Case Study: HITT Contracting Co|Lab

A collaborative space for research and testing to transform the construction and real estate industries

Welcome to Co|Lab, HITT Contracting's designated space for the research and testing of emerging materials, approaches, and technology.

Building Facts

- Location: Falls Church, VA
- Size: 8,600 square feet
- Acreage: 0.49

Co|Lab serves as HITT Contracting's designated space for research and testing that will rapidly transform the construction and real estate industries. This important work will rely heavily on collaboration amongst their industry and community partners, investing resources to mock up, test, and share their experiences broadly to improve the way we build.

Photos courtesy of HITT Contracting

MATERIALS
Exploring Inventive Elements

Sourcing the right materials means understanding and trusting your options. Co|Lab provides a platform to bring the AEC community together to test innovative materials that will benefit their stakeholders.

APPROACHES
Developing Efficient Solutions

In an ever-changing landscape, we must constantly evaluate new means and methods that can drive productivity in the way we develop and deliver our built environment.

TECHNOLOGY
Harnessing the Power of Innovation

Leveraging technology in the 21st century requires a willingness to try new things. Co|Lab aims to test and showcase innovative solutions to equip their community with the knowledge needed to drive efficiencies across the supply chain.

HITT, in partnership with architect William McDonough + Partners, designed Co|Lab as a space to inspire innovative thinking. The facility itself was designed and constructed to meet the most rigorous industry standards, using cutting edge approaches, and focusing on healthy materials, sustainability, and energy efficiency.

In addition to earning LEED v4 Platinum certification, the facility was designed to achieve the International Living Future Institute's (ILFI) Zero Energy Certification, as well as its Petal Certifications for meeting the requirements for Materials, Place, and Beauty. The ILFI certifications are anticipated to be earned in 2020.

The open lobby features two glass doors, which allow for maximum flexibility to create indoor/outdoor space for gatherings. Outside is a solar powered smart bench that doubles as public art, one of the requirements for the ILFI Beauty Petal.

Building Automation System Controls & Dashboard

The performance dashboard is a touchscreen interface that captures Co|Lab's operational metrics. Energy consumption is submetered by process, providing insights into the building's operations. This data is used to optimize operational efficiency and help the facility meet its Zero Energy goals, which require Co|Lab to produce at least as much energy as it consumes over a 12-month audit period. They anticipate submission of their 12-month performance data in summer 2020.

Operational efficiency continues to be an area of interest for building owners and tenants alike. In Washington, DC, regulators passed the DC Omnibus Bill, which requires all new buildings to operate at net zero energy by 2050, a prime example of municipalities stepping up to lead by example.
The dashboard visualizes real-time operations, from water heater electricity consumption to production output of the rooftop photovoltaic solar array. HITT can use the data to compare performance over time.

Cross-Laminated Timber

Co|Lab is a Cross Laminated Timber (CLT) and Glulam structure. CLT is a prefabricated, engineered timber product that provides design flexibility and reduced environmental impacts compared to traditional structural materials like concrete and steel. Glulam is a stress-rated engineered wood beam composed of wood laminations, or "lams", that are bonded together with durable, moisture-resistant adhesives.

Co|Lab is the first CLT project built by HITT, and the material was selected for several reasons:

1. Developers and end-users are interested in CLT because of the speed of installation, and the material is quickly gaining traction in the Pacific Northwest. At the time of construction, Co|Lab was the first Type IV CLT structure in Virginia and only the second commercial application in the DC region.
2. CLT provides a warm and unique aesthetic, inspiring architects to use the material in a range of project types from mixed-use, multifamily, and corporate office. As you continue through the space, you'll notice that the design features the exposed CLT for these reasons.
3. Trees sequester carbon. Buildings and construction together account for 36% of worldwide energy consumption and almost 40% of carbon dioxide emissions. It is our responsibility to identify materials that help mitigate environmental impacts of our work. This CLT was sourced from FSC certified black spruce.

Because mass timber was a new building approach at the time of construction, HITT contracted the material supplier to install the material. The building was erected by an eight-person installation team. The panels surrounding the elevator were the first installed. Each panel, column, and beam was individually lifted and placed by crane and guided into place by the installation team. With the construction industry facing a skilled labor shortage, finding more efficient construction approaches is increasingly important.

Healthy Materials

HITT is committed to the use of healthy materials as a key component of Co|Lab's design and long-term goals. They used third party certifications and transparency documentation such as Cradle to Cradle certified or Declare to choose materials with lesser health impacts for installers and building occupants. These steps helped them achieve a goal to raise awareness about the chemicals in our buildings and equip their team members with the knowledge to make better product decisions, both in design and construction, and as consumers.

