Memorandum

To:	Cassandra Manetas, Washington State Department of Transportation (WSDOT)
From:	Caroline Raftery, Senior Historic Preservation Specialist, ICF Allison Lyons Medina, Senior Historic Preservation Specialist, ICF
Date:	April 12, 2024
Re:	**Westinghouse Warehouse Carbon Cost Memo**

Introduction

The Westinghouse Warehouse at 1051 1st Avenue South in Seattle, Washington on King County Parcel No. 766620-6955 was demolished as part of the Washington State Department of Transportation (WSDOT)'s Westinghouse Electric Supply Co. Warehouse – 1051 1st Ave S Building Demolition Project (Project). Prior to the demolition, preservation and rehabilitation options were considered, and the structural integrity of the building was assessed.[1] These studies, per WSDOT, concluded that the building was structurally unsound, and preservation or rehabilitation was not a viable option.

The energy consumed by buildings accounts for approximately 13% of the United States' greenhouse gas emissions.[2] Of this total consumed, the majority accounts for the operation of buildings while the remainder is made up of what is termed "embodied energy," which represents the energy required to produce and assemble building materials. Embodied energy is captured in a material during its fabrication and continued use in extant buildings and structures.

The intent of this memorandum (memo) is to meet a mitigation measure requiring WSDOT to complete a memo comparing the carbon costs of hypothetically preserving, rehabilitating (or reusing), or demolishing the Westinghouse Warehouse and replacing it with new Leadership in Energy and Environmental Design (LEED)-certified or standard non-energy-conscious construction. The

[1] According to the National Park Service, Preservation is "the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property" and Rehabilitation is "the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values." Rehabilitation is often used interchangeably with other terms, such as Adaptive Reuse. For more information on these definitions, please see: https://www.nps.gov/orgs/1739/secretary-standards-treatment-historic-properties.htm.

[2] United States Environmental Protection Agency. "Sources of Greenhouse Gas Emissions," November 16, 2023.

following memo calculates carbon costs as embodied carbon and carbon emissions in a building. To complete this memo, ICF consulted previous architectural documentation and conditions assessments of the Westinghouse Warehouse. Using data available from these studies, ICF utilized the Care Tool software program to approximate hypothetical carbon costs for four scenarios: preservation, rehabilitation, and two new construction options. The findings are presented below. Attachment A includes the analysis from Care Tool. Attachment B includes a glossary with full definitions of the terms used in these calculations.

Methodology

The findings and conclusions reached in the memorandum were developed through the following tasks.

Site Visit

Two ICF Senior Historic Preservation Specialists visited the site on September 14, 2023, and confirmed there were no extant physical elements of the building on the site.

Previous Reports

ICF's initial research focused on establishing the existing condition of the Westinghouse Warehouse prior to demolition. ICF reviewed two sources that provided this background information. First, ICF reviewed the "Westinghouse Warehouse, 1051 1st Avenue S, King County Washington DAHP Level II Mitigation Report."[3] This document included historic contexts, physical descriptions, contemporary photographs, and building floor plans. The photographs were instrumental in detailing the material and condition of the building before demolition. Information from this report is summarized in the following section of this memo.

Second, ICF reviewed HDR's "WSDOT – Emergency Structural Observation of 1051 1st Avenue South" memorandum.[4] This document provided structural engineering observations and concluded the building had "suffered differential (uneven) settlements, especially the north portion (the 1948 addition) due to such activities, vibration, preloading/unloading of soil;" "joint separation between the old and newer addition [could] clearly be seen on the east and west walls;" "several diagonal cracks [were] also noticed at some windows and door openings;" and "there [were] other signs of differential settlements inside both portions of the building, but mostly at the north addition." In summary, HDR asserted "the lateral load resisting systems [were] deficient and [did] not meet current codes."[5]

The HDR report cited an earlier report by CPL, Inc. completed in October 2009 that evaluated "the expected performance of the building during an earthquake, and [provided] general recommendations to strengthen the building, if desired." The report noted "shear stress in several concrete walls is above the expected strength of the walls," "the amount of reinforcing steel in the wall is less than the prescribed minimum," and "there is no in-plane connection to transfer seismic forces from the roof diaphragm to the walls." Recommendations to mitigate deficiencies were provided. Despite these deficiencies, according to HDR, the 2009 report found that if the building were

[3] ICF. "Westinghouse Warehouse, 1051 1st Avenue S, King County Washington DAHP Level II Mitigation Report. April 2023.
[4] HDR. "WSDOT – Emergency Structural Observation of 1051 1st Avenue South." September 2022.
[5] Ibid.

