in Table 11.5.1.1-1.

Projects without roof availability for PV or meeting Section 10.5.1 exceptions may use the referenced equation to adjust required credits below the default threshold per Section 11.5.1(e).

Unconditioned spaces, semi-heated spaces, and parking garages must achieve 50% of the credits referenced for other building types in Table 11.5.1.1-1.

ASHRAE 90.1 4.2.1 COMPLIANCE PATH: ENERGY COST BUDGET (ECB) METHOD

This approach compares the annual energy cost of the proposed design to that of a budget building. The budget building is essentially a clone of the proposed design but adjusted to meet the prescriptive requirements. The proposed design achieves *ASHRAE 90.1-2019* compliance if the energy cost doesn't exceed the budget. For *ASHRAE 90.1-2022*, on-site renewable must be included in the budget building model when prescriptively required and meet an additional improvement below the energy cost budget based on an adjustment referencing the prescriptively required energy credits from Section 11. Refer to the Building Envelope Backstop section referenced below for further guidance addressing limitations on envelope trade-offs when applying the ECB Method.

Avoid using the ECB Method to demonstrate improved regulated energy savings for EAc3: Enhanced Energy Efficiency.

ASHRAE 90.1 4.2.1 COMPLIANCE PATH: APPENDIX G PERFORMANCE RATING METHOD (PRM)

ASHRAE 90.1, Appendix G Performance Rating Method (PRM) uses a stable baseline methodology that supports comparison of building performance across versions of *ASHRAE 90.1* using a variety of performance metrics. Using the PRM, an energy modeler can develop a single set of *ASHRAE 90.1,* Appendix G Baseline Building Design and Proposed Building Design models to document compliance with this prerequisite, with *EAc3: Enhanced Energy Efficiency*, and with any code requirements linked to *ASHRAE 90.1-2016* or later or *IECC-2018* or later.

The stable baseline methodology in the PRM requires a Performance Index (PI) less than or equal to the Performance Index Target (PIT), with further adjustments and limitations addressing on-site renewable energy. The scale for the Performance Index ranges from one to zero, where one represents a baseline building that minimally complies with *ASHRAE 90.1-2004* requirements, and zero represents a net-zero building.

Calculate the Performance Index Target using the results of the baseline building model completed under the PRM protocol, and the Building Performance Factor (BPF) for the project type and climate zone. The BPFs are provided in *ASHRAE 90.1,* Table 4.2.1.1 for the energy cost metric.

Refer to the Building Envelope Backstop section for further guidance addressing limitations on envelope trade-offs when applying the PRM Method. Also, refer to *ASHRAE 90.1-2022 G1.2.1(b)* for similar requirements limiting trade-offs from interior lighting power.

Major renovations

Major renovations have slightly less stringent Performance Index Targets than New Construction, determined by multiplying published BPFs by a factor of 1.05 (See *ASHRAE 90.1-2019,* Addendum cr or *ASHRAE 90.1-2022 4.2.1.3*).

Appendix G PRM. Alternative Metrics in Lieu of Energy Cost

Although the *ASHRAE 90.1*, Appendix G PRM references a cost metric, the energy modeler may instead demonstrate *EAp2: Minimum Energy Performance* compliance for the PRM using the future source energy metric referenced in *EAc3: Enhanced Energy Efficiency*, or a site energy metric, or a current source energy metric. Substitute all PRM references to cost with the new metric. Building Performance Factors to assess compliance must be specific to the metric and the referenced version of *ASHRAE Standard 90.1*.

EAc3: Enhanced Energy Efficiency only uses the future source energy metric and does not use energy cost, site energy, or source energy metrics (See *EAc3: Enhanced Energy Efficiency*, Option 2).

Energy modelers can limit the documentation level of effort by calculating both prerequisite and credit compliance using the future source energy metric.

OPTION 1. ASHRAE 90.1-2019. APPENDIX G PRM, ALTERNATIVE METRICS

- **Future source energy**. Calculate the PIT for both the prerequisite and *EAc3: Enhanced Energy Efficiency* with BPFs from the prerequisite Table 1. 90.1-2019, Equivalent Building Performance Factors for a Future Source Energy Metric.
- **Site energy or source energy metric**. (Prerequisite only). Apply *ASHRAE 90.1-2019*, Addendum ch for a source energy metric matching those listed in Addendum ch, Table X4-1, follow Addendum ch, Section X5, Methodology for BPF Adjustment To Account for Localized Conversion Factors.

OPTION 2. ASHRAE 90.1-2022. APPENDIX G PRM, ALTERNATIVE METRICS

- **Future source energy metric**. Calculate the PI_T for the prerequisite with BPFs from the prerequisite Table 2. 90.1-2022, Equivalent Building Performance Factors for a Future Source Energy Metric.
  - **Core and shell projects**. Use the same BPFs to document the prerequisite and EAc3: Enhanced Energy Efficiency.
  - **New Construction projects**. Calculate the less stringent PI_T for *EAc3: Enhanced Energy Efficiency* using Table 6. 90.1-2019 equivalent building performance factors for a future source energy metric.
  - **Site energy or source energy metric**. (Prerequisite only). Apply *ASHRAE 90.1-2022*, Informative Appendix I. For the source energy metric, use the *90.1-2022*, Appendix I5. Methodology for BPF Adjustment to Account for Localized Conversion Factors if the project source energy conversions do not match those listed in Addendum Table I4-1.

Appendix G PRM. Treatment of On-site Renewable Energy

OPTION 1. ASHRAE 90.1-2019 PRM. TREATMENT OF ON-SITE RENEWABLE ENERGY

Per *ASHRAE 90.1-2019*, Section 4.2.1.1, the renewable energy contribution towards meeting PRM requirements is limited to 5% of Baseline Building Performance.

This varies from *EAc3: Enhanced Energy Efficiency*, Option 2, which either includes or excludes the entire renewable contribution from the determination of credit compliance.

OPTION 2. ASHRAE 90.1-2022 PRM. TREATMENT OF ON-SITE RENEWABLE ENERGY

Per *ASHRAE 90.1-2022*, Section 4.2.1.1*,* the modeler must perform three calculations of proposed building performance to account for the renewable energy contribution prescriptively required in Section 10.5.1 Renewable Energy Resources:

- Proposed building performance without any credit for the on-site renewable energy contribution.
- Proposed building performance including the on-site renewable energy contribution prescriptively required from Section 10.5.1.
- Proposed building performance including all on-site renewable energy contributions.

The renewable energy contribution toward meeting PRM requirements over and above the amount prescriptively required from Section 10.5.1 is limited to 5% of baseline building performance.

This varies from *EAc3: Enhanced Energy Efficiency*, Option 2, which either includes or excludes the entire renewable contribution from determination of credit compliance.

Appendix G PRM. Exceptions to Mandatory Measures

For mandatory measures, the modular may document the associated savings in the energy simulation and account for the measure's absence instead of complying with the mandatory provisions. Model the Baseline Building Performance (BBP) per Appendix G requirements and the Proposed Building Performance (PBP) as designed for measures that are not required for inclusion in the BBP, such as daylighting controls. For measures where Appendix G requires the PBP to match the BBP, model the measure as present in the baseline BBP and absent in the proposed PBP.

ECB and Appendix G PRM. Building Envelope Backstop

New buildings using the Energy Cost Budget (ECB) Method or the Appendix G Performance Rating Method (PRM) must limit building envelope trade-offs per *ASHRAE 90.1-2019,* Addendum cr or the associated requirements embedded in *ASHRAE 90.1-2022*. Doing so prioritizes building envelope performance that has a lifetime impact over more short-lived efficiency measures.

Projects must either meet the prescriptive building envelope requirements of *ASHRAE 90.1,* Section 5.5 or apply *ASHRAE 90.1,* Section 5.6 Building Envelope Trade-off Compliance Path to demonstrate that the building envelope does not significantly underperform compared to a prescriptively compliant building envelope. (See more details for each path under the prescriptive method section of this guidance).

If using the Building Envelope Trade-off Compliance Path, the proposed envelope performance factor cannot exceed the baseline envelope performance factor by more than 15% for residential occupancies or more than 7% for non-residential occupancies.

For projects that cannot prescriptively comply with *ASHRAE 90.1* building envelope criteria, the design team should evaluate Building Envelope Trade-Off compliance early in the design process and make any necessary design changes to meet these minimum requirements. Compliance may prove particularly challenging for projects with high window-to-wall ratios.

> **Additional considerations**
> Projects pursuing points for *EAc2: Reduce Peak Thermal Loads* and using the Building Envelope Trade-Off Compliance Path must have a proposed envelope performance factor that does not exceed the baseline envelope performance factor.

Equivalence to ASHRAE 90.1

Refer to the Project Priorities Library for regional paths addressing equivalence to *ASHRAE 90.1*.

For U.S.-based projects, state or local codes are equivalent to *ASHRAE 90.1-2019* or *ASHRAE 90.1-2022* when the U.S. Department of Energy Building Energy Codes Program status of state energy code adoption indicates a commercial code efficiency category matching the referenced version of *ASHRAE 90.1* or later for the project location in effect at the time of project permit application.

For projects documenting equivalence with *ASHRAE 90.1*, provide additional documentation to demonstrate compliance with the provisions of the envelope backstop referenced in *ASHRAE 90.1-2019 Addendum cr* and *ASHRAE 90.1-2022*. Examples include:

- The project meets the prescriptive envelope requirements for the referenced code.

- The project complies with *ASHRAE 90.1-2019,* Addendum cr G1.2.1(c) requirements or *ASHRAE 90.1-2022 Section G1.2.1(d)* requirements.
- The project complies with Thermal Energy Demand Intensity (TEDI) criteria specified in the referenced code requirements.
- The envelope weighted average UA (U-factor x Area) in all climate zones and the weighted average Solar Heat Gain Coefficient (SHGC) in climate zones 1 through 4 does not exceed the prescriptive maximum by an established percentage. Replace fenestration area exceeding the prescriptive maximum with opaque assemblies to determine the prescriptive maximum UA.
- The energy consumption model for the proposed design with a proposed envelope does not exceed the simulated energy consumption for the proposed design with a prescriptively compliant envelope by a given percentage.

The *2021 International Energy Conservation Code* (IECC 2021) and *ASHRAE 90.1-2019* with Addendum cr are equivalent.

The *2024 International Energy Conservation Code* (IECC 2024) with additional envelope backstop provisions and *ASHRAE 90.1-2022* are equivalent.

For both versions of the standard:

- *IECC, Section C407, Total Building Performance* may only be used to document prerequisite compliance with additional documentation demonstrating compliance with the envelope backstop.
- Use *IECC Prescriptive Compliance* (*C402* through *C406*) instead of the *ASHRAE 90.1-2019* prescriptive method.

District Energy Systems (DES)

ASHRAE 90.1 refers to district energy systems (DES) as purchased chilled water or purchased heat, even when this energy is part of a campus distribution plant, and not directly purchased from a utility or municipality. Because DES systems are outside the project scope of work, DES efficiency cannot contribute towards achieving prerequisite compliance.

For projects that use the ECB method, model purchased heat and/or purchased chilled water as independent energy sources using the same utility rates per unit of energy for the energy cost budget and design energy cost models.

For projects that use the PRM, use one of the following modeling methods to document the DES:

METHOD A. ASHRAE 90.1-2022 ADDENDUM A (REMOVES INHERENT DES PENALTY)

The project may apply *ASHRAE 90.1-2022*, Addendum a to either the *ASHRAE 90.1-2019* or *ASHRAE 90.1-2022*, Appendix G criteria as applicable to avoid the inherent penalty in the Appendix G PRM Performance Index Targets when modeling purchased heat and purchased chilled water. Model HVAC systems for the baseline building design from the criteria in *ASHRAE 90.1-2022*, Addendum a, as if all heating and cooling generation equipment is on-site.

Model the proposed design with natural gas-forced draft boilers in place of district heating and water-cooled chillers in place of district cooling, matching the type and number specified in Addendum a. For projects using *ASHRAE 90.1-2019*, replace all *ASHRAE 90.1-2022*, Addendum a references to Section 6 prescriptive criteria for the proposed building design with *ASHRAE 90.1-2019*, Section 6.

> **Additional considerations: Linked credits**
>
> **EAc3: Enhanced Energy Efficiency**. Use Method A for prerequisite compliance if crediting DES efficiency towards the project performance in *EAc3: Enhanced Energy Efficiency.*
>
> **EAc4: Renewable Energy**. In the energy simulation, use submetering to distinguish onsite fuel from the modeled fuel for the district hot water plant. This information informs the *EAc4: Renewable Energy*, Renewable Energy Attributes, Project Energy Source criteria.

METHOD B. DIRECTLY MODEL PURCHASED HEAT AND/OR PURCHASED CHILLED WATER

Apply the PRM requirements to model purchased heat and/or purchased chilled water as independent energy sources in the baseline and proposed design, with the same utility rates or source energy conversion factors for the baseline and proposed design. Use published utility rates or source energy conversion factors when available.

Otherwise, if purchased energy rates or source energy conversion factors are not published for the district energy sources serving the project, derive these purchased energy rates and/or conversion factors as follows:

- **Purchased chilled water (CHW)**. Multiply the utility rate or source energy conversion factor for electricity by a factor of 0.325 to estimate the chilled water utility rate or source energy conversion factor.
- **Purchased heat from district hot water (HHW)**. Multiply the utility rate or source energy conversion factor by a factor of 1.5 for the predominant fossil fuel source used to generate the district hot water or natural gas if unknown.
- **Purchased heat from district steam**. Multiply the utility rate or source energy conversion factor by a factor of 1.7 for the predominant fossil fuel source used to generate the district hot water or natural gas if unknown.

Table 2. Summary of EA credit linkages to EAp2: Minimum Energy Efficiency

	Option 1 ***ASHRAE 90.1-2019***	**Option 2** ***ASHRAE 90.1-2022***
Applicability	Limited to projects registered before January 1, 2028	Available to all projects. Required for projects registered on or after January 1, 2028.
Linked Credits		
EAc3: Enhanced Energy Efficiency		
Prescriptive method (Option 1, Path 1 of the credit)	Required as a precondition to document points for additional efficiency. (See Case 1. *ASHRAE 90.1-2019*).	Points automatically awarded for prerequisite compliance using Prescriptive Method. (New Construction: four points. Core and Shell: 2 points). Further points for incremental efficiency beyond the minimum per *ASHRAE 90.1-2022 Section 11*. Additional Efficiency Requirements (See Case 2. *ASHRAE 90.1-2022*).
Appendix G PRM (Option 2 of the credit) NOTE: Treatment of on-site renewable energy varies from prerequisite.	Incremental performance improvement documented using the future source energy metric earns points.	New Construction. Points rewarded for improvement beyond a *90.1-2019* equivalent-baseline using the future source energy metric. Performance target for prerequisite and credit are determined separately using simple calculations adjusting referenced Building Performance Factor (BPF).
		Core and Shell: Two points rewarded for meeting *ASHRAE 90.1-2022* using the future source energy metric. Further points for additional incremental improvements.
EAc2: Reduce Peak Thermal Loads		
Precondition for all credit options	Building envelope cannot perform worse than a prescriptively compliant envelope per *ASHRAE 90.1-2019* 5.5 or 5.6	Building envelope cannot perform worse than a prescriptively compliant envelope per *ASHRAE 90.1-2022 5.5* or *5.6*.
Option 3. Thermal Bridging		Comply with the prescriptive thermal bridging requirements of *ASHRAE 90.1-2022*, *Section 5.5.5(a)* without exceptions.
Prescriptive method, ECB, or Appendix G PRM (Option 4, Path 2, Envelope)	Rewards improvements to peak thermal loads documented using the *ASHRAE 90.1 Section 5.6 Building Envelope Trade-Off Method* (used for the prerequisite for the prescriptive method or for the envelope backstop in the ECB Method, and PRM Method).	Rewards improvements to peak thermal loads documented using the *ASHRAE 90.1 Section 5.6 Building Envelope Trade-Off Method*. (Used for the prerequisite for the prescriptive method or for the envelope backstop in the ECB Method, and PRM Method).
Prescriptive method	Total System Performance Ratio (TSPR)	Total System Performance Ratio (TSPR).

	Option 1 ***ASHRAE 90.1-2019***	**Option 2** ***ASHRAE 90.1-2022***
(Option 4, Path 2, Ventilation)	Same documentation may be used to demonstrate peak thermal load reductions for ventilation, prerequisite HVAC compliance using the prescriptive method, and further improvements for *EAc3: Enhanced Energy Efficiency*.	Same documentation may be used to demonstrate peak thermal load reductions for ventilation, prerequisite HVAC compliance using the prescriptive method, and further improvements for *EAc3: Enhanced Energy Efficiency*.
Appendix G PRM (Option 4, Path 3)	Same documentation may be used to demonstrate peak thermal load reduction for this credit and energy efficiency meeting the efficiency requirements for *EAp2: Minimum Energy Efficiency* and *EAc3: Enhanced Energy Efficiency*.	Same documentation may be used to demonstrate peak thermal load reduction for this credit and energy efficiency meeting the efficiency requirements for *EAp2: Minimum Energy Efficiency* and *EAc3: Enhanced Energy Efficiency*.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All	All	Document compliance with mandatory measures from *ASHRAE Standard 90.1.*
		Prescriptive method	*ASHRAE 90.1* compliance forms or COMcheck compliance report confirming a system-by-system approach.
		Energy simulation (*ASHRAE 90.1* Appendix G PRM or ECB Method)	Input-output reports from modeling software.
			ASHRAE 90.1 compliance forms.
			Energy consumption and demand for each building end-use and energy source.
			Exceptional calculation and supporting documentation (if applicable).
			USGBC Minimum Energy Performance Calculator or *ASHRAE Standard 90.1 Performance Based Compliance Form*91.
			Supporting documentation for metrics, as applicable, including published reference for source energy conversion factors, published reference for utility rates or tariffs per energy source, and for projects attempting Enhanced Energy Efficiency, published reference for greenhouse gas emissions factors. Appendix I site or source energy calculations as applicable for projects using *90.1-2022.*
District Energy System	All	All	Documentation on DES including energy source serving the project (as applicable).

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[91] ASHRAE Standard 90.1 Performance Based Compliance Form, ASHRAE, (n.d.), https://www.energycodes.gov/ashrae-standard-901-performance-based-compliance-form.

REFERENCED STANDARDS

- ASHRAE 90.1-2019 (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527)
- ASHRAE 90.1-2022 (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082)
- ASHRAE 90.4 (store.accuristech.com/ashrae/standards/ashrae-90-4-2022?product_id=2524333)
- IECC 2021 (codes.iccsafe.org/content/IECC2021P3)
- IECC 2024 (codes.iccsafe.org/content/IECC2024P1)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Prerequisite

FUNDAMENTAL COMMISSIONING

EAp3

REQUIRED

New Construction
Core and Shell

INTENT

To improve energy performance and limit greenhouse gas emissions by verifying that systems are operating per the owner's project requirements.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Comply with Commissioning Requirements	

Comply with *ANSI/ASHRAE/IES Standard 90.1* commissioning requirements for building systems, controls, and the building envelope, with the following additional provisions:

- All projects shall provide fundamental commissioning. Section 4.2.5.2 exceptions shall not apply.
- The referenced version of Standard 90.1 with errata shall be:
  - 2019 or later for projects registered before January 1, 2028.
  - 2022 or later for projects registered on or after January 1, 2028.
- By the end of the design development phase, the owner shall designate a commissioning provider (CxP) with experience completing commissioning on at least two projects of equal or larger scope and complexity.
- In addition to the requirements of the applicable version of *ASHRAE 90.1*, the CxP shall:
  - In predesign or as early as possible, assist in the development of the owner's project requirements (OPR), reviewing and updating the OPR through design and construction. OPR must include HVAC, service water heating, power, lighting, other equipment (include on-site renewable energy), and envelope.
  - During design, review the basis of design (BOD) for compliance with the OPR, and attend at least one meeting focused on mechanical, electrical, and plumbing, and one focused on envelope, which may be separate or combined, to discuss review comments and commissioning.

- During construction, review submittals and substitutions for design deviations that impact the OPR, attend milestone meetings at 50% and 100% completion, and perform a sample review (minimum 10%) of completed contractor documentation for quality assurance/quality control. For envelope, include testing in the commissioning documents and witness a sample of tests (not required for Core and Shell projects).
- **Occupancy/operations phase**: Develop an ongoing commissioning plan.

REQUIREMENTS EXPLAINED

The prerequisite requires that projects perform commissioning for building systems, controls, and the building envelope in compliance with the minimum requirements of *ASHRAE Standard 90.1* and additional LEED BD+C: New Construction and LEED BC+C: Core and Shell rating system provisions.

Automatic Achievement of Prerequisite through EAc5: Enhanced Commissioning, Option 1

Projects that achieve all *EAc5: Enhanced Commissioning*, Option 1 requirements for the building enclosure and MEP systems automatically comply with the prerequisite requirements since the credit requirements encompass all commissioning requirements from the *ASHRAE 90.1* standard referenced in *EAp3: Fundamental Commissioning*.

Therefore, when planning the commissioning scope, review the *EAc5: Enhanced Commissioning*, Option 1 requirements, paying special attention to the required timing for Commissioning Provider (CxP) engagement during predesign or very early in the commissioning process to accomplish the broader commissioning scope of work required for credit compliance.

Tables 1 and 2 compare the required tasks for *EAp3: Fundamental Commissioning* and *EAc5: Enhanced Commissioning*, Option 1.

Compliance using EAp3 Fundamental Commissioning Path

REQUIRED ASHRAE STANDARD 90.1 VERSION

Projects registered before January 1, 2028, can reference *ASHRAE Standard 90.1-2019* or any later version. Projects registered on or after January 1, 2028, must use *ASHRAE Standard 90.1-2022* or later.

The commissioning requirements for the 2019 and 2022 versions of *ASHRAE 90.1* are similar. One notable addition to *ASHRAE 90.1-2022* that influences the commissioning scope is the requirement for whole-building air-leakage testing for buildings less than 25,000 square feet (2,320 square meters).

> **Additional considerations**
> Use a single version of *ASHRAE Standard 90.1* for *EAp2: Minimum Energy Efficiency, EAp3: Fundamental Commissioning*, and *EAp4: Energy Metering and Reporting* streamlines documentation efforts.

Approved Equivalent Standards

Projects may use *IECC 2021* instead of *Standard 90.1-2019* and *IECC 2024* instead of *ASHRAE Standard 90.1-2022*. Projects that use IECC instead of ASHRAE must still comply with all additional LEED BD+C: New Construction and LEED BD+C: Core and Shell rating system requirements.

SELECTING THE COMMISSIONING PROVIDER (CXP)

As buildings and systems become more complex and the systems required for Cx expand beyond traditional mechanical equipment, many CxPs will consist of a team instead of one person. Therefore, either an entity or an individual can act as the CxP. For projects that use a CxP entity, designating a single person as the Cx Project Lead or Manager ensures consistency in documentation and quality control of the process.

Minimum qualifications

The CxP must have direct commissioning experience from the design phase through the construction phase for at least two projects with equal or larger scope and complexity. The previous experience should address buildings of similar types and size range, similar types and capacities of HVAC and service water heating equipment, and controls with similar complexity, and the building envelope unless this scope of work is completed independently by a Building Envelope Commissioning Provider (BECxP).

Experience documented for a CxP entity must reflect the team performing the commissioning work for the project.

Eligible entities

Per *ASHRAE Standard 90.1-2019*, Section 4.2.5.2, the CxP must be completely independent of the design or construction team. Consider the following when selecting a CxP:

- The CxP can be a third-party entity not currently contracted for any design or construction aspects of the building or site.
- The owner can employ the CxP, provided the entity meets the CxP minimum qualifications.
- The CxP can be employed by the company performing the design or construction of the building; however, they must be a completely independent member of the design team and not directly associated with any aspect of the design and/or installation of the building systems.
- If the CxP employs any company that has direct influence on the design and construction, the Commissioning Plan must clearly address any potential conflicts of interest and demonstrate that the CxP acts and operates solely on behalf of the owner, reports directly to the owner, and works entirely independently from the design and construction team.

Verification and Testing (V&T) Providers

ASHRAE Standard 90.1 also requires that the CxP includes Verification and Testing (V&T) providers. A V&T provider is an entity that completes the activities needed to implement the building functional performance testing (FPT) activities or verify that elements of the building project meet stated requirements. In many cases, the entity acting as the CxP fulfills this requirement. Confirm that an individual qualified in verification and FPT execution is part of the commissioning team.

CxP requirements for Building Envelope Commissioning

The CxP must include qualified individuals who can perform the building envelope design review and air barrier inspection or a V&T provider who can perform air leakage testing.

> **V&T PROVIDER FOR BUILDING ENVELOPE COMMISSIONING**
> *ASHRAE Standard 90.1-2019*, Section 5.4.3.1.1 requires an independent third party to test whole-building pressurization for air leakage. Alternately, a continuous air barrier design and installation verification program conducted by an independent third party meets the requirements when using Section 5.4.3.1.1, Exception 3. *ASHRAE Standard 90.1-2019*, Section 5.9.1.2, requires verification and testing, including a design review, periodic field inspection, and reporting.

Teams must confirm the compliance path for testing and ensure qualified individuals conduct each element of the commissioning efforts.

Timing for CxP engagement

Identify a CxP no later than the end of the design development phase. The CxP is primarily responsible for leading the design and construction team through all aspects of the mechanical, electrical and plumbing (MEP) systems and building envelope systems commissioning, respectively.

> **Additional considerations**
> A single entity can perform all MEP and Building Envelope system commissioning efforts, provided the entity meets the minimum requirements.

For projects that use different qualified individuals to perform various Cx tasks, ensure sufficient collaboration within the team to provide continuity from design through operations. For example, an entity may have different CxP team members review the design documents than the team witnessing testing.

SCOPE OF FUNDAMENTAL COMMISSIONING

The prerequisite requires that projects conform with *ASHRAE Standard 90.1* requirements for all referenced systems and provisions outlined in the LEED BD+C: New Construction and LEED BD+C: Core and Shell rating system.

Projects using *ASHRAE Standard 90.1-2022* for compliance guidance must include relevant verification, testing, and commissioning for the additional efficiency measures and thermal break requirements from *ASHRAE Standard 90.1-2022*.

Systems requiring commissioning

At a minimum, commissioned systems must include all energy-using systems within the project boundary that are referenced in *ASHRAE 90.1 Sections 5–10*, including the building envelope, HVAC, service water heating, power, lighting, on-site renewable energy, energy monitoring systems, refrigeration equipment, energy storage systems, load management systems, and other energy-using systems within the project's boundary.

Owner's Project Requirements (OPR)

The Owner's Project Requirements (OPR) document the functional requirements of the building. It also details the expectations of the building's use and operation. The OPR includes objectives for the project, which verify that all stated goals integrate with the building design, construction, and operation.

The owner or a design professional can develop the OPR. However, the owner must provide input during the development, ensuring that the OPR captures the project's critical elements, like sustainability goals and targets. If a CxP's engagement begins before the OPR development, the CxP may provide input on the initial development efforts. The OPR is a living document requiring ongoing updates throughout the design phases.

> **Additional considerations**
> The owner plays a critical role in developing and updating the OPR. The OPR establishes a clear vision for the project, identifying expected outcomes and goals for sustainable building development. As the project progresses, decisions should align with the OPR. The owner must remain a key stakeholder and ultimate approver of the document's final version.

Basis of Design (BOD)

The project's design professionals typically create the basis of design (BOD). The BOD explains how the design and construction team will execute the OPR. Include processes and assumptions made early in the design phases to achieve the OPR's intent in the BOD, along with relevant project information. A BOD addresses performance criteria, general building characteristics (e.g., envelope, HVAC, water), and governing codes and standards, at minimum.

The BOD is a living document requiring updates throughout the design and construction phases.

Cx Plan

The Cx Plan, developed by the CxP, outlines the goals and objectives, general project information, and all systems included in the commissioning scope of work. The plan details the complete Cx process, including roles and responsibilities, key tasks and milestones performed by each responsible party, and functional performance test (FPT) or verification procedures for all systems verified, commissioned, or tested.

Design Reviews

Design reviews by the CxP are critical elements of the commissioning process. Reviews support the energy efficiency goals of *ASHRAE Standard 90.1* by verifying that the design meets the Standard's requirements. Early reviews allow teams to correct areas of the design that do not meet the requirements before construction begins, avoiding costly change orders during construction.

The CxP must review the OPR, BOD, and design reviews and confirm that the construction documents include the required commissioning information.

The design reviews should confirm that the design meets relevant energy efficiency, energy metering and reporting, peak thermal load reduction, renewable energy, and grid-interactive requirements documented for the LEED Energy and Atmosphere (EA) credit category.

During the design phase, the CxP must participate in at least one coordination meeting to discuss design review comments.

Submittal Reviews and Functional Performance Test Development

During construction, the CxP must review submittals for equipment included in the Cx scope of work. This review allows the CxP to identify deviations from the design and OPR and provide comments to the owner, engineer, and contractor on any significant issues. Addressing these issues before procurement saves time and money by avoiding incorrect equipment purchases.

The CxP is the primary one responsible for developing the functional performance tests (FPTs). FPTs written specifically for the equipment and systems designed for the project provide the most value. Therefore, CxPs must use the design team’s approved submittals to develop any testing procedures for the project. The FPTs should cover all modes of operations, including seasonal testing.

Pre-commissioning Site Visits and Contractor Documentation Review

Determining commissioning readiness before execution is essential minimizing potential delays from failed testing efforts. Through visual inspections and a sample review of the contractor’s completed documents, the CxP can confirm the timing for FPT execution efforts.

The CxP must review at least 10% of the contractor’s completed Cx documents. This quality assurance review allows the CxP to understand the quality of documentation efforts and identify any gaps in the process. Performing this review before the Cx readiness site visit helps the CxP to determine timing for the required site visit.

Before Cx execution, the CxP must complete at least one site visit to verify Cx readiness.

> **Additional considerations**
> Projects with phased construction and phased Cx testing should consider multiple Cx readiness site visits that align with each phase of the construction efforts.

Functional Performance Tests — Execution

The CxP must witness functional performance testing executed by the contractors and subcontractors. Perform testing when all system components are installed, energized, programmed, balanced, and checked for functionality.

FPT SAMPLING

A sampling strategy is acceptable for functional testing of projects with a large number of similar system types, like an office with multiple VAV boxes or a multi-family residential building with individual heat pumps for each tenant.

An acceptable sampling rate is typically 10%. The CxP should consider the testing procedure's failure rate when using a sampling rate. If multiple failures occur for the same equipment or system type, determine if there is a systemic issue.

> **Additional example — sampling rate and failure rate**
> A hotel has 200 fan coil units. The owner and CxP agree to a 10% sampling strategy. During testing, the CxP tests 20 fan coil units. If 10 of the 20 tests fail, conduct additional testing. Failures of that magnitude would cause more concern.

SEASONAL OR DEFERRED TESTING

When necessary, the CxP can use seasonal or deferred testing. For example, if the initial FPT effort occurs in the summer, tests for heating mode can occur during colder months. Once testing is complete, the CxP is responsible for amending the final report and other documents.

Meetings

During the construction phase, the CxP participates in 50% and 100% milestone meetings to discuss the commissioning findings and work toward resolving identified issues.

Final Cx Report

The CxP is the primary one responsible for authoring the final Cx report. The final report should include, at minimum, an executive summary of the Cx process and the results of the project's testing efforts, an updated issues and resolution log that identifies items that are closed and proposed resolutions for outstanding items, copies of the final versions of the OPR and BOD, design review logs, copies of the approved submittals used for the FPTs, and copies of the completed FPTs.

Provide a preliminary Cx report for projects that finalize the LEED application before completing Cx. The Report must address all major envelope, MEP, renewable, and grid-interactive systems, confirm system installation, and indicate that Cx has commenced for all systems.

The CxP must provide the Final Cx Report to the owner once the Cx is complete.

Ongoing Cx Plan

An ongoing Cx Plan ensures systems remain operationally efficient throughout the building's life. The plan should provide facility managers with procedures, blank FPTs, and a recommended schedule for ongoing Cx activities.

The ongoing Cx plan should address requirements for continuous documentation and updates. Building operations change over time, including retrofits or equipment replacement projects. Ensure the ongoing Cx plan reflects the most current information for the building.

KEY TASKS AND MILESTONES FOR COMMISSIONING

The Commissioning Provider is responsible for completing the following tasks to comply with *EAp3: Fundamental Commissioning requirements*:

- **Predesign (or immediately upon engagement of the CxP no later than the end of design development)**
    - Assist in the development of the OPR.
    - Develop Cx Plan.

- **Design Phase**
    - Review Basis of Design (BOD).
    - Develop or approve Cx specifications.
    - Design document reviews (design drawings and specifications).
    - Attend at least one coordination meeting.
    - Assist in updating the OPR.

- **Construction Phase**
    - Perform focused submittal reviews for design deviations that impact the OPR.
    - Perform field reviews.

    - Review/witness performance testing.
    - Attend milestone meetings at 50% and 100% completion.
    - Review sampling of QA/QC documentation (checklist and tests).
    - Track identified issues to resolution (Issues/Resolution Log).
    - Develop a preliminary commissioning report.

- **Occupancy/Operations Phase**
    - Review training program.
    - Develop final commissioning report.
    - Develop or review the ongoing Cx plan.

Comparison of Fundamental EAp3: Fundamental Commissioning and EAc5: Enhanced Commissioning

Table 1 for MEP systems and Table 2 for the Building Envelope provide a detailed comparison of key tasks and milestones for *EAp3: Fundamental Commissioning* and *EAc5: Enhanced Commissioning*.

Table 1. MEP System Tasks for EAp3: Fundamental Commissioning and EAc5: Enhanced Commissioning

Phase	**Task Descriptions**	**Fundamental *ASHRAE 90.1-2019***	**Enhanced *ASHRAE 202-2018***	**Minimum Requirements as listed**
	Identification of CxP	Section 4.2.5.2, with timing required by LEED	Section 5.1.1, with timing required by LEED	**Fundamental:** By the end of design development phase. **Enhanced:** During predesign or very early in the design phase.
Predesign For CxP engaged later than predesign, tasks must be completed immediately upon CxP engagement.	Assist in Development/Review and Update Owner's Project Requirements (OPR) to include HVAC, Service Water Heating, Power, Lighting and Other Equipment	Required by LEED	Section 6.2, 6.3	**Enhanced:** OPR shall list and define the systems and assemblies to be commissioned, including sampling strategies accepted by the Owner. It should clearly define objectives, Cx scope and requirements and identify the number, format and

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced *ASHRAE 202-2018*	Minimum Requirements as listed
				scheduling of design and submittal reviews.
	Develop Cx Plan	Section 4.2.5.2.1 Section 4.2.5.2.2	Section 7.2, 7.3	**Fundamental and Enhanced:** Development of Cx Plan. **Enhanced:** Update Cx plan at least once per phase (DD, CD, Construction).
Design Phase	Review Basis of Design (BOD)	Required by LEED	Section 8.2, 8.3	**Enhanced:** Review BOD for compliance with OPR.
	Update Cx Plan	Not Required	Section 7.2, 7.3	**Enhanced:** Update Cx plan at least once per phase (DD, CD, Construction).
	Develop Cx Specification	Section 4.2.5.1.1, 4.2.5.2.1, 6.9.2	Section 9.2, 9.3	
	Design Document Reviews (Design Drawings and Specifications)	Section 4.2.5.2, 4.2.5.2.2	Section 10.2, 10.3	Full Drawing and Specification Review for systems to be commissioned. **Fundamental and Enhanced:** detail compliance with the OPR and provisions in respective standards. Each design review to include issues log for tracking/resolution of issues. **Enhanced**: Back-check review to confirm if recommendations

Phase	**Task Descriptions**	**Fundamental *ASHRAE 90.1-2019***	**Enhanced *ASHRAE 202-2018***	**Minimum Requirements as listed**
				and comments have been addressed.
	Attend coordination/design meetings to discuss review comments and commissioning	Required by LEED	Required by LEED	**Fundamental**: Minimum of one coordination or design review meeting discussing design review comments. **Enhanced**: Minimum of one additional coordination or design review meeting discussing review comments.
	Update to OPR	Required for LEED	Section 6.2, 6.3	**Fundamental and Enhanced**: Update OPR as needed prior to end of Design Phase.
Construction Phase	Pre-Construction Kick-off Meeting	Not Required	Section 12.2.4	**Enhanced**: CxP conducts a Cx kick-off and scoping meetings with the Project Team to explain Cx procedures and coordinate Cx Activities throughout the Construction Phase.
	Update Cx Plan	Not Required	Section 7.2, 7.3	**Enhanced**: Update Cx plan at least once per phase (DD, CD, Construction).

Phase	**Task Descriptions**	**Fundamental *ASHRAE 90.1-2019***	**Enhanced *ASHRAE 202-2018***	**Minimum Requirements as listed**
	Submittal Review	Required by LEED	Section 11.2, 11.3	**Fundamental**: Review submittals or substitutions for design deviations impacting the OPR. **Enhanced**: Thorough review of relevant building system submissions for compliance with the Design Documents and OPR.
	Schedule	Required relative to other tasks	Section 7.2.3.d	**Fundamental**: Ensure Cx requirements/ milestones are included in the project construction schedule. **Enhanced**: Detailed description of Cx activities and a schedule of activities. Schedule is included in the Cx plan.
	Field Reviews	Section 4.2.5.1	Section 12.2.6	**Fundamental**: Minimum of one site visit to verify Cx readiness **Enhanced**: Minimum of one site visit to review contractor completed construction checklists. A checklist for each major system type should be reviewed during the site visit.
	Testing (Review/witness performance testing)	Section 4.2.5.2	Section 12.2.6	**Fundamental and Enhanced**: Minimum of one site visit to witness execution of functional-

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced *ASHRAE 202-2018*	Minimum Requirements as listed
				performance testing, per the scope of the project.
	Meetings	Required by LEED	Required by LEED	**Fundamental and Enhanced**: Milestone meetings at 50% and 100%
	QA/QC Documentation (Checklist and Tests)	Required by LEED	Section 12.2.2a, 12.2.6.c	**Fundamental**: Sample review of completed contractor documentation (i.e., 10%) **Enhanced**: Additional reviews of completed contractor documentation (i.e., 25%)
	Track identified issues to resolution (Issues/Resolution Log)	4.2.5.1, 4.2.5.2	Section 13.2, 13.3	**Fundamental**: Include Issues and Resolution (I/R) Log in the preliminary Cx r Report. **Enhanced**: Maintain a formal I/R log throughout the project until the owner resolves or accepts all issues. The final I/R log, with all items closed, is included in the final Cx rReport.
	Systems Manual	Not Required	Section 14.2, 14.3	**Enhanced**: Compile the Systems Manual, which includes all information needed to understand, operate and maintain the building's systems and assemblies.

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced *ASHRAE 202-2018*	Minimum Requirements as listed
	Operations and Maintenance Manual	Not Required	Required for LEED	**Enhanced:** Compile an Operations and Maintenance Manual from contractor submissions.
	Preliminary Commissioning Report	4.2.5.1.2, 4.2.5.2.2	Section 17.2.1	**Fundamental and Enhanced:** Completion of LEED Online documentation as well as report summarizing Cx activities to end of Construction Phase, Including OPR, Cx Plan and reports.
Occupancy/Operations Phase	Review Training Program**-**	4.5.2.2.2.c.5	Section 15.2, 15.3	**Fundamental:** Review the training plan. **Enhanced:** Review the training plan and confirm that it has been implemented. Include training plan in the Systems Manual.
	Post-Occupancy Review	Not Required	Section 16.2, 16.3	**Enhanced:** Conduct minimum of one in person, post occupancy site visit with Facility Maintenance staff (or similar) prior to end of the warranty period.
	Final Commissioning Report	4.2.5.2.2	Section 17.2.3	Full report summarizing Cx activities, including Occupancy Phase activities.
	On-going Cx Plan	Required for LEED	Required for LEED	**Fundamental and Enhanced:** Provide an ongoing Cx plan that allows building operators to maintain a

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced *ASHRAE 202-2018*	Minimum Requirements as listed
				building's high performance. At minimum, include a set of blank forms for future use by the O&M team.

Table 2. Building Enclosure (Envelope) Tasks for EAp3: Fundamental Commissioning and EAc5: Enhanced Commissioning

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced ASTM E2947-2021	Minimum Requirements as listed
	Identification of CxP	Section 4.2.5.2, with timing required by LEED	Section 5.1.1, with timing required by LEED	**Fundamental:** By the end of design development phase. **Enhanced:** During predesign or very early in the design phase.
Predesign (or immediately upon CxP engagement)	Assist in Development/Review and Update Owner's Project Requirements (OPR) to include Envelope	Required by LEED	Section 6.3	**Fundamental and Enhanced:** Include building envelope requirements in OPR. OPR to be updated as needed during design and construction phases.
Design Phase	Review Basis of Design (BOD)	Required by LEED	Section 7.2.3	**Fundamental and Enhanced:** Review BOD for compliance with OPR related to building envelope.
	Develop BECx Plan	Section 4.2.5.2.1.a Section 4.2.5.2.2.a	Section 6.5 7.3.6 (DD phase) 7.4.5 (CD phase) 9.6 (Construction Phase)	**Fundamental:** Development of BECx plan. **Enhanced:** Update BECx plan at least once per phase (DD, CD, Construction).

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced ASTM E2947-2021	Minimum Requirements as listed
	Design Document Reviews (Design Drawings and Specifications)	Section 4.2.5.2.2.b	Section 7.1.1 7.2.3 (SD phase) 7.3.4 (DD phase) 7.4.3 (CD phase)	Full Drawing and Specification Review for critical barrier design and continuity. **Fundamental:** Focus on air and thermal barrier continuity and performance. **Enhanced:** Review air, thermal, moisture and vapor barrier continuity and performance. Each design review to include issues log for tracking/resolution of issues. **Enhanced:** Back-check review confirming if recommendations/comments have been addressed.
	Develop BECx Specification	Section 4.2.5.1.1 Section 4.2.5.2.1.d	Section 7.4.6	
	Attend Key Building Envelope Focused Design meetings	Required by LEED	Section 7.2.2 Section 7.3.2 Section 7.4.2	Fundamental: Minimum of one coordination or design review meeting to discuss design review comments. Enhanced: Number of meetings increased to each design phase (SD, DD, CDs)
	Update to OPR	Required by LEED	Sections 7.2.5, 7.3.5, 7.4.4	Fundamental and Enhanced: Update OPR as needed

Phase	Task Descriptions	Fundamental *ASHRAE 90.1-2019*	Enhanced ASTM E2947-2021	Minimum Requirements as listed
				prior to end of Design Phase.
Construction Phase	Pre-Construction Kick-off Meeting	Not Required	Section 9.2.1	Enhanced: BECxA to lead meeting, prepare agenda to minimally include discussion on roles/responsibilities, BECx plan and spec overview, schedule, summary of mock-up, site reviews and testing.
	Review Submittals/Substitutions	Required by LEED	Section 9.2.2	Fundamental: Review submittals/substitutions for design deviations that impact the OPR. Enhanced: Thorough review of relevant building envelope submissions for compliance with the Design Documents and OPR.
	Schedule	Required relative to other tasks	Section 9.2.2.3	Fundamental: Ensure BECx requirements and milestones are in the project Construction Schedule. Enhanced: Review and comment on Construction Schedules as required.
	Mock-ups	Not Required	Section 9.3.3	Enhanced: Attend mock-up reviews (laboratory, factory, Performance mock-ups (PMU), in place mock-ups) as applicable.

Phase	**Task Descriptions**	**Fundamental *ASHRAE 90.1-2019***	**Enhanced ASTM E2947-2021**	**Minimum Requirements as listed**
	Field Reviews	Section 4.2.5.2.2.c.3	Section 9.3.1	Fundamental: Minimum of one (1) per envelope assembly type. Enhanced: should include more regularly scheduled /periodic site reviews with a focus on early reviews (approx. 10% of installation).
	Testing (Review/witness performance testing)	Section 4.2.5.2.2.c.3	Section 9.3.1	Fundamental: N/A Enhanced: Witnessing a sampling of envelope tests. May also include laboratory and mockup testing.
	Meetings	Required by LEED	Section 9.3.4	**Fundamental**: Milestone meetings at 50% and 100%. **Enhanced**: Additional milestone meetings (i.e., 25%, 50%, 75% and 100% of envelope schedule minimum).
	QA/QC Documentation (contractor's checklists)	Required by LEED	Section 9.2.2	**Fundamental**: Sampling review of building envelope contractor checklists (i.e., 10%). **Enhanced**: Review a minimum of 25% sampling of installer checklists.
	Operations and Maintenance Manual	Not Required	Section 9.4	Confirm compliance with OPR, BOD and BECx Plan.
	Construction Phase BECx Report	Section 4.2.5.2.2.c	Section 9.7	**Fundamental and Enhanced**: Completion of LEED Online documentation as

Phase	**Task Descriptions**	**Fundamental *ASHRAE 90.1-2019***	**Enhanced ASTM E2947-2021**	**Minimum Requirements as listed**
				well as report summarizing BECx activities to end of Construction Phase, Including OPR, BECx Plan and reports.
Occupancy/Operations Phase	Review Building Envelope Training Program	4.5.2.2.2.c.5	Section 10.2	Review that training plan has been implemented.
	Post-Occupancy Review	Not Required	Section 10.3	**Enhanced**: Conduct minimum of one in-person post occupancy site visit with Facility Maintenance staff (or similar) before the end of envelope warranty period.
	Final BECx Report	Section 4.2.5.2.2.d	Section 10.1	Full report summarizing BECx activities, including Occupancy Phase activities.
	On-going BECx Plan	Not Required	Section 10.4	**Enhanced**: Contribute to development of Preventative Maintenance Plan for Building Envelope (i.e., On-Going BECx Plan) for owner.

Core and Shell

For LEED BD+C: Core and Shell projects, complete commissioning for systems within the core and shell scope of work. Follow all BD+C: New Construction requirements with the following guidance.

SCOPE OF WORK

The commissioning scope of work for a Core and Shell project varies depending on the energy and water-using systems included in the design. For example, a project may consist of base building systems, like air-source heat pumps and central air handling units. Alternatively, the developer may limit the scope of work and provide a cold shell with no central HVAC equipment and minimal levels of lighting. Per the project scope, the CxP must verify and test systems.

DESIGN REVIEW FOR CORE AND SHELL PROJECTS

During the design reviews, include review comments on *LEED BD+C: Core and Shell* systems and how any incomplete system can meet *ASHRAE Standard 90.1* requirements for tenant fit-outs. This includes both energy efficiency measures and tenant metering requirements.

FINAL COMMISSIONING REPORT

Along with the required elements listed in the Final Commissioning Report section above, identify and defer any tests until base building systems connect with future tenant equipment (e.g., a central VAV air handling unit with controls testing that must be deferred until after installing tenant VAV terminal equipment).

TENANT GUIDELINES FOR COMMISSIONING

IPp4: Tenant Guidelines allow owners to inform all tenants of the building's sustainable design and construction features. Project teams are encouraged to include a section on commissioning addressing any interconnection between base building and tenant-installed systems.

DOCUMENTATION

Project types	Options	Documentation
All	All	If the report is a draft, include a plan for the completion of commissioning and training, including climatic and other conditions required for performance of any deferred tests.
		Confirmation of compliance with *ANSI/ASHRAE/IES Standard 90.1* commissioning requirements for building systems, controls, and the building envelope (Section 4.2.5.2 exceptions shall not apply).
		Confirmation of design phase meeting.
		Provide Commissioning Plan and sample FPT Test scripts (one sample per discipline).
		Owner’s Project Requirements and BOD
		Identification of Commissioning Provider including key personnel (CxP) and Verification and Testing (V&T) providers (as applicable).
		Qualifications of CxP and V&T providers.
		Ongoing Cx Plan (post-occupancy).
		Confirmation of construction phase milestone meetings at 50% and 100% completion.
		Confirmation that submittals were reviewed and at least 10% of the contractor’s documents were QA/QC’d

REFERENCED STANDARDS

- ANSI/ASHRAE/IES Standard 90.1 commissioning requirements for building systems, controls, and the building envelope, with the following additional provisions:
  - The referenced version of Standard 90.1 with errata shall be:
    - 2019 for projects registered before January 1, 2028.
    - 2022 for projects registered on or after January 1, 2028.
- ASHRAE 90.1-2019 (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527)
- ASHRAE 90.1-2022 (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082)
- IECC 2021, (codes.iccsafe.org/content/IECC2021P3)
- IECC 2024, (codes.iccsafe.org/content/IECC2024P1)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Prerequisite

ENERGY METERING AND REPORTING

EAp4

REQUIRED

New Construction
Core and Shell

INTENT

To support energy management practices and facilitate identification of ongoing opportunities for energy and greenhouse gas emissions savings by tracking and reporting building energy use and demand.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Energy Monitoring and Recording	
AND	
Report Energy Data	

Comply with the following requirements:

Energy Monitoring and Recording

- Install (or use existing) devices to monitor and record energy use per *ANSI/ASHRAE/IES Standard 90.1.* The version of Standard 90.1 shall be:
    - 2019 or later for projects registered before January 1, 2028.
    - 2022 or later for projects registered on or after January 1, 2028.
- Install (or use existing) devices to monitor and record energy use for the following, meeting the same monitoring and reporting requirements as required in *ASHRAE* for electrical end uses:
    - On-site renewable electricity generation
- Major renovations and buildings eligible for exceptions to *ASHRAE 90.1-2019*, Section 10.4.6, or 90.1-2022, Section 10.4.7, must install measurement devices capable of monitoring whole-building energy use for each building energy source and building peak electricity demand at least monthly.

AND

Report Energy Data
Commit to reporting the following data to USGBC at least annually: monthly energy data for 12 consecutive months of total energy consumption for each energy source, on-site renewable energy generation, and peak electrical demand. This commitment must carry forward for five years or until the building changes ownership or lessee.

> **Exception for Core and Shell projects**
> Future tenant utility services and meters that will be installed in the tenant scope of work.

REQUIREMENTS EXPLAINED

The prerequisite requires the installation of devices to monitor and record monthly energy use per energy source and peak electric demand and to report monthly energy use data to USGBC post-occupancy for all buildings.

New construction projects subject to the *ASHRAE Standard 90.1* provisions referenced by this prerequisite must also provide metering and sub-metering of electricity at 15-minute intervals, and additional reporting capabilities. Electrical system designers should evaluate these requirements early in the project design to ensure the electrical distribution, circuitry, wiring necessary to accommodate the required submetering. Addressing these requirements too late in the design can substantially escalate costs.

Record and report data so owners and facility managers can access and use it to make informed decisions on energy efficiency and carbon emission reduction strategies.

Refer to Table 1 for a summary of the prerequisite energy metering and reporting requirements.

Table 1. Summary of LEED v5 EAp4: energy metering and reporting requirements

	Projects subject to *ASHRAE 90.1-2010* monitoring and reporting requirements			
	Referenced 90.1 Sections OR LEED-specific requirements	**New buildings (except small buildings)**	**Tenant spaces >= 10,000 sq. ft. (excludes shared building systems)**	**Small buildings and major renovations LEED-specific requirements**
Monitoring				
Total energy use by energy source	*90.1-2019 10.4.6.1* *90.1-2022 10.4.7.1*	Monthly		Monthly

	Projects subject to *ASHRAE 90.1-2010* monitoring and reporting requirements			
	Referenced 90.1 Sections OR LEED-specific requirements	**New buildings (except small buildings)**	**Tenant spaces >= 10,000 sq. ft. (excludes shared building systems)**	**Small buildings and major renovations LEED-specific requirements**
(except residential dwelling units) • natural gas • fuel oil • propane • district chilled water • district steam • district hot water				
Total Electricity (except residential dwelling units)	*90.1-2019 8.4.3.1* *90.1-2022 8.4.3.1*	15-minute	15-minute	Monthly
Sub-metered electricity (except residential dwelling units) • HVAC • Interior lighting • Exterior lighting • Receptacle circuits • Refrigeration systems (*90.1-2022*)	*90.1-2019 8.4.3.1* *90.1-2022 8.4.3.1*	15-minute	15-minute	N/A
Large chilled water plant electricity and efficiency in kW/ton	*90.1-2019 6.4.3.11* *90.1-2022 6.4.3.11*	15-minute	15-minute	
On-site renewable electricity	LEED-Specific	15-minute		Monthly
Reporting				
Commit to annually sharing monthly data with USGBC for: • Energy consumption by energy source • On-site renewable energy generation • Peak electrical demand	LEED-Specific	x		x
Capable of creating user reports for consumption and demand at least hourly, daily, monthly, and annually, with a system capable of maintaining all data collected for 36 months.	*90.1-2019 10.4.6.2* *90.1-2022 10.7.4.2*	x	x	
Visual display				

	Projects subject to *ASHRAE 90.1-2010* monitoring and reporting requirements			
	Referenced 90.1 Sections OR LEED-specific requirements	**New buildings (except small buildings)**	**Tenant spaces >= 10,000 sq. ft. (excludes shared building systems)**	**Small buildings and major renovations LEED-specific requirements**
Graphical display of electricity data for buildings with any of the following: • AHUs with fans > 10 hp • Chilled water plants • Hot water plants	*90.1-2019 8.4.3* *90.1-2022 8.4.3*	x		
Graphical display of chilled water plant data for large chilled water plants	*90.1-2019 6.3.4.11.2* *90.1-2022 6.3.4.11.2*	x		

NOTE**:** Small buildings refer to commercial buildings less than 25,000 sq. ft. (2,323 sq. m.) or residential projects with less than 10,000 sq. ft. (929 sq. m.) of common space. All other new buildings are subject to *ASHRAE 90.1* monitoring and reporting requirements.

Energy Monitoring and Recording

SMALL BUILDINGS AND MAJOR RENOVATIONS

ASHRAE 90.1 energy monitoring and reporting requirements don’t apply to major renovations and small buildings eligible for exceptions to *ASHRAE 90.1-2019*, Section 10.4.6 or *ASHRAE 90.1-2022*, Section 10.4.7, including commercial buildings under 25,000 sq. ft. (2,323 sq. m.), and new residential buildings with less than 10,000 sq. ft. (929 sq. m.) of common space.

For these project applications, provide measurement devices capable of monitoring whole-building energy use for each building energy source and building peak electricity demand at least monthly. The prerequisite compliance doesn’t require further submetering or interval metering.

Provide monitoring for all energy sources supplied to the project from outside the building boundary, including utility usage and energy supplied from a campus utility plant or adjacent building.

ASHRAE STANDARD 90.1 MONITORING AND RECORDING REQUIREMENTS

All other projects must comply with *ASHRAE Standard 90.1* energy monitoring and recording requirements:

Whole-Building Energy Monitoring Requirements

Electricity meters must be capable of metering and recording total project electricity use at 15-minute intervals. Refer to *ASHRAE 90.1*, Sections 8.4.3.1.

For all other fuels, provide measurement devices capable of monitoring whole-building energy use for each building energy source at least monthly. Include all energy sources supplied to the building from outside the project boundary. Refer to *ASHRAE 90.1-2019* 10.4.6.1 or *ASHRAE 90.1-2022* 10.4.7.1.

Electricity Submetering Requirements (ASHRAE 90.1, Section 8.4.3.1)

Projects must submeter end-use electricity data at 15-minute intervals for HVAC, interior lighting, exterior lighting, and receptacle; and if using *ASHRAE 90.1-2022* - refrigeration systems.

Combine electricity end-uses less than 10% of the whole-building electrical load with other categories. For example, if exterior lighting loads are less than 10% of the whole-building load, teams can report exterior lighting with interior lighting. Use the energy end-use estimation from *EAp1: Operational Carbon Projection and Decarbonization Plan* to determine applicable loads.

ASHRAE Standard 90.1 Tenant Electricity Submetering (ASHRAE 90.1, Section 8.4.3.1)

Tenant spaces larger than 10,000 sq. ft. (929 sq. m.) require electricity submetering at 15-minute intervals, both for total tenant electricity use, and for direct tenant loads for HVAC, interior lighting, exterior lighting, receptacle, and if using *ASHRAE 90.1-2022* - refrigeration systems. For acceptable grouping of end-uses, reference the building-level 10% exception.

Exclude electricity from shared HVAC equipment (e.g., a central air handling unit providing supply air to the tenant space) when determining the tenant submetering requirements. The estimated load must include electricity for system components in the tenant space such as fan coil units and variable air volume (VAV) terminals.

ASHRAE Standard 90.1 Reporting

Refer to *ASHRAE 90.1*, Sections 8.4.3.2 and *90.1-2019 10.4.6.1* or *90.1-2022 10.4.7.1*.

The monitoring system must include the capability to report total and sub-metered electricity data at least hourly, daily, monthly, and annually, and the capability of reporting whole-building energy consumption monthly and annually, with system capable of maintaining all data collected for 36 months.

The monitoring system must include functionality for tenants to access their electricity data.

Use third-party energy monitoring services or applications to comply with the data reporting and storage requirements.

Graphically display electricity data in buildings that are required to have digital control systems (buildings with air handling units with fans > 10 hp (7.5 kW), chilled water plants, or hot water plants).

ASHRAE Standard 90.1 Version

Projects registered before January 1, 2028, must reference the energy monitoring and recording requirements in *ASHRAE Standard 90.1-2019* or later. Projects registered on or after January 1, 2028, must use the slightly augmented energy monitoring and recording requirements from *ASHRAE Standard 90.1-2022*. For example, *ASHRAE 90.1-2022* adds a submetering requirement for refrigeration systems.

> **Additional considerations**
> Teams that use a single version of *ASHRAE Standard 90.1* for *EAp2: Minimum Energy Efficiency*, *EAp3: Fundamental Commissioning*, *and EAp4: Energy Metering and Reporting* can streamline documentation efforts.

International Energy Conservation Codes (IECC) Equivalent Standard

IECC is an approved equivalent standard for this prerequisite. IECC 2021 requirements can replace *ASHRAE Standard 90.1-2019*. IECC 2024 requirements can replace *ASHRAE Standard 90.1-2022*.

On-site renewable energy

All projects shall separately monitor on-site renewable energy generation. Projects subject to *ASHRAE Standard 90.1* monitoring and recording requirements must record renewable electricity data in 15-minute intervals. Major renovations or small buildings eligible for exceptions to *ASHRAE 90.1-2019*, Section 10.4.6 or *ASHRAE 90.1-2022*, Section 10.4.7 require only monthly data collection.

Energy use on a shared site
Projects in a campus application or shared site can address site lighting or other site energy use within the project's metered data or in a separate meter dedicated to the campus. For example, if there is a shared parking lot with exterior lighting, project teams can include metered data from all exterior lighting within the project's reported data. Teams can exclude exterior lighting if they confirm that the campus energy meter reports the required data.

District heating and district cooling sources supplied from outside the project boundary must be separately metered for the project and not through a shared campus energy meter.

> **Additional considerations: EVSE metering recommended**
> Consider submetering electric vehicle service equipment (EVSE) for vehicle charging to exclude this energy from the total energy consumption modeled for *EAc3: Enhanced Energy Efficiency* or used to assess compliance for LEED O+M: Existing Buildings.

Report Energy Data

Report data annually to USGBC for at least five years post-occupancy. Data must include monthly peak electrical demand and monthly energy consumption from each energy source (including on-site renewable energy generation). Provide data using the USGBC-provided platform, which includes third-party interfaces with tools such as ENERGY STAR® Portfolio Manager.

This valuable data enhances the understanding of building performance for project owners and managers. It also educates occupants and building users on behaviors that impact energy consumption, and how positive behavioral changes can create better buildings.

USGBC aims to collect data from all LEED BD+C projects. Comparing data across similar project types allows for ongoing benchmarking of high-performing buildings within the LEED portfolio. The data influences refinements and enhancements to future LEED Rating System requirements. Data shared with USGBC gives critical insight into the industry on the design, construction, and operation of high-performing buildings.

Core and Shell Projects

ENERGY MONITORING AND RECORDING FOR CORE AND SHELL

Comply with the Energy Monitoring and Recording criteria above for the project scope of work.

Provide meters for each utility connection installed in the project scope, each district energy source supplied to the project, and all on-site renewable energy.

If the project is a new commercial building that is at least 25,000 sq. ft. (2,323 sq. m.) or a residential project with at least 10,000 sq. ft. (929 sq. m.) of common space, comply with the *ASHRAE 90.1* monitoring and reporting provisions:

- At 15-minute intervals, provide electricity metering capable of monitoring total electrical use associated with the project scope of work. Include all common area and shared space electrical use, plus electric usage for tenant systems and equipment installed in the project scope.

- Provide electricity end-use submetering at 15-minute intervals for HVAC, interior lighting, exterior lighting, and receptacles installed within the project scope. Include all common area and site energy use, all shared HVAC equipment, and any HVAC, lighting, or receptacles installed in tenant spaces.

- For each tenant space ≥ 10,000 sq. ft. (929 sq. m.) with electrical systems in scope, provide electricity submetering at 15-minute intervals for total tenant electricity in scope, and for HVAC, lighting, and receptacle end-uses in scope. If the future tenant configuration is unknown, install the necessary circuitry, wiring, and hardware to accommodate the required submetering upon tenant buildout.

- Provide required recording and reporting functionality. If networking functionality is not operational upon substantial project completion, design the monitoring system to comply with the requirements upon activation of networking capabilities.

- If the required monitoring, data storage, and/or reporting functionalities are in the tenant scope, these may be excluded from the core and shell project scope.

REPORTING FOR CORE AND SHELL

Annually report energy data to USGBC for at least five years for the meters controlled by the owner.

> **Additional considerations**
> Teams can report all data, including tenant energy use. However, this is not required to meet the prerequisite.

Projects pursuing IPc2: Green Leases

Consider including information on how energy consumption for the whole-building energy use and in common areas is shared with tenants.

Consider requesting annual tenant energy disclosures, even if not pursuing *IPc2: Green Leases*.

RESIDENTIAL

The following are acceptable in place of reporting whole-building energy usage to USGBC:

- Provide a separate electric meter for each non-transient dwelling unit.
- Provide central metering per energy source for all common area uses and shared services. Report this metered data to USGBC.

> **Additional considerations**
> It's encouraged for residential dwelling units to aggregate and report whole-building energy consumption, including residential dwelling units, when not precluded by utility service restrictions or regulatory provisions. This data must be available for residential projects pursuing LEED EB:O+M certification.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All	All	Confirmation of compliance with 90.1-2019 monitoring or 90.1-2022 requirements.
			Documentation showing monitoring and recording devices of all utilities, including renewable energy, district energy, electrical plans, schedules, or other documents that detail the required monitoring and recording devices.
			Evidence of a commitment from the owner or responsible party that the required energy data will be shared with USGBC.
			List of energy sources delivered to the building.

REFERENCED STANDARDS

- ASHRAE 90.1-2019, (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527)
- ASHRAE 90.1-2022, (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082)
- IECC 2021, (codes.iccsafe.org/content/IECC2021P3)
- IECC 2024, (codes.iccsafe.org/content/IECC2024P1)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Prerequisite

FUNDAMENTAL REFRIGERANT MANAGEMENT

EAp5

REQUIRED

New Construction
Core and Shell

INTENT

To reduce greenhouse gas emissions from refrigerants by accelerating the phaseout of refrigerants with high global warming potential (GWP) and by reducing refrigerant leakage.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Option 1. No Refrigerants	
OR	
Option 2. Refrigerants	

Option 1. No Refrigerants

Do not use refrigerants in the project.

OR

Option 2. Refrigerants

Meet the following requirements:

- Complete refrigerant inventory. Complete an inventory of the refrigerant-containing equipment installed within the project scope of work and any existing equipment owned by the building owner. The inventory shall include the refrigerant type, GWP, amounts of refrigerants contained in each, and the total GWP of all refrigerants.
- Do not use hydrochlorofluorocarbon refrigerants in new equipment.
- Evaluate available alternatives during the design process for any refrigerants with GWP > 700.
- Leak check and repair. Prior to substantial completion, check both new and existing refrigerant-containing equipment for refrigerant leaks and repair all identified leaks. For systems with field-assembled joints, perform a leak check, vacuum check, and pressure check prior to charging with refrigerant.

REQUIREMENTS EXPLAINED

Option 1 applies only to projects without refrigerants. Projects with refrigerants must follow Option 2.

Option 1. No Refrigerants

Buildings with no refrigerant-containing equipment automatically meet the prerequisite.
Option 1 criteria does not preclude the use of equipment containing less than 0.5 lbs. (225 g), such as standard residential refrigerators, small wine coolers, or portable space dehumidifiers.

OR

Option 2. Refrigerants

Teams pursuing this path must avoid hydrochlorofluorocarbon (HCFC) refrigerants, analyze alternatives for refrigerants with a Global Warming Potential (GWP) greater than 700, inventory all refrigerant-using equipment, and ensure no leaks from refrigerant-containing equipment.

NO HYDROCHLOROFLUOROCARBON (HCFC) REFRIGERANTS

Projects must not use HCFC refrigerants, which cause damage to the ozone layer and often have very high global warming potential (GWP).

