

Oct 22nd, 3:40 PM - 5:00 PM

## Approaches to Renewing Brutalist-Era Lab Buildings

Jean Caroon  
*Goody Clancy*

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Brutalism + the Public University: Past, Present & Future

# APPROACHES TO RENEWING BRUTALIST-ERA LAB BUILDINGS



**Jean Carroon, FAIA, LEED Fellow**

Principal /Design, Preservation, Sustainability

October 22, 2021

**GOODYCLANCY**

ARCHITECTURE / PLANNING / PRESERVATION

# Goody Clancy: 60s and 70s Era Lab Buildings

2000

2010

2020

## Characteristics:

showcase the bare [building materials](#) and [structural elements](#)

philosophical approach striving to create simple, honest, and functional

## Renewal requirements:

Modern labs for teaching and research

Collaboration/work spaces

State-of-the art systems

Optimize envelope performance

Phasing for budget and minimal swing space

BEAUTY



**DREYFUS CHEMISTRY 1967**  
MIT



**GANT SCIENCE COMPLEX 1970-74**  
UConn



**OLSEN HALL 1971**  
UMASS LOWELL



**MORRISVILLE 1976**



**PURCHASE 1972**



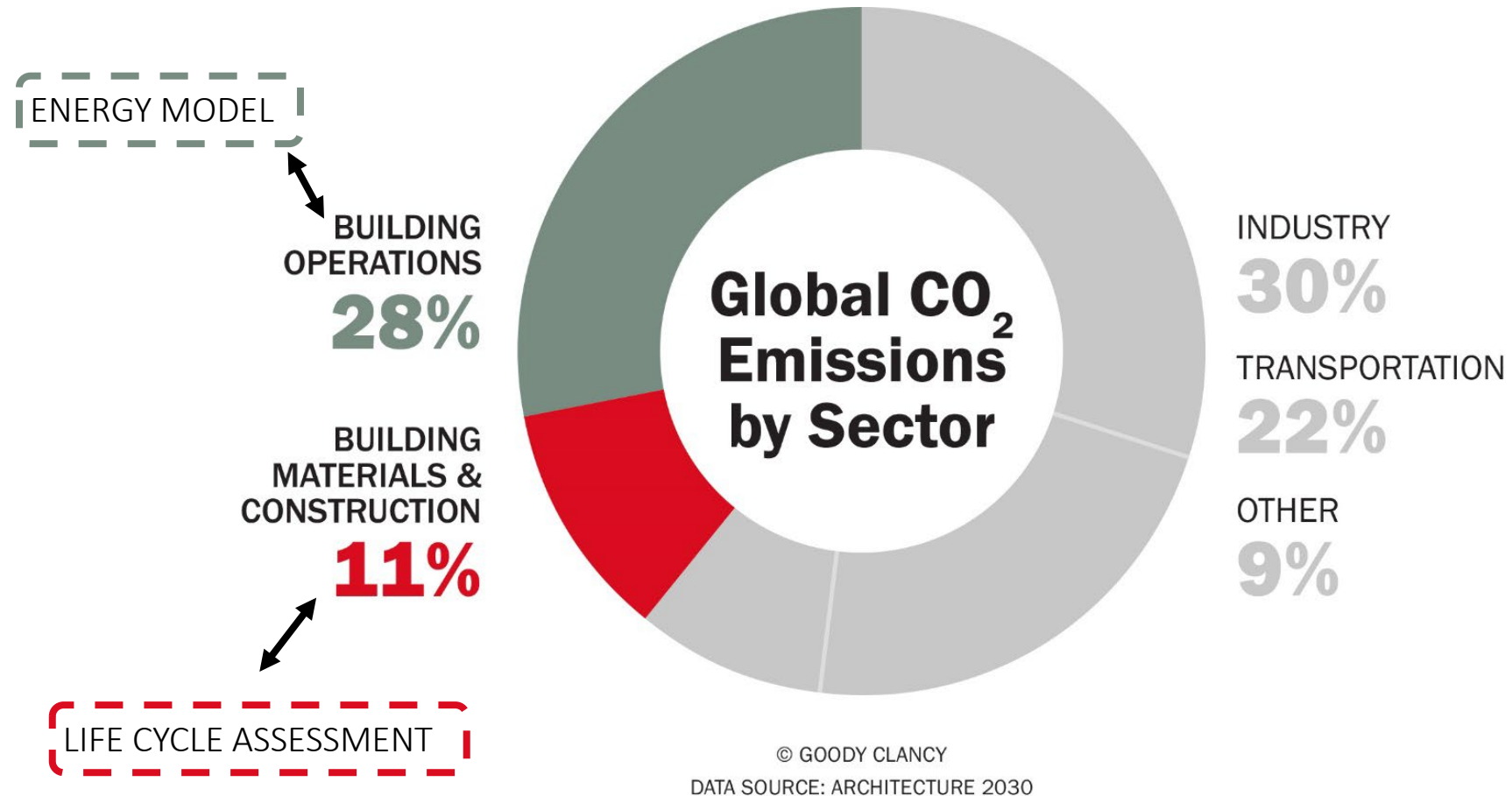
**STONY BROOK 1973**

over **1 million square feet**

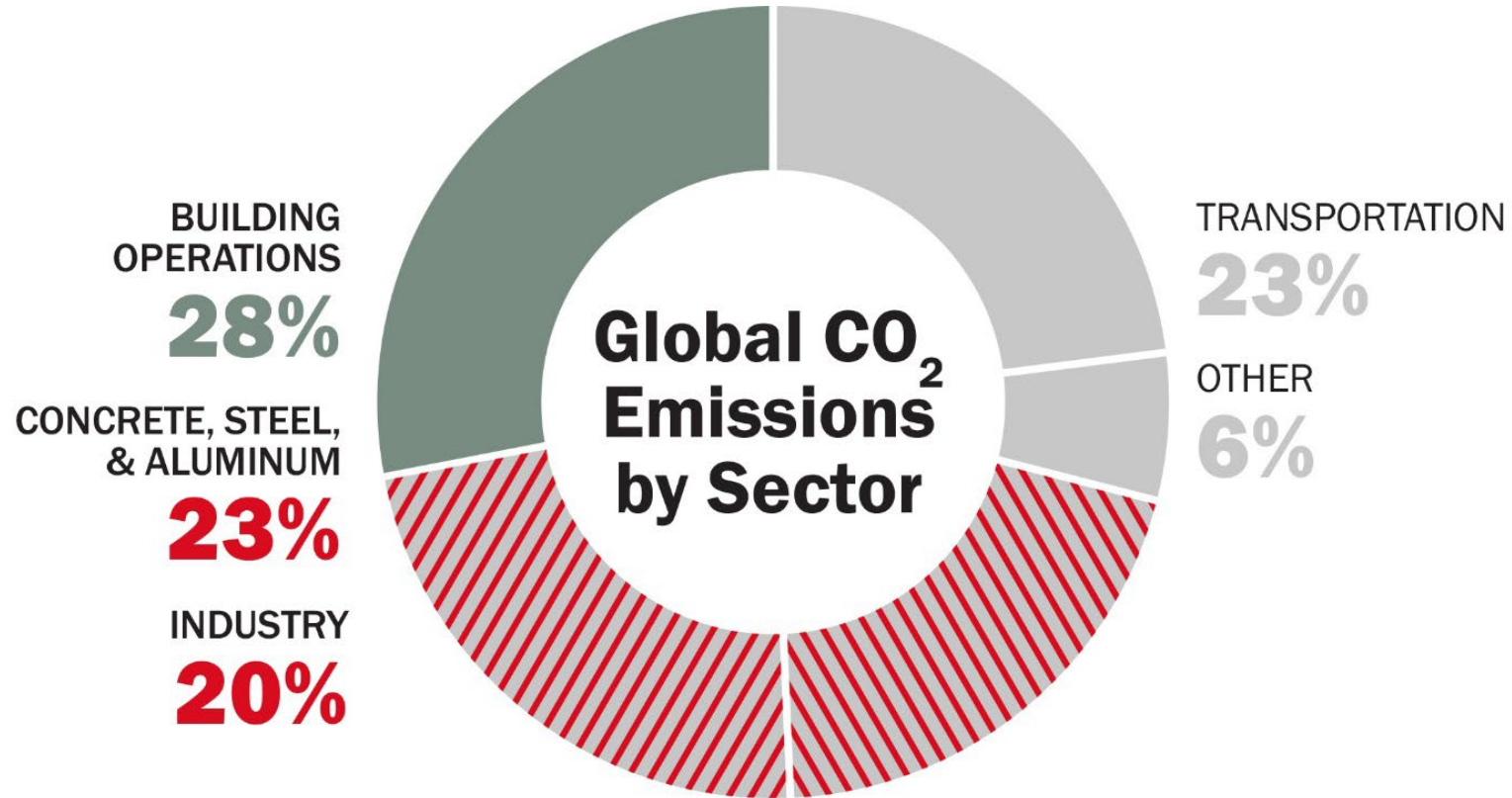
**3 SCIENCE BUILDINGS**  
SUNY

**BUILDING REUSE IS CLIMATE ACTION!**

# Global Building Sector Emissions



# Global Building Sector Emissions



© GOODY CLANCY

DATA SOURCE: 2016 GLOBAL ABC REPORT; IEA

# The Problem and the Opportunity

***Between now and 2060, the world is projected to add 2.5 trillion ft<sup>2</sup> of buildings, or an area equal to the entire current global building stock.***