"significantly damaged in a major earthquake…the occupants should be able to safely exit the building."[6]

Choosing Embodied Carbon Calculation Software Tool

ICF studied publicly accessible online software programs designed to evaluate the estimated embodied carbon impacts associated preservation, rehabilitation, demolition, and new construction. ICF identified software programs that could approximate the embodied carbon impacts associated with materials (embodied emissions/costs) and systems (operational emissions/costs). After exploring available tools and data requirements, ICF selected the online software program Care Tool to evaluate the carbon costs associated with hypothetically preserving the Westinghouse Warehouse as it was prior to demolition (preservation), partially reusing the building (rehabilitation), and demolishing and replacing the building with both a LEED-certified building and a non-energy-conscious, standard building. Care Tool compares the embodied and operational carbon costs associated with preservation, rehabilitation, or new construction. In doing so, Care Tool can reveal the carbon emissions associated with an existing building based on its material and use. The tool does not measure the emission required to transport or reassemble materials but is a good baseline for understanding comparative emissions.

The Care Tool program was also selected because it has the potential to be easily utilized for future carbon cost studies by the public. It is free and accessible to the public and generates calculations that address the questions of carbon cost studies comparing preservation, rehabilitation, and demolition/new construction.

Care Tool Limitations

One of the limitations of Care Tool for the Westinghouse Warehouse study was its limited capacity to address the transportation of building materials off-site for reuse. The intent of this memo is to compare the carbon costs of preservation, rehabilitation, and demolition/new construction, but the intricacies of carbon costs can be factored in many ways.

While it was the most appropriate choice for this study, there are limitations to Care Tool. Tools like Care Tool focus on the carbon costs associated with a specific building on site, but other programs may be able to evaluate the carbon cost externalities related to the transport and reuse of materials off-site.

In the case of the Project, WSDOT partially or entirely reused or salvaged and transported materials during and after demolition. This included turning concrete into rubble; recycling rebar; salvaging wood beams; and transporting salvaged beams to Montana. The findings in this memo were generated using Care Tool; however, these findings do not account for the carbon savings of transporting and reusing materials completed by WSDOT.

EC3 Tool, Tekla, etc.

In addition to Care Tool, there are other software programs, including EC3 Tool and Tekla Structures that provide fields for more detailed information about materials to be included in the calculations. These tools were not chosen because the technical details about materials were not available for this Project and might be onerous requirements for other projects. Additionally, the software is only

[6] Ibid.

available for a fee. Therefore, these tools did not seem useful for future projects where public accessibility is important.

Westinghouse Warehouse

History

The Westinghouse Warehouse was constructed in 1939 in a combination of the Art Moderne and Streamline Moderne architectural styles adapted for an industrial warehouse building. The popularity of these two architectural styles overlapped with one another in the 1920s and 1930s and they share influences and characteristics that would later congeal into the various substyles of American Modernism in the post-World War II period. Contemporaneous with the emergence of these architectural styles was the development of new methods of construction, driven by the invention of new building materials and technologies that provided innovative design solutions for common challenges in the construction and use of industrial buildings. From 1939 to the mid-1970s, the building was a warehouse with commercial storage and a distribution center for freight handling. From 1975 to 1994 the building was a manufacturing warehouse for a sportswear company. From 1994 to 2007 ownership changed a few times and research did not reveal what the building was used as during this time. In 2007, WSDOT acquired the building, and in 2010 the interior was modified for use as a field office.