> **Developed and developing countries**
> In developed countries, government regulations have already phased out HCFC refrigerants for new equipment per the Kigali Amendment to the Montreal Protocol.
>
> In developing countries, teams must take precautions to limit selections to equipment that does not use HCFCs. Equipment specifications must disallow HCFCs such as R-22 used in air conditioners or R-123 commonly used in chillers.

EVALUATION OF ALTERNATIVE REFRIGERANTS

Global warming potential (GWP) measures the relative contribution of a substance toward heating the atmosphere compared to the same mass of carbon dioxide (CO2). For example, R-410A with a GWP of 2,088 traps 2,088 times more heat in the atmosphere than CO2.
This prerequisite references 100-year GWPs assessed in accordance with the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report or later.
Reviewing refrigerant properties during the design process allows teams to address high GWP refrigerants and find suitable alternatives before construction begins. As the industry continues

developing new alternative refrigerants, projects can find cost-effective solutions that meet efficiency and environmental goals.

EQUIPMENT WITH GWP > 700

During the design process, if the specifications reference equipment with refrigerant GWP exceeding 700 or do not specify the refrigerant(s) to use, develop a list of alternative equipment options with refrigerant GWP less than or equal to 700. Review all proposed options with the owner.

Refrigerant properties vary in efficiency, toxicity, flammability, volumetric capacity, and pressure ratings. Not all refrigerants are interchangeable within a piece of equipment or system. Therefore, completing this evaluation early in design provides the most benefit.

For applications where a GWP less than 700 is impractical, consider using reclaimed refrigerant instead of newly manufactured virgin refrigerant to limit the overall impact.

- Table 1 provides a common list of refrigerants and their GWP, adapted from the Net Zero Carbon Guide and The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI).

Table 1. Common refrigerants and their applications

Refrigerant	Classification	GWP	Common system applications
R404A	HFC blend	3,920	Low-medium temperature commercial refrigeration Low-medium temperature industrial refrigeration Ice Machines
R410A	HFC	2,088	Conventional VRF systems Heat pumps Chillers
R22	HCFC	1,810	Commercial refrigeration Industrial refrigeration Commercial air conditioning Residential air conditioning
R134a	HFC	1,430	Heat pumps Chillers
R32	HFC	633	Hybrid VRF systems Heat pumps Chillers
R513A	HFO	573	Medium temperature commercial refrigeration Medium temperature industrial refrigeration Chillers Air conditioning units Heat pumps
R600 (Butane)	HC	4	Heat pumps Chillers

Refrigerant	Classification	GWP	Common system applications
R290 (Propane)	Natural	3	Commercial Refrigeration Heat Pumps Chillers
R1234ze	HFO	<1	Heat Pumps Chillers
R744 (CO2)	Natural	1	Heat Pumps
R717 (NH4, ammonia)	Natural	0	Heat Pumps

EQUIPMENT INVENTORY

Project teams must identify all refrigerant-containing equipment included in the scope of work, including any existing equipment within the project boundary owned or controlled by the project owner and/or facilities manager. Equipment that contains less than 0.5 pounds (225 grams) of refrigerant, such as standard residential refrigerators in dwelling units, can be excluded from the calculations.

Manage the inventory during the Construction Phase. If equipment substitutions occurred during the submittal and procurement phases, update the inventory to reflect the actual installed equipment.

Table 2 is a sample and non-comprehensive list of the types of refrigerant-using equipment that a project's scope of work may include.

> **Additional considerations: Equipment inventory**
> Completing the inventory in the Construction Documents Phase provides owners and design professionals with a complete understanding of the future climate impacts.

Table 2. Refrigerant-containing equipment

Application	Equipment/System Type
HVAC, Space Cooling Equipment	Stationary air conditioners and heat pump Chillers Computer room air conditioning (CRAC) units
Service Water Heaters	Heat pump service water heaters
Retail	Food Refrigeration Cold Storage
Commercial	Vending Machines Ice Machines
Industrial Process Refrigeration	Process chillers Ice rink chillers Other process refrigeration

Data Collection

Document the refrigerant properties for each type of equipment, including type of refrigerant, refrigerant GWP ($GWP_{REFRIGERANT}$), and refrigerant charge (Rc).

When the project design includes field-assembled refrigerant piping with long pipe lengths or large pressure drops (e.g., variable refrigerant flow (VRF) systems, industrial process equipment), teams must account for additional required Rc in the calculations per the manufacturer’s specifications or confirm that the manufacturer’s default charge or referenced submittals already account for this additional charge.

Calculate the total equipment GWP for each equipment using Equation 1.

Equation 1. $GWP_{EQUIPMENT}$ calculation

$$GWP_{EQUIPMENT} = R_C \times GWP_{REFRIGERANT}$$

The project’s total GWP is the sum of the GWPs for all refrigerant-using equipment in the project:

Equation 2. GWP_{TOTAL} calculation

$$GWP_{TOTAL} = \sum GWP_{EQUIPMENT}$$

Determine the weighted average GWP for the project by dividing the project’s total GWP by the sum of Refrigerant Charge for all equipment:

Equation 3. Weighted average GWP calculation

$$Weighted\ average\ GWP = \frac{GWP_{TOTAL}}{\Sigma R_C}$$

LEAK CHECK AND REPAIR

Perform leak checks for all refrigerant-containing equipment in the project, including new and existing equipment. Field-installed piping requires vacuum and pressure testing during the installation process per the International Mechanical Code Chapter 11, *EPA Clean Air Act Section 608, European Union F-Gas Regulations*, or similar referenced standards.

For existing systems or self-contained systems, leak check inspections may leverage electronic leak detectors, data from the Building Automation System, visual inspections for oil residue on joints or for bubbling from leaks after applying soapy water, audible detection of hissing or bubbling sounds, and/or pressure testing.

Renovation Projects

For major renovations, properly decommission refrigerant-containing equipment that has been removed or disposed of during construction. The U.S. EPA regulations (*40 CFR Part 82, Subpart F*) require refrigerant recovery and proper recycling, reclamation, or destruction of refrigerants classified as ozone-depleting substances. International projects must comply with other regional regulations, like the European Union F-gas regulation.

- **Recovery**. Extract all refrigerant from the equipment, including refrigerant in refrigerant piping. Store in a leak-free container.
- **Disposal options**. Recycle, reclaim, or destroy the recovered refrigerant as follows:
  - **Recycling**. Clean the refrigerant and reuse it on-site, in other equipment owned by the same owner.
  - **Reclamation**. Clean the refrigerant for resale. The refrigerant must meet specific purity requirements. Reclamation efforts commonly occur in a dedicated processing facility.
  - **Destruction**. Incineration or other technologies break down the refrigerants into less harmful components that will not contribute to ozone depletion or high GWP.

> **Core and Shell only**
> For Option 2, address all refrigerant-containing equipment in the Core and Shell scope of work and any existing equipment within the boundary owned or controlled by the project owner and/or facilities manager. The inventory may exclude tenant equipment not installed as part of the Core and Shell scope of work.

DOCUMENTATION

Project types	Options	Path	Documentation
New Construction and Core and Shell	Option 1. No Refrigerants	All	Description of the cooling and heating systems used for the project. Confirmation that no refrigerants are used within the project boundary and how the project meets cooling, heating, and other project loads without refrigerants.
	Option 2. Refrigerants	All	Narrative summarizing the evaluation of available alternatives for any refrigerant with a GWP >700. Include a list of the original selected refrigerants as compared to the alternatives considered.

Project types	Options	Path	Documentation
			Refrigerant inventory with complete list of all refrigerant-containing equipment. Each piece of equipment shall include the equipment type, refrigerant type, GWP, and Rc.
			Total GWP of all refrigerants (Equation 2 from *EAp5: Fundamental Refrigerant Management*).
			Narrative describing the refrigerant leak check evaluation. Include confirmation that the leak check has occurred for all equipment.
			Attestation that all leaks are repaired prior to charging with refrigerant.

REFERENCED STANDARDS

- EPA 2023 AIM ACT Technology Transitions Rule, (epa.gov/climate-hfcs-reduction/regulatory-actions-technology-transitions)
- EPA regulations - 40 CFR Part 82, Subpart F, (ecfr.gov/current/title-40/chapter-I/subchapter-C/part-82/subpart-F)
- International Mechanical Code Chapter 11, (codes.iccsafe.org/content/IMC2021P3)
- EPA Clean Air Act Section 608, (epa.gov/section608/section-608-clean-air-act)
- European Union F-Gas Regulations, (eur-lex.europa.eu/eli/reg/2024/573/oj)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

ELECTRIFICATION

EAc1

New Construction (1–5 points): 5 points are required for LEED BD+C: New Construction Platinum projects
Core and Shell (1–4 points): 4 points are required for LEED BD+C: Core and Shell Platinum projects

INTENT

To encourage buildings to be designed so they do not depend on burning fuel on-site, leading to better indoor and outdoor air quality and to low carbon operations as the grid decarbonizes.

REQUIREMENTS: NEW CONSTRUCTION

Achievement pathways	Points
New Construction	1–5
Option 1. No On-Site Combustion	5
OR	
Option 2. No On-Site Combustion Except at Low Temperatures	1–4
Path 1. Space Heating	2
AND/OR	
Path 2. Service Water Heating	1
AND/OR	
Path 3. Cooking and Other Process Loads	1

Option 1. No On-site Combustion (5 points)

Design and operate the project from start-up with no on-site combustion except for emergency support systems.

Combined weighted average equipment efficiency for space heating and service water heating (SWH) must be at least 1.8 coefficient of performance (COP).

The following equipment may be excluded from the COP determination:

- Space heating equipment in climate zones 0–2.
- Supplemental heating equipment designed only for operation at low temperatures.
- SWH equipment in nonresidential spaces complying with the point-of-use water heater criteria in *ASHRAE 90.1-2022*, Section 11.5.2.3.3, W05, without exceptions.

OR

Option 2. No On-site Combustion Except at Low Temperatures (1–4 points)

Pursue any combination of the following paths for a maximum of 4 points:

PATH 1. SPACE HEATING (2 POINTS)

Design space heating to be capable of operating without on-site combustion except in low temperatures. Projects in climate zones 3 and above must have a weighted average space heating equipment efficiency of at least 1.8 COP.

The following equipment may be excluded from the COP determination:

- Supplemental or auxiliary heating equipment designed only for operation at low temperatures.

AND/OR

PATH 2. SERVICE WATER HEATING (1 POINT)

Design service water heating systems to be capable of operating without on-site combustion except at low temperatures. Projects with total service water heating capacity exceeding 34,000 Btu/hr (10 kW) must have a weighted average service hot water equipment efficiency of at least 1.8 COP OR domestic hot water solar fraction of at least 0.4.

The following equipment may be excluded from the COP determination:

- SWH equipment in nonresidential spaces complying with the point-of-use water heater criteria in *ASHRAE 90.1-2022*, Section 11.5.2.3.3, W05, without exceptions.
- Supplemental or auxiliary heating equipment designed only for operation at low temperatures.

AND/OR

PATH 3. COOKING AND OTHER PROCESS LOADS (1 POINT)

Design cooking, laundry, process equipment, and on-site power generation except emergency support systems to be capable of operating without on-site combustion (projects that do not have these systems automatically earn this point).

The following equipment may be excluded:

- Process heating equipment designed for operation at low temperatures.

Equipment efficiency: Determine weighted average COP using either of the following:

- **Equipment efficiencies at rated conditions**: For equipment with multiple rated conditions, use the rating closest to 17°F (–9°C) OA db, 32°F (0°C) entering liquid temperature, or 44°F (6°C) heating source leaving liquid temperature.
- Annual average COP calculated with an energy simulation.

District energy: Projects with district energy must comply with the requirements of this credit at the district facility or see additional guidance for interpretation of credit requirements.

Fuel cells: Fuel cells using fossil fuel are ineligible for credit.

Low temperatures: “Low temperatures” refer to outside air dry-bulb temperatures (OA db) below 20°F (–6.5°C).

REQUIREMENTS: CORE AND SHELL

Achievement pathways	Points
Core and Shell	1–4
Option 1. Electrification	2–4
Path 1. No On-Site Combustion	3–4
OR	
Path 2. No On-Site Combustion Except at Low Temperatures	1–3
Case 1. Space Heating	1–2
OR	
Case 2. Service Water Heating	1
OR	
Path 3. No On-Site Combustion—Limited Scope	1–2
Option 2. Electrification Readiness	1

Option 1. Electrification (2–4 points)

For Paths 1 and 2:

- Include all heating and service hot water systems necessary to meet total building heating and service water heating load in the calculations of weighted average COP.
- Future heating or service water heating systems must be included in the calculations with a COP of 1.0.
- Future equipment may be excluded from the calculations and deemed as compliant when the applicable building code, or construction drawings for projects with tenancy, confirms a weighted average COP of at least 1.8 for future installed equipment.

PATH 1. NO ON-SITE COMBUSTION (3–4 POINTS)

Design and operate the project from start-up with no on-site combustion except for emergency support systems.

Combined weighted average equipment efficiency for space heating and service water heating must be at least 1.8 COP for 4 points and at least 1.3 COP for 3 points.

The following equipment may be excluded from the COP determination:

- Space heating equipment in climate zones 0–2.
- Supplemental heating equipment designed only for operation at low temperatures.
- Service hot water heating (SWH) equipment with a total project SWH capacity less than 34,000 Btu/hr (10 kW).
- SWH equipment in nonresidential spaces complying with the point-of-use water heater criteria in *ASHRAE 90.1-2022*, Section 11.5.2.3.3, W05, without exceptions.

OR

PATH 2. NO ON-SITE COMBUSTION EXCEPT AT LOW TEMPERATURES (1–3 POINTS)

Pursue any combination of the following cases for a maximum of 3 points:

Case 1. Space Heating (1–2 points)

Design space heating to be capable of operating without on-site combustion except at low temperatures. Projects must have a weighted average space heating equipment efficiency of at least 1.8 COP for 2 points and 1.3 COP for 1 point.

The following equipment may be excluded from the COP determination:

- Space heating equipment in climate zones 0–2
- Supplemental heating equipment designed only for operation at low temperatures

Case 2. Service Water Heating (1 point)

Design service water heating systems to be capable of operating without on-site combustion except at low temperatures. Projects with total service water heating capacity exceeding 34,000 Btu/hr (10 kW) must have a weighted average service hot water equipment efficiency of at least 1.8 COP OR domestic hot water solar fraction of at least 0.4.

The following equipment may be excluded from the COP determination:

- SWH equipment in nonresidential spaces complying with the point-of-use water heater criteria in *ASHRAE 90.1-2022*, Section 11.5.2.3.3, W05, without exceptions.
- Supplemental heating equipment designed only for operation at low temperatures.

OR

PATH 3. NO ON-SITE COMBUSTION—LIMITED SCOPE (1–2 POINTS)

Do not install on-site combustion equipment in the project except for emergency support systems.

Combined weighted average equipment efficiency for space heating and service water heating must be at least 1.8 COP. Points are awarded per Table 1 based on the qualifying minimum project scope of work.

The following equipment may be excluded from the COP determination:

- Space heating equipment in climate zones 0–2.
- Supplemental heating equipment designed only for operation at low temperatures.
- Service hot water heating (SWH) equipment with a total project SWH capacity less than 34,000 Btu/hr (10 kW).
- SWH equipment in nonresidential spaces complying with the point-of-use water heater criteria in *ASHRAE 90.1-2022*, Section 11.5.2.3.3, W05, without exceptions.

Table 1. Points for no on-site combustion, limited scope

Minimum Project Scope of Work	Points
One or more heating, service water heating, or process heating systems	1
At least 30% of the project’s peak combined heating and service water heating load	2

AND/OR

Option 2. Electrification Readiness (1 point)

Provide building infrastructure that ensures the capability of operating the building without on-site combustion except at low temperatures, and of installing heating and service water heating systems that will have a weighted average COP of at least 1.8.

Include the details for electrification readiness in the project plans and the tenant guidelines and include tenant guidance for designing and installing efficient electrified systems. Provide the following infrastructure as applicable to the project application, and sized to ensure the capability to meet the requirements in Table 1:

  - Dedicated physical space for future electric space heating, service water heating, or process heating equipment. Provide designated spaces of sufficient size for outdoor heat pump equipment.
  - Chase ways with space for refrigerant lines, condensate drainage, or other required piping.
  - When electrical distribution systems are installed within the project scope, provide a junction box in the same physical space as the space allocated for the future electric equipment, and dedicated electrical panel space for an appropriately phased branch circuit sized to accommodate the future electric equipment or appliances to meet the specified load.
  - For portions of the building where ventilation air is not installed within the project scope of work, provide space and accommodations capable of supporting energy recovery ventilation for at least 50% of ventilation air.

For all options

Equipment Efficiency

Determine weighted average COP using either of the following:

- **Equipment efficiencies at rated conditions**:
  - For equipment with multiple rated conditions, use the rating closest to 17°F (–9°C) OA db, 32°F (0°C) entering liquid temperature, or 44°F (6°C) heating source leaving liquid temperature.
  - Annual average COP calculated with an energy simulation.
- **District energy**: Projects with district energy must comply with the requirements of this credit at the district facility or see additional guidance for interpretation of credit requirements.
- **Fuel cells**: Fuel cells using fossil fuel are ineligible for credit.
- **Low temperatures**: Low temperatures refer to outside air dry-bulb temperatures (OA db) below 20°F (–6.5°C).

REQUIREMENTS EXPLAINED: NEW CONSTRUCTION

This credit rewards decarbonization achieved through electrifying building systems traditionally fueled with on-site combustion, including space heating, service water heating, cooking, and other process equipment.

Under Option 1, maximum points are available to projects that fully electrify all building systems. Option 2 selectively rewards electrification per system category for heating, service water heating, cooking, and other process loads and affords flexibility for a hybrid design capable of limiting on-site combustion to low-temperature operation.

For both options, electrified space heating and service water heating equipment must meet efficiency criteria to limit undue burden on the electric power grid. For further guidance, refer to the Weighted Average COP section.

Option 1. No On-site Combustion

Electrification

Projects designed to operate entirely without on-site combustion for building energy use or for district energy supplied to the building offer the most significant emission reduction through electrification. Projects pursuing this option must eliminate on-site combustion from the building system design and operations. Refer to the Exemptions section below for limited exceptions.

Efficiency

The combined weighted average equipment efficiency for applicable space heating and service water heating equipment must be at least 1.8 COP, per the guidance in the Weighted Average COP section below.

Option 2. No On-site Combustion Except at Low Temperatures

For Option 2, teams may apply any combination of Path 1, Path 2 and Path 3, which separately address electrification of space heating, service hot water heating, and cooking and other process systems, respectively.

PATH 1. SPACE HEATING

Electrification

All space heating systems must operate without on-site combustion, except in low-temperature operating mode at or below 20°F (-6.5 °C).

Design electrified space heating equipment with sufficient capacity to meet the entire project space heating load at the system-, zone- and space-level for outdoor temperatures above 20°F (-6.5 °C) or the project’s design heating temperature. Hybrid designs with fuel/electric equipment must have a sequence of operations with at least one all-electric operating mode above 20°F (-6.5 °C).

Credit achievement is automatic for projects that neither install space heating equipment in the project scope nor require space heating for occupant thermal comfort.

Efficiency

Projects in climate zones 3 and above must design space heating to achieve a weighted average equipment efficiency of at least 1.8 COP. Refer to the Weighted Average COP section for calculations and exclusions from COP determination.

PATH 2. SERVICE WATER HEATING

Electrification

All service water heating must operate without on-site combustion, except in low-temperature operating mode at or below 20°F (-6.5 °C).

Service water heating supplies hot water for purposes other than space heating and process applications. It is primarily for handwashing, showering, and cleaning.

Design electrified service water heating equipment with sufficient capacity and distribution capability to provide all necessary service water heating at outdoor temperatures above 20°F (-6.5 °C) or the project’s design heating temperature.

Path 2 is unavailable to projects without service water heating.

Efficiency

If the total project service water heating capacity exceeds 34,000 Btu/h (10 kW), design the service water heating system with efficient heat pump technology to achieve a weighted average service water heating equipment efficiency of at least 1.8 COP or generate at least 40% of the building’s total service water heating load with solar thermal energy.

Point-of-use service water heating equipment in non-residential spaces may be excluded from the weighted average COP determination if it meets *ASHRAE 90.1-2022 Section 11.5.2.3.3, W05*, without exceptions.

Refer to the Weighted Average COP section for calculations and exclusions from COP determination.

PATH 3. COOKING AND OTHER PROCESS LOADS

Electrification

This path encourages design teams to eliminate on-site combustion from cooking, laundry, pool or spa heating, power generation, and all other process applications.

Other process applications commonly addressed through electrification include process heating, process drying, pre-conditioned air or 400 Hz systems in airports, and powering of vehicles or equipment operated exclusively on the project site (e.g., forklifts or golf carts).

All process systems must operate without on-site combustion except in low-temperature operating mode for outdoor dry-bulb temperatures at or below 20°F (-6.5 °C).

Projects automatically comply with Path 3 when electricity powers all building systems and equipment except space conditioning systems, service water heating systems, and systems referenced in the Exemptions section below.

REQUIREMENTS EXPLAINED: CORE AND SHELL

To achieve full electrification of a core and shell project upon final build-out with efficient heat pump technologies, the core and shell scope of work must either include the design and installation of these systems or incorporate electrification readiness strategies to support future installation of these systems.

The credit rewards projects by the degree of electrification and readiness addressed in the core and shell scope of work.

Option 1. Electrification

Path 1 and Path 2 require a substantial proportion of heating and service water heating equipment installed in the project scope of work, included in current tenant construction drawings, or dictated by local code.

Refer to the Weighted Average COP section for further background and guidance.

PATH 1. NO ON-SITE COMBUSTION

Refer to New Construction Option 1 above.

For a Core and Shell project scope that addresses only a portion of combined space heating and service water heating loads, the 1.3 COP weighted average COP threshold worth three points is more attainable than the 1.8 COP threshold worth four points.

> **Example**
> A dedicated outside air system with 3.0 COP heat pump supplies 15% of total combined heating and service water heating required for the project, achieving a weighted average COP of 1.3. No other systems are in scope.

PATH 2. NO ON-SITE COMBUSTION EXCEPT AT LOW TEMPERATURES

Case 1. Space Heating

Refer to New Construction Option 2, Path 1 above.
For a Core and Shell project scope that addresses only a portion of space heating loads, the 1.3 COP weighted average COP threshold worth one point is more attainable than the 1.8 COP threshold worth two points.

Case 2. Service Water Heating

Refer to New Construction Option 2, Path 2 above.

PATH 3. NO ON-SITE COMBUSTION — LIMITED SCOPE

This path applies to projects that have inadequate scope to achieve points under Path 1 or Path 2.

Projects must fully electrify any space heating or service water heating systems in scope and achieve a combined weighted average equipment efficiency of at least 1.8 COP for these systems per the guidance in the *Weighted Average COP* section below.

Minimum scope must include at least one space heating, service water heating, or process heating system for one point; and at least 30% of the project's combined heating and service water heating load for two points.

Option 2. Electrification Readiness

Electrification of building heating systems directly reduces carbon emissions in buildings. For Core and Shell projects, the exact project scope may vary, and project teams may only provide the infrastructure without selecting and installing all heating generation equipment. Under this circumstance, demonstrate that the provided building infrastructure supports future equipment that does not rely on combustion for space heating, service water heating, and process heating. Refer to the rating system language for specific electrification-readiness strategies that must be included in the project design if applicable to the project application.

Provide tenant guidelines that explain the electrification readiness strategies and address the design and installation of efficient electrified systems.

REQUIREMENTS EXPLAINED: BOTH NEW CONSTRUCTION AND CORE AND SHELL (ALL OPTIONS)

Weighted Average COP

The minimum weighted average COP criteria is predicated on a design that uses heat pump technology instead of inefficient electric resistance heating to meet most of the project's space heating and service water heating loads. This COP criteria limits increased grid peak demand associated with electrification.

EXCLUSIONS FROM WEIGHTED AVERAGE COP DETERMINATION

Optionally exclude the following equipment from the weighted average COP determination:

- **Space heating equipment in climate zones 0–2**. This equipment is not required because electric resistance heating contributes much less to peak grid load in hot climates than in cooler climates. Refer to *ASHRAE Standard 169*, Climatic Data for Building Design Standards[92] to determine the project's climate zone.
- Supplemental heating equipment designed only for operation at or below 20°F (-6.5 °C).
- This equipment can skew the average efficiencies calculated using capacity-weightings of rated efficiencies. This exclusion applies to supplemental or auxiliary electric heating used for space heating or service water heating. It is also fuel for low-temperature operation for space heating or service water heating in Option 2 (Core and Shell Option 1, Path 2).
- Point of use service water heating equipment in non-residential spaces meeting *ASHRAE 90.1-2022*, Section 11.5.2.3.3, W05, without exceptions. Electric point-of-use water heaters are often more appropriate than centralized heat pump equipment and negligibly increase peak electric demand for non-residential projects with low service water heating demand distributed throughout the building. Therefore, teams may exclude point-of-use water heaters in non-residential spaces from the COP determination if they comply with *ASHRAE 90.1-2022*, 11.5.2.3.3, W05 without exception.
- Non-residential service water heating equipment that does not comply with the *ASHRAE 90.1-2022 11.5.2.3.3* criteria must be included in determining the weighted average COP. For example, storage water heaters supplying showers or commercial kitchen operations.

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[92] "ASHRAE Standard 169 Climatic Data For Building Design Standards", ASHRAE, (2021), https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/169_2020_a_20211029.pdf.

    - This exception does not apply to equipment in residential spaces due to higher service water heating demand for these space types.
    - Service water heating equipment for projects with a total service water heating capacity of less than 34,000 Btu/h (10 kW). For New Construction, this refers to the installed capacity. For Core and Shell, this refers to the total capacity necessary to meet project loads, regardless of whether the equipment is in the project scope.

For Core and Shell, future equipment where applicable building code or construction drawings for projects with tenancy confirm a weighted average COP of at least 1.8.

Projects don’t need to calculate the weighted average COP if all equipment meets one of the criteria above. For example, there is no required minimum COP for a non-residential project in climate zone 1 with point-of-use water heating for 100% of its service water heating load per *ASHRAE 90.1-2022 11.5.2.3.3.*

When installing heat pump space heating for a project in climate zones 0–2 or heat pump service water heating is installed for projects with a total service water heating capacity of less than 34,000 Btu/h (10 kW), the analyst may include all heating and service water heating equipment in the calculations to demonstrate the required COP.

INCLUDED EQUIPMENT FOR WEIGHTED AVERAGE COP DETERMINATION

- Include all equipment not specifically excluded above in the weighted average COP determination.
    - **Option 1. No On-site Combustion**. (Core and Shell Option 1, Path 1) Include all space heating and service water heating not specifically excluded above.
    - **Option 2. No On-site Combustion**. (Core and Shell Option 1, Path 2)
        - **Path 1. Space Heating**. (Core and Shell, Case 1) Include all space heating equipment not specifically excluded above.
        - **Path 2. Service Water Heating**. (Core and Shell, Case 2). Include all service water heating equipment not specifically excluded above.
    - Projects pursuing both Path 1 and Path 2 may optionally show a combined weighted average equipment efficiency for space heating and service water heating of at least 1.8 COP rather than a weighted average COP per system.
    - **Core and Shell Option 1, Path 3. No On-Site Combustion — Limited Scope**. Include all space heating and service water heating equipment included in the project scope of work not specifically excluded above.

For New Construction, assess the weighted average COP based on total installed equipment capacity.

Core and Shell only

Path 1. No On-site Combustion and Path 2. No On-site Combustion Except at Low Temperatures. Assess weighted average COP based on the total capacity necessary to meet project loads, regardless of whether the project scope installs the equipment. Use a COP of 1.0 for future heating or service water heating capacity that is not in the project scope.

Path 3. No On-Site Combustion — Limited Scope. Assess weighted average COP based on the project scope of work.

METHODOLOGIES FOR WEIGHTED AVERAGE COP DETERMINATION

Projects may determine weighted average COP using a streamlined method, rated capacities, or energy simulation.

Method 1. Streamlined Weighted Average COP Determination

The streamlined method conservatively estimates compliance based on *ASHRAE 90.1*, Section 6.8 mandatory rated heating efficiencies of at least 2.0 COP for heat pumps and heat recovery chillers.

- To confirm a weighted average COP of at least 1.8, document that at least 80% of equipment capacity consists of heat pumps, heat recovery chillers, or solar heating.
- To confirm a weighted average COP of at least 1.3, document that at least 30% of equipment capacity consists of heat pumps, heat recovery chillers, or solar heating.

For New Construction and Core and Shell Path 3, assess compliance based on total installed equipment capacity.

For Core and Shell Paths 1 and 2, assess compliance based on the total capacity necessary to meet project loads.

Method 2. Energy Simulation

Calculate the COP by dividing total annual heating generation by total annual heating energy consumption (using consistent units in numerator and denominator) per Equation 1.

Equation 1. COP calculation using energy simulation data

$$COP = \frac{\text{Total annual heating generation}}{\text{Total annual heating consumption}}$$

Include all applicable space heating and service water heating energy used at the plant, system, and zone levels.

Projects may use any of the following to document the weighted average COP:

- Modeling used for *EAp2: Minimum Energy Efficiency*
    - *ASHRAE 90.1*, Appendix G Performance Rating Method, proposed model.
    - *ASHRAE 90.1*, Energy Cost Budget Method design energy cost model.
    - Total System Performance Ratio (TSPR). Simplified model from *ASHRAE 90.1-2022*, Section 6.6.2.2 Mechanical System Performance Rating Method. This only shows space heating efficiency. Demonstrate service water heating compliance using one of the other methods.
- Energy simulation used to document local code compliance.
- Simplified energy simulation used to estimate energy consumption for *EAp1: Operational Carbon Projection and Decarbonization Plan*, provided the model inputs include sufficient detail relevant to equipment efficiencies, capacities, and loads estimations.

For Core and Shell Paths 1 and 2, modifications to these models or post-processing of modeled results may be necessary to show a COP of 1.0 for all future capacities not in the project scope of work.

Method 3. Rated Capacities

Calculate the weighted average COP based on the capacity-weighted average rated equipment efficiency per Equation 2.

Equation 2. Weighted average COP

$$Weighted\ \text{average}\ COP = \frac{\sum rated\ capacity\ of\ each\ equipment\ \times\ rated\ COP\ of\ each\ equipment}{total\ rated\ equipment\ capacity\ of\ all\ equipment}$$

If equipment has more than one rated condition, calculate the weighted average COP using the rated conditions closest to the following:

- **Air source heat pumps**. 17°F (-9°C) OA db

- **Ground source heat pumps**. 32°F (0°C) entering liquid temperature
- **Liquid source heat pump and heat recovery water-chilling packages**. 44°F (6°C) heating source leaving liquid temperature.

Reference *ASHRAE 90.1*, Section 6.8 Tables to identify applicable rated conditions.
For equipment with efficiency ratings using HSPF, AFUE, or any rating other than COP or COPH, convert these ratings to COP using Table 2 before calculating the weighted average COP.

> **Additional considerations**
> For heat pump water-chilling packages or heat recovery water-chilling packages rated per *ASHRAE 90.1*, Table 6.8.1-16, adjust COP using the equations from Table 2 to align equipment ratings for entering/leaving heating liquid temperature at medium, high, or boost conditions with the default low ratings.

Table 2. Determination of equipment COP for calculation of weighted average COP

Heating equipment type	Heating equipment efficiency rating	Equation to convert to COP	Test procedure
Electrically operated air-cooled unitary heat pumps	HSPF2	= -0.0296 x HSPF22 + 0.7134 x HSPF2	AHRI 210/240-2023
	SCOP2H	= -0.3446 × SCOPH22 + 2.434 × SCOPH2	AHRI 210/240-2023
	COPH at 17°F db/15°F wb (–8.3°C db/–9.4°C wb)	= COPH	AHRI 340/360
PTHP	COPH	= COPH	AHRI 310/380
SPVHP	COPH	= COPH	AHRI 390
VRF air cooled	HSPF	= -0.0296 x HSPF2 + 0.7134 x HSPF	AHRI 1230
	COPH at 17°F db/15°F wb (–8.3°C db/–9.4°C wb)	= COPH	AHRI 1230
	SCOPH	= -0.3446 × SCOPH2 + 2.434 × SCOPH	AHRI 210/240-2023
VRF water source	COPH 68°F (20°C) entering water	= COPH	AHRI 1230
VRF groundwater source	COPH 50°F (10°C) entering water	= COPH	AHRI 1230
VRF ground source	COPH 32°F (0°C) entering water	= COPH	AHRI 1230

Heading equipment type	Heating equipment efficiency rating	Equation to convert to COP	Test procedure
Electrically Operated DX-DOAS Air-source heat pump or water-source heat pump	ISCOP	= ISCOP	AHRI 920
Electrically operated water-source heat pump, water-to-water, water loop	COPH 68°F (20°C) entering water	= COPH	ISO 13256-1
Electrically operated water-source heat pump, water-to-air, groundwater	COPH 50°F (10°C) entering water	= COPH	ISO 13256-1
Electrically operated water-source heat pump, brine-to-air, ground loop	COPH 32°F (0°C) entering water	= COPH	ISO 13256-1
Air-source heat pump and heat recovery chiller packages	COPH at 17°F db/15°F wb (–8.3°C db/–9.4°C wb), Low leaving heating water temperature = 105°F (40 °C)	= COPH	AHRI 550/590
	COPH at 17°F db/15°F wb (–8.3°C db/–9.4°C wb), Medium leaving heating water temperature = 120°F (50 °C)	= 1.14 x COPH	
	COPH at 17°F db/15°F wb (–8.3°C db/–9.4°C wb), High leaving heating water temperature = 140°F (60 °C)	= 1.37 x COPH	
Water source electrically operated positive displacement. (COPH evaluated at 54°F (19°C) source water entering temperature/44 °F (7°C) source water leaving temperature)	COPH Low leaving hot water temperature = 105°F (40 °C)	= COPH	AHRI 550/590
	COPH Medium leaving hot water temperature = 120°F (50 °C)	= 1.26 x COPH	
	COPH High leaving hot water temperature = 140°F	= 1.73 x COPH	
Water source electrically operated positive displacement or centrifugal. (at 75°F/65 °F source entering/leaving water temperature)	COPH Boost leaving hot water temperature = 140°F (60 °C)	= 1.31 x COPH	AHRI 550/590
Electric furnace	AFUE	= 1.0 x AFUE	10 CFR 430 Appendix N
Electric boiler	None listed	COP = 0.96 if not rated	10 CFR 430

Heading equipment type	Heating equipment efficiency rating	Equation to convert to COP	Test procedure
Electric service hot water heaters	COP 50°F (10°C) entering air and 60°F (21°C) entering water	= COP	AHRI Standard 1301
	UEF	= UEF x 1.3	10 CFR 430 Appendix E

NOTE: Equations to convert HSPF, HSPF2, and SCOP2 to COP are from *ASHRAE 90.1-2019 11.5.2(c)* and 90.1-2022 12.5.2(c). The remaining conversions are rough approximations not accounting for variability in standby losses or other factors referenced in the test procedures.

District Energy Systems (Applicable for New Construction and Core and Shell)

If the project has thermal energy from a District Energy System (DES), either refer to DES compliance paths in the Project Priorities Library or demonstrate that the DES complies with the following credit requirements at the district facility:

- **New Construction Option 1, No On-site Combustion**. (Core and Shell Option 1, Path 1)
  - No on-site combustion may be used in the district energy facility to generate heating, cooling, or electricity supplied to the project. Average district heating efficiency must be at least 1.8 COP.
- **New Construction Option 2, No On-Site Combustion Except at Low Temperatures**. (Core and Shell Option 1, Path 1)
  - If district heating supplies any of the project's space heat (New Construction Path 1 or Core and Shell Case 1), service water heating (New Construction Path 2 or Core and Shell Case 2), or process energy (New Construction Path 3), the district heating facility must be capable of generating the entire required district heating capacity without using on-site combustion above 20°F (-6.5 °C). Average district heating efficiency must be at least 1.8 COP for New Construction Paths 1 and 2 (Core and Shell Cases 1 and 2).

Fuel Cells and Combined Heat and Power Ineligible

Projects with fuel cells that use fossil fuel to generate electricity or combined heat and power systems (CHP) that use fuel to generate heat and electricity are ineligible for credit.

Exemptions (Applicable for New Construction and Core and Shell)

On-site combustion may be used for the following limited circumstances:

- **Emergency support systems**. Emergency support systems generate electricity, heating, or cooling upon failure of the primary system in a power outage or extreme temperature event.
    - To apply the exemption, the sequence of operations must specifically limit emergency support system operations to emergency events associated with power disruptions or extreme temperatures falling outside of ASHRAE 99% design conditions for a prolonged period.
    - Emergency power systems are not exempt for locations where power outages commonly occur for more than 200 hours per year.

- **Portable equipment**. Exclude portable equipment for outdoor cooking amenities or outdoor patio heating not in the project scope when limited to less than 200 hours per year. Do not permanently pipe fuel lines to the equipment.
- **Special circumstances**. Use limited on-site combustion for specialty cases where on-site combustion is integral to system function. Examples include:
    - Portable laboratory equipment
    - Wood-fired ovens in commercial kitchens fitted with emissions control devices
    - Vocational schools using fossil fuels solely for the purpose of training
    - Electric incinerators for medical waste
    - Fireplaces, hearths, and fire pits exclusively designated to support ceremonial practices (such as those unique to indigenous cultures or religious practices that require the use of fire)

These special circumstances do not extend more broadly to process equipment except where approved on a project-specific basis for systems with very low greenhouse gas emissions.

Platinum Requirements

Projects aiming to achieve LEED Platinum certification must meet the following criteria applicable to the project type.

- **New Construction**. Achieve five points. (no on-site combustion)
- **Core and Shell**. Achieve four points. (no on-site combustion)
- Projects served by District Energy Systems. Refer to the Project Priorities Library for DES compliance paths.

The Platinum requirements intentionally encompass industrial and manufacturing processes. To obtain Platinum certification, on-site boilers used for manufacturing production must comply with the credit criteria.

Exceptions to Platinum requirements, such as for renewable fuels, may be included in the Project Priorities Library.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All		Documentation of all heating, service water heating, solar water heating, and process heating equipment within the project. Include information on the energy source, equipment quantity, and the capacity and efficiency for each piece of equipment (equipment cutsheets or schedules).
			Description of emergency support and on-site generation equipment, including how it is used on site. Include an estimated annual run-time for any combustion equipment.
			Document emergency support systems and on-site generation equipment including system type, fuel source, and capacity.
			Documentation that the project is subject to local code that requires full electrification down to 20 deg F or lower. Provide relevant code language and applicability (if applicable).
			Weighted average COP calculation, as applicable for SWH and Space heating. Projects may determine weighted average COP using a streamlined method, rated capacities, or energy simulation.
	Option 1		Narrative or Mechanical drawings showing that systems used for heating, SHW, and cooking and other process loads are not fueled by onsite combustion.
New Construction	Option 2	All	Sequence of Operations for hybrid electric/non-electric systems and evidence that electric equipment (electric mode) can meet space heating, SHW, and process heating loads >20F (as applicable). Evidence may include equipment capacities and accompanying design load calculations, or energy simulation reports, or other.
			For projects attempting no on-site combustion except at low temperatures, document how the applicable systems can operate without on-site combustion at outside air temperatures above 20°F (-6.5 °C).
		Path 1	Total building space heating load at OA Temp 20*F or below.
			Provide a description of the basis of analysis for space heating loads.
			Sequence of operations for all space heating equipment.
		Path 2	Sequence of operations for all service water heating equipment.
			Sequence of operations for all solar water heating equipment.

Project types	Options	Paths	Documentation
		Path 3	Confirmation that the project's emergency support systems (if installed), use on-site combustion, and that the system will only run during power outages, and for less than 200 hour/years.
		Path 3	Add multi-option selection (multiple check boxes), systems in scope of work (cooking, laundry, other process), similar to CI.
		Path 3	Add Schedules or cutsheets showing electrified equipment.
Core and Shell Only	Option 1	Path 2	For projects attempting no on-site combustion except at low temperatures, document how the applicable systems can operate without on-site combustion at outside air temperatures above 20°F (-6.5 °C).
	Option 1	Path 3	Add calculation for the installed space heating and service water heating equipment capacity as a percentage of the project's peak combined heating and service water heating load.
			Confirmation that the project's emergency support systems (if installed), use on-site combustion and the system will only run during power outages and for less than 200 hour/years.
	Option 2		Documentation of base building design showing applicable infrastructure, including floor plans, mechanical plans, electrical plans, and one-line diagrams.
			Narrative describing the sizing and capabilities to meet future needs.
			Add tenant guidelines describing electrification readiness and designing and installing efficient electrified systems.
New Construction and Core and Shell			District Energy System Relevant documentation and calculations, demonstrating the relevant DES criteria have been met (as applicable).

REFERENCED STANDARDS

- ASHRAE 90.1-2019, (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527)
- ASHRAE 90.1-2022, (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

REDUCE PEAK THERMAL LOADS

EAc2

New Construction (1–5 points)
Core and Shell (1–5 points)

INTENT

To minimize demand on grid resources and improve the resilience of buildings.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–5
Option 1. Infiltration and Balanced Ventilation	2
AND/OR	
Option 2. Ventilation Energy Recovery	1
AND/OR	
Option 3. Thermal Bridging	1
AND/OR	
Option 4. Peak Thermal Load Reductions	1–3
Path 1. Peak Load Intensity	1–3
OR	
Path 2. *ASHRAE 90.1* Trade-Off Methods	1–3
OR	
Path 3. Energy Simulation	1–3

Comply with any combination of Options 1–4 for a maximum of 5 points.

For all options, the building envelope must meet the requirements of *ASHRAE 90.1*, Section 5.5, Prescriptive Building Envelope Compliance Path or *ASHRAE 90.1*, Section 5.6, Building Envelope Trade-Off Compliance Path per the version of *ASHRAE 90.1* referenced in *EAp2: Minimum Energy Efficiency*. Building envelope efficiency shall not be traded off with other building systems.

Option 1. Infiltration and Balanced Ventilation (2 points)

Comply with both of the following:

Balanced Ventilation

Design the ventilation and exhaust airflows within 10% of each other and include a test, adjusting, and balance (TAB) report demonstrating balanced ventilation in the commissioning scope. This requirement does not apply to Core and Shell projects.

AND

Infiltration

Use an air leakage test to demonstrate a measured air leakage of the building envelope less than or equal to Table 1 below. Buildings smaller than 25,000 square feet (2,322 square meters) must use a whole-building air leakage test.

- Complete air leakage testing using ASTM *E779*, *ANSI/RESNET/ICC 380*, *ASTM E3158*, *ASTM E1827*, or equivalent.
- For buildings greater than 5,000 sq. ft. (465 sq. m.), maximum air leakage is determined per sq. ft. or sq. m. of building envelope area (including exterior walls, roofs, and base floor/slab).
- For projects that include both new construction and major renovation, use the weighted average maximum air leakage.

Table 1. Caps on air leakage rates

Building conditioned floor area (CFA)	**Pressure test conditions across the building envelope**	**Maximum air leakage**[1]	
		New construction	**Major renovation**
≥ 5,000 sq. ft. (465 sq. m.)	At pressure difference of 50 Pascals (0.2 in H2O)	0.13 cfm/sq. ft. (0.65 L/s*sq. m.) 1	0.20 cfm/sq. ft. (1.0 L/s*sq. m.) 1
	At pressure difference of 75 Pascals (0.3 in H2O)	0.18 cfm/sq. ft. (0.90 L/s*sq. m.) 1	0.27 cfm/sq. ft. (1.35 L/s*sq. m.) 1
< 5,000 sq. ft. (465 sq. m.)	At 50 Pascals (0.2 in in H2O)	1 ACH	1.5 ACH
	At 75 Pascals (0.3 in H2O)	1.35 ACH	2 ACH

OR

Residential

- Compartmentalize each residential dwelling unit to minimize leakage between units. Perform a blower door test of residential dwelling units, following the procedures in *ANSI/RESNET/ICC 380* or equivalent. For each unit tested, demonstrate a maximum leakage of enclosure area that is no more than 1.5 times the thresholds identified in Table 1 (enclosure area refers to all surfaces enclosing the dwelling unit, including exterior and party walls, floors, and ceilings). Demonstrate a weighted average leakage of the enclosure area for the building, including dwelling units, that complies with the caps in the limits identified in Table 1.

AND/OR

Option 2. Ventilation Energy Recovery (1 point)

Each fan system supplying outdoor air must have an energy or heat recovery system with a minimum 70% enthalpy recovery ratio or a minimum of 75% sensible heat recovery ratio. Provisions must be made to bypass or control the energy recovery system during moderate outside air conditions.

In aggregate, fan systems supplying less than 15% of the project's total outdoor air can be excluded.

> **Core and Shell only**
> Fan systems must supply a minimum of 50% of the ventilation air required for the project per *ASHRAE Standard 62.1-2022*, Ventilation Rate Procedure, to qualify for this option.

AND/OR

Option 3. Thermal Bridging (1 point)

Comply with the prescriptive thermal bridging requirements of *ASHRAE 90.1-2022*, Section 5.5.5(a), including all applicable requirements of Sections 5.5.5.1–5.5.5.5, without applying exceptions for projects in climate zones 0–3.

AND/OR

Option 4. Peak Thermal Load Reductions (1–3 points)

Comply with the following:

- Ventilation loads must be included in the determination of peak coincident loads.
- Measure building envelope air leakage using air leakage testing and use the measured air leakage to calculate the peak loads for Path 1, Path 2 (envelope), and Path 3. (Meeting the leakage rates in Option 1 is not required to pursue this option.)
- Demonstrate balanced ventilation meeting the criteria in Option 1 above.

AND

PATH 1. PEAK LOAD INTENSITY (1–3 POINTS)

Limit the sum of peak heating load and peak cooling load per unit of treated floor area to be less than or equal to the thresholds specified in Table 2 below. Calculate peak loads using one of the following:

- WUFI Passive Design Tool, following the Passive House Institute US protocol.
- Passive House Planning Package, following the Passive House Institute protocol to determine maximum heating load and maximum cooling load.

Table 2. Points for meeting caps on the sum of peak heating and cooling loads

Points	New construction	Major renovation
1	16 Btu-h/sq. ft. (50 W/sq. m.)	20 Btu-h/sq. ft. (63 W/sq. m.)
2	12 Btu-h/sq. ft. (38 W/sq. m.)	15 Btu-h/sq. ft. (47 W/sq. m.)
3	8 Btu-h/sq. ft. (25 W/sq. m.)	10 Btu-h/sq. ft. (32 W/sq. m.)

OR

PATH 2. ASHRAE 90.1 TRADE-OFF METHODS (1–3 POINTS)

Comply with envelope and/or HVAC improvements for a maximum of 3 points.

Envelope loads (1–2 points)
Demonstrate a percent improvement in the sum of system peak heating loads and system peak cooling loads associated with the *proposed envelope performance factor* compared to the *base envelope performance factor* determined in accordance with the *ASHRAE 90.1-2022 Building Envelope Trade-off Option (Normative Appendix C)*. Points are awarded according to Table 3.

Table 3. Points for percentage improvement in peak thermal loads from envelope

Points	Percent improvement
1	10%
2	20%

AND/OR

Ventilation Loads (1 point)
Demonstrate a minimum 10% improvement in the sum of building peak coincident heating loads and building peak coincident cooling loads for the total system performance ratio (TSPR) proposed building design versus the product of the TSPR reference building design and *ASHRAE 90.1-2022, Table L5-4, Mechanical Performance Factors* (MPF), for the project's location and climate zone determined in accordance with the *ASHRAE 90.1-2022 Mechanical System Performance Rating Method* (Normative Appendix L).

OR

PATH 3. ENERGY SIMULATION (1–3 POINTS)

Demonstrate a performance index calculated per *ASHRAE 90.1-2019* or later from Normative Appendix G's Performance Rating Method, replacing all references to cost with the sum of building peak coincident heating loads and building peak coincident cooling loads.

Points are awarded according to Table 4.

Table 4. Points for performance index for peak heating and cooling loads

Performance index	Points
0.5	1
0.4	2
0.3	3

REQUIREMENTS EXPLAINED: NEW CONSTRUCTION

The credit rewards reduced peak heating and peak cooling loads, primarily achieved through enhanced building envelope performance and lower ventilation loads.

This limits strain on the grid during peak summer and winter operations when grid capacity and associated grid emissions are highest.

Options 1, 2, and 3 are distinct peak thermal load reduction strategies. Option 4 rewards overall peak thermal load reductions achieved from the strategies referenced in Options 1–3 and any further peak load reduction measures employed for the project.

For credit eligibility, the peak thermal load reduction measures designed for the building must be fully implemented during construction. The construction phase verification is required to confirm measured air leakage (Options 1 and 4), balanced ventilation (Options 1 and 4), and reduced thermal bridging (Options 3).

New construction projects may apply any combination of Options 1–4 for up to five points.

For All Options

The building envelope must comply with *ASHRAE 90.1* prescriptive method requirements as a pre-condition for all options.

Do not claim trade-offs between the envelope and other energy-using systems. This sets a higher bar for the building envelope than *EAp2: Minimum Energy Efficiency* for projects documented using *ASHRAE 90.1 Energy Cost Budget (ECB)* or *ASHRAE 90.1* Ap*pendix G Performance Rating Method* (PRM).

Envelope performance must comply with one of the following:

- *ASHRAE Standard 90.1*, Section 5.5, Prescriptive Building Envelope Compliance Path.
- *ASHRAE Standard 90.1*, Section 5.6, Building Envelope Trade-off Compliance Path. (Refer to *EAp2: Minimum Energy Efficiency* guidance on this topic).

Use the same version of *ASHRAE 90.1 referenced for EAp2: Minimum Energy Efficiency* (i.e., *ASHRAE 90.1-2019* or *ASHRAE 90.1-2022*).

Option 1. Infiltration and Balanced Ventilation

This strategy reduces heat gains and losses associated with infiltration and exfiltration. Projects must provide testing during the construction phase to verify the achievement of both the balanced ventilation and measured air leakage criteria.

Balanced ventilation

Design the building's mechanical system and controls to support balanced ventilation airflow that maintains the building's total supply ventilation airflow within 10% of the total exhaust airflow.

During construction, provide testing, adjusting, and balancing (TAB) of building air handling systems that verifies a ratio of ventilation to exhaust airflow between 90% and 110% on a whole-building basis.

Infiltration

Design and construct the building's air barrier to minimize air leakage through the building enclosure. During construction, provide air leakage testing to confirm the project achieves targeted performance levels (referenced in Table 1 of the credit requirements). The testing must conform to one of the referenced air leakage testing standards:

ASTM testing criteria

ASTM defines air leakage testing criteria. *ASTM E779* uses the fan-pressurization method for testing.[93] *ASTM E3158* provides a standard method for testing large or multizone buildings. *ASTM E1827* determines air tightness using an orifice blower door. Residential spaces in mixed-use buildings may also apply *ANSI/RESNET/ICC 380*.

Residential buildings

In residential buildings, compartmentalize each unit, incorporating measures to limit air leakage between units). Determine credit compliance by conducting blower door testing of units per *ANSI/RESNET/ICC 380*. Sample rates may apply depending on the number of units within the building.

Maximum leakage rates for each unit cannot exceed 150% of the Table 1 thresholds for the enclosure area.

Furthermore, weighted average building leakage rates must be less than the Table 1 thresholds. Calculate the weighted average using the measured results for the individual dwelling units.

Failed testing

If a unit fails testing, corrective action is recommended to reduce air leakage in the space. Determine compliance with the credit by the weighted average of leakage rates reported for the project. If a single unit fails in a project with a large number of dwelling units, the project may still show compliance with this option.

Option 2. Ventilation Heat Recovery

Energy recovery ventilators (ERV) or heat recovery ventilators (HRV) reduce peak heating and cooling loads associated with ventilation by pre-treating the incoming outside air with heated or cooled air recovered from the exhaust stream.

For each system that supplies outdoor air to the building, include an ERV or HRV with at least a 70% enthalpy recovery ratio or 75% sensible heat recovery ratio.

Controls for ERVs and HRVs

ERVs must have controls to disable energy exchange or bypass air during economizer operation. The requirement does not apply to systems with design outdoor airflow rates of less

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[93] “Standard Test Method for Determining Air Leakage Rate by Fan Pressurization,” ASTM, January 23, 2019, https://www.astm.org/e0779-19.html.

than 80% and design outdoor air volume of less than 10,000 cfm. For details, refer to *ASHRAE 90.1-2022* Section 6.5.6.1.2.2, Provision for Air Economizer or Bypass Operation.

Exceptions

In aggregate, fan systems supplying less than 15% of the project's total outdoor air can be excluded.

Exclude the following systems from the requirements in addition to this 15% exclusion:
Kitchen exhaust demand ventilation systems meeting the provisions of *ASHRAE 90.1 6.5.7.2.3*(b).

Laboratory exhaust systems meeting the provisions of *ASHRAE 90.1 Section 6.5.7.3* (a) or (b). Kitchen or laboratory systems must meet these criteria to be eligible for this exclusion, even if the project's total kitchen or laboratory exhaust volumes are less than those referenced in Section 6.5.7.

Option 3. Thermal Bridging

Projects must document prescriptive compliance with each thermal bridging requirement in *ASHRAE 90.1-2022 Section 5.5.5a*, designing and constructing a continuous thermal barrier that minimizes heat conductance associated with thermal bridges. A thermal bridge is an element that penetrates the building insulation, such as a wall and roof intersection, a wall and window intersection, an exterior cladding support, or a beam penetrating the exterior wall assembly.

Do not use the envelope trade-off method to show compliance with this option.

> **Climate zones 0–3**
> Projects in warmer climate zones (0–3) cannot apply any exceptions and must comply entirely with Section 5.5.5. Providing thermal breaks, continuous insulation, and using reflective exterior coatings on exterior surfaces can reduce solar heat gain and prevent moisture intrusion.

Option 4. Peak Thermal Load Reductions

Option 4 rewards overall peak thermal load reduction quantitatively assessed for the project using one of three methods:

- Path 1 leverages passive building modeling tools to document peak thermal load intensities below the required thresholds.
- Path 2 leverages *ASHRAE 90.1* trade-offs for the prescriptive method to show a reduction in peak thermal loads below a referenced baseline.
- Path 3 leverages the *ASHRAE 90.1 Appendix G Performance Rating Method* to show a reduction in peak thermal loads below a referenced baseline.

For all three paths, the referenced tools can be used to inform an integrative design process and make design decisions that holistically reduce peak thermal loads. The analysis should reflect the savings from the strategies referenced in Options 1–3 and further savings for any other load reduction strategies incorporated in the building design, such as improved insulation, improved window performance, or lower internal loads.

Preconditions applicable to all paths

Projects pursuing Option 4 must comply with all the following:

- **Ventilation loads**: When calculating peak heating and peak cooling loads, account for ventilation loads. Use the design of outdoor air from the project's design documents.
- **Measured Air Leakage**: During construction, provide air leakage testing to measure the building's air leakage and use the measured air leakage to calculate peak loads. If evaluating credit compliance during the design phase, perform the peak load calculations using the targeted air leakage that aligns with project design documents. Recalculate during construction if measured air leakage exceeds targeted air leakage.

Measured air leakage must be less than or equal to the *ASHRAE 90.1* required air leakage rates.

For Path 2, this measured air leakage requirement only applies to envelope loads calculations, not ventilation loads calculations.

- **Balanced Ventilation**. Maintain the project's ventilation and exhaust airflows within 10% of each other (see Option 1 Balanced Ventilation requirements).

PATH 1. PEAK LOAD INTENSITY

Path 1 requires projects to limit peak thermal loads below the specified thresholds.

Calculate the sum of the peak heating load and peak cooling load per unit of treated floor area using either the WUFI Passive Design Tool or the Passive House Planning Package.

> **Additional considerations**
> Under this option, projects designed to achieve Passive House compliance (using either PHIUS or PHI) will likely achieve three points.

PATH 2. ASHRAE 90.1 TRADE-OFF METHODS

For projects documenting *EAp2: Minimum Energy Efficiency* using the prescriptive method or Energy Cost Budget Method, Path 2 provides the most streamlined method for showing compliance. However, due to the limitations of the referenced *ASHRAE 90.1 Trade-off Methods*, it may not be possible to show loads reductions for some buildings using this path. For example, projects with minimal envelope contribution to peak thermal loads cannot achieve the required envelope loads thresholds. Similarly, the Total System Performance Ratio (TSPR) calculations referenced for the Ventilation Loads requirements are only available for a subset of building types.

Envelope loads

Use the *ASHRAE Standard 90.1*, Section 5.6, Building Envelope Trade-off Compliance Path analysis to show credit compliance. (Refer to *EAp2: Minimum Energy Efficiency* guidance on this topic). Amend the proposed inputs to reference measured air leakage. If this is not possible in the software interface, perform the air leakage testing as required, but use the *ASHRAE 90.1* prescriptively required air leakage as a conservative savings estimate.

Extract the system peak heating loads and the system peak cooling loads from the modeled outputs for the proposed envelope factor and the base envelope factor.

Show the project achieves the required percentage improvement in the sum of system peak heating loads and system peak heating loads comparing the results for the two models.
The peak load metric used here is distinct from the metric of annual energy cost used to assess compliance with *ASHRAE 90.1*.

Ventilation loads

This case rewards projects for a 10% improvement in the sum of building peak coincident heating loads and building peak coincident cooling loads achieved through HVAC control strategies addressing ventilation loads, such as demand control ventilation or energy recovery ventilation.

Use the *ASHRAE Standard 90.1*, Section 6.6.2 Mechanical System Performance Path analysis to show credit compliance. (Refer to *EAp2: Minimum Energy Efficiency* guidance on this topic). Extract the building peak coincident heating loads and the building peak coincident cooling loads from the TSPR modeled outputs for the referenced building design and for the proposed building design. Calculate performance using the following equations:

Equation 1. Reference peak (based on modeled outputs from the referenced building design)

$$REFERENCE_{peak} = Bldg\ peak\ coincident\ heating\ loads + Bldg\ peak\ coincident\ cooling\ loads$$

Equation 2. Proposed peak (based on modeled outputs from the proposed building design)

$$PROPOSED_{peak} = Bldg\ peak\ coincident\ heating\ loads + \mathrm{B}ldg\ peak\ coincident\ cooling\ loads$$

Equation 3. Performance target

$$Performance\ \mathrm{t}arget = REFERENCE_{peak}\ \times\ MPF$$

where:

MPF = Mechanical performance factor for project’s location and climate zone per *ASHRAE Standard 90.1-2022, Table L5-4*

Equation 4. % improvement

$$\%\ improvement =\ 100\% - \frac{PROPOSED_{peak}}{Performance\ \mathrm{t}arget}$$

PATH 3. ENERGY SIMULATION

Projects that comply with *EAp2: Minimum Energy Efficiency* using the *ASHRAE 90.1 Appendix G Performance Rating Method* (PRM) can use the PRM modeled results to show compliance with this path.

This path is the most appropriate selection for projects with high process loads or projects with significant quantities of laboratory or kitchen exhaust. Unlike Path 1 and Path 2, this path allows credit for lower plug and process loads documented using *ASHRAE 90.1 Section G2.5 Exceptional Calculation Methods* (See *EAc3: Enhanced Energy Efficiency* guidance for further information).

Performance index
For the *ASHRAE 90.1 Appendix G* baseline and proposed models, extract the building peak coincident heating load and the building peak coincident cooling load.

Calculate the Baseline Building Performance (BBP), the Proposed Building Performance (PBP), and the Performance Index (PI) by replacing the cost metric with the sum of building peak coincident heating load and building peak coincident cooling load.

Equation 5. Performance index (PI)

$$PI = \frac{PBP}{BBP}$$

For this path, neither building performance factors (BPFs) nor performance index targets (PIt) are used. Per Table 4 of the Rating System, points achievement is directly linked to the Performance Index equal to the ratio of peak thermal loads for the proposed building compared to the baseline building that meets *ASHRAE 90.1-2004* prescriptive criteria.

REQUIREMENTS EXPLAINED: CORE AND SHELL

Option 1. Infiltration

Same as LEED BD+C: New Construction, Option 1, except:

Core and Shell projects are not required to meet the Balanced Ventilation requirements of this option.

Option 2. Ventilation Energy Recovery

Same as LEED BD+C: New Construction, Option 2, if:

Option 2 is only available to LEED BD+C: Core and Shell projects that include fan systems within the project scope of work. At least 50% of the total ventilation air required by the *ASHRAE Standard 62.1-2022*, Ventilation Rate Procedure must be installed as part of the Base Building scope of work.

Option 3. Thermal Bridging

Same as LEED BD+C: New Construction, Option 3, except:

LEED BD+C: Core and Shell projects are not required to meet the Balanced Ventilation requirements of this option.

Option 4. Peak Thermal Load Reductions

Same as LEED BD+C: New Construction, Option 4.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	Option 1	All	Confirmation that supply and exhaust flows designed within 10% of each other.
			Balanced ventilation design calculations.
			Air leakage test report describing method, conditions, and results. Note: Include which Path (New Construction or Major Renovation; larger or smaller than 5,000 sq. ft.; Pressure Test Condition) is followed.
	Option 2	All	Documentation showing outdoor air delivery systems and flow rates, including energy recovery devices and efficiencies, and OA bypass controls (e.g., mechanical schedules, specifications, submittals, controls diagram).
	Option 3	All	Comcheck or *ASHRAE 90.1-2022* prescriptive thermal bridging compliance forms. Include Details of envelope and calculations showing that intersections and edges of each type meet *ASHRAE 90.1 2022* sections 5.5.5.
	Option 4	All	Ventilation loads must be included in the determination of peak coincident loads.
			Air leakage test report describing method, conditions, and results.
			Confirmation that supply and exhaust flows are designed within 10% of each other.
		Path 1	Input/output report from PHPP or WUFI.
			Sum of peak sensible heating and cooling load.
			Input/output reports from *ASHRAE 90.1-2022*, Building envelope trade-off option and/or TSPR as applicable.
			Envelope peak load reduction and/or TSPR peak load reduction.
		Path 2 Envelope AND Path 2 Ventilation	Sum of peak heating loads and peak cooling loads (Base/Reference Case)
			Sum of peak heating loads and peak cooling loads (Proposed Case)
		Path 3	Calculation of Performance index using sum of peak heating and peak cooling.

REFERENCED STANDARDS

- ASHRAE 90.1-2019 (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527)
- ASHRAE 90.1-2022 (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082)
- ASHRAE 62.1-2022 (scope requirements for Core and Shell), (store.accuristech.com/ashrae/standards/ashrae-62-1-2022?product_id=2501063)
- Passive House Planning Package (PHPP) following the Passive House Institute (PHI) protocol (passivehouse.com/04_phpp/04_phpp.htm#PH10)
- WUFI Passive Design Tool, following the Passive House Institute US (PHIUS) protocol (phius.org/resources/tools-and-support/wufi-passive-design-tool)
- ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization (astm.org/e0779-19.html)
- ASTM E3158 Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building (www.astm.org/e3158-18.html)
- ASTM E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door (astm.org/e1827-11r17.html)
- ANSI/RESNET/ICC 380 Standard for Testing Airtightness of Building, Dwelling Unit, and Sleeping Unit Enclosures; Airtightness of Heating and Cooling Air Distribution Systems; and Airflow of Mechanical Ventilation Systems (www.resnet.us/wp-content/uploads/Std380-2022_Strk-UndrIn_blk_wCover_cln5.pdf)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

ENHANCED ENERGY EFFICIENCY

EAc3

New Construction (1–10 points): 8 points are required for LEED BD+C: New Construction Platinum projects
Core and Shell (1–7 points): 5 points are required for LEED BD+C: Core and Shell Platinum projects

INTENT

To design buildings that minimize energy use to reduce the environmental damage caused by resource extraction, air pollution, and greenhouse gas emissions and to facilitate the transition to a clean energy future.

REQUIREMENTS: NEW CONSTRUCTION

Achievement pathways	Points
New Construction	1–10
Option 1. Prescriptive Path	1–10
Path 1. Regulated Loads	1–7
Case 1. *ASHRAE 90.1-2019*	1–5
OR	
Case 2. *ASHRAE 90.1-2022*	4–7
AND/OR	
Path 2. Plug and Process Loads (PPL)	1–4
Case 1. Plug Load Management	1
AND/OR	
Case 2. Efficient Plug and Process Load Equipment	1–4
OR	
Case 3. Plug and Process Load Exceptional Calculation	1–4
OR	
Option 2. Energy Simulation	1–10
Path 1. Percentage Reduction Excluding On-Site Renewable Contribution	1–10
OR	
Path 2. Percentage Reduction Including On-Site Renewable Contribution	1–10

Option 1. Prescriptive Path (1–10 points)

PATH 1. REGULATED LOADS (1–7 POINTS)

Points are awarded according to Table 1 below, using either Case 1 or Case 2.

Case 1. ASHRAE 90.1-2019 (1–5 points)

Available only to projects registered before January 1, 2028.

Comply with the provisions of *ASHRAE 90.1-2019*, Sections 5–10.