— UN ENVIRONMENT, GLOBAL STATUS REPORT 2017

***Reusing and retrofitting an existing building can result in a 70%–85% reduction in embodied carbon emissions compared to new construction.***

— ZERO NET CARBON COLLABORATION FOR EXISTING AND  
HISTORIC BUILDINGS, 2019

# The Bigger Picture

*Raw material extraction causes over 90% of biodiversity loss and water stress around the world. Driven by construction, extraction is expected to double by 2060.*

— OECD – GLOBAL MATERIALS OUTLOOK TO 2060





# You Cannot Manage What You Cannot Measure

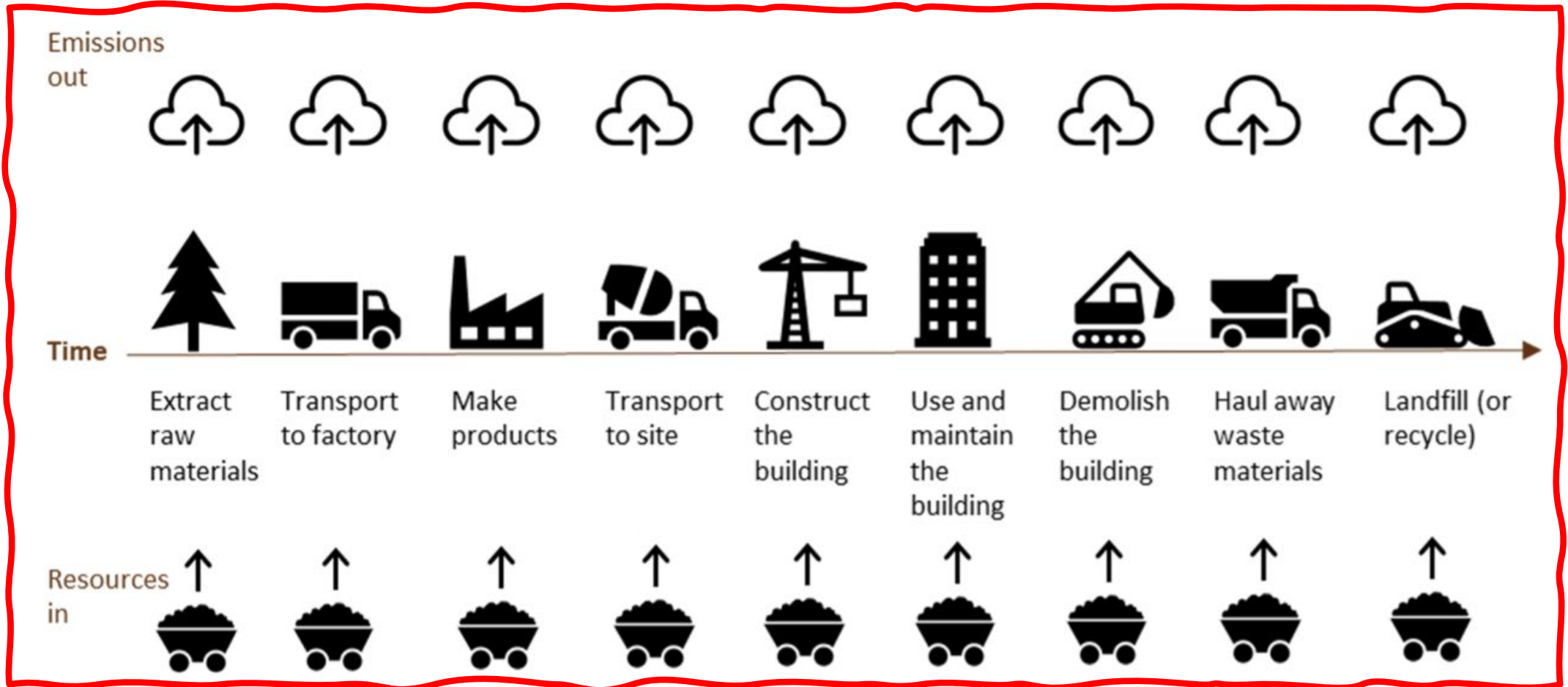


Image Courtesy of Athena Institute

# Available Tools and Data

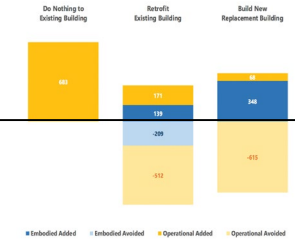


Software Tools



Data Sources

# C.A.R.E. Carbon Avoided: Retrofit Estimator



## Development Team

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*Siegel & Strain Architects*

Erin McDade

*Architecture 2030*

Lori Ferriss

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## Advisory Committee

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*Carbon Leadership Forum*

Stephanie Carlisle

*Carbon Leadership Forum*

Stacy Smedley

*Building Transparency*

Carl Elefante

*American Institute of Architects*

Peter Cox

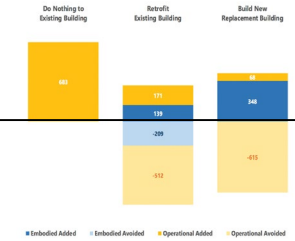
*Carrig Conservation, ICOMOS*

Brad Jacobson

*EHDD*



# C.A.R.E. Carbon Avoided: Retrofit Estimator



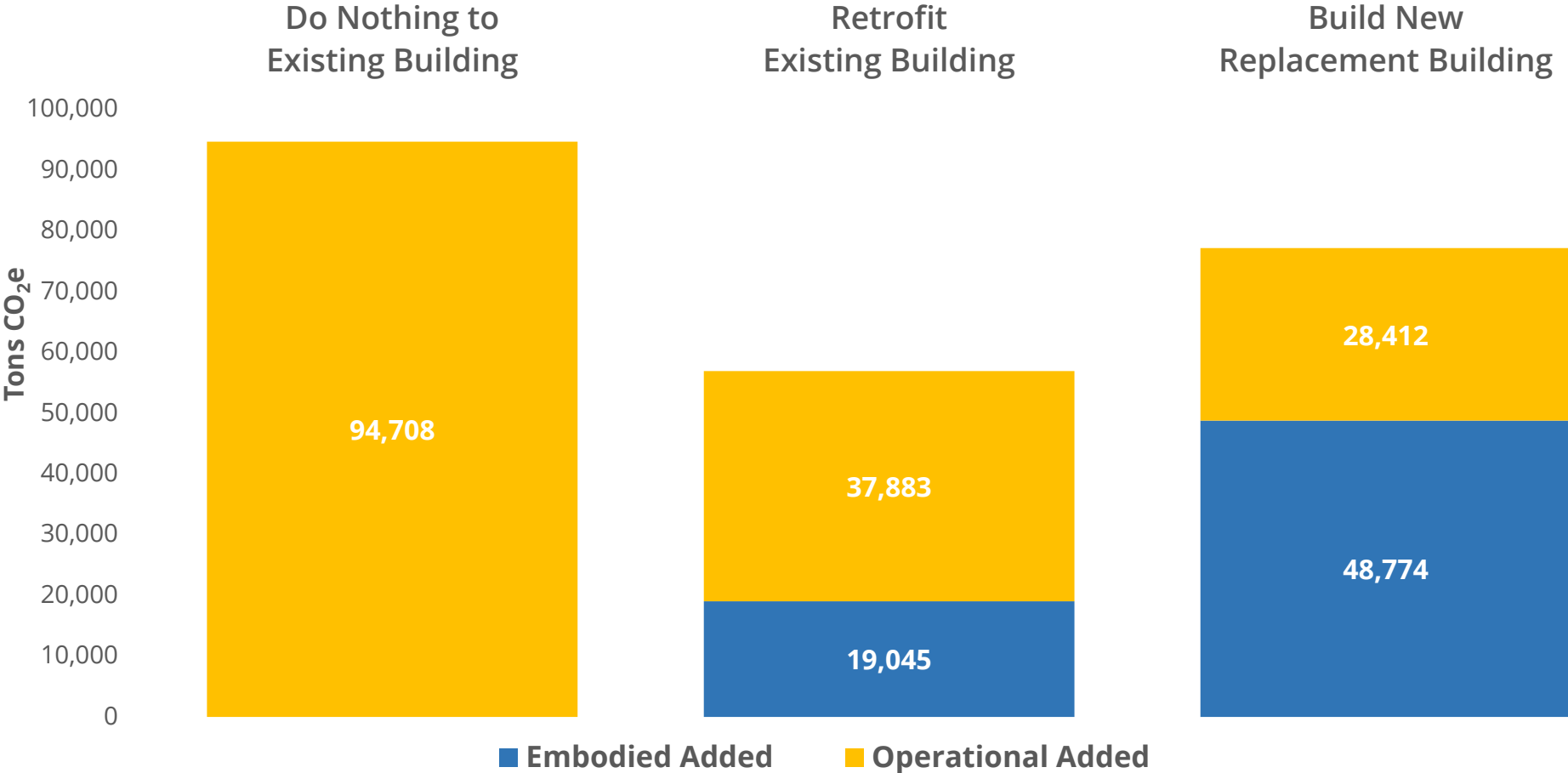
## What it Does

Evaluates total carbon emissions of existing building reuse compared to new construction