Significance

The Westinghouse Warehouse was determined eligible for the National Register of Historic Places under Criterion A in the areas of Commerce and Industry for its association with the development of the Seattle Tide Lands, Westinghouse Electric Supply Company, and Oregon & Washington (Union Pacific) Railroad, and under Criterion C as a largely intact example of Art Moderne/Streamline Modern architectural style adapted to an industrial facility.

Scale and Materiality

Prior to demolition, the building was an approximately 58,592 square-foot hybrid structure composed of concrete, steel, and timber, with two floors above grade. The overall floor plan was approximately 100 feet by 300 feet. The building appeared to have been constructed in two phases. The original building was built in 1939, and a two-story addition to the north was constructed in 1948.

The first story was mainly constructed out of concrete floors, concrete columns, and concrete slabs. The second floor utilized timber beams, columns, and tongue and groove timber decking for the roof. The roof consisted of straight sheathed tongue and groove decking that spanned to timber purlins. The purlins spanned to timber girders that are supported by interior timber columns and exterior concrete piers.

The second floor of the original building consisted primarily of a two-way concrete slab supported by interior concrete columns or exterior concrete piers. A one-way slab and concrete beam system went between one bay of columns at approximately the middle of the original building.

The second floor of the north addition consisted of a one-way slab that spanned concrete beams. The concrete beams spanned to concrete girders that were supported by interior concrete columns or exterior concrete piers.

Specific exterior materials observed in 2023 Level II Mitigation Report photographs and 2023 Google Streetview are listed in Table 1.

Table 1. Exterior Windows and Doors Counts

	East Elevation	South Elevation	West Elevation	North Elevation
First floor	21 single-height multi-light windows 22 double-height multi-light windows 3 multi-light glass block windows 1 pair of double doors 1 single door	5 single-height multi-light windows 3 double-height multi-light windows 1 door 3 roll-up garage doors	5 single-height multi-light window bands 3 single-height multi-light windows 3 roller doors 1 double door	1 single-height multi-light window band 1 roll-up garage door
Second floor	21 single-height multi-light windows 21 double-height multi-light windows 3 multi-light glass block windows	9 single-height multi-light windows 3 single height multi-light window bands	13 single-height multi-light window bands 3 single-height multi-light windows	2 single-height multi-light window bands

These windows were all originally steel multi-light windows but over time about half of them had been replaced with various window types (most notably the steel frames were replaced with aluminum frames and the light numbers decreased).

Specific interior materials mentioned in the 2023 Level II Mitigation Report prior to demolition are listed in Table 2:

Table 2. Interior Materials

	General materials	Exterior wall columns	Interior wall columns	Walls and doors	Circulation
First floor	Concrete columns, beams; and sections of dropped acoustical tile ceiling covering otherwise exposed concrete beams	36	54	Most walls were concrete with some constructed of vertical wood boards or gypsum boards. Approximately 34 doors, 1 double door, 1 roller door	1 elevator and elevator shaft and 4 stairwells
Second floor	Wood posts, beams, and wood board ceiling	39	55	Approximately 20 doors, 2 double doors	
Roof	Wood roof structure	n/a	n/a	n/a	n/a

Approximate totals

- Windows: 138. *Note: these varied in dimension, function, material, and age.*
- Doors: 58 (entrances or between interior rooms) and 7 (warehouse roll-up or roller)

Carbon Cost Calculations

To evaluate the carbon costs associated with the preservation, rehabilitation, and demolition/new construction scenarios for Westinghouse Warehouse, ICF used information derived from the approximations listed in the general building section above. This information assumes the subject of analysis is approximately 58,592 square feet; two floors above grade; a hybrid office structure composed of concrete, steel, and wood; and has a window-to-wall ratio of 20%.

A summary of the carbon costs associated with hypothetically preserving the Westinghouse Warehouse as it was prior to demolition, partially reusing the building (rehabilitation), and replacing the building with a LEED-certified building or a non-energy-conscious standard building follow. Please see the attached glossary for full definitions of the terms used in these calculations.