Pursuing the Materials Petal for ILFI requires documentation of red-list free materials throughout the building. The due diligence process was incredibly challenging and time consuming; the submittal timeline alone was double that of a typical LEED certified project.

ILFI's Red List includes chemicals known to be mutagens or carcinogens, and those that have severe side effects for humans exposed over time. Unless specifically labeled as Red List free, every product in the building requires documentation including a complete ingredient list proving that the material does not contain Red List chemicals. If there was no compliant product available, they submitted for an exception to ILFI, a process requiring a due diligence path and extensive documentation.

Examples of Co|Lab's material choices to ensure the building is Red List free include:

- Avoiding PVC, a common element in building materials from pipes to individual wires. Instead the building utilizes copper pipes.
- The conference room features felt ceiling, carpet tiles, glassboard, and a curtainwall system, all of which are certified Red List free.
- While not required for the Materials Petal, all the furniture in Co|Lab is Red List free. The due diligence process prompted their furniture partner Haworth to remove an unnecessary chemical in one of their furniture products, a prime example of how consumers can drive market change.

One of the most valuable outcomes of the due diligence process for healthy materials is that manufacturers were prompted to change their formulations and eliminate Red List chemicals. At Co|Lab, examples included removing unnecessary coatings and adjusting skylight materials to remove PVC.

INTERNATIONAL LIVING FUTURE INSTITUTE

The Red List contains the worst-in-class materials prevalent in the building industry as identified by International Living Future Institute (ILFI). Commonly-used chemicals on the Red List are polluting the environment, bio-accumulating up the food chain until they reach toxic concentrations, and harming construction workers and building occupants alike.

Learn more about Red List Chemicals

Cradle to Cradle is a third-party certification that is focused on product lifecycle. The standard requires evaluating a product's lifecycle, components, and the resources required to make it. Cradle to Cradle seeks to create more materials with useful end-of-lives, ultimately reducing the impact of our structures.

Read more about Cradle to Cradle certification.

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Daylight Harvesting

Utilizing natural daylight reduces energy consumption, allowing Co|Lab to achieve its Zero Energy goals. To maximize natural daylighting while minimizing the effects of excessive glare, the design team analyzed numerous scenarios, considering factors such as site orientation, glazing variations, skylight impact, and shade selection. The building façade and window layout was designed through an iterative process utilizing a plugin to the building information modeling software.

The design also incorporates operable windows for natural ventilation.

The interior conference room window is LCD switchable glass that transitions from clear to opaque by flipping a switch, allowing conference room occupants privacy when needed.