## Who it's For

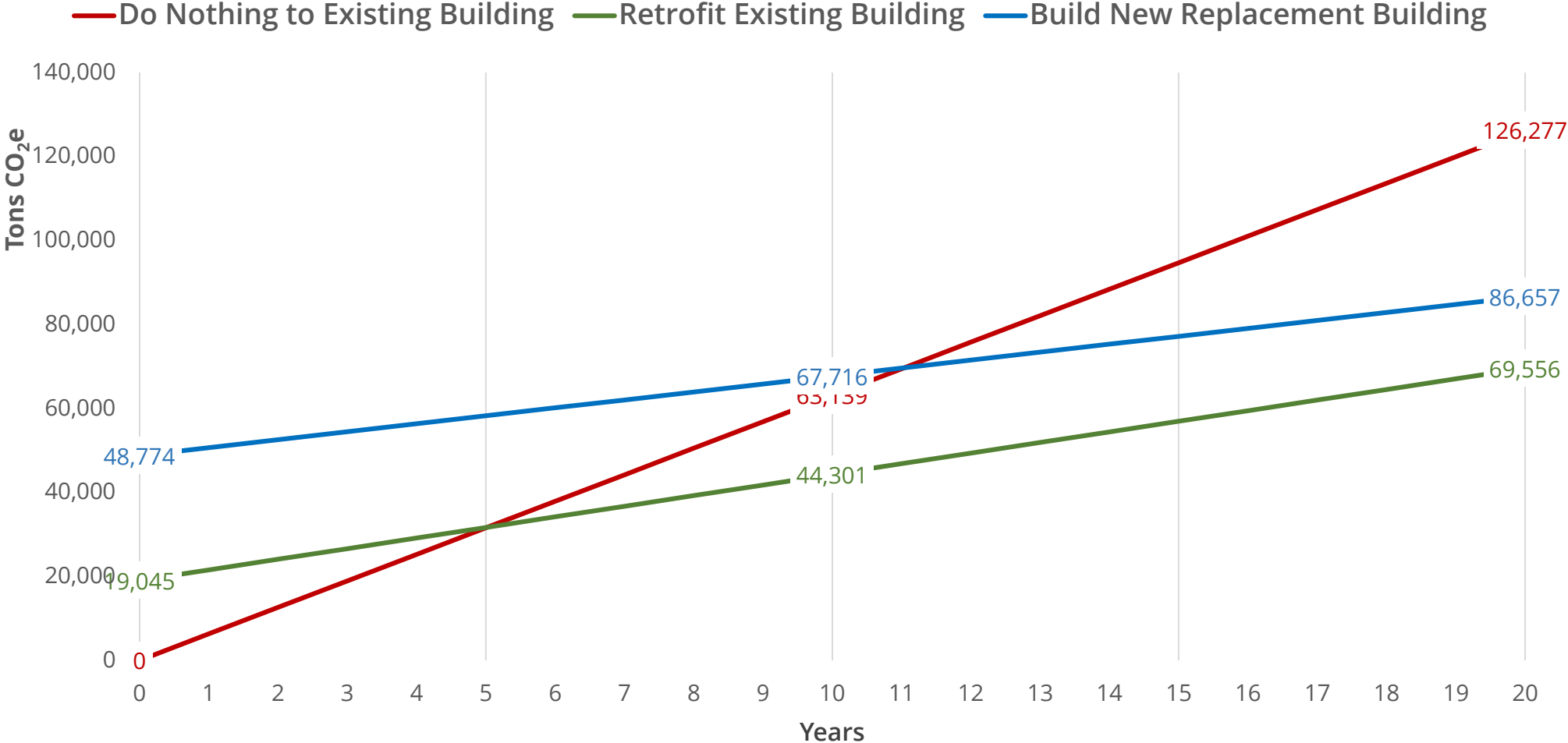
- Public officials
- Planners
- Preservation officers
- Building owners
- Real estate developers
- Building industry professionals

# Results: Total Carbon Emissions Comparison

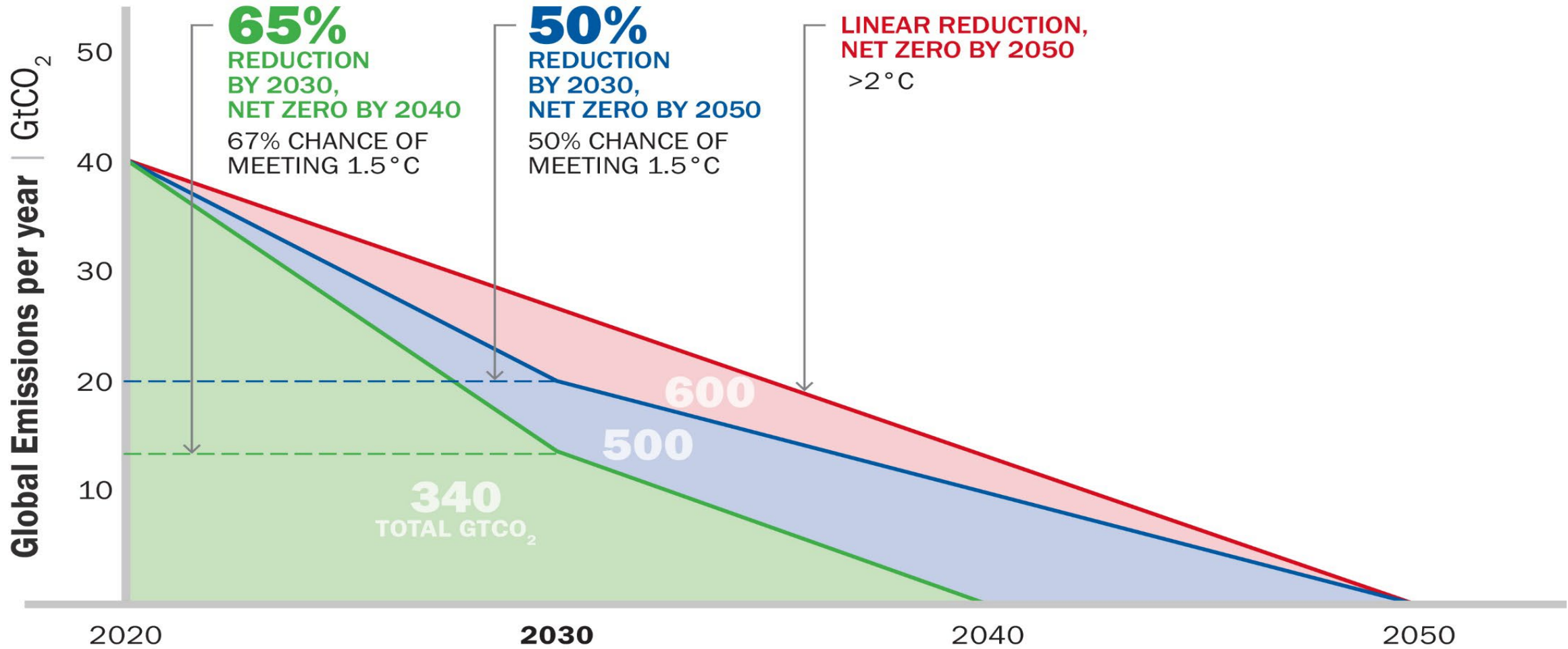


# Results: Carbon Emissions Over Time

## Cumulative Emissions Over Time



# The Time Value of Carbon



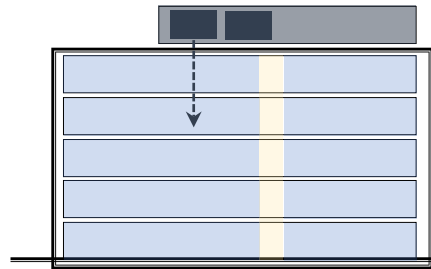
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DATA SOURCE: ARCHITECTURE 2030

# Approaches to Energy Systems

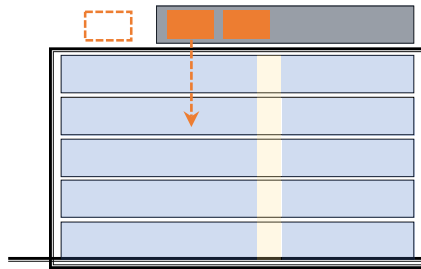




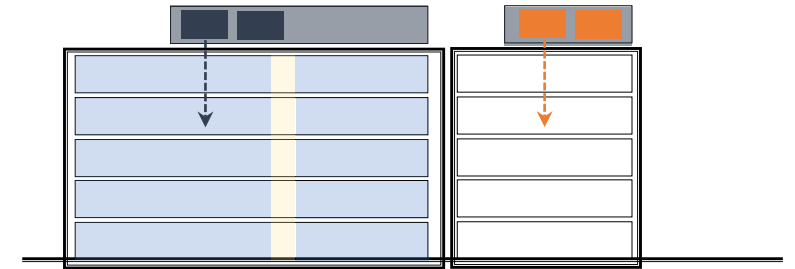
# Approaches to Mechanical System Renewal