Preservation

Preserving the Westinghouse Warehouse as it was prior to demolition would have resulted in the following carbon costs:

Cost Type	Cost Estimate
Embodied Emissions	N/A
Embodied Emissions Intensity	N/A
Operational Emissions	14100 metric tons of CO2 emissions over 25 years
Total Emissions	14100 metric tons of CO2 emissions over 25 years
Total Emissions Intensity	241 kgCO2e/ft2 over 25 years
Energy Use Intensity (EUI)	86.1 kBtu/ft2 a year
Operational Emissions Intensity	9.6 kgCO2e/ft2 a year

The operational emissions would have been equivalent of 134 gasoline-powered vehicles driven or 63,463 gallons of gasoline consumed in one year.

Rehabilitation/Reuse

Reusing the majority of the Westinghouse Warehouse as it was prior to demolition would have resulted in the following carbon costs:

Cost Type	Cost Estimate
Embodied Emissions	1043 metric tons of CO_2 emissions cradle-to-gate*
Embodied Emissions Intensity	17.8 kgCO_2e/ft^2 over 25 years
Operational Emissions	5672 metric tons of CO_2 emissions over 25 years

Cost Type	Cost Estimate
Total Emissions	6715 metric tons of CO_2 emissions over 25 years
Total Emissions Intensity	115 $kgCO_2e/ft^2$ over 25 years
Energy Use Intensity (EUI)	86.1 $kBtu/ft^2$ a year (43.1 $kBtu/ft^2$ a year target)
Operational Emissions Intensity	9.6 $kgCO_2e/ft^2$ a year

**cradle-to-gate is a term used by Care Tool*

The entire estimate assumes a target reduction in energy use of 50%, introduction of 25% renewable energy sources for electricity, 80% structural reinforcement or replacement, partial replacement of exterior walls, reglazing window frames, replacing roof, 70% interior finish restoration (30% new finishes), 50% building reconfiguration, and repairing and reusing mechanical, electrical, and plumbing systems. The operational emissions would be the equivalent of 54 gasoline-powered vehicles driven or 255,529 gallons of gasoline consumed in one year.

New Construction (LEED-Certified Building)

If the Westinghouse Warehouse were demolished and replaced with a LEED-certified building comparable in size and scale to the demolished building, the approximate carbon costs would be:

Cost Type	Cost Estimate
Embodied Emissions	1769 metric tons of CO_2 emissions cradle-to-gate
Embodied Emissions Intensity	30.2 $kgCO_2e/ft^2$ over 25 years
Operational Emissions	0
Total Emissions	1769 metric tons of CO_2 emissions over 25 years
Total Emissions Intensity	30 $kgCO_2e/ft^2$ over 25 years
Energy Use Intensity (EUI)	0 $kBtu/ft^2$-yr
Operational Emissions Intensity	0

**cradle-to-gate is a term used by Care Tool, please see Embodied Emissions definition in Attachment B*

The entire estimate assumes a 100% target reduction in energy use and 100% renewable energy sources for electricity. The operational emissions would be non-existent.

New Construction (Non-LEED-Certified Building)

If the Westinghouse Warehouse were demolished and replaced with a standard, non-energy-conscious building comparable in size and scale to the demolished building, the approximate carbon costs would be:

Cost Type	Measurement
Embodied Emissions	1769 metric tons of CO_2 emissions cradle-to-gate*
Embodied Emissions Intensity	30.2 kg/ ft^2 a year
Operational Emissions	15753 metric tons of CO_2 emissions over 25 years
Total Emissions	17522 metric tons of CO_2 emissions over 25 years
Total Emissions Intensity	299 $kgCO_2e/ft^2$ over 25 years
Energy Use Intensity (EUI)	86.1 $kBtu/ft^2$ a year
Operational Emissions Intensity	10.8 $kgCO_2e/ft^2$ a year

**cradle-to-gate is a term used by Care Tool, please see Embodied Emissions definition in Attachment B*

This entire estimate assumes no change in target reduction in energy use compared to the hypothetically preserved Westinghouse Warehouse and no renewable sources for electricity. The operational emissions would be the equivalent of 150 gasoline-powered vehicles driven or 70,904 gallons of gasoline consumed in one year.