Implement Additional Efficiency Requirements credits calculated per *ASHRAE 90.1-2022*, Section 11, from the list of eligible measures referenced below. Where *ASHRAE 90.1-2022*, Section 11 references the prescriptive requirements of *ASHRAE 90.1-2022*, Sections 5–10, such as lighting power density or equipment efficiency, replace those references with the matching prescriptive values in *ASHRAE 90.1-2019*.

OR

Case 2. ASHRAE 90.1-2022 (4–7 points)

Comply with the provisions of *ASHRAE 90.1-2022*, Sections 5–11.

Implement incremental *ASHRAE 90.1-2022*, Section 11, credits above the minimum required from the list of eligible measures below.

Eligible measures from *ASHRAE 90.1-2022*, Section 11.5.2, for LEED points:

- HVAC measures (H01 to H07)
- Service water heating measures (W01 to W09)
- Lighting measures (L01 to L06)
- G07 building mass/night flush

Table 1. Points for ASHRAE 90.1-2022, section 11 credits

Points	Case 1. *ASHRAE 90.1-2019*	Case 2. *ASHRAE 90.1-2022*
1	25 credits	N/A
2	50 credits	
3	75 credits	
4	100 credits	Min. required by 90.1-2022
5	125 credits	Min. required by 90.1-2022 plus 25 credits
6	N/A	Min. required by 90.1-2022 plus 50 credits
7	N/A	Min. required by 90.1-2022 plus 75 credits

AND/OR

PATH 2. PLUG AND PROCESS LOADS (1–4 POINTS)

Case 1. Plug Load Management (1 point)

Implement the following:

- Provide a plug load dashboard that is accessible through an application to all regular occupants of the building if tenants can opt out of displaying their plug loads to other tenants.
- For building types and/or tenant types with IT departments, implement policies for PCs, monitors, and visual displays to be controlled off when not in use, except during scheduled maintenance periods.

AND/OR

Case 2. Efficient Plug and Process Load Equipment (1–4 points)

Install or reuse eligible plug and process equipment meeting the criteria in Table 2 for 90% of applicable equipment by quantity or rated load. Either include or exclude all eligible equipment reused in the project from the calculations.

- For one, Table 2 equipment category (1 point)
- For two, Table 2 equipment categories (2 points)
- For three or more, Table 2 equipment categories (3 points)

OR

For process-intensive buildings, install or reuse eligible plug and process equipment meeting the criteria in Table 2 for at least 90% of total applicable equipment rated load. Rated load of compliant equipment must total at least:

- 0.5 Watt/sq. ft. (5.4 W/sq. m.) (3 points)
- 1.0 Watt/sq. ft. (10.8 W/sq. m.) (4 points)

Table 2. Plug, process, refrigeration, and conveyance equipment criteria

Equipment category	**Applicable equipment**	**Criteria**
ENERGY STAR® products: plug loads and small appliances	Office equipment Appliances Electronics Other (e.g., vending machines, pool pumps, water coolers)	ENERGY STAR® rated or approved equivalent with at least 0.1 W/sq. ft. (1.1 W/sq. m.) of total rated load
ENERGY STAR® products: process loads	Commercial food service equipment Data center/server equipment Commercial laundry equipment Electric vehicle chargers (EVSE) Other (e.g., laboratory-grade refrigerators and freezers)	ENERGY STAR® rated or approved equivalent with at least 0.1 W/sq. ft. (1.1 W/sq. m.) of total rated load
People conveyance	Elevators Escalators Moving walkways	*ISO 25745.* At least Class A rated
Data center electrical system	Electrical system design	*ASHRAE 90.4-2022*. Design electrical loss component is at least 20% lower than the maximum design electrical loss.
Refrigeration systems	Referenced in *ASHRAE 90.1,* Section 6.8 tables AND not ENERGY STAR® eligible	10% improvement beyond *ASHRAE 90.1*, Section 6.8 tables
	Refrigerated warehouse	*California Title 24-2022*, Section 120.6, refrigerated warehouse requirements
Airport equipment	Baggage handling equipment	Individual carrier systems with variable frequency drive
	Aircraft and jetway air-conditioning	Preconditioned air systems with efficiencies meeting *ASHRAE 90.1* prescriptive efficiencies for HVAC equipment

OR

Case 3. Plug and Process Load Exceptional Calculation (1–4 points)

Using the *ASHRAE 90.1*, Section G2.5, exceptional calculation method, demonstrate a minimum percentage improvement in total project plug and process, refrigeration, and conveyance loads. Points are awarded according to Table 3.

Table 3. Points for percent improvement in plug and process loads

Percent improvement	**Points**
10%	1
20%	2
30%	3
40%	4

OR

Option 2. Energy Simulation (1–10 points)

Demonstrate an improvement in future source energy calculated per *ASHRAE Standard 90.1*, Normative Appendix G, Performance Rating Method, with the following additional provisions:

- Use the *ASHRAE 90.1* version applied for *EAp2: Minimum Energy Efficiency*
- Replace *ASHRAE 90.1-2019 or 90.1-2022*, Table 4.2.1.1, Building Performance Factors (BPF), with Table 5 below. For major building renovation areas, multiply the BPF by 1.05.
- Replace all references to cost with future source energy. Use an electric site-to-source energy conversion factor of 2.0 based on future projections for the U.S. A lower national average value may be used as applicable for projects outside of the U.S.
- Model energy efficiency measures for plug and process loads using the Section G2.5 exceptional calculation method or approved calculations in the LEED reference guidance.
- Calculate the performance index (PI) and percentage improvement with and without the plug and process savings.
- Calculate the PI and PI target as follows:
  - $PI_{nre} = PBP_{nre} / BBP$
  - $PI = PBP / BBP$
  - $PI_t = [BBUE + (BPF \times BBRE)] / BBP$

  where:
    - PI_{nre} = performance index for future source energy excluding on-site renewable contribution
    - PI = performance index for future source energy including on-site renewable contribution
    - PIt = performance index target for future source energy use
    - BBP = baseline building performance for baseline building future source energy use
    - BBUE = baseline building unregulated future source energy use
    - BBRE = baseline building regulated future source energy use
    - PBP_{nre} = proposed building performance without any credit for reduced annual future source energy from on-site renewable energy generation systems
    - PBP = proposed building performance, including the reduced annual future source energy associated with all on-site renewable energy generation systems

Points are awarded according to Table 4, using either Path 1 or Path 2.

Table 4. Points for percentage improvement in PI below PIT

Path 1. Percentage reduction excluding on-site renewable contribution (100% – PI_{nre} / PI_t)	**OR**	**Path 2. Percentage reduction including on-site renewable contribution (100% – PI / PI_t)**	**Points**
3%		10%	1
6%		20%	2
9%		30%	3
12%		40%	4
15%		50%	5
18%		60%	6
21%		70%	7
24%		80%	8
27%		90%	9
30%		100%	10

Table 5. ASHRAE 90.1-2019 — Equivalent building performance factors for a future source energy metric

Building type	**Climate zone**																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.74	0.69	0.73	0.70	0.73	0.70	0.71	0.70	0.63	0.70	0.71	0.69	0.68	0.70	0.70	0.68	0.68	0.68	0.74
Healthcare/hospital	0.72	0.72	0.73	0.73	0.74	0.71	0.72	0.74	0.71	0.72	0.73	0.71	0.74	0.73	0.80	0.73	0.77	0.78	0.79
Hotel/motel	0.72	0.71	0.72	0.71	0.71	0.70	0.71	0.73	0.72	0.71	0.73	0.73	0.71	0.73	0.74	0.70	0.72	0.70	0.70
Office	0.62	0.63	0.61	0.62	0.58	0.60	0.57	0.62	0.55	0.55	0.61	0.57	0.58	0.61	0.59	0.58	0.60	0.54	0.58
Restaurant	0.65	0.62	0.63	0.61	0.62	0.58	0.63	0.63	0.63	0.67	0.66	0.66	0.70	0.70	0.68	0.73	0.72	0.74	0.77
Retail	0.57	0.54	0.53	0.53	0.48	0.47	0.47	0.47	0.47	0.52	0.50	0.56	0.57	0.53	0.59	0.58	0.56	0.53	0.60
School	0.57	0.57	0.58	0.57	0.55	0.54	0.57	0.51	0.49	0.48	0.51	0.52	0.51	0.53	0.51	0.53	0.50	0.51	0.58
Warehouse	0.28	0.30	0.24	0.27	0.23	0.24	0.27	0.23	0.20	0.33	0.26	0.28	0.40	0.32	0.29	0.44	0.38	0.40	0.44
All others	0.65	0.62	0.64	0.62	0.57	0.54	0.57	0.56	0.58	0.59	0.57	0.60	0.60	0.59	0.65	0.62	0.62	0.61	0.64

REQUIREMENTS: CORE AND SHELL

Achievement pathways	Points
Core and Shell	1–7
Option 1. Prescriptive Path	1–7
Path 1. Regulated Loads	1–6
Case 1. *ASHRAE 90.1-2019*	1–5
OR	
Case 2. *ASHRAE 90.1-2022*	2–6
AND/OR	
Path 2. Plug and Process Loads (PPL)	1–3
Case 1. Plug Load Management	1
AND/OR	
Case 2. Efficient Plug and Process Load Equipment	1–3
OR	
Option 2. Energy Simulation	1–7
Path 1. Percentage Reduction Excluding On-Site Renewable Contribution	1–7
OR	
Path 2. Percentage Reduction Including On-Site Renewable Contribution	1–7

Option 1. Prescriptive Path (1–7 points)

PATH 1. REGULATED LOADS (1–6 POINTS)

Points are awarded according to Table 1 below, using either Case 1 or Case 2.

Case 1. ASHRAE 90.1-2019 (1–5 points)

Available only to projects registered before January 1, 2028.

- Comply with the provisions of *ASHRAE 90.1-2019*, Sections 5–10.
- Implement Additional Efficiency Requirements credits calculated per *ASHRAE 90.1-2022*, Section 11, from the list of eligible measures referenced below. Where *ASHRAE 90.1-2022*, Section 11, references the prescriptive requirements of *ASHRAE 90.1-2022*, Sections 5–10, such as lighting power density or equipment efficiency, replace those references with the matching prescriptive values in *ASHRAE 90.1-2019*.
  - **Central systems**. Earn 1 point for every 13 energy credits where the LEED BD+C: Core and Shell project includes a central HVAC system or service water heating system that includes chillers, boilers, service water heating equipment, or loop pumping systems with heat rejection.
  - **All others**. Earn 1 point for every nine energy credits for all other LEED BD+C: Core and Shell projects.

OR

Case 2. ASHRAE 90.1-2022 (2–6 points)

- Comply with the provisions of *ASHRAE 90.1-2022*, Sections 5–11.
- Implement incremental *ASHRAE 90.1 2022*, Section 11 credits, above the minimum required from the list of eligible measures below.
    - **Central systems:** 1 point for every 13 incremental energy credits where the LEED BD+C: Core and Shell project includes a central HVAC system or service water heating system that includes chillers, boilers, service water heating equipment, or loop pumping systems with heat rejection.
    - **All others:** 1 point for every nine incremental energy credits for all other LEED BD+C: Core and Shell projects.

Eligible measures from ASHRAE 90.1-2022, Section 11.5.2, for LEED points

- HVAC measures (H01 to H07)
- Service water heating measures (W01 to W09)
- Lighting measures (L01 to L06)
- G07 building mass/night flush

Table 1. Points for ASHRAE 90.1-2022, section 11 credits

Points	**Compliance Path**			
	Case 1. *ASHRAE 90.1-2019*		**Case 2. *ASHRAE 90.1-2022***	
	Central systems	**All others**	**Central systems**	**All others**
1	13 credits	9 credits	N/A	N/A
2	26 credits	18 credits	Min. required by *ASHRAE 90.1-2022*	Min. required by *ASHRAE 90.1-2022*
3	39 credits	27 credits	Min. required + 13 credits	Min. required + 9 credits
4	52 credits	36 credits	Min. required + 26 credits	Min. required + 18 credits
5	65 credits	45 credits	Min. required + 39 credits	Min. required + 27 credits
6	–	–	Min. required + 52 credits	Min. required + 36 credits

AND/OR

PATH 2. PLUG AND PROCESS LOADS (1–3 POINTS)

Case 1. Plug Load Management (1 point)

Implement the following:

- Provide a plug load dashboard that is accessible through an application to all regular occupants of the building displaying base building plug loads, and with the capability for tenants to choose whether to display plug loads to their occupants.

- Configure the plug load monitoring system with the capability for expandability to monitor future plug loads for each floor and for individual tenant spaces.

AND/OR

Case 2. Efficient Plug and Process Load Equipment (1–3 points)

Install or reuse equipment meeting the criteria in Table 2. Points are awarded according to Table 2 up to a maximum of 3 points for each equipment category where the criteria are met.

Table 2. Plug, process, refrigeration, and conveyance equipment criteria

Equipment category	Applicable equipment	Criteria	Points
People conveyance	Elevators Escalators Moving walkways	*ISO 25745.* At least Class A-rated	2
Data center electrical system	Electrical system design	*ASHRAE 90.4-2022.* Design electrical loss component is at least 20% lower than the maximum design electrical loss.	1
Refrigeration systems	Referenced in *ASHRAE 90.1*, Section 6.8 tables, AND not ENERGY STAR® eligible	10% improvement beyond *ASHRAE 90.1*, Section 6.8 tables	1
	Refrigerated warehouse	*California Title 24-2022*, Section 120.6, refrigerated warehouse requirements	
Airport equipment	Baggage handling equipment	Individual carrier systems with variable frequency drive	2
	Aircraft and jetway air-conditioning	Preconditioned air systems with efficiencies meeting *ASHRAE 90.1* prescriptive efficiencies for HVAC equipment	

Data centers

Data centers that comprise at least 40% of the project’s gross area with the electrical system in the project scope earn 2 points for complying with the data center electrical system requirements.

Warehouses

Refrigerated warehouses that comprise at least 20% of the project’s gross floor area with the refrigeration systems in the project scope earn 2 points for complying with the refrigeration system requirements.

OR

Option 2. Energy Simulation (1–7 points)

Demonstrate an improvement in future source energy calculated per *ASHRAE Standard 90.1*, Normative Appendix G, Performance Rating Method, with the following additional provisions:

- Use the *ASHRAE 90.1* version applied for *EAp2: Minimum Energy Efficiency*.
  - **Case 1**. *ASHRAE 90.1-2019*. Replace *ASHRAE 90.1-2019*, Table 4.2.1.1, Building Performance Factors, with Table 4. For major building renovation areas, multiply the BPF by 1.05.
  - **Case 2**. *ASHRAE 90.1-2022*. Replace *ASHRAE 90.1-2022*, Table 4.2.1.1, Building Performance Factors, with Table 5. For major building renovation areas, multiply the BPF by 1.05.
- Replace all references to cost with future source energy. Use an electric site-to-source energy conversion factor of 2.0 based on future projections for the U.S. A lower national average value may be used as applicable for projects outside of the U.S.
- Model energy efficiency measures for plug and process loads using the Section G2.5 exceptional calculation method or approved calculations in the LEED reference guidance. Calculate the performance index (PI) and percentage improvement with and without the plug and process savings.
- Calculate the PI and PI Target as follows:
  - $PI_{nre} = PBP_{nre} / BBP$
  - $PI = PBP / BBP$
  - $PI_t = [BBUE + (BPF \times BBRE)] / BBP$

    where:
    - PI_{nre} = performance index for future source energy excluding on-site renewable contribution
    - PI = performance index for future source energy including on-site renewable contribution
    - PIt = performance index target for future source energy use
    - BBP = baseline building performance for baseline building future source energy use
    - BBUE = baseline building unregulated future source energy use
    - BBRE = baseline building regulated future source energy use
    - PBP_{nre} = proposed building performance without any credit for reduced annual future source energy from on-site renewable energy generation systems
    - PBP = proposed building performance, including the reduced annual future source energy associated with all on-site renewable energy generation systems

Points are awarded according to Table 3, using either Path 1 or Path 2.

Table 3. Points for percentage improvement in PI Below PIT

Path 1. **Percentage reduction excluding on-site renewable contribution (100% – PInre / PIt)**		**OR**	**Path 2.** **Percentage reduction including on-site renewable contribution (100% – PI / PIt)**		**Points**
Case 1. ***ASHRAE 90.1-2019***	**Case 2.** ***ASHRAE 90.1-2022***		**Case 1.** ***ASHRAE 90.1-2019***	**Case 2.** ***ASHRAE 90.1-2022***	
2%	N/A		10%	N/A	1
5%	N/A		20%	0%	2
8%	0%		30%	13%	3
11%	3%		40%	26%	4
14%	6%		50%	39%	5
17%	9%		60%	52%	6
20%	12%		70%	65%	7

Table 4. ASHRAE 90.1-2019 — Equivalent building performance factors for a future source energy metric

Building type	**Climate zone**																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.74	0.69	0.73	0.70	0.73	0.70	0.71	0.70	0.63	0.70	0.71	0.69	0.68	0.70	0.70	0.68	0.68	0.68	0.74
Healthcare/hospital	0.72	0.72	0.73	0.73	0.74	0.71	0.72	0.74	0.71	0.72	0.73	0.71	0.74	0.73	0.80	0.73	0.77	0.78	0.79
Hotel/motel	0.72	0.71	0.72	0.71	0.71	0.70	0.71	0.73	0.72	0.71	0.73	0.73	0.71	0.73	0.74	0.70	0.72	0.70	0.70
Office	0.62	0.63	0.61	0.62	0.58	0.60	0.57	0.62	0.55	0.55	0.61	0.57	0.58	0.61	0.59	0.58	0.60	0.54	0.58
Restaurant	0.65	0.62	0.63	0.61	0.62	0.58	0.63	0.63	0.63	0.67	0.66	0.66	0.70	0.70	0.68	0.73	0.72	0.74	0.77
Retail	0.57	0.54	0.53	0.53	0.48	0.47	0.47	0.47	0.47	0.52	0.50	0.56	0.57	0.53	0.59	0.58	0.56	0.53	0.60
School	0.57	0.57	0.58	0.57	0.55	0.54	0.57	0.51	0.49	0.48	0.51	0.52	0.51	0.53	0.51	0.53	0.50	0.51	0.58
Warehouse	0.28	0.30	0.24	0.27	0.23	0.24	0.27	0.23	0.20	0.33	0.26	0.28	0.40	0.32	0.29	0.44	0.38	0.40	0.44
All others	0.65	0.62	0.64	0.62	0.57	0.54	0.57	0.56	0.58	0.59	0.57	0.60	0.60	0.59	0.65	0.62	0.62	0.61	0.64

Table 5. ASHRAE 90.1-2022 — Equivalent building performance factors for a future source energy metric

Building type	**Climate zone**																		
	0A	**0B**	**1A**	**1B**	**2A**	**2B**	**3A**	**3B**	**3C**	**4A**	**4B**	**4C**	**5A**	**5B**	**5C**	**6A**	**6B**	**7**	**8**
Multifamily	0.64	0.59	0.62	0.60	0.61	0.59	0.61	0.60	0.49	0.57	0.59	0.56	0.55	0.57	0.57	0.55	0.55	0.55	0.60
Healthcare/hospital	0.64	0.64	0.66	0.65	0.66	0.63	0.64	0.65	0.63	0.64	0.65	0.62	0.64	0.62	0.69	0.63	0.68	0.69	0.70
Hotel/motel	0.65	0.63	0.64	0.63	0.62	0.61	0.62	0.63	0.62	0.59	0.60	0.60	0.57	0.58	0.59	0.56	0.58	0.56	0.56
Office	0.54	0.54	0.53	0.54	0.49	0.52	0.49	0.52	0.45	0.46	0.52	0.47	0.48	0.51	0.48	0.48	0.50	0.45	0.49
Restaurant	0.61	0.58	0.58	0.57	0.57	0.54	0.58	0.59	0.57	0.62	0.61	0.61	0.65	0.64	0.63	0.67	0.66	0.69	0.72
Retail	0.47	0.45	0.44	0.44	0.40	0.39	0.37	0.39	0.36	0.40	0.41	0.42	0.45	0.43	0.46	0.44	0.43	0.42	0.46
School	0.52	0.53	0.53	0.53	0.51	0.51	0.53	0.48	0.46	0.43	0.48	0.47	0.45	0.49	0.46	0.46	0.44	0.44	0.48
Warehouse	0.25	0.25	0.21	0.24	0.20	0.21	0.24	0.20	0.17	0.30	0.22	0.25	0.36	0.28	0.25	0.40	0.34	0.36	0.40
All others	0.58	0.56	0.56	0.56	0.50	0.47	0.49	0.48	0.48	0.49	0.49	0.50	0.51	0.50	0.55	0.52	0.52	0.52	0.55

REQUIREMENTS EXPLAINED

This credit rewards decreased regulated and unregulated energy usage below the *ASHRAE 90.1-2019* requirements referenced in *EAp2: Minimum Energy Efficiency*, Option 1. To limit documentation level of effort, use the same *ASHRAE* 90.1 compliance method for prerequisite and credit compliance — either the prescriptive method or Appendix G Performance Rating Method (PRM).

For the prescriptive method, use the *ASHRAE 90.1-2022* standard for maximum achievement of points, and to earn 4 New Construction points or 2 Core and Shell points automatically per *EAc3: Enhanced Energy Efficiency*, Option 1 Path 1 Case 2.

Table 6. Linked prerequisite and credit compliance options for energy efficiency

EAp2: Minimum Energy Efficiency	**Linked *EAc3: Enhanced Energy Efficiency*** **(choose Option 1 OR Option 2)**	**Available points**	
		New Construction	**Core and Shell**
Option 1. *ASHRAE 90.1-2019*, Prescriptive method	Option 1. Prescriptive Path	1–9	1–7
	Path 1. Regulated Loads, Case 1. *ASHRAE 90.1-2019*. Implement additional efficiency measures for HVAC, service water heating, lighting, and/or building mass with night flush using *ASHRAE 90.1-2022*, Section 11 method	1–5	1–5
	AND/OR	+	+
	Path 2. Plug and Process Loads	1–4	1–3

EAp2: Minimum Energy Efficiency	**Linked *EAc3: Enhanced Energy Efficiency* (choose Option 1 OR Option 2)**	**Available points**	
		New Construction	**Core and Shell**
Option 2. *ASHRAE 90.1-2022*, Prescriptive Method	Option 1. Prescriptive Path	1–10	1–7
	Path 1. Regulated Loads, Case 2. *ASHRAE 90.1-2022*. 4 New Construction or 2 Core and Shell points automatically rewarded for prerequisite compliance. Up to 3 additional points to implement incremental efficiency measures for HVAC, service water heating, lighting, and/or building mass with night flush per *ASHRAE 90.1-2022*, Section 11.	4–7	2–6
	AND/OR	+	+
	Path 2. Plug and Process Loads	1–4	1–3
Option 1 or Option 2. *90.1-2019 or 90.1-2022* Energy Cost Budget Method (ECB)	Option 1. Prescriptive Path Path 2. Plug and Process Loads	1–4	1–3
New Construction and Core and Shell Option 1. *ASHRAE 90.1-2019*: and New Construction Option 2. *ASHRAE 90.1-2022*, Appendix G Performance Rating Method (PRM)	Option 2. Energy Simulation Implement efficiency measures to achieve a percentage reduction in future source energy below a performance Index Target (PIt) referenced to *ASHRAE 90.1-2019* equivalent performance.	1–10	1–7
Core and Shell Option 2 *ASHRAE 90.1-2022*, Appendix G Performance Rating Method (PRM)	Option 2. Energy Simulation Implement efficiency measures to achieve a percentage reduction in future source energy below a performance Index Target (PIt) referenced to *ASHRAE 90.1-2022* equivalent performance. 2-3 points automatically rewarded for future source energy that minimally complies with *ASHRAE 90.1-2022* (0% reduction).		2–7

Option 1. Prescriptive Path

Option 1. Prescriptive Path rewards improved efficiency for regulated loads under Path 1 and for plug and process loads under Path 2, with points weighted for each path based on the typical distribution of regulated versus plug and process loads in buildings. Combined points for Paths 1 and 2 cannot exceed 10 for LEED BD+C: New Construction, or seven for LEED BD+C: Core and Shell.

For less complex buildings, the prescriptive path offers a streamlined approach to achieving energy efficiency without requiring complex energy modeling by implementing predefined efficiency measures. It is particularly beneficial for projects with limited resources or those that do not require the flexibility of the energy simulation path.

PATH 1. REGULATED LOADS

Path 1 is available to projects that comply with *EAp2: Minimum Energy Efficiency* using the prescriptive method.

- Case 1 applies to projects complying with Prerequisite Option 1 using *ASHRAE 90.1-2019*, Sections 5–10.
- Case 2 applies to projects complying with Prerequisite Option 2 using *ASHRAE 90.1-2022*, Sections 5–11.

Projects registered beginning January 1, 2028 must use *ASHRAE 90.1-2022*, and earlier registered projects may use either *ASHRAE 90.1-2019* or *ASHRAE 90.1-2022*.

For both Case 1 and Case 2, projects must use the protocol in *ASHRAE 90.1-2022*, Section 11. Additional Efficiency Requirements to achieve energy credits. See guidance from *EAp2: Minimum Energy Efficiency* and *ASHRAE 90.1-2022*, Section 11. Additional Efficiency Requirements.

Case 1. *ASHRAE 90.1-2019*

ASHRAE 90.1-2022, Section 11 energy credits must be achieved from the list of eligible HVAC, lighting, service water heating, or building mass/night flush measures rather than the full list of measures from *ASHRAE 90.1-2022*, Section 11.5.2.

Use the less stringent *ASHRAE 90.1-2019* prescriptive references in lieu of *ASHRAE 90.1-2022* prescriptive references for the following measures:

- H02: HVAC Heating Performance Improvement (*ASHRAE 90.1-2019 11.5.2.2.2*).
    - Refer to the heating equipment efficiencies in *ASHRAE 90.1-2019*, Section 6.8.1 tables.
- H03: HVAC Cooling Performance Improvement (*ASHRAE 90.1-2019 11.5.2.2.3*).
    - Refer to the cooling equipment efficiencies in *ASHRAE 90.1-2019*, Section 6.8.1 tables.
- L06: Reduce Interior Lighting Power (*ASHRAE 90.1-2019 11.5.2.5.6*).
    - Determine the interior lighting power allowance using the *ASHRAE 90.1-2019*, Section 9.6 Alternative Compliance Path: Space-by-Space Method.

Points are awarded dependent on project scope, up to a maximum of 5 points:

- **New Construction**. One point for each 25 *ASHRAE 90.1-2022*, Section 11 energy credits documented for eligible measures.
- **Core and Shell — projects with central systems.** One point for each 13 *ASHRAE 90.1-2022*, Section 11 energy credits documented for eligible measures. This encompasses any project with Core and Shell scope of work that includes central boilers, chillers, service water heating equipment, or loop pumping systems with heat rejection such as water- or ground-source heat pump loops.
- **Core and Shell — projects without central systems.** One point for each nine *ASHRAE 90.1-2022*, Section 11 energy credits documented for eligible measures.

Example. Path 1. Regulated Loads, Case 1. ASHRAE 90.1-2019
A New Construction retail project in climate zone 4A achieves 52 energy credits from three eligible measures, earning two LEED Points.

- H02: HVAC Heating Performance Improvement. 20% or greater weighted average improvement in *ASHRAE 90.1-2019* heating efficiency achieves 28 energy credits per 90.1-2022, Table 11.5.3-6 and adjustment equations from *11.5.2.2.2*.
- L04: Increased Daylighting Control Area. 65% of total daylighting area with continuous daylight dimming achieves four energy credits per *ASHRAE 90.1-2019*, Table 11.5.3-6.
- L06: Reduce Interior Lighting Power. 10% or greater improvement in *ASHRAE 90.1-2019* regulated lighting power achieves 20 energy credits per *ASHRAE 90.1-2019*, Table 11.5.3-6 and allowed adjustments from *11.5.2.5.6*.

$$\begin{aligned} EC_{eligible} &= EC\_H02 + EC\_L04 + EC\_L06 \\ EC_{eligible} &= 28 + 4 + 20 = 52 \end{aligned}$$

Ineligible measures such as E01: Improved Envelope Performance or R01: On-site Renewable Energy do not contribute towards achievement of points under Case 1.

Case 2. ASHRAE 90.1-2022

Minimum Required by ASHRAE 90.1-2022
Projects earn 4 New Construction points or 2 Core and Shell points for complying with *EAp2: Minimum Energy Efficiency*, Option 2. *ASHRAE 90.1-2022* using the prescriptive method. Any *ASHRAE 90.1-2022*, Section 11.5.2 efficiency measures may be used to achieve the minimum energy credits required by *2022* Section 11 for the project’s building type and climate zone.

However, per *ASHRAE 90.1-2022 11.5.2*, the combined contribution of renewable and load management measures is limited to 60% of the total required energy credits.

Incremental energy credits

For additional LEED points, projects must achieve incremental energy credits above the minimum required for prescriptive method compliance. These incremental energy credits must be from the list of eligible HVAC, lighting, service water heating, or building mass/night flush measures rather than the full list of measures from *ASHRAE 90.1-2022*, Section 11.5.2.

To assess achievement of incremental energy credits (EC_{inc}):

- Identify the minimum energy credits required by *ASHRAE 90.1-2022*, Section 11 (EC_{req}).
- Determine the total combined energy credits achieved using *AHRAE 90.1-2022*, Section 11 from eligible measures and from non-eligible measures (EC_{total}).
- Determine the total combined energy credits achieved from the list of eligible measures. ($EC_{eligible}$).
- The quantity of incremental energy credits achieved is equal to the lesser of the energy credits from eligible measures, or the total combined energy credits minus the energy credits required by *ASHRAE 90.1-2022*, Section 11.

$$\mathrm{EC_{inc}} = \mathrm{Minimum}\ (\mathrm{EC_{eligible}}, \mathrm{EC_{total}} - \mathrm{EC_{req}})$$

Points are awarded dependent on project scope:

- **New Construction**. Earn one point for each 25 incremental *ASHRAE 90.1-2022*, Section 11 energy credits documented for eligible measures, up to a maximum of three additional points.
- **Core and Shell projects with central systems**. Earn one point for each 13 incremental *ASHRAE 90.1-2022*, Section 11 energy credits documented for eligible measures, up to a maximum of four additional points. Central systems refer to LEED BD+C: Core and Shell scope of work that includes central boilers, chillers, service water heating equipment, or loop pumping systems with heat rejection such as water- or ground-source heat pump loops.
- **Core and Shell projects without central systems**. Earn one point for each nine incremental *ASHRAE 90.1-2022*, Section 11 energy credits documented for eligible measures, up to a maximum of 4 additional points.

Example 1
A new construction two-story retail project in climate zone 4A earns five LEED points: four points for complying with *ASHRAE 90.1-2022* using the prescriptive method and one additional point for achieving at least 25 incremental energy credits above the minimum required from the list of eligible measures.

Per *ASHRAE 90.1-2022*, Table 11.5.3-6, the project must achieve at least 50 energy credits to comply with *ASHRAE 90.1-2022* using the prescriptive method.

$$\mathrm{EC_{req}} = 50$$

- The project documents achievement of 97 total energy credits per *ASHRAE 90.1-2022*, Section 11.
- H02: HVAC Heating Performance Improvement. 20% or greater weighted average improvement in *ASHRAE 90.1-2022* heating efficiency achieves 28 energy credits.
- L04: Increased Daylighting Control Area. 65% of total daylighting area with continuous daylight dimming achieves four energy credits.
- L06: Reduce Interior Lighting Power. 10% or greater improvement in *ASHRAE 90.1-2022* regulated lighting power achieves 20 energy credits.
- E01: Improved Envelope Performance. 4.5% improvement in envelope performance factor achieves 45 energy credits.

$$\mathrm{EC_{total}} = \mathrm{EC\_H02} + \mathrm{EC\_L04} + \mathrm{EC\_L06} + \mathrm{EC\_E01}$$
$$\mathrm{EC_{total}} = 28 + 4 + 20 + 45 = 97$$

- 52 of these energy credits are from measures eligible for LEED points (H02, L04, and L06).

$$\mathrm{EC_{eligible}} = \mathrm{EC\_H02} + \mathrm{EC\_L04} + \mathrm{EC\_L06}$$
$$\mathrm{EC_{eligible}} = 28 + 4 + 20 = 52$$

- The project achieves 47 incremental energy credits above the minimum required for prescriptive method compliance.

$$\mathrm{EC_{inc}} = \mathrm{Minimum}\ (\mathrm{EC_{eligible}},\ \mathrm{EC_{total}} - \mathrm{EC_{req}})$$
$$\mathrm{EC_{inc}} = \mathrm{Minimum}\ (52,\ 97 - 50) = 47$$

Example 2.

The project referenced in Example 1 adds a roof-mounted photovoltaic array with a rated capacity of at least 0.75 W/sq. ft. (8.1 W/sq. m.) of the project's gross floor area, achieving 30 energy credits for measure R01: On-site Renewable Energy, and maximizing the combined allowable *ASHRAE 90.1-2022*, Section 11 contribution for renewable and load management credits. This results in achievement of six total LEED points for Path 1: four points for complying with *ASHRAE 90.1-2022* using the prescriptive method, and two additional points for achieving at least 50 incremental energy credits above the minimum required from the list of eligible measures.

- $EC_{req} = 50$
- The project documents achievement of 127 total energy credits per *ASHRAE 90.1-2022,* Section 11.

$$\begin{aligned} EC_{total} &= EC\_H02 + EC\_L04 + EC\_L06 + EC\_E01 + EC\_R01 \\ EC_{total} &= 28 + 4 + 20 + 45 + 30 = 127 \end{aligned}$$

- 52 of these energy credits are from measures eligible for LEED points (H02, L04, and L06).

$$\begin{aligned} EC_{eligible} &= EC\_H02 + EC\_L04 + EC\_L06 \\ EC_{eligible} &= 28 + 4 + 20 = 52 \end{aligned}$$

- The project achieves 52 incremental energy credits above the minimum required for prescriptive method compliance.

$$\begin{aligned} EC_{inc} &= \text{Minimum} \quad (\text{ECeligible}, \text{ECtotal} - \text{ECreq}) \\ EC_{eligible} &= \text{Minimum} \quad (52, \quad 127 - 50) = 52 \end{aligned}$$

Eligible Measures for Path 1

Table 1. Eligible measures from ASHRAE 90.1-2022, Section 11.5.2 for LEED points

HVAC measures	**Lighting measures**
H01: HVAC System Performance Improvement (*ASHRAE 90.1-2022*, Addendum j). (cannot be used in conjunction with H02, H03, or H06)	L01. Lighting System Performance (not included in *ASHRAE 90.1-2022*, but may be in future ASHRAE addenda)
H02: HVAC Heating Performance Improvement	L02: Lighting Dimming and Tuning
H03: HVAC Cooling Performance Improvement	L03: Increase Occupancy Sensor
H04: Residential HVAC Controls	L04: Increase Daylight Area
H05: Ground-Source Heat Pump	L05: Residential Light Controls
H06: DOAS/Fan Controls	L06: Light Power Reduction
H07: Guideline 36 Sequences	
Service Water Heating (SWH) measures	**Load management measures**
W01: SHW Preheat Recovery	G07: Building Mass/Night Flush
W02: Heat-Pump Water Heater	
W03: Efficient Gas Water Heater	
W04: SWH Pipe Insulation	
W05: Point-of-Use Water Heaters	
W06: Thermostatic Balancing Valves	
W07: SHW Submeters	
W08: SHW Distribution Sizing	
W09: Shower Drain Heat Recovery	

The remaining measures referenced in *ASHRAE 90.1-2022*, Section 11.5.2 are ineligible for incremental LEED points, since these measures are separately rewarded in other LEED credits:

- E01: Improved Envelope Performance rewarded in *EAc2: Reduce Peak Thermal Loads*
- P01: Energy Monitoring is rewarded under *EAc5: Enhanced Commissioning*, Option 2, Monitoring-Based Commissioning (MBCx)
- R01: Renewable Energy rewarded in *EAc4: Renewable Energy*
- Q01: Efficient Elevator Equipment and Q02: Efficient Kitchen Equipment rewarded in *EAc3: Enhanced Energy Efficiency*, Option 1, Path 2. Plug and Process Loads.
- G01 to G06: Load Management measures rewarded in *EAc6: Grid Interactive*.

Maximum achievable points

Lower quantities of available *ASHRAE 90.1-2022* energy credits from eligible measures for some project types and climate zones place further limitations on the maximum available LEED points for these applications, as shown in Table 2.

Table 2. Maximum LEED points availability for Option 1, Prescriptive Path, Path 1. Regulated Loads (New Construction)

Building type	**Case 1. *ASHRAE 90.1-2019***		**Case 2. *ASHRAE 90.1-2022***	
	Maximum points	Climate zones	Maximum points	Climate zones
Multifamily	5	All	7	All
Healthcare	5	0B, 1B, 2A, 0A, 2B, 3A, 3B, 3C, 4A, 5C, 6A, 6B, 7, 8	7	All
	4	1A, 4B, 4C, 5A, 5B		
Office	4	0A, 0B, 1A, 1B, 2A, 2B, 6A, 6B, 7, 8	7	All
	3	3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C		
Hotel Motel	5	0A, 0B, 1A, 1B, 2A, 3A, 6A, 6B, 7, 8	7	All
	4	2B, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C		
Restaurant	5	0A, 0B, 1B, 4A, 5A, 5B, 6A, 6B, 7, 8	7	All except 3C
	4	1A, 2A, 2B, 3A, 3B, 4B, 4C, 5C	6	3C
	2	3C		
Retail	5	0A, 0B, 1A, 1B2A, 2B, 3A, 3B, 4A, 6A, 6B, 7, 8	7	All
	4	3C, 4B, 4C, 5A, 5B, 5C		
Warehouse	5	6A, 8	7	0A, 0B, 1A, 1B, 4A, 5A, 5B, 6A, 6B, 7, 8
	4	5A, 6B, 7	6	2A, 2B, 3A, 3B, 3C, 4B, 4C, 5C
	3	0A, 0B, 1A, 1B, 4A, 5B		
	2	2A, 2B, 3A, 3B, 3C, 4B, 4C, 5C		
Education	5	0A, 0B, 1B, 1A, 2A, 2B, 3A, 8	7	All
	4	3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7		
Other	2	All except 0A	6	All except 0A
	1	0A	5	0A

Equivalence to ASHRAE 90.1

Refer to the Project Priorities Library for regional paths addressing equivalence to *ASHRAE 90.1*.

To be eligible to apply *EAc3: Enhanced Energy Efficiency*, Option 1, Prescriptive Path, Path 1. Regulated Loads, projects using an *ASHRAE 90.1*-equivalent standard must use a prescriptive method from the equivalent standard: compliance must be demonstrated per category of building systems (building envelope, HVAC, lighting, service water heating, etc.), without trade-offs between system categories.

For projects that use a standard other than *ASHRAE 90.1* or *International Energy Conservation Code (IECC)* for prerequisite compliance, projects must apply the methodology in *ASHRAE 90.1-2022*, Section 11 to achieve points under Path 1:

- **Case 1**. Prescriptive values from the *ASHRAE 90.1-2019*-equivalent standard for efficiencies such as lighting power density allowance or equipment efficiency may replace *ASHRAE 90.1-2022*, Section 11 referenced values.
- **Case 2**. Four New Construction points or two Core and Shell points are automatically rewarded for prescriptive compliance with an *ASHRAE 90.1-2022*-equivalent standard. For additional points, projects must document achievement of *ASHRAE 90.1-2022* Section 11 credits, including:
    - The minimum required credits for the project type and climate zone AND
    - Incremental credits above the minimum required from the list of eligible measures.

For projects that use the *International Energy Conservation Code (IECC)* prescriptive method for prerequisite compliance, energy credits from *IECC-2024*, Section C406 Additional Efficiency Renewable and Load Management Requirements may directly replace energy credits from *ASHRAE 90.1-2022*, Section 11 Additional Efficiency Requirements. Projects must exclusively use either *ASHRAE 90.1-2022* or *IECC-2024* to document achievement of energy credits. Eligible measures from *IECC-2024 C406* are limited to HVAC (H01 to H05), Lighting (L01 to L06), and Service Water Heating (W01 to W10).

- **Case 1**: Implement additional efficiency credits calculated per *IECC-2024 C406* from the list of eligible measures. Prescriptive values from *IECC-2021*, Sections C402–C405 such as lighting power density allowance and equipment efficiency may replace *IECC-2024*, Section 11 referenced values.
- **Case 2**
    - Four New Construction points or two Core and Shell points are automatically rewarded for compliance with *IECC-2024*, Sections C402–C406.
    - Implement incremental C406 credits, above the minimum required from the list of eligible measures.

District energy
Projects may optionally account for District Energy System (DES) efficiency when assessing energy credits for Case 1 and incremental energy credits beyond the minimum required for Case 2:

- H02: HVAC Heating Performance Improvement or H03: HVAC Cooling Performance Improvement. Calculate the heating and/or cooling capacity weighted-average improvement separately for the DES system, and for the building systems. Use the peak DES capacity supplied to the building and the sum of equipment capacity on-site to calculate the heating and/or cooling capacity-weighted average improvement for the combined systems.
- H05: Ground-Source Heat-Pump System. Demonstrate that the credit requirements are met by a Ground-Source Heat-Pump District Energy System serving the project.
- W02: Heat-Pump Water Heater or W03: Efficient Gas Water Heater. Demonstrate that the credit requirements are met for a District Heating System serving the project.

PATH 2. PLUG AND PROCESS LOADS

Path 2 places a spotlight on plug, process, cooking, refrigeration, and elevator/escalator system energy use that represent 30% to 50% of building energy usage yet are only partially or peripherally addressed through *ASHRAE 90.1* standard requirements.

Projects may apply Case 1 in conjunction with Case 2, or document compliance with Case 1, Case 2, or Case 3 independently (Case 3 is only available for New Construction).

Case 1. Plug Load Management (New Construction and Core and Shell)

A plug load dashboard empowers building occupants to actively engage in reducing building energy consumption from plug loads. For projects with required monitoring and recording of receptacle use at 15-minute intervals per *EAp4: Energy Metering and Reporting*, the dashboard should visualize this data and compare receptacle energy consumption to the prior interval annually, monthly, daily, and hourly. The dashboard is only required to show usage for receptacle circuits but may optionally address other process usage (such as elevators), or other building end-uses (such as lighting or HVAC energy).

New Construction
The dashboard must be accessible to all regular building occupants. For buildings with multiple tenants or multiple floors, the dashboard may be configured so that an individual user sees only the receptacle usage for common areas and for their space.

Buildings that have Information Technology (IT) departments operating in the building must also develop and implement policies for monitors, visual displays, personal computers, and laptops to be controlled off or in a very low power mode when not in use, except during scheduled maintenance periods.

Core and Shell

The dashboard must be configured with the capability for all regular building occupants to view common area receptacle usage and include functionality enabling each tenant manager to provide their occupants with access to plug load data specific to the tenant space. The project design must include a plug load monitoring system feeding into the plug load dashboard, including the capability for expandability to monitor future plug loads for each floor and for each individual tenant spaces.

Case 2. Efficient Plug and Process Load Equipment (New Construction and Core and Shell)

Case 2 provides a streamlined path for rewarding plug and process equipment efficiency. The path is best suited for projects where a significant proportion of the project's plug and process load consists of equipment referenced in Table 2.

New Construction

One point is rewarded for each equipment category where at least 90% of applicable project equipment in the project scope meets the efficiency criteria, up to a maximum of three points.

Up to 90% of applicable equipment may be assessed using either equipment quantity or rated load:

- **Equipment quantity**. Divide the total quantity of equipment that meets the efficiency criteria for the equipment category by the total quantity of applicable equipment within the project scope for the equipment category.
- **Rated load**. For applicable equipment in the equipment category, divide the sum of rated load for equipment that meets the efficiency criteria by the sum of rated load for all equipment within the project scope.

Either include or exclude all applicable equipment reused in the project from the calculations. Reused ENERGY STAR® products are deemed compliant even when not meeting current *ENERGY STAR®* specifications.

To ensure a measurable impact on project performance, Table 2 criteria for both ENERGY STAR® products and categories specify a minimum 0.1 W/sq. ft. (1.1 W/sq. m.) of eligible equipment per unit of gross floor area. Credit gets rewarded as one consolidated Table 2 equipment category when the project has less than 0.1 W/sq. ft. (1.1 W/sq. m.) of rated load for each individual ENERGY STAR® Products Equipment Category but exceeds this value for the sum of the two categories.

New Construction: Process-intensive buildings

Process-intensive buildings such as data centers, restaurants, or refrigerated warehouses have greater potential to achieve substantial building energy savings from a single Equipment Category. Therefore, projects with combined equipment load from the equipment categories in Table 2 totaling at least 0.5 Watt/sq. ft. (5.4 W/sq. m.) of gross floor area may assess compliance based on 90% of total applicable equipment rated load rather than per equipment category. All applicable equipment from all Table 2 equipment categories must be included in the assessment of credit compliance.

Core and Shell

The credit rewards efficiency measures implemented for plug and process equipment commonly within the Core and Shell scope of work. Points are rewarded per Core and Shell Table 2 for each equipment category with project scope meeting the credit criteria, up to a maximum of three points. To be eligible for credit, all equipment installed within the project scope of work for the referenced equipment category must meet the credit criteria. For example, for a project with multiple elevators and escalators, each elevator and escalator that is eligible for an ISO 25745 rating must achieve at least a Class-A rating to qualify for points under the people conveyance equipment category.

> **Equivalence to ENERGY STAR® products**
> Refer to the Project Priorities Library for regional paths addressing equivalence to ENERGY STAR® products.

Case 3. Plug and Process Load Exceptional Calculation (New Construction only)

Case 3 primarily applies to project applications with unique plug and process loads largely unaddressed by Table 2 equipment categories (such as manufacturing or laboratory) or projects where the streamlined methodology from Cases 1 and 2 insufficiently reveals magnitude of impact for plug and process efficiency measures implemented for the project. Case 3 cannot be combined with Case 1 or Case 2.

Project analysts must use the *ASHRAE 90.1*, Section G2.5 exceptional calculation method to demonstrate a minimum percentage improvement in total plug and process energy usage compared to a baseline representative of standard practice for a similar newly constructed building.

Perform a detailed assessment to determine the total estimated annual building energy consumption from all plug and process equipment, even when regulated under *ASHRAE 90.1*:

- Receptacle equipment
- Cooking equipment
- Refrigeration equipment
- Conveyance equipment including elevators, escalators, or moving walkways
- Process heating or process cooling (e.g., for manufacturing processes)
- Data center IT equipment and Electrical Loss Component
- All other process energy used to support a manufacturing, industrial, or commercial activity other than conditioning spaces and maintaining comfort and amenities for the occupants of a building.

For projects where startup plug and process energy usage projections are lower than estimated full build-out usage, use either the full build-out usage or a lesser value representing the maximum plug and process usage possible from the building power and thermal energy generation capacity installed in the project scope of work.

For each process efficiency measure implemented in the project, document that the efficiency measure is not conventional practice. Examples include:

- A recent study with researched tabulations or monitored data establishing standard practice for the given application in similar newly constructed facilities.
- A new-construction utility or government program that provides incentives for the measure.
- A document showing the systems used to perform an analogous function in similar facilities built or reconstructed within the past 10 years.
- Applicable prescriptive requirements from the version of *ASHRAE 90.1* or equivalent standard used for *EAp2: Minimum Energy Efficiency*.

Use the conventional practice references to define the baseline systems. Provide detailed calculations and supporting narrative justification for any variations in baseline and proposed energy use.

Option 2. Energy Simulation

Option 2 rewards future source energy improvement below a Performance Index Target (PI_t) documented per *ASHRAE 90.1*, Appendix G Performance Rating Method (PRM). The credit structure prioritizes efficiency over on-site renewable energy, setting the performance improvement thresholds more than three times higher for Path 2 (including on-site renewable contribution) than for Path 1 (excluding on-site renewable contribution).

For credit compliance assessment, apply simple additional calculations to the outputs from the *ASHRAE 90.1 Appendix G PRM* energy models used to document *EAp2: Minimum Energy Efficiency*, adjusting the metric, treatment of renewable energy, and/or Building Performance Factor (BPF).

- **Future source energy**. The future source energy metric must be used to assess credit compliance even when a different metric is used to document prerequisite compliance.
- **Building Energy Factor (BPF)**. Performance Index Target (PI_t) must be calculated using LEED-published BPFs derived for the future source energy metric.
- **Treatment of on-site renewable energy**.
    - The on-site renewable energy contribution must either be fully excluded for Path 1 or fully included for Path 2.
    - The Performance Index Target (PI_t) includes no adjustments for renewable energy, unlike *ASHRAE 90.1-2022* which adjusts for prescriptively required on-site renewable energy.

Further energy savings may also be documented for plug and process and/or district energy efficiency measures that do not contribute towards prerequisite compliance.

Future source energy metric

All projects must use the future source energy metric for credit compliance. This metric reflects the average environmental impact of building energy consumption through 2050, considering the primary energy sources and their associated emissions.

Future source energy conversion factor (primary energy factor)

The terms source energy and source energy conversion factor referenced below may be used interchangeably with the corresponding terms primary energy and primary energy factor (PEF) commonly used in the European Union (EU).

Source energy is defined as the site energy plus the estimated energy consumed or lost in the extraction, processing, and transportation of primary energy forms such as coal, oil, natural gas, biomass, and nuclear fuel; energy consumed in conversion to electricity or thermal energy; and energy consumed or lost in transmission and distribution to the building site.

Source energy conversion factors must be at least one for all electricity and combustible fuel sources.

Electricity

For electricity, future source energy is determined using a national average electric site-to-source conversion factor rather than a more granular determination by grid region or province to enable broader comparison of building energy efficiency across the entire spectrum of projects, and to account for the interconnectedness of electric grids.

For projects located in the U.S., use a national average electricity source energy conversion factor of 2.0 based on projections through 2050.

Projects located in other countries must use this same source energy conversion factor of 2.0 or provide data supporting a lower average source energy conversion factor for the project's country. EU-average values may be used instead of the national average for projects in the European Union. The source energy conversion factor must be one of the following:

- Current published national- or EU-average source energy conversion factor.
- National- or EU-average source energy conversion factor from the present through 2050 or earlier, determined based on published policy-based grid renewable projections. Calculate by averaging the current published national or EU-average source energy conversion factor and the predicted source energy conversion factor for the year 2050 or earlier or by an average that accounts for year-to-year source energy projections.

For example, projects in Europe may use the current default factor from the EU directive (1.9 as of this publication[94]), a lower published factor from the project's EU member state, or a factor determined based on policy-based published grid renewable projections through 2050 for the EU or the project's member state.

More granular future source energy conversion factors per state, province, or eGRID region are not allowed because these necessitate greater complexity of the *EAc3: Enhanced Energy Efficiency* credit requirements and increase ambiguity in comparative results.

Fuel

Use one of the following references for conversion factors:

- ENERGY STAR® Portfolio Manager Technical Reference: Source Energy
- Natural Gas source energy conversion factor = 1.09 per *ASHRAE 90.1-2022*, Table I5-1.
- *ASHRAE 100-2024*, Table 5-2 or *ASHRAE 228*, Table 4.

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[94] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (Text with EEA relevance), https://eur-lex.europa.eu/eli/dir/2023/1791/.

- Published national or EU-average source energy conversion factor conforming to the definition of source energy provided above.

District Energy Systems (DES)

For projects that directly model purchased heat and/or purchased chilled water as independent sources, refer to *EAp2: Minimum Energy Efficiency, District Energy Systems* (DES), Method B.

Source energy factors published by the DES provider or calculated for a campus DES system must conform to the definition of source energy provided above.

Future source energy metric

The future source energy metric prioritizes energy efficiency, limiting trade-offs with decarbonization measures recognized in other LEED credits. Other metrics used for code compliance or *EAp2: Minimum Energy Efficiency* are not applicable for *EAc3: Enhanced Energy Efficiency*:

- Energy costs can fluctuate due to market conditions, subsidies, and other economic factors, skewing the representation of the environmental footprint of energy use for the cost metric.
- A site energy metric overemphasizes the decarbonization already credited under *EAc1: Electrification.*
- A greenhouse gas emissions metric overemphasizes the decarbonization already credited under *EAc1: Electrification* and *EAc4: Renewable Energy*.

Building performance factor

Performance Index Target (PI_t) must be calculated using LEED-published Building Performance Factors (BPFs) derived for the future source energy metric.

For major renovations or projects with existing building area in the project boundary, multiply the LEED-published BPFs by 1.05 for the proportion of existing building area associated with each building area type.

NEW CONSTRUCTION

Reference New Construction Table 5. 90.1-2019, Equivalent Building Performance Factors for a Future Source Energy Metric. For projects that document prerequisite compliance using *ASHRAE 90.1-2022*, this directly rewards the differential future source energy savings from *ASHRAE 90.1-2019* to *ASHRAE 90.1-2022*.

CORE AND SHELL

Case 1. *ASHRAE 90.1-2019*: If the prerequisite was documented using *ASHRAE 90.1-2019 Appendix G PRM*, use Building Performance Factors from Core and Shell Table 4. 90.1-2019, Equivalent Building Performance Factors for a Future Source Energy Metric.

Case 2. *ASHRAE 90.1-2022*: If the prerequisite was documented using *ASHRAE 90.1-2022 Appendix G PRM*, use Core and Shell Table 5. 90.1-2022, Equivalent Building Performance Factors for a Future Source Energy Metric. Future source energy less than or equal to the Performance Index Target automatically achieves three points without crediting on-site renewable energy (Path 1), or two points when counting on-site renewable energy (Path 2).

Treatment of on-site renewable energy

The Performance Index Target *(*PI_t) for *EAc3: Enhanced Energy Efficiency* omits the *ASHRAE 90.1-2022 4.2.1.1* PRE adjustment for prescriptively required on-site renewable energy, matching the *ASHRAE 90.1-2019* equation for PI_t:

$$\mathrm{PI_t} = [\mathrm{BBUE} + (\mathrm{BPF} \text{ x } \mathrm{BBRE})] \ / \ \mathrm{BBP}$$

To determine the Performance Index (PI), either fully exclude the renewable contribution for Path 1, or fully include the renewable contribution for Path 2.

PATH 1. PERCENTAGE REDUCTION EXCLUDING ON-SITE RENEWABLE CONTRIBUTION

Path 1, the default energy simulation path, focuses solely on energy efficiency, requiring energy savings at or near achievable technical potential for maximum achievement of points.

This path does not recognize any on-site renewable contribution for the project (striking out *ASHRAE 90.1 G2.4* on-site renewable energy guidance). Calculate the proposed building performance with total proposed design energy for all electricity, fuel, and district energy use, regardless of whether this energy is purchased or generated from on-site renewable systems.

PATH 2 PERCENTAGE REDUCTION INCLUDING ON-SITE RENEWABLE CONTRIBUTION

Path 2 applies primarily to project types that have limited opportunities for incremental energy savings beyond the referenced standard, such as unconditioned warehouses; and to projects that generate a large proportion of total building energy from on-site renewables.

Consistent with *ASHRAE 90.1* G2.4, this path credits the on-site renewable contribution for the project. Prior to calculating the proposed building performance (PBP), subtract eligible on-site renewable energy generation from the proposed design energy consumption. Total savings documented for on-site renewable electricity generation can be up to 100% of building electricity use on an annual basis. To qualify for credit compliance, the on-site renewable energy must be installed and commissioned within the project scope of work or an earlier scope of work on the site of a contiguous campus with all renewable attributes allocated to the project.

Plug and process efficiency

For *EAc3: Enhanced Energy Efficiency*, projects may document credit for plug and process efficiency using *ASHRAE 90.1*, G2.5 Exceptional Calculation Method.

Document that each process efficiency measure is not conventional practice. Provide detailed calculations and narrative justification supporting the future source energy savings claimed. (See additional guidance above from Option 1, Path 2, Case 3 Plug and Process Load Exceptional Calculation). To convey the magnitude of impact associated with process efficiency measures, the energy analyst must separately report the Performance Index, Performance Index Target, and all associated terms with- and without- the process efficiency savings.

District energy

For *EAc3: Enhanced Energy Efficiency*, energy analysts may optionally replace prescriptive purchased heat and purchased chilled water efficiencies modeled per *ASHRAE 90.1-2022*, Addendum a with improved virtual DES efficiencies representative of the DES purchase heat and purchased chilled water systems serving the project.

Provide an engineering analysis based on monitored data and/or energy simulation to justify the improved virtual DES efficiencies modeled for the project. For each DES source, virtual DES efficiency must account for total annual energy required to generate and distribute the district energy. Include all pump energy use from the DES and within the project, thermal distribution losses, heat rejection, and all operational effects influencing efficiency such as standby losses, equipment cycling, equipment staging, and partial-load operation. When thermal distribution losses are not measured or modeled, estimate default losses of 5% for chilled water, 10% for hot water, 15% for closed-loop steam, and 25% for open-loop steam.

No further adjustments are required to a Baseline Building Performance model with purchased heat and purchased chilled water documented per *ASHRAE 90.1-2022*, Addendum a in *EAp2: Minimum Energy Efficiency.*

Combined Heat and Power

To limit undue credit for site-recovered energy from Combined Heat and Power (CHP) with on-site combustion emissions, projects must model CHP systems using one of the following methods instead of *ASHRAE 90.1* G2.4.2.1:

- **CHP in baseline and proposed**. Model CHP systems including all fuel inputs and associated site-recovered energy identically in the baseline design and the proposed design.
- **Purchased electricity in baseline and proposed**. Model purchased electricity instead of the on-site electricity generation. Either credit site-recovered energy from the CHP towards the thermal loads for the baseline and proposed design identically or ignore the site-recovered energy contribution in the baseline and proposed design).
- **CHP in proposed; purchased electricity in baseline**. Model CHP systems including all fuel inputs and associated site-recovered energy in the proposed design. Model the baseline design per *ASHRAE 90.1* with purchased electricity and with no credit for site-recovered energy.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	Option 1	Path 1: Case 1 and 2	Demonstrate compliance with *EAp2: Minimum Energy Efficiency.*
		Path 1: Case 1 and 2	List options showing prescriptive compliance with *ASHRAE 90.1 2019.*
		Path 2: Case 1	IT department policies for plug load controls.
			Evidence of a plug load dashboard accessible to all regular occupants of the building (specifications, photos, screenshots, etc.)
		Path 2: Case 2	Provide documentation demonstrating the *ISO 25745* rating for people conveyance equipment (as applicable).
			Provide the design ELC calculation following methods in Informative Appendix C, and calculation for the percentage of reduction from *ASHRAE 90.4-2022* maximum design electrical loss (as applicable).
			Provide refrigeration equipment cut-sheets (as applicable).
			Provide refrigerated warehouse design documents to verify compliance with *California Title 24-2022 Section 120.6* (as applicable).
			Provide documentation for the Baggage Handling Equipment Individual Carrier System, such as specifications or cut sheets, to verify the installation of variable frequency drives (as applicable).

Project types	Options	Paths	Documentation
			Provide documentation for the Preconditioned Air (PCA) Systems, such as specifications or cut sheets, to verify efficiencies meeting *ASHRAE 90.1* prescriptive efficiencies for HVAC equipment (as applicable)
	Option 2	Path 1 and Path 2	Link to *EAp2: Minimum Energy Efficiency.*
			USGBC MEPC.
New Construction	Option 1	Path 2: Case 2	Evidence of ENERGY STAR® equivalency documentation for non-rated equipment (as applicable).
			Applicable plug and process load equipment power density and calculated percent meeting the required criteria. Including equipment, rated power, and quantity (either including or excluding all reused equipment).
		Path 2: Case 3	Plug and process load exceptional calculation and documentation.

REFERENCED STANDARDS

- ASHRAE 90.1-2019 (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527).
- ASHRAE 90.1-2022 (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082).
- ASHRAE 100-2024 (ashrae.org/technical-resources/bookstore/standard-100)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

RENEWABLE ENERGY

EAc4

New Construction (1–5 points): 100% of site energy use from any combination of Tier 1, Tier 2, and Tier 3 renewable energy is required for LEED Platinum projects.
Core and Shell (1–4 points): 100% of base building energy use from any combination of Tier 1, Tier 2, and Tier 3 renewable energy is required for LEED Platinum projects.

INTENT

To encourage and recognize the use of renewable energy to reduce environmental and economic impacts associated with fossil fuel energy use and increase the supply of new renewable energy within the electrical grid, fostering a just transition to a green economy.

REQUIREMENTS

Achievement pathways	Points
New Construction	1–5
Option 1. Renewable Energy Supply or Procurement	1–5
Core and Shell	1–4
Option 1. Renewable Energy Supply or Procurement	1–4
AND/OR	
Option 2. Renewable Energy Readiness	1

Option 1. Renewable Energy Supply or Procurement (1–5 points New Construction, 1–4 points Core and Shell)

Supply or procure renewable energy meeting the renewable energy criteria referenced below. Points are rewarded according to Table 1.

Points documented for Tier 1, Tier 2, and/or Tier 3 renewable energy may be added together up to a maximum of 5 points:

Table 1. Points for renewable energy procurement for New Construction projects

Points	**Tier 1**			**Tier 2**	**Tier 3**
	Minimum Rated Capacity1	**OR**	**Percent of Annual Site Energy**	**Percent of Annual Site Energy**	**Percent of Annual Site Energy**
1	A * 1 W/sq. ft. (A * 10.8 W/sq. m.)	OR	5%	20%	50%
2	A * 2 W/sq. ft. (A * 21.6 W/sq. m.)	OR	10%	40%	100%
3			20%	60%	

Points	Tier 1			Tier 2	Tier 3
	Minimum Rated Capacity1	OR	Percent of Annual Site Energy	Percent of Annual Site Energy	Percent of Annual Site Energy
4			35%	80%	
5			100% Tier 1 and/or Tier 2 renewable energy		

*A = the sum of gross floor area of all floors up to the three largest floors.

> **Core and Shell only**
> Points documented for Tier 1, Tier 2, and/or Tier 3 renewable energy may be added together up to a maximum of 4 points, based on the percentage of total annual base building site energy use, where base building energy use is defined as the greater of the estimated site energy consumption from base building energy meters or 25% of the total estimated building energy use:

Table 2. Points for renewable energy procurement for Core and Shell projects

Points	Tier 1			Tier 2	Tier 3
	Minimum Rated Capacity^1	OR	Percent of Annual Base Building Site Energy	Percent of Annual Base Building Site Energy	Percent of Annual Base Building Site Energy
1	A* 1 W/sq. ft. (A* 10.8 W/sq. m.)	OR	15%	35%	100%
2	A* 2 W/sq. ft. (A* 21.6 W/sq. m.)	OR	30%	70%	200%
3			65%	100%	
4			100%	200%	

*A = the sum of gross floor area of all floors up to the three largest floors.

Renewable Energy Criteria

Renewable energy classifications

TIER 1: ON-SITE RENEWABLE ENERGY GENERATION OR SOCIAL IMPACT PROJECT

The renewable generation equipment may be located:

- On the project site.

- On the campus on which a project is located.
- On the site of a social impact project, provided that the renewable power system is provided, installed, and commissioned at no cost to the social impact entity, that the ownership of the renewable power system is transferred to the social impact entity, and that the rights to the power provided be given to the social impact entity.

TIER 2: NEW OFF-SITE RENEWABLE ELECTRICITY

Off-site renewable electricity produced by new generation asset(s):

- Contracted to be operational within two years of building occupancy, OR
- Contracted no more than five years after commercial operations date

TIER 3: OFF-SITE RENEWABLE ENERGY

- Off-site renewable electricity that is Green-e® Energy certified or equivalent.
- Renewable fuels that are Green-e® Energy certified or equivalent.

Renewable energy contract length

- Contract length shall be 10 years or prorated across 10 years for shorter contract lengths.

Renewable energy environmental attributes

- **Ownership**: All environmental attributes (energy attribute certificates, EACs) or renewable energy certificates, RECs) associated with renewable energy generation must be retired on behalf of the LEED project for the renewable energy procurement to contribute to credit achievement.
- **Project energy source**: Renewable electricity generation and EAC/REC procurement can only be applied to project electricity use or district energy use up to 100% of annual electricity plus district energy use. Renewable fuels can only be applied to project fuel use or district heat up to 100% of annual fuel plus district heat use.

> **Core and Shell only**
> Renewable electricity generation and EAC procurement can only be applied to project electricity use or district energy use up to 100% of total estimated building annual electricity plus district energy use. Renewable fuels can only be applied to project fuel use or district heat up to 100% of total estimated building annual fuel plus district heat use.

- **Vintage**: EACs credited to the project must be generated no earlier than 18 months before the LEED project's initial application submission date.
- **Location**: Tier 2 and Tier 3 renewable assets must be in the same country or region where the LEED project is located.
- **Tier 2 bulk purchase**: Green-e® Energy certification or equivalent is required for one-time purchase or annual purchase of EACs or renewable power totaling more than 100% of the tenant's annual electricity use.

AND/OR

Option 2. Renewable Energy Readiness (1 point) — Core and Shell only

Design the project for renewable energy readiness. Document renewable energy readiness features in the project design and provide tenant guidelines indicating how tenants can leverage these features to install renewable energy capacity for their tenant space. Tenant guidelines shall include a copy of the construction documents or a comparable document indicating the information below. Projects shall either document solar readiness in accordance with the criteria below or an equivalent solar readiness standard, or document equivalent on-site renewable energy readiness for another qualifying renewable energy source.