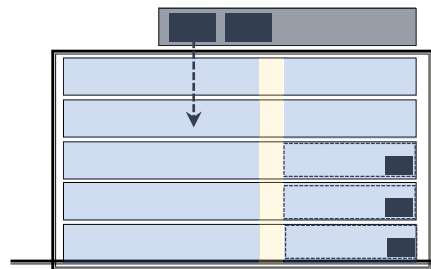
Outdated Equipment



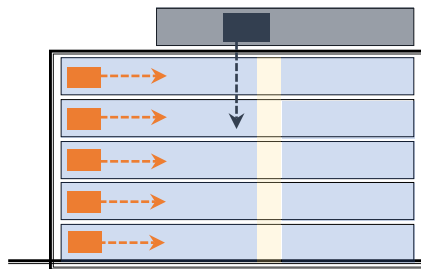
Replacement/Temp Systems



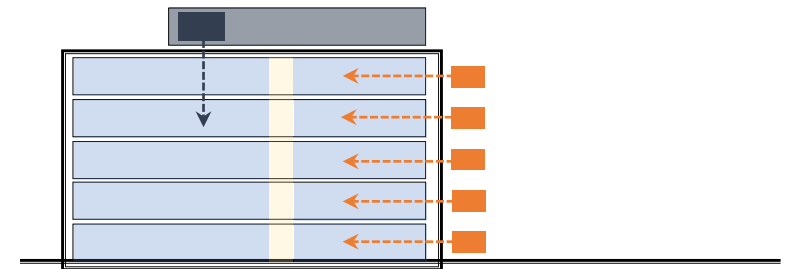
Addition Brings New Systems



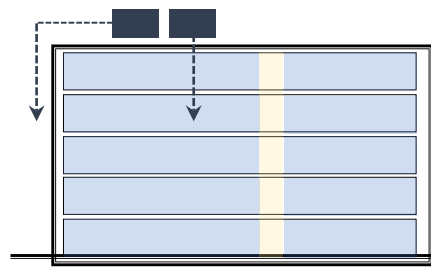
Incremental Changes



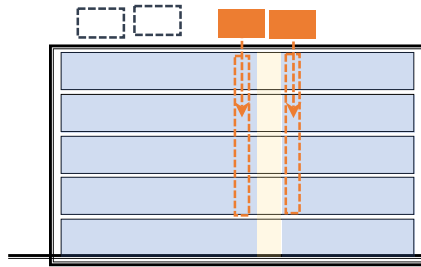
Floor - by - Floor



Systems Tower



Ductwork Doesn't Fit



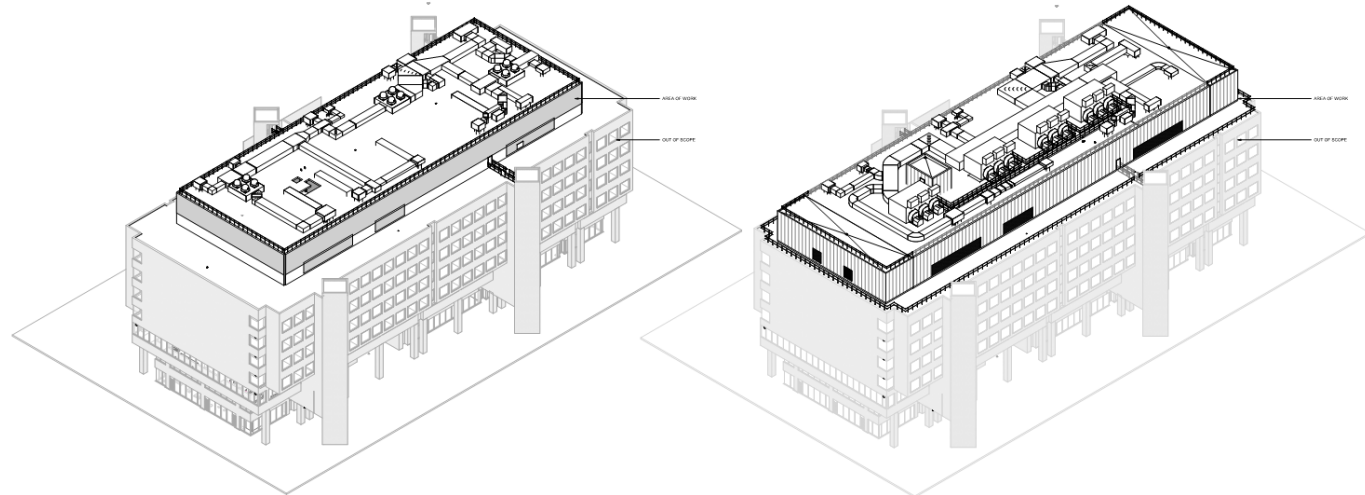
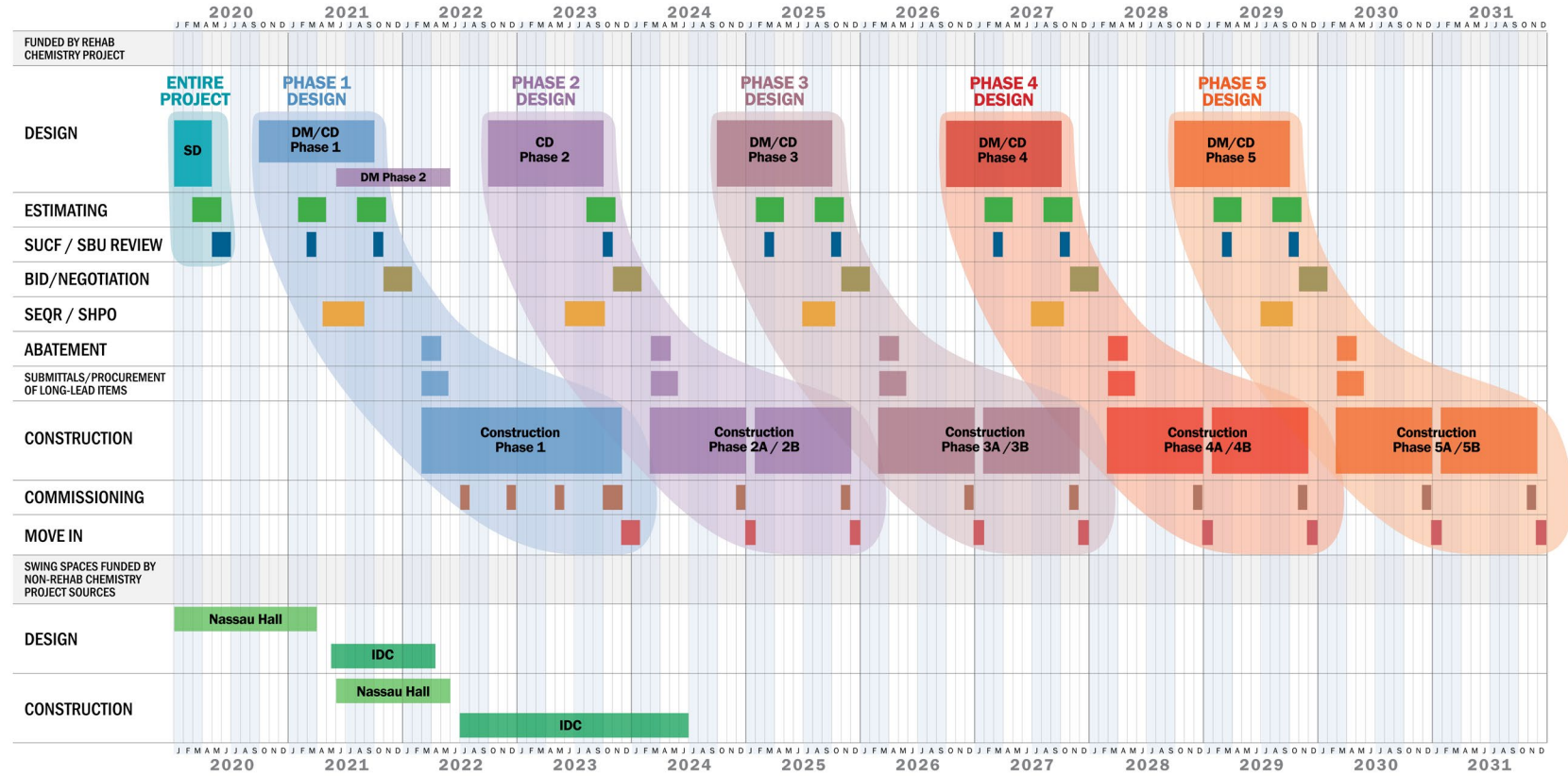
New Pathways