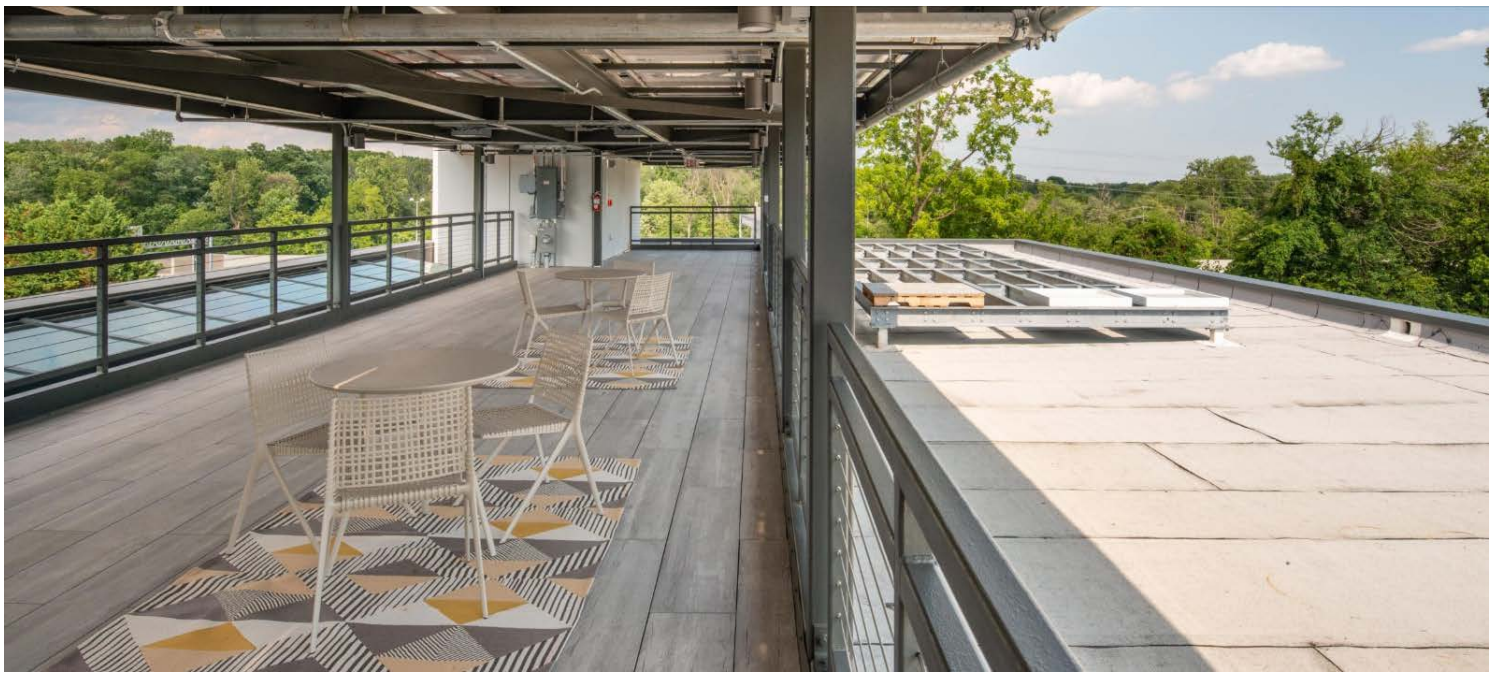
Photovoltaic Solar Array

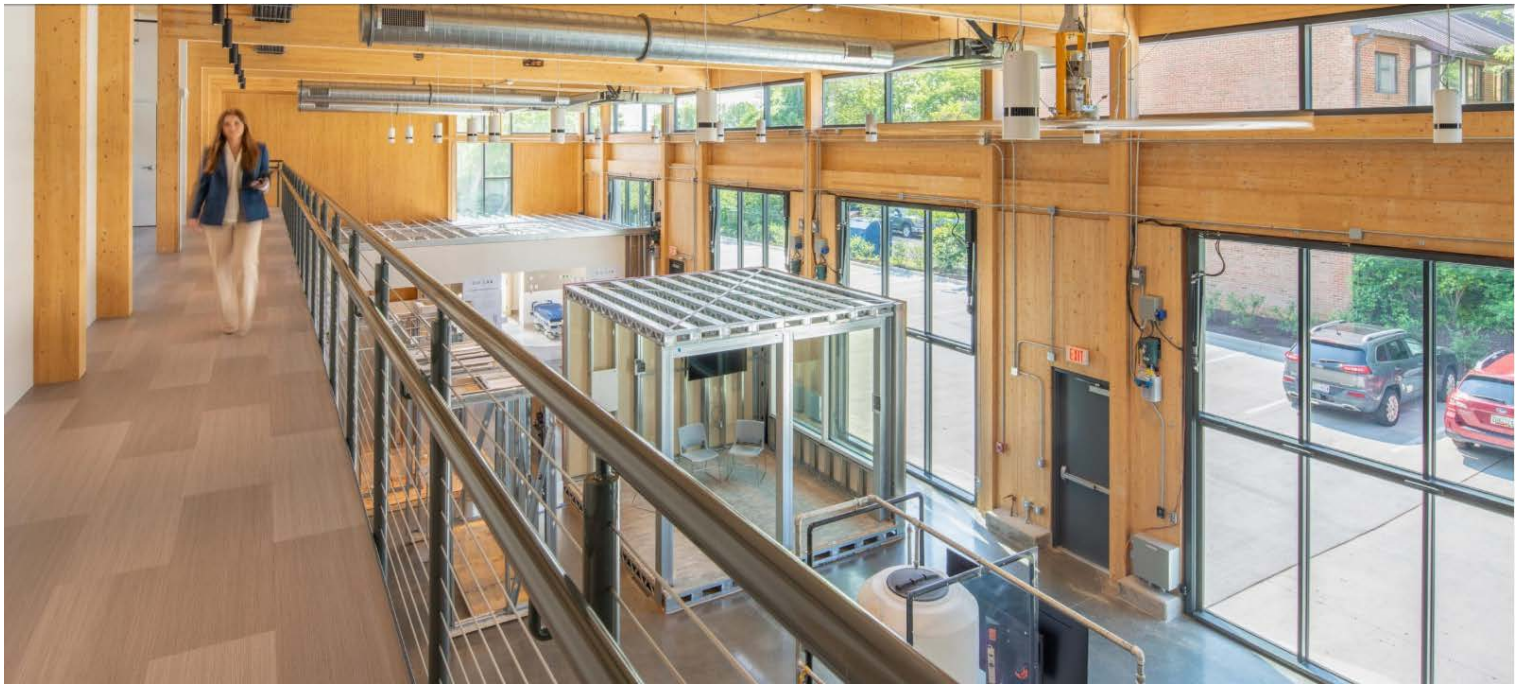
To achieve the Zero Energy certification goals, the Co|Lab team researched options for renewable power early in the design process. They assessed the viability of wind, solar, and geothermal onsite, ultimately selecting photovoltaic solar power. They chose efficient panels to maximize production and minimize rooftop space, leaving ample space for rooftop R&D projects.