Conclusions and Recommendations

When comparing the total emissions intensity of the four hypothetical scenarios, the demolition of the Westinghouse Warehouse and subsequent new construction of a LEED-certified building would have the lowest carbon cost. The rehabilitation or reuse of the Westinghouse Warehouse would have the second lowest carbon cost. Preserving the building as it was before demolition would have the third lowest carbon cost. Constructing a new building without energy-conscious materials or systems would have the greatest carbon cost. See Table 3 for a summary of these comparisons.

Table 3. Conclusions

	Preservation	Rehabilitation/Reuse	Demolition and New Construction (LEED-certified Building)	Demolition and New Construction (Non-LEED-certified Building)
Overall Carbon Cost	14,100 metric tons of CO_2 emissions over 25 years. This is the equivalent of 83,900 gasoline-powered passenger vehicles driven in a year or 39,664,675 gallons of gasoline consumed.	6,715 metric tons of CO_2 emissions over 25 years. This is the equivalent of 39,950 gasoline-powered passenger vehicles driven in a year or 18,889,950 gallons of gasoline consumed.	1,769 metric tons of CO_2 emissions over 25 years. This is the equivalent of 10,525 gasoline-powered passenger vehicles driven in a year or 4,976,375 gallons of gasoline consumed.	17,522 metric tons of CO_2 emissions over 25 years. This is the equivalent of 104,250 gasoline-powered passenger vehicles driven in a year or 49,291,100 gallons of gasoline consumed.

It is important to note that for these hypothetical comparisons, the LEED-certified building attributes selected in the Care Tool software program involved a building with the highest possible energy savings standards. This building would have no carbon emissions as it would rely solely on renewable energy. New construction can be LEED-certified and still have emissions. Alternative new construction scenarios may not have had lower emissions than the preservation or rehabilitation scenarios.

Based on this study of the Westinghouse Warehouse and the use of the Care Tool, ICF would recommend the following for more precise future carbon cost studies. First, without precise pre-demolition drawings and a survey of pre-demolition materials, the precise carbon cost of the demolition of the Westinghouse Warehouse cannot be calculated beyond a general estimate. While Care Tool provided a baseline of information, for a more in-depth analysis of the carbon costs of future building projects, ICF recommends the precise measurement of each element of the building be documented prior to demolition (e.g., dimensions and materiality of window and doors throughout, dimension, amount, type, and age of wood on second floor and gypsum board, etc.). Data related to transportation and disposal and/or reuse and recycling of materials could be factored into the analysis to provide more insight into the carbon emissions or avoided carbon emissions associated with future demolition projects.

Finally, a complete and thorough estimate of carbon emissions would consider the carbon emissions related to transporting salvaged and demolished material from a site, producing new material, and bringing new material to the site. For future carbon cost memos, incorporating an analysis of embodied

and operational emissions as well as emissions related to externalities is recommended; however, the current study was limited by available software tools that did not incorporate this information.

Enclosures:

Attachment A	Care Tool Analysis – Westinghouse Warehouse
Attachment B	Glossary

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ATTACHMENT A

CARE TOOL ANALYSIS – WESTINGHOUSE WAREHOUSE

Westinghouse Warehouse

General Information

PROJECT LOCATION

Country	USA
State/Province	WA
Postal Code	98104

CLIMATE INFORMATION

Heating Degree Days	N/A
Cooling Degree Days	N/A

MODEL INFORMATION

Modeled Timeframe	25

ELECTRICITY GRID EMISSIONS

Default

Existing Building

BUILDING CHARACTERISTICS

Total Floor Area	58592 ft²
Floors Above Grade	2
Floors Below Grade	0
Type of Structure	Hybrid
Window-to-Wall Ratio	0.2

BUILDING USE

Primary Use	Office
Floor Area	58592 ft²
Secondary Use	N/A
Floor Area	N/A

OPERATIONAL ENERGY AND EMISSIONS

Existing Building EUI	86.1 kBtu/ft²-yr
Existing Building Emissions Intensity	9.6 $kgCO_2e/ft^2$