# Chemistry Building Rehab

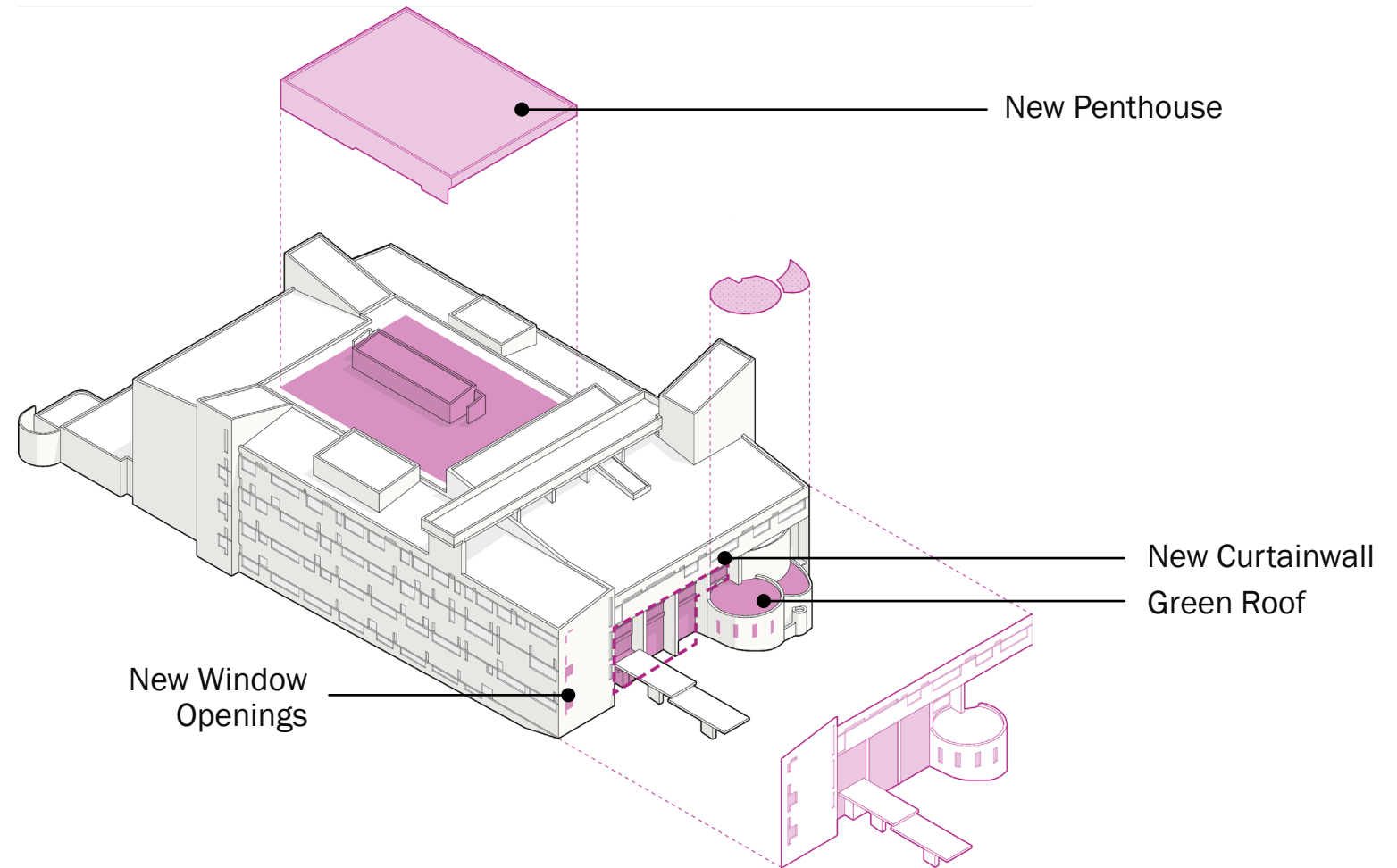
SUNY Stony Brook University

## Phased Renovation of Hood-Intensive 1973 Research and Teaching Building

- 5 phases to be constructed over 10+ years
- Complex choreography of internal swing space
- Phase 1: mechanical infrastructure and expanded penthouse



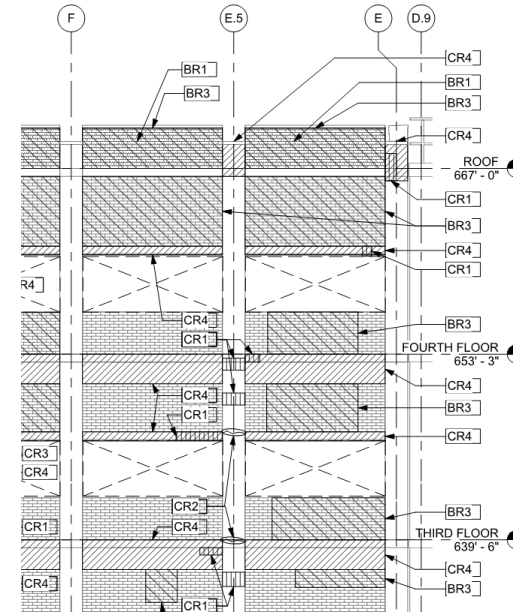
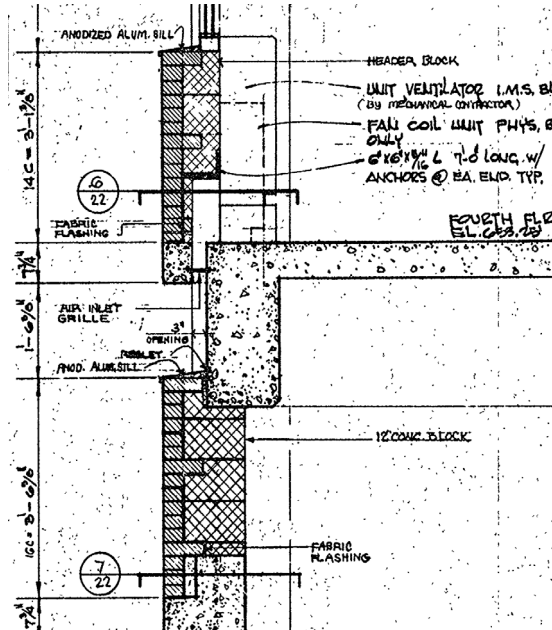
# Building Envelope



# Case Study: Our Investigation Process

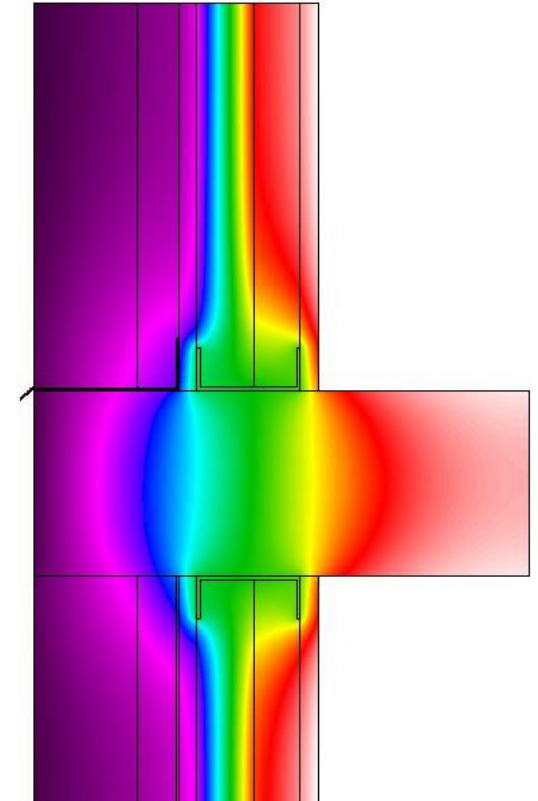
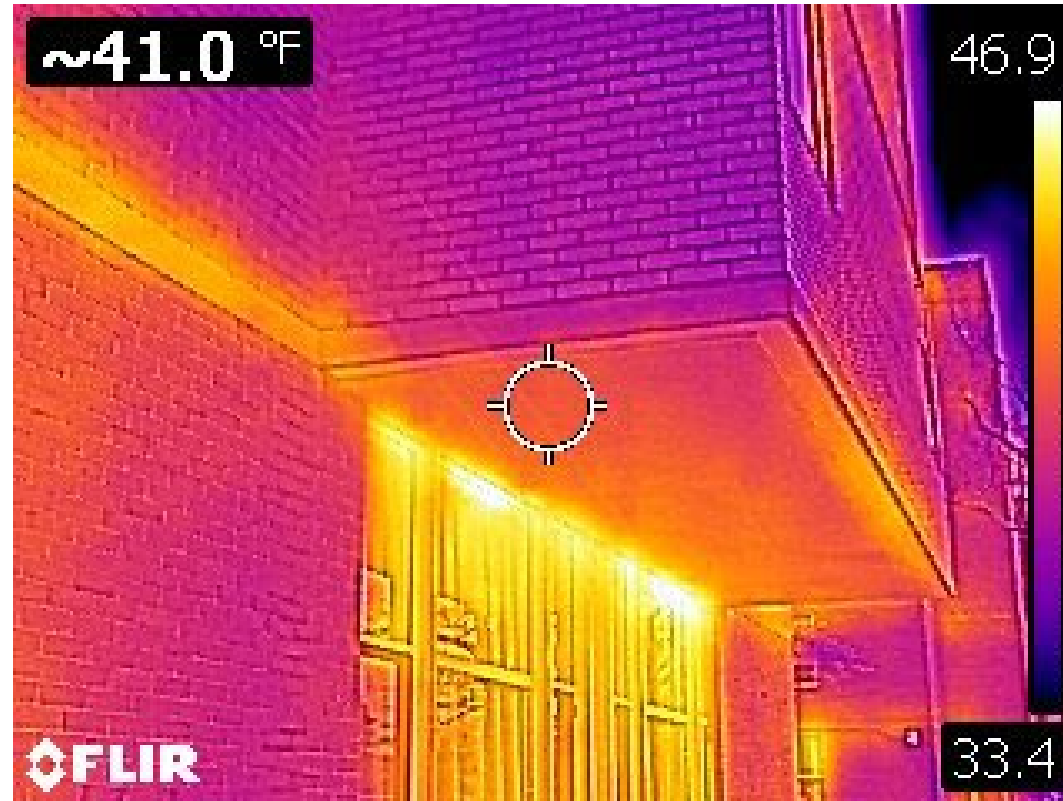
## Gant Science Complex, UConn