SOLAR READINESS

Solar zone

A designated solar zone shall be included in the project design.

- Designate a dedicated solar zone area equal to at least 40% of the gross roof area.
- Conduct an analysis to determine the most appropriate location for optimal location of the solar zone, avoiding shading from trees, buildings, etc., and accounting for future construction that may result in shading.
- Perform a wind and load analysis and confirm that the roof or other structure encompassing the solar zone is designed to accommodate all mounting configurations identified in the tenant guidelines.
- Total area shall be comprised of areas that have no dimension less than five feet and are no less than 160 square feet.
- No obstruction, such as vents, chimneys, or roof-mounted equipment, shall be in the solar zone or planned for future installation in the solar zone.
- Any obstruction located on the roof or other part of the building that projects above a solar zone shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane. (Exceptions: projects located within 10 degrees of the earth's equatorial plane, or any

obstruction located north of all points of the solar zone in the northern hemisphere, or any obstruction located south of all points of the solar zone in the southern hemisphere.)

- All sections of the solar zone located on steep-sloped roofs shall have an azimuth range between 90 degrees and 300 degrees of true north.
- If the project is intended to include future mechanical or electrical equipment in or near the solar zone, tenant guidelines shall include a sample plan showing how the equipment can be installed to maintain the integrity of the solar zone.

Mounting considerations

- Identify the panel-mounting options most likely to be implemented in a future solar panel installation. Provide documentation confirming that the roof warranty is not affected by the future installation of solar panels. Install roof-penetrating mounts at the time of roof installation if analysis indicates roof-penetrating mounts are best-suited for the project application. Roof-penetrating mounts must be designed to limit thermal bridging and included in the envelope commissioning.

Interconnection pathways

- Construction documents shall indicate locations reserved for inverters and metering equipment, and a pathway reserved for routing of conduit from the solar zone to the point of interconnection with the electrical service. For projects with high service water heating loads where there is the potential for the solar zone to be used for water heating, construction documents shall indicate a pathway for routing of plumbing from the solar zone to the water heating system.

Electrical service

- The main electrical service panel shall have a minimum busbar rating of 200 amps.
- The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be permanently marked as “For future solar electric”.

REQUIREMENTS EXPLAINED: NEW CONSTRUCTION

This credit promotes renewable energy generation and procurement, reducing the impacts of fossil fuel use and supporting grid decarbonization.

Option 1. Renewable Supply or Procurement

The credit establishes a three-tier hierarchy for renewable energy, preferentially rewarding renewable energy supply and procurement that has the most direct and long-term impacts on building decarbonization:

- **Tier 1**. On-site renewable energy generation or social impact project
- **Tier 2**. New off-site renewable electricity
- **Tier 3**. Off-site renewable energy

Projects may choose to supply or procure renewable energy from Tier 1, Tier 2, and Tier 3 renewable energy for a maximum of five points.

For all three tiers of renewable energy, the project team should first confirm that the project will comply with the credit requirements for renewable energy environmental attributes and renewable contract length before proceeding with procurement and/or installation of the renewable energy.

RENEWABLE ENERGY CLASSIFICATIONS

Tier 1: On-site Renewable Energy Generation or Social Impact Project

On-site renewable energy generation when strategically integrated with grid-interactive strategies can increase the building resilience and support effective grid management.

To qualify as a Tier 1 renewable system, the renewable energy must be produced and generated either on the project site, the site of the contiguous campus where the project is located, or the site of a social impact project.

ELIGIBLE TIER 1 RENEWABLE RESOURCE TYPES

Eligible Tier 1 renewable energy resources include:

- Solar electric (photovoltaic)
- Solar thermal (i.e., for service water heating or hot water heating)
- Wind
- Recovered heat from municipal wastewater

Only usable energy generated from the renewable system shall be considered towards the Tier 1 renewable energy contribution. Usable energy is defined as the output energy from the system less any transmission and conversion losses, such as standby heat loss, losses when converting electricity from DC to AC, or waste heat that is exhausted to the atmosphere. Sell the excess energy beyond the building’s energy demand at a given point to the utility company (net metering) when all associated renewable attributes are retained by the project owner. Net metered electricity may count toward the renewable contribution up to 100% of annual electricity and district energy use.

> **Additional considerations: non-qualifying systems**
> Renewable fuels harvested, produced, or refined offsite and used to generate thermal energy or electricity onsite are classified as Tier 3 renewable energy and don’t count as Tier 1 renewable energy.

TIER 1 SOCIAL IMPACT PROJECT

Project owners may opt to install renewable energy on the site of a social impact project with a capital investment like that incurred for installing a new renewable system on their own project site. A social impact project is defined as a building or project site providing housing and/or community services to historically marginalized communities. Examples include but are not limited to affordable housing projects, community centers, schools, or recreational facilities serving historically marginalized communities.

For social impact projects, the social impact project owner who owns, operates, and/or occupies the building will have no financial burden for the renewable equipment, the installation, or the commissioning of the renewable system. The social impact project owner must gain ownership of the system. They will have the right to power generated from the new system. This provides affordable clean power that will result in permanent cost savings to members of historically marginalized communities.

For residential social impact projects, residents responsible for paying their own electricity bills must receive proportionate cost savings for the renewable power generation. Renewable generation may be allocated first to central water heating and HVAC equipment serving the residential units before proportioning the remainder to the residents.

> **Additional considerations: Non-qualifying Tier 1 social impact projects**
> Most community renewable energy installations do not comply with the social impact project requirements for location of the renewable system and permanent transfer of ownership and rights to the power to the social impact project owner.

TIER 1 COMMISSIONING

Tier 1 renewable systems must be installed and commissioned per *EAp3: Fundamental Commissioning.* For projects pursuing *EAc5: Enhanced Commissioning*, Option 1, Path 1: Enhanced Commissioning for MEP Systems, Tier 1 renewable systems must also comply with the commissioning criteria for that credit. Qualifying for the credit requires completing the functional testing of renewable before the final LEED Certification application.

The commissioning provider for an equity or campus renewable project may be different than the project's commissioning provider. Documentation of previous commissioning of equity or campus renewable projects is acceptable, provided it complies with the *EAp3: Fundamental Commissioning* and *EAc5: Enhanced Commissioning* requirements. For existing campus or equity systems that were not commissioned during the original system design and construction, re-commissioning of the system is required.

TIER 1 METHODS FOR DEMONSTRATING COMPLIANCE

To achieve points in Tier 1 on-site renewable energy systems a project must either install the minimum rated capacity of on-site renewable energy as a function of project area for the three largest floors or install qualifying renewable energy that will generate the specified percent of the project's annual site energy. Projects may quickly calculate compliance using either method and apply the method that leads to greatest achievement of points.

TIER 1 MINIMUM RATED CAPACITY METHOD FOR DEMONSTRATING COMPLIANCE

The minimum rated capacity method is most appropriate for multi-story building projects or projects with high process loads not capable of supplying a significant proportion of building site energy use through on-site renewable energy.

The area (A) used to calculate the minimum rated capacity is the sum of the gross project floor area of all the floors up to the three largest floors. This value refers to the project dimensions, regardless of whether the renewable system is installed on the project site, on the campus, or on the site of a social impact project.

- For projects with three floors or less, A is equal to the total gross floor area of the project.
- For multi-story buildings with equal floor plates across all floors, A is equal to three times the floor plate area.
- For all other projects, A is determined by identifying the three largest floors and summing the area for these three floors.

Use the area (A) to calculate the required minimum rated capacity of renewable energy for up to two points. For solar photovoltaic panels, use the Direct Current (DC) rated capacity, without degrading for system losses.

Table 3.

Points	**Minimum rated capacity**	
	IP units	**SI units**
1	A x 1.0 Watt/sq. ft.	A x 10.8 Watt/sq. m.
2	A x 2.0 Watt/sq. ft.	A x 21.6 Watt/sq. m.

For a building taller than three stories, the minimum required rated capacity corresponds to:

- Approximately 20% of gross roof area covered by solar photovoltaics for one point, OR
- Approximately 40% of gross roof area covered by solar photovoltaics for two points.

The 1-point threshold for minimum rated capacity is double the value of on-site renewable energy prescriptively required by *ASHRAE 90.1-2022* without exceptions.

TIER 1 PERCENT OF ANNUAL SITE ENERGY METHOD FOR DEMONSTRATING COMPLIANCE

This method is most appropriate for projects with three or fewer floors that have relatively low process loads. Projects must use the percent of annual site energy method when documenting more than two points for Tier 1 renewable energy.

Tier 2: New Off-site Renewable Electricity

Age of the renewable generator marks the key difference between Tier 2 and Tier 3 qualified electricity generation resources. Tier 2 requires new off-site renewable power either from generators contracted to be built and operational within two years of building occupancy or from generators with a commercial operations date (COD), no more than five years before the execution of the purchase contract.

OLDER CONTRACTS

It is acceptable to use older long-term purchase contracts to comply with the COD requirement, provided that the contract shows the COD for the generators occurred less than five years before the contract was executed, and the allocated energy generation from the contract meets all Renewable criteria below. For example, a 20-year purchase contract for newly installed wind power executed 10 years ago allocated to the project in accordance with Renewable criteria below qualifies as Tier 2 renewable energy.

Tier 3: Off-site Renewable Energy

Tier 3 encompasses both renewable electricity that is *Green-e® Energy*-certified or equivalent, and renewable fuels certified to the *Green-e® Renewable Fuels* standard or equivalent.

For renewable electricity, the Commercial Operations Date of the renewable power generator may be up to fifteen years old to meet the *Green-e® Energy Generator Age and New Date* criteria.

Eligible renewable electricity resource types: Tiers 2 and 3

Eligible renewable power generation resources for Tier 2 and Tier 3 electricity include:

- Solar electric (Photovoltaics)
- Wind
- Geothermal energy (electricity or heat generated from subterranean steam or hot water)
- Ocean-based energy (such as wave or tidal energy conversion)*
- Low-impact hydropower*
- Biomass production*

These renewable electricity generation sources should meet the criteria in *Green-e® Framework for Renewable Energy Certification*, Section IIIA, Renewable Resource Types, including any applicable location-specific criteria (e.g., Section II. Eligible Sources of Supply from the *Green-e® Renewable Energy Standard for Canada and the United States*).

Nearly all solar electric, wind, and geothermal power generation systems that meet the *Green-e® New Date* criteria qualify as *Green-e®* renewable resource types.

By contrast, many hydropower, biomass power generation, and ocean-based energy systems do not meet the Green-e® Framework criteria governing those system types. If considering a renewable resource that is not wind or solar and is not Green-e® certified, review applicable Green-e® criteria to confirm resource eligibility.

For instance, in the United States, hydropower must meet one of the following criteria per the *Green-e® Renewable Energy Standard for Canada and the United States*, Section II. Eligible Sources of Supply:

- New generation capacity on a non-impoundment, OR
- New generation capacity on an existing impoundment from a hydropower facility certified by the Low Impact Hydropower Institute (LIHI), or from a hydropower facility consisting of a turbine in a pipeline or in an irrigation canal.

> **Additional considerations: Geoexchange systems ineligible**
> Geoexchange systems such as geothermal heat pumps that use vapor compression cycles are not considered a renewable energy resource. These systems are credited in *EAc3: Enhanced Energy Efficiency.*

Eligible Tier 3 Renewable Fuel Resource Types

For any fuel used on the project site or for district heating, the project may procure renewable fuel that is Green-e® certified or equivalent. The Green-e® renewable fuels standard certifies biomethane—also called renewable natural gas (RNG) — that meets specific production facility and feedstock criteria and is purified to meet gas pipeline specifications.

Annual Site Energy Determination (For Tier 1, Tier 2, and Tier 3 Percent of Annual Site Energy)

For New Construction, annual site energy refers to the total building annual site energy use including electricity, on-site fuel use, and district thermal energy. This includes all regulated and unregulated energy use.

> **Exclusion of energy for electric vehicle charging**
> Exclude energy for electric vehicle charging of vehicles used for off-site transportation purposes if this electric vehicle supply equipment (EVSE) is separately metered from the main building energy use.

Renewable energy procurement may be contractually linked to a percentage of monthly metered data for each project energy source, summing together to the renewable percent of annual site energy claimed for the project, or annual site energy may be estimated for the project.

ANNUAL SITE ENERGY ESTIMATION: ENERGY SIMULATION

Projects using energy modeling to demonstrate compliance with *EAp2: Minimum Energy Efficiency* must use the proposed building performance before accounting for renewable energy credit as the basis for annual site energy.

- For projects referencing the *ASHRAE 90.1*, Appendix G Performance Rating Method (PRM), use the site energy consumption for the proposed building performance (PBP) without any credit for the on-site renewable energy contribution.
- For projects referencing the *ASHRAE 90.1*, Energy Cost Budget Method (ECB), use the site energy consumption for the proposed design without any credit for the on-site renewable energy contribution.

ANNUAL SITE ENERGY ESTIMATION: PRESCRIPTIVE PATH

Projects using the prescriptive method to show compliance with *EAp2: Minimum Energy Efficiency* must rely on estimations from *EAp1: Operational Carbon Projection and Decarbonization Plan* to determine total annual site energy for renewable energy credit calculations. Break down the site energy into electric, fuel, and district energy consumption.

> **Additional considerations**
> Refer to the District Energy Guidance for optional site energy adjustments that may be applied for district energy use.

RENEWABLE ENERGY CRITERIA

Contract Length

Projects must retain energy attribute certificates (EACs) for the annual renewable energy generation for a minimum of 10 years. Contractual documentation must show ownership of the EACs for the required duration. Examples include a ten-year contract for renewable power from:

- **Tier 1**. Third party-owned on-site renewable energy system
- **Tier 2**. Virtual Power Purchase Agreement (VPPA)
- **Tier 3**. Green Tariff

For contract durations shorter than 10 years, prorate the renewable energy across 10 years. For a one-time bulk purchase of renewable energy, the annual renewable energy quantity allocated to the project is the total purchase quantity divided by 10.

For older contracts, only count the remaining time left in the contract no earlier than 18 months before the initial submission date for LEED certification (consistent with the Vintage criteria below).

For Tier 3 renewable energy where a ten-year contract is not available, project teams may show compliance with the 10-year minimum contract term by demonstrating the following:

- The project has an executed contract for a minimum of one year, or where contracts are not available per regulatory requirements, document that the project has been enrolled in the Green-e® or equivalent utility tariff for a minimum of one month. AND
- The building owner must provide a signed letter of commitment indicating that the project will remain continuously enrolled in the 100% renewable Green-e® or equivalent utility tariff, or alternate 100% Green-e® or equivalent procurement source for a minimum of 10 years (or the number of years documented for credit if less than 10 years).

Environmental Attributes

When procuring off-site electricity, environmental attributes must meet specific requirements for ownership, source, vintage, and location.

An energy attribute certificate (EAC) is a transferrable certificate, record or guarantee used to track the environmental attributes for a unit of energy and the rights to those attributes. Examples of EACs include Renewable Energy Certificates (RECs) and Guarantees of Origin (GOs), where one REC or one GO corresponds to one Megawatt-Hour (MWH) of renewable electricity.

OWNERSHIP

Ownership of the renewable energy environmental attributes must reside with the LEED BD+C project, demonstrated through retirement of the energy attribute certificates (EACs) on behalf of the LEED project.

If the renewable attributes are not retained by the project owner, the renewable project is disqualified from credit compliance. For example, if the project cedes ownership of the RECs from on-site photovoltaics in exchange for a utility incentive, the system is ineligible for credit.

The renewable energy contract shall not permit replacement of EACs from one project with that of a different renewable energy project (referred to as REC Arbitrage) unless the contract specifies that the replacement EACs meet all relevant LEED criteria. For example, the contract shall not allow replacement of Tier 2 EACs with those of an asset older than five years at the time of contract execution.

PROJECT ENERGY SOURCE

Renewable electric generation from Tier 1, Tier 2, and/or Tier 3 can only be applied to electricity or district thermal energy up to 100% of total combined electricity and district thermal energy.

Tier 3 renewable fuels can only be applied to project fuel use or district heat up to 100% of the total combined fuel and district heat.

Therefore, if the project uses any fuel on-site:

- The qualifying combined Tier 1 and Tier 2 energy use as a percentage of annual site energy will be less than 100%.
- The project must procure both Tier 3 electricity and Tier 3 renewable fuel to achieve 100% Tier 3 renewable energy required for two points.

VINTAGE

Renewable energy cannot be generated more than 18 months before the initial submission date for LEED certification.

A one-time purchase of EACs or RECs cannot occur more than 18 months before the initial submission date for LEED Certification unless the terms of the purchase agreement ensure renewable energy generation occurs no earlier than the referenced date.

Allocation of renewable power to the project from a multi-year contract must be limited to power generation beginning 18 months prior to LEED initial submission.

LOCATION

For projects in large countries such as the U.S., India, and China, the renewable energy must be generated in the same country as the project. For projects in smaller countries such as those in the European Union, the renewable energy must be generated in the same multi-country geographical region as the project, provided that these countries share an interconnected electric utility grid or that EACs are unavailable in the project's country.

TIER 2 BULK PURCHASES

Tier 2 bulk purchases totaling more than 100% of the project's total combined annual electricity and district energy usage require Green-e® Energy certification (or equivalent). This ensures the proper level of transparency and verification necessary to confirm additionality and environmental impact associated with the EACs.

GREEN-E® EQUIVALENCE

Projects not using Green-e® certified products for Tier 2 bulk purchases or for Tier 3 electricity or fuel must demonstrate equivalency to the Green-e® requirements.

For electricity, the EACs retired on behalf of the LEED Project must:

- Be certified under an eco-label or similar program developed by an independent organization or government entity with transparent accounting process and standards in place.
- Be from an eligible renewable energy resource (see *Green-e® Framework for Renewable Energy Certification*, *Section IIIA, Renewable Resource Types,* and additional regional requirements as applicable, i.e., *Appendix D: Green-e® Renewable*

Energy Standard for Canada and the United States, Section II (Eligible Sources of Supply).
- Be from renewable assets that have come online within the last 15 years, or for projects outside the U.S., the eco-label program may instead include provisions ensuring incremental environmental benefits for assets older than 15 years.
- Have a verifiable chain of custody.
- Have a mechanism to prevent double counting.

For Tier 3 fuel, the EACs retired on behalf of the LEED Project must have a mechanism to prevent double counting and meet one of the following criteria:

- Certified under an eco-label or similar program developed by an independent organization with transparent accounting process and standards in place, OR
- Officially recognized as a renewable fuel source in the country, province, state, or locality in which the project is located.

DISTRICT ENERGY SYSTEMS (DES)

District Energy Systems Fueled by Renewable Energy

For District Energy sources fueled by renewable energy, projects may either allocate this renewable energy towards credit compliance, or exclude the renewable energy proportion from the project's annual site energy determination:

ALLOCATION OF DES RENEWABLE ENERGY TO THE PROJECT

For each district energy source serving the project, assign the project the proportion of DES input energy that meet the LEED requirements for each Tier of renewable energy:

- **Tier 1**. On-site renewable electricity generation or solar thermal energy generation at the District Energy Plant.
- **Tier 2**. New off-site renewable electricity.
- **Tier 3**. Green-e® or equivalent off-site renewable electricity for DES electricity inputs, or Green-e® or equivalent fuel for DES fuel inputs.

For example, allocate the project Tier 3 renewable fuel totaling 60% of the project's annual district heating energy consumption for a district heating system with 60% of annual energy inputs from Green-e® or equivalent fuel. EACs must be retained by either the DES supplier or the project owner to be eligible for this approach.

In place of documentation showing a 10-year contract for renewable fuels, the project may submit evidence of annual DES renewable percentage achieved for the most recent three years of operation and provide narrative confirmation justifying that ongoing achievement is anticipated at or above the specified level.

OR

EXCLUSION OF DES RENEWABLE ENERGY PROPORTION FROM ANNUAL SITE ENERGY DETERMINATION

For each district energy source fueled by renewable energy, exclude this proportion of renewable energy from the annual site energy determination. To be eligible for exclusion, the renewable energy shall either be an Eligible Renewable Electricity Resource Type or an Eligible Tier 3 Renewable Fuel Resource Type per the descriptions above, or shall be classified as renewable energy by national, state, or local policy governing the project location.

For example, for a district heating system fueled by 70% biofuel classified as renewable in the project's country, include only the 30% of project district heating associated with non-renewable fuel inputs in the annual site energy determination used for credit compliance.

Annual Site Energy Adjustments for District Energy Systems (optional)

For projects where the high efficiency associated with district chilled water generation artificially inflates total estimated site energy consumption, projects may optionally apply either the DES Multiplier or the Virtual DES Efficiency to all District Energy System (DES) sources serving the project:

DES Multiplier

- Multiply total reported site energy consumption for purchased chilled water by 0.325.
- Multiply total reported site energy consumption for purchased heat by 1.2.

Virtual DES efficiency in EAc3 Enhanced Energy Efficiency

Projects crediting DES efficiency towards the project performance in *EAc3: Enhanced Energy Efficiency* by modeling the proposed district energy use as virtual on-site chilled-water and hot-water plants may optionally use the total modeled site energy consumption from this proposed rather than separating out the site energy consumption for purchased chilled water and purchased hot water.

In the energy simulation, use submetering to distinguish fuel used onsite from the modeled fuel use for the district hot water plant. Per the Renewable Attributes, Project Energy Source criteria, either renewable electricity generation or renewable fuel may be applied to the submetered fuel and/or electricity use associated with the district heating system, whereas only renewable fuel may be applied to fuel used on the project site.

DES Site energy adjustments are not applicable to projects modeled using *ASHRAE Standard 90.1-2022*, Addendum a. Projects applying Addendum a should use submetering to distinguish fuel used onsite from the modeled fuel used for the district hot water plant.

REQUIREMENTS EXPLAINED: CORE AND SHELL

Core and Shell options afford enhanced flexibility for developers to implement renewable energy supply, procurement, and/or readiness strategies. Projects may achieve all four available points through Option 1. Renewable Energy Supply or Procurement or one point for Option 2. Renewable Energy Readiness and up to three points under Option 1.

Option 1. Renewable Energy Supply or Procurement (Core and Shell)

Core and Shell projects may choose to supply or procure renewable energy from Tier 1 or Tier 2 for a maximum of four points, from Tier 3 for a maximum of two points, or from any combination of Tier 1, Tier 2, and Tier 3 renewable energy for a maximum of two points.

The Tier 1 Minimum Rated Capacity Method for Demonstrating Compliance is identical for New Construction and Core and Shell, with no differences in the required thresholds.

By contrast, for Core and Shell*,* the percentage of annual site energy is calculated using the base building site energy rather than the total building site energy referenced in New Construction, more closely aligning the required percent procurement with the core and shell scope of work.

Annual base building site energy determination (for Tier 1, Tier 2, and Tier 3)

To calculate the annual base building site energy use:

- Perform the total annual site energy determination described above. Include all building energy consumption inclusive of base building energy use tenant use.
- Estimate the total annual site energy consumption from base building energy meters, including:
  - Meters for equipment fully contained within the project scope of work, such as elevators, parking garage lighting and ventilation, site lighting, common area lighting, common area HVAC, and common area receptacles and process equipment.

  - Meters for shared building systems serving tenants (i.e., chiller plant, boiler plant, central water heating, shared VAV air handling units, and dedicated outside air handling units).

Annual base building site energy use is equal to the total annual site energy consumption from base building energy meters when this comprises more than 25% of estimated total annual site energy use.

Otherwise, the base building site energy use is 25% of total annual site energy use.

Option 2. Renewable Energy Readiness

For projects where financial and leasing considerations preclude large on-site renewable energy installations within the Core and Shell scope of work, Option 2 incentivizes developers to incorporate renewable energy readiness features into the project design to enable future on-site renewable energy installation by tenants.

Projects must design for solar readiness in accordance with the *Solar readiness* credit criteria or a similar standard, or document equivalent on-site renewable readiness for another qualifying renewable energy source such as wind energy or solar thermal energy.

Tenant guidelines must integrate guidance on how tenants can use this available infrastructure to apply on-site renewables to their project.

SOLAR READINESS

A design for solar readiness must include one or more solar zones, and address mounting considerations, interconnection pathways, and electrical capacity per the detailed criteria in the credit requirements.

Solar zones
Solar zones set aside designated spaces to house future solar energy generation equipment and provide the necessary structural support to accommodate the equipment. The design team must perform a wind and load analysis to inform the solar zone design and design the roof or other supporting structure with the structural integrity to accommodate the solar installation. The solar zone should avoid shaded areas or obstructions from other equipment, maximizing the potential for solar collection.

Mounting considerations
The solar zone must be designed to accommodate all panel-mounting options identified in the tenant guidelines. For roof-penetrating mounts, it may be necessary to install these mounts within the Core and Shell scope of work to ensure the future integrity of the roofing system.

Envelope commissioning must address any potential impact of the roof mounts on the building enclosure integrity, including thermal bridging and/or moisture intrusion.

Interconnection pathways
Dedicated areas must be designed for future inverters and metering equipment, and pathways reserved for conduit routing. These interconnection pathways must specifically address anticipated tenant design configurations. For example, for distributed net-metering of each tenant's electricity, the design should accommodate conduit pathways to the projected location for each tenant electrical panel and should reserve nearby space for inverters and other equipment. For projects where solar thermal hydronic systems may be installed, the design should address pathways for routing of plumbing.

Electrical service
Sufficient electrical space must be permanently reserved and marked for future solar electric use within the main electrical service panel.

LEED Platinum Requirements

To achieve LEED Platinum, projects must supply 100% of energy usage from any combination of Tier 1, Tier 2, and/or Tier 3 renewable energy:

- **New construction**. 100% of total annual site energy usage
- **Core and Shell**. 100% of total annual base building site energy usage

Refer to the Project Priorities Library for regional compliance alternatives.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All	All	For third-party-owned systems, provide a purchase letter or contract of commitment showing renewable energy for targeted point threshold, including confirmation of renewable attribute ownership, quantity of renewable energy, type of renewable energy, country or region, duration of contract, and commercial operations date (COD).
			Confirmation of renewable attribute ownership by building owner.
			For shared RE attributes, provide confirmation of allocation of attributes to the project. Documentation from owner's representative confirming the capacity/generation that is allocated to the project building and confirming that this capacity/generation will double count toward any other LEED projects, only for projects that share on-site

Project types	Options	Paths	Documentation
			renewable resources with other buildings on a campus, and/or share off-site renewable resources with other buildings in a portfolio.
		Tier 1	Plans or documentation confirming Tier 1 renewable systems and their rated capacity (DC and AC).
			Documentation showing the system meets the requirements for a social impact project.
			Calculation for Tier 1 renewable energy system rated capacity per floor area W/sq. ft. using Equation 1 and Equation 2.
			Gross building area of the three largest floors (if using the area-based approach for Tier 1).
		Tier 2 and Tier 3	Evidence that EACs meet ownership/vintage/location/*Green-e®* or equivalent requirements as applicable.
New Construction	All	All	Calculator showing percent of annual site energy per Tier (1,2,3).
			Documentation describing method and/or calculations for determining annual site energy consumption if values are adjusted due to DES (as applicable).
Core and Shell	All	All	Calculator showing percent of annual base building site energy per Tier (1,2,3).
			Documentation describing method and/or calculations for determining annual base building site energy consumption.
	Option 2		Documentation demonstrating equivalent onsite renewable energy readiness for an alternative qualifying renewable energy source.
			Confirm an analysis was conducted for the solar zone location, including considerations for wind and load, and explaining how the solar zone meets the credit requirements. Additionally, identify the selected mounting option.
			Confirm that the roof warranty is not affected by the future installation of solar panels.
			Confirm that tenant guidelines have been provided and developed, including dimensioned construction documents (e.g., building roof plans, elevations, and site plan) showing the designated solar zone, obstructions, and location reserved for inverters and metering equipment, pathways, future mechanical or electrical equipment, etc.
			Confirm the main electrical service panel's busbar rating and the reserved space allocated for the installation of a double-pole circuit breaker in the main electrical service panel to accommodate a future solar electric installation.

REFERENCED STANDARDS

- Green-e® Framework for Renewable Energy Certification (green-e.org/programs/energy/documents)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

ENHANCED COMMISSIONING

EAc5

New Construction (1–4 points)
Core and Shell (1–3 points)

INTENT

To further ensure that the building systems function as designed, and that they continue to maintain energy performance over time.

REQUIREMENTS: NEW CONSTRUCTION

Achievement pathways	Points
New Construction	1–4
Option 1. Enhanced Commissioning	1–3
Path 1. Enhanced Commissioning for MEP Systems	2
AND/OR	
Path 2. Enhanced Commissioning for Building Enclosure	1
AND/OR	
Option 2. Monitoring-Based Commissioning (MBCx)	1–2
Path 1. Basic Software	1
OR	
Path 2. Enhanced Software	2

Option 1. Enhanced Commissioning (1–3 points)

Owner must designate an independent commissioning provider (CxP) during predesign or very early in the design phase.

PATH 1. ENHANCED COMMISSIONING FOR MEP SYSTEMS (2 POINTS)

- Comply with *ANSI/ASHRAE/IES Standard 202-2024*, Commissioning Process, for mechanical, electrical, plumbing, control, data center, process, building monitoring, and renewable energy systems.
- Comply with the following additional requirements:
    - During the design phase, attend at least two coordination/design meetings to discuss review comments and commissioning.
    - Prior to or during occupancy, review the training materials to confirm that they meet the training plan, and confirm that the training occurred.

AND/OR

PATH 2. ENHANCED COMMISSIONING FOR BUILDING ENCLOSURE (1 POINT)

Comply with all tasks and deliverables referenced with *ASTM E2947-21a, Standard Guide for Building Enclosure Commissioning*, except Sections 7.2.4 and 7.4.3.

Comply with the following field-testing requirements:

- Building air leakage testing, as per *ASTM E783*, *ASTM E779*, *ASTM E1186*, or *ASTM E3158*.
- Water penetration testing, as per *ASTM E1105* or *AAMA 501.2*.
- Infrared imaging, as per *ASTM C1153* or *ASTM C1060*.

During occupancy, review the training materials to confirm that they meet the training requirements provided in the building enclosure commissioning (BECx) plan or specification, and confirm that the training occurred.

AND/OR

Option 2. Monitoring-Based Commissioning (MBCx) (1–2 points)

PATH 1. BASIC SOFTWARE (1 POINT)

Process and communications

Commit to implementing MBCx for a minimum of three years, through a contract with an MBCx provider or qualified monitoring-based commissioning provider (MBCxP) staff person. MBCx shall commence no later than building occupancy and shall be fully coordinated between the commissioning provider, facilities management, and MBCxP.

Develop a monitoring-based commissioning plan summarizing the process including all of the following:

- Roles and responsibilities
- Software technology description, including frequency and duration for trend monitoring
- Review and reporting criteria, including:
    - Training of facilities staff
    - Expeditious communication of major anomalies or faults identified to facilities staff
    - At least quarterly, MBCxP summary of anomalies and faults detected and communication with facilities staff to discuss and prioritize issues
    - At least annually, MBCxP summary reporting of trends, benchmarks, faults, energy savings opportunities, corrective actions taken, and planned actions
    - At least two MBCxP reviews of building systems, equipment, and operational controls

Energy information system (EIS)
Provide a remotely accessible platform with software functionality to perform smart analytics and visually present all metered data referenced in *EAp4: Energy Metering and Reporting*.

Include the following functionality:

- Annual energy benchmarking of energy use intensities
- Comparison of energy consumption to the prior interval annually and monthly; for electric interval meters, daily and hourly
- For electric interval data, hourly loadshape with comparisons
- Visualization and reporting of hourly electric submetered data

In addition, provide hourly monitoring and visualization of electric energy use for:

- Elevators, escalators, and/or moving walkways.
- Commercial kitchen equipment in spaces with more than 10 kW of rated capacity.
- Process equipment in spaces with more than 10 kW of rated capacity.

OR

PATH 2. ENHANCED SOFTWARE (2 POINTS)

Comply with Path 1 AND provide the following enhanced monitoring and software technology functionality:

- Fault detection and diagnostics (FDD) for projects with large HVAC or refrigeration capacity. For total project installed capacity of cooling, heating, or refrigeration systems exceeding 7,200 kBtu/hr (600 tons or 2,110 kW), provide a remotely accessible FDD system that addresses at least 60% weighted by capacity of:
    - Air-handling equipment AND
    - Large hydronic or commercial refrigeration equipment (chillers, boilers, etc.)

- The FDD system must include the following functionality:
    - Perform smart analytics and visually present FDD data
    - Direct link from reported fault to view relevant trend data
    - Fault sorting and filtering
    - Exporting of fault reports (summary reports and detailed individual faults)
    - Data historian capable of storing critical trend data for at least three years

- Energy information system (EIS)

- For major renovations and buildings less than 25,000 sq. ft., comply with *ASHRAE 90.1*, Section 8.4.3 requirements, for measurement devices in new buildings, without exceptions. Include visualization of this data per Path 1 requirements above and provide automated reporting of energy use anomalies.

- For all other buildings, include the following additional functionality for the EIS:
  - Automated reporting of energy use anomalies
  - Normalization of energy consumption
  - Greenhouse gas emissions reporting

REQUIREMENTS: CORE AND SHELL

Achievement pathways	Points
Core and Shell	1–3
Option 1. Enhanced Commissioning	1–2
Path 1. Enhanced Commissioning for Building Enclosure	1
AND/OR	
Path 2. Enhanced Commissioning for Building Enclosure and MEP Systems	2
AND/OR	
Option 2. Monitoring-Based Commissioning (MBCx)	1

Option 1. Enhanced Commissioning (1–2 points)

Owner must designate an independent commissioning provider (CxP) during predesign or very early in the design phase.

PATH 1. ENHANCED COMMISSIONING FOR BUILDING ENCLOSURE (1 POINT)

Comply with all tasks and deliverables referenced with *ASTM E2947-21a*, Standard Guide for Building Enclosure Commissioning, except Sections 7.2.4 and 7.4.3.

Comply with the following field-testing requirements:

- Building air leakage testing, as per *ASTM E783, ASTM E779, ASTM E1186*, or *ASTM E3158*
- Water penetration testing, as per *ASTM E71105* or *AAMA 501.2*
- Infrared imaging, as per *ASTM C1153* or *ASTM C1060*

During occupancy, review the training materials to confirm that they meet the training requirements provided in the building enclosure commissioning (BECx) plan or specification, and confirm that the training occurred.

OR

PATH 2. ENHANCED COMMISSIONING FOR BUILDING ENCLOSURE AND MEP SYSTEMS (2 POINTS)

Comply with Path 1, AND:

- Comply with *ANSI/ASHRAE/IES Standard 202-2024*, Commissioning Process, for mechanical, electrical, plumbing, control, data center, process, building monitoring, and renewable energy systems.
- Provide commissioning for components installed within the project scope of work. For any systems or controls that require future interconnection with tenant systems, provide templates for future commissioning of these interconnections addressing the most likely tenant interconnection scenarios in the systems manual and tenant guidelines. At a minimum, provide these templates for design review checks, functional tests, and systems manual addenda.
- The CxP must comply with the following additional requirements:
    - Attend at least two coordination meetings during the design phase and at least four milestone meetings during the construction phase to discuss review comments and commissioning.
    - Provide an ongoing commissioning plan.
    - During occupancy, review the training materials to confirm that they meet the training plan, and confirm that the training occurred.

AND/OR

Option 2. Monitoring-Based Commissioning (MBCx) (1 point)

PROCESS AND COMMUNICATIONS

Commit to implementing MBCx for a minimum of three years, through a contract with an MBCx provider or qualified monitoring-based commissioning provider (MBCxP) staff person. MBCx shall commence no later than building occupancy and shall be fully coordinated between the commissioning provider, facilities management, tenants, and MBCxP.

Develop a monitoring-based commissioning plan summarizing the process including all the following:

- Roles and responsibilities
- Software technology description including frequency and duration for trend monitoring Review and reporting criteria including:
    - Training of facilities staff
    - Expeditious communication of major anomalies or faults identified to facilities staff

    - At least quarterly, MBCxP summary of anomalies and faults detected and communication with facilities staff to discuss and prioritize issues
    - At least annually, MBCxP summary reporting of trends, benchmarks, faults, energy savings opportunities, corrective actions taken, and planned actions
    - At least two MBCxP reviews of building systems, equipment, and operational controls

AND

ENERGY INFORMATION SYSTEM (EIS)

Provide a remotely accessible platform with software functionality to perform smart analytics and visually present all metered data referenced in *EAp4Energy Metering and Reporting,* and to be expandable to include all tenant data referenced in *EAp4: Energy Metering and Reporting*. Include the following functionality:

- Annual energy benchmarking of energy use intensities
- Comparison of energy consumption to the prior interval annually and monthly, and for electric interval meters, daily and hourly
- For electric interval data, hourly loadshape with comparisons
- Visualization and reporting of hourly electric submetered data
- For tenant spaces > 10,000 sq. ft. (930 sq. m.), tenant portal with capability to provide visualization and reporting of:
    - Base building data for shared systems serving the tenants and
    - Tenant electricity energy use (excluding shared systems)

In addition, provide hourly monitoring and visualization of electric energy use for:

- Elevators, escalators, and/or moving walkways.
- Commercial kitchen equipment in spaces with more than 10 kW of rated capacity.
- Process equipment in spaces with more than 10 kW of rated capacity.

REQUIREMENTS EXPLAINED: NEW CONTRUCTION

The credit rewards projects that provide commissioning beyond the *EAp3: Fundamental Commissioning* requirements. Option 1 requires early engagement of a Commissioning Provider to lead a comprehensive commissioning process spanning from pre-design through the warranty period.

Option 2 requires the implementation of a monitoring-based commissioning process that verifies ongoing performance post-occupancy leveraging automated data analytics and reporting. Projects can combine Options 1 and Option 2 to achieve up to four points.

Option 1. Enhanced Commissioning

Option 1 offers two compliance paths. Projects can combine Paths 1 and 2 to achieve a total of three points. Enhanced commissioning activities for MEP systems or the building enclosure will lead to optimized system performance and further integration of the CxP into the design and post-occupancy efforts in a new construction project.

Enhanced commissioning provides substantial value for the limited additional efforts beyond EAp3: Fundamental Commissioning. *EAp3: Fundamental Commissioning* Tables 1 and 2 provide a comparison of the *ASHRAE* Standard 90.1 Commissioning Requirements for the prerequisite versus the credit requirements from *ASHRAE Standard 202* for MEP systems and *ASTM E2947-2021* for the building enclosure, along with typical milestones for key tasks to occur.

Projects that achieve both paths under Option 1 will automatically achieve *EAp3: Fundamental Commissioning*.

PATH 1. ENHANCED COMMISSIONING FOR MEP SYSTEMS

ASHRAE Standard 202-2024

ASHRAE Standard 202-2024 outlines the commissioning process for mechanical, electrical, plumbing, control, data center, process, building monitoring, and renewable energy systems. It is a systematic process that begins in the early design phase and continues through the warranty or post-occupancy phase. Along with the *ASHRAE Standard 202-2024* requirements, teams must also comply with incremental LEED BD+C requirements.

EAp3: Fundamental Commissioning, Table 1 provides a detailed comparison of the *ASHRAE Standard 90.1, Commissioning Requirements* for the prerequisite and the *ASHRAE Standard 202* requirements for Enhanced Commissioning of MEP systems. The table also provides timing for each task.

Timing of CxP Engagement

ASHRAE 202 requires CxP review of the Owners Project Requirements (OPR) and initial development of the Commissioning Plan during pre-design, necessitating very early engagement of the CxP in the design process. If the CxP is engaged after pre-design, take alternative measures ensuring alignment with the intent of the Standard 202 timeline.

> **Examples of acceptable CxP engagement after pre-design**
>
> - Portfolio applications where the OPR and Cx Plan at the predesign phase are like other projects.
>
> - A qualified employee of the owner provides the initial review of the OPR and initial draft of the Cx Plan and CxP is designated early in design development to continue the analysis.

Commissioning Scope

The enhanced MEP commissioning scope must comprehensively address alignment with the OPR, expanding the focus beyond energy and GHG emissions to address water efficiency, air quality, and thermal comfort. Commissioned systems must include the following if in the project scope:

- Mechanical (HVAC and refrigeration, including any process heating or cooling systems in the project).
- Electrical (lighting, receptacle power).
- Plumbing (indoor fixtures, service water heating, pool equipment, etc.).
- Data center (electrical, cooling, humidity; identify a mechanism for evaluating whether server equipment efficiency targets are met).
- Building monitoring. Include all monitoring systems required by *ASHRAE 90.1*, as well as any Energy Information System and Fault Detection and Diagnostic (FDD) systems referenced in Option 2.
- On-site renewable systems, including all Tier1 systems credited in *EAc4: Renewable Energy*.
- Controls. Include systems credited in *EAc6: Grid Interactive.*

Additional LEED Tasks

LEED appends additional required tasks to those referenced in *ASHRAE 202-2024*:

MINIMUM OF TWO DESIGN PHASE MEETINGS

Early CxP involvement in design phase meetings aids complete integration of commissioning requirements and recommendations from the CxP into the final construction documents. Using these early interactions also leads to collaborative discussions and collectively addressing the CxP’s design review comments.

REVIEW OF TRAINING MATERIALS

Facility staff training represents a critical step between the construction phase and post-occupancy. Before or during occupancy, the CxP must review training material to confirm that the training documents meet the training plan and sufficiently address the OPR and BOD. The CxP must also confirm that training occurred.

PATH 2. ENHANCED COMMISSIONING FOR BUILDING ENCLOSURE

Addressing the performance of the building enclosure (also referred to as the building envelope) is as important as the MEP systems. For certain project types, the building enclosure may be the most important factor for continued building energy performance. The credit requires projects to follow a comprehensive process that includes all tasks referenced in *ASTM E2947-21a*, Standard Guide for Building Enclosure Commissioning, except Section 7.2.4 and 7.4.3 *ASTM Standard E2974-21a*.

Building Enclosure Commissioning Provider (BECxP)

ASTM E2974-21a requires a Building Enclosure Commissioning Provider (BECx) to lead and implement the Building Enclosure Commissioning Process. The entity serving as the BECxP performs each required task or delegates it to the appropriate member. The BECxP must be proficient in core competencies for enclosure-related design, construction, and performance.

The CxP and the BECxP can be the same entity or distinct entities.

TIMING OF BECXP ENGAGEMENT

E2947-21a, Section 6 describes the pre-design phase tasks, which require BECxP engagement by pre-design. If the BECxP is engaged after pre-design, take alternative measures ensuring alignment with the intent of *E2947-21a* timeline.

> **Examples of acceptable BECxP engagement after pre-design**
>
> - Portfolio applications where the OPR and Cx Plan at the predesign phase are like other projects.
>
> - A qualified employee of the owner provides the initial review of the OPR and initial draft of the Cx Plan and CxP is designated early in design development to continue the analysis.

Minimum field testing

At minimum, field testing must include air leakage testing, water penetration testing, and infrared imaging, if applicable to the project scope:

- **Air leakage testing**. Provide field testing of air leakage using one of the referenced ASTM or ANSI standards. *ASTM E783* evaluates air leakage through windows and doors. *ASTM E779* uses the fan-pressurization method for testing. *ASTM E1186* provides an array of methods for evaluating air leakage. *ASTM E3158* provides a standard method for testing large or multizone buildings. *ASTM E1827* determines air tightness using an orifice blower door. Residential spaces in mixed use buildings may also apply *ANSI/RESNET/ICC 380*.
- **Water penetration testing**. For projects with scope of work including fenestration or exterior doors, apply *ASTM 1105* or *AAMA 501.2* to provide water penetration of installed exterior windows, skylights, doors, and curtain walls. Otherwise, water penetration testing is not required.
- **Infrared imaging**. *ASTM C160* is appropriate for envelope scope of work that includes framed members. For scope that includes a roof with insulation above deck, *ASTM C1153* can be used to locate wet insulation. Otherwise, infrared imaging is not required.

EAp3: Fundamental Commissioning, Table 2 compares the *ASHRAE 90.1* Commissioning Requirements for the prerequisite and the *ASTM E2947-21a* requirements for Enhanced Commissioning of the Building Enclosure. The table also provides the timing for each task.

Option 2. Monitoring-Based Commissioning (MBCx)

Monitoring-based commissioning enables building operators to identify operational issues as they occur, facilitating achievement of the project’s performance goals on an ongoing basis. Both Paths 1 and 2 require an Energy Information System (EIS) that enables visualization, analytics, and automated reporting of the metered data referenced in *EAp4: Energy Metering and Reporting*; and a minimum three-year commitment to implement monitoring-based commissioning (MBCx) informed by the EIS. Path 2 requires enhanced monitoring and software functionality.

SELECTING AN MBCX PROVIDER

Contract with a third-party MBCx Provider (MBCxP) for a minimum three-year timeframe or designate a qualified MBCxP on the building operations team. The MBCxP must have direct experience on similar projects. Many MBCxP’s have a programming or controls integration background and extensive experience with Energy Information System (EIS) and Fault Detection and Diagnostics (FDD) technologies.

The MBCxP can be the same as the CxP or can be a different entity. If the CxP and the MBCxP are different entities, a communication plan must be established so both entities can coordinate during the construction phase and the warranty period.

MBCX PLAN

Teams must develop a comprehensive MBCx Plan that summarizes the complete process building operators will follow during the term of the MBCx contract. Refer to the rating system language for the specific details that must be included in the plan.

Path 1. Basic Software

An Energy Information System (EIS) empowers operators to review trends, identify anomalies, perform preventative and predictive maintenance, and reduce energy consumption and greenhouse gas (GHG) emissions over the building's lifespan.

The EIS system must provide visualization and analytics of the metered data required in *EAp4: Energy Metering and Reporting*.

- For new commercial buildings that are at least 25,000 sq. ft. (2,323 sq. m.) and residential projects with at least 10,000 sq. ft. (929 sq. m.) of common space, the metered data includes monthly energy use for each non-electric energy source, and hourly energy use for electricity recorded for the whole project, for each tenant ≥ 10,000 sq. ft. (929 sq. m.), for specific end-uses (HVAC, interior lighting, exterior lighting, receptacles, and refrigeration), and for on-site renewable electricity generation. Marginal additional EIS visualization and analytics capabilities are necessary beyond the *ASHRAE 90.1* energy monitoring and recording requirements.

- For major renovations and smaller new buildings, the metered data only includes monthly energy consumption for each energy source, and monthly peak electric demand. Unlike *EAp4: Energy Metering and Reporting*, this data must be automatically transmitted for use in the EIS platform analytics.

The credit further requires hourly monitoring of large electric power uses — like elevators and commercial kitchen equipment — and incorporation of this data into the EIS reporting.
The EIS system must include all visualization and analytic capabilities referenced in the credit language.

Path 2. Enhanced Software

Projects that comply with Path 1. Basic Software requirements can achieve an additional point for providing enhanced monitoring and software functionality to inform the monitoring-based commissioning.

The path requires the most incremental functionality for projects with large HVAC or refrigeration capacity, or major renovations, or small new buildings. For all other project applications, this path only requires three additional functions for the EIS system.

FAULT DETECTION AND DIAGNOSTICS (FDD) FOR PROJECTS WITH LARGE HVAC OR REFRIGERATION CAPACITY

FDD Software is only required for projects with large HVAC or refrigeration capacity, where any of the following apply:

- Total project installed capacity of cooling exceeds 7,200 kBtu/h (600 tons or 2110 kW)
- Total project installed capacity of heating exceeds 7,200 kBtu/h (2110 kW)
- Total project installed capacity of refrigeration exceeds 7,200 kBtu/h (600 tons or 2110 kW)

FDD is a program procedure for identifying and isolating system operational flaws. FDD uses data-driven or knowledge-driven techniques. Data-driven techniques include artificial intelligence (AI) and machine learning. Knowledge-driven techniques include having an FDD specialist use qualitative methods to analyze fault scenarios.[95] Refer to the credit language for minimum required FDD software functionality.

Include fault detection algorithms that address at least 60% of total air handling unit capacity. Additionally, include fault detection algorithms that address at least 60% of total combined capacity for large commercial refrigeration systems, large hydronic heating systems, and large hydronic cooling systems where large systems are defined as a system with total installed capacity exceeding 7,200 kBtu/h (600 tons or 2110 kW).

Faults assessed may include improper economizer or energy recovery operation, faulty sensor readings, improper valve and damper operation, improper equipment schedules, Improper operation of control system reset algorithms (e.g., setpoint always at maximum value), non-optimal zone temperature setpoints (e.g., lower than recommended deadband; same values for occupied and unoccupied setpoints), equipment short cycling, improper chiller and boiler plant lockouts, and unstable/hunting control loop.

ADDITIONAL MONITORING FOR MAJOR RENOVATIONS AND SMALL BUILDINGS

For major renovations and small buildings less than 25,000 sq. ft. (2,323 sq. m.) provide additional hourly electricity metering for the whole project, for each tenant ≥ 10,000 sq. ft. (929 sq. m.), for specific end-uses (HVAC, interior lighting, exterior lighting,

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[95] Mirnaghi, M., and Haghighat, F. (2020), “Fault detection and diagnosis of large-scale HVAC systems in buildings using data-driven methods: A comprehensive review”, *Energy and Buildings*, 229, https://doi.org/10.1016/j.enbuild.2020.110492.

receptacles, and refrigeration), and for on-site renewable electricity generation. (See *ASHRAE 90.1*, Section 8.4.3 criteria, ignoring exceptions addressing building area).

The EIS shall provide visualization and analytics of this metered data.

ADDITIONAL EIS SOFTWARE FUNCTIONALITY

For new construction of buildings larger than 25,000 square feet (2,323 square meters), provide additional functionality for the EIS:

- Automated reporting of energy use anomalies
- Normalization of energy consumption
- Greenhouse gas emissions reporting

REQUIREMENTS EXPLAINED: CORE AND SHELL

Option 1. Enhanced Commissioning

PATH 1. ENHANCED COMMISSIONING FOR BUILDING ENCLOSURE

Same as BD+C: New Construction Option 1, Path 2.

PATH 2. ENHANCED COMMISSIONING FOR BUILDING ENCLOSURE AND MEP SYSTEMS

To achieve 2 points under Option 1, Core and Shell projects must address both Building Enclosure and MEP systems. This encourages a focus on the envelope, which often has the greatest impact on building lifetime performance for the Core and Shell scope of work. Refer to the additional guidance above for BD+C: New Construction Option 1, Paths 1 and 2.

For Core and Shell projects, commission systems and equipment installed in the base building scope of work.

Base buildings often install central air handling units or central plant equipment that require future interconnections to tenant-provided systems or components (such as VAV terminal units, or fan coils, or water loop heat pumps. For these systems, the CxP must provide templates that support the tenant in commissioning of these interconnections. These should provide a listing of key considerations that should be evaluated during design review, sample functional test procedures, and sample systems manual content that the tenant would include to address the tenant design.

Option 2. Monitoring-based Commissioning

Meet the same requirements as BD+C: New Construction Option 2, plus:

For Core and Shell projects, the base building EIS must have expansion capability, to ensure all data identified in *EAp4: Energy Metering and Reporting* is accessible through the EIS. This includes metering requirements for future tenants.

Tenant requirements

If the project anticipates future tenants will lease space that is greater than 10,000 sq. ft. (929 sq. m.), install submeters for compliance with *EAp2: Minimum Energy Efficiency*. The base building EIS must include a tenant portal, where tenants can access reports, including visual representations of the energy consumption. At minimum, tenants must have access to the base building data for shared systems that serve the tenant space, and the electricity energy use associated with their space.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All	All	Final (or Draft) Commissioning Report. If the report is a draft, include a plan for the completion of commissioning and training, including climatic and other conditions required for performance of any deferred tests.
	Option 1	Path 1 and/or Path 2	Confirmation of compliance with *ANSI/ASHRAE/IES Standard 202-2024* and/or *ASTM E2947-21a Standard Guide for Building Enclosure Commissioning*, except Section 7.2.4 and 7.4.3 (As applicable)
			Confirmation of design phase/milestone meetings
			Provide Commissioning Plan and sample FPT Test scripts (1 sample per discipline)
			Owner's Project Requirements and BOD
			Identification of Commissioning Provider including key personnel (CxP) and Verification and Testing (V&T) providers (as applicable)
			Qualifications of CxP and V&T providers
			Confirmation that submittals were reviewed and at least 25% of the contractors' documents were QA/QC'd
	Option 1	Path 1. Enhanced Cx for MEP Systems	Provide evidence, such as contract or other documentation, confirming the involvement of CxP during predesign or very early in the design phase
		Path 2. Enhanced Cx for building Enclosure	Field report or completed test that proves building air leakage testing, water penetration testing, infrared imaging was completed

Project types	Options	Paths	Documentation
	Option 2	Path 1. MBCx – Basic Software	Documentation of owner commitment to at least three years of MBCx for the building and identification of key individual(s) responsible for MBCx (contract, letter signed by owner, job descriptions or other evidence)
			MBCx Plan
			Narrative describing the EIS, including functionality, accessibility, and sample graphics. Identify systems included in the MBCx plan
	Option 2	Path 2. MBCx – Enhanced EIS	Narrative describing the EIS, including functionality, accessibility, and sample graphics. Identify systems included in the MBCx plan. As applicable, confirm compliance with *ASHRAE 90.1 Section 8.4.3* or additional functionality of EIS.
		Path 2. MBCx – Enhanced Software	Schedules, drawings, or other documentation confirming FDD devices installed in the system and verification that 60% threshold is met for systems exceeding 600 tons
			Narrative describing the FDD system functionality, accessibility, and sample graphics, reports or trends from the system.
Core and Shell	Option	Path 1. Enhanced Cx for MEP Systems	Confirmation of all construction phase milestone meetings

REFERENCED STANDARDS

- ASHRAE 90.1-2019, (store.accuristech.com/ashrae/standards/ashrae-90-1-2019-i-p?product_id=2088527)
- ASHRAE 90.1-2022, (store.accuristech.com/ashrae/standards/ashrae-90-1-2022-i-p?product_id=2522082)
- ANSI/ASHRAE/IES Standard 202-2024, (store.accuristech.com/ashrae/standards/ashrae-202-2024?product_id=2908468)
- ASTM E2947-21a Standard Guide for Building Enclosure Commissioning, (astm.org/e2947-21a.html)
- ANSI/ASHRAE/IES Standard 202-2024, (ashrae.org/technical-resources/bookstore/commissioning)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

GRID INTERACTIVE

EAc6
New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To enhance power resilience and position buildings as active partners contributing to grid decarbonization, reliability, and power affordability through integrated management of building loads in response to variable grid conditions.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1. Energy Storage	1–2
AND/OR	
Option 2. Demand Response Program	1
AND/OR	
Option 3. Automated Demand-Side Management	1
Path 1. System-Level Controls	1
OR	
Path 2. Building Automation System	1
Option 4. Power Resilience	1

All projects must evaluate grid-interactive measures concerning the current and forecasted grid context, location, building type, and ownership structure and account for the results in decision-making.

Interval recording meters and equipment capable of accepting an external signal must also be provided.

Option 1. Energy Storage (1–2 points)

Provide on-site electric storage and/or thermal storage meeting the criteria in Table 1.

Include automatic load management controls capable of storing the electric or thermal energy during off-peak periods or periods with low grid carbon intensity and using stored energy during on-peak periods or periods of high grid carbon intensity.

Table 1. Peak storage capacity relative to peak demand

Storage	1 Point	2 Points
Electric Storage Capacity Relative to peak electric demand	0.2 kWh/kW	0.4 kWh/kW
Thermal Storage Capacity Relative to peak coincident thermal demand (heating + cooling + service water heating + process heat)	1.0 kWh/kW or Btu/Btu/hr or ton-hrs/ton	2.0 kWh/kW or Btu/Btu/hr or ton-hrs/ton

AND/OR

Option 2. Demand Response Program (1 point)

Enroll in a minimum one-year demand response (DR) contract with a qualified DR program provider, with the intention of multiyear renewal.

On-site electricity generation and fuel combustion cannot be used to meet the demand-side management criteria.

AND/OR

Option 3. Automated Demand-side Management (1 point)

On-site electricity generation and fuel combustion cannot be used to meet the demand-side management criteria.

PATH 1. SYSTEM-LEVEL CONTROLS (1 POINT)

Provide automated demand response controls for at least two of the following systems installed within the project scope of work:

- HVAC systems (50% of rated capacity)
- Lighting systems (50% of power)
- Automatic receptacle controls
- Service water heating (90% of capacity)
- Electric vehicle supply equipment

OR

PATH 2. BUILDING AUTOMATION SYSTEM (1 POINT)

Develop a plan for shedding at least 10% of the project’s peak electricity demand for a minimum of one hour. The plan must address both winter and summer peaks considering electrified grid projections.

Have in place a control system that automatically sheds electricity demand in response to triggers denoting strain on the grid or high grid emissions. For example:

- A signal from a demand response program provider
- Data obtained through an API indicating high grid emissions
- Peak demand tariff period when the grid is operating in the highest demand window
- Time-of-use rate when pricing is highest

AND/OR

Option 4. Power Resilience (1 point)

Identify critical equipment that requires continuous operation. Design the project to be able to island and operate independently from the grid to power the critical loads with the project's on-site renewable and energy storage systems for at least three days.

REQUIREMENTS EXPLAINED

This credit rewards projects that implement solutions to reduce stress on the grid and increase building resilience. Projects are encouraged to combine the strategies from Options 1–3 to optimize resilient solutions for the project.

All options

Evaluate Grid-interactive Measures

Projects that pursue this credit must complete an evaluation of potential grid-interactive measures that are viable for the project. Using this research, teams can make informed decisions on solutions that can be integrated into the design.

Helpful guidance supporting this evaluation is provided in New Buildings Institute (NBI) GridOptimal Buildings Initiative,[96] ASHRAE's Grid-Interactive Building Guide or the U.S. Department of Energy's Grid-Interactive Efficient Building guide.[97] [98] Projects outside the U.S. are encouraged to reference local technical reports that include further context for the regional grid context.

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[96] "The GridOptimal Buildings Initiative", New Buildings Institute (NBI), (October 26, 2021), https://newbuildings.org/resource/gridoptimal/.

[97] "ASHRAE Releases Guide on the Role of Grid Interactivity in Decarbonization", ASHRAE, (November 2, 2023), https://www.ashrae.org/about/news/2023/ashrae-releases-guide-on-the-role-of-grid-interactivity-in-decarbonization.

[98] "Grid-Interactive Efficient Buildings", U.S. Department of Energy, (n.d.), https://www.energy.gov/eere/buildings/grid-interactive-efficient-buildings.

Interval-recording and External Signal

For all options, the design must include electric meters with interval recording capabilities. Grid-interactive equipment installed as part of the project's scope must be capable of receiving an external signal directly or indirectly to indicate when load management should be enabled.

Peak Load Determination — Option 1 and Option 3, Path 2

For options that reference a reduction in peak thermal or peak electricity demand, use the modeled coincident peak demand for the proposed design for projects documented using the Energy Cost Budget Method or Appendix G Performance Rating Method in *EAp2: Minimum Energy Efficiency*. For projects documented using the prescriptive method, generate estimates of peak thermal or peak electricity demand using the approach outlined in *EAp1: Operational Carbon Projection and Decarbonization Plan*.

The peak demand contribution from electric vehicle supply equipment (EVSE) for recharging vehicles used for off-site transportation may be excluded from the peak load determination if separate metering is provided for the EVSE.

Option 1. Energy Storage

Projects are awarded points for installing on-site electric and/or thermal storage that meets capacity requirements, relative to peak demand, per Table 1.

Electricity storage refers to large batteries that store electricity until it is needed.

Thermal energy storage (TES) stores heating or cooling energy for later reuse. Examples include ice storage, chilled water storage, and hot water storage.

Electrical peak demand differs from thermal peak demand, especially in an all-electric building. In an all-electric building, the peak demand includes the contribution of thermal demand and other loads such as lighting, plug and process loads, pumps, and fans. For an all-electric building, the Table 1 thermal storage capacity thresholds that compare to peak coincident thermal demand are expected to achieve similar electricity demand reductions to the Table 1 electric storage capacity thresholds that compare to peak electric demand.

Using the peak electric or peak thermal demand determined consistent with the method described above, determine the total capacity required to meet thresholds for the type of storage.

Energy simulation results typically report the peak thermal load separately for each category of peak thermal load (i.e., heating, cooling, service water heating, and process heating or cooling).

To assess peak coincident heating load for heating + cooling + service water heating + process heating or cooling:

- Determine the category with the highest peak load (the primary load).
- Determine the time (month, day, and hour) when this highest peak load occurs.
- Calculate peak coincident load by adding the primary load to the simultaneous load for all other categories with substantive use. Ignore categories with peak loads or annual energy use less than 10% of the primary load.

Provide automatic load management controls for the thermal or electric storage systems.

For projects that include both an electric and thermal storage system on site, points can be prorated to achieve the minimum required thresholds of Table 1.

> **Example: Thermal storage**
> A project with peak space heating loads of 1,000,000 Btu/h (290 kW) and coincident cooling loads occurring at the same time are negligible. The energy modeling results indicate peak space heating occurs January 10 at 6 a.m., based on the modeled weather data. Peak space cooling loads occurring in the summer are lower than the space heating peak. The analyst uses the simulation outputs to identify simultaneous service water heating loads of 200,000 Btu/h (60 kW), resulting in peak coincident loads of 1,2000,000 Btu/h (350 kW). This requires the project to install 1,2000,000 Btu (350 kWh) of thermal storage capacity to earn one point.

Option 2: Demand Response Program

Established demand response (DR) programs and contracting with a qualified provider offers a streamlined path to credit compliance. Projects can contract directly with the utility or with a DR program provider.

Project teams must clearly identify what systems will be included in the program, during a demand response (DR) event. Teams should work with the DR provider to determine the best strategy for the specific project and contract. For example, teams can commit to a reduction of a specified percentage, when a signal is received. Teams may also commit to automated reductions in select equipment or systems, in response to a direct, automated signal from the DR program provider.

Contract length
Execute contracts for at least one year and commit to ongoing renewal of the contract.

Option 3. Automated Demand-side Management

Projects must select between Paths 1 and Path 2.

On-site electricity generation and fuel combustion cannot be used to meet the demand-side management criteria. This includes renewable electricity generation, which is separately credited in *EAc4: Renewable Energy*.

PATH 1. SYSTEM-LEVEL CONTROLS

Path 1 is most suitable for small buildings or buildings without a Building Automation System.

Projects must provide Automated Demand Response (ADR) controls for at least two systems, selecting from HVAC, lighting, automatic receptacle controls, service water heating, or EVSE.

HVAC systems
Provide ADR for at least 50% of the total rated capacity. Examples include smart thermostats that adjust the cooling and heating setpoints or controllers for variable-speed equipment that limits maximum speed during a demand response event.

Lighting systems
Provide ADR for at least 50% of installed lighting power. For example, provide automated dimming for 50% of installed lighting power.

Automatic receptacle controls
Provide ADR to turn off automatic receptacle controls as defined in *ASHRAE 90.1 Section 8.4.2*.

Service water heating
Provide ADR for at least 90% of installed service water heating capacity. For example, provide storage water heaters with ADR technology that controls the heating cycle off during a demand response event.

Electric vehicle supply equipment (EVSE)
Provide ADR capable of curtailing and scheduling vehicle charging for all EVSE. The project must have at least some EVSE equipment in scope.

PATH 2. BUILDING AUTOMATION SYSTEM

Path 2 requires building-level controls that automatically shed at least 10% of building electricity in response to triggers denoting strain on the grid. A signal from a demand response provider is the most common trigger. Refer to the Rating System for other examples.

Develop a comprehensive plan that provides clear direction for implementing the automated load shedding, both in summer and in winter. Address the following in the plan:

- Individual assignments.
- Communication protocols.
- Project total peak electricity demand.
- Systems and end-uses targeted for peak load shedding.
- Justification for why systems and end uses were selected.
- Triggers for initiating automated load shedding, and rationale for selecting these triggers. Address both current grid context and future projections that account for renewables and electrification trends.
- Total percentage of load included in the load-shedding program and a description of the method used to estimate this percentage. Address both winter and summer peaks.

Option 4. Power Resiliency

This option requires on-site renewable generation paired with energy storage capable of powering the building’s critical equipment operation for at least 72 hours. Critical equipment is those most essential to maintain functionality during a power outage, often related to life safety or business continuity. Examples include servers, communication equipment, life support equipment, security systems, emergency lighting, or minimum HVAC capacity needed to maintain life-support conditions. To be eligible for this option, the project must have at least some critical equipment.

The design must include an automatic transfer switch and controls that enable the project to operate the building’s on-site renewable systems, energy storage, and critical equipment in the event of a power outage (referred to as islanding).

CORE AND SHELL PROJECTS

For Core and Shell projects, peak electric demand or coincident peak thermal demand must be determined for the whole building energy use, inclusive of expected tenant energy.

Owners may provide an option for future tenants to opt out of participation in the DR program. It is highly recommended that owners include educational information on the importance of the DR program, including environmental and resilience benefits.

Option 1. Energy Storage

Same as LEED BD+C: New Construction, Option 1.