The 2,800-square-foot array features 360w panels, is grid-tied and designed to provide the building's annual power consumption, at a minimum. The array runs at 22.2% efficiency, enabling Co|Lab to achieve Zero Energy, as it is modeled to produce 75,000 kWh, 118% of the estimated facility's consumption.

The roof's structural load is 100 lbs per square foot, five times the requirement. The steel dunnage on the roof will allow a wide spectrum of R&D projects.

The original design included wall-mounted lithium batteries for onsite storage of solar energy, providing backup power for key building systems. Unfortunately, the specified battery lost its Underwriters Laboratories (UL) rating during construction, and due to the three-phase electrical system and storage requirements for the array, HITT was unable to identify another battery that met their goals. They continue to research replacement batteries and expect to find a solution soon given the evolution in battery technology.





Mock Up Bays

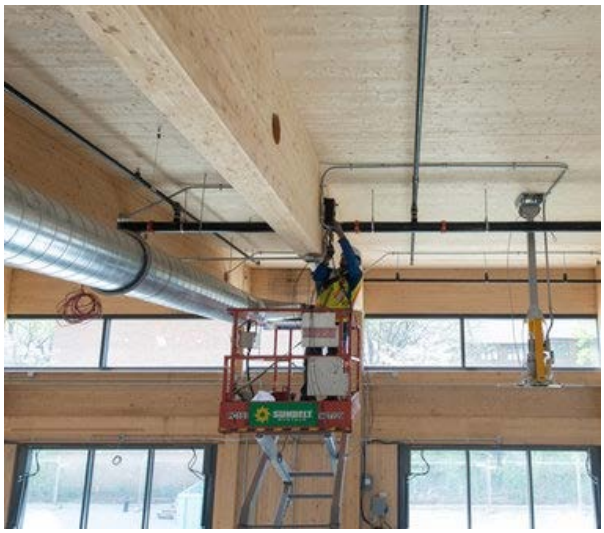
Central to the 8,600-square-foot facility is a double height mockup bay space, where most of the research and development projects are located.

From the catwalk overlooking the mockup bays, you can see the precuts in the beams for the mechanical / electric / plumbing (MEP) systems and ductwork. Because the timber was prefabricated offsite, the MEP was coordinated using Building Information Modeling (BIM). Prefabrication requires absolute precision to minimize on-site changes, which can be difficult when working with wood. As the construction industry adapts to new techniques such as robotics, prefabrication will continue to impact and influence the industry.

The R&D projects at Co|Lab focus on materials, approaches, and technologies that can impact the built environment. The bays feature hydraulic bi-fold doors with 9'9" access that open externally, providing flexibility to build tall mockups within the double height bay space. A carpentry zone, located along the north wall, supplies teams with tools, material, and equipment to construct mockups.

MEP Approach

Co|Lab offers a diverse variety of uses, which challenged the design team to be creative in meeting their energy efficiency goals.



The bays feature radiant heat flooring that provide a comfortable temperature all year, and is the most efficient option given the 25-foot ceiling height. This water-based, hydronic method of heating uses a closed loop recirculating system. Powered by electrical energy from the solar array, it is used in combination with ceiling-mounted air conditioning units to regulate temperatures throughout the high bay spaces. The system will maintain a dewpoint above the outside air to prevent floor condensation.

Co|Lab also uses a Variable Refrigerant Flow (VRF) HVAC system, a modern heat pump system where localized fan coil units create multizone systems, providing operational efficiencies. Centralized outdoor units are mounted on the roof; the ducted indoor units are visible throughout the space. All systems are sub-metered by process and tracked in the building automation system (BAS) dashboard.