- Field verification of existing documentation
- Documentation of conditions to enable accurate cost modeling
- Blower-door test for infiltration
- Visual survey plus exploratory demolition to validate wall assembly as needed
- Thermal imaging



# Envelope Retrofit Process

- Analyze Performance of Existing Envelope
- THERM modeling, WUFI, Energy Modeling
- Identify Weak Links
- Glazing, window frames, exposed structure
- Improve Envelope Performance:
  - Increase Effective R-Value
  - Improve Airtightness
  - Reduce Heat Loss through Glazing and Thermal Bridges
- Avoid Unintended Effects
- Condensation, corrosion, mold growth

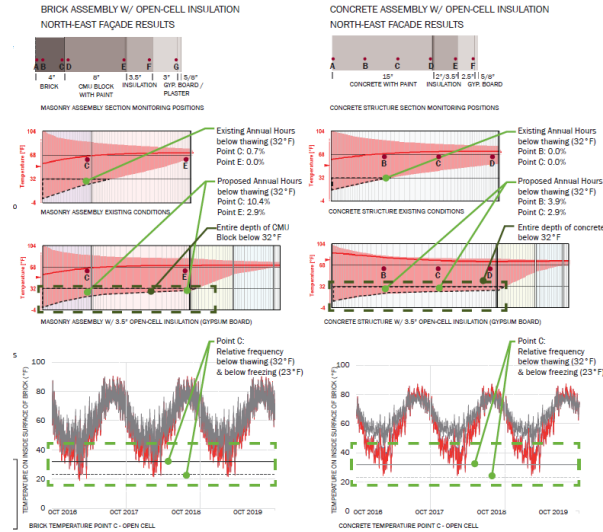


Exterior Wall at Floor Slab

# Case Study: Our Analytical Process and Tools

*Gant Science Complex, UConn*

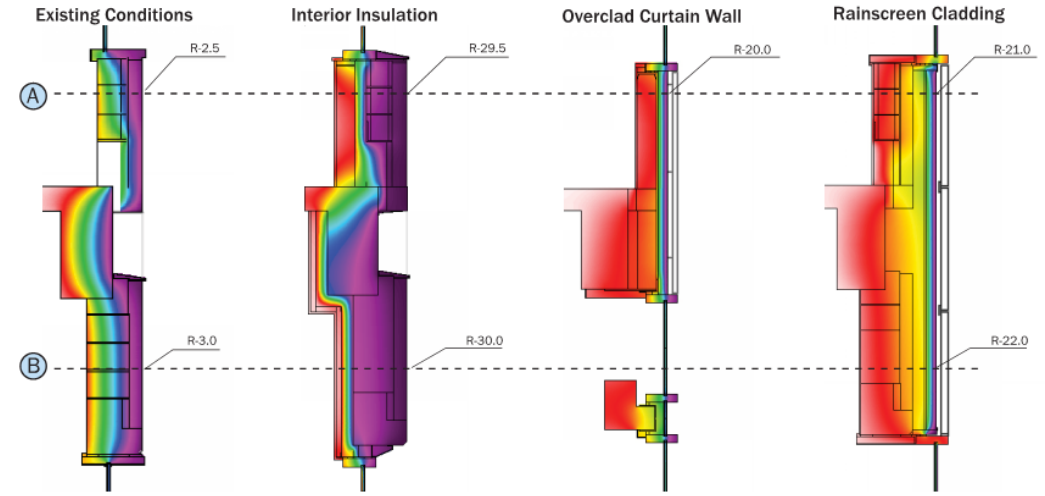
- Hygrothermal Analysis
- Thermal modeling
- Energy Modeling
- Building systems considerations
- Life Cycle analysis
- Multiple facade options
- Wall repair mockup