Existing Operational Emissions Intensity	9.6 $kgCO_2e/ft^2$-yr

Building Reuse

BUILDING CHARACTERISTICS

Does the Reuse include an addition?	No
Total Floor Area Reused	58592 ft²
Reused Floors Above Grade	2
Reused Floors Below Grade	0
Total Floor Area of Addition	N/A
Addition Floors Above Grade	N/A
Addition Floors Below Grade	N/A

BUILDING USE

Will there be a change of use in the Existing Reused Building?	No

REUSED FLOOR AREA

Primary Use	Office
Floor Area	58592 ft²
Secondary Use	N/A
Floor Area	N/A

ADDITION

Primary Use	N/A
Floor Area	N/A
Secondary Use	N/A
Floor Area	N/A

OPERATIONAL ENERGY AND EMISSIONS

Establish Baseline

Reuse Baseline EUI	86.1 kBtu/ft²-yr
Reuse Baseline Emissions Intensity	9.6 $kgCO_2e/ft^2$

Set Target - Reuse

Reuse: Target reduction in energy use	50%
Reuse EUI Target	43.1 kBtu/ft²-yr
Installing all electric systems and equipment?	No

Set Target - Addition

Does addition have a distinct EUI target?	No
Addition: Target reduction in energy use	N/A
Addition EUI Target	N/A
Installing all electric systems and equipment?	No

Set Target - Renewables

Percentage of electricity produced by on-/off-site renewables	25%

Reuse Operational Emissions Intensity 9.6 $kgCO_2e/ft^2$-yr

EMBODIED EMISSIONS

	EMBODIED EMISSIONS INTENSITY
Structural System Reuse	12 $kgCO_2e/ft^2$
Extent of Structural Reinforcement or Replacement	80%
Lateral Upgrade	No
Envelope Reuse	0.6 $kgCO_2e/ft^2$
Exterior Walls	MasonryMedium
Windows/Glazing	Medium
Roofing	Major
Insulate Walls	No
Interior Reuse	3.1 $kgCO_2e/ft^2$
Extent of Restore/Refurbish Finishes	70%
Extent of New Finishes	30%
Extent of Rebuilding/Reconfiguration	50%
Mechanical, Electrical, Plumbing Systems Reuse	2.1 $kgCO_2e/ft^2$

Medium

Addition

N/A

Modifiers

Low Embodied Emissions Concrete
Responsibly Sourced Timber
Low Embodied Emissions Envelope
High Performance Mechanical, Electrical, Plumbing System

Reuse Embodied Emissions Intensity 17.8 $kgCO_2e/ft^2$-yr

New Building

BUILDING CHARACTERISTICS

Total Floor Area	58592 ft²
Floors Above Grade	2
Floors Below Grade	0

BUILDING USE

Primary Use	N/A
Floor Area	58592 ft²
Secondary Use	N/A
Floor Area	N/A

OPERATIONAL ENERGY AND EMISSIONS

Establish Baseline

New Building EUI Baseline	N/A
New Building Baseline Emissions Intensity	N/A

Set Target

Target reduction in energy use	100%
New Building EUI Target	N/A
Installing all electric systems and equipment?	Yes
Percentage of electricity produced by on-/off-site renewables	100%