Option 2. Demand Response Program

Same as LEED BD+C: New Construction, Option 2.

Option 3. Automated Demand-Side Management

Same as LEED BD+C: New Construction, Option 3, plus:

For Core and Shell projects, the tenant lease agreement must describe details of what systems are included in the automatic DR control. Communicating this information is important for both the base building systems and for any systems that may impact the tenant spaces.

Additionally, include language describing any tenant efforts to integrate their systems with the DR controls, as applicable.

Option 4. Power Resiliency

Same as BD+C: New Construction, Option 4.

District Energy Systems (DES)

For projects documenting energy efficiency savings for a campus district energy system in *EAc3: Enhanced Energy Efficiency*, the district energy must be included in the determination of peak electric demand.

Grid-interactive strategies applied to the DES system may be used to document achievement of Option 1, Option 3, and Option 4 at the building level.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Description of the grid interactive measures evaluated and the relevant context (e.g., forecasted grid conditions, project location, building type, ownership structure, and other relevant factors), and confirmation that the results have been accounted for in decision-making.
			Confirmation the project has interval recording meters and equipment capable of accepting an external signal.
			Documentation that the technology and controls in place for energy storage, demand response, automated demand-side management, and power resiliency, as applicable, are within the CxP scope of work.
			Affirmation that the technology and controls in place for energy storage, demand response, automated demand-side management, and power resiliency, as applicable, are documented in the project systems manual, or Current Facilities Requirements (CFR) and Operations and Maintenance (OM) plan.
	Option 1		Calculation showcasing achievement of point threshold. (Estimated Energy use, Peak Demand, Storage Capacity, Peak Storage Capacity Relative to Peak Demand).
			Narrative documenting the automatic load management controls.
	Option 2		Proof of enrollment in demand response program.
	Option 3	Path 1	Identification of systems with automatic demand response controls and calculation showing required thresholds have been met.
		Path 2	Project total peak electricity demand and total percentage of load included in the load shedding program.
			Description of how the project will shed 10% of the peak demand for one hour and what triggers the event. (Examples include short narrative, Sequence of Operations, etc.).
	Option 4		Define and give examples of critical equipment that requires continuous operation. Provide evidence of controls capable of meeting power resiliency
			Narrative describing the on-site renewable and energy storage system design and operation, and calculation to demonstrate islanding capabilities for the critical infrastructure for at least three days.
Core and Shell	Option 3	Path 1 and Path 2	Tenant Lease Agreement showing the inclusion of automatic demand response control within their scope of work.
		Path 1. System Level Controls	Building systems manual, or Current Facilities Requirements and O&M plan that address the technology and controls in place for Automated Demand Response System-Level controls.

REFERENCED STANDARDS

- GridOptimal (The GridOptimal Buildings Initiative) (newbuildings.org/resource/gridoptimal)
- ASHRAE Grid-Interactive Building Guide (store.accuristech.com/ashrae/standards/grid-interactive-buildings-for-decarbonization-design-and-operation-resource-guide)
- DOE Grid-interactive efficient buildings (energy.gov/eere/buildings/grid-interactive-efficient-buildings)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Energy and Atmosphere Credit

ENHANCED REFRIGERANT MANAGEMENT

EAc7
New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To reduce greenhouse gas emissions by accelerating the use of refrigerants with low global warming potential (GWP) and promoting better refrigerant management practices.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1. No Refrigerants or Low GWP	1–2
Path 1. No Refrigerants	1
OR	
Path 2. Low GWP Refrigerants	1–2
AND/OR	
Option 2. Limit Refrigerant Leakage	1
AND/OR	
Option 3. GreenChill Certification for Food Retailers	1–2

Option 1. No Refrigerants or Low GWP (1–2 points)

PATH 1. NO REFRIGERANTS (1 POINT)

Do not use refrigerant-containing equipment in the project.

> **Core and Shell only**
> Projects with future equipment necessary to meet the project’s heating or cooling load are not eligible for this option.

OR

PATH 2. LOW GWP REFRIGERANTS (1–2 POINTS)

The maximum total weighted average refrigerant GWP in all new refrigerant-containing equipment is less than or equal to 80% (1 point) or 50% (2 points) of the total weighted average GWP of refrigerants meeting the benchmarks in Table 1.

Projects that limit effective refrigerant GWP by reducing refrigerant charge per unit of capacity relative to comparable equipment may use adjusted benchmarks.

Table 1. Refrigerant GWP Benchmarks

GWP benchmark*	Equipment and systems
1400	Heat pump service hot water heaters
700	HVAC
	Data centers, computer room air-conditioning, and information technology equipment cooling
	Process chiller equipment or ice rink refrigeration equipment
300	All other process refrigeration for retail, industrial, or cold storage

*GWP benchmarks are based on a 100-year time horizon GWP relative to CO2.

AND/OR

Option 2. Limit Refrigerant Leakage (1 point)

> **Core and Shell only**
> This option is only applicable to projects with at least 20% of total estimated heating and cooling generation capacity in the project scope of work.
>
> Design, construct, and operate the project's refrigerant-using equipment to minimize refrigerant leakage.

DESIGN

- Refrigerant-using equipment shall be self-contained, with no field-installed piping:
  - For equipment with refrigerants > 700 GWP AND
  - For at least 80% of the total GWP of refrigerants used in the project.
- Specify an automatic leak detection system in fully enclosed spaces with equipment that has an overall refrigerant charge exceeding 100 tCO2e.

INSTALLATION

- Field-installed refrigerant piping shall use brazed or press type fittings.

OPERATION

- Have in place a refrigerant maintenance plan and designate a responsible oversight party. The plan shall include standards for recordkeeping and protocols for:
  - Updating the refrigerant inventory.
  - Tracking and recording refrigerant charge and leakage rates for all refrigerant-using equipment.

    - Ensuring that installation, maintenance, and removal of refrigeration-containing equipment is performed by appropriately certified refrigeration personnel, including in tenant spaces.
    - Performing an annual audit and calibration of automatic leak detection systems.
    - For equipment without automatic leak detection systems, checking pressure loss and leaks at least as frequently as follows at the following minimum intervals for equipment containing refrigerant with total GWP as follows: every 24 months for 50 tCO2e or less; every 12 months for 50 to 500 tCO2e; every 3 months for more than 500 tCO2e.
    - Identifying the maximum time frame for repairing leaks.
    - Making leakage testing and repair twice as frequent if the total annual refrigerant recharge/leakage exceeds 1%.

AND/OR

Option 3. GreenChill Certification for Food Retailers (1–2 points)

Available to projects where food retailing constitutes more than 20% of the project's gross area.

Demonstrate achievement of the Environmental Protection Agency's GreenChill Certification program for projects in the U.S. For international projects, comply with the relevant GreenChill requirements for the certification level.

- GreenChill Silver certification (1 point)
- GreenChill Gold or Platinum certification (2 points)

For all options

District Energy

Projects with district energy must comply with the requirements of this credit at the district facility or see additional guidance for interpretation of credit requirements.

REQUIREMENTS EXPLAINED

The credit builds on the *EAp5: Fundamental Refrigerant Management* requirements and rewards teams who further minimize or eliminate refrigerant impacts for their projects. Refrigerants used in equipment that provides thermal comfort, service water heating, process heating or cooling, or refrigeration for food storage or other process application in buildings are powerful greenhouse gases, typically causing over one thousand times the detrimental impact than carbon dioxide. As projects electrify heating and service water heating systems with heat pumps, mitigation of refrigerant impact becomes increasingly important.

This credit rewards strategies for reducing refrigerant impact by limiting refrigerant global warming potential under Option 1, and by reducing refrigerant leakage under Option 2. Projects may achieve a maximum of two points using either Option 1, Path 2, or by combining Option 1, Path 2 and Option 2.

There is a third path available for food retailers that comprehensively addresses the high refrigerant emissions associated with refrigeration equipment for cold storage.

Option 1. No Refrigerants or Low GWP Refrigerants

Path 1 rewards the elimination of refrigerants for the few project applications that can accomplish this without jeopardizing thermal comfort or total greenhouse gas emissions.

Path 2 requiring the selection of low-impact refrigerants is more appropriate for most projects, supporting a design that comprehensively addresses decarbonization through electrification using efficient heat pump technology.

PATH 1. NO REFRIGERANTS

To pursue this path, the project cannot use refrigerants in the building or in district energy systems serving the building.

Alternative design solutions — including passive strategies — present opportunities to remove refrigerants from buildings and promote further decarbonization. Consider employing passive cooling strategies such as natural ventilation, night flushing, and thermal massing solutions or passive heating strategies such as solar storage and added insulation. Review opportunities to minimize infiltration and ventilation losses through the building envelope.

> **Additional considerations**
> Projects are encouraged to pursue a design that includes electrification of space heating, service water heating, and process heating systems with efficient heat pump technology per *EAc3: Enhanced Energy Efficiency* rather than using electric resistance or fuel heating to meet the requirements for this path. Therefore, Path 1 is limited to one point.

PATH 2. LOW GWP REFRIGERANTS

Path 2 requires the use of refrigerants with weighted average global warming potential that average at least 20% lower than the Refrigerant GWP benchmarks in Table 1 of the credit.

These GWP benchmarks are primarily derived from GWP limits in the *EPA 2023 AIM Act Technology Transitions Rule*, which are like those in the *EU F-Gas Regulations* and other regulations following the Montreal Protocol and Kigali Agreement.

Calculations

Use equipment data and the project's total weighted average GWP reported in the refrigerant inventory completed for *EAp5: Fundamental Refrigerant Management*.

For each refrigerant-using equipment, determine the GWP benchmark using the equipment's refrigerant charge reported in the refrigerant inventory, and the Table 1 GWP benchmark for the equipment:

Equation 1. GWP benchmark for each piece of equipment

$$GWP_{Equipment\_Benchmark} = R_{C_{Equipment}} \times GWP_{Benchmark}$$

Calculate the total benchmark GWP by summing the GWP benchmark for each piece of equipment.

Equation 2. Total GWP benchmark

$$GWP_{Total\_Benchmark} = \Sigma\ GWP_{Equipment\_Benchmark}$$

Calculate the weighted average GWP benchmark by dividing the total GWP benchmark by the sum of refrigerant charge for all equipment.

Equation 3. Weighted average $\text{GWP}_{\text{Benchmark}}$ calculation

$$Weighted\ \text{average}\ GWP\ _{Benchmark} = \frac{GWP_{Total\_Benchmark}}{\Sigma Rc\ for\ all\ equipment}$$

Total weighted average GWP for the project cannot exceed 80% of the weighted average GWP benchmark for 1 point; and cannot exceed 50% of weighted average GWP to achieve both points.

Equation 4. Percentage (%) threshold calculations

$$\%\ of\ benchmark = \frac{Weighted\ \text{average}\ GWP}{Weighted\ \text{average}\ GWP_{Benchmark}}$$

Adjusted Benchmarks for Limiting Effective GWP

For equipment that has been specifically designed to limit effective refrigerant GWP by minimizing refrigerant charge, projects may reference comparable equipment to establish an adjusted benchmark instead of using the refrigerant charge for the project equipment.
To be eligible to apply adjusted benchmarks, neither the GWP for the comparable equipment, nor the GWP for the referenced project equipment may exceed the GWP benchmark in Table 1. Comparable equipment shall have the same equipment type description and size category as the referenced project equipment (see section 6.8 tables in the *ASHRAE 90.1 Standard* for equipment types and size categories).

Calculate the adjusted benchmark by multiplying the original Table 1 benchmark by the ratio of refrigerant charge per unit of capacity for the comparable equipment versus the project equipment.

> **Example: Adjusted benchmark calculation**
> The project team evaluates two water-cooled centrifugal chiller alternatives with GWP less than 700, the first with a refrigerant charge per unit of capacity equal to 3.0 lb/ton (0.38 kg/kW), the second with a refrigerant charge per unit of capacity equal to 1.5 lb/ton (0.19 kg/kW). The project team selects the second chiller.
>
> From Table 1, the GWP Benchmark for HVAC equipment is 700. The adjusted GWP Benchmark is 1,400, calculated as 700 x 3.0 / 1.5.

Option 2. Limit Refrigerant Leakage

Combine design and construction strategies with operational best practices to effectively manage refrigerant leakage for the life of a building.

Design

Field-installed piping experiences much higher leakage rates than self-contained equipment. During design, prioritize self-contained equipment. At minimum, projects must specify self-contained equipment for systems that use refrigerants with a GWP ≥ 700. Additionally, teams must use self-contained equipment for at least 80% of the total refrigerant GWP. Self-contained equipment is less prone to leakage and better accommodates leakage detection measures than equipment with field installed piping.

Installation
For projects that include field-installed piping, install piping in a manner that limits leakage. Use brazed or press type fittings to minimize the potential for refrigerant leaks.

Install automatic leak detection systems in any fully enclosed space that houses equipment with an overall refrigerant charge greater than 100 tCO2e. (tCO2e is a metric ton of carbon dioxide equivalent, where a metric ton equals 1,000 kg or 2,205 lbs.)

Operations
Maintaining systems during operations provides continued assurance that refrigerant leaks are identified as soon as possible, reducing GWP for leakage. Teams must develop a refrigerant maintenance plan that requires updates to the refrigerant inventory, tracking and recording of refrigerant charge and leakage rates, routine pressure testing on required systems, annual audits, and calibration of automatic leak detection system devices.

Major leaks identified during operations require immediate corrective action. Additionally, where leakage exceeds 1% of the total annual refrigerant recharge, teams must conduct additional testing and repairs, to reduce the total leakage of the system. This ensures systems operate as intended and minimizes global warming associated with leakage.

Teams must designate a key individual or the appropriate management team to manage and enforce the plan.

Core and Shell Projects

OPTION 1. NO REFRIGERANTS OR LOW GWP REFRIGERANTS

Path 1. No Refrigerants

To be eligible for Path 1, demonstrate that additional equipment is not required to meet the project’s heating and cooling load.

This path is not available to projects where mechanical heating or cooling are likely to be installed during tenant buildout, even for a single space such as an office space in a large unconditioned warehouse.

Projects that do not install equipment as part of the base scope are ineligible for this option.

Path 2. Low GWP Refrigerants

Teams must include any new refrigerant-containing equipment installed during the project’s scope of work. Future tenant equipment may be excluded. Core and shell projects may also include refrigerant-using equipment installed as part of the tenant scope of work if tenants specify the equipment on their construction documents. When including tenant equipment, include all refrigerant-using equipment specified on the tenant drawings.

OPTION 2. LIMIT REFRIGERANT LEAKAGE

Include at least 20% of the total predicted heating and cooling generation capacity in the project's scope of work for the base building.

> **Example 1: Eligible project**
> An owner pursues LEED BD+C: Core and Shell certification for a speculative office and laboratory base building. The base building systems include chillers, central air handling units, and laboratory exhaust fans. Through energy modeling or load calculations, the project team confirms that the total heating and cooling generation capacity exceeds 20% of the total predicted capacity. The building is eligible to pursue this credit and document compliance for the systems within the scope of work.

> **Example 2: Non-eligible project**
> An owner pursues LEED BD+C: Core and Shell certification for a speculative office building. The scope of work is limited to a cold, dark shell. The project excludes base building systems and cannot pursue this credit.

District Energy Systems

OPTION 1. NO REFRIGERANTS OR LOW GWP REFRIGERANTS

Path 1. No Refrigerants

Refrigerants cannot be used to generate any district energy source serving the project. Teams connected to a DES for any energy source should work directly with their provider to determine if compliance is met for this option.

Path 2. Low GWP Refrigerants

Teams can elect to include the refrigerant impacts from the DES when compliance cannot be demonstrated based solely on new equipment within the project scope.

Where teams include DES equipment within the calculations, account for all new and existing equipment containing refrigerant from all district energy sources serving the project. Teams must work with the district energy provider to determine the equipment type, refrigerant type, and refrigerant charge.

For projects that also have refrigerant-containing equipment within the building, the weighted average GWP can be determined using the percentage capacity from each source. For example, if 90% of the energy comes from a DES and 10% from systems on site, teams can apply those percentages to respective DES and on-site equipment weighted average GWP values.

OPTION 2. LIMIT REFRIGERANT LEAKAGE

Demonstrate that at least 50% of the combined peak heating and cooling capacity generates on-site. Alternatively, projects demonstrate compliance with the specified criteria for all refrigerant-using systems in the building and all refrigerant-using systems in the district energy system serving the project.

Retail Only

- Meet Option 1 and/or Option 2 under the LEED BD+C: New Construction criteria.

AND/OR

OPTION 3. GREENCHILL CERTIFICATION FOR FOOD RETAILERS

Option 3 offers another path, eligible for up to two points for projects with 20% or more gross floor area of food retail space. Food retail spaces include grocery stores, convenience stores, big-box wholesalers, and general merchandise retailers with large refrigeration sections. Additional spaces may include bakeries, seafood and meat markets, and juice and smoothie bars.

In 2007, the U.S. EPA launched a voluntary partnership program called GreenChill that works cooperatively with the food retail industry to reduce refrigerant emissions and decrease their impact on the ozone layer and climate change.[99] A food retailer achieves Silver-, Gold-, or Platinum-Level certification.

U.S. projects that document GreenChill certification earn points based on the level of certification achieved. International projects must document compliance with each requirement outlined on the EPA GreenChill website for the targeted certification level.

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[99] "GreenChill Program", U.S. EPA, (2024, November 4), https://epa.gov/greenchill.

DOCUMENTATION

Project types	Options	Paths	Documentation
New Construction and Core and Shell	All	All	Mechanical schedules (or similar) that show equipment type, capacity, quantity, refrigerant type, and maximum refrigerant charge.
	Option 1	Path 1	Attestation that no refrigerants are used on the project (*EAp5: Fundamental Refrigerant Management* requires a narrative describing how the building loads will be met if this option is pursued).
		Path 2	Weighted Average $GWP_{Benchmark}$ calculation (Equation 3 from *EAc7: Enhanced Refrigerant Management*).
			Weighted Average GWP calculation from *EAp5: Fundamental Refrigerant Management.*
	Option 2	All	Documentation of compliance with field-installed piping limits.
			Contractor documentation demonstrating that installation complies with credit criteria.
			Refrigerant Maintenance Plan that describes how the refrigerant-using systems will be maintained. The plan must identify the designated responsible party for implementing the plan.
			Plans, specifications, or field photos confirming automatic leak detection, if applicable.
	Option 3	US projects	Demonstrate that the project has achieved EPA's GreenChill Store Certification Program.
		International Projects	Compliance documentation demonstrating that the project meets relevant GreenChill requirements for the certification level specified.
Core and Shell	All	All	Confirmation that Core and Shell project is eligible for this Option.

REFERENCED STANDARDS

- ASHRAE Standard 15-2019: Safety Standard for Refrigeration Systems, (ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards)
- EPA Green Chill, (epa.gov/greenchill)
- EPA 2023 AIM Act Technology Transitions Rule, (epa.gov/climate-hfcs-reduction/regulatory-actions-technology-transitions)
- European Union F-gas regulations, (eur-lex.europa.eu/eli/reg/2024/573/oj)

MATERIALS AND RESOURCES (MR)

OVERVIEW

The Materials and Resources (MR) category in LEED v5 focuses on critical areas that result in reductions in embodied carbon, protecting human and environmental health, and fostering a circular economy. Alongside these critical areas of focus, the credits target data availability, transparency, and supply chain improvements, ultimately increasing the accessibility of compliant materials for all.

The MR credits support LEED v5's materials strategy by furthering the shift toward multi-attribute product selection and procurement. This approach evaluates materials based on a variety of key metrics, from their sourcing to manufacturing processes and overall environmental and social impacts to guide projects toward well-rounded material choices that go beyond single-issue solutions.

Another key focus of the MR credit category is embodied carbon, or the emissions generated during the extraction, manufacturing, transportation, installation, and disposal of products. The impact of opportunities for reductions in embodied carbon go beyond design phase EPD analysis and whole building life cycle assessment, with material reuse and key waste management practices playing an important role in the global effort to minimize the impacts of building materials on the environment. As embodied carbon from building materials accounts for at least 11% of annual global emissions, LEED v5 targets strategies for high-impact actions like supply chain decarbonization, low-embodied carbon material selection, and building reuse to help project teams achieve meaningful carbon reductions immediately.

LEED v5 simplifies strategies to maximize impact and promote industry alignment. The MR category harmonizes terminology and standards across systems, aligning with initiatives like the Embodied Carbon Harmonization and Optimization (ECHO) project, the Mindful Materials Common Materials Framework and the AIA Architecture and Design Materials Pledge.[100][101][102] These efforts reduce complexity, making it easier for manufacturers and project teams to meet sustainability goals and establish workflows that will keep industry advancement moving forward.

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[100] "Embodied Carbon Harmonization and Optimization (ECHO) Project", Embodied Carbon Harmonization and Optimization (ECHO) Project, (n.d.), https://www.echo-project.info/.

[101] "Mindful MATERIALS Home", mindful MATERIALS, (2024), https://www.mindfulmaterials.com/.

[102] "AIA Materials Pledge", AIA, (n.d.) https://www.aia.org/design-excellence/climate-action/zero-carbon/materials-pledge.

Decarbonization
The MR category equips projects to reduce embodied carbon across the supply chain using strategies like whole building life cycle assessments, analysis of environmental product declarations (EPDs) and jobsite emissions tracking (*MRc2: Reduce Embodied Carbon, MRp2: Quantify and Assess Embodied Carbon*). Reducing construction waste and promoting circularity lessens demand for virgin resources and extends material life, which also directly reduce embodied carbon emissions from the supply chain (*MRc5: Construction and Demolition Waste Diversion, MRp1: Planning for Zero Waste Operations*).

Embodied carbon could account for half of new construction's carbon footprint by 2050. LEED v5 plans for a different outcome by rewarding manufacturing innovations that decarbonize new materials coupled with circular strategies that preserve resources and cut emissions.

Quality of life
The MR category enhances indoor environmental quality by promoting low-emitting materials reducing occupant exposure to harmful chemicals (*MRc3: Low-Emitting Materials*, *MRc4: Building Product Selection and Procurement*). Improved air quality supports health, cognitive function, and overall well-being, benefiting building occupants. Upstream and downstream impacts from product manufacturing can also affect fence line communities, supply chain actors, and installers, making the selection of materials focused on green chemistry and ecological protections a priority (*MRc4: Building Product Selection and Procurement*).

Ecological conservation and restoration
Prioritizing reuse and diverting waste from landfills decreases reliance on virgin material and reduces methane emissions, preserving natural resources and reducing environmental harm (*MRc5: Construction and Demolition Waste Diversion*, *MRp1: Planning for Zero Waste Operations*). When product manufacturing shifts to support a circular economy, improvements to ecological conservation and restoration can be significant (*MRc4: Building Product Selection and Procurement*).

Ultimately, LEED v5 empowers project teams to make practical, high-impact choices that cut embodied carbon emissions, improve health outcomes and advance a sustainable market — building a future where both people and the planet can thrive.

Impact Area Alignment

☑ Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Materials and Resources Prerequisite

PLANNING FOR ZERO WASTE OPERATIONS

MRp1

REQUIRED

New Construction
Core and Shell

INTENT

To reduce the amount of waste that is generated by building occupants and hauled to and disposed of in landfills and incinerators through reduction, reuse, and recycling services and education, and to conserve natural resources for future generations. To set the building up for success in pursuing zero waste operations.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Storage and Collection of Recyclables	
AND	
Zero Waste Operations Planning	

Comply with the following requirements:

Storage and Collection of Recyclables

Provide dedicated areas accessible to waste haulers, janitorial staff, and building occupants for the collection and storage of recyclable materials for the entire building.

- Collection and storage areas may be separate locations.
- Recyclable materials must include organics/food waste, mixed paper, corrugated cardboard, glass, plastics, and metals.
  - Mixed recyclables are acceptable for paper, corrugated cardboard, glass, plastics, and metals if required by local conditions.
  - Space for the storage of organics/food waste recycling is required even if service is not available at the time of building occupancy.
- Take appropriate measures for the safe collection, storage, and disposal of batteries, mercury-containing lamps, and electronic waste.

Zero Waste Operations Planning

Include design details, maintenance manuals, and/or other resources from the design and construction team that help facilitate building occupants and operators to meet high-performance waste prevention and recycling goals once in operation.

> **Core and Shell only**
> Communicate the building's infrastructure and service options information in the tenant guidelines.

REQUIREMENTS EXPLAINED

The goal for the prerequisite is to minimize waste generated by building occupants and to implement strategies in reducing, reusing, and recycling waste throughout the building's lifecycle. This includes incorporating design measures that prioritize waste prevention, material reuse, and effective waste management. It also encourages project teams to thoughtfully consider and plan for the access requirements of all individuals who will service and use the building. Additionally, teams should anticipate and accommodate the operational needs necessary for achieving zero waste by enabling effective waste diversion practices. This includes ensuring proper sorting, storage, and access solutions to facilitate recycling, composting, and other waste diversion methods while prioritizing reuse as a key strategy.

Storage and Collection of Recyclables

Municipal solid waste has become a growing concern as the volume of waste generated in the U.S. continues to increase.[103] An obstacle to effective recycling in buildings is the lack of convenient, dedicated physical spaces for collection. Incorporating recycling infrastructure early in the design process encourages successful recycling once operations begin. Well-designed and accessible waste management infrastructure is intuitive (easy to locate, reach, and use) for all occupants, regardless of physical ability or mobility, anticipating how and where waste will be discarded by occupants. Address concerns for noise, odor, and vectors.

Recycling includes traditional materials like glass, plastic, and metals, as well as organic materials, like food scraps, paper products, and landscape materials. Organic materials collected in buildings can be composted onsite or offsite. Composting can occur at multiple scales and locations: small-scale systems might include basic compost piles or bins, while large-scale operations involve centralized, commercial facilities that process organic waste from an entire region.

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[103] "U.S. Municipal Solid Waste", University of Michigan Center for Sustainable Systems, (2024), https://css.umich.edu/sites/default/files/2025-02/CSS04-15.pdf.

To meet the prerequisite, teams must provide dedicated area(s) for recyclable items including organics (compostables), mixed paper, corrugated cardboard, glass, plastics, and metals. Teams should work with the owner and architects to provide sufficient collection and storage space for all required recyclables based on the building size, occupants, and local recycling markets. In many places, recycling of various materials is required by laws or regulations. Project teams should check for local requirements and service vendors to ensure maximal waste diversion.

Given the substantial greenhouse gas emissions from discarded organic waste in landfills (from methane production), it is required to plan space for composting organic materials generated by occupants, even if composting services are not immediately available at time of building occupancy. For organics collection, some material processors will encourage paper products to be recycled separately (such as office paper placed in mixed-paper recycling bins and excluded from food scraps collection). Check with local authorities for guidance on best practices for mixed paper or cardboard and other forms of organics composting.

To meet the prerequisite, project teams must provide an adequate amount of dedicated space for recycling with the appropriate infrastructure to handle such recycling. This includes planning for the installation of collection systems or bins for recyclable materials that are collected by the building and sent for recycling at time of occupancy. Base these bins or collection on current service offerings in the project region.

Commingled recycling bins (excluding organics) are acceptable if the local municipality or recycling vendor allows commingled recycling, though commingled recycling tends to reduce the quality of diverted materials and leads to lower overall recovery rates. Therefore, source separation of recycled material types is encouraged to maximize diversion rates and help meet zero-waste goals, but is not required unless separate streams are required by local regulations or guidelines.

There is a growing environmental concern for the increasing volume of electronic waste (e-waste), such as computers, cameras, printers, and keyboards. The e-waste disposal procedure is more hazardous than cardboard, glass, plastic, metals, and paper. Therefore, identifying safe storage areas, recycling facilities, and haulers that can process e-waste is important. Teams must indicate space dedicated to the storage and collection of recyclables, composts, and e-waste areas on a floor plan and describe how these spaces will be serviced and accessed safely by building occupants and staff.

Project teams should follow the TRUE waste hierarchy framework that prioritizes waste management actions to minimize environmental impact and conserve resources. It ranks waste management strategies from most to least preferred, focusing on reducing waste generation and maximizing resource recovery before resorting to disposal, in this order:

- **Reduce**. Minimize waste at the source e.g., use fewer materials and resources.
- **Reuse**. Extend the life of products by using them more than once.
- **Recycle**. Transforming waste material into new products.
- **Compost**. Decomposing organic waste into nutrient-rich soil.
- **Anaerobic Digestion**. Breaks down organic material into a form of nutrient-rich liquid for soil application and it does not necessarily equal composting.

Zero Waste Operations Planning

Project teams must include design details, maintenance manuals, and other resources in a plan to help building operators to minimize waste and implement recycling practices post-occupancy. Consider implementing reusable infrastructure, such as refillable dispensers, reusable service ware, and reusable event items, while also establishing comprehensive systems for waste diversion, including take-back programs for specialty items and user-friendly sorting stations with adequate storage. The plan should consist of materials for training staff and contractors, such as literature, presentations, and onboarding training resources. These resources may cover topics like designated recycling and composting areas, waste separation procedures, and proper disposal guidelines. It can include strategies to help with waste prevention, materials recovery, and operational procedures that support zero-waste objectives.

> **Core and Shell only**
> Communicate the building’s infrastructure and service options information in the Tenant Guidelines.
>
> Core and Shell project teams may have limited influence on how the final tenant space is fitted out. The tenant guidelines help tenant design teams understand and design features to achieve significant reductions in waste generation. To effectively communicate details of waste management, the Tenant Guidelines should provide clear, actionable information that outlines the building’s waste management system and encourages responsible waste disposal practices. This allows tenants to remain informed about the building’s systems and their responsibilities. Teams should include information on the waste collection and

disposal collection area, waste minimization initiatives, waste pick up schedule, training materials, and contact information.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Storage and Collection of Recyclables	All	Proof of space for recycling and composting.
			Pictures of final spaces incorporated into the building with signage.
			Narrative describing the dedicated recycling storage areas for the project, including the size, accessibility, and expected volume for the project.
	Zero Waste Operations Planning		Zero-waste plan, including any resources used to train staff and contractors (e.g., literature, presentation, onboarding training, etc.).

REFERENCED STANDARDS

- Compostable BPI standard (bpiworld.org)
- TRUE diversion rate guidelines (true.gbci.org/true-diversion-data-additional-guidance)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Materials and Resources Prerequisite

QUANTIFY AND ASSESS EMBODIED CARBON

MRp2

REQUIRED

New Construction
Core and Shell

INTENT

To quantify the embodied carbon impacts of the structure, enclosure, and hardscape of a project and assess the top sources of embodied carbon.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Embodied Carbon	
AND	
High-Priority Embodied Carbon Sources	

Comply with the following requirements:

Embodied Carbon

- Quantify the embodied carbon impacts (global warming potential or GWP) of the structure, enclosure, and hardscape materials for the project. All ancillary structures, such as parking structures or outbuildings within the LEED project boundary, must be included in the calculations. At a minimum, include asphalt, concrete, masonry, structural steel, insulation, aluminum extrusions, structural wood and composites, cladding, and glass.
- Quantify the cradle-to-gate (A1–A3) embodied carbon emissions for each material, defined as the product's GWP/unit times the amount of material used.
    - Alternatively, projects using life-cycle assessment or embodied carbon software tools may report A1–A3 results from their tool.

AND

High-Priority Embodied Carbon Sources

Identify the top three sources of embodied carbon on the project and describe how project-specific strategies were considered to reduce the impacts of these hot spots.

> **Core and Shell only**
> Communicate the embodied carbon measurements and material suppliers in the tenant guidelines.

REQUIREMENTS EXPLAINED

This prerequisite ensures that all projects become acquainted with embodied carbon and gain a basic understanding of how to quantify and measure it. It also highlights the critical role of material selection, emphasizing that informed choices across major material categories are essential to achieving meaningful reductions in embodied carbon. The prerequisite aims to raise awareness of the upfront embodied carbon associated with key materials used in the structure, enclosure, and hardscape of a project. This prerequisite does not mandate reductions in embodied carbon.

Project teams can achieve this prerequisite in two ways:

- As a stand-alone assessment conducted for projects not attempting the *MRc2: Reduce Embodied Carbon*, OR
- As an output from projects that are attempting the *MRc2: Reduce Embodied Carbon*.

The intention is that many projects will attempt to earn points from the *MRc2: Reduce Embodied Carbon* and use the analysis as the documentation for this prerequisite with no further analysis needed.

In addition, all projects will need to summarize the top three sources of embodied carbon in their project and describe what strategies in the project were considered to reduce the impact of these hotspots.

Embodied Carbon

The extraction and manufacturing phases of building materials account for a substantial portion of embodied carbon emissions, primarily due to energy-intensive raw material extraction, transportation from manufacturers to construction sites, and the waste produced during manufacturing. Projects that seek carbon reductions in the early design phases (schematic design and design development) can make the most significant decisions to reduce embodied carbon early in projects, not after design is complete when material substitutions may not be allowed or become cost prohibitive. The owner, designers, and contractors can collectively make decisions to reduce the impacts a building's materials will have on the environment by using a fully integrated and collaborative design process.

QUANTIFY EMBODIED CARBON IMPACTS

Quantifying the Embodied Carbon Impacts provides a holistic assessment of embodied carbon impacts across major material groups within the project's structure, enclosure, and hardscape. Calculate the Global Warming Potential (GWP) for all materials within each sub-category. For example, within the structural system, the GWP of each type of concrete, steel, or other materials is individually assessed and then combined to determine the total GWP for the structure. Similarly, for the enclosure, materials like insulation, cladding, and glazing are evaluated, and components such as paving and landscaping materials are analyzed for the hardscape. By summing up the impacts of all sub-category materials, the project team can achieve a detailed understanding of the embodied carbon for each major group, enabling informed decisions to reduce the project's overall environmental impact.

Teams must use building project documents, including construction drawings and specifications or software tools to group materials into a Bill of Materials (BOM) of structure, enclosure, and hardscape materials used on the project. The BOM must encompass all elements within the LEED project boundary, including any ancillary structures like attached or detached parking garages and other components with significant embodied carbon impacts. Quantities may come from as-built data or estimated quantities from the design phase.

QUANTIFY THE CRADLE-TO-GATE EMBODIED CARBON EMISSION

Quantifying the cradle-to-gate (A1–A3) embodied carbon emissions for each material focuses on emissions associated with raw material extraction (A1), transportation to the manufacturing site (A2), and the manufacturing processes (A3). Calculate the GWP based on the cradle-to-gate (A1-A3 stages) impacts for each applicable material used in the project. This involves multiplying the GWP/unit (from EPDs or default values) by the quantity of each material.

Teams will locate EPDs to determine the embodied carbon values for each material. If EPDs are unavailable, teams may use industry-standard defaults provided by regional data sources or integrated within qualifying software tools. Projects should follow a hierarchy of data:

- Use specific EPDs for the product, as published by the manufacturer. If a product-specific EPD is not available, use the U.S. Environmental Protection Agency (EPA) default values when available.

- Refer to the most recent Carbon Leadership Forum (CLF) Material Baselines report.[104]
- Consult other widely used, well-established, authoritative publications or databases in the industry and supported by extensive peer-reviewed research.
- Use industry-wide EPDs relevant to the project region (see Table 1).

Table 1. Common industry-wide EPD data for North America

Material	Organization
Concrete	National Ready Mixed Concrete Association (NRMCA)
Steel	American Institute of Steel Construction (AISC)
	Steel Recycling Institute (SRI)
Masonry	National Concrete Masonry Association (NCMA)
Wood	American Wood Council (AWC)
Insulation	North American Insulation Manufacturers Association (NAIMA)

Tools and databases

A variety of free tools and databases are available for finding EPDs and calculating embodied carbon as part of common building design software/tools, enhancing usability in design workflows. Below is a list of different types of tools and databases relevant to embodied carbon and LCA for analyzing and comparing materials and products.

The data sources within these databases vary, from EPDs, manufacturer-provided data, academic research, industry statistics, government publications, and other databases. These differences in data sources can influence the accuracy and comparability of the results. Some databases account for regional variations in life cycle inventory (LCI) data, baseline LCA values, and EPD information, while others may only support analysis within specific countries or regions. Refer to the table below for credible and widely recognized LCA tools and data sources and standardized methodologies, supported by robust, up-to-date databases.

RESULTS OF THE EMBODIED CARBON QUANTIFICATION

When tallied up, the results of the embodied carbon quantification represent the total embodied carbon calculated from the cradle-to-gate (A1–A3) stages of materials used in the project's structure, enclosure, and hardscape. With the results of this quantification, teams can identify the high GWP materials early in design and prioritize alternatives or modifications.

Table 2. Common LCA software and reporting metrics

LCA Software	Reporting Metrics
Athena	A1–A3 stages (cradle-to-gate)
Tally	A1–A5, B1–B7 stages, and C1–C4

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[104] "Carbon Leadership Forum Material Baselines for North America / August 2023", Carbon Leadership Forum (CLF), (2023), https://carbonleadershipforum.org/clf-material-baselines-2023/.

LCA Software	Reporting Metrics
OneClick LCA	A1–A5, and optional B and C

High-priority embodied carbon sources

High-priority embodied carbon sources such as concrete steel and insulation are responsible for significant embodied carbon emissions. There is an incredible opportunity for embodied carbon reduction in these high-impact materials through policy, design, material selection, and specification. For example, optimizing a structure to minimize the use of concrete can lower demand for concrete and reduce emissions by 22%.[105] In addition, projects can explore mandates to procure structural steel produced in the U.S. to reduce transportation emissions.

Projects must identify the three primary contributors to embodied carbon using the analysis from this prerequisite. Use strategies within design and procurement to reduce carbon emissions from the structure, enclosure, and/or hardscape materials. A hot spot analysis is mandatory to identify the most carbon-intensive materials, allowing teams to focus on areas with the greatest potential for impactful reductions.

For each of these key sources, explain how the team evaluated and implemented project-specific strategies to reduce their environmental impact. For instance, structural materials such as concrete and steel often emerge as hot spots due to their high embodied carbon. An acceptable analysis would include examining options like low-carbon concrete mixes, recycled steel, or changes in design that reduce material use and are ideally part of an early design analysis to ensure the greatest impact.

> **Core and Shell only**
>
> Projects must include the embodied carbon measurements and material supplier information in the tenant guidelines. This involves sourcing EPDs, conducting a WBLCA to calculate embodied carbon impacts, and documenting suppliers' sustainability attributes like recycled content or certifications. The guidelines should offer recommendations for low-impact material selection and outline opportunities for material reuse. This ensures that tenants have information

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[105] "Increase Material Efficiency and Reduce Use", Carbon Smart Materials Palette™, Architecture 2030, (n.d.), https://www.materialspalette.org/increase-material-efficiency-and-reduce-use/.

about the environmental impact of the project's materials, helping to promote sustainable decision-making during fit-out and renovation processes.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Embodied Carbon	All	Bill of Materials (worksheet) that lists the quantities of major structure, enclosure, and hardscape materials used in the project, along with the cradle-to-gate (A1–A3) embodied carbon emissions for each material. Provide a description of the data sources used to determine the embodied carbon values for each material. Include justification of used baselines (regional, industry, similar construction type, etc.) if EPA GSA, CLF, or other recommended embodied carbon values are not available. Projects using life-cycle assessment or embodied carbon software tools may report the results from their tool.
			Provide alternative documentation if EPDs are not available.
	High-Priority Embodied Carbon Sources		Document the top three high-priority embodied carbon sources and describe the solutions considered to reduce the impacts.

REFERENCED STANDARDS

- Buy Clean/GSA/EPA (gsa.gov/real-estate/gsa-properties/inflation-reduction-act/lec-program-details/material-requirements)
- Carbon Leadership Forum (benchmarks) (carbonleadershipforum.org/clf-material-baselines-2023)
- NRMCA average EPDs (nrmca.org/association-resources/sustainability/environmental-product-declarations/)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Materials and Resources Credit

BUILDING AND MATERIALS REUSE

MRc1

New Construction (1–3 points)
Core and Shell (1–5 points)

INTENT

To incorporate reused materials into new building design, thereby reducing embodied carbon, keeping materials in circularity, reducing demand for virgin material sourcing, preserving resources and histories, and increasing demand for reused materials.

REQUIREMENTS

Achievement pathways	Points
New Construction	1–3
Option 1. Building Reuse	1–3
AND/OR	
Option 2. Materials Reuse	1–2
Core and Shell	1–5
Option 1. Building Reuse	1–5
AND/OR	
Option 2. Materials Reuse	1–2

Option 1. Building Reuse
(1–3 points New Construction, 1–5 points Core and Shell)

Maintain the existing building structure, including floor decking, roof decking, and enclosure. Calculate reuse of the existing project area according to Table 1.

Portions of buildings deemed structurally unsound or hazardous are excluded from the credit calculations.

Table 1. Points for reuse of existing building structure and enclosure elements for New Construction projects

Percentage of Existing Structure and Enclosure Reuse by Project Area	Points
20%	1
35%	2
50%	3

Table 2. Points for reuse of existing building structure and enclosure elements for Core and Shell projects

Percent of Existing Structure and Enclosure Reuse by Project Area	Points
10%	1
20%	2
30%	3
40%	4
50%	5

AND/OR

Option 2. Materials Reuse (1–2 points)

- Survey and identify opportunities for materials reuse and/or procurement of reused materials from off-site.
- Reuse materials by keeping them in place or acquiring them from applicable salvage sources or reuse markets and incorporating the materials into the new project design. Specific targeted materials are valued higher because they have high impacts (embodied carbon or pollution) are hard to recycle and significant amounts of these materials end up in landfill.
- For projects with deconstruction or demolition in scope, conduct a salvage assessment prior to deconstruction or demolition activities and identify materials that can be retained on-site or diverted off-site to reuse markets.
  - Salvaged materials sent for off-site reuse contribute to MRc5: Construction and Demolition Waste Diversion. Materials retained on-site contribute to this credit option.

Calculate the percent reused per material type according to Equation 1.

Points are achieved according to Table 3.

Equation 1. Reuse % per material type

$$Reuse\ \%\ per\ material\ type\ =$$
$$Amount\ of\ material\ type\ reused\ /\ Total\ amount\ of\ material\ type\ in\ New\ Construction\ scope$$

Table 3. Points for incorporating reused materials

Reuse materials threshold	Points
Reuse at least 15% of 1 targeted material type OR Reuse at least 15% of 2 other material types OR Reuse an equivalent weighted average of targeted and other material types	1 point

Reuse materials threshold	Points
Reuse at least 30% of 1 targeted material type OR Reuse at least 15% of 2 targeted material types OR Reuse at least 15% of 4 other material types OR Reuse an equivalent weighted average of targeted and other material types	2 points

Table 4. Reuse material types and correlating units

Material type	Unit
Targeted materials	
Carpeting	Surface area
Ceilings	Surface area
Furniture (ancillary and systems)	Pieces, weight, volume, or floor area
Interior walls	Linear or surface area
Other materials	
Dimensional lumber	Board foot or linear
Doors	Count
Casework	Linear
Floor-covering materials (not including carpet)	Surface area
Lighting fixtures	Count
Plumbing fixtures	Count
Mechanical equipment	Count
Door hardware	Count
Project defined other	Project defined

REQUIREMENTS EXPLAINED

This credit encourages projects to reuse existing buildings and building materials. Option 1 rewards projects that reuse structural and enclosure elements of existing buildings. Option 2 is focused on the reuse of nonstructural products by keeping materials in place or acquiring materials from salvaged sources. This option encourages projects to focus on reusing targeted materials that have high environmental impacts. Points are earned based on the percentage of targeted and other materials that are reused in the project.

Reusing materials in new building designs benefit the environment by lowering the demand for virgin material sourcing, decreasing embodied carbon, and extending the lifecycle of products. Materials diverted through construction activities and sent offsite for reuse contribute to the *MRc5: Construction and Demolition Waste Diversion*.

- *MRc4: Building Product Selection and Procurement*
- *MRc5: Construction and Demolition Waste Diversion*
- *MRc2: Reduce Embodied Carbon*
- *PRc1: Project Priorities*

Option 1. Building Reuse

Building reuse extends the lifespan of structures by revitalizing existing buildings or adapting properties when their original function changes. Demolishing an old building and rebuilding with new materials increases a building's carbon footprint due to the energy required for both processes. Reusing a building conserves resources by reducing the need for new construction materials and minimizes waste. This option can be more cost-effective, reducing the environmental impact associated with construction.

Option 1 addresses the onsite reuse of existing structure and enclosure materials, including materials left in-situ as well as those procured offsite and incorporated into the building's structure/enclosure. To earn points, projects maintain portions of the existing building structure and enclosure and/or incorporate offsite reuse from the early design phase and work with architects and structural engineers to identify structural elements of the existing space that can be reused.

Table 5 outlines how different types of reuse are recognized within the LEED v5 Materials and Resources category, including their contributions to *MRc5: Construction and Demolition Waste Diversion* and *MRc4: Building Product Selection and Procurement*.

Table 5. Types of building/material reuse and credit contributions

Credits/Options/Paths	**Onsite reuse (keep materials in place or within the same project)**	**Procure offsite salvaged materials and incorporate them into the project**	**Divert onsite materials to salvage markets**
	(Onsite-onsite)	(Offsite-onsite)	(Onsite-offsite)
MRc1: Building and Material Reuse, Option 1. Building Reuse (structural materials)	x	x	
MRc1: Building and Material Reuse, Option 2. Materials Reuse (nonstructural materials)	x	x	
MRc5: Construction and Demolition Waste Diversion			x
MRc4: Building Product Selection and Procurement (nonstructural materials)	x	x	

Teams are awarded points by salvaging 20% or more of the existing building structural elements, including enclosure elements. Key existing structural elements include floor and roof decking, load-bearing walls, columns, and beams that provide the primary support framework for the building. Enclosure elements include the building's exterior skin and structural framing that form the thermal and weather barrier of the building. Enclosure materials in this credit includes facades, cladding, and exterior walls, while excluding nonstructural components like roofing membranes, shingles, window assemblies, and other elements that are not essential to the building's integrity or enclosure.

Teams must exclude hazardous and unsound materials (e.g., remediated as part of the project for historic, abandoned, or unsafe buildings) from the calculation because these materials cannot be safely reused or incorporated into the project. Nonhazardous materials are encouraged to be diverted from landfill or incineration and can contribute to *MRc5: Construction and Demolition Waste Diversion*.

For projects with new building components or additions, base the calculations on the existing floor area, not including additional floor area. Per the equation below, the reuse calculation is based on the surface areas of major existing structural and enclosure elements. Teams should prepare a calculation table or spreadsheet listing all enclosure and structural elements within the existing building prior to construction or renovation. Teams should quantify each item, listing the square footage of both the existing area and the retained area. Determine the percentage of existing elements that are retained by dividing the square footage of the total retained materials area by the square footage of the total existing materials area. The reused area in the calculation should include any salvaged or reused materials sourced off-site and integrated into the project.

Equation 2. Percentage of existing building reuse

$$\text{Existing building reuse} = \frac{\text{Area reused onsite } + \text{ Area reused from offsite}}{\text{Existing building area}} \times 100$$

Option 2. Materials Reuse

Option 2 addresses the onsite reuse of nonstructural materials. This option also encourages the scanning of availability for the procurement of offsite reused materials that are incorporated into the building.

Deconstruction, which involves carefully dismantling structures to salvage materials, supports environmental outcomes by reducing waste, air pollution, carbon emissions, and resource use while conserving energy from the creation of otherwise new materials.[106]

Teams must conduct a salvage assessment to identify opportunities for reusing materials within the project. The assessment must also scan local or regional sources for reclaimed materials from off-site locations that could be incorporated into the project. A salvage assessment is typically conducted prior to any construction taking place, and is done by deconstruction professionals, sustainability consultants, or salvage experts and includes an inventory of materials categorized by type, quantity, and reuse potential. An assessment is considered adequate if it thoroughly covers all relevant materials, addresses safety concerns, and provides actionable guidance for stakeholders to implement reuse or recycling strategies effectively.

The assessment also includes evaluating the existing building or site for salvageable components and exploring local markets, suppliers, or deconstruction initiatives for reusable materials. Architectural salvage stores, reuse websites/databases, and Habitat for Humanity ReStores are places to find reused building materials.

Table 2 of the requirement outlines the points awarded for incorporating reused materials into a project. Points are based on the reuse percentage per material type, by quantity, relative to the total amount of the material type. Higher percentages of reused materials and achieving more material types earn more points, encouraging teams to prioritize salvaging and reusing structural elements, enclosure components, and other building materials.

Reusing materials

Reusing existing materials for a purpose other than what it was originally built or designed for, reused for the same purpose, or materials that are modified and reinstalled can reduce waste and extend useful life, providing economic and environmental benefits to owners, contractors, building occupants, and communities. Reduce the need to purchase new materials when reusing existing materials, leading to direct savings on materials and transportation costs. Reusing materials onsite also helps reduce the overall embodied carbon on the project as it eliminates the need to produce new materials that generate greenhouse gas emissions. A reduction in construction and demolition waste will decrease the environmental burden on waste management systems.

This credit option rewards projects for incorporating reused elements into the building. The sources for reused materials can be from onsite or gathered offsite from vendors, other projects,

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[106] “Deconstruction and Building Material Reuse: A tool for local governments and economic development practitioners”, Delta Institute, (2018, May), https://delta-institute.org/wp-content/uploads/2018/05/Deconstruction-Go-Guide-6-13-18-.pdf.

salvage yards, donations, and more. Early coordination with contractors is recommended to help identify salvageable materials and align salvage efforts with the construction schedule. Teams should photograph materials before, during, and after salvage, as well as images of offsite-sourced items for verification if requested by reviewers.

Targeted materials found in Table 3 for this credit include carpeting, ceilings, furniture (ancillary and systems), and interior walls. Prioritizing these materials is based on several criteria, including high embodied carbon, toxic impacts in landfills, and significant potential for recovery in existing or emerging salvage and reuse markets, despite current low participation levels. Teams should refer to the EPA WARM tool and Build Reuse association for more on the impacts of targeted materials in LEED.[107,108] These targeted materials receive a 2x multiplier compared to other reused materials. However, all forms of reuse are recognized in this credit and are eligible for additional rewards in other LEED credits.

Salvaging materials

Successful salvaging begins with careful planning and requires a thorough audit of the existing materials and structures to identify which materials can be reclaimed. It is recommended to conduct an early salvage assessment during building design to determine which tools and methods will be most valuable and effective for removal and preservation.

Teams must calculate the percentage of salvaged materials per material type categories listed in the credit, Table 3. Calculation must be based on the unit specified per the materials type. Project teams are welcome to include unlisted material type(s) in the table as “project defined other.”

Conduct salvage assessment for projects with deconstruction or demolition in scope

For projects with deconstruction or demolition in scope, conduct a salvage assessment to document the quantity of materials that could be salvaged and reused on- or off-site. A salvage assessment is most useful when conducted before construction activities begin. Conducting a salvage assessment identifies valuable materials and components that can be reclaimed and reused, thus reducing waste and disposal costs. Examples of salvageable materials include clean wood, siding, roofing materials, plumbing, finishes, and lighting fixtures.

Teams are recommended to connect with local/regional reuse organizations and/or visit reuse facilities to understand available materials that could be incorporated into the project. Teams can also better understand the demand in the local area for salvaged materials generated by

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[107] “Waste Reduction Model (WARM)”, United States Environmental Protection Agency, (n.d.), https://www.epa.gov/warm.

[108] “Home page”, Build Reuse, (n.d.), https://www.buildreuse.org/.

deconstructing building(s). Examples include structural elements like wood, steel, brick, and concrete, as well as non-structural components such as doors, windows, cabinetry, and flooring.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Building reuse	All	Worksheet that shows the percent reuse compared to the existing structure.
			Photos or as-built drawings that show the existing building structure, including floor decking, roof decking, and enclosure maintained. Floor plan that demonstrates the areas of reuse.
	Option 2. Materials Reuse		Worksheet that shows material reuse.
			Salvage assessment if demolition or deconstruction is within the project scope.

REFERENCED STANDARDS

- US EPA WARM (epa.gov/warm)
- Build Reuse Association (buildreuse.org)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

— Ecological Conservation and Restoration

Materials and Resources Credit

REDUCE EMBODIED CARBON

MRc2

New Construction (1–6 points): A 20% reduction in embodied carbon is required for LEED Platinum projects
Core and Shell (1–8 points): A 20% reduction in embodied carbon is required for LEED Platinum projects

INTENT

To track and reduce embodied carbon of major structural, enclosure, and hardscape materials from construction processes on new construction and renovation projects.

REQUIREMENTS

Achievement pathways	Points
New Construction	1–6
Option 1. Whole-Building Life-Cycle Assessment	1–6
AND/OR	
Option 2. Environmental Product Declaration (EPD) Analysis	1–3
Path 1. Project-Average Approach	1–3
OR	
Path 2. Materials-Type Approach	1–2
AND/OR	
Option 3. Track Carbon Emissions from Construction Activities	1–2
Core and Shell	1–8
Option 1. Whole-Building Life-Cycle Assessment	1–7
AND/OR	
Option 2. Environmental Product Declaration (EPD) Analysis	1–4
Path 1. Project-Average Approach	1–4
OR	
Path 2. Materials-Type Approach	1–3
AND/OR	
Option 3. Track Carbon Emissions from Construction Activities	1–2

Quantify the reduction of embodied carbon of major structure, enclosure, and hardscape materials. All ancillary structures, such as parking structures or outbuildings within the LEED project boundary, must be included in the calculations.

Both baseline projects and final results may use as-designed or as-constructed final quantities provided that quantities did not change more than 10% from design through construction. Results must be based on embodied carbon intensities of materials as constructed.

Points are awarded according to Table 1 for reductions in embodied carbon. Projects may earn up to 6 points total.

Table 1. Points for embodied carbon reductions in Options 1 and 2 for New Construction projects

	Option 1. Whole-building life cycle assessment	**AND/ OR**	**Option 2.EPD Analysis**		
			Path 1. Project-average approach	**OR**	**Path 2. Materials-type approach**
Meet baseline or industry average	2		1		Three material categories for one point OR Five or more material categories for two points
10% reduction in GWP	3		–		–
20% reduction in GWP	4		2		–
30% reduction in GWP	5		–		–
40%+ reduction in GWP	6		3		–

NOTE: Meeting the baseline or industry average in Table 1 can achieve no more than two points.

Table 2. Points for embodied carbon reductions in Options 1 and 2 for Core and Shell projects

	Option 1. Whole-building life cycle assessment	AND/ OR	Option 2. EPD analysis		
			Path 1. Project-average approach	**OR**	**Path 2. Materials-type approach**
Meet baseline or industry average	2		1		Two material categories for one point OR Four material categories for two points OR Six or more material categories for three points
10% reduction in GWP	3		–		–
20% reduction in GWP	4		2		–
30% reduction in GWP	5		–		–
40%+ reduction in GWP	6		3		–
50%+ reduction in GWP	7		4		–

NOTE: Meeting the baseline or industry average in Table 2 can achieve no more than two points.

Option 1. Whole-building Life Cycle Assessment (1–6 points New Construction, 1–7 points Core and Shell)

Conduct a cradle-to-grave (modules A–C, excluding operating energy and operating water-related energy) whole-building life-cycle assessment (WBLCA) of the project's structure, enclosure, and hardscape materials. Compare results to a baseline developed for the project and earn points according to Table 1.

Include results for the following impact categories in the WBLCA report:

- Global warming potential (GWP) (greenhouse gases), in kg CO_2e
- Depletion of the stratospheric ozone layer, in kg CFC-11e
- Acidification of land and water sources, in moles H^+ or kg SO_2e
- Eutrophication, in kg nitrogen eq or kg phosphate eq
- Formation of tropospheric ozone, in kg NOx, kg O_3 eq, or kg ethene

- Depletion of nonrenewable energy resources, in MJ using CML/depletion of fossil fuels in TRACI

AND/OR

Option 2. Environmental Product Declaration (EPD) Analysis (1–3 points New Construction, 1–4 points Core and Shell)

PATH 1. PROJECT-AVERAGE APPROACH (1–3 POINTS)

Earn points for reducing embodied carbon of the project based on EPD data for the procured materials compared to industry average values. Points are awarded according to Table 1 for the whole-project weighted average of applicable material categories. Industry averages for material categories are defined by the U.S. Environmental Protection Agency (EPA), the most recent Carbon Leadership Forum (CLF) Material Baselines report, or similarly robust and widely recognized publications, and industry-wide EPDs applicable to the project region.

Projects must track the GWP/unit of the materials installed, reconciling the design-phase embodied carbon intensities if materials or GWP values have changed. The reconciliation of material quantities is not necessary unless quantities have changed more than 10% from design through construction. Projects must use project-specific material quantities and identify product-specific or facility-specific Type III EPDs for covered materials to demonstrate reductions. Biogenic carbon may only be included for calculations that include C-stage emissions.

OR

PATH 2. MATERIALS-TYPE APPROACH
(1–2 POINTS NEW CONSTRUCTION, 1–3 POINTS CORE AND SHELL)

Earn points according to Table 1 by demonstrating that structural, enclosure, and hardscape materials for targeted material types have lower embodied carbon impacts than industry benchmarks as demonstrated by product-specific Type III EPDs. Track the GWP per unit of the materials installed, reconciling the design-phase embodied carbon intensities if materials or GWP values have changed. The reconciliation of material quantities is not necessary unless quantities have changed more than 10% from design through construction.

A weighted-average approach can be used to calculate average embodied carbon intensity values within a product category.

Industry averages for embodied carbon intensity values are defined by the U.S. EPA, the most recent CLF Material Baselines report, or similarly robust and widely recognized publications and industry-wide EPDs applicable to the project region.

AND/OR

Option 3. Track Carbon Emissions from Construction Activities (1–2 points)

Earn points for tracking carbon emissions during construction activities according to Table 3.

Table 3. Points for tracking emissions during construction activities

Pathway	Type of construction-phase emissions to track	LCA modules	Points
Path 1	Track all fuel and utility usage for contractor jobsite operations	A5	1
Path 2	Track all fuel and utility usage for contractor and subcontractor jobsite operations	A5	2

REQUIREMENTS EXPLAINED

The goal of *MRc2: Reduce Embodied Carbon* is to implement strategies that reduce embodied carbon through the various stages of a project, from early design development through construction activities and procurement. There are several pathways to reduce embodied carbon. Each way can be tailored to different project stages and objectives.

The intention of this credit is to provide flexibility but increase carbon literacy through incentivizing completing a WBLCA alongside product research through EPD analysis. This allows project teams to earn a maximum of six points, but meeting the baseline or industry average can achieve no more than two points in this credit.

For example, if a project team aims to achieve the maximum six points for this credit but are only able to achieve a 20% reduction in GWP as identified in their WBLCA, they can take either Path 1 or Path 2 in Option 2 to earn the additional two points. Path 1 and Path 2 are not allowed to be combined. Project teams could also pursue Option 3 and track construction phase emissions to earn points in action or exclusion of Option 1 or Option 2.

Option 1. Whole-building Life Cycle Assessment

This pathway rewards projects seeking carbon reductions in the early design phases (Schematic Design and Design Development). The most significant decisions can be made early on in projects to reduce embodied carbon, rather than after the design is complete when material substitutions may not be allowed or become cost prohibitive. When using a fully integrated and collaborative design process, decisions can collectively be made by the owner, designers, and contractors to substantially cut embodied carbon emissions.

A WBLCA allows projects to demonstrate reductions in life cycle stages from raw material extraction and manufacturing, through construction, demolition, and disposal and provides owners and design teams with a better understanding of the full life cycle impacts of design decisions. WBLCAs assess all stages of a building's life cycle in their calculation, including the product stage (Modules A1–A3), construction stage (Modules A4–A5), use stage (Modules B1–B7), end-of-life stage (Modules C1–C4) and the benefits and loads beyond the system boundary stage (Modules D).[109]

The baseline and proposed buildings must be of comparable size, function, orientation, and operating energy performance as defined in *EAp2: Minimum Energy Efficiency*. The service life of the baseline and proposed buildings must be the same and at least 60 years to fully account for maintenance and replacement. Baseline assumptions must be based on standard design and material selection for the project location and building type. Use the same life cycle assessment software tools and data sets to evaluate both the baseline building and the proposed building and report all listed impact categories. Data sets must be compliant with *ISO 14044*[110].

When developing a baseline model (also known as reference building), use recommended modeling software and generate a model that is comparable in size, function, orientation, building geometry, structural and thermal performance. If a team iterates early in design and makes design changes to create a lower embodied carbon design, they may use their early design iteration as a baseline given that it aligns with the comparative requirements listed above. A team may also make a copy of their proposed design which includes low embodied carbon implementation and replace materials with the regional commonly used materials. For further guidance on developing a baseline model, see the following resources:

- Whole Building Life Cycle Assessment: Reference Building Structure and Strategies[111]
- National Guidelines for whole-building life cycle assessment[112]
- City of Vancouver Embodied Carbon Guidelines[113]

Option 2: EPD Analysis

EPDs are a standardized way of communicating the environmental impacts associated with a product's raw material extraction, energy use, chemical makeup, waste generation, and air, soil and water emissions, among other endpoints. Project teams who analyze EPDs can more

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[109] "Measuring Embodied Carbon" (Figure 1), Carbon Leadership Forum (CLF), (2023), https://carbonleadershipforum.org/toolkit-2-measuring/.

[110] "ISO 14040", ISO, (2006), https://www.iso.org/standard/37456.html.

[111] "Whole Building Life Cycle Assessment: Reference Building Structure and Strategies", American Society of Civil Engineers (ASCE), (2018), https://sp360.asce.org/personifyebusiness/Merchandise/Product-Details/productId/239605051.

[112] Bowick, Matthew, O'Connor, Jennifer; et al. "National guidelines for whole-building life cycle assessment", National Research Council Canada, https://doi.org/10.4224/40002740.

[113] "Embodied Carbon Guidelines", City of Vancouver, (October 2023), https://vancouver.ca/files/cov/embodied-carbon-guidelines.pdf.

accurately compare and evaluate similar products, improving their decisions when selecting materials during design.

PATH 1: PROJECT-AVERAGE APPROACH

Projects can earn points by reducing embodied carbon, measured by comparing the project's total embodied carbon of procured materials to industry average values through an EC3 comparison or similar tool. For industry averages values project teams should use EPA values, the most recent Carbon Leadership Forum (CLF) Material Baselines Report, or similar. If no values are found in these given sources, regionally appropriate industry wide EPD's are acceptable. Project teams must provide a narrative comparing the impact between the procured materials and the industry averages as well as a justification of the sources used for comparison if they vary from those recommended.

PATH 2: MATERIAL-TYPE APPROACH

This path is also meant to align with state and federal procurement policies, specifically the *Federal Buy Clean Act*[114], a U.S. federal government initiative that prioritizes the use of locally made, lower-carbon construction materials in federal procurement and federally funded projects to allow flexibility in choosing products to reduce embodied carbon. Project teams will compare their structure, enclosure, and hardscape targeted material types to product-specific Type III EPDs to demonstrate that the products they have procured have a lower embodied carbon intensity than typical across the industry.

Project teams can research products with EPDs in online databases (see Table 4). In addition to these databases, many manufacturers publish EPDs directly on their website. Industry-specific associations may also have resources available for searching EPDs related to their trade.

Table 4. Resources for finding EPDs

Material and product databases
Embodied Carbon in Construction Calculator (EC3)[115]
LCA Digital Commons[116]
Quartz[117]
Athena[118]

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[114] "Federal Buy Clean Initiative", Office of the Federal Chief Sustainability Officer, Council on Environental Quality, (n.d.), accessed April 2, 2025, https://www.sustainability.gov/archive/biden46/buyclean/index.html.

[115] "Embodied Carbon in Construction Calculator", Building Transparency, (n.d.), https://buildingtransparency.org/auth/login.

[116] "LCA Digital Commons", Federal LCA Commons, (n.d.), https://www.lcacommons.gov/.

[117] "Quartz Countertops", Pharos, (2025), https://pharos.habitablefuture.org/common-products.

[118] "Athena research teams follow common building materials from cradle-to-grave to calculate the environmental effects at each stage in the product's life cycle", Athena Sustainable Materials Institute, (2025), https://www.athenasmi.org/our-software-data/lca-databases/.

Material and product databases
EPD Library[119]
The ICE Database[120]
Open LCA Nexus[121]
The International EPD System[122]
UL Spot[123]
Environmental Product Declaration Australasia[124]
Institut Bauen and Umwelt e.V.[125]
Sustainable Minds[126]

Option 3: Track Carbon Emissions from Construction Activities

Tracking construction emissions is an emerging practice among leading contractors aiming to reduce environmental impact and achieve sustainability goals. This option provides incentives for projects to begin tracking and reporting carbon emissions. It is not required for projects to show reduction of carbon emissions to earn points.

Option 3 aligns with aspects of the Sustainable Construction Leaders Contractor Commitment[127], where the guidelines are intended to set a sustainability benchmark specific to the construction industry. The guidelines also encourage companies to procure sustainable materials through the submittal process. Contractors are encouraged to follow the Associated General Contractors (AGC) Playbook on Decarbonization and Carbon Reporting for the Construction Industry[128], a document created by contractors for contractors to help address carbon emissions for the projects they build.