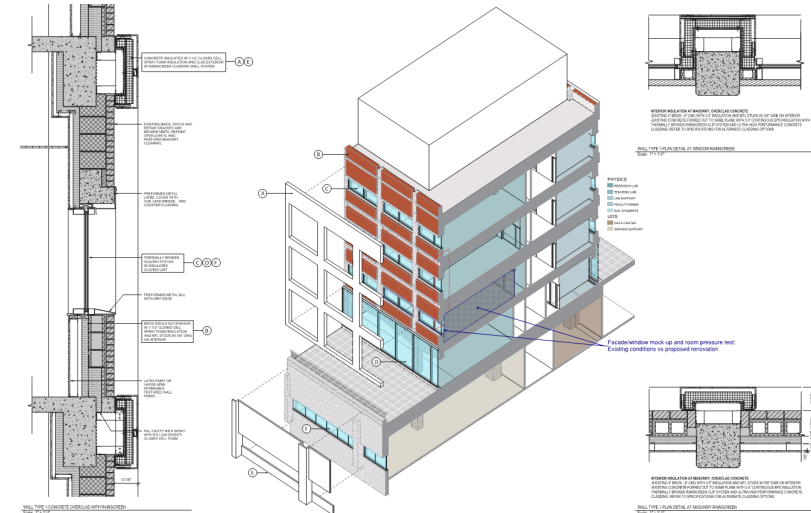
## WUFI Analysis



**Exploratory/Mockup**

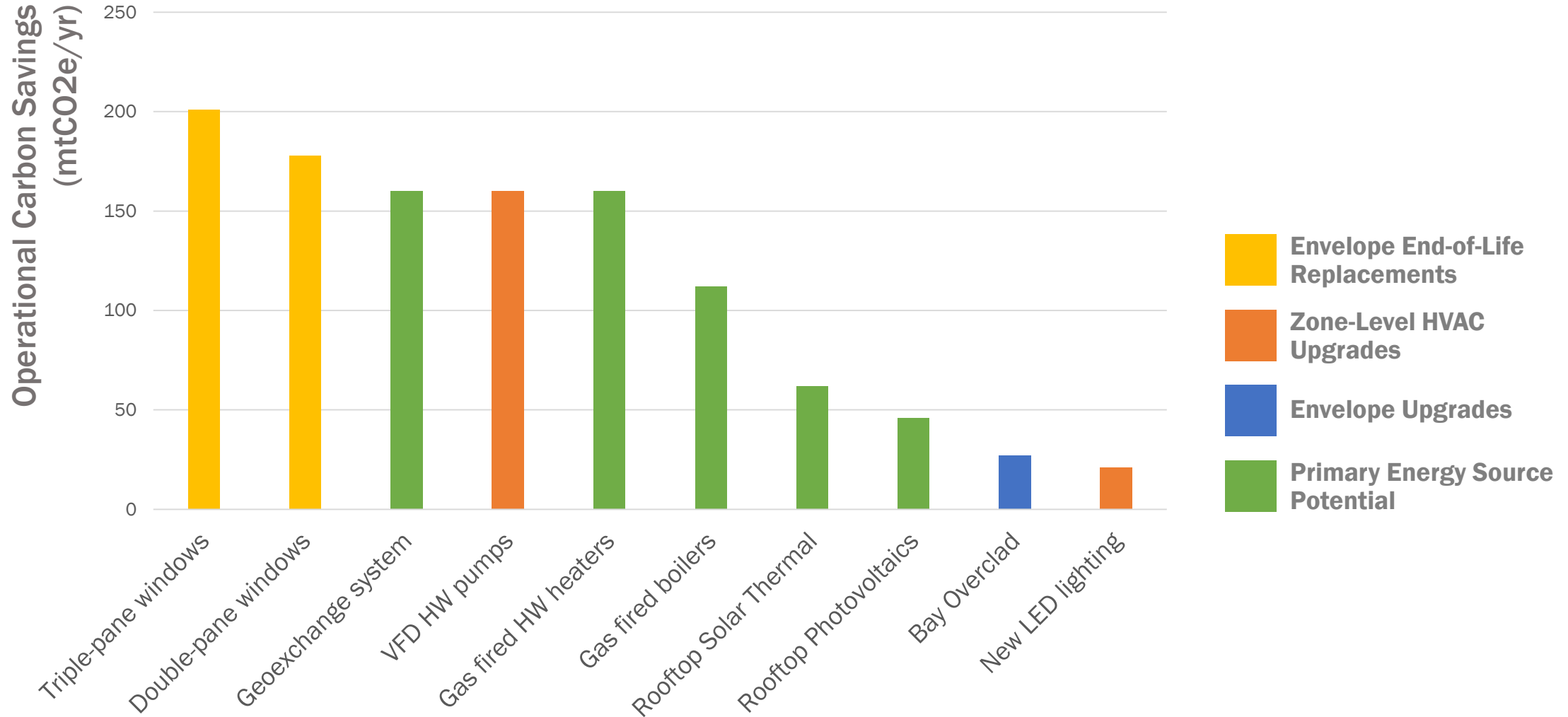


## Thermal Modeling

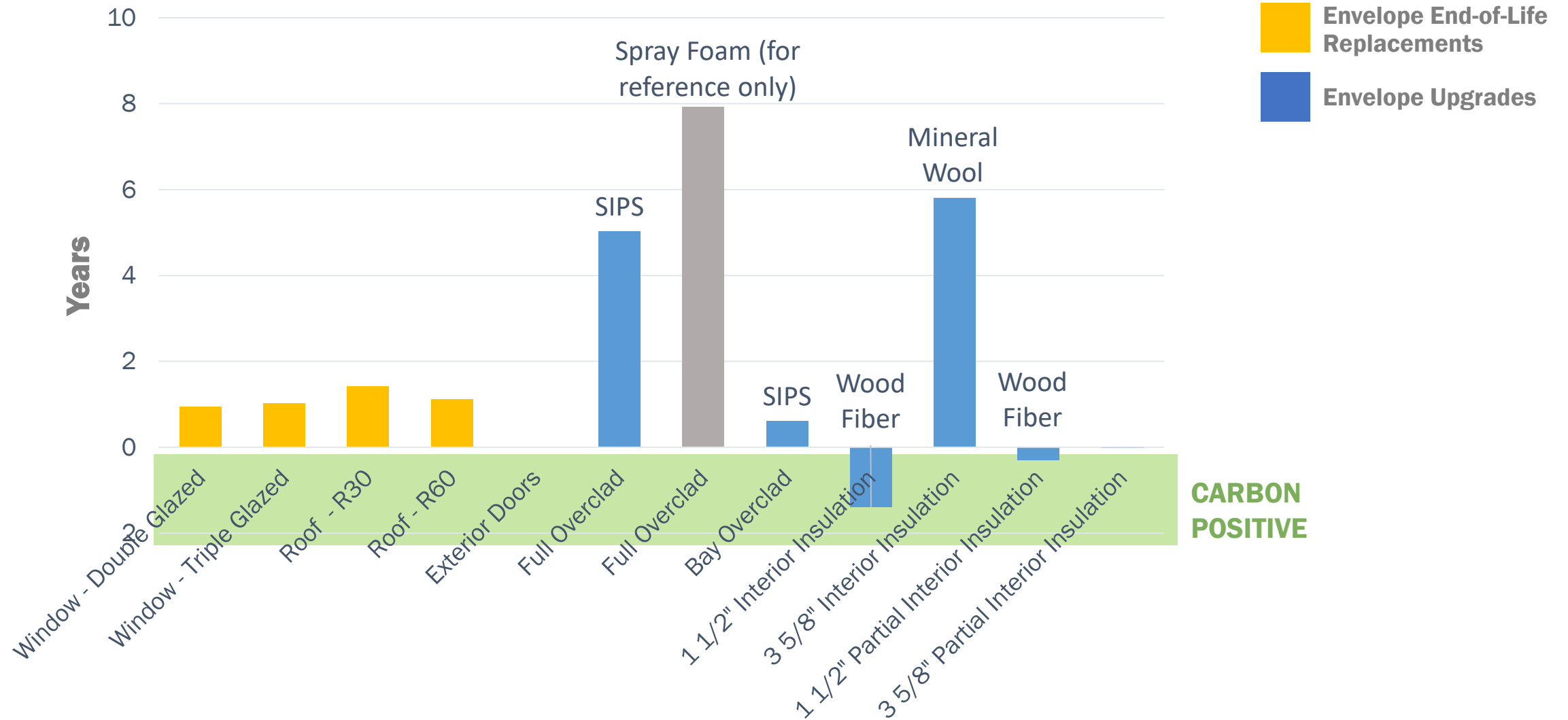


**Exterior Wall Cladding Alternatives**

# Top Ten Operational Carbon Savings Measures



# Carbon Payback Period







# Gant Science Complex

UNIVERSITY OF CONNECTICUT

# UCONN GANT SCIENCE COMPLEX

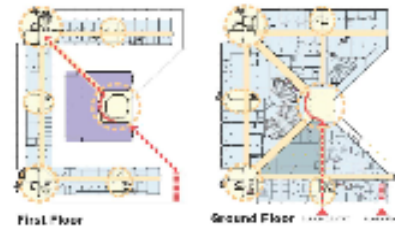
## INTEGRATION

- Transform a work-horse science building into a campus-wide amenity with new collaboration and gathering spaces throughout the building at multiple scales
- Remodel an inward-focused lab building into an extroverted, multi-disciplinary academic complex



## EQUITABLE COMMUNITIES

- Improve wayfinding on the ground floor to give clarity to the circulation and increase building porosity
- Increase visual connection between occupants and the campus through larger ground & plaza level openings



## ECOSYSTEMS

- Link the complex to the adjacent campus "woodland corridor"
- Transform the under-utilized plaza deck into an outdoor amenity
- Utilize native, drought resistant plants in the landscape design



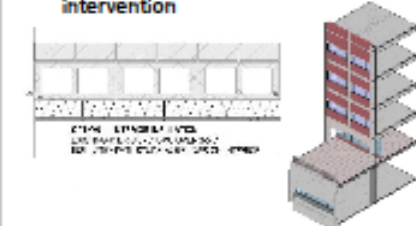
## WATER

- Reduces indoor water use by 37% over LEED baseline
- Collect waste and stormwater from the complex and redirect it to the campus water treatment plant
- Utilize reclaimed water for flush water in toilets and urinals



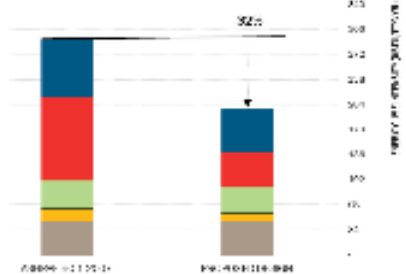
## ECONOMY

- Balance lofty performance goals with the cost constraints inherent to a public university project, including augmenting the façade restoration with high-performance windows (U-0.24) and added insulation (R-27) for improved thermal comfort with minimal intervention



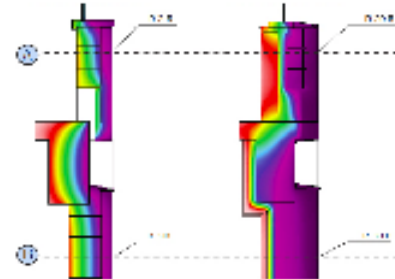
## ENERGY

- Reduce demand for space heating by 60% and total annual energy consumption by 32% over code baseline through envelope upgrades, low-energy lighting, and new HVAC systems utilizing demand-controlled ventilation & heat recovery tech



## WELLBEING

- Enhance occupant thermal comfort by reducing air infiltration through the envelope from 1.60 cfm/sf to 0.10 cfm/sf and improving the exterior wall assembly's R-value from R-2 to R-30 on average



## RESOURCES

- Repair and reuse existing building elements when possible, such as existing brick and terrazzo flooring
- Reuse existing core structural system and façade elements



## CHANGE

- Extend the life of an existing research facility to meet the current and projected needs of the university's STEM initiatives through targeted program and systems updates

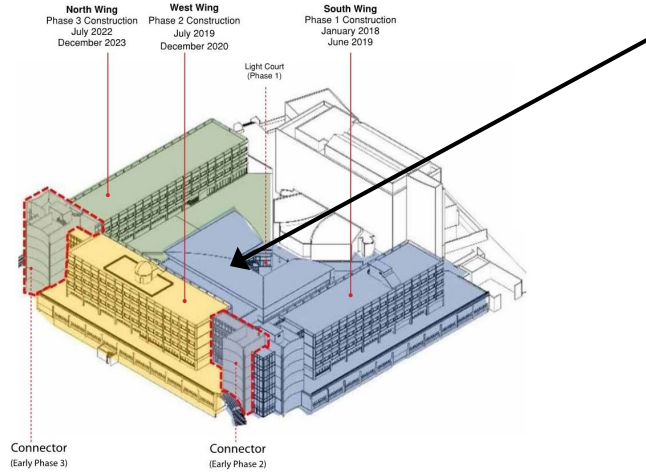


## DISCOVERY

- Inform design through investigative mock-ups, including the interactive teaching lab simulation, where professors taught sample classes and provided feedback to inform the final design of the space