New Building Operational Emissions Intensity 0.0 $kgCO_2e/ft^2$-yr

EMBODIED EMISSIONS

Hybrid

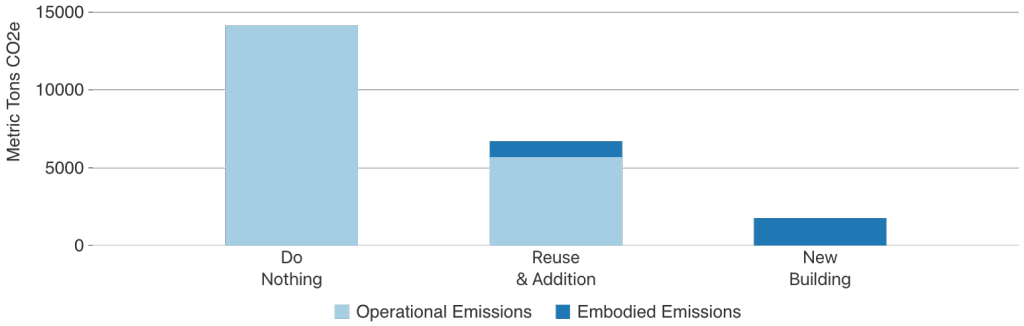
Modifiers

No modifiers

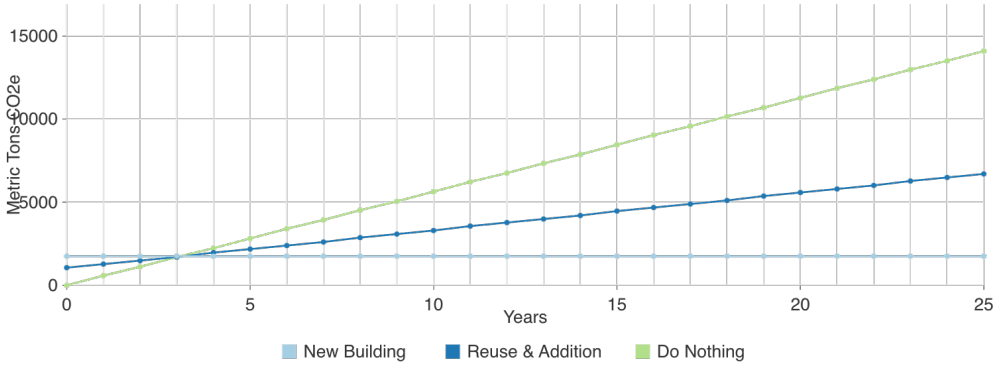
New Building Embodied Emissions Intensity 30.2 $kgCO_2e/ft^2$-yr

Results

Total Added Embodied & Operational Emissions over 25 Years



Cumulative Emissions Over Time



	DO NOTHING	REUSE & ADDITION	NEW BUILDING
Embodied Emissions (Metric Tons CO2e, cradle to gate)	N/A	1043	1769
Operational Emissions (Metric Tons CO2e / 25 years)	14100	5672	N/A
Total Emissions (Metric Tons CO2e / 25 years)	14100	6715	1769
Total Emissions Intensity ($kgCO_2e/ft^2$ / 25 years)	241	115	30

ATTACHMENT B

GLOSSARY

Glossary.

Term	Definition
Preservation	The act or process of applying measures necessary to sustain the existing form, integrity, and materials of a historic property.
Rehabilitation (aka, reuse)	The act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values.
LEED	LEED (Leadership in Energy and Environmental Design) is the world's most widely used green building rating system. LEED certification provides a framework for healthy, highly efficient, and cost-saving green buildings, which offer environmental, social, and governance benefits.
Embodied Emissions	The carbon emissions associated with a building taking into consideration the partial product life cycle from resource extraction (cradle) to the factory gate (i.e., before it is transported to the consumer). Embodied carbon (kgCO2e) refers to the Greenhouse Gases (GHGs) emitted during the extraction, manufacture, transportation, construction, replacement, and deconstruction of building materials, together with the end of life emissions.
Embodied Emissions Intensity	The rate of carbon emissions over time (i.e., 25 years) relative to the intensity of a specific activity, or an industrial production process (i.e., material composition and construction).
Energy Use Intensity (EUI)	Expresses a building's energy use as a function of its size and other characteristics. EUI is expressed in energy per square foot.
Operational Emissions	Indicates total annual operating emissions per square foot.
Operational Emissions Intensity	Indicates total annual operating emissions per square foot, based on a building's target Energy Use Intensity, and % of electricity demand met by renewable energy.
kBtu	One-thousand British thermal units.
Total Emissions	Carbon emissions factoring in both embodied emissions and operational emissions.
Total Emissions Intensity	Calculated by applying the target to the intensity of the specified emissions and assuming that the emissions intensity of all other relevant emissions remains unchanged.