PATH 1. TRACK ALL FUEL AND UTILITY USAGE FOR CONTRACTOR JOBSITE OPERATIONS

Fuel usage tracking may include the type and amount of fuel consumed by construction equipment, vehicles, and machinery. Utility usage tracking may include electricity and water consumption on-site for construction activities.

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[119] "Search the EPD Library", The International EPD System, (n.d.), https://environdec.com/library.

[120] "Embodied Carbon – The ICE Database", Circular Ecology, (2025), https://circularecology.com/embodied-carbon-footprint-database.html.

[121] "openLCA Nexus", Open LCA Nexus, (n.d.), https://nexus.openlca.org/.

[122] The International EPD System, (n.d.), EPD International AB, (n.d.), https://portal.environdec.com/.

[123] UL Spot, UL LLC, (n.d.), spot.ul.com/.

[124] "Register and manage you EDPS online", The EPD Portal, The International EPD System, (n.d.), https://epd-australasia.com/.

[125] "Home page", Institut Bauen and Umwelt e.V., (n.d.), http://ibu-epd.com/.

[126] "Home page", Sustainable Minds, (n.d.), https://www.sustainableminds.com/.

[127] "Contractor's Commitment to sustainable building practices", Building Green, (2021), https://www.buildinggreen.com/sites/default/files/Contractors-Committment-Sustainability.pdf.

[128] *Associated General Contractors (AGC) Playbook on Decarbonization & Carbon Reporting*, Association of General Contractors of America, (2024), https://www.agc.org/climate-change-playbook.

PATH 2. TRACK ALL FUEL AND UTILITY USAGE FOR CONTRACTOR AND SUBCONTRACTOR JOBSITE OPERATIONS

See Path 1. for fuel and utility usage for contractor jobsite operations. Path 2 additionally requires that subcontractors also track their fuel and utility usage, including equipment operation and specific tasks. This can include fuel used to transport materials to or from the jobsite.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Whole-building Life Cycle Assessment	All	Provide Baseline LCA report and raw WBLCA file. Provide Proposed Design LCA report and raw WBLCA file. Provide comparative excel file or input into LEED form comparing the outputs of the baseline vs. proposed reports to identify reductions achieved by major material category or strategy. Align with ECHO.
			Justification of used baselines (regional, industry, similar construction type, etc.) if EPA GSA, CLF, or other recommended embodied carbon values are not available.
			Narrative of process to use WBLCA to inform design.
			Summary of strategies that resulted in reductions.
			Confirmation that material quantities in the reports represent as-constructed final quantities, or as-designed quantities (provided quantities did not change more than 10% from design through construction).
	Option 2. EPD Analysis	Path 1. Project-Average Approach	Results of analysis using EC3 or similar tool/software or EPDs.
			Justification of used baselines (regional averages, industry averages, etc.) if EPA GSA, CLF, or other recommended embodied carbon values are not available.
			Confirmation that material quantities in the reports represent as-constructed final quantities, or as-designed quantities (provided quantities did not change more than 10% from design through construction).
			Narrative of major savings/changes.
	Option 2. EPD Analysis	Path 2. Materials Type Approach	Provide summary sheet/table and the product-specific Type III EPDs for the as-constructed materials.
			Provide justification of used baselines if EPA GSA, CLF, or other recommended embodied carbon values are not available.
			Confirmation that material quantities in the reports represent as-constructed final quantities, or as-designed quantities (provided quantities did not change more than 10% from design through construction).
	Option 4. Track Carbon Emissions from Construction Activities	Paths 1 and 2	Description of tracking process initiated and how it was monitored and logged.
			Proof of emissions tracking (such as monthly tracking logs, photos or log of shipments inbound/outbound from jobsite, and associated emissions estimates).
			Carbon emissions calculations (spreadsheet or report).

REFERENCED STANDARDS

- None

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Materials and Resources Credit

LOW-EMITTING MATERIALS

MRc3

New Construction (1–2 points)
Core and Shell (1 point)

INTENT

To reduce concentrations of chemical contaminants that can damage air quality and the environment. To protect human health and the comfort of installers and building occupants.

REQUIREMENTS

Achievement pathways	Points
New Construction	1–2
Low-emitting Material Criteria	1–2
Core and Shell	1
Low-emitting Material Criteria	1

Specify and install permanently installed products, paints, coatings, adhesives, sealants, flooring, walls, ceilings, insulation, furniture, and/or composite wood products that meet the low-emitting criteria. Points are awarded according to Table 1.

Table 1. Thresholds for low-emitting materials for New Construction projects

Pathway	Product categories	Threshold	Points
Path 1	Achieve all three categories: • Paints and coatings • Flooring • Ceilings	>90% of all products in each product category	1
Path 2	Achieve Path 1, plus any two of these additional categories: • Adhesives and sealants • Walls • Insulation • Composite wood	>80% of each additional product category	2
Path 3	Achieve Path 1 plus the furniture category	>80% of the furniture product category	2

Table 2. Thresholds for low-emitting materials for Core and Shell projects

Product categories	Threshold	Points
Achieve any three categories: • Paints and coatings • Flooring • Ceilings • Adhesives and sealants • Walls • Insulation • Composite wood	>90% of all products in each product category	1

> **Core and Shell only**
> Products to be specified and installed by tenants may be excluded.
> Communicate the base building's product list in the tenant guidelines.

Product Categories

The following products and materials are not applicable to the low-emitting materials product categories: structural elements, equipment related to fire suppression, HVAC (including ductwork), plumbing, electrical, conveying and communications systems, poured concrete, structural framing, structural insulated panels (SIPs), and water-resistive barriers (material installed on a substrate to prevent bulk water intrusion).

Paints and coatings

- Paints and coatings, by volume, cost, or surface area, must meet the volatile organic compounds (VOC) emissions evaluation criteria.
- The paints and coatings product category includes all interior paints and coatings wet-applied on-site.
- Exclude foamed-in-place and sprayed insulation (include in insulation category).

Adhesives and sealants

- Adhesives and sealants, by volume or cost, must meet the VOC emissions evaluation criteria.
- The adhesives and sealants product category includes all interior adhesives and sealants wet-applied on-site, including those used to install air or vapor barrier membranes and floor-setting materials.

Flooring

- Nonstructural flooring materials, by surface area or cost, must meet the VOC emissions evaluation criteria.

- The flooring product category includes all types of hard and soft surface flooring finishes (e.g., carpet, ceramic tile, vinyl, rubber, engineered wood, solid wood, stone, or laminate), raised flooring systems, entryway ("walk-off") systems, area rugs, wood subflooring, underlayments, sandwich panels, and air barrier membranes and vapor barrier/vapor retarder membranes (if used inside an air barrier membrane).
- Exclude poured concrete, composite wood subflooring (include in the composite wood category, if applicable), and wet-applied products applied on the floor.

Walls

- Nonstructural wall materials, by surface area or cost, must meet the VOC emissions evaluation criteria.
- The walls product category includes all finish wall treatments (e.g., wall coverings or wall tile), finish carpentry (e.g., millwork, paneling, railings, or trim/moldings), gypsum wallboard, wall base/skirting, interior and exterior doors, nonstructural wall framing, and nonstructural sandwich panels.
- Exclude wet-applied products applied on the wall, case goods, cabinetry (included in the furniture category), countertops (included in the furniture category), bathroom accessories, door hardware, and curtain wall and storefront systems.

Ceilings

- Nonstructural ceiling materials, by surface area or cost, must meet the VOC emissions evaluation criteria.
- The ceilings product category includes all types of ceiling finishes (e.g., ceiling panels and ceiling tile), suspension grids, surface ceiling structures (such as gypsum wallboard or plaster), suspended systems (including canopies and clouds), and nonstructural sandwich panels.
- Exclude wet-applied products applied on the ceiling and corrugated metal decking.

Insulation

- Insulation products, by surface area or cost, must meet the VOC emissions evaluation criteria.
- The insulation product category includes all thermal and acoustic boards, batts (faced and unfaced), rolls, blankets, sound attenuation fire blankets, and foamed-in-place, loose-fill, blown, and sprayed insulation.
- Exclude insulation installed outside an air barrier membrane.

Furniture

- Furniture in the project scope of work, by cost, area, or number of units, must meet the furniture emissions evaluation criteria or VOC emissions evaluation criteria.
- The furniture product category includes all permanently installed office furniture, cubicles/systems furniture, seating, desks, tables, filing/storage, specialty items, beds, case goods, casework, countertops, moveable/demountable partitions, bathroom/toilet partitions, shelving, lockers, retail fixtures (including slatwall), window treatments, and furnishing items (such as nonfixed area rugs, cubicle curtains, and mattresses) purchased for the project.
- A custom item in the furniture category is considered to meet the low-emitting criteria if all components of the finished piece, applied on- or off-site, are declared under the furniture

category and meet the VOC emissions evaluation criteria. Alternatively, a custom piece meets the criteria if the finished piece meets the furniture emissions evaluation or VOC emissions evaluation criteria.
- Exclude office and bathroom accessories, art, recreational items (such as game tables), cabinet and drawer hardware, and planters from the credit.

Composite wood

- Composite wood products, by surface area or cost, must meet the formaldehyde emissions evaluation criteria.
- The composite wood product category includes all particleboard, medium-density fiberboard (both medium density and thin), hardwood plywood with veneer, composite or combination core, and wood structural panels or structural wood products.

Low-emitting Criteria

VOC emissions evaluation criteria

- **Third-party certification.** Product has a qualifying third-party certification, valid at the time of product purchase, that demonstrates testing and compliance according to the *California Department of Public Health (CDPH) Standard Method v1.2-2017*. using the private office scenario. Products used in classrooms may be modeled using the schools or private office scenario.

OR

- **Qualified independent laboratory report.** Product has a qualifying laboratory report (or summary) demonstrating the product has been tested no more than three years prior to the product's purchase, according to the *California Department of Public Health (CDPH) Standard Method v1.2-2017*. Products must meet the VOC limits in Table 4-1 of the private office scenario. Products used in classrooms may be modeled using the schools or private office scenario.

OR

- Product is inherently nonemitting, salvaged, or reused.

Furniture emissions evaluation criteria

- Product has a qualifying third-party certification, valid at the time of product purchase, that demonstrates testing according to *ANSI/BIFMA Standard Method M7.1-2011* (R2021) and complies with specific sections of the *ANSI/BIFMA e3-2014* or *e3-2024*, Furniture Sustainability Standard. Statements of product compliance must include the exposure scenario(s).
- Seating products must be evaluated using the seating scenario. Classroom furniture must be evaluated using the standard school classroom scenario. Other products should be evaluated using the open plan or private office scenario, as appropriate. The open plan scenario is more stringent.

OR

- Product is inherently nonemitting, salvaged, or reused.

Salvaged and reused materials
Product is more than one year old at the time of use.

If another product (including but not limited to adhesives, sealants, paints, and coatings) is applied to the inherently nonemitting material and has a separate manufacturer and cost, to the end user, from the original material, the applied product may be documented as a separate product and meet the low-emitting criteria applicable to the applied product, even if applied off-site.

If another product is applied to the inherently nonemitting/salvaged/reused material and does not have a separate manufacturer and cost, to the end user, the result is considered a new finished product that no longer qualifies as an inherently nonemitting material and is subject to the VOC emissions evaluation criteria.

Formaldehyde Emissions Evaluation Criteria

Product has a qualifying third-party certification from a California Air Resources Board (CARB) approved/Environmental Protection Agency (EPA) recognized third-party certifier (TPC), valid at the time of product purchase, that demonstrates the product is one of the following:

- Certified as ultra-low-emitting formaldehyde (ULEF) product under the *EPA Toxic Substances Control Act*, *Formaldehyde Emission Standards for Composite Wood Products* (*TSCA, Title VI*) (*EPA TSCA Title VI*), or *CARB Airborne Toxic Control Measure* (ATCM).
- Certified as no added formaldehyde resins (NAF) product under *EPA TSCA Title VI* or *CARB ATCM*.
- Wood structural panels manufactured according to *PS 1-09* or *PS 2-10* (or one of the standards considered by *CARB* to be equivalent to *PS 1* or *PS 2*) and labeled bond classification Exposure 1 or Exterior.
- Structural wood product manufactured according to *ASTM D 5456* (for structural composite lumber), *ANSI A190.1* (for glued laminated timber), *ASTM D 5055* (for I-joists), *ANSI PRG 320* (for cross-laminated timber), or *PS 20-15* (for finger-jointed lumber).

OR

- Product is inherently nonemitting, salvaged, or reused.

REQUIREMENTS EXPLAINED

Installing low-emitting products can significantly reduce the quantity of indoor air contaminants in buildings. Coupled with adequate ventilation and filtration, specifying and installing low-emitting materials is an important strategy towards improving indoor air quality.

This credit is awarded to projects with permanently installed products that meet established low-emitting criteria. There are multiple pathways for earning credit compliance. In New Construction, product categories are grouped to reflect the significant impact emissions can have from walls, ceiling, and flooring due to the large surface area these categories cover, as well as progress in the market. In the Core and Shell and ID+C rating systems, product categories may be attempted individually, based on project scope.

Identifying and Specifying Low-emitting Products

The easiest way to find products with a VOC emissions evaluation may be to search third-party certification program databases from the qualified third-party certifiers or programs listed on the CDPH website.

Other sources for finding compliant products include online aggregated product databases including Ecomedes[129], the Sustainable Minds® Transparency Catalog™[130], Building Ease[131], and UL SPOT®.[132]

Save certificates for the specified products, ensuring that the specified products and the certificates match. Make note of any certificates expected to expire before the time of purchase. Certification periods that begin after the product’s date of purchase do not demonstrate compliance with the installed product. Track progress towards credit achievement using the LEED materials calculator.

There are international third-party programs and low-emitting third-party standards that can be used for this credit. See the Low-emitting Materials resource document on USGBC’s website.[133]

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[129] “Home page”, ecomedes, (n.d.), https://www.ecomedes.com/.

[130] “Sustainable Minds® Transparency Catalog™”, Sustainable Minds, (2025), https://transparencycatalog.com/.

[131] “Welcome to the BuildingEase Platform”, BuildingEase, (n.d.), https://app.buildingease.com/.

[132] “SPOT® – Sustainable Product Database”, UL Solutions, (2025), https://spot.ul.com/.

[133] “Low-Emitting Materials”, U.S. Green Building Council, (n.d.), https://www.usgbc.org/credits/new-construction-core-and-shell-a-new-construction-retail-new-construction-data-38.

Calculating Product Category Achievement

Project teams can decide how many product categories to attempt to earn points. To achieve one point, the project demonstrates meets or exceeds the threshold for each product category. This can be based on cost, surface area, volume, or number of units, depending upon the measurement methods available for each product category. Project teams can choose different measurement types to measure progress towards achievement if the measurement method is consistent in each product category. For example, a project could use “surface area” to demonstrate achievement of the Flooring category, “number of units” for the furniture category, and “volume” for the Adhesives and Sealants category.

Project teams are advised to set project-achievable category goals and research, specify, and track low- or non-emitting products in those categories according to the low-emitting criteria appropriate for the products. A targeted approach focusing on specific products, or product categories, is likely to be more manageable and successful than amassing documentation for all products in every category and determining attempted categories post-construction. Additionally, aiming for 100% compliance within a category, when possible, may simplify the process by eliminating the need to track individual units.

This credit will be documented by product category using the LEED materials calculator. Note that this calculator is combined with the *MRc4: Building Product Selection and Procurement* calculator. Teams are encouraged to combine submittal reviews and product vetting with the criteria found in both credits to maximize credit achievement and harmonize product selection, specification, and documentation processes.

Except for the overall product exclusions stated in the Requirements, all permanently installed, nonstructural products — within and inclusive of the project's air barrier membrane — must be in the calculation for the attempted categories. These products are expected to impact indoor air quality and can be tested in alignment with the low-emitting criteria. Products installed in parking garages and basements are to be included, as these spaces are occupied by people, even if intermittently.

Product categories which have no applicable products installed (i.e., they are not in the project scope of work) are not eligible to attempt the category.

PAINTS AND COATINGS

This category applies to products covered in *CSI Masterformat 09 90 00 Painting and Coating*. Exterior painting, staining and finish can be excluded. Exterior paint cannot be excluded from the calculation if used indoors. Aerosol products are included. Coatings also includes sealers which are products applied to either block materials from penetrating into or leaching out of a substrate, to prevent subsequent coatings from being absorbed by the substrate, or to prevent harm to subsequent coatings by materials in the substrate (*SCAQMD Rule 1113*).

VOCs in paints and coatings may be ingredients that are included to enhance product performance and shelf life, added by the contractor, or byproducts of the paint drying process. Water-based acrylic latex paints generally have lower VOCs than solvent-based paints. Lime and mineral silicate paints are most likely to be compliant with VOC limits. Paints that are advertised as antimicrobial, recycled, specialty paints (chalk, dry-erase, magnetic), and paints containing alkylphenol ethoxylates (APE) or PFAS may have compliant emissions evaluations, but introduce additional human and/or environmental hazards not addressed by this credit that the project team may wish to consider.

ADHESIVES AND SEALANTS

Common adhesives and sealants used in construction are defined in *SCAQMD Rule 1168*. An adhesive is any substance used to bond one surface to another surface by attachment. A sealant is any material with adhesive properties that is designed to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. Note that sealers are different types of products and are to be categorized as coatings. Aerosol products are also included in this product category for LEED calculation purposes.[134]

FLOORING

In most buildings, the flooring category represents a significant source of indoor emissions due to the large amount of surface area covered in relation to the project. Consider reusing existing floors, where possible. When reuse is not available, solid wood floors, ceramic tiles, cork floors (especially pre-finished without a PVC/vinyl layer), linoleum sheet and tile, are likely to have compliant VOC emissions evaluations, as are many carpet and vinyl flooring products. Evaluate products holistically, like the presence of contaminants or additives like lead in recycled content products, additives included in sealants, and those used for the cleaning of flooring materials.

Other concerns can relate to the project team’s environmental priorities, such as the lack of recovery and circularity options for vinyl products at end of life, or potential toxic emissions released during a product’s production. These additional multi-attribute considerations may not be addressed by product emissions criteria but are considered in the aligned MRc4: Building Product Selection and Procurement.

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[134] United States Environmental Protection Agency, (n.d.), Controlling Pollutants and Sources: Indoor Air Quality Design Tools for Schools, epa.gov/iaq-schools/controlling-pollutants-and-sources-indoor-air-quality-design-tools-schools#WallsandCeilingMaterials.

WALLS

In many buildings, the walls category represents a significant source of indoor emissions from products due to the large surface area. For instance, gypsum wallboard and doors often comprise most of the surface area in this category. Look for compliant gypsum wallboards especially those made with natural gypsum or post-consumer recycled content. As it relates to the *MRc5: Construction and Demolition Waste Diversion*, consider how a project can separate unpainted gypsum wallboard cut-offs for manufacturer take-back and recycling.

CEILINGS

Like the walls category, the ceilings category is likely to be strongly influenced by surface area. See the walls category for notes on gypsum wallboard. Acoustical ceiling systems are also a popular material option and are likely to have compliant VOC emissions evaluation. Be sure to also include ceiling suspension grids/components, noting that powder-coated metal components are most likely to be compliant.

INSULATION

Insulation products with compliant testing typically include both natural and synthetic products. Products include:

- Expanded cork
- Blown-in wood fiber
- Cellulose
- Fiberglass or mineral wool
- Hemp or wood fiber batts and boards
- Unfaced fiberglass batts
- Formaldehyde free mineral wool batts and boards

Plastics and foam insulation products can also meet the emission criteria. Even if products meet the emissions evaluation criteria, they may still include problematic ingredients like formaldehyde and fire retardants. Consider these when selecting products and seek synergies for product optimization with the *MRc4: Building Product Selection and Procurement*.

FURNITURE

The furniture category includes both systems furniture as well as ancillary furniture. Typically, the ability to find compliant furniture will be more available from systems furniture manufacturers, as opposed to free standing or custom furniture. A convenient way to find products with a furniture emissions evaluation is to search product databases that list qualified third-party verified programs and reports. See the Low-Emitting Materials resource document on USGBC's website.

The Business and Institutional Furniture Manufacturers Association (BIFMA) writes standards for furniture safety, ergonomics, and sustainability. Qualifying furniture products in LEED will meet the *ANSI/BIFMA M7.1-2011 (R2021) Standard Test Method* for Determining VOC Emissions from Office Furniture Systems, Components, and Seating. In addition, products must comply with *ANSI/BIFMA e3-2024e Furniture Sustainability Standard*, Section 7.6.2. Laboratories that conduct the tests must be accredited under *ISO/IEC 17025* for the test methods they use.

COMPOSITE WOOD

The composite wood product category includes all particleboard, medium density fiberboard (both medium density and thin), hardwood plywood with veneer, composite or combination core, and wood structural panels or structural wood products. Products in this category must meet the Formaldehyde Emissions Evaluation requirements in the rating system.

Formaldehyde emissions evaluation

The composite wood category typically includes products that adhere to classifications and standards defined by leading industry organizations and frameworks, such as the *CARB* standards, ensuring low formaldehyde emissions and compliance with stringent air quality requirements. *CARB* maintains a list of composite wood mills that have been approved by third-party certifiers[135], and this list can be used to help find and specify compliant composite wood products. Certificates demonstrating a product is certified as NAF or ULEF for products must be from a CARB-approved Third-Party Certifier[136]. The certification period must cover the date of purchase.

Note that this credit does not refer to the minimum requirements of the *CARB 93120 ATCM* or *EPA TSCA Title VI*. It uses the more stringent requirements for ULEF resins or NAF resins as defined in the *CARB ATCM*. These criteria are some of the strongest available for formaldehyde emissions from composite wood. Ensure the certificate confirms this threshold is met.

The CARB composite wood definition includes wood structural panels, structural composite lumber, glued laminated timber, I-joists, cross-laminated timber, and finger-jointed lumber.

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[135] "CARB composite wood mills", CARB, (n.d.), https://ww2.arb.ca.gov/resources/documents/certified-mills-list-january-2-2025.

[136] "CARB-Approved Third-Party Certifier", CARB, (n.d.), https://ww2.arb.ca.gov/resources/documents/carb-approved-third-party-certifiers-executive-orders.

These products are subject to other standards. APA – The Engineered Wood Association website[137] can be used to source compliant products.

Goods containing composite wood components like doors with a composite wood core do not belong in the composite wood category. They are subject to the more comprehensive emissions evaluations of other categories.

VOC Emissions Evaluation Criteria

CDPH Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v.1.2-2017[138] is also known as the emission testing method for California Specification 01350, which is widely recognized as a leadership standard for its stringent scientific criteria and detailed specificity. It uses the chronic reference exposure levels established by the California Office of Environmental Health Hazard Assessment, which include some of the most stringent criteria in use, although they do not account for non-cancer risks.

Compliant products can come from qualified third-party product certifications or from a qualified independent laboratory. See USGBC resource for list of qualifying third-party certifications.

Qualifying independent laboratory reports that are provided by the manufacturer may be used to demonstrate VOC emissions evaluation, although because they are not third-party verified, the project team must confirm all criteria are reported on the report, including:

- Declaration that the product has been tested according to *CDPH Standard Method v1.2-2017* and complies with the VOC limits in Table 4-1 of the method.
- TVOC results at 14 days measured as specified in *CDPH Standard Method v1.2-2017*
- Test date (less than three years from date of purchase).
- The name of the laboratory that performed the evaluation and documentation (such as accreditation number or certificate with scope of accreditation) demonstrating the accreditation under *ISO/IEC 17025* for the test method.
- The modeling scenario used (must be private office unless the product is installed in a classroom).

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[137] "About Us", APA, (n.d.), https://www.apawood.org/about-us.

[138] "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers, version 1.2", Indoor Air Quality Section Environmental Health Laboratory Branch Division of Environmental and Occupational Disease Control, California Department of Public Health, (January 2017), https://www.cdph.ca.gov/programs/ccdphp/deodc/ehlb/iaq/cdph%20document%20library/cdph-iaq_standardmethod_v1_2_2017_ada.pdf.

- For wet-applied products, the amount of product applied in mass per surface area (during testing).

Inherently Non-emitting Criteria

Inherently non-emitting products are building materials that, owing to their composition or use in construction, do not emit VOCs and therefore do not require an emissions evaluation. Products that are inherently non-emitting include stone, ceramic, powder-coated metals, plated or anodized metal, and unfinished or untreated solid wood. For the purposes of this credit, untreated and unfinished solid wood (not engineered wood) can also be considered non-emitting even though such materials will likely emit some amount of formaldehyde naturally. Ceramic and powder-coated metals meet the criteria for being inherently non-emitting when their manufacturing processes result in chemically stable and inert surfaces that do not release VOCs into the environment after production. These materials are compliant without any VOC emissions testing if they do not include additives, surface coatings, binders, or sealants, as such products would emit VOCs.

If a product applied to the inherently non-emitting material has a separate manufacturer and cost to the end-user from the original material, the applied product may be documented as a separate product subject to the applicable low-emitting criteria, even if applied off-site.

If a product applied to the inherently non-emitting material does not have a separate manufacturer and cost to the end-user, the result is considered a new finished product that no longer qualifies as an inherently non-emitting material and is subject to the applicable low-emitting criteria.

Salvaged or Reused Materials Criteria

Products that are salvaged and reused and more than one year old will automatically comply with the VOC emission evaluation and do not require emissions evaluations. For salvaged or reused composite wood products, project teams must account for any off-site applied finishes or treatments in the composite wood category. These must comply with the VOC emissions evaluation criteria to ensure comprehensive assessment of the product’s total environmental impact.

Some salvaged or reused materials will have products applied to them (such as sealants or finishes). For instance:

- If a product is applied to the salvaged or reused material and has a separate manufacturer and cost to the end-user from the original material, the applied product may be documented as a separate product subject to the applicable low-emitting criteria, even if applied off-site.
- If a product is applied to the salvaged or reused material but does not have a separate manufacturer and cost to the end-user, the result is considered a new finished product that no longer qualifies as a salvaged or reused material and is subject to the applicable low-emitting criteria.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	Path 1. Achieve Paints and Coatings, Flooring, and Ceilings	Provide documentation for every product in the calculator that meets Low Emitting Materials criteria. Complete the USGBC material calculator.
	All	Path 2. Achieve Path 1 plus any two: Adhesive and Sealants, Walls, Insulation, and Composite Wood	Provide documentation for every product in the calculator that meets Low Emitting Materials criteria. Complete the USGBC material calculator.
	All	Path 3. Achieve Path 1 plus Furniture	Provide documentation for every product in the calculator that meets Low Emitting Materials criteria. Complete the USGBC material calculator.

REFERENCED STANDARDS

- CDPH Standard Method v1.2 (cdph.ca.gov/programs/ccdphp/deodc/ehlb/iaq/cdph%20document%20library/cdph-iaq_standardmethod_v1_2_2017_ada.pdf)
- ANSI/BIFMA Standard M7.1, etc. (bifma.org)
- SCAQMD Rule 1113 (aqmd.gov/home)
- SCAQMD Rule 1168 (aqmd.gov/home)
- CARB ATCM 93120 (arb.ca.gov)
- EPA TSCA Title VI (epa.gov/formaldehyde/formaldehyde-emission-standards-composite-wood-products)
- ASTM D5456, 5055 (astm.org)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Materials and Resources Credit

BUILDING PRODUCT SELECTION AND PROCUREMENT

MRc4

New Construction (1–5 points)
Core and Shell (1–5 points)

INTENT

To encourage the use of products and materials that have sustainability information available and that have environmentally, economically, and socially preferable impacts in alignment with industry momentum. To reward project teams for selecting products from manufacturers who have disclosed sustainability information about their products and optimized their products across multiple criteria areas.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–5
Product Categories	1–5

Select nonstructural building products that demonstrate achievement in one or more of five criteria areas:

- Climate health
- Human health
- Ecosystem health
- Social health and equity
- Circular economy

Products that achieve two or more criteria areas are considered multi-attribute. Products that achieve higher levels of use and/or that are across additional criteria areas will be given a higher value in credit calculations.

Achievement is demonstrated through eligible compliant manufacturer product documentation, which includes third-party product certifications, ecolabels, declarations, and standards. A single product document can demonstrate multiple benefits and/or achievement levels, or the product can earn multi-attribute criteria through a combination of separate eligible product documents.

There are three achievement levels for products:

- **Level 1**: A product in this level achieves a first step toward sustainability for a criteria area. Widespread achievement of these practices drive market transformation toward sustainability outcomes within the criteria area. Products scored at this level earn a 1x multiplier.
- **Level 2**: This level represents a leadership position in the marketplace for a given sustainability attribute. Products at this level are optimized and demonstrate a level of sustainability that peers aspire to achieve. Products scored at this level earn a 2x multiplier.
- **Level 3**: Products that earn this level are elite and represent the forefront of sustainability. Products scored at this level earn a 3x multiplier.

This credit rewards the selection of eligible interior and enclosure materials from the following product categories:

- Paints and coatings
- Adhesives and sealants
- Flooring
- Walls
- Ceilings
- Insulation
- Furniture
- Composite wood
- Plumbing fixtures

Eligible products meet the achievement levels and are scored as 1, 2, or 3. These scores are added across criteria areas to add up to a maximum score of 5 per product. This cumulative score is called the product “multi-attribute score.”

Each individual product’s value (cost, area, volume, or unit) is adjusted based on its multi-attribute score:

$$\text{Product value} \times \text{Multi-attribute score} = \text{Adjusted product value for LEED}$$

To determine total compliant product value per category, follow Equation 1.

Equation 1. Calculate the multi-attribute adjusted value of a product category

$$Product\ category\ adjusted\ value\ for\ LEED = 100 \times \frac{\begin{pmatrix}Product\ A\ multi\text{-}attribute\ score\ \times \\ Product\ A\ value\end{pmatrix} + \begin{pmatrix}Product\ B\ multi\text{-}attribute\ score\ \times \\ Product\ B\ value\end{pmatrix} + \begin{pmatrix}Product\ C\ multi\text{-}attribute\ score\ \times \\ Product\ C\ value\end{pmatrix} + \begin{pmatrix}Product\ D\ multi\text{-}attribute\ score\ \times \\ Product\ D\ value\end{pmatrix}}{(Total\ value\ of\ all\ products\ in\ the\ product\ category)}$$

Any product category adjusted value for LEED that exceeds 100% earns 1 point. Points are awarded for achievement of whole product categories, up to a maximum of 5 points according to Table 1.

Table 1. Points for multi-attribute achievement of product categories

Number of product categories	Points
1 product category	1
2 product categories	2
3 product categories	3
4 product categories	4
5 product categories	5

NOTE: Please see the resources section of the credit library for additional details on this credit.

REQUIREMENTS EXPLAINED

This credit incentivizes projects to prioritize more environmentally responsible materials and choose products with multiple eco-friendly attributes. It focuses on finish materials, such as paints, coatings, flooring, and walls, and considers their impact on the overall environmental performance of the project.

Some structure, enclosure, and hardscape materials are not included in this credit, but are addressed in the embodied carbon credits including *MRp2: Quantify and Assess Embodied Carbon* and *MRc2: Reduce Embodied Carbon*. Other materials can earn rewards for multi-attribute considerations within the Project Priorities library.

In this credit, products are evaluated based on how they perform according to five criteria areas: climate health, human health, ecosystem health, social health and equity, and circular economy. Within each criteria area, there are three achievement levels that products can meet. Evaluation will be based on how products demonstrate achievement in each of the criteria areas with respect to the three levels. A product that reaches achievement levels in multiple criteria areas is considered a multi-attribute product and will earn a higher value within this credit.

Selecting Building Products

The goal is to recognize products that are optimized across multiple attributes, including promoting human and environmental health, supporting regenerative sourcing practices, and fostering a circular economy. These criteria areas are meant to align with the impact areas in the *Mindful Materials Common Materials Framework* (CMF) and the *AIA Architecture and Design (A&D) Materials Pledge*.

The AIA A&D Materials Pledge[139] provides a framework to encourage the use of building materials that prioritize sustainability throughout their lifecycle, including aspects like green chemistry, responsible sourcing, and end-of-life management. The Mindful Materials Common Materials Framework (CMF)[140] standardizes product evaluations, emphasizing environmental and health impacts. AIA has also introduced reporting requirements, while the CMF is expanding its focus to include data integration and related advancements. Both initiatives aim to enhance transparency and optimization in building materials, functioning independently of specific certifications by providing a structured framework that allows various standards to align with key impact areas. The five criteria areas help connect different ecolabels, offering a consistent and holistic approach to material evaluation, where certifications are scored based on disclosure, verification, and optimization, among other criteria.

Product Categories

To achieve a point, the project must demonstrate they meet or exceed the threshold for each product category. This can be based on cost, surface area, volume, or number of units, depending upon the measurement methods available for each product category. Project teams can choose different measurement types to measure progress towards achievement as long as the measurement method is consistent in each product category. For example, a project could use “surface area” to demonstrate achievement of the flooring category, “number of units” for the furniture category, and “volume” for the adhesives and sealants category.

This credit will be documented by product category using the LEED materials calculator. This calculator is combined with the *MRc3: Low-Emitting Materials* calculator. Teams are encouraged to combine submittal reviews and product vetting with the criteria found in both credits to maximize credit achievement and harmonize product selection, specification, and documentation processes.

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[139] *Materials Pledge | AIA*, (n.d.), aia.org/design-excellence/climate-action/zero-carbon/materials-pledge.

[140] *mindful MATERIALS CMF Reference Guide*, (n.d.), Mindful MATERIALS, mindfulmaterials.com/cmf-reference-guide.

PRODUCT MULTIPLIERS

Multipliers are awarded for products that earn any level of achievement in one or more criteria areas. A product does not have to be multi-attribute (meet achievement levels in multiple criteria areas) to have a multiplier. Products that achieve a first step towards sustainability for a criteria area are categorized as Level 1 and will receive a 1x multiplier. Products in Level 2 represent a leadership position in the marketplace for a given sustainability attribute and will receive a 2x multiplier. Products in Level 3 are elite and represent the forefront of sustainability and will receive a 3x multiplier. These scores are added across criteria areas to add up to a maximum score of five per product. This value is called the multi-attribute score for the product.

MULTI-ATTRIBUTE SCORING OF PRODUCTS

Product documentation provided by manufacturers will be eligible for reward in this credit. The documentation must meet the USGBC-approved list of eligible product documentation. Individual products selected for compliance with *MRc4: Building Product Selection and Procurement* credit may have more than one eligible product documentation. Multiple document scores can be added together for a combined multi-attribute score for that product, but only the highest value in each criteria area will be awarded (double counting is not allowed).

MULTI-ATTRIBUTE ADJUSTED VALUE

Each eligible product earns a multi-attribute score (MAS) based on its level of achievement in each criteria area. The MAS is multiplied by the product's value to find each product's adjusted product value for LEED. In a single product category, each eligible product's adjusted value is added together and divided by the total unadjusted value of all products in the product category. This value is the Product Category Adjusted Value for LEED. This value is how to determine credit achievement. Any product category adjusted value for LEED that exceeds 100% earns one point.

Equation 2. Calculating product category adjusted value

$$\mathit{Product\ category\ adjusted\ value\ for\ LEED} = 100 \times \frac{\begin{pmatrix}\mathit{Product\ A\ multi{-}attribute\ score} \times \\ \mathit{Product\ A\ value}\end{pmatrix} + \begin{pmatrix}\mathit{Product\ B\ multi{-}attribute\ score} \times \\ \mathit{Product\ B\ value}\end{pmatrix}}{(\mathit{Total\ value\ of\ all\ products\ in\ the\ product\ category})}$$

NUMBER OF PRODUCT CATEGORIES

There are a total of nine product categories to consider, which include paints and coatings, adhesives and sealants, flooring, walls, ceilings, insulation, furniture, composite wood, and plumbing fixtures. Projects may earn one point for each category up to a maximum of five product categories.

Projects can earn points based on the number of categories in which they select eligible materials that meet the required criteria. Nonstructural products that do not clearly align with one of the product categories listed below may still be eligible to be included for assessment. This credit is designed to offer flexibility in evaluating different product types that fall outside the nine listed categories. This tiered point system incentivizes broader and deeper integration of sustainable materials across multiple categories, encouraging projects to enhance their overall environmental performance by incorporating products that support health, sustainability, and reduced environmental impact. Table 2 lists the product categories and some examples of products found within the categories.

Table 2. Product categories and example of products

Product categories	**Description and example of products**
Paints and coatings	Paints and coatings are materials applied to surfaces for protection and decoration. Coatings are generally chosen for their enhanced protective properties and functional capabilities, whereas paints are chosen for their aesthetic appeal. Examples of products: • Primers • Sealers • Topcoats • Specialized dyes • Specialized sealers • Specialized hardeners • Specialized toppings for concrete floors • Plasters
Adhesives and sealants	Adhesives and sealants are substances used to bond two materials together and are widely used in construction, manufacturing, and various other industries. The main difference is that adhesives are focused on creating strong bonds between surfaces, while sealants are designed to fill gaps and prevent the infiltration or leakage of fluids, gases, or other substances. Examples of products: • Wood bonding adhesive • Tile bonding adhesive • Carpet bonding adhesive • Sealants for joints and gaps in walls, floors, and ceilings • Specialty adhesives for flooring • Specialty adhesives for panel • Sealants for HVAC system

Product categories	Description and example of products
Flooring	Flooring are materials used to cover the ground surface of a building or structure to provide a functional walking surface for building users. The flooring product category encompasses a wide range of materials, including both hard and soft surface finishes. Examples of products: • Carpet • Ceramic tile • Vinyl flooring • Rubber flooring • Engineered wood flooring • Solid wood flooring • Stone flooring • Terrazzo flooring • Laminates flooring • Raised flooring systems • Wall base • Transition strips • Stair nosing • Entryway systems • Area rugs • Wood and composite wood subflooring • Underlayment • Other types of floor coverings
Walls	Wall products are designed to provide crucial functions within a building and refer to materials and finishes used to provide structural support, insulation and protection within a building. It also helps regulate indoor temperatures and maintain comfort levels by reducing heat transfer between the indoor and outdoor environments. Wall serves as barriers for protection against sound, fire and moisture. Examples of products: • Wall coverings • Wall paneling • Wall tile • Surface wall structures e.g., gypsum wall board or plaster • Cubicle wall • Curtain wall • Partition walls • Trim • Interior and exterior doors • Wall frames • Interior and exterior windows • Window treatments
Ceilings	Ceiling products are materials and systems used to construct, finish, or enhance the ceilings of a building. Ceilings play a key role in acoustics, lighting, insulation, and the overall functionality of a space.

Product categories	Description and example of products
	Examples of products: • Ceiling panels • Ceiling tile • Surface ceiling structures e.g., gypsum or plaster • Suspended or drop ceiling systems e.g., grid systems, canopies and clouds • Glazed skylights
Insulation	Insulation is any type of material that provides a barrier within the walls, ceilings, and floors of a home and helps regulate temperature and noise.[141] It plays an important role in heat transfer and maintaining indoor temperatures in buildings by providing thermal resistance. Examples of products: • Thermal and acoustic boards • Batt Insulation • Roll Insulation • Blanket Insulation • Sound attention fire blankets • Foamed-in place insulation • Loose-fill insulation • Blown insulation • Sprayed insulation
Furniture	Furniture refers to movable objects that support various human activities, such as seating, eating, sleeping, and storing items. Furniture is both functional and decorative, playing a significant role in the design and use of interior spaces. It can be made from a variety of materials, including wood, metal, plastic, glass, and fabric, and comes in many styles, shapes, and sizes to suit different needs and tastes. Examples of products: • Seating • Desks • Tables • Filing/storage • Free-standing cabinetry • Systems furniture • Partitions • Bathroom partitions • Shelving • Lockers • Specialty and custom fixtures • Furniture furnishing

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[141] *Powering today, Transforming tomorrow,* (n.d.), The Department of Energy's Energy.gov, energy.gov/.

Product categories	Description and example of products
Composite wood	Composite wood is engineered wood products that are made by combining wood fibers, particles, or veneers with adhesives or resins to create a material that is often used in place of solid wood. Examples of products: • Particleboard • Medium density fiberboard • Hardwood plywood with veneer • Composite or combination core • Wood structural panels or structural wood products
Plumbing fixtures	A plumbing fixture is connected to the plumbing system and is designed to deliver and drain water. Examples of products: • Water closets • Urinals • Lavatory and kitchen faucets • Showerheads

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Product categories	All	USGBC material calculator.
			Provide documentation for every product in the calculator that meets BPSP criteria.
			Confirmation that all products were installed, and that all relevant products in the category were included in calculations.

REFERENCED STANDARDS

- AIA A&D Materials Pledge (aia.org/design-excellence/climate-action/zero-carbon/materials-pledge)
- Mindful Materials CMF (mindfulmaterials.com)

Impact Area Alignment

☑ Decarbonization

— Quality of Life

☑ Ecological Conservation and Restoration

Materials and Resources Credit

CONSTRUCTION AND DEMOLITION WASTE DIVERSION

MRc5

New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To reduce construction and demolition waste disposed of in landfills and incineration facilities and pollution to the environment. To reduce the environmental impacts and embodied carbon of manufacturing new materials and products. To delay the need for new landfill facilities that are often located in frontline communities. To create green jobs and materials markets for building construction services.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Construction and Demolition Materials Management Plan	
AND	
Diversion	1–2

Comply with the following requirements:

Construction and Demolition Materials Management Plan

Develop and implement a construction and demolition (C&D) materials management plan and achieve points through diversion and recycling.

AND

Diversion (1–2 points)

Follow the materials management plan and provide a final waste management report detailing all waste generated, including disposal and diversion rates for the project. Calculations can be by weight or volume but must be consistent throughout. Points are awarded according to Table 1.

Divert C&D waste materials by employing strategies including off-site salvage, source-separation for single-material recycling, mixed C&D recycling, and industry/manufacturer take-back programs.

- Source-separated materials are considered 100% diverted for credit calculation purposes. These include:
    - Recovered materials sent to a single-material recycler.
    - Recovered materials sent for off-site salvage/reuse.
    - Materials sent to a qualifying manufacturer or industry take-back program.
    - Salvaged materials, which are valued at twice the diversion rate (200%) of other diverted materials for credit calculation purposes. Salvaged materials include recovered materials sent off-site for reuse.
      NOTE: Materials reused on-site contribute to *MRc1: Building and Materials Reuse*.
- Mixed C&D materials sent to a processing facility for recovery must take the facility average recycling rate. Recycling rates not verified by a third party must assume a maximum of 35% diversion rate.
- Materials destined for alternative daily cover or incineration/energy recovery are considered waste (0% diverted).
- Exclude hazardous waste from calculations. Exclude on-site reuse from credit calculations (include in *MRc1: Building and Materials Reuse*).
- Exclude excavated soil and land-clearing debris from calculations.

Table 1. Points for C&D diversion

Thresholds	**Points**
Divert at least 50% of the total construction and demolition material At least 10% of diverted materials must be salvaged or source-separated and sent to single-material recycler(s)	1
Divert at least 75% of the total construction and demolition material At least 25% of the total diverted materials must be salvaged or source-separated and sent to single-material recycler(s)	2

> **Core and Shell only**
> Include the building's approved construction and demolition waste management plan in the tenant guidelines.

REQUIREMENTS EXPLAINED

This credit encourages projects to plan and make design changes that reduce waste during construction. It rewards behavior change that leads to increased quality of recycling and a higher potential for materials to be recovered during construction.

Construction and Demolition Materials Management Plan

Creating the construction and demolition material management plan early in the design phase allows sufficient time for planning and coordination, identifying effective strategies, and establishing contractual agreements to maximize waste prevention and diversion. It also educates project teams, construction site workers, and waste haulers on the importance of following the plan for diverting materials from landfills and incinerators successfully. The salvage assessment featured in the *MRc1: Building and Materials Reuse* is also useful to identify materials that can be diverted off-site to reuse markets. A well-structured plan can minimize costs and maximize returns by lowering disposal costs, recovering value from scrap materials, and identifying materials for reuse.

General contractors are required to develop a customized C&D material management plan for the deconstruction/demolition and construction phases. This plan should begin in the project design phase prior to construction. The plan must include a summary of materials targeted for diversion from landfills or incineration, and identify recycling haulers, single-material recycling facilities, mixed C&D processing facilities, data collection, and reporting procedures. Teams must indicate in the plan whether the selected recycling facilities that process mixed C&D materials have third-party verification of their recycling rates. Recycling rates not verified by a third-party must assume a maximum of 35% diversion rate. The 35% cap serves as a baseline assumption for mixed-material facilities without verification, reflecting an approximate average recycling rate for facilities in the U.S. If the project team uses a recycling facility for which recycling rates have been independently certified by an approved third-party process, such as the Recycling Certification Institute, then the project team can use the verified recycling rate. This third-party verification of recycling rates provides assurance that diversion rates are accurate and that materials are being diverted from the landfill.

The plan must also include strategies targeted to reduce the total amount of waste generated during construction, renovation, or demolition activities.

Diversion

WASTE TRACKING

Teams are required to develop a method for tracking the amount of all waste and recyclable materials generated during demolition activities. Web-based tools can provide contractors with an easy, step-by-step process for electronically tracking and submitting waste management and recycling plans. Electronic tracking can also save time and money by identifying materials that can be recycled, locating the nearest recycling facilities, following recycling progress in real time, gathering comprehensive statistics, and creating reports regarding waste generation and recycling for projects. Waste tracking systems can also identify opportunities for recycling, off-site reuse, and salvage. Examples of waste tracking software include Green Halo, Waste Management's Diversion and Recycling Tracking Tool (DART), SmartWaste, and Enviance.

DIVERSION RATE

Project teams are required to calculate total waste generated and diverted to determine the C&D waste diversion rate. Contractors are recommended to keep all tickets/paperwork in a safe location (if not online) and track the diversion rate periodically (e.g., monthly or bimonthly) so that adjustments can be made to meet diversion goals. Teams must ensure that calculations for all materials are done by weight. Many waste management facilities use scales to weigh loads of materials as they enter and exit the site. However, not all facilities have scales available. In such cases, a volume-based calculation is used instead. When a facility does not have scales, use a volume-to-weight conversion factor if volume is provided. If local conversion rates are not available, projects may use national averages, such as those found in Table 2.

Table 2. Default volume to weight conversion factors for common C&D waste

Construction and Demolition (C&D) materials	
Asphalt paving (with or without rebar)	1 cubic yard = 773 lbs
Concrete (with or without rebar)	1 cubic yard = 860 lbs
Gypsum Board	1 cubic yard = 467 lbs
Wood	1 cubic yard = 169-268 lbs
Metal	1 cubic yard = 143-225 lbs
Roofing	1 cubic yard = 731-860 lbs.
Mixed C&D (Bulk)	1 cubic yard = 484 lbs
Aggregate (rock)	1 cubic yard = 999 lbs
Cardboard (flat)	1 cubic yard = 106 lbs
Cardboard (baled)	1 cubic yard = 700-1100 lbs

SOURCE: U.S. Environmental Protection Agency Volume-to-Weight Conversion Factors, April 2016

Excluding ADC

All materials that are recycled, salvaged, reused, or donated are included in the project's diversion rate. However, projects must exclude certain materials from the diversion total while still accounting for them in the total C&D waste calculations. Specifically, alternative daily cover cannot be counted as diverted waste because it's a disposal method rather than a true form of recycling, as the material is used for landfill operations rather than being repurposed into new products. To obtain ADC values from a mixed recycling or certified facility, request detailed documentation of material processing and their average ADC rates per month. If they do not have the ADC rates monthly, then quarterly, semi-annual, or annual rates are acceptable.

Hazardous waste, land-clearing debris, soil, and landscaping materials must be excluded from diversion totals. Soil is excluded because clean soil is rarely landfilled due to its high cost and other suitable uses, which could skew results, while contaminated soil is typically classified as hazardous and managed under strict regulations, often requiring specialized disposal. Similarly, land-clearing debris, such as rocks and trees, is generally not landfilled due to its weight and is commonly diverted. Hazardous waste must follow regulatory guidelines for safe handling, disposal in lined landfills, or destruction to prevent environmental harm. This includes proper identification, labeling, and containment of hazardous materials, as well as transportation by certified handlers to facilities equipped to manage such waste.

Equation 1. Diversion rate

$$Diversion\ rate = \frac{Total\ waste\ diverted\ from\ landfill}{Total\ waste\ produced\ by\ project} \times 100$$

SOURCE-SEPARATED MATERIAL

Project teams must identify materials that will be diverted from landfill and incineration facilities. Common C&D waste materials include concrete, metals, brick, wood, and cardboard. Depending on the project's scope of work, additional sources may include carpet, ceilings, gypsum board, and furniture.

The project must account for source separation or salvage as a percentage of the total diversion in the achievement thresholds. This represents a percentage of the overall diversion amount for the project and is not in addition to the overall diversion rate.

Teams should target source separation where each homogeneous material is collected and sent to a specific recycling facility (or is sent for reuse). Source-separated materials in this way are not mixed with other materials, significantly reducing the contamination in recycling streams and leading to higher diversion rates overall for those recovered materials. Source separation involves segregating recyclable materials from mixed waste at the point of generation. This practice involves sorting materials such as metals, wood, and concrete directly at the construction or demolition site before they are commingled in a central recycling area or bin. Contractors should consider setting up dedicated areas on construction sites and clearly label and monitor bins for each source separated material to ensure proper collection. Teams are encouraged to prioritize the source separation of materials like carpet, ceiling tiles, gypsum board, and furniture. While these materials may not be specifically targeted, their significant environmental impacts make their diversion particularly important for reducing overall environmental harm.

SALVAGING MATERIALS

Successful salvaging begins with careful planning and requires a thorough audit of the existing materials and structures to identify which materials can be reclaimed. It is recommended to conduct an early salvage assessment during building design to determine which tools and methods will be most valuable and effective for removal and preservation.

Projects that salvage materials offsite must send materials from the job to legitimate offsite salvage and reuse vendors or markets. Destinations must be locations that either directly reuse the materials or place them into a marketplace for distribution, sale, or reuse. Materials must not be stockpiled without the intention of being cycled back into use. Stockpile locations are acceptable only if they actively work to move materials through reuse cycles and provide documentation detailing what actions will be taken if the materials remain unused for an extended period. Even with best intentions, some salvaged materials do not find a home in a new project for various reasons and ultimately get recycled or disposed. This entropy of salvaged materials is acceptable so long as the majority of materials sent for salvage are intended to remain in circulation.

MIXED C&D MATERIALS

Mixed C&D materials, or commingled waste is recyclable material mixed in a single container that is sorted and processed at an off-site recycling facility.

Projects must obtain diversion rates from each commingled or mixed waste processing facility used. Facilities must operate legally and be regulated by state and local authorities. However, these authorities may not oversee diversion rates or the reporting of such rates, hence the need for certifications like Recycling Certification (RCI) or equivalent (as determined by USGBC) to ensure accurate tracking and reporting of diversion rates. Project teams are encouraged to use facilities verified by an approved third-party to achieve higher diversion rates. Facilities whose recycling rates are not third-party verified can only claim a maximum diversion rate of 35%.

Certified recycling facilities

Projects must use a recycling facility that processes and recycles commingled (mixed) construction and demolition waste materials that have received independent third-party certification of their recycling rates. Qualified third-party organizations who certify facility average recycling rates include these minimum program requirements:

- The certification organization follows guidelines for environmental claims and third-party oversight, including *ISO/IEC 17065* and relevant portions of the *ISO 14000* family of standards.
- The certification organization is an independent third-party who continuously monitors certified facilities to ensure that they are operating legally and meeting the minimum program requirements for facility certification and recycling rates.

- Certification organizations shall certify to a protocol that was developed on a consensus basis for recycling facility diversion rates that is not in a draft or pilot program.

The methodology for calculating facility recycling rates:

- Must be developed with construction and demolition recycling industry stakeholders and be specific to the construction and demolition recycling industry;
- Must include a methodology that is applicable across broad regions (i.e., nationally); and,
- Must refer to a published and publicly available standard.

Data submitted by the facilities to the certification organization in support of the recycling rate is audited. At a minimum, the audit includes the evaluation of recyclable sales records, verification of facility sales into commodity markets, an assessment of downstream materials and how these materials are managed after they leave the site, monitoring off-site movement of materials, and a review of the facility's customers' weight tags information.

- Facilities submit data to the certification organization that supports the recycling rate, such as a mass balance recycling rate (tons in/tons out) for a 12-month period, or quarterly sorts completed and verified by an independent third-party entity.
- Breakdown of materials (by type and by weight), including analysis of supporting data relating to amounts (in tons) and types of materials received and processed at the facility.
- At a minimum, the third-party certifying organization conducts an on-site visit of the facility for the first-year certification, with subsequent site visits occurring at least once every two years, unless additional visits are deemed necessary by the certification organization. The site visit will:
    - Examine how materials enter, are measured, deposited, processed/sorted, and exit facility.
    - Conduct interviews with key personnel and discuss how materials are managed after they leave the site.
    - Confirm equipment types and capacity.
    - Observe and verify load/materials sorting and accuracy.
    - Verify use and accuracy of scales including calibration frequency.

- Diversion rates shall adhere to these requirements:

    - Measurements must be based on weight (not volume), using scales.
    - Diversion rates must be available on a website and viewable by the general public.

    - Methodology for calculating diversion and recycling rates must be publicly available and applicable to national or country-level accounting standards for construction and demolition waste recycling facilities.

Facility recycling data submitted to certification program will be analyzed for recycling rates using a mass balance formula or quarterly sorts completed and verified by an independent third-party entity.

Final recycling rate will include overall facility diversion rates with and without ADC/Beneficial Reuse and will include separate recycling rates by material type as well as combined average including wood derived fuel/biofuel separate from other waste to energy or incineration end markets.

Project Type Variations

For projects with incomplete or speculative spaces, the building owner must commit to preserving the approved C&D waste management plan and applying it during future phases of construction to ensure consistency in waste reduction efforts. Additionally, they may pursue certification under LEED AP Interior Design + Construction (LEED AP ID+C) for the unfinished spaces, which promotes sustainable practices such as material reuse, recycling, and overall resource efficiency.

For projects with incomplete or speculative spaces completed by the tenant, project teams must include the building's approved C&D waste management plan in the Tenant Guidelines, serving as a best-practice example to guide tenants in managing their own construction or fit-out activities. This inclusion not only promotes uniformity in waste management practices but also encourages tenants to adopt sustainable strategies that align with the broader environmental goals of the building.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Construction and Demolition Materials Management Plan	All	Provide the Construction and Demolition Materials Management Plan.
	Diversion		Provide the C&D Waste Diversion calculator.
			Summary of waste tickets and confirmation that the numbers reported correspond to all the tickets for the project.
			Confirmation that ADC is excluded from diverted waste calculations (but is included in total construction and demolition waste generated calculations).
			Upload documentation with the facility average diversion rate of any mixed C&D materials sent to a processing facility. For those projects sending mixed C&D materials to a processing facility that has third party verified recycling rates, include proof of the third-party recycling rate and facility certification through an approved program.

REFERENCED STANDARDS

- EPA volume to weight conversion factors (epa.gov/smm/volume-weight-conversion-factors-solid-waste)
- RCI (recyclingcertification.org)
- TRUE diversion criteria (true.gbci.org/true-diversion-data-additional-guidance)

INDOOR ENVIRONMENTAL QUALITY (EQ)

OVERVIEW

Buildings are more than shelters — they offer stable environments with the power to enable human activities, foster health, and cultivate safety and comfort. Through the Indoor Environmental Quality (EQ) credit category, LEED v5 offers a framework to create places where more people can thrive. The rating system includes established practices for air quality, thermal comfort, daylight and views, and acoustics and incorporates holistic design considerations such as biophilia, accessibility, adaptability and responsiveness. Using these strategies, project teams can develop buildings that welcome and care for all occupants more effectively, adapt to changing conditions, and drive long-term value.

Decarbonization
Decarbonization is integral for creating a more stable and predictable climate as well as lasting social and economic value. The reduction in fossil fuel use from energy efficiency and renewable energy measures has the co-benefit of improved air quality, especially in neighborhoods close to sources like power plants and highways. Through an integrative design process and collaborative planning, project teams can create spaces that are energy and resource-efficient, and human-centric.

Quality of life
Human-centric design is interwoven throughout EQ, fostering diverse environments that enhance occupant well-being, improve health outcomes, and create more memorable, delightful spaces. LEED v5 builds on established approaches and advances new, innovative pathways to address a broader range of human experiences and bolster occupants' quality of life.

Good indoor air quality is a cornerstone of the EQ credit category. LEED v5 offers best practices for responding and adapting to regular or episodic indoor and outdoor air pollution, to reduce exposures and protect the health of occupants. Key methods to achieve that goal include improved filtration (*EQp2: Fundamental Air Quality*), designing management modes for wildfire smoke or respiratory diseases (*EQc4: Resilient Spaces*), and testing and monitoring air quality (*EQc5: Air Quality Testing and Monitoring*).

EQ credits provide additional options to support the well-being of workers and building users, including older adults and children, caregivers, and people with disabilities. For example, *EQc3: Accessibility and Inclusion* encourages careful design with best practices for physiological and neurological inclusivity, while *EQp1: Construction Management* outlines comprehensive construction management practices to reduce construction workers' exposure to harmful pollutants and extreme heat. Through these and other strategies, occupants benefit from better health and cognitive outcomes, and increased levels of comfort and satisfaction.

Together, EQ credits and prerequisites help indoor spaces remain conducive to health and well-being even during adverse conditions.

Ecosystem conservation and restoration

Finally, the EQ category emphasizes the importance of dynamic spaces that foster emotional connections between people and their environments. With credit strategies that enhance access to high-quality daylight, views, and biophilic design, EQ credits incentivize ecological placemaking. Aligning building systems with natural environmental patterns, for example, through lighting or thermal patterns, can contribute to a positive occupant experience while also improving building efficiency (*EQc2: Occupant Experience*).

EQ prerequisites and credits empower project owners, occupants, and the building community to create buildings where occupants can experience a sense of belonging and stewardship toward their built environment, community, and natural world.

CROSS-CUTTING ISSUES

Floor area calculations and floor plans

For many of the credits in the EQ category, compliance is based on the percentage of floor area that meets the credit requirements. In general, floor areas and space categorization should be consistent across EQ credits. Any excluded spaces or discrepancies in floor area values should be explained and highlighted in the documentation. See Space Categorization below for additional information on which floor area should be included in which credits.

Space categorization

The EQ category focuses on the interaction between the occupants of the building and the indoor spaces in which they spend their time. For this reason, it is important to identify which spaces are used by the occupants, including any visitors (transients), and what activities they perform in each space. Depending on the space categorization, the credit requirements may or may not apply (Table 1).

Occupied versus unoccupied space

All spaces in a building must be categorized as either occupied or unoccupied. Occupied spaces are enclosed areas intended for human activities. Unoccupied spaces are places intended primarily for other purposes; they are occupied only occasionally and for short periods of time. In other words, they are inactive areas. Examples of spaces that are typically unoccupied include the following:

- Mechanical and electrical rooms
- Egress stairway or dedicated emergency exit corridor
- Closets in a residence (but a walk-in closet is occupied)
- Data center floor area, including a raised floor area
- Inactive storage area in a warehouse or distribution center

For areas with equipment retrieval, the space is unoccupied only if the retrieval is occasional.

Regularly versus nonregularly occupied spaces

Occupied spaces are further classified as regularly occupied or nonregularly occupied, based on the duration of the occupancy. Regularly occupied spaces are enclosed areas where people normally spend time, defined as more than one hour of continuous occupancy per person per day, on average. The occupants may be seated or standing as they work, study, or perform other activities.

For spaces that are not used daily, the classification should be based on the time a typical occupant spends in the space when it is in use. For example, a computer workstation may be largely vacant throughout the month, but when it is occupied, a worker spends 1-5 hours there. It would then be considered regularly occupied because that length of time is sufficient to affect the person’s well-being, and they would have an expectation of thermal comfort and control over the environment.

Occupied spaces that do not meet the definition of regularly occupied are nonregularly occupied, areas that people pass through, or areas used an average of less than one hour per person per day.

Examples of regularly occupied spaces include the following:

- Airplane hangar
- Auditorium
- Auto service bay
- Bank teller station
- Conference room
- Correctional facility cell or day room
- Data center network operations center
- Data center security operations center

- Dorm room
- Exhibition hall
- Facilities staff office
- Facilities staff workstation
- Food service facility dining area
- Food service facility kitchen area
- Gymnasium
- Hospital autopsy and morgue
- Hospital critical-care area
- Hospital dialysis and infusion area
- Hospital exam room
- Hospital waiting room
- Hospital diagnostic and treatment area
- Hospital laboratory
- Hospital nursing station
- Hospital operating room
- Hospital patient room
- Hospital recovery area
- Hospital staff room
- Hospital surgical suite
- Hospital solarium
- Hospital waiting room
- Hotel front desk
- Hotel guest room
- Hotel housekeeping area
- Hotel lobby
- Information desk
- Meeting room
- Natatorium
- Open-office workstation
- Private office
- Reception desk
- Residential bedroom
- Residential dining room
- Residential kitchen
- Residential living room
- Residential office, den, workroom

- Retail merchandise area and associated circulation
- Retail sales transaction area
- School classroom
- School media center
- School student activity room
- School study hall
- Shipping and receiving office
- Study carrel
- Warehouse materials-handling area

Examples of nonregularly occupied spaces include the following:

- Break room
- Circulation space
- Copy room
- Corridor
- Fire station apparatus bay
- Hospital linen area
- Hospital medical record area
- Hospital patient room bathroom
- Hospital short-term charting space
- Hospital prep and cleanup area in surgical suite
- Interrogation room
- Lobby (except hotel lobby)*
- Locker room
- Residential bathroom
- Residential laundry area
- Residential walk-in closet
- Restroom
- Retail fitting area
- Retail stock room
- Shooting range
- Stairway

*Hotel lobbies are considered regularly occupied because people often congregate, work on laptops, and spend more time there than they do in an office building lobby.

Table 1. Space types in EQ credits

Space category	Prerequisite or credit
Occupied space	EQp2: Fundamental Air Quality EQc1: Enhanced Air Quality EQc2: Occupant Experience EQc5: Air Quality Testing and Monitoring
Regularly occupied space	EQc2: Occupant Experience EQc1: Enhanced Air Quality EQc4: Resilient Spaces EQc5: Air Quality Testing and Monitoring
Quiet space	EQc2: Occupant Experience
Classroom and core learning spaces	EQc2: Occupant Experience

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Indoor Environmental Quality Prerequisite

CONSTRUCTION MANAGEMENT

EQp1

REQUIRED

New Construction

INTENT

To promote the well-being of construction workers and building occupants by minimizing environmental quality problems associated with construction and renovation.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Construction Management	

Develop and implement construction management practices for the construction and preoccupancy phases of the building. The practices must address all of the following:

- **No smoking**: Prohibit smoking during construction except in designated smoking areas located at least 25 feet (7.5 meters) from the building. Install signage that prohibits smoking during construction.
- **Extreme heat protection**: Implement measures that protect construction workers from extreme heat.
- **HVAC protection**: Keep contaminants out of the HVAC system. Do not run permanently installed equipment if possible or maintain proper filtration if it is used. Replace all air filtration media after completion of construction and before occupancy. Confirm that testing and balance work is completed with new filtration.
- **Source control**: Keep sources of contaminants out of the building and have a plan to eliminate any that are introduced.
    - Store carpets, acoustical ceiling panels, fabric wall coverings, insulation, upholstery and furnishings, and other absorptive materials in a designated area protected from moisture damage.
- **Pathway interruption**: Prevent circulation of contaminated air and when cutting concrete or wood, sanding drywall, installing volatile-organic-compound-emitting materials, or performing other activities that affect indoor air quality in other workspaces.

  - Isolate areas of work to prevent contamination of other spaces, whether they are finished or not. Seal doorways and windows, or tent off areas as needed using temporary barriers.
  - Use walk-off mats at entryways to reduce introduced dirt and pollutants.
  - Use dust guards and collectors on saws and other tools.
- **Housekeeping**: Maintain a clean jobsite. Use vacuum cleaners with high-efficiency particulate filters and use sweeping compounds or wetting agents for dust control when sweeping.
- **Scheduling**: Sequence construction activities to reduce air quality problems. For renovation projects, coordinate construction activities to minimize or eliminate disruption of operations in occupied areas.

REQUIREMENTS EXPLAINED

Using established best practices during construction can protect construction workers from poor air quality and extreme heat.

The prerequisite requires projects to develop and implement construction management practices for the buildings' construction and preoccupancy phases. The required practices are primarily adapted from the *SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3*.[142] The extreme heat requirement is adapted from OSHA prevention guidance for preventing heat-related illness.[143]

The practices must address all the following criteria:

No Smoking

Prohibiting smoking during construction supports a healthier and safer work environment. Smoking is a fire hazard. It creates odors and elevated levels of airborne contaminants that are associated with respiratory, cardiovascular, and other health problems.[144] Although cigarette smoking has declined among U.S. workers overall, its prevalence remains high among construction workers.[145] Prohibiting smoking preserves the integrity and longevity of building materials that can absorb smoke, such as insulation and drywall.

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[142] "SMACNA IAQ Guidelines for Occupied Buildings Under Construction", SMACNA, (n.d.), https://store.smacna.org/iaq-guidelines-for-occupied-buildings-under-construction.