Landscaping and Site Attributes

Native landscaping was planted around the building. More than 30% of the site is open space, and 89% of the open space is vegetation. The open space features a variety of trees and plant species, providing visual interest year-round.

The project team initially planned to use rainwater collection and an associated greywater system for non-potable water usage within the building. But the code required that all collected water be used within 24 hours, which was not viable due to the varied levels of building occupancy day by day.

High Performance Envelope

The high-performance building envelope is composed of two main elements: glazed portions constructed using a thermally-broken curtainwall system; and rainscreen assembly that is clad with high performance cementitious panels that are a Red List-free product.

Computerized Exterior Green Wall

The south side of the building features a computerized green wall with eight different species of plants. All of the plants were grown within a prefabricated panel system in a facility in Culpeper, Virginia over a 3-month period. Once ready, the 70 planted panels that make up the green wall were installed at Co|Lab.

This green wall application is a test, as the south-facing wall will have lots of sun exposure. The computerized wall system self-monitors the soil moisture and health, adding water and fertilizer automatically as needed. By monitoring the outdoor air temperature, the wall identifies when it needs to drain the water lines so that the pipes don't freeze during the changing seasons.

Reclaimed Wood Millwork

During design, the team assessed the site to identify trees that could potentially be harvested for reuse in the building. Although the reclamation process yielded less material than anticipated due to the location near a major highway, reclaimed cherry was harvested for the custom front door, and reclaimed maple was used for portions of the grey millwork surrounding the lobby bar. The wood was milled in-place to rough sawn planks, and offered an opportunity to incorporate unique biophilic design elements into the building from items that would otherwise have been considered waste.

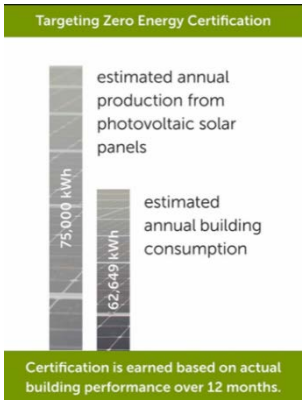
3D Printed Lights

The lighting package at Co|Lab uses all LED fixtures to maximize efficiency. The four artichoke lights hanging over the work bar overlooking the bays were 3D printed by HITT. This exercise both saved money and allowed them to test this additive manufacturing method.

Design for Disassembly

The exterior rainscreen system is an example of Design for Disassembly, a design principle that supports the Circular Economy. By thinking about end-of-life during design and construction, decisions can be made to support deconstruction and material reuse. For example, the bulk of this building uses mechanical fasteners in lieu of adhesive, which facilitates reuse. Each rain screen panel can be easily removed one of two ways: by the screws on the small format panels or through the clips hanging the larger panels.

Other examples of products that can easily be disassembled include the CLT structure, felt ceiling system, carpet tiles (installed with no adhesives), steel solar canopy, solar panels, roof decking, and entry stair. By using standard sizes for items like cabinetry, they are more likely to be repurposed.



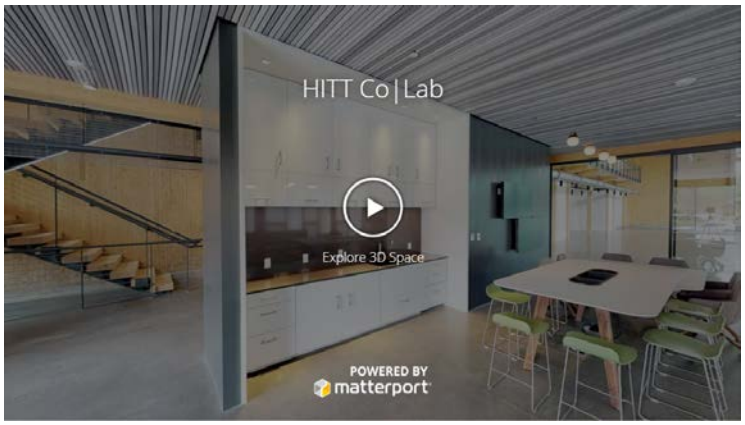
Education

A key goal for Co|Lab is to educate the industry, as knowledge is the path to driving real change. It is a vision shared by sustainability organizations like ILFI and the USGBC, alongside other design and construction-focused industry associations. An educational gallery wall is a dynamic installation that will tell the Co|Lab story over time. Currently it features information on the facility itself, but it will evolve to focus on Co|Lab's R&D projects.

