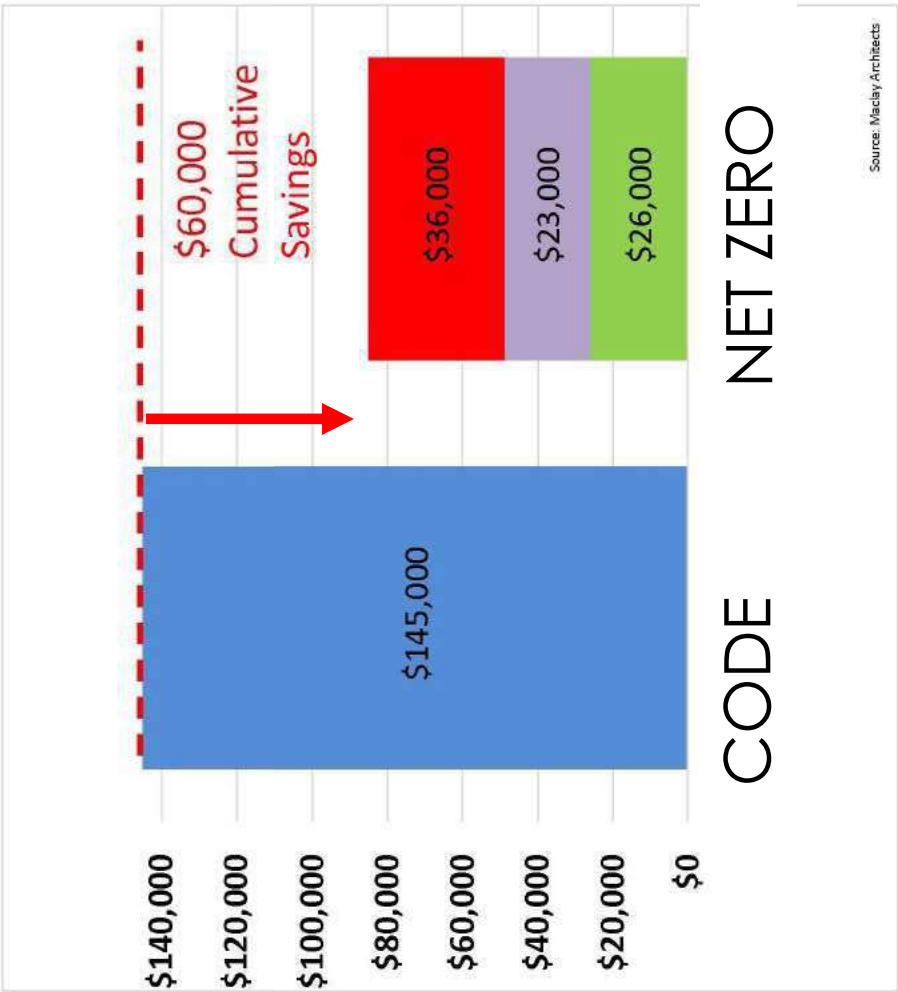
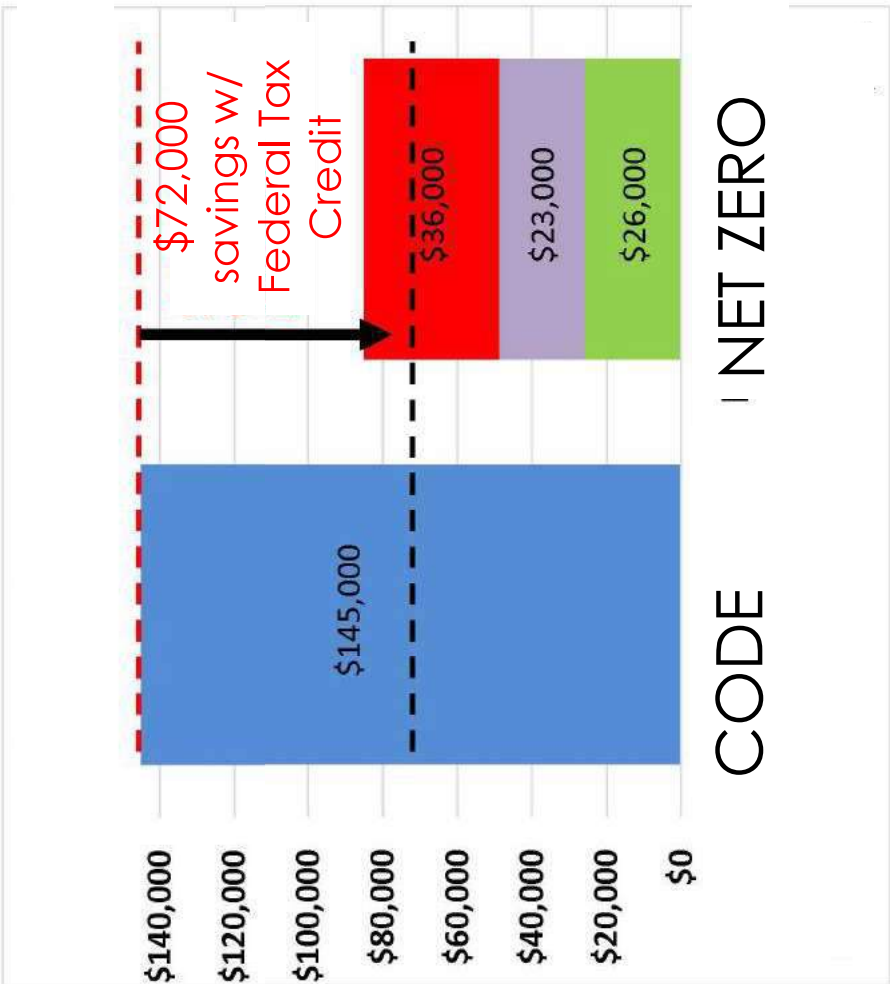


Single Family 30-year Costs