[143] "Heat Prevention", OSHA, (Accessed Feb 3 2025), https://www.osha.gov/heat-exposure/prevention.

[144] Öberg, Mattias et al., "Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries", (2021), *The Lancet*, Volume 377, Issue 9760, 139 – 146.

[145] Syamlal, G., King, B. A., and Mazurek, J. M. , "Tobacco product use among workers in the construction industry, United States, 2014-2016", (2018), American Journal of Industrial Medicine, 61(11), 939–951, https://doi.org/10.1002/ajim.22907.

Projects must prohibit smoking on the entire jobsite during the construction phase except in designated outdoor smoking areas. This applies to conventional cigarettes (cigarettes, cigars, pipes), cannabis (medical or recreational), and electronic smoking devices (e-cigarettes).

Projects may elect to provide an outdoor designated smoking area on site. An outdoor smoking area can be a covered pavilion with safe disposal bins for cigarettes. The area must be at least 25 feet (7.5 meters) away from the building.

Temporary signage

Projects must communicate the no smoking policy with temporary signage that is displayed until construction completion. The exact design and content of the signs is up to the project team and can be tailored to the project location and circumstances including to accommodate safety sign guidelines.

Protection from Extreme Heat

Construction workers exposed to hot environments are at risk for heat-related illnesses and injuries.[146] Construction management practices must address actions that employers and workers can take to prevent heat-related illnesses, which include heat stroke, exhaustion, cramps, and fainting.

Preventive measures include providing cool, shaded, or air-conditioned areas for rest, implementing required rest breaks, and scheduling labor-intensive activities in cooler parts of the day. Scheduling must accommodate reduced workdays for workers who are new to working in a warm environment (or returning to work), and during seasonal changes or abrupt weather changes. Provide workers with proper attire, like light-colored, breathable clothing.

Train workers on extreme heat measures to increase awareness and likelihood of successful implementation. Refer to the *IPp2: Human Impact Assessment* and *IPp1: Climate Resilience Assessment* findings to ensure the training and preventive measures are guided by a thorough understanding of the social context of the local community and workforce.

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[146] *Heat stress and workers*, (2024, July 11), Heat Stress, cdc.gov/niosh/heat-stress/about/index.html#:~:text=Workers%20who%20are%20exposed%20to,heat%20storage%20within%20the%20body.

HVAC Protection

Construction activities release contaminants that may unintentionally enter the building's HVAC system. Safeguard against this by avoiding use of HVAC systems during construction or, when use of the system is necessary, by ensuring the equipment has proper filtration during use.

Replace all HVAC filters prior to occupancy and after all construction activities are complete. Additionally, complete all tests and balance efforts after installing the new filters.

Source Control

Building materials that are exposed to the environmental conditions during construction can be soiled or degraded prior to installation. Proper storage and material handling can ensure they are protected from contaminants, dirt, debris, and moisture during the construction process.

If there is enough storage capacity on site, keep materials in a separate, ventilated or conditioned building or storage area. Keep materials away from heavy traffic areas to limit exposure to dirt, debris, and dust. Absorptive materials like carpet, ceiling panels, wall coverings, and insulation can trap moisture, leading to mold and mildew growth. Cover or raise these materials off the floor.

Pathway Interruption

Certain construction activities, such as cutting, sawing, sanding, and painting, can result in emissions of airborne contaminants into the interior space. Their migration to adjacent spaces can result in inadvertent exposure to contaminated air, dust, debris, and odors. Proper hazard identification and appropriate control measures are necessary to safeguard health.

Control measures include the use of personal protective equipment, and the use of temporary barriers to isolate emissions and prevent their spread into adjacent spaces. Examples of isolation techniques include sealing doors and windows, tenting areas with high levels of activity, or using dust guards or collectors on power tools. Additionally, when installing manufactured countertops, implement dust control measures and use personal protective equipment when sawing or sanding.[147]

For entryways and indoor pathways between construction areas and other interior spaces, use walk-off mats to minimize migration of dirt and pollutants into clean areas.

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[147] "Worker Exposure to Silica during Countertop Manufacturing, Finishing and Installation", (n.d.), *OSHA NIOSH Hazard Alert* (Number 2015-106), Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), https://osha.gov/sites/default/files/publications/OSHA3768.pdf.

Housekeeping

Regular and thorough housekeeping can help control or eliminate workplace hazards.[148]

Sweeping

Sweep finished and hard surfaces using sweeping compounds or wetting agents, which can be oil-based, gritted, or gritless, to help control dust.

Vacuums

Use vacuums with high-efficiency filters to trap fine particles that would otherwise escape through the vacuum's exhaust, for a cleaner job site with better air quality.

Scheduling

Construction activities can be sequenced to minimize exposure, resulting in adverse impacts for workers not directly involved in the construction activity.

Schedule construction activities that generate significant dust or emissions at different times or places. For example, schedule drywall finishing and carpet installation for different days or different sections of the building.

Install absorptive-finish materials after wet-applied materials have fully cured whenever possible. For example, install carpet and ceiling tile after paints and stains are completely dry.

In currently occupied buildings, consider relocating them before disruptive activities start in those areas to reduce their exposure to air and noise pollution. If the building is operational, communicate the construction activity schedule with workers and occupants. This may minimize foot traffic and encourage avoidance of the area, as necessary and feasible.

Schedule high-intensity activities during cool hours of the day and plan for work/rest periods and other scheduling modifications in line with the extreme heat protections.

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[148] Canadian Centre for Occupational Health and Safety, (2024 Feb 10), *Workplace Housekeeping,* ccohs.ca/oshanswers/hsprograms/housekeeping.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	LEED v5 Construction Management Implementation Checklist
			LEED v5 Construction Management Implementation Checklist Affirmation at completion of construction

REFERENCED STANDARDS

- Sheet Metal and Air-Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008 (Chapter 3) (store.smacna.org/iaq-guidelines-for-occupied-buildings-under-construction)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Indoor Environmental Quality Prerequisite

FUNDAMENTAL AIR QUALITY

EQp2

REQUIRED

New Construction

INTENT

To design for above-average indoor air quality to support occupant health and well-being.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Investigate Regional and Local Air Quality	
AND	
Ventilation and Filtration Design	
AND	
Entryway System Design	

Investigate Regional and Local Air Quality

Investigate outdoor air quality in accordance with *ASHRAE Standard 62.1-2022*, Sections 4.1–4.3.

AND

Ventilation and Filtration Design

Meet the requirements of *ASHRAE Standard 62.1-2022*, Sections 5 and 6. Use the ventilation rate procedure, the IAQ procedure, the natural ventilation procedure, or a combination thereof. Comply with the following additional provisions:

- **Filtration**. Each central HVAC system that supplies outdoor air and/or recirculated air to regularly occupied spaces must meet one of the following:
  - Minimum efficiency reporting value (MERV) of 13, in accordance with *ASHRAE Standard 52.2–2017*; OR
  - Equivalent filtration media class of ePM1 50%, as defined by *ISO 16890-2016, Particulate Air Filters for General Ventilation — Determination of the Filtration Performance*; OR
  - In-room air-cleaning systems; OR

  - Systems tested for effectiveness and safety per *ASHRAE Standard 241-2023*, Section 7.4 (and Normative Appendix A). If treating for particles and gases, use systems tested for effectiveness per *ASHRAE 62.1-2022*, Addendum N. If treating for infectious aerosols, use systems tested for effectiveness per *ASHRAE Standard 241-2023*, Section 7.
- **Outdoor air measurement**. Provide outdoor airflow measurement devices for all mechanical ventilation systems with outdoor air intake flow greater than 1,000 cfm (472 L/s).

Healthcare

- For healthcare spaces, meet the requirements of Sections 6–10 of *ASHRAE Standard 170-2021*.

Residential

- For residential spaces, follow the additional dwelling unit provisions below.

Dwelling Unit Provisions

If the project building contains residential units, each dwelling unit must meet all of the following requirements:

  - Design and install a dwelling-unit mechanical ventilation system that complies with *ASHRAE 62.2-2022*, Sections 4, 6.6, and 6.7. Supply and balanced mechanical ventilation systems must be designed and constructed to provide ventilation air directly from the outdoors. Mechanical ventilation systems are not required when the project meets the exception detailed in *ASHRAE 62.2-2022*, Section 4.1.1.
  - Design and install local mechanical exhaust systems in each kitchen and bathroom, including half baths, that comply with *ASHRAE 62.2-2022*, Sections 5 and 7. Exhaust air to the outdoors. Do not route exhaust ducts to terminate in attics or interstitial spaces. Recirculating range hoods or recirculating over-the-range microwaves do not satisfy the kitchen exhaust requirements. For exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (188 liters per second), provide makeup air at a rate approximately equal to the exhaust air rate. Makeup air systems must have a means of closure and be automatically controlled to start and operate simultaneously with the exhaust system. Use ENERGY STAR® labeled bathroom exhaust fans in all bathrooms (including half baths) or performance equivalent for projects outside the U.S. A heat recovery ventilator (HRV) or energy recovery ventilator (ERV) may be used to exhaust single or multiple bathrooms if it has an efficacy level meeting the *ENERGY STAR® Technical Specifications for Residential Heat-Recovery Ventilators and Energy-Recovery Ventilators* (H/ERVs), version 2.3 as certified by the Home Ventilating Institute.
  - Unvented combustion appliances (ovens and ranges excluded) are not allowed.

- A carbon monoxide (CO) monitor must be installed on each floor of each dwelling unit, hard-wired with a battery backup. CO monitors are required in all types of units, regardless of the type of equipment installed in the unit.
- Any indoor fireplaces and woodstoves must have solid glass enclosures or doors that seal when closed. Any indoor fireplaces and woodstoves that are not closed combustion or power-vented must pass a backdraft potential test to ensure that depressurization of the combustion appliance zone is less than 5 Pa.
- Space- and water-heating equipment that involves combustion must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting) or with power-vented exhaust or located in a detached utility building or open-air facility.

AND

Entryway System Design

Install permanent entryway systems to capture dirt and particulates entering the building at primary exterior entrances. There is no length requirement for entryway systems.

REQUIREMENTS EXPLAINED

This prerequisite requires the project team to research regional and local air quality and provide ventilation systems and design elements that effectively support air quality within the building. Healthcare and residential projects have additional considerations.

Investigate Regional and Local Air Quality

Indoor air quality is significantly influenced by outdoor air quality, which can be highly localized varying over time, season, and throughout the project site.

To understand outdoor air quality for the project, regional air quality and local air quality must be investigated, considering seasonal variations. *ASHRAE 62.1* provides a template for documenting this investigation. In many regions, spring months have higher pollen levels from flowering plants and trees. Summer months in some dry, hot regions have higher levels of PM2.5 due to wildfires and ozone from photochemical smog. Air quality for the project’s location will likely change over time, due to climate change. For example, the periods with higher pollen levels and wildfires may increase or intensify. For this reason, information collected during the *IPp1: Climate Resilience Assessment* should be included in this investigation.

REGIONAL AIR QUALITY

Regional air quality is partially determined by reviewing compliance with national ambient air quality standards. In the U.S., use available air quality monitoring data to determine the region's status relative to acceptable levels for six regional outdoor air quality pollutants (particulate matter, carbon monoxide, ozone, nitrogen dioxide, lead, sulfur dioxide).

LOCAL AIR QUALITY

Local air quality is typically determined through observations by walking around the project site and reviewing the neighborhood context. Examples of items to survey include facilities on site and on adjacent properties, description of sources of vehicle exhaust on site and adjacent properties, identification of potential contaminant sources on the site and from adjoining properties. Most of this information will be gathered in the *IPp2: Human Impact Assessment*.

The results of the outdoor air quality investigation inform the design of critical elements of the mechanical system, including the air intake locations on the building, the filtration levels used, or the use of air-cleaning devices. The investigation also helps determine exhaust and equipment locations to minimize impacts to neighboring buildings or building occupants.

Ventilation and Filtration

ASHRAE Standard 62.1-2022 is the referenced ventilation standard for most commercial buildings. The Standard establishes minimum ventilation requirements and other measures for indoor air quality that is acceptable to human occupants and that minimizes adverse health effects.[149]

The standard involves designing for indoor air quality using one of three available procedures: the ventilation rate procedure (VRP), indoor air quality procedure (IAQP), or the natural ventilation procedure (NVP). Any combination of options may be used for compliance with this prerequisite.

IAQP VERIFICATION

If the IAQP is used to comply with this prerequisite, an extra verification step after building completion is required that involves air quality testing and conducting a subjective occupant evaluation. These verification steps are outlined in *ASHRAE 62.1-2022*, Section 7.3 Indoor Air Quality Procedure Verification.

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[149] "Standards 62.1 & 62.2", ASHRAE, (2022), https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2.

FILTRATION

This prerequisite has additional filtration requirements beyond those in *ASHRAE 62.1. MERV 13* filtration (and ePM1 50%) is becoming standard practice. Most HVAC systems can be designed to easily accommodate this level of filtration. The filtration requirements apply to all central HVAC systems that supply outdoor air, recirculated air, or outdoor air and recirculated air to regularly occupied spaces.

MERV 13 filtration is not required for systems that supply air to warehouses or other areas addressed in the *ASHRAE* exemption for outdoor air treatment.

> **Exemption to 6.1.4**
> Systems supplying air for enclosed parking garages, warehouses, storage rooms, janitor’s closets, trash rooms, recycling areas, and shipping/receiving/distribution areas are exempt.

An alternative approach that uses in-room air cleaning systems offers flexibility in meeting this prerequisite requirement for situations where design constraints make the central system-level filtration requirement infeasible or impractical.

AIR CLEANING SYSTEMS

Air cleaning systems may be used in the design to meet the prerequisite requirements. Before selecting the air cleaning system ensure the manufacturer has a safety testing report and manufacturer certification that the product is safe. Verified effectiveness values also provided by the manufacturer must be used in the design calculations as applicable.

- **Safety**. All air cleaning systems require safety testing according to *ASHRAE Standard 241-2023* Section 7.4 and Normative Appendix A. This standard has the most up to date language to assess safety which includes addressing chemical emissions and some potential byproducts, ultraviolet radiation, combustion byproducts and noise generated during operation. Testing is conducted in a specialized test chamber with specific environmental controls.[150]
- **Effectiveness for particle filtration efficiency or gaseous removal efficiency**. For systems that treat particles and gases, use only systems that have a verified effectiveness determined according to *ASHRAE Standard 62.1-2022*, Addendum N.
- **Effectiveness for infectious aerosols**. For systems being selected to treat infectious aerosols and meet the minimum equivalent clean airflow rates outlined in *ASHRAE 241-*

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[150] “Control of Infectious Aerosols”, ASHRAE. (2023), https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/241_2023_a_20241021.pdf.

2023, Section 5.1, for compliance with the *EQc4: Resilient Spaces* credit Option 2 - Management Mode for Respiratory Diseases treat infectious aerosols - use only systems that have a verified effectiveness according to *ASHRAE Standard 241-2023*, Section 7.

OUTDOOR AIR MEASUREMENT

With proper outdoor airflow monitoring, facility managers can identify ventilation issues and correct problems before they impact IAQ. This credit requires airflow monitoring for larger systems (more than 1,000 cfm (472 L/s) of outside air). Airflow monitoring is encouraged for smaller systems but not required.

Specific alarm and system control capabilities are not addressed in this prerequisite and may be designed to suit the project's specific needs.

Healthcare

- Healthcare projects must comply with *ASHRAE Standard 170-2021* for ventilation design and filtration requirements. *ASHRAE 170*, Table 7-1 specifies the minimum outdoor air changes per hour (ACH) and minimum total ACH for each healthcare space type. Both requirements must be met. For space types not covered in *Standard 170*, use *ASHRAE Standard 62.1-2022*.

Entryway Systems

Permanent entryway systems prevent dirt and particulates from entering the building. The entryway system requirement for this prerequisite is intentionally broad to accommodate more project situations and to ensure feasibility as a prerequisite requirement.

Acceptable entryway systems include permanently installed grates, grilles, and slotted systems that allow for cleaning underneath, or rollout mats.

Entryway systems are required at all primary exterior entrances**.**

PRIMARY VS. NON-PRIMARY ENTRANCES

Primary exterior entrances are the main, designated entry points to the building. These entrances typically have the most visibility and accessibility. Design elements, like canopies or biophilic elements, often attract entry.

Non-primary entrances are less visible and often have limited access or are used less frequently. A non-primary entrance includes service access points or lift lobbies, side or back doors, garage and parking level entries, emergency exits, connections between concourses, and atrium entries.

While the prerequisite only requires entryway systems at primary exterior entrances, projects may benefit from installing entryway systems at all exterior entrances of the building.

ENTRYWAY SYSTEM LENGTH AND DESIGN

There are no length requirements for the entryway systems, but it is highly recommended to use the best practice length of at least 10 feet (3 meters) long in the primary direction of travel which allows for approximately two full steps per shoe from an average person.

Design the entryway system to accommodate and withstand specific climate conditions. Areas with high precipitation, for example, may need more absorbent mats made with mold- and mildew-resistant materials. If using rollout mats, consider selecting ones that have a solid backing. A nonporous backing captures dirt and moisture and helps prevent contaminants from collecting underneath the mat.

Regular cleaning and maintenance will extend the integrity of the entryway system. Projects are encouraged to provide routine care for these systems which is typically weekly.

Residential

- Residential projects have additional provisions for dwelling units.

DWELLING-UNIT MECHANICAL VENTILATION

ASHRAE Standard 62.2-2022 establishes minimum requirements for acceptable indoor air quality in residential buildings. Requirements for dwelling-unit mechanical ventilation systems are specified for different system types that consist of supply systems, exhaust-only systems, or balanced systems. Exhaust-only ventilation systems are only permitted in certain situations. Supply and balanced mechanical ventilation systems must provide ventilation air directly from the outdoors via a dedicated outdoor air supply duct to the unit or the HVAC equipment serving the unit. All systems must be tested and balanced before occupancy.

MECHANICAL EXHAUST SYSTEMS

ASHRAE Standard 62.2-2022 requires mechanical exhaust systems for kitchens, bathrooms, and half-baths. Recirculating range hoods do not meet the requirements of the Standard.

Fans with ENERGY STAR® labels (or performance equivalent for projects outside the U.S.) are required in all bathrooms (including half-baths). These fans use about 50% less energy than standard models.[151] Performance equivalent for international projects means that the product meets the ENERGY STAR® key product criteria for the product type outlined on the ENERGY STAR® website.

UNVENTED COMBUSTION APPLIANCES

Unvented combustion appliances such as charcoal and propane grills are a significant source of air pollution and are not permitted within the project. Lease agreements should clearly identify this requirement for all residents.

CARBON MONOXIDE MONITORING

Hard-wired CO monitors are required for each dwelling unit. A monitor must be installed on each level for dwelling units with multiple floors. Specify CO monitors with battery backup to ensure continuous functionality in the event of a power outage.

INDOOR FIREPLACES AND WOOD STOVES

Indoor fireplaces and wood stoves must include solid glass enclosures or doors that seal when closed to reduce the risk of smoke exposure for residents.

For projects that do not include smoke control elements (closed combustion or power-venting), perform a backdraft potential test for each appliance. Testing must confirm the depressurization of the combustion appliance zone is less than five Pascals. This is the pressure difference considered safe to ensure proper combustion air intake for natural draft appliances, preventing dangerous back drafting while still allowing for efficient operation.[152]

DWELLING UNIT SPACE-HEATING AND WATER-HEATING EQUIPMENT

Many residences have their own water-heating equipment in the dwelling unit, including equipment that uses combustion (i.e., gas-fired water heaters). When including these systems, design and confirm that the installed systems use a closed combustion design.

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[151] “Ventilation fans”, (n.d.), ENERGY STAR®, https://energystar.gov/products/ventilation_fans.

[152] Fitzgerald, J., Bohac, D., “Measure Guideline: Combustion safety for natural draft appliances through appliance zone isolation”, The National Renewable Energy Laboratory and U.S. Department of Energy’s Building America Program, NorthernSTAR, and Center for Energy and Environment, (2014), https://www1.eere.energy.gov/buildings/publications/pdfs/building_america/measure_guide_combustion_safety_appliancezone.pdf.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Results of regional and local air quality investigation, at minimum, date and time of observations, a description of the site, observed odors or irritants, and conclusions regarding acceptability of the outdoor air quality.
			Indication of whether the building is in an area where the national guideline is exceeded (outdoor air treatment is required per *ASHRAE 62.1-2022*, Section 6.1.4).
			Calculation documents for mechanical ventilation (VRP), natural ventilation (NVP) and IAQ procedure (IAQP).
			Air cleaning systems (if used): supporting documentation for safety and effectiveness.
			IAQ Procedure: Air Quality Test Plan and Occupant Survey Methodology.
			IAQ Procedure: Completed air quality testing report including time, date, testing methods complying with credit requirements, results and limits of the tested contaminants in all locations, and lab accreditation scope for VOCs.
			IAQ Procedure: Subjective Occupant Evaluation Results.
			Floor plans or photos of entryway systems.
			Design documents confirming filter grade and implementation.
			Control diagrams showing outdoor air measurement devices (where required).
			Confirmation the outdoor air measurement devices measures airflow rates.
Residential	All	All	Confirmation there are CO monitors in all units.
			Description of how each system complies with *ASHRAE 62.2-2022*.

REFERENCED STANDARDS

- ASHRAE standard 62.1-2022 (ashrae.org/technical-resources/bookstore/standards-62-1-62-2)
- ASHRAE standard 62.2-2022 (ashrae.org/technical-resources/bookstore/standards-62-1-62-2)
- ASHRAE standard 170-2021 (ashrae.org/technical-resources/standards-and-guidelines/standards-addenda/ansi-ashrae-ashe-standard-170-2017-ventilation-of-health-care-facilities)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Indoor Environmental Quality Prerequisite

NO SMOKING OR VEHICLE IDLING

EQp3

REQUIRED

New Construction
Core and Shell

INTENT

To minimize exposure to tobacco smoke, smoke from tobacco substitutes or cannabis, and vehicle emissions.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	N/A
Prohibit Smoking	
AND	
Prohibit Vehicle Idling	

Comply with the following requirements:

Prohibit Smoking

- **Indoor smoking**: Prohibit smoking inside the building with limited exceptions (see below).
- **Outdoor smoking**: Prohibit smoking outside the building except in designated smoking areas located at least 25 feet (7.5 meters) (or the maximum extent allowable by local codes) from all entries, outdoor air intakes, and operable windows.
- **School projects**: Prohibit all smoking on-site.

AND

Prohibit Vehicle Idling

- Prohibit vehicle idling on-site.

Communicate the no-smoking and vehicle idling prohibition policy to occupants. Have in place provisions for enforcement or prohibitive signage.

Residential

- Meet the requirements above for all areas inside and outside the building except dwelling units and private balconies:
    - For residential projects that do not prohibit smoking, each dwelling unit where smoking will be permitted must meet the following compartmentalization requirements:
        - Perform a blower door test of residential dwelling units, following the procedures in *ANSI/RESNET/ICC 380* or equivalent. For each unit tested, demonstrate a maximum leakage of enclosure area that is no more than 1.5 times the thresholds identified in Table 1 ("enclosure area" refers to all surfaces enclosing the dwelling unit, including exterior and party walls, floors, and ceilings). Demonstrate a weighted average leakage of enclosure area for the building, including dwelling units, that complies with the caps in the limits identified in Table 1.

Table 1. Caps on air leakage rates

Building conditioned floor area (CFA)	**Pressure test conditions across the building envelope**	**Maximum air leakage**	
		New construction	**Major renovation**
≥ 5,000 sq. ft. (465 sq. m.)	At pressure difference of 50 Pascals (0.2 in H2O)	0.13 cfm/sq. ft. (0.65 L/s*sq. m.)	0.20 cfm/sq. ft. (1.0 L/s*sq. m.)
	At pressure difference of 75 Pascals (0.3 in H2O)	0.18 cfm/sq. ft. (0.90 L/s*sq. m.)	0.27 cfm/sq. ft. (1.35 L/s*sq. m.)
< 5,000 sq. ft. (465 sq. m.)	At 50 Pascals (0.2 in H_2O)	1 ACH	1.5 ACH
	At 75 Pascals (0.3 in H2O)	1.35 ACH	2 ACH

REQUIREMENTS EXPLAINED

Establishing smoke-free and idle free policies may minimize exposure to tobacco smoke, smoke from tobacco substitutes and cannabis, and vehicle emissions.

This prerequisite requires the project to prohibit smoking inside the building and its immediate vicinity, restrict smoking on site, and prevent vehicle idling.

Prohibit Smoking

Smoke-free policies effectively reduce tobacco use, protect people from secondhand smoke exposure, prevent tobacco-related illnesses and deaths, and help more people successfully quit smoking.

Smoking is prohibited for conventional cigarettes (cigarettes, cigars, pipes), cannabis (medical or recreational), and electronic smoking devices (e-cigarettes). The intent is to keep the air inside the building free from pollutants and contaminants associated with smoking.

INDOOR SMOKING

Smoking must always be strictly prohibited inside the building. Evidence of this prohibition can be obtained through a policy from the owner or facility manager or smokefree indoor air law.

OUTDOOR SMOKING

Smoking must be prohibited on the project site except in areas specifically designated for smoking. No smoking is permitted within 25 feet (7.5 meters) of all building openings, such as doors, windows, and ventilation intakes to minimize the likelihood of smoke entering the building. Emergency exits do not qualify as building openings if the doors are alarmed, as alarmed doors will rarely be opened. Emergency exits without alarms qualify as building openings.

Smoking is not allowed in programmable spaces (e.g., outdoor cigar lounges or casino areas, courtyards, outdoor cafes or sidewalk seating, space used for business purposes).

A designated smoking area is a specific outdoor location where smoking is permitted. This can be an unenclosed pavilion with safe disposal bins for cigarettes. Business cannot be conducted in this area but design strategies to make people feel comfortable such as covered seating are encouraged.

Schools

- Schools must prohibit all smoking on site to ensure no secondhand smoke exposure to students, staff, and visitors. Banning smoking on school premises also sets a strong example for students, encouraging them to adopt and maintain healthy, smoke-free lifestyles. Signage must be posted on the property line to indicate the no-smoking policy. Signage at the school helps to ensure public awareness and compliance with smoke-free environments, especially in areas where children's health is a priority. The signs serve as a clear visual reminder for staff, visitors, and passersby.

Residential

- Smoking is prohibited for all areas inside and outside residential buildings except in dwelling units and on private balconies. If smoking is permitted in a residential project, each dwelling unit where smoking will be permitted must meet the compartmentalization requirements that follow the procedures in *ANSI/RESNET/ICC 380* or equivalent. For each unit tested, demonstrate a maximum leakage of enclosure area that is no more than 1.5 times the thresholds identified in Table 1.

- Prohibiting smoking on private residential balconies is a best practice for protecting nearby nonsmoking units and balconies from ETS infiltration. Consider prohibiting smoking on balconies in lease agreements.

> **Exclusions**
> The enforcement of no-smoking policies does not extend to areas within residential healthcare projects, such as long-term care facilities, where residents may have a clinical need to smoke.
>
> This prerequisite is not intended to prohibit or deter indigenous or other cultural ceremonial practices (e.g., smudging) which may include the combustion of tobacco and other ceremonial materials. LEED projects that accommodate cultural ceremonial practices may still pursue this prerequisite.

NO SMOKING SIGNAGE

The project team determines the placement and design of signage, allowing for flexibility to address site-specific considerations.

When communicating a no smoking policy, use signage that includes illustrations, photographs, or clear and concise wording. Consider using explicit language such as “No smoking allowed within x feet” or “Smoking is allowed in designated smoking areas only”. Signs should clearly indicate the designated smoking areas.

Prohibit Vehicle Idling

Vehicle idling is prohibited to minimize the likelihood of vehicle exhaust entering the building and to provide better air quality on site and for the neighboring community. An idling vehicle emits harmful chemicals and gases into the air. Exposure to these chemicals can aggravate asthma, allergies, and cardiovascular and respiratory diseases. Note that some cities, campuses, and other institutions may already have vehicle idling policies in place as part of their efforts to reduce emissions.

A vehicle idling policy is a set of guidelines designed to minimize the unnecessary running of vehicle engines while stationary. Such a policy typically prohibits idling beyond a specified duration, except in certain situations where exceptions may apply. For example, exceptions might be allowed for cold weather conditions where engine idling is necessary to maintain vehicle performance or occupant comfort, during emergency or safety situations, or for vehicles with specific operational needs, such as refrigeration trucks or vehicles running specialized equipment. The policy should require all vehicles and equipment to be turned off when not in active use.

NO IDLING SIGNAGE

It is the responsibility of the project team to determine signage content and the best locations for placement. For best results, place signage where drivers are most likely to idle, such as near vehicle waiting or parking areas. The signage should inform drivers of the policy upon arrival, departure, and waiting for parking spaces or picking up passengers.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	All	Site plan or map showing the location of designated outdoor smoking areas, vehicle idling signage, location of property line, and site boundary and indicating 25-foot (7.5-meter) distance from building openings.
			Description of project's no smoking policy, including information on how policy is communicated to building occupants and enforced.
			Description of project's vehicle idling policy, including information on how policy is communicated to building occupants and enforced.
Core and Shell	All Core and Shell Projects	All Core and Shell Projects	The Tenant Guidelines communicating the building's indoor and outdoor smoking and vehicle idling policies and the locations and details of signage installed to communicate the policies.
Residential		Projects that permit smoking	Air leakage calculations and blower door test report
			Confirmation that the blower door test of residential dwelling units follows the procedures in ANSI/RESNET/ICC 380 or equivalency of testing method demonstrated.

REFERENCED STANDARDS

- None

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Indoor Environmental Quality Credit

ENHANCED AIR QUALITY

EQc1

New Construction (1 point)

INTENT

To design for increased indoor air quality (IAQ) to better protect the health of building occupants.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Option 1. Increased Ventilation	1
OR	
Option 2. Enhanced Indoor Air Quality Design	1

Design the building to exceed the requirements of *ASHRAE 62.1-2022*, Section 6. If using the ventilation rate procedure to comply with *EQp2: Fundamental Air Quality*, use Option 1 or Option 2; if using the IAQ procedure, use Option 2.

Option 1. Increased Ventilation (1 point)

Increase breathing zone outdoor air ventilation rates by at least 15% above the minimum rates (for 1 point, or 30% for exemplary performance) as determined in *EQp2: Fundamental Air Quality*.

Increased outdoor air rates should be provided to 95% of all regularly occupied spaces.

OR

Option 2. Enhanced Indoor Air Quality Design (1 point)

In addition to the design compounds and design limits outlined in *ASHRAE 62.1-2022*, Tables 6-5 and 6-6, design and verify enhanced IAQ using the lower design limits listed below in Table 1.

Table 1. Additional design limits for enhanced indoor air quality design

Design compound or PM2.5	Enhanced IAQP design limit
PM2.5	10 ug/m^3
Formaldehyde	20 μg/m^3
Ozone	10 ppb

REQUIREMENTS EXPLAINED

The credit incentivizes designing systems that continuously provide enhanced air quality during building occupancy. For measures that provide enhanced air quality only in specific circumstances, refer to *EQc4: Resilient Spaces* for more guidance.

Both options in this credit use measures described in *ASHRAE Guideline 42-2023*, Enhanced Indoor Air Quality in Commercial and Institutional Buildings, with the goal of providing enhanced indoor air quality. Projects are encouraged to address additional measures from *ASHRAE Guideline 42* beyond those included in this credit.

NOTE: If the Ventilation Rate Procedure is being used for *EQp2: Fundamental Air Quality*, it is expected Option 1 for this credit will be used. However, it is not required. Review both options and choose the one that most aligns with the project goals for enhanced air quality.

Option 1. Increased Ventilation

Providing additional outdoor airflow, above the minimum requirements for ventilation and building pressurization, can further dilute and reduce indoor air pollutants. Research has shown increased ventilation may improve cognitive performance and associated productivity and income, reduce absenteeism in commercial offices[153], and sleep quality in residential applications. [154]

INCREASED VENTILATION THRESHOLDS

Projects must demonstrate a 15% increase in outdoor airflow rates over the minimum requirements of *ASHRAE Standard 62.1-2022*. Most large HVAC systems can accommodate a 15% increase with minimal impacts to the design and to energy consumption.

REGULARLY OCCUPIED SPACES REQUIREMENT

At least 95% of all regularly occupied spaces must have increased ventilation. This provides flexibility for projects that cannot meet the higher thresholds in every space.

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[153] Licina, D., Wargocki, P., Pyke, C., and Altomonte, S. “The future of IEQ in green building certifications”, *Buildings and Cities*, 2(1), (2021): pp. 907–927, https://doi.org/10.5334/bc.148.

[154] Wargocki, P.,Akimoto, Mizuho, et al. “Ventilation and sleep quality”, AIVC, (2023), https://www.aivc.org/resource/ventilation-and-sleep-quality.

DETERMINING THE INCREASED VENTILATION REQUIREMENT

The following VRP calculations determine the increased ventilation requirement:

- **Single-zone or 100% outdoor air system**. Multiply the calculated minimum outdoor air flow for the system (Vot) by 1.15.
- **Multiple-zone recirculating system**. Multiply the uncorrected outdoor air flow for the system (V_{ou}) by 1.15. Multiply the breathing zone outdoor airflow for the critical zone (V_{bz} for critical zone) by 1.15. Calculate the new system ventilation efficiency (Ev) using the updated values for Vou and the critical zone Vbz and recalculate the required outdoor air intake flow for the system (Vot) using these values.

Option 2. Enhanced Indoor Air Quality Design

The option requires using more stringent design limits for ozone, formaldehyde and PM2.5 to achieve enhanced levels of IAQ beyond *EQp2: Fundamental Air Quality*. This credit uses LEED-specific design targets, selected by the LEED indoor environmental quality technical advisory group, with the following basis:

OZONE

A design target of 10 ppb was selected as referenced in the Environmental Health Committee (EHC) Emerging Issue Report. This number reflects the thinking that ozone indoors is harmful and lower the concentration the better. Studies indicate that any safe threshold would exist at very low concentrations.[155]

FORMALDEHYDE

A design target of 20 µg/m³ (16 ppb) was selected based on the NIOSH recommended airborne exposure limit (REL) and FEMA goal for emergency housing[156]. Formaldehyde is a carcinogen that can irritate the skin and eyes.[157] Long-term exposure has been associated with increased allergic sensitivity and asthma. Many building products contain formaldehyde as addressed in the *MRc3: Low-Emitting Materials*.

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[155] “Emerging issue: Ozone and indoor air chemistry”, ASHRAE, (2011), https://www.ashrae.org/file%20library/communities/committees/standing%20committees/environmental%20health%20committee%20(ehc)/ehc_emerging_issue-ozoneandindoorairchemistry.pdf.

[156] “Formaldehyde — A Common Air Pollutant”, Chemical Insights, (2021), https://chemicalinsights.org/wp-content/uploads/FactSheet_Formaldehyde.pdf.

PM2.5

A design target of 10 ug/m3 was selected based on the WHO global air quality guidelines, PM2.5 interim target 4. [158] This number reflects the thinking that adverse effects from PM2.5 can occur at low concentrations approaching zero, so PM2.5 should be maintained as low as reasonably achievable in interior spaces.

If air cleaning systems are used to achieve the enhanced IAQ design targets, refer to the guidance on air cleaning devices in *EQp2: Fundamental Air Quality*.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Increased Ventilation	All	Calculations documented under the fundamental air quality prerequisite
	Option 2. Enhanced Indoor Air Quality Design	All	Documentation provided under the fundamental air quality prerequisite

REFERENCED STANDARDS

- ASHRAE 62.1-2022 (store.accuristech.com/ashrae/standards/ashrae-62-1-2022?product_id=2501063)

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[158] "WHO global air quality guidelines", World Health Organization, (2021) https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf.

Impact Area Alignment

— Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Indoor Environmental Quality Credit

OCCUPANT EXPERIENCE

EQc2

New Construction (1–7 points)

INTENT

To move beyond neutral or sufficient spaces toward human-centered design that supports customization, enjoyment, and emotional connections between people and the building, thus increasing the likelihood of consistent satisfaction and ongoing stewardship.

REQUIREMENTS: NEW CONSTRUCTION

Achievement pathways	Points
New Construction	1–7
Option 1. Biophilic Environment	1–4
Path 1. Integrated Biophilic Design	1
AND/OR	
Path 2. Quality Views	2–3
AND/OR	
Option 2. Adaptable Environment	1
AND/OR	
Option 3. Thermal Environment	1
AND/OR	
Option 4. Sound Environment	1–2
Path 1. Mapping Acoustical Expectations for Indoor and Outdoor Spaces	1
OR	
Path 2. Acoustic Criteria for Indoor and Outdoor Spaces	2
AND/OR	
Option 5. Lighting Environment	1–6
Path 1. Solar Glare	1
AND/OR	
Path 2. Quality Electric Lighting	1
AND/OR	
Path 3. Proximity to Windows for Daylight Access	1
AND/OR	
Path 4. Daylight Simulation	1–4

Option 1. Biophilic Environment (1–4 points)

PATH 1. INTEGRATED BIOPHILIC DESIGN (1 POINT)

Integrate biophilic design that demonstrates each of the following five principles adapted from *The Practice of Biophilic Design* by Kellert and Calabrese[159]:

- Biophilic design requires repeated and sustained engagement with nature.
- Biophilic design focuses on human adaptations to the natural world that, over evolutionary time, have advanced people's health, fitness, and well-being.
- Biophilic design encourages an emotional attachment to the building and building location.
- Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities.
- Biophilic design encourages mutual reinforcing, interconnected, and integrated architectural solutions.

AND/OR

PATH 2. QUALITY VIEWS (2–3 POINTS)

Provide occupants in the building with a view to the outdoor natural or urban environment for 75% (for 2 points, 90% for 3 points) of all regularly occupied floor area. Auditoriums, conference rooms dedicated to video conferencing, and gymnasiums may be excluded. Views into interior atria may be used to meet up to 30% of the required area.

- Views must be through glass with a visible light transmittance above 40%. If the glazing has frits, patterns, or tints, the view must be preserved. Neutral gray, bronze, and blue-green tints are acceptable.
- Views must include at least one of the following:
  - Nature, urban landmarks, or art; OR
  - Objects at least 25 feet (7.5 meters) from the exterior of the glazing.
- Occupants must have direct access to the view and be within three times the head height of the glazing.

AND/OR

Option 2. Adaptable Environment (1 point)

Allow occupants choice and flexibility, and/or the capability to adapt the space to meet their individual needs. Provide variability and/or optionality for thermal, sound, and lighting

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[159] Kellert, S. and Calabrese, E. *The Practice of Biophilic Design*, (2015), https://www.biophilic-design.com.

environments that invite occupants to either alter their experience and/or move between sensory zones. Include at least one accessible quiet space that allows occupants to retreat from high levels of sensory stimulation. Projects must also demonstrate at least one of the additional strategies below:

Additional strategies

- Provide socializing, meeting, dining, eating, and/or working areas where occupants can sit outside the main action and have permanent architectural features at their backs, creating a comfortable, semi-protected space that overlooks the larger area (prospect). Provide alternative paths that enable travel around the perimeter of the space so that people are not required to travel across a large open space.
- Provide choice in furniture configuration and a variety of seating to accommodate a wide range of body types, including seating with back rests and without arm rests.
- Provide height variety for permanently installed fixtures, like counters and sinks, and/or height-adjustable tables and desks, where appropriate.
- Provide outdoor or transitional space that encourages interaction with nature and is flexible or multiuse. Ensure the space is easily accessible for all occupants from within the building or located within 2,000 feet (600 meters) of a building entrance or access point.

AND/OR

Option 3. Thermal Environment (1 point)

Design indoor occupied spaces to meet the requirements of *ASHRAE Standard 55-2023*, *Thermal Environmental Conditions for Human Occupancy* with errata. Investigate thermal conditions in and around the project and explain how the design considers the following:

- Thermal conditions that align and adjust with changing seasons.
- Overcooling during nontemperate seasons.
    - Design solutions for newly arrived occupants or occupants transitioning between different thermal environments to adjust to the space while maintaining an appropriately warm environment for those already in the building.
    - Design solutions for long-term occupants in transition spaces to customize their working area.
- Support for occupants carrying out different tasks requiring varying levels of movement.
    - Cooling solutions for those completing high-movement tasks.

AND/OR

Option 4. Sound Environment (1–2 points)

PATH 1. MAPPING ACOUSTICAL EXPECTATIONS FOR INDOOR AND OUTDOOR SPACES (1 POINT)

Determine the desired sound environment early in the design process by mapping the acoustical expectations for each primary indoor and outdoor space, specific to the use of the space and occupant needs. Categories to consider include noise exposure, acoustical comfort and noise sensitivity, acoustical privacy, communication, and soundscape.
These are example classifications for:

- **Noise exposure zones**: High risk, medium risk, low risk, or no risk.
- **Acoustical comfort**: Loud zone, quiet zone, mixed zone, circulation, sensitive, and no specific expectations.
- **Acoustical privacy**: High speech security, confidential speech privacy, normal speech privacy, marginal speech privacy, or no privacy.
- **Communication zones**: Excellent, good, marginal, and none or no specific expectations.
- **Soundscape management**: Preserve, improve, restore, mitigate, specialized (e.g., wellness, therapeutic, or agency in equity), or no specific expectations.

Define acoustic criteria and potential design strategies and solutions to meet the acoustical expectations for each space. Categories to consider include internally generated background noise, externally intrusive background noise, electronically generated masking sound, outdoor acoustical environment, airborne sound reverberation, sound insulation, vibration insulation, and impact noise.

OR

PATH 2. ACOUSTIC CRITERIA FOR INDOOR AND OUTDOOR SPACES (2 POINTS)

Through calculations, modeling, and/or measurements, demonstrate that the mapping exercise completed in Path 1 informed design strategies and solutions to meet acoustic criteria for at least 75% of the occupied spaces, and all classrooms and other core learning spaces.

AND/OR

Option 5. Lighting Environment (1–6 points)

PATH 1. SOLAR GLARE (1 POINT)

Provide manual or automatic (with manual override) glare-control devices in all regularly occupied spaces that will receive direct or reflected sun penetration. Spaces designed intentionally for direct sunlight may be excluded.

AND/OR

PATH 2. QUALITY ELECTRIC LIGHTING (1 POINT)

Comply with the following requirements for regularly occupied spaces:

Electric light glare control
Each luminaire shall meet one of the following requirements:

- Have calculated luminance of less than 6,000 candela per square meter (cd/sq. m.) between 45 and 90 degrees from nadir.
- Achieve a unified glare rating (UGR) of 19 or lower using the UGR tabular method for each space.
- Achieve a UGR rating of 19 or lower using software modeling calculations of the designed lighting. (Modeling must be performed as outlined in the NEMA White Paper on Unified Glare Rating[160]).

Color rendering
Use luminaires that have a color rendering index of at least 90, or that meet the color rendering requirements in Table 1, in accordance with *Illuminating Engineering Society (IES) TM-30-20.*

Table 1. Color rendering requirements using TM-30-20

Measure		Requirement
Fidelity index	R_f	78 or higher
Gamut index	R_g	95 or higher
Red Local Chroma Shift	Rcs,h1	-1% to 15%

AND/OR

PATH 3. PROXIMITY TO WINDOWS FOR DAYLIGHT ACCESS (1 POINT)

Design the interior layout to provide at least 30% of the regularly occupied area to be within a 20-foot (6 meters) horizontal distance of envelope glazing. The glazing must have a visible light transmittance above 40%. Regularly occupied areas with visual obstructions (incapable of providing a view to envelope glazing) should be excluded from the compliant area.

OR

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[160] "NEMA White Paper on Unified Glare Rating", NEMA, (2021), accessed March 21, 2025, https://www.nema.org/standards/view/white-paper-on-unified-glare-rating-(ugr)

PATH 4. DAYLIGHT SIMULATION (1–4 POINTS)

Perform a daylight simulation analysis for the project to understand and optimize access to daylight and visual comfort. Use the calculation protocols in *IES LM-83-23* with the following clarifications:

- Calculate spatial daylight autonomy$_{300/50\%}$ (sDA$_{300/50\%}$) and annual sunlight exposure$_{1000,250}$ (ASE$_{1000,250}$) as defined in *IES LM-83-23* for each regularly occupied space in the project. sDA$_{150/50\%}$ may be used for areas without visual tasks with design targets of 225 lux.
- For any regularly occupied spaces with ASE$_{net(1000,250h)}$ greater than 20%, identify how the space is designed to address glare.
- Calculate the average sDA$_{300/50\%}$ or sDA$_{150/50\%}$ for the total regularly occupied floor area. Do not exclude spaces based on ASE. Points are awarded based on this calculation, according to Table 2.

Table 2. Points for daylight simulation

Average sDA300/50% or sDA150/50% value	**Points**
≥ 40%	1
≥ 55%	2
≥ 65%	3
≥ 75%	4

REQUIREMENTS: CORE AND SHELL

Achievement pathways	Points
Core and Shell	1–7
Option 1. Biophilic Environment	1–4
Path 1. Integrated Biophilic Design	1
AND/OR	
Path 2. Quality Views	2–3
AND/OR	
Path 3. Outdoor Connections	1
AND/OR	
Option 2. Lighting Environment	1–6
Path 1. Solar Glare	1
AND/OR	
Path 2. Quality Electric Lighting	1
AND/OR	
Path 3. Proximity to Windows for Daylight Access	1
AND/OR	
Path 4. Daylight Simulation	1–4

Option 1. Biophilic Environment (1–4 points)

PATH 1. INTEGRATED BIOPHILIC DESIGN (1 POINT)

Integrate biophilic design that demonstrates each of the following five principles adapted from *The Practice of Biophilic Design* by Kellert and Calabrese[161]:

- Biophilic design requires repeated and sustained engagement with nature.
- Biophilic design focuses on human adaptations to the natural world that, over evolutionary time, have advanced people's health, fitness, and well-being.
- Biophilic design encourages an emotional attachment to the building and building location.
- Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities.
- Biophilic design encourages mutual reinforcing, interconnected, and integrated architectural solutions.

AND/OR

PATH 2. QUALITY VIEWS (2–3 POINTS)

Provide occupants in the building with a view to the outdoor natural or urban environment for 75% for 2 points or 90% for 3 points of all regularly occupied floor area. Auditoriums, conference

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[161] Kellert, S. and Calabrese, E. *The Practice of Biophilic Design*, (2015), https://www.biophilic-design.com.

rooms dedicated to video conferencing, and gymnasiums may be excluded. Views into interior atria may be used to meet up to 30% of the required area.

- Views must be through glass with a visible light transmittance above 40%. If the glazing has frits, patterns, or tints, the view must be preserved. Neutral gray, bronze, and blue-green tints are acceptable.
- Views must include at least one of the following:
  - Nature, urban landmarks, or art; OR
  - Objects at least 25 feet (7.5 meters) from the exterior of the glazing.
- Occupants must have direct access to the view and be within three times the head height of the glazing.

AND/OR

PATH 3. OUTDOOR CONNECTIONS (1 POINT)

Allow occupants choice and flexibility to easily transition between indoor and outdoor environments. Provide outdoor or transitional space that encourages interaction with nature. Ensure the space is accessible for all occupants from within the building or located within 2,000 feet (60 meters) of a building entrance or access point.

AND/OR

Option 2. Lighting Environment (1–6 points)

PATH 1. SOLAR GLARE (1 POINT)

Provide manual or automatic (with manual override) glare-control devices in all regularly occupied spaces that will receive direct or reflected sun penetration. Spaces designed intentionally for direct sunlight may be excluded.

AND/OR

PATH 2. QUALITY ELECTRIC LIGHTING (1 POINT)

Comply with the following requirements for regularly occupied spaces:

Electric light glare control

Each luminaire shall meet one of the following requirements:

- Have calculated luminance of less than 6,000 candela per square meter (cd/sq. m.) between 45 and 90 degrees from nadir.
- Achieve a unified glare rating (UGR) of 19 or lower using the UGR tabular method for each space.

- Achieve a UGR of 19 or lower using the software modeling calculations of the designed lighting. Modeling must be performed as outlined in the "NEMA White Paper on Unified Glare Rating"[162].

Color rendering

Use luminaires that have a color rendering index of at least 90, or that meet the color rendering requirements in Table 1, in accordance with *Illuminating Engineering Society (IES) TM-30-20*.

Table 1. Color rendering requirements using TM-30-20

Measure		Requirement
Fidelity index	R_f	78 or higher
Gamut index	R_g	95 or higher
Red Local Chroma Shift	Rcs,h1	-1% to 15%

AND/OR

PATH 3. PROXIMITY TO WINDOWS FOR DAYLIGHT ACCESS (1 POINT)

Design the building floorplates and interior layout to provide at least 30% of the regularly occupied area to be within a 20-foot (six-meter) horizontal distance of envelope glazing. The glazing must have a visible light transmittance above 40%. Regularly occupied areas with visual obstructions (incapable of providing a view to envelope glazing) should be excluded from the compliant area.

OR

PATH 4. DAYLIGHT SIMULATION (1–4 POINTS)

Perform a daylight simulation analysis for the project to understand and optimize access to daylight and visual comfort. Use the calculation protocols in *IES LM-83-23* with the following clarifications:

- Calculate spatial daylight autonomy$_{300/50\%}$ (sDA$_{300/50\%}$) and annual sunlight exposure$_{1000,250}$ (ASE$_{1000,250}$) as defined in *IES LM-83-23* for each regularly occupied space in the project. sDA$_{150/50\%}$ may be used for areas without visual tasks with design targets of 225 lux.
- For any regularly occupied spaces with ASE$_{net(1000,250h)}$ greater than 20%, identify how the space is designed to address glare.

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[162] "NEMA White Paper on Unified Glare Rating", NEMA, (2021), accessed March 21, 2025, https://www.nema.org/standards/view/white-paper-on-unified-glare-rating-(ugr)

- Calculate the average sDA300/50% or sDA 150/50% for the total regularly occupied floor area. Do not exclude spaces due to ASE. Points are awarded based on this calculation, according to Table 2.

Table 2. Points for daylight simulation

Average sDA300/50% or sDA150/50% value	Points
≥ 40%	1
≥ 55%	2
≥ 65%	3
≥ 75%	4

REQUIREMENTS EXPLAINED: NEW CONSTRUCTION

This credit promotes spaces that are designed to enhance the occupant experience through multisensory experiences, connections with nature and natural systems, spatial variability and opportunities for personalization, as well as a broader view of thermal, sound, and lighting design. Though there are multiple options to achieve the credit — and strategies will (and should) look significantly different between projects — all approaches should aid in catalyzing enjoyment and memorability of the space, in turn, increasing the likelihood of sustained satisfaction and ongoing stewardship of the building.[163]

Core and Shell projects do not have Options for Thermal or Lighting Environment, as there are fewer opportunities for projects to address these topics within the Core and Shell scope. These topics may be included in the *IPp4: Tenant Guidelines*.

Option 1. Biophilic Environment

PATH 1. INDOOR BIOPHILIC DESIGN

Biophilic design is based on the ethical imperative to promote human and environmental health and wellbeing by reconnecting people to nature and to each other within the built environment. Incorporating nature, both directly or indirectly, can offer significant benefits to physical, mental, and social health.[164] Biophilic design can also be a tool to improve how we connect with others

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[163] DeKay, M., and Brager, G. (2023), Experience Design Schemas: Diagrams for Bioclimatic, Energy, and Resiliency Architecture. Routledge.

[164] Catherine O. Ryan, William D. Browning, and Dakota B. Walker, *The economics of biophilia: Why designing with nature in mind makes financial sense,* second edition, New York: Terrapin Bright Green, LLC., (2023), http://www.terrapinbrightgreen.com/report/eob-2.

to enhance a sense of community.[165] Effective biophilic design considers cultural, geographical, and ecological contexts. Refer to the *IPp2: Human Impact Assessment* findings for relevant contextualization.

Strategies must contribute to an integrated experience and should not exist in an individual or fragmented manner. As such, there is no minimum threshold for the number of required biophilic design strategies. Instead, projects must demonstrate compliance with each of the five principles adapted from *The Practice of Biophilic Design* by Kellert and Calabrese[166]:

- **Biophilic design requires repeated and sustained engagement with nature**. Projects must incorporate nature, or natural patterns or systems, throughout multiple facets of the building.
- **Biophilic design focuses on human adaptations to the natural world that over evolutionary time have advanced people's health, fitness, and wellbeing**. Complying with this principle requires creating spaces that support fundamental needs of both human and natural communities, including access to daylight and fresh air, connections to nature through views and materials, opportunities for movement and sensory engagement, spaces for both social interaction and quiet refuge, and integration with local ecosystems and natural patterns.
- **Biophilic design encourages an emotional attachment to particular settings and places**. Projects must understand, embrace, and celebrate the specific ecology, culture, climate, and/or region of a project so that it is culturally and ecologically responsive and unique.
- **Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities**. Complying with this principle requires design that elicits a positive emotional response, increasing the likelihood of ongoing enjoyment, belonging, and, ultimately, stewardship, of fellow occupants and of the building.
- **Biophilic design encourages mutual reinforcing, interconnected, and integrated architectural solutions**. Projects must apply an ecosystem approach to the design process, where the solution is greater than the sum of its parts, and nature and natural systems or processes are holistically integrated directly and indirectly throughout the project.

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[165] Heath, O., Jackson, V., and Goode, E. *Creating Positive Spaces by Designing for Community, Interface, Wellbeing,* (2019), https://www.interface.com/content/dam/interfaceinc/interface/publications/brochures-collateral/emea/design-guides/community-design-guide/DesignGuide_community_emea_EN.pdf.

[166] Kellert, S. and Calabrese, E. *The Practice of Biophilic Design*, (2015), https://www.biophilic-design.com.

Any biophilic design framework may be used to demonstrate compliance. Other widely respected frameworks include the *14 Patterns of Biophilic Design* by Terrapin Bright Green[167] and the *Biophilic Design Framework*[168] developed by Judith Heerwagen and Gordon H. Orians.

Table 3. Frameworks and strategies for biophilic design

Frameworks	Strategy category	Specific strategy
14 Patterns of Biophilic Design (Terrapin Bright Green)	Nature in the space	Visual connection with nature
		Non-visual connection with nature
		Non-rhythmic sensory stimuli
		Thermal and airflow variability
		Presence of water
		Dynamic and diffuse light
		Connection with natural systems
	Natural analogues	Biomorphic forms and patterns
		Material connection with nature
		Complexity and order
	Nature of the space	Prospect
		Refuge
		Mystery
		Risk/Peril
The Practice of Biophilic Design (Kellert & Calebrese)	Direct experience of nature	Light
		Air
		Water
		Plants
		Animals
		Weather
		Natural landscapes and ecosystems
		Fire
	Indirect experience of nature	Images of nature
		Natural materials
		Natural colors
		Simulating natural light and air
		Naturalistic shapes and forms
		Evoking nature
		Information richness
		Age, change, and the patina of time
		Natural geometries
		Biomimicry

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[167] "14 Patterns of Biophilic Designs", Terrapin Bright Green, (n.d.) https://www.terrapinbrightgreen.com/reports/14-patterns/

[168] Heerwagen, J. and Orians, G.H. *Biophilic design: the theory, science and practice of bringing buildings to life,* (USGBC and John Wiley & Sons: 2011), https://www.usgbc.org/resources/biophilic-design-theory-science-and-practice-bringing-buildings-life

Frameworks	Strategy category	Specific strategy
	Experience of space and place	Prospect and refuge
		Organized Complexity
		Integration of Parts to Wholes
		Transitional Spaces
		Mobility and Wayfinding
		Cultural and Ecological Attachment to Place
Biophilic Design Framework (Heerwagen & Orians)	Prospect	Unobstructed views
		Visual access to the horizon
		Elevated positions
	Refuge	Concealed or protected spaces
		Shelter from environmental conditions
		Secluded seating areas
	Mystery	Curving paths
		Partial views into other spaces
		Elements that entice exploration
	Complexity	Diverse textures and patterns
		Richness in visual detail
		Layered views
	Coherence	Logical organization of space
		Clear pathways
		Consistent design elements
	Change and Variability	Seasonal changes
		Natural lighting variations
		Presence of water
	Risk/Peril	Elements that evoke thrill or excitement
		Overlooks or balconies
		Stepping stones or bridges
	Security and Safety	Easily accessible escape routes
		Clear lines of sight
		Sturdy construction

PATH 2. QUALITY VIEWS

Light, shadow, color, and patterns can create engaging spaces that enhance occupant well-being.[169] Visual connections to the outdoors, particularly through windows offering natural views, provide documented psychological and emotional benefits.[170] These benefits extend across building types and sectors, from improved patient recovery in healthcare settings to increased

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[169] Heschong, L., *Visual Delight in Architecture: Daylight, Vision, and View*, (2021), Routledge.

[170] Kellert, S. and Calabrese, E. (2015), The Practice of Biophilic Design, https://www.biophilic-design.com/.

productivity in offices to better learning outcomes in schools.[171] Views and daylight are essential components of healthy human habitats, however, this doesn't require excessive glazing. Strategic window placement and thoughtful interior layouts can maximize outdoor connections while maintaining building performance.

Consider findings from the *IPp2: Human Impact Assessment*, related to the project's physical context. Identify exterior site elements that meet the view quality requirements of this credit: nature, urban landmarks, arts, or objects at least 25 feet (7.5 meters) from the exterior of the glazing.

Occupants must have direct access to the view and be within three times the head height of the glazing. For example, if the top of a window is eight feet high, occupants must be positioned no more than 24 feet (8 × 3) away from that window. Account for any permanent interior obstructions in the calculations. For example, identify interior features that may block the view to the window, such as structural columns. Vertical columns smaller than one foot (0.3 meters) wide and horizontal features smaller than one foot (0.3 meters) high typically do not block views. Analysis must consider occupant positions throughout all regularly occupied areas to confirm that quality views are present for at least 75% of the total area.

Exterior views through glazing, or vision glazing, must be clear and undistorted. Projects should use bird-friendly — or glazing with elements visible only to birds — to maintain clear views (refer to *SSc1: Biodiverse Habitat*, Option 2. Bird-friendly Glass). While some patterns are permitted if they maintain visibility, avoid frits, fibers, patterned glazing, or added tints that distort color balance or obstruct the views. Neutral gray, bronze, and blue-green tints typically do not distort the color balance.

Gymnasiums and Auditoriums

- Gymnasiums and auditoriums may be excluded from the quality views requirements.

Option 2. Adaptable Environment

OPTIONALITY OR FLEXIBILITY

Adaptable environments empower occupants to control and customize their surroundings, fostering a greater sense of comfort and belonging. This can take two forms: by providing occupants the ability to move between spaces with different sensory characteristics and to

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[171] Catherine O. Ryan, William D. Browning, and Dakota B. Walker, The economics of biophilia: *Why designing with nature in mind makes financial sense*, second edition, (2023), New York: Terrapin Bright Green, LLC. http://www.terrapinbrightgreen.com/report/eob-2.

adjust conditions of the space itself. While adaptable spaces have the potential to benefit all occupants, sensory customization opportunities are particularly important for neurodivergent individuals — approximately 15–20% of the population — who may experience heightened sensitivities to environmental factors or stimuli like noise, light, and textures.[172][173]

Rating system requirements are flexible to encourage highly specific design strategies. Projects must demonstrate optionality between zones or flexibility through personal comfort options for categories outlined in Table 4.

Table 4. Optionality or flexibility strategies

Category	**Examples**
Thermal environment	Personal control systems, warm or cool enclaves, radiant heating or cooling, transitional spaces that act as buffer zones between indoor and outdoor areas, or spaces with varying sun and shade exposure.
Sound environment	Combining active, high-sensory collaboration zones with quieter areas featuring sound masking, white noise, nature sounds, or acoustic alcoves for focused work, which aligns with the requirements under Option 4. Sound Environment.
Lighting environment	Combination of task lighting, dimmable lighting systems, circadian lighting that mimics natural daylight cycles in intensity and color temperature, zoned lighting controls, natural light zones, or gradual transition lighting designed to change in intensity to help eyes adjust.

Project specific strategies that do not fit within the three categories, but meet the intent of Option 2, to create diverse sensory spaces, may be submitted for compliance. This may include spatial character, degree of stimulation, or other strategies to enable people to manage their own sensory needs.[174]

QUIET ZONES

Quiet zones are required for all projects pursuing this option. Quiet zones are crucial for neurologically inclusive spaces because many neurodivergent individuals, including people with autism, experience hypersensitivity, or sensory processing differences that make them more sensitive to environmental stimuli, particularly sound. For these individuals, everyday sounds that some individuals might easily filter out — like HVAC systems, conversations, or equipment noise — can trigger sensory overload, leading to increased stress, decreased focus, and

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[172] “Designing a neurodiverse workplace”, HOK, (2019), https://www.hok.com/ideas/publications/hok-designing-a-neurodiverse-workplace/, accessed October 26, 2021.

173 Doyle N., “Neurodiversity at work: A biopsychosocial model and the impact on working adults.” Br Med Bull; (2020), https://doi: 10.1093/bmb/ldaa021.

[174] “Designing a neurodiverse workplace”, HOK.

difficulty communicating effectively.[175] Quiet zones must be accessible to all occupants and comfortable for extended use. Restrooms are not applicable for compliance.

Adaptability Strategies

There is a menu of adaptability strategies intended to increase the number of people who can, not only successfully use the space, but enjoy it. Findings from the *IPp2: Human Impact Assessment* must be used to better understand unique occupant needs to inform strategy selection. An alternative strategy may be acceptable in place of the provided strategies if it meets this intent.

Option 3. Thermal Environment

More closely aligning indoor conditions with outdoor environments by adjusting temperature setpoints to correspond with exterior conditions can positively impact thermal comfort, as research indicates that occupants' thermal comfort preferences and expectations vary seasonally in relation to climate conditions.[176,177] Designing in connection with natural patterns can increase occupant comfort and result in more efficient buildings by reducing reliance on air conditioning and heating.

To prevent thermal discomfort and wasted energy, projects must carefully manage cooling systems to avoid overcooling spaces during warmer seasons. Project designs must consider seasonal temperature changes, potential overcooling during non-temperate months, and the needs of occupants performing tasks with high metabolic rates. *ASHRAE Standard 55-2023* outlines methods to determine acceptable thermal conditions in mechanically conditioned spaces and in occupant-controlled naturally conditioned spaces, considering occupants' anticipated metabolic rate (activity level) and clothing as well as environmental variables such as temperature and air speed. Projects must comply with *ASHRAE Standard 55–2023* using the applicable method. To address the risk of overcooling in non-temperate/warm seasons, teams must refer to *ASHRAE 55-2023,* Informative Appendix E, Sections 8.1 and 8.2.

To avoid discomfort or physiological stress for people transitioning between thermal environments, specifically occupants entering from the outdoors, create zones with intermediate temperatures to allow gradual acclimatization and consider utilizing air movement as a cooling

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[175] Gonçalves, A.M., Monteiro, P. "Autism Spectrum Disorder and auditory sensory alterations: a systematic review on the integrity of cognitive and neuronal functions related to auditory processing." *J Neural Transm* 130, (2023): 325–408 https://doi.org/10.1007/s00702-023-02595-9.

[176] Lyu Yue, Chen Zhongqing, Seasonal thermal comfort and adaptive behaviours for the occupants of residential buildings: Shaoxing as a case study, Energy and Buildings, Volume 292, 2023, 113165, https://www.sciencedirect.com/science/article/pii/S037877882300395X, https://doi.org/10.1016/j.enbuild.2023.113165.).

[177] Munonye, C. (2020) The Influence of Seasonal Variation of Thermal Variables on Comfort Temperature in Schools in a Warm and Humid Climate, Open Access Library Journal, 7: e6753, https://doi.org/10.4236/oalib.1106753.

strategy. Transition spaces include spaces at the indoor/outdoor boundary (e.g., lobby entrance). Projects must also account for long-term occupants of these areas including, but not limited to, receptionists or security guards, etc. Provide adaptability options such as local air speed reduction to allow long-term occupants to customize their microclimate (these design strategies may also contribute to Option 2. Adaptable Environment).

Provide thermal comfort support for occupants carrying out tasks requiring varying levels of movement. This must include considerations for occupants completing metabolically demanding tasks.

Option 4. Sound Environment

PATH 1. MAPPING ACOUSTICAL EXPECTATIONS FOR INDOOR AND OUTDOOR SPACES

Mapping involves establishing acoustical expectations for the project spaces and identifying design targets that increase the likelihood of achieving those expectations. Performing this mapping early in the design process minimizes the potential of locating incompatible spaces adjacent to each other.

The mapping exercise must include documenting acoustical expectations based on intended space function and related occupant needs. Standardized classifications for typical acoustical expectations may be used for this mapping exercise (see Table 5). Teams may refer to the USGBC worksheet to help guide this mapping process.

Table 5. Mapping acoustical expectations

Noise exposure zones	Acoustical comfort	Acoustical privacy	Communication zones	Soundscape management
High risk, Medium risk, Low risk, No risk.	Loud zone, Quiet zone, Mixed zone, Circulation, Sensitive, No specific expectations.	High Speech Security, Confidential Speech Privacy, Normal Speech Privacy, Marginal Speech Privacy, No Privacy	Excellent, Good, Marginal, None, No specific expectations	Preserve, Improve, Restore, Mitigate, Specialized (e.g., Wellness, Therapeutic, Agency in equity), No specific expectations.