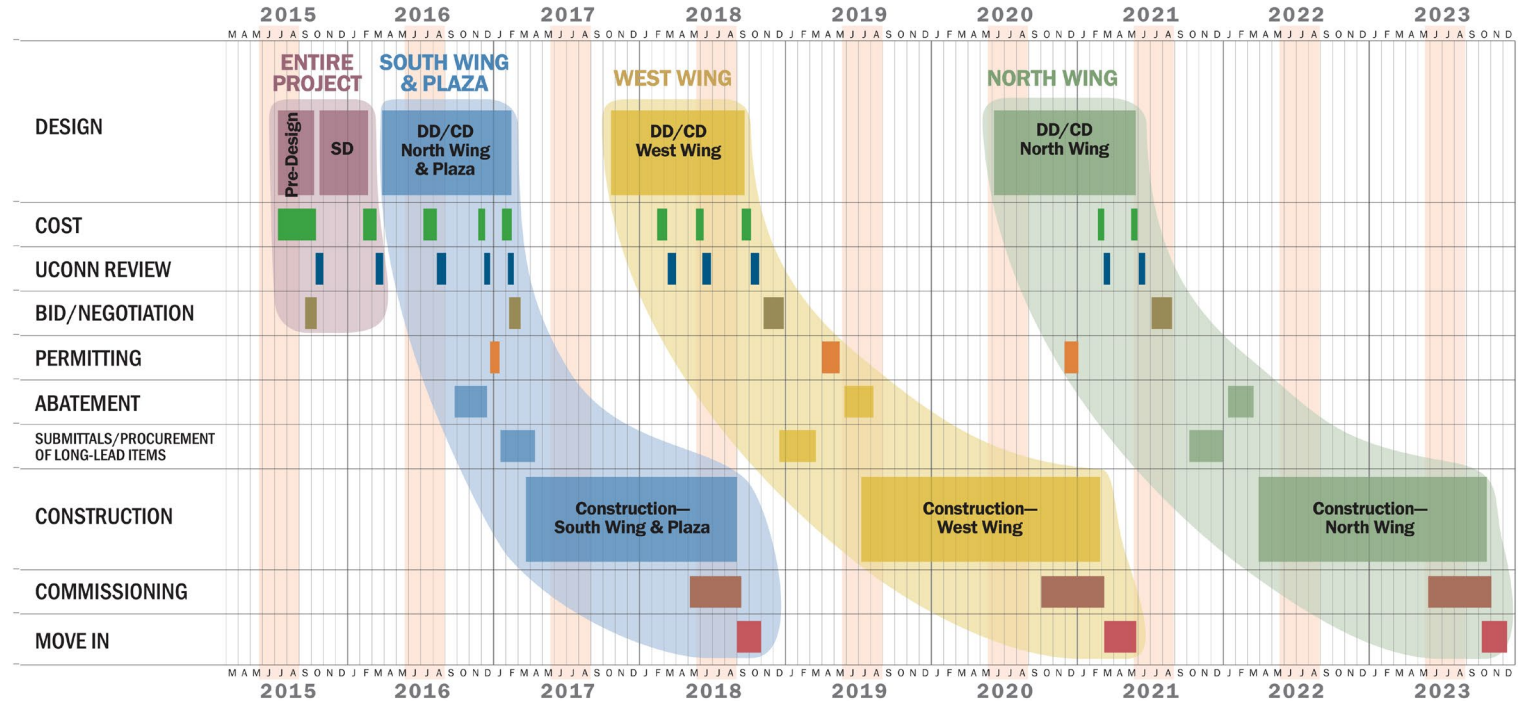
# Planning and Building the Phased Project

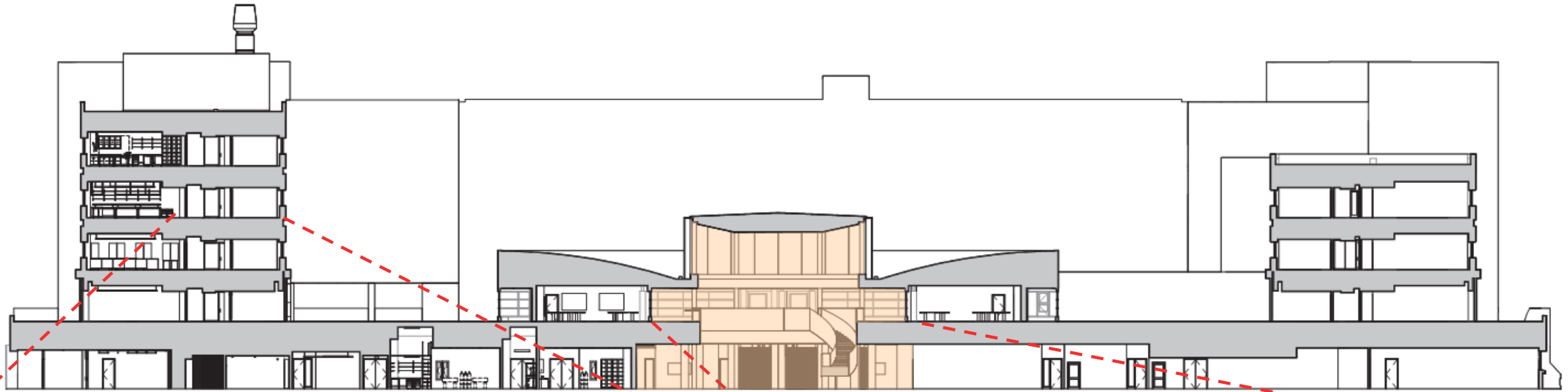


Campus Data Center at Ground Floor

- Phase 1** South Wing–Physics
- Phase 2** West Wing–EEB
- Phase 3** North Wing–EEB/BIO

- Staggered design phases (post-SD) to accommodate incremental funding
- Dependent upon other projects’ timing
- Renovate one wing at a time
- Swing space required
- LEED straddles v.3–v.4 transition
- Data Center = “no-fly zone”









NO  
SMOKING  
ALLOWED

OLSEN HALL

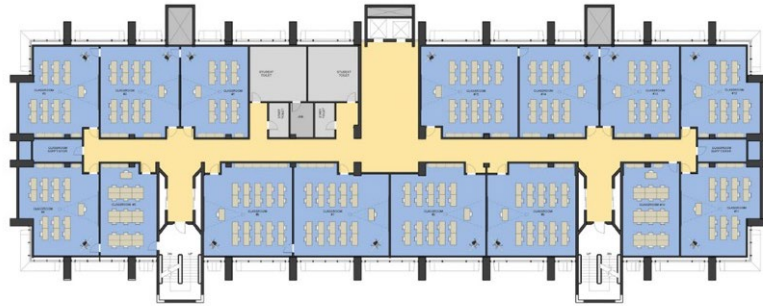
## Proposed Renovation Plans and Illustrations from Goody Clancy Master Plan

### Olsen Hall Renovation

University of Massachusetts Lowell

#### Master Plan Guides Incremental Renovations

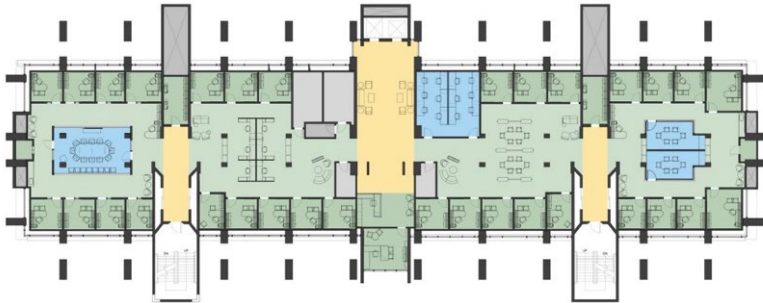
- 1971 six-story Brutalist biology research and teaching facility
- Our Master Plan proposed renovations as distinct projects to be implemented as funding allows
- Responds to growing significance of interdisciplinary research and blurring of traditional departmental boundaries
- Adds research lab space
- Adds core research facilities



3RD FLOOR—CLASSROOMS



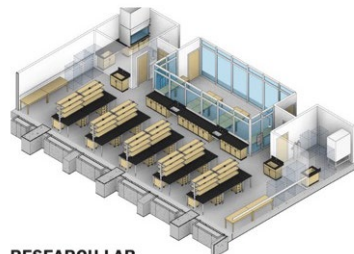
6TH FLOOR—RESEARCH LABS



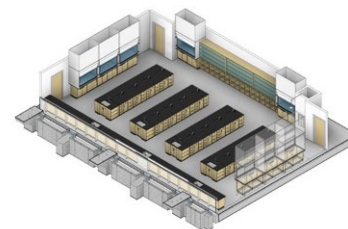
2ND FLOOR—FACULTY OFFICES



5TH FLOOR—TEACHING LABS



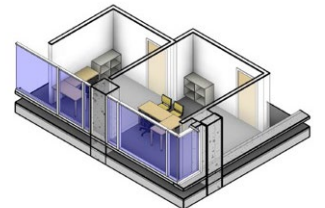
RESEARCH LAB



CHEMISTRY TEACHING LAB



CLASSROOM



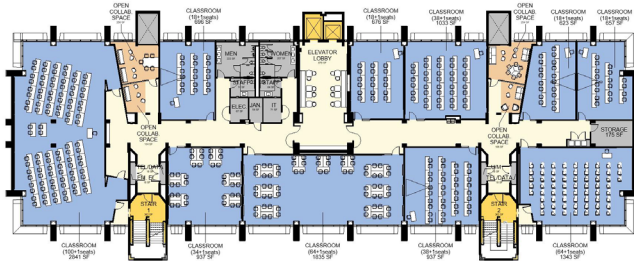
FACULTY OFFICE/DIRECTOR OFFICE

# Olsen Hall Renovation

University of Massachusetts Lowell

## Phase 1: Classroom Floor 3

- Third-floor renovation included mechanical and electrical systems, classrooms, and public spaces
- Mix of labs and active-learning, flat-floor, and tiered classrooms
- New formal and informal collaboration spaces





## Olsen Hall Renovation

University of Massachusetts Lowell

### Attractive “Sticky Spaces” that Support Engagement

- Elevator lobbies transformed through lighting, furnishings and finishes
- Corridors “opened up” with transparency, new lighting and seating, and exposed systems above
- Improvements also addressed accessibility, life safety, energy efficiency, and deferred maintenance



**ELEVATOR LOBBY:  
BEFORE, AND AFTER RENOVATION**



**CORRIDOR:  
BEFORE, AND AFTER RENOVATION**

# Thank You!

**Jean Carroon, FAIA, LEED Fellow**

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