In addition, each project in the bays offers signage that briefly explains the project, goals, metrics, methodology, and partners, where applicable.

Construction Team

HITT Contracting	Owner
William McDonough + Partners	Architect
Staengl Engineering	MEP Engineer
Simpson Gumpertz & Heger	Structural Engineer



Take a Virtual Tour to explore Co|Lab's facility at https://colab.build/explore

LEED Scorecard

Co|Lab earned 80 LEED points, achieving LEED v4 Platinum BD+C certification. The specific credits earned within each impact category are outline on the LEED Scorecard.

CoLab

LEED BD+C: New Construction (v4) — PLATINUM, AWARDED AUG 2019

SUSTAINABLE SITES — AWARDED: 5 / 10

Prereq	Construction activity pollution prevention	0 / 0
Credit	Site assessment	1 / 1
Credit	Site development - protect or restore habitat	0 / 2
Credit	Open space	1 / 1
Credit	Rainwater Mgmt	0 / 3
Credit	Heat island reduction	2 / 2
Credit	Light pollution reduction	1 / 1

WATER EFFICIENCY — AWARDED: 8 / 11

Prereq	Outdoor water use reduction	0 / 0
Prereq	Indoor water use reduction	0 / 0
Prereq	Building-level water metering	0 / 0
Credit	Cooling tower water use	0 / 2
Credit	Water metering	1 / 1
Credit	Outdoor water use reduction	2 / 2
Credit	Indoor water use reduction	5 / 6

ENERGY & ATMOSPHERE — AWARDED: 27 / 33

Prereq	Fundamental commissioning and verification	0 / 0
Prereq	Minimum energy performance	0 / 0
Prereq	Building-level energy metering	0 / 0
Prereq	Fundamental refrigerant Mgmt	0 / 0
Credit	Enhanced commissioning	3 / 6
Credit	Advanced energy metering	1 / 1
Credit	Demand response	0 / 2
Credit	Renewable energy production	3 / 3
Credit	Enhanced refrigerant Mgmt	0 / 1
Credit	Green power and carbon offsets	2 / 2
Credit	Optimize energy performance	18 / 18

MATERIAL & RESOURCES — AWARDED: 9 / 13

Prereq	Storage and collection of recyclables	0 / 0
Prereq	Construction and demolition waste Mgmt planning	0 / 0
Credit	Building life-cycle impact reduction	3 / 5
Credit	Building product disclosure and optimization - environmental product declarations	1 / 2
Credit	Building product disclosure and optimization - sourcing of raw materials	2 / 2
Credit	Building product disclosure and optimization - material ingredients	1 / 2

MATERIAL & RESOURCES — CONTINUED

Credit	Construction and demolition waste Mgmt	2 / 2

INDOOR ENVIRONMENTAL QUALITY — AWARDED: 13 / 16

Prereq	Minimum IAQ performance	0 / 0
Prereq	Environmental tobacco smoke control	0 / 0
Credit	Enhanced IAQ strategies	2 / 2
Credit	Low-emitting materials	3 / 3
Credit	Construction IAQ Mgmt plan	1 / 1
Credit	IAQ assessment	1 / 2
Credit	Thermal comfort	1 / 1
Credit	Interior lighting	2 / 2
Credit	Daylight	2 / 3
Credit	Quality views	1 / 1
Credit	Acoustic performance	0 / 1

REGIONAL PRIORITY — AWARDED: 3 / 4

Credit	Optimize energy performance	1 / 1
Credit	Access to quality transit	0 / 1
Credit	Site development - protect or restore habitat	0 / 1
Credit	Rainwater Mgmt	0 / 1
Credit	Outdoor water use reduction	1 / 1
Credit	Indoor water use reduction	1 / 1

LOCATION & TRANSPORTATION — AWARDED: 8 / 18

Credit	LEED for Neighborhood Development location	0 / 16
Credit	Sensitive land protection	1 / 1
Credit	High priority site	1 / 2
Credit	Surrounding density and diverse uses	2 / 5
Credit	Access to quality transit	3 / 5
Credit	Bicycle facilities	0 / 1
Credit	Reduced parking footprint	0 / 1
Credit	Green vehicles	1 / 1

INTEGRATIVE PROCESS CREDITS — AWARDED: 1 / 1

Credit	Integrative process	1 / 1

TOTAL — 80 / 110

Learn More

HITT Contracting Co|Lab https://colab.build/

LEED v4 BD+C https://www.usgbc.org/credits/new-construction/v4

CO | LAB