For each primary indoor and outdoor space, the mapping exercise is continued to identify acoustic criteria and subsequent design strategies or solutions that if implemented in the design increase likelihood of the project to meet the desired expectations. Example acoustic criteria and design targets are listed in Table 6.

Table 6. Common acoustic criteria

Acoustic criteria category	**Example design or performance target**	
	Acoustic criteria threshold	Threshold reference
Internally generated background noise	e.g., 35 dBA	e.g., ANSI S12.60–2010
Externally intrusive background noise		
Electronically generated masking sound	None	N/A
Outdoor acoustical environment	e.g., Daytime: 55 dBA, Nighttime: 50 dBA	e.g., local code
Airborne sound reverberation	e.g., 0.7s	e.g., AS/NZS 2107:2016
Sound insulation	e.g., STC 45	e.g., FGI Guidelines
Vibration insulation	e.g., IIC 50	e.g., WELL Beta Feature Impact Noise Management
Impact noise	e.g., NISR	

PATH 2. ACOUSTIC CRITERIA FOR INDOOR AND OUTDOOR SPACES

This pathway builds off the mapping exercise in Path 1. It requires using generally accepted engineering practices to demonstrate the project design is likely to meet the acoustical expectations outlined for the space. The acoustical consultant will select calculations, modeling methods, or measurements as appropriate for the acoustic criterion. For example, if the acoustic criterion is internally generated background noise below 35 dBA, the project might calculate sound pressure levels or measure sound pressure levels in the completed space.

The acoustic environment is particularly important to consider when designing classrooms and other core learning spaces because it can affect students' learning and teacher health and well-being. For this reason, to earn this path all classroom or core learning spaces must comply with the acoustic criteria defined in Path 1.

For other project types, more flexibility is provided for projects prioritizing better acoustics in targeted environments. 75% of the occupied spaces must comply with the acoustic criteria defined in Path 1.

Option 5. Lighting Environment

PATH 1. SOLAR GLARE

When designing spaces with daylight, solar glare must be considered, which can significantly disrupt visual comfort and impact thermal comfort. This means evaluating how natural light might create uncomfortable reflections on digital screens and potentially interfere with tasks requiring visual concentration.

Projects must provide glare-control devices for all transparent glazing in regularly occupied spaces. The requirement applies to transparent glazing, so diffused and translucent glazing systems do not require glare-control devices. All glare-control devices must be operable by the building's occupants to address unwanted glare and to allow for active participation between the building and the building occupant. Automatic devices with user override and exterior shading designs such as awnings, louvers, and shading screens are acceptable.

Glare-control devices are not required for spaces designed specifically for direct sunlight such as atriums or solar collection areas where direct sunlight is part of the design intent. In these cases, teams must establish a clear rationale, articulate the benefits, and ensure alignment with project goals. For example, the space may be intentionally designed to support Option 1. Integrated Biophilic Design or Option 2. Adaptable Environments.

Table 7. Glare control devices

Acceptable glare-control devices	Unacceptable glare-control devices
Interior window blinds	Fixed fins
Interior shades	Fixed louvers
Curtains	Dark color glazing
Moveable exterior louvers	Frit glazing treatment
Moveable screens	Additional glazing treatments
Moveable awnings	

PATH 2. QUALITY ELECTRIC LIGHTING

Properly focused lighting at the right level and quality enhances concentration and minimizes distractions.[6] Poorly lit spaces can cause headaches and eye discomfort while well-illuminated work environments can help reduce stress levels and improve the overall well-being of employees.[6] Electric lighting glare can significantly impact specific populations — such as aging adults and neurodivergent individuals — by causing discomfort, visual strain, and even emotional or cognitive disruptions.[178]

Projects must meet both Electric Light Glare Control and Color Rendering requirements within all regularly occupied spaces. Exceptions to the electric glare requirements include wallwash fixtures properly aimed at walls, as specified by manufacturer's data, indirect uplighting fixtures, provided there is no view down into these uplights from a regularly occupied space above, and

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[178] Aryani, S., Kusumawanto, A., Suryabrata, J. and Wijaya, D. "The correlation of lighting and mood in the workplace: digital image-based research", *Journal of Graphic Engineering* and Design. (2024): 15. 23-31, https://doi.org/10.24867/JGED-2024-1-023, accessed April 5, 2025, https://www.researchgate.net/publication/378820577_The_correlation_of_lighting_and_mood_in_the_workplace_digital_image-based_research.

any other specific applications (i.e., adjustable fixtures). Exceptions to the color rendering requirements include non-white light sources used for decorative color effects that are in addition to the general illumination.

Electric light glare control can be documented based on individual luminaire specifications (luminance) or for the space as a whole (UGR).

Luminance

Minimizing light fixture luminance helps reduce disability and discomfort glare. The threshold, 6,000 candela per square meter (cd/sq. m.) between 45 and 90 degrees from nadir, was selected to align with *WELL v2 Feature L04 — Electric Light Glare Control*.[179] Luminance information for the luminaire can be found in manufacturer specifications.

Unified Glare Rating

Unified Glare Rating (UGR) is a measure of the discomfort produced by a lighting system along a psychometric scale of discomfort. The value of 19 corresponds to just acceptable glare. The UGR approach requires software modeling calculations of the designed lighting. Modeling must be performed as outlined in the NEMA White Paper on Unified Glare Rating[180].

Color Rendering: Color Rendering Index

Color Rendering Index (CRI) is the most widely adopted method for evaluating color fidelity. The CRI requirement of 90 or above indicates that the light source closely mimics natural light, allowing colors to appear vibrant and true to their actual hue. This is especially important in environments where color differentiation is critical, such as in medical facilities, retail spaces, or galleries. CRI information for the luminaire can be found in manufacturer specifications. The luminaire must have a CRI of at least 90.

Color Rendering: TM-30-20

TM-30 is a newer method developed by the Illuminating Engineering Society (IES) for measuring color fidelity. The luminaire requirements for this credit are based on the Priority Level 1 criteria for the Preference design intent recommendation in *TM-30-20 Annex E* (see Table 8). This threshold was selected to align with *WELL v2 Feature L08 – Electric Light Quality*.[181]

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[179] "Electric Light Glare Control", WELL Standard v2, (n.d.) https://v2.wellcertified.com/en/wellv2/light/feature/4.

[180] "NEMA White Paper on Unified Glare Rating", NEMA, (2021), accessed March 21, 2025, https://www.nema.org/standards/view/white-paper-on-unified-glare-rating-(ugr)

[181] WELL Standard v2, https://v2.wellcertified.com/en/wellv2/light/feature/8.

Table 8. Color rendering requirements for TM-30 method

Measure		Requirement
Fidelity index	R_f	78 or higher
Gamut index	R_g	95 or higher
Red Local Chroma Shift	Rcs,h1	-1% to 15%

PATH 3. PROXIMITY TO WINDOWS FOR DAYLIGHT ACCESS

This path involves designing the building floorplates and interior layout to have regularly occupied areas located in close proximity — within 20 feet (six meters) — of envelope glazing (e.g., windows, curtain walls, or other transparent elements in the building façade).
The 30% threshold serves as a baseline or entry-level standard that aligns with *WELL v2 Precondition L01 — Light Exposure*, encouraging projects to incorporate daylight access into the design.[182] Projects aiming for more extensive daylighting strategies should explore Path 4. Daylight Simulation.

PATH 4. DAYLIGHT SIMULATION

Daylight is dynamic and highly dependent on local climate and site conditions, with daily and seasonal variations. These dynamic qualities can be explored during the design process using daylight simulation tools and daylight performance metrics standardized by the daylight design community. Incorporating simulation early in the design phase supports the optimization of building form, window placement, façade elements, and interior configurations to achieve the best possible balance of natural light.

Occurrences of direct sunlight can be minimized with thoughtful design, but daylight glare and reflections will likely still be needed and desired by occupants for certain parts of the day or year. For this reason, it is highly recommended to also pursue Option 5. Path 1. Solar Glare.

This path uses a tiered point system with four thresholds of increasing stringency based on spatial Daylight Autonomy (sDA) calculations, indicating how much of a space receives sufficient daylight throughout the year. According to research conducted under the *Illuminating Engineering Society's LM-83 standard*[183], spaces with sDA values of 75% or higher provide preferred levels of daylight, while spaces with sDA values between 55% and 75% achieve nominally acceptable daylight levels. The credit's highest point threshold aligns with this research by requiring the preferred sDA level of 75% or greater.

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[182] WELL Standard v2, https://v2.wellcertified.com/en/wellv2/light/feature/1.

[183] Illuminating Engineering Society LM-83 Standard, https://store.ies.org/product/approved-method-ies-spatial-daylight-autonomy-sda-and-annual-sunlight-exposure-ase/?v=0b3b97fa6688

Building Model

The model must be sufficiently detailed and complete to ensure accurate predictions of daylight performance. A simulation checklist must be used to support high-quality modeling practices. Checklist details are outlined in *LM-83*, Section 4. Details include but are not limited to:

- Exterior details, e.g., neighboring buildings/obstructions, trees, ground plane
- The orientation of the building, in relation to true north, is as designed.
- The geometry of the space is accurately modeled, i.e., wall thicknesses, angled ceilings, walls, fenestration surfaces, interior partitions and furniture.
- Blinds and window groupings and glazing properties
- Interior surface reflectance/material properties
- Local climate data, e.g., TMY weather data files

Daylight Performance Metrics

There are two daylight performance metrics that must be calculated: spatial daylight autonomy (sDA) and annual sunlight exposure (ASE). Both metrics are outlined in the Illuminating Engineering Society (IES) standard *LM 83-23: Approved Method: IES Spatial Daylight Autonomy (sDA)* and *Annual Sunlight Exposure (ASE).*

The sDA method assesses the prevalence of daylight over the course of a year. Calculate sDA for each regularly occupied space and calculate an average sDA across the total regularly occupied floor area. Include all regularly occupied spaces regardless of the ASE results. This approach intentionally differs from the calculation procedure outlined in the *LM-83 standard* to accommodate the wide range of project types and locations that pursue LEED. LEED associates points to daylit areas, despite the glare risk. Some designers find it confusing to exclude overlit areas from daylight calculations. Use $sDA_{300/50\%.}$ for all spaces except areas without visual tasks.

REGULARLY OCCUPIED AREAS WITHOUT VISUAL TASKS

Some spaces in the indoor environment are used for less critical visual tasks like walking through spaces or performing non-visually demanding activities. Adequate daylight in these spaces is 150 lux in *LM-83*. These spaces may be identified by reviewing IES horizontal ambient illuminance design targets for spaces with illuminance targets of 225 lux or less. For these spaces, calculate sDA using sDA150/50% as an alternative to the standard sDA300/50%.

ASE assesses the risk of visual discomfort from too much sunlight in the space. There are two variations of ASE introduced in the 2023 version of the *LM-83* standard. ASE_{net} is used for this LEED credit to encourage LEED projects to use automated glare control if desired. Calculate $\text{ASE}_{\text{net1000,250}}$ for each regularly occupied space. ASE is only calculated on a room-by-room basis.

Regularly occupied spaces with $\text{ASE}_{\text{net(1000,250h)}}$ greater than 20%

Based on IES's experience to date and analysis of the study data, an ASE_{net} of 20% or higher is a level of concern. For spaces where ASE_{net} exceeds 20%, projects must work with the designer to consider architectural methods to reduce the risk of sunlight penetration or consider the use of an automated daylight management system in as many window areas necessary to guarantee that it can avoid excessive occurrence of direct sunlight within the space.

Auditoriums

- Auditoriums may be excluded from the daylight requirements.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Biophilic Environment	Path 1. Integrated Biophilic Design	Report/narrative identifying, classifying, and explaining each of five biophilic design principles incorporated into the project using the LEED v5 Indoor biophilic design Template. Evidence of the project's indoor biophilic design features (for example any one of the following: contract documents, photographs, renderings, architectural mood board).
		Path 2. Quality Views	Percentage of regularly occupied area with access to views (%)
			LEED v5 Quality Views calculator or a quality view simulation report.
			Architectural drawings that demonstrate direct access to the view and qualifying distance from glazing or a quality view simulation report and report checklist.
	Option 2. Adaptable Environment	All	Report/narrative identifying, classifying, and explaining each variability and/or optionality strategy for thermal, sound, and lighting environments.
			Optional evidence of variability and/or optionality strategy for thermal, sound, and lighting environments (for example, contract documents, photographs, product information from the manufacturer).
			Identification of one or more accessible quiet space.
			Identification of the additional adaptability strategy in the project (prospect areas, furniture, permanently installed fixtures, outdoor transitional space).

Project types	Options	Paths	Documentation
		Prospect areas	Evidence of the project's prospect spaces and alternative paths of travel (for example, contract documents, photographs, narrative).
		Furniture	Evidence of the project's furniture configuration choices and variety of seating (for example, contract documents, photographs, product information from manufacturer).
		Permanently Installed Fixtures	Evidence of the height variety for permanently installed fixtures (for example, contract documents, photographs, product information from manufacturer).
		Outdoor Transitional Space	Evidence of occupant access to outdoor or transitional space and opportunities for interaction with nature (for example, floor and site plans, contract documents, photographs, narrative).
	Option 3. Thermal Environment	All	Design documentation per *ASHRAE* 55-2023.
			Identify transition spaces and spaces with occupants carrying out different activities and provide design documents that show solutions for these spaces to address various thermal comfort requirements.
	Option 4. Sound Environment	Path 1. Mapping Acoustical Expectations for Indoor and Outdoor Spaces	LEED v5 Acoustics Mapping Template.
			Potential design strategies and solutions the project could use to meet the Acoustical Expectations for each space.
		Option 4. Path 2. Acoustic Criteria for Indoor and Outdoor Spaces	Calculations, modeling, and/or measurements to demonstrate how the strategies and solutions contribute to accomplishment of the Acoustic Criteria identified in the LEED v5 Acoustics Mapping Template.
	Option 5. Lighting Environment	Path 1. Solar Glare	Contract documents highlighting provision of glare-control devices in all qualifying regularly occupied spaces.
			Floor plans highlighting regularly occupied spaces.
		Path 2. Quality Electric Lighting	Lighting specifications with luminance values.
			Documentation demonstrating required UGR using UGR Tabular Method or software modeling calculations of the designed lighting.
			Lighting specifications with color rendering information.
		Path 3. Proximity to Windows for Daylight Access	LEED v5 Daylight calculator a quality view simulation report.
			Evidence of proximity to envelope glazing (for example, floor plans and sections, showing furniture (at least within scope), identifying all space types and whether they are regularly or nonregularly occupied, indicating the horizontal distance from regularly occupied areas to the envelope glazing).

Project types	Options	Paths	Documentation
			Evidence of the visible light transmittance for each regularly occupied space (for example, contract documents)
		Path 4. Daylight Simulation	Average sDA value for all regularly occupied floor area (%).
			Daylight simulation report and model simulation checklist.
			Evidence of the simulation inputs including model simulation checklist.
			Explain which regularly occupied spaces have a ASEnet(1000,250h) greater than 20%. How was the space is designed to address glare?
			Explain which areas used sDA150/50% in the simulation, and the tasks that take place there, justifying that design targets of only 225 lux are needed.

REFERENCED STANDARDS

- *The Practice of Biophilic Design* by Kellert and Calabrese (docs.wixstatic.com/ugd/21459d_81ccb84caf6d4bee8195f9b5af92d8f4.pdf)
- *14 Patterns of Biophilic Design* by Terrapin Bright Green, (terrapinbrightgreen.com/reports/14-patterns)
- Biophilic Design Framework developed by Judith Heerwagen and Gordon H. Orians, (usgbc.org/resources/biophilic-design-theory-science-and-practice-bringing-buildings-life)
- ASHRAE 55 (ashrae.org/technical-resources/bookstore/standard-55-thermal-environmental-conditions-for-human-occupancy)
- Illuminating Engineering Society (IES) TM-30-20 (ies.org)
- WELL v2 (wellcertified.com/en/wellv2/overview.
- LM-83 (store.ies.org/product/approved-method-ies-spatial-daylight-autonomy-sda-and-annual-sunlight-exposure-ase/?v=0b3b97fa6688)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Indoor Environmental Quality Credit

ACCESSIBILITY AND INCLUSION

EQc3

New Construction (1 point)
Core and Shell (1 point)

INTENT

To support the diverse needs of occupants and increase widespread usability of the building to foster an individual and collective sense of belonging.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
Accessibility and Inclusion Strategies	1

Comply With Local Accessibility Codes

All projects must support access for those with physical disabilities through designs meeting all locally applicable accessibility codes identified in *IPp2: Human Impact Assessment.* If there is no code in place, include the following strategies:

- Accessible routes or regularly used exterior building entrances have ramps to accommodate elevation change.
- All doors meant for human passage have a minimum clear width of 32 in (0.86 meters).
- Reception desks, security counters, and service counters all have a front approach, wheelchair-accessible section.

AND

Include at least 10 of the following accessibility and inclusion strategies most relevant to the project that go beyond the locally applicable accessibility code.

ACCESSIBILITY FOR PHYSICAL DIVERSITY

- Provide wave-to-open or vertical hand/foot press door operators at all regularly used building entrances.
- Design meeting spaces to accommodate mobility devices for at least 10% of occupants.
- Incorporate accessible and inclusive equipment and activities in fitness facilities. Ensure an open and accessible route to and around the equipment.

- Where nonaccessible routes are provided (e.g., stairs), provide an alternate accessible route that starts and terminates at the same location.

ACCESSIBILITY FOR SAFETY AND AGING

- Provide nonslip flooring.
- Fix underside of area rugs to floor and provide transition strips at all edges.
- Provide visual indication or railing at all full-height glazing, except in private residences.
- Provide audible and visual alerts for emergency alerts.
- Provide closed risers (visually and physically) in all stairs.
- Use visual contrast between walls and floors, walls and doors, and walls and casework.
- Provide visual, tactile, contrasting, or photoluminescent warnings at floor level changes.

ACCESSIBILITY FOR SOCIAL HEALTH

- Provide lactation room pods.
- Provide at least one fully accessible, all-gender, single-use restroom OR one multiuse, all-gender restroom on each floor of the building.
- Include at least one adult changing station or table in a designated, accessible restroom or family restroom, or in one men's and one women's restroom.
- Provide signage in all languages spoken by more than 5% of the local population.
- Support neurodivergent users by achieving *EQc2: Occupant Experience, Option 1, Biophilic Environments, Path 1, Integrated Biophilic Design*.

ACCESSIBILITY FOR NAVIGATION

- Provide wayfinding signage that clearly indicates exits, entrances, and major functions in the project.
- Provide nontext diagrams and symbols at signage.
- Provide braille, visual and auditory cues, and/or continuous linear indicators on paths of travel.
- Use patterns and color blocking to identify key access spaces.
- Provide haptic/tactile maps for wayfinding.

REQUIREMENTS EXPLAINED

This credit encourages design that embraces the principles of accessibility and Inclusive Design, considering physical, sensory, and cognitive needs of occupants.[184] The goal is to go

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[184] Zallio, M. and Clarkson, P. (2021, December), Inclusion, diversity, equity and accessibility in the built environment: A study of architectural design practice, sciencedirect.com/science/article/pii/S0360132321007496.

beyond basic accessibility measures to create environments that not only accommodate individuals with disabilities but also consider how all people interact, socialize, and move through spaces.

Comply with Local Accessibility Codes

All projects must ensure accessibility at a foundational level by demonstrating compliance with all relevant local accessibility codes identified in *IPp2: Human Impact Assessment*. If the project is in a region with no accessibility code, demonstrate three foundational physical accessibility elements:

- Ramps for accessible routes and entrances
- Clear width for human passage
- Front approach wheelchair accessible section

In these cases, including fully accessible restrooms on all floors is highly encouraged.

RAMPS FOR ACCESSIBLE ROUTES AND ENTRANCES

Ramps are required in and around buildings to provide accessibility for individuals with mobility impairments, as mandated by the Americans with Disabilities Act (ADA). Unlike solutions that require separate or specialized accommodations, integrated ramps allow people with mobility disabilities, as well as people with strollers, to use the same paths as other occupants, promoting dignity and inclusion through shared building circulation. Ramps must be installed at primary entrances where steps are present to ensure at least one accessible entry point. Inside buildings, ramps are necessary where level changes exceeding 0.5 inches occur, such as between floors or platforms, if elevators or lifts are not available. In parking areas, ramps should connect accessible parking spaces to building entrances via an accessible route. Emergency exits must also include ramps or accessible egress routes to support safe evacuation. All ramps must comply with ADA design standards, including proper slope, width, landings, handrails, and slip-resistant surfaces, ensuring they are safe and functional for all users.

CLEAR WIDTH FOR HUMAN PASSAGE

Projects must provide a minimum clear width of 32 inches (0.815 meters) at all doorways meant for human passage and 36 inches (0.915 meters) for circulation paths, with passing spaces of 60 inches (1.525 meters) provided at least every 200 feet (61 meters) along any path less than 60 inches (1.525 meters) wide. Teams are strongly encouraged to consider a minimum clear doorway width of 36 inches (0.91 meters) for enhanced accessibility for all occupants.

FRONT APPROACH WHEELCHAIR ACCESSIBLE SECTION

For all transaction surfaces, including reception desks and service counters, a front approach wheelchair-accessible section is required to promote height inclusivity and ensure individuals using wheelchairs can access and navigate spaces safely, efficiently, and with dignity.

Projects must demonstrate that the accessible portions of counters are no higher than 36 inches (0.914 meters) above the floor and at least 36 inches (0.914 meters) wide.

Accessibility and Inclusion Strategies

Accessibility and inclusion strategies are organized into four categories: physical diversity, safety and aging, social health, and navigation. These strategies were selected based on research showing they provide the most significant benefits to the largest number of people, beyond what is typically required by local accessibility codes, including ADA.

Projects must include at least 10 of the following strategies. Findings from the *IPp2: Human Impact Assessment* must be used to understand unique occupant needs to inform strategy selection. Do not select strategies that are present in the existing local code, unless the team demonstrates increased stringency.

If fewer than 10 strategies are relevant to the project due to project type variations, teams may submit up to three alternative inclusive design strategies that meet the intent of credit, for compliance.

Table 1. Accessibility for physical diversity strategies

Accessibility for physical diversity	Examples, specifications, and explanation
Wave-to-open or vertical hand/foot press door operators at all regularly used building entrances.	No-touch door activation devices accommodate a wide range of users, including those with mobility impairments, people carrying objects or children, and individuals with temporary injuries.
Meeting spaces to accommodate mobility devices for at least 10% of occupants.	Accommodations include, but are not limited to, clear floor spaces, and pathways of travel without obstruction. Users must be able to park mobility devices next to or within the seating area to avoid exclusion.
Accessible and inclusive equipment and activities in fitness facilities. And Open and accessible route to and around the equipment.	Projects with fitness equipment and activities must be designed to accommodate a range of physical abilities. This includes providing an inclusive range of strength and stretching training equipment. A minimum clearance of 36 inches (0.915 meters) is the appropriate threshold for accessible routes between exercise equipment, as this aligns with ADA requirements for accessible paths and allows adequate space for wheelchair users to navigate between equipment.
Alternate accessible route that starts and terminates at the same location for non-accessible routes.	Directness and proximity of the accessible route are essential to maintain a similar level of convenience to the non-accessible route. The alternative accessible route must be in the same general area as the circulation paths. As per *International Code Council* (ICC), the maximum allowable difference between the start and end points of an accessible route and its non-accessible counterpart is 200 feet (61 meters) in most indoor facilities, though it’s recommended to minimize this distance for those with mobility challenges, ideally to 100 feet (30 meters).[185]

Table 2. Accessibility for safety and aging

Accessibility for safety and aging	Examples and explanation
Non-slip flooring	Acceptable non-slip flooring includes but is not limited to textured tiles, rubber flooring, and epoxy coated flooring providing slip resistance.
Fix area rugs to floor below and provide transition strips over high traffic areas.*	Solutions include non-slip backing, double-side carpet tape, and rug gripper to keep the rug in place. Transition strips to smooth the connection between two different types of flooring materials are required in high traffic areas.
Provide visual indication or railings at all full height glazing, except in private residences.	Providing visual indicators, such as markers or patterns, will make it more noticeable for all users, including those with vision impairments. Adding railings at full-height glass also helps provide a physical barrier for people to easily detect and use for support, though not required.
Provide audible and visual alerts for emergency alerts.	Providing emergency alerts ensures that all users, including those with hearing or visual impairments, can respond to

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[185] “Accessible and Usable Buildings and Facilities”, International Code Council, (2017), 2017 ICC A117.1, https://codes.iccsafe.org/content/icca117-12017P4/chapter-4-accessible-routes.

Accessibility for safety and aging	Examples and explanation
	emergencies. This includes, but is not limited to, loud unique alarm sounds, voice announcements, flashing strobe lights, or LED beacons.
Provide closed risers (visually and physically) on all stairs.	Closed risers eliminate gaps, reduce the risk of tripping or falling, particularly for small children or pets, and make stairs more secure. In addition, closed risers also offer privacy and reassurance through a more solid visual structure.
Use visual contrast between walls and floors, walls and doors, and walls and casework.	Incorporating distinct visual contrast between different architectural elements improves navigation and wayfinding, particularly for individuals with visual impairments. Projects must use contrasting colors, textures, and/or material for walls, floors, doors, casework i.e., drawers and cabinet doors, or other permanently installed features.
Provide visual, tactile, contrasting, or photoluminescent warnings at floor level changes.	Incorporate bold color contrasts or reflective strips to mark transitions, use textured materials such as ribbed or grooved strips to provide tactile cues, and apply varied surface finishes to create both visual and tactile distinctions. Photoluminescent markings are recommended to be applied to ensure visibility in low-light conditions, particularly in staircases or emergency exit areas.

*Not required for Core and Shell projects

Table 3. Accessibility for social health

Accessibility for social health	Examples and explanation
Provide lactation rooms or lactation pods.	Dedicated lactation rooms, or breastfeeding support rooms, support higher rates of breastfeeding, improved work performance, and physical and emotional wellbeing.[186] It is recommended that these rooms include features such as an electrical outlet, seating, and a table, along with access to a sink and refrigerator either within the room or on the same floor to better accommodate pumping and breastfeeding needs.
Provide at least one fully accessible all-gender single-use restroom OR one multi-use all-gender restroom on each floor of the building.	Providing all-gender restrooms creates a more inclusive and welcoming environment for people who may prefer gender-neutral options.[187]
At least one adult changing station or table in a designated, accessible restroom or family restroom.	Locate the changing station in a family or accessible restroom that complies with ADA guidelines for door width, turning space (60 inches or 1.52 meters diameter), and clear floor area (30 x 48 inches or 0.76 x 1.22 meters). Use a height-adjustable adult changing table with a weight capacity of at least 350 lbs (160 kg) to accommodate diverse user needs. Ensure the table is at least 72 inches

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[186] De Souza, C. B., Venancio, S. I., and da Silva, R. P. G. V. C. (2021), Breastfeeding Support Rooms and Their Contribution to Sustainable Development Goals: A Qualitative Study, Frontiers in public health, 9, 732061, https://doi.org/10.3389/fpubh.2021.732061.

[187] Harwood-Jones, M., Martin, K. and Airton, L. (2021, August), Research and Recommendations on Gender-Inclusive Washrooms and Changerooms, queensu.ca/hreo/sites/hreowww/files/uploaded_files/Washroom%20Report%20-%20Digital.pdf.

Accessibility for social health	Examples and explanation
	(1.83 meters) long and 30 inches (0.76 meters) wide for adequate space.
Provide signage in all languages spoken by more than 5% of the local population.	Ensure services and information are accessible to diverse communities. Provide additional signage for people with limited English proficiency (LEP) when they constitute 5% of the population or 1,000 individuals, whichever is smaller.
Support neurodivergent users by achieving at least 1 point under EQc2: Occupant Experience, Option 1. Biophilic Environments, Path 1. Integrated Biophilic Design.	Biophilic design is particularly valuable for neurodivergent populations, approximately 15-20% of the global population.[188] Achieve at least 1 point under *EQc2: Occupant Experience, Option 1. Biophilic Environments, Path 1. Integrated Biophilic Design*.

Table 4. Accessibility for navigation

Accessibility for navigation	Examples and explanation
Provide wayfinding signage that clearly indicates exits, entrances, and major functions in the project.	Signage should be clear, concise, and easy to understand, using both text and universally recognized symbols to accommodate individuals with varying levels of literacy.
Provide non-text diagrams and symbols at signage.	Diagrams and symbols can convey instructions or warnings more quickly than text alone, making it easier for people with varying levels of literacy or visual impairments to understand. Provide alternative signage where applicable.
Provide Braille, visual and auditory cues, and/or continuous linear indicators on paths of travel.	Braille, along with visual and auditory cues or continuous linear indicators, enhances safety and usability for everyone, including those with vision impairments.
Use pattern and color blocking to identify key access spaces.	Utilizing contrasting colors and unique patterns helps differentiate important spaces such as entrances, exits, and pathways, making them more recognizable and easier to navigate, particularly for the visually impaired. Provide visual contrast where applicable.
Provide haptic maps or tactile maps for wayfinding.	Wayfinding remains a significant barrier for visually impaired people during their daily life.[189] Haptic or tactile maps enable more users to form a clearer and more comprehensive understanding of an environment.

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[188] Doyle, N. (2020, October 14), Neurodiversity at work: a biopsychosocial model and the impact on working adults, https://pubmed.ncbi.nlm.nih.gov/32996572/.

[189] Ottink, L., van Raalte, B., Doeller, C.F., Van der Geest, T.M., and Van Wezel, R.J.A. (2022, July 7), “Cognitive map formation through tactile map navigation in visually impaired and sighted persons”, *Scientific Reports*, 12, 11499, https://www.nature.com/articles/s41598-022-15858-4.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	All	Comply with Local Accessibility Codes	Confirmation of whether there is a locally applicable accessibility code for the project.
			If the project has not met all locally applicable accessibility codes: contract documents highlighting the appropriate ramps, door widths, and front approach wheelchair accessible counter sections.
		Accessibility and Inclusion Strategies	Project Strategies (check, from the standard list in Requirements, which strategies have been implemented).
			Narrative identifying locations in documents where project strategies are documented (file name, page number, at minimum).

REFERENCED STANDARDS

- ADA (ada.gov/law-and-regs/design-standards/)
- ANSI A117.1 (codes.iccsafe.org/content/ICCA117.12017P7)
- OSHA (osha.gov/laws-regs)

Impact Area Alignment

— Decarbonization

☑ Quality of Life

— Ecological Conservation and Restoration

Indoor Environmental Quality Credit

RESILIENT SPACES

EQc4

New Construction (1–2 points)
Core and Shell (1–2 points)

INTENT

To support design features that increase the capacity for occupants to adapt to changing climate conditions and be protected from events that may compromise the quality of the indoor environment and subsequently occupant health and well-being.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–2
Option 1. Management Mode for Episodic Outdoor Ambient Conditions — New Construction Only	1
AND/OR	
Option 2. Management Mode for Respiratory Diseases — New Construction Only	1
AND/OR	
Option 3. Design for Occupant Thermal Safety During Power Outages	1–2
Path 1. Consider Extreme Heat	1
AND/OR	
Path 2. Consider Extreme Cold	1
AND/OR	
Option 4. Operable Windows	1–2

Comply with any of the following options for up to two points:

Option 1. Management Mode for Episodic Outdoor Ambient Conditions — New Construction Only (1 point)

This option applies to LEED BD+C: New Construction projects only.

Design systems with the capability to operate an episodic outdoor event management mode as described in *ASHRAE Guideline 44*. The mode should address varying outdoor conditions or events that could negatively influence indoor air quality, such as wildfire smoke. Include the management mode in the design and commissioning documents. Verify proper implementation of the mode during commissioning.

AND/OR

Option 2. Management Mode for Respiratory Diseases — New Construction Only (1 point)

Design occupied spaces with the capability to operate an infection risk management mode that provides the minimum equivalent clean airflow rates outlined in *ASHRAE 241-2023*, Section 5.1. Include the management mode in the design and commissioning documents as outlined in *ASHRAE 241-2023*, Section B10.2 Design Documentation. Verify proper implementation of the mode during commissioning.

AND/OR

Option 3. Design for Occupant Thermal Safety During Power Outages (1–2 points)

PATH 1. CONSIDER EXTREME HEAT (1 POINT)

Demonstrate through thermal modeling that a building will passively maintain thermally habitable conditions during a power outage that lasts two days during peak summertime conditions of a typical meteorological year. Designate specific thermal safety zones where habitable conditions will be maintained during a power outage.

AND/OR

PATH 2. CONSIDER EXTREME COLD (1 POINT)

Demonstrate through thermal modeling or Passive House certification that a building will passively maintain thermally habitable conditions during a power outage that lasts two days during peak wintertime conditions of a typical meteorological year. Designate specific thermal safety zones where habitable conditions will be maintained during a power outage.

AND/OR

Option 4. Operable Windows (1–2 points)

Design 50% for 1 point or 75% for 2 points of the regularly occupied spaces to have operable windows with the capability to provide access to outdoor air during heat waves or localized power outages. The windows must meet the opening size and location requirements of *ASHRAE 62.1-2022*, Section 6.4.

REQUIREMENTS EXPLAINED

Incorporating resilient design solutions into our buildings increases the adaptive capacity of our communities, strengthening their capacity to respond to climate change and natural disasters.

This credit addresses a building's ability to remain functional, maintain the quality of the indoor environment, and protect occupant health and wellbeing during major, episodic, disruptive events such as extreme weather conditions, wildfires, pandemics, or power outages. Although this credit addresses the design of events separately, teams are encouraged to consider and design for the possibility of multiple events occurring at the same time (such as a wildfire and extreme heat event).

Leveraging information from *IPp1: Climate Resilience Assessment* and *IPp2: Human Impact Assessment*, select two strategies for up to two points. Teams can select any two options or paths, even those not identified as a high priority under *IPp1: Climate Resilience Assessment*.

Building readiness plans may be developed and communicated to facilitate operating in specialized modes only when necessary, and to educate building occupants on the transition from normal operations to management mode for the duration of the condition or event.

Option 1. Management Mode for Episodic Outdoor Ambient Conditions

Episodic outdoor ambient conditions can range from incidents such as the release of toxic chemicals outside a building to the widespread presence of wildfire smoke. Having an episodic outdoor event management mode facilitates the protection of building occupants from these and other outdoor pollution events.

System design for event management mode

ASHRAE Guideline 44, Protecting Building Occupants from Smoke During Wildfire and Prescribed Burn Events, specifies enhanced modes of operation to preserve indoor air quality (IAQ) during periods of heightened outdoor air pollution.

Refer to *ASHRAE Guideline 44* to design HVAC systems capable of operating in a smoke-ready mode or other event management mode. Teams can leverage guidance from Standard 44 to design and apply similar modes of operation for any events that impact outdoor air quality including increases in nearby construction activity or chemical gas releases.

Commissioning requirements

ASHRAE Guideline 44 prescribes testing HVAC systems in smoke-ready conditions. Include the requisite sequences of operation in design documents and ensure that event management mode is included in the commissioning scope of work to verify that all equipment responds as intended.

Option 2. Management Mode for Respiratory Diseases

Following the COVID-19 pandemic, industry experts developed strategies to reduce airborne infectious disease transmission in buildings for the protection of public health and to facilitate keeping buildings operational during periods of heightened risk. One resulting standard — *ASHRAE Standard 241-2023*, Control of Infectious Aerosols — specifies an infection risk management mode with ventilation and filtration strategies for reducing occupant exposure to airborne pathogens that cause significant personal and economic damage each year.

Projects pursuing this option must design occupied spaces with the capability to operate in an Infection Risk Management Mode. This mode provides minimum equivalent clean airflow rates, calculated as the equivalent clean airflow rate per person multiplied by the anticipated number of people in a space. The building owner and facility manager must determine when to apply this mode of operation.

Commissioning requirements

Include the requisite sequences of operation in design documents and ensure that Infection Risk Management Mode is included in the commissioning scope of work to verify that all equipment responds as intended.

Option 3. Design for Occupant Thermal Safety During Power Outages

During power outages when backup power is unavailable, mechanical cooling, heating, and ventilation become inaccessible. Designing spaces to sustain thermal habitability passively or through manual occupant controls allows the building to remain livable until power is restored.

Projects that pursue Option 3 have two paths to consider: One for extreme cold and one for extreme heat. Based on the project's location, teams should determine which option, or both, are appropriate.

Thermal safety zones

Designate thermal safety zones where thermal habitability can be maintained during a loss of power. Analyze conditions on the assumption that building occupants will congregate in the safety zones during an outage. This may increase the expected occupant density above normal assumptions for the space. Include enough thermal safety zones so the occupant density does not exceed one person per 20 square feet (1.9 square meters).

> **Example**
> An office building has 400 employees. If 20,000 square feet (1,858 square meters) of space is identified as being thermally safe, teams must analyze the

> space assuming 400 people will be in that 20,000 square feet area (1,858 square meters).
>
> A 20,000 square feet (1,858 square meters) zone can accommodate up to 1,000 people. Therefore, the project would meet the sizing requirements.

Thermal habitability

Define habitable conditions as applicable to the project type. Thermally safe conditions may differ from a healthcare facility to a typical office building. For example, the heat stress index for an office building will be different than a nursing home. Consider the project type and the population when performing the initial analysis. Thermal habitability is not thermal comfort and will therefore be different than the comfort zone prescribed in *ASHRAE Standard 55*.

Natural ventilation

Thermal safety zones must have access to natural ventilation. This is achievable through operable windows, doors, operable panels, or louvers.

Thermal models

Thermal models analyze heat transfer within a building, accounting for climate, insulation, glazing specifications, solar gains, envelope leakage rates, and ventilation. Use computer simulation software to perform the thermal modeling for each path, based on project-specific inputs. Consider using modeling tools that are approved for Passive House compliance.

The analysis uses a two-day period. This was selected as an entry-level duration for LEED projects for design purposes. A four-day period has been used previously in the LEED v4 pilot credit Passive Survivability and Back-up Power During Disruptions. A timeframe of 72 hours (3 days) is often used for general emergency preparedness planning (such as disaster-ready kits). For example, extreme heat or cold periods can last longer than two days. According to the EPA using heat wave tracking data by the National Oceanic and Atmospheric Administration (NOAA), the average heat wave in major U.S. urban areas has been about four days long.[190]

PATH 1. CONSIDER EXTREME HEAT

Demonstrate with a thermal model that the building will passively maintain habitable conditions for at least two days during a power outage in hot, summer months. The two-day period must represent the peak summertime conditions of a typical meteorological year (TMY).

AND/OR

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[190] https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves#ref6.

PATH 2. CONSIDER EXTREME COLD

Demonstrate with a thermal model or through Passive House certification that the building will passively maintain habitable conditions for at least two days during a power outage in cold, winter months. The two-day period must represent the peak wintertime conditions of a TMY.

Option 4. Operable Windows

During a power outage, ventilation may rely on operable windows, doors, or other openings to maintain airflow. Operable windows can also be used for thermal comfort depending on outside weather conditions and may minimize reliance on building systems and support adaptability for future changes in building use.

For this option, design operable windows to support ventilation in at least 50% of the regularly occupied floor area. Specify and size the windows to meet minimum window opening area and locations. The natural ventilation procedure in *ASHRAE 62.1-2022 Section 6.4* includes calculations and minimum openable area tables for determining these minimums. The opening sizes and locations will depend on the designer's approach to opening placement. For example, openings may be placed on one side of a zone, on opposite sides of a zone, or in the corner of a zone. The information provided in the tables is based solely on buoyancy-driven flow and does not address thermal comfort.

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Management Mode for Episodic Outdoor Ambient Conditions	All	Design documents confirming management mode design and sequence of options.
			Final Commissioning Report, confirming that management mode was tested during Commissioning.
	Option 2. Management Mode for Respiratory Diseases	All	Design documents confirming management mode design and sequence of options.
			Final Commissioning Report, confirming that management mode was tested during Commissioning.
	Option 3. Design for Occupant Thermal Safety during Power Outages	Path 1 and Path 2	Thermal model report and results and identify thermal safety zones.
	Option 4. Operable Windows	All	*ASHRAE Standard 62.1* calculations for opening areas and distances for all regularly occupied spaces.
			Percentage of spaces with operable windows.

REFERENCED STANDARDS

- ASHRAE Guideline 44 (store.accuristech.com/ashrae/standards/guideline-44-2024-protecting-building-occupants-from-smoke-during-wildfire-and-prescribed-burn-events?product_id=2923808)
- ASHRAE 241-2023 (store.accuristech.com/ashrae/standards/ashrae-241-2023?product_id=2567398)
- FEMA P-361 (fema.gov/sites/default/files/documents/fema_p-361_safe-rooms-for-tornadoes-and-hurricanes_122024.pdf)
- FEMA E-74 (2011) (fema.gov/sites/default/files/2020-07/fema_earthquakes_reducing-the-risks-of-nonstructural-earthquake-damage-a-practical-guide-fema-e-74.pdf)
- REDi Version 1.0 (redi.arup.com)

Impact Area Alignment

—	Decarbonization
☑	Quality of Life
—	Ecological Conservation and Restoration

Indoor Environmental Quality Credit

AIR QUALITY TESTING AND MONITORING

EQc5

New Construction (1–2 points)

INTENT

To support better management of indoor air quality (IAQ) and identify opportunities for health-based approaches to building operations.

REQUIREMENTS

Achievement pathways	Points
New Construction	1–2
Option 1. Preoccupancy Air Testing	1–2
Path 1. Particulate Matter and Inorganic Gases	1
AND/OR	
Path 2. Volatile Organic Compounds	1
AND/OR	
Option 2. Continuous Indoor Air Monitoring	1

Option 1. Preoccupancy Air Testing (1–2 points)

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing. Retail projects may conduct the testing within 14 days of occupancy. The number of measurements should be specified according to Table 1 and taken in representative locations of the building.

Table 1. Number of measurements required for preoccupancy air testing

Total occupied floor area, sq. ft. (sq. m.)	Number of measurements
≤ 5,000 (500)	1
> 5,000 (500) and ≤ 15,000 (1,500)	2
> 15,000 (1,500) and ≤ 25,000 (2,500)	3
> 25,000 (2,500) and ≤ 200,000 (20,000)	4 plus 1 additional measurement per each 25,000 sq. ft. (2,500 sq. m.) above 25,000 sq. ft.
> 200,000	10 plus 1 additional measurement per each 50,000 sq. ft. (4600 sq. m.) above 200,000 sq. ft.

PATH 1. PARTICULATE MATTER AND INORGANIC GASES (1 POINT)

Test for the particulate matter (PM) and inorganic gases listed in Table 2 using an allowed test method and demonstrate that the contaminants do not exceed the concentration limits listed in the table. Measure for a four-hour period, calculating peak concentration for carbon monoxide and average concentration for ozone, PM2.5, and PM10.

Table 2. Limits for particulate matter and inorganic gases

Contaminant (CAS#)	**Concentration limit (µg/m^3)**	**Allowed test methods (laboratory-based)**	**Direct reading instrument minimum specifications**
Carbon monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	*ISO 4224* *EPA Compendium Method IP-3* *GB/T 18883-2002* for projects in China	Direct calibrated electrochemical instrument with accuracy of +/– 3% of reading and resolution of 0.1 ppm NDIR CO sensors with accuracy of 1% of 10 ppm full scale and display resolution of less than 0.1 ppm
Particulates (for projects in attainment areas)	ISO class 8 or lower per *ISO 14644-1:2015* OR meet PM 10: 50 µg/m3 PM 2.5: 12 µg/m3	n/a	Accuracy (+/–): Greater of 5 µg/m3 or 20% of reading Resolution (+/–): 5 µg/m3
		IP-10A	
Particulates (for projects in nonattainment areas)	ISO class 8 or lower per *ISO 14644-1:2015* OR meet PM 10: 50 µg/m3 PM 2.5: 35 µg/m3	n/a	Accuracy (+/–): Greater of 5 µg/m3 or 20% of reading Resolution (+/–): 5 µg/m3
		IP-10A	
Ozone	0.07 ppm OR 0.01 ppm for projects pursuing *EQc1: Enhanced Air Quality*, Option 1, Path 2	*ISO 13964* *ASTM D5149-02* EPA-designated methods for ozone	Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min. average data) +/– 5 ppb

AND/OR

PATH 2. VOLATILE ORGANIC COMPOUNDS (1 POINT)

Perform a screening test for total volatile organic compounds (TVOC). Use *ISO 16000-6*, *EPA TO-17*, or *EPA TO-15* to collect and analyze the air sample. Calculate the TVOC value per *EN 16516:2017*; *CDPH Standard Method v1.2 2017*, Section 3.9.4; or alternative calculation method if full method description is included in test report.

If the TVOC levels exceed 500 µg/m3, investigate for potential issues by comparing the individual volatile organic compound (VOC) levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and retest if necessary.

Test for the individual VOCs listed in Table 3 using an allowed test method and demonstrate that the contaminants do not exceed the concentration limits listed in the table. Laboratories that conduct the tests must be accredited under *ISO/IEC 17025* for the test methods they use.

Table 3. Volatile organic compound limits

Contaminant (CAS#)	**Concentration limit (µg/m^3)**	**Allowed test methods**
Formaldehyde 50-00-0	20 µg/m^3 (16 ppb)	*ISO 16000-3, 4* *EPA TO-11a* *EPA comp. IP-6A* *ASTM D5197-16*
Acetaldehyde 75-07-0	140 µg/m^3	
Benzene 71-43-2	3 µg/m^3	*ISO 16000-6* *EPA IP-1* *EPA TO-17* *EPA TO-15* *ISO 16017-1, 2* *ASTM D6196-15*
Hexane (n-) 110-54-3	7000 µg/m3	
Naphthalene 91-20-3	9 µg/m3	
Phenol 108-95-2	200 µg/m3	
Styrene 100-42-5	900 µg/m3	
Tetrachloroethylene 127-18-4	35 µg/m3	
Toluene 108-88-3	300 µg/m3	
Vinyl acetate 108-05-4	200 µg/m3	
Dichlorobenzene (1,4-) 106-46-7	800 µg/m3	
Xylenes — total 108-38-3, 95-47-6, and 106-42-3	700 µg/m3	

AND/OR

OPTION 2. CONTINUOUS INDOOR AIR MONITORING (1 POINT)

Provide indoor air monitors for all the following parameters:

- Carbon dioxide (CO2)
- Particulate matter (PM2.5)
- Total volatile organic compounds

- Temperature
- Relative humidity

Monitors must be building grade or better and located 3–6 feet (1–2 meters) above the floor.

REQUIREMENTS EXPLAINED

This credit helps the project gain a better understanding of their indoor air.

The pre-occupancy testing provides this insight prior to building use to prevent occupant exposure to unsatisfactory air. Continuous indoor air monitoring provides this understanding throughout operations, to track contaminant levels over time and to proactively identify any issues and faults.

Teams may use both options for a total of two points and may find it beneficial to perform air testing prior to occupancy at the same time as setting up the continuous monitoring systems.

Option 1. Pre-occupancy Air Testing

Construction activities and building materials can introduce contaminants that may negatively affect a building's indoor air quality. Testing after construction incentivizes the contractors to follow construction management practices in accordance with *EQp1: Construction Management* and follow low-emitting material specifications. It also verifies that the indoor environment is acceptable for human occupancy and ensures that ventilation systems are effectively maintaining adequate IAQ.

Number of measurements

The number of measurement points required is outlined in Table 1 of the rating system. The table provides a consistent number of measurements per floor area (square feet or square meters) to help with planning for testing and the associated costs.

The floor area in Table 1 reflects the total occupied floor area for the project, including all regularly and non-regularly occupied areas. For example, corridors are non-regularly occupied and must be included in the total area for this calculation. Unoccupied areas, such as mechanical and electrical rooms, are excluded.

Projects may choose to test take more measurements beyond the minimum if desired. Exceeding the minimum number of measurements does not earn additional points but will provide a more comprehensive assessment of the indoor air quality.

Measurement locations

Measurement locations must be selected to best represent the project occupancy and function(s). Use the following criteria to determine representative locations for the project:

- **Regularly occupied spaces**. Prioritize regularly occupied spaces. Non-regularly occupied spaces must be included in the total area for determining the occupied floor area but need not be tested.
- **Multiple space types**. If more than one measurement is necessary per Table 1, test multiple space types. For example, in an office building, test open office spaces, but also consider closed offices, conference rooms, quiet space, and other occupied space types. In a school building, test classroom spaces, but also consider the auditorium, administrative offices, student assembly areas, and lab spaces.
- **Different ventilation systems**. If the project has multiple ventilation systems, identify a measurement location in areas served by each ventilation system, up to the required number of measurement points.
- **Multiple floors**. For projects with multiple floors, select locations on different floors.
- **Spaces where the highest concentrations of contaminants are likely to occur**. This could be due to the construction or fit-out of the space, or a lower ventilation rate. For example, private offices may have a higher concentration of contaminants compared to open offices, due to a higher density of furniture and finish materials in an enclosed space.

Failed testing

If a test fails, take corrective action (e.g., clean and flush out the space) and retest. All test locations must meet the concentration limits in Table 2 for Path 1 compliance and/or Table 3 for Path 2 compliance.

Timing for air quality testing

Air quality measurements must be conducted after construction is complete and before occupancy. For the purposes of this credit, construction is complete once all furniture and finishes are installed, construction punch-list items that would generate VOCs or other contaminants are complete, and testing and balancing of the HVAC system has been conducted.

Testing must be done under normal operating ventilation conditions. If there are unoccupied setbacks in the ventilation system, test during normal occupied hours to achieve the typical ventilation conditions.

All testing and retesting must be completed before occupancy.

Retail Projects

- Retail projects may perform testing within 14 days of occupancy. This is to accommodate the unique compressed construction timeline for typical retail projects.

PATH 1. PARTICULATE MATTER AND INORGANIC GASES

Each location must be tested for all contaminants in Table 2.

Table 2 outlines the approved test methods for each contaminant. Teams can use laboratory-based testing or take measurements using direct-reading instruments. If using direct readings, all instruments must meet the minimum specifications of Table 2. Alternative methods may be used for Path 1 contaminants if the project team documents that the accuracy and resolution specifications in Table 2 are met.

PATH 2. VOLATILE ORGANIC COMPOUNDS

A screening test for total volatile organic compounds (TVOC) and test for each individual VOC in Table 3 must be performed at each measurement location.

Because VOC testing and analysis is complex, it must be performed using specific methods by a laboratory that is accredited under *ISO/IEC 17025* for the test method used.

TVOC screening is intended to serve as a general indicator of the VOC levels in the building and is used to capture situations where investigation of individual VOCs beyond those targeted via Table 3 may be needed. While projects are not required to meet a specific TVOC threshold, they are required to report TVOC results. If the TVOC concentration exceeds 500 ug/m3, the team must work with the laboratory to compare the individual VOC levels from the GC/MS results to associated cognizant health-based limits and perform corrective actions as necessary.

Option 2. Continuous Indoor Air Monitoring

During occupancy, airborne contaminants can enter a building from the outdoors or be introduced by indoor sources and activities such as cleaning, cooking, candles, 3D printers, or improperly vented heating appliances. Permanently installed continuous indoor air monitors enable the identification of potential issues and timely corrective actions to assure systems designed to maintain indoor air quality in the building continue to work as intended through the project’s operational phase.

Number of monitors

A successful monitoring strategy must consider the data collection purpose and dedicated resources for ongoing data management. Fewer, well managed monitors are usually more beneficial than copious neglected monitors. Include at least one monitor per 25,000 square feet (2,500 square meters) of total occupied floor area. This density is a good entry point for getting started with indoor air quality monitoring. Additional monitors can be added as desired up to the best-practice density of one monitor per 5,000 square feet (500 square meters) of total occupied floor area.

Monitor locations

Monitors must be placed to best represent the project occupancy and function(s). This will vary depending on the purpose of the monitoring. Use the following criteria to determine representative locations for the project:

- **Multiple space types**. Consider including monitors in multiple space types. For example, in an office building: monitor the open office spaces, but also consider closed offices, conference rooms, quiet spaces, and other occupied space types. In a school building: monitor classroom spaces, but also consider the auditorium, administrative offices, student assembly areas and lab spaces.
- **Different ventilation systems**. If the project has multiple ventilation systems, consider placing monitors in areas served by each ventilation system.
- **Multiple floors.** For projects with multiple floors, consider placing monitors on different floors.
- **Spaces where the highest concentrations of contaminants are likely to occur**. This could be due to the construction or fit-out of the space, a lower ventilation rate or air filtration level, the presence of combustion or operable windows, or occupant activities. For example, cafeterias may have a higher concentration of contaminants compared to classrooms, due to the presence of cooking.
- **Spaces occupied by at-risk populations or spaces designated for cleaner air**. Consider placing monitors in areas where people who are more susceptible to poor indoor air quality congregate. For example, this may include spaces with infants, children, pregnant women, acute care facilities, and assisted living facilities.

If monitoring to support IAQ management during wildfires and prescribed burn events, review *ASHRAE Guideline 44*, Section 5.5.1.2 for considerations for monitor placement.

Monitors must be permanently installed at a height corresponding to the breathing zone of a typical occupant. In most situations, the breathing zone is 3–6 feet (0.9–1.8 m) above finished floor height, based on the location of an occupant's head when seated or standing. Alternative mounting heights based on the anticipated occupant position in a space may be considered.

Where possible, place monitors at least three feet (0.9 meters) away from doors, windows, air filters, air supply outlets, exhaust intakes, stoves, printers, and other potential airborne contaminant sources or sinks. In areas where this is not possible, locate monitors closer to air returns than air diffusers.

Monitors located in ducts do not meet the requirements.

Monitor specifications

Select indoor air monitoring devices that measure carbon dioxide (CO2), fine particulate matter (PM2.5), total volatile organic compounds (TVOC), temperature, and relative humidity. Monitors must meet the building grade requirements of *RESET Grade B*[191] or *UL 2095 Grade B*.

Hourly reporting

Monitors must report hourly (or higher frequency including 15-minute data for CO2) data to a remote location that logs pollutant levels over time. A digital display, or integration with the building management system, is not required to achieve the credit.

Table 4. RESET Grade B monitor specifications

RESET Grade B monitor specifications	CO2	PM2.5	TVOC	Temperature	Relative humidity
Data loss	10%				
Operating range for temperature	0–40 ℃				
Operating range for relative humidity	10-80 % RH non-condensing				
Data output interval	5 min				
Sampling type		Active airflow			
Sensor output resolution	5 ppm	1 µg/m3	4.4 ppb	0.1 ℃	1 % RH
Measuring range	400–5000 ppm	0-500 µg/m3	65-870 ppb	0-40 ℃	10-80 % RH
Accuracy*	400–2000 ppm : ±50 && 3% 2000–5000 : ±50 && 5%	0 - 150 : ±5 && 15% 150 - 500 : ±5 && 20%	65 – 260 ppb : ±8.7 && 15% 260 - 870 : ±8.7 && 20%	±1 ℃	±8% RH

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[191] "Indoor Air Quality Monitors", RESET, GIGAbase Canada, (2025), accessed April 5, 2025, https://reset.build/directory/monitors/type/indoor.

RESET Grade B monitor specifications	CO2	PM2.5	TVOC	Temperature	Relative humidity
Performance check and re-calibration	Required	Required	Required	Required	Required

*EXAMPLE: If a reference monitor is reading 900 ppm, a Grade B monitor's reading must read within 50 + (0.03 x 900) = ±77. The Grade B monitor's reading must be between 823 and 977 ppm

DOCUMENTATION

Project types	Options	Paths	Documentation
All	Option 1. Pre-occupancy air testing	Path 1 and Path 2	Completed air quality testing report, including time, date, testing methods complying with credit requirements, results and limits of the tested contaminants in all locations, and lab accreditation scope for Path 2 VOCs if applicable.
			Evidence of testing locations
			Document confirming substantial completion of construction, highlighting the date. The intent is to confirm that construction was complete prior to the time/date of the air quality testing.
	Option 2. Continuous Indoor Air Monitoring	All	Evidence of monitoring locations and description of monitoring approach
			Specifications of building grade air monitors.

REFERENCED STANDARDS

- ISO 4224 (iso.org/standard/32229.html)
- EPA Compendium Method IP-3, GB/T 18883-2002 (nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=30003ULE.txt)
- ISO 13964 (iso.org/standard/23528.html)
- ASTM D5149-02 (astm.org/d5149-24.html)
- EPA designated methods for Ozone (epa.gov/system/files/documents/2024-12/amtic-list-december-2024_final.pdf)
- ISO IEC 17025 (iso.org/ISO-IEC-17025-testing-and-calibration-laboratories.html)
- CDPH Standard Method v1.2-2017 (cdph.ca.gov/Programs/cls/dehl/ehl/Pages/AQS/VOCs.aspx)
- Reset Air Accredited Monitors (reset.build/directory/monitors)
- UL 2905 (shopulstandards.com/ProductDetail.aspx?productId=ULE2905_2_S_20230110)

PROJECT PRIORITIES (PR)

OVERVIEW

The historical Innovation credit category has evolved in LEED v5 to become the Project Priorities (PR) credit category. The goal is greater flexibility for projects to address their unique context and priorities including typology, culture, location, areas of innovation and individual performance objectives. Credits can be added to the library as they are developed enabling an adaptive and agile response to rapidly evolving industry knowledge, developing technologies and emerging innovative solutions. And empowering projects to pursue improvements that are most meaningful to their specific goals and circumstances.

For example, the evolution of the building industry over the last 15 years has fostered a need for more sector-specific sustainability metrics. Additionally, greater adoption of reporting has prompted real estate organizations to establish targets in areas including decarbonization, occupant health and biodiversity. The PR credit category aims to provide recognition for projects pursuing these goals outside of the established credits in LEED v5.

New metrics and strategies can be continually applied to LEED without waiting for the next version to debut, allowing for a more nimble and dynamic development of credits and compliance paths in between releases of new rating system versions.

By embracing flexibility and encouraging continuous innovation, the PR credit category ensures that LEED remains a dynamic tool for advancing sustainability. It empowers project teams to align their efforts with evolving best practices, sector-specific goals, and emerging global challenges, ensuring that buildings remain resilient, forward-thinking, and impactful over time.

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

PROJECT PRIORITIES

PRc1

New Construction (1–9 points)
Core and Shell (1–9 points)

INTENT

To promote achievement of credits that address geographically sensitive or adaptation-specific environmental, social equity, and public health priorities. To encourage projects to think creatively to test and accelerate new sustainable building practices and strategies.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1–9
Regional Priority	1–9
Project-Type Credits	
Exemplary Performance	
Pilot Credits	
Innovation Strategies	

Achieve any combination of the following for a maximum of nine points:

Regional Priority

Achieve a regional priority credit from USGBC’s Project Priority Library. These credits have been identified by USGBC as having additional regional importance for the project’s region.

Project-type Credits

Achieve a project-type credit from USGBC’s Project Priority Library. These credits have been identified by USGBC as addressing unique needs for the given adaptation or building application.

Exemplary Performance

Achieve an exemplary performance credit from USGBC’s Project Priority Library. These credits have been identified by USGBC as going above and beyond an existing LEED v5 prerequisite or credit in the LEED v5 priority areas of scale, decarbonization, resilience, health, equity, and/or ecosystems.

Pilot Credits

Achieve a pilot credit from *USGBC's Project Priority Library*.

Innovative Strategies

Achieve significant, measurable, environmental performance using a strategy not addressed in the LEED v5 green building rating system.

Identify all the following criteria:

- The intent of the proposed innovation strategy
- Proposed requirements for compliance
- Proposed submittals to demonstrate compliance
- The design approach or strategies used to meet the requirements

REQUIREMENTS EXPLAINED

Teams earn recognition for implementing innovative measures addressing distinct focus areas in their projects through the *PRc1: Project Priorities*. This credit offers multiple pathways for projects to address their respective priorities and go beyond the requirements listed in other LEED credits. This flexibility enables teams to effectively address the distinct needs of their projects, fostering innovation and adaptability. Each project can chart its path forward based on its own goals.[192]

Projects prioritize efforts based on their unique contexts. Teams can choose the best credits for addressing their project's goals and targets. Some projects may concentrate most of their effort toward a single priority area, including project type specific priorities or exemplary performance. Other projects might choose to address different priority areas more uniformly.

For example, an office building in a coastal city prone to hurricanes and flooding might prioritize enhancing resiliency to regional climate challenges with applicable credit pathways focused on flood mitigation, building safety, and reinforced construction materials and design. Similarly, an urban mixed-use development comprised of residential and commercial spaces might have a variety of sustainable priorities to address, such as incorporating renewable energy efficiency, providing indoor environmental quality to building tenants and promoting methods for active or cleaner forms of transportation.

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[192] "Green buildings", PNNL, (n.d.), https://www.pnnl.gov/explainer-articles/green-buildings.

To achieve the maximum nine points available, project teams should incorporate as many credits under each pathway as they prefer, using any combination of project type credits, exemplary performance credits, regional priorities, innovation strategies, and pilot credit pathways.

Project Type

Achieve a project-type credit from the USGBC's Project Priority Library. USGBC has identified these credits as addressing unique needs for the given adaptation or building application.

> **Example strategies: Project type**
>
> A data center project might focus on project type credits specific to data centers that address energy efficiency, advanced cooling technologies, and renewable energy integration.

Exemplary performance

Achieve exemplary performance requirements of an existing LEED v5 credit eligible for exemplary performance, as specified in USGBC's Project Priority Library. Exemplary performance earns points by exceeding the credit requirements or achieving the next incremental percentage threshold for the credit.

Regional priority

Identify the environmental and/or social equity and/or public health priorities for the project's location and achieve LEED credits that address those regional priorities. Regional priority credits address geographically specific environmental and/or social priorities for the project's region.

Innovation strategies

Achieve innovation credits from the USGBC's Project Priority Library. Alternatively, achieve innovation credits by adopting new strategies not addressed in the LEED rating system that demonstrate reduced environmental impacts, increased decarbonization, and improved social impacts. Projects must submit documentation identifying the intent of the proposed innovation credit, proposed requirements for compliance, proposed submittals to demonstrate compliance, and the design approach or strategies used to meet the requirements.

Pilot credits

Achieve pilot credits from the USGBC's Project Priority Library. USGBC has identified these credits to explore new aspects of sustainable design, building, and construction and potentially include in future additions of the LEED rating system.

DOCUMENTATION

Project types	Options/ Paths	Required for Upload	Documentation
All	Project type	Description	Project type narrative
		Documentation	Project type submittals
	Exemplary performance	N/A	Exemplary performance credit and threshold are documented in the credit pursuing an EP point
	Regional priority	Description	Narrative describing regional priorities
	Innovation strategies	Description	Narrative describing the innovation, including details
		Documentation	Any documentation, including calculations, submittals, case studies, etc. that supports the innovation strategy
	Pilot credit	Registration	Upload confirmation that the project is registered for a Pilot credit
		Survey	Complete and upload the pilot credit survey
		Submittals	Complete and upload all pilot credit submittals

REFERENCED STANDARDS

- None

Impact Area Alignment

☑ Decarbonization

☑ Quality of Life

☑ Ecological Conservation and Restoration

Project Priorities Credit

LEED AP

PRc2

New Construction (1 point)
Core and Shell (1 point)

INTENT

To encourage team integration required by a LEED AP and to streamline the application and certification process.

REQUIREMENTS

Achievement pathways	Points
New Construction and Core and Shell	1
LEED AP	1

At least one principal participant of the project team must be a LEED AP with a specialty appropriate for the project.

REQUIREMENTS EXPLAINED

The credit rewards projects that include a LEED AP with an active credential on the project team at the time of certification review.

A key design team member must have a LEED AP with a Building Design and Construction specialty. While all LEED AP credentials provide an understanding of the green building community and certification requirements, team members with the Building Design and Construction specialty have extensive knowledge and experience with prerequisites and credits for a New Construction or Core and Shell project.

LEED APs without specialty do not qualify for this credit.

DOCUMENTATION

Project types	Options/ Paths	Required for Upload	Documentation
All	All	(open-ended inputs)	Full name of LEED AP with specialty
		(open-ended inputs)	Specialty credential of the LEED AP
		(open-ended inputs)	GBCI Credential Number

REFERENCED STANDARDS

- None

APPENDIX I. LEED PLATINUM REQUIREMENTS

NEW CONSTRUCTION

EAc1: Electrification
Five points are required.

EAc3: Enhanced Energy Efficiency
Eight points are required.

EAc4: Renewable Energy
100% of site energy use from any combination of Tier 1, Tier 2, and Tier 3 renewable energy.

MRc2: Reduce Embodied Carbon
20% reduction in embodied carbon.

CORE AND SHELL

EAc1: Electrification
Four points are required.

EAc3: Enhanced Energy Efficiency
Five points are required.

EAc4: Renewable Energy
100% of base building energy use is from any combination of Tier 1, Tier 2, and Tier 3 renewable energy.

MRc2: Reduce Embodied Carbon
20% reduction in embodied carbon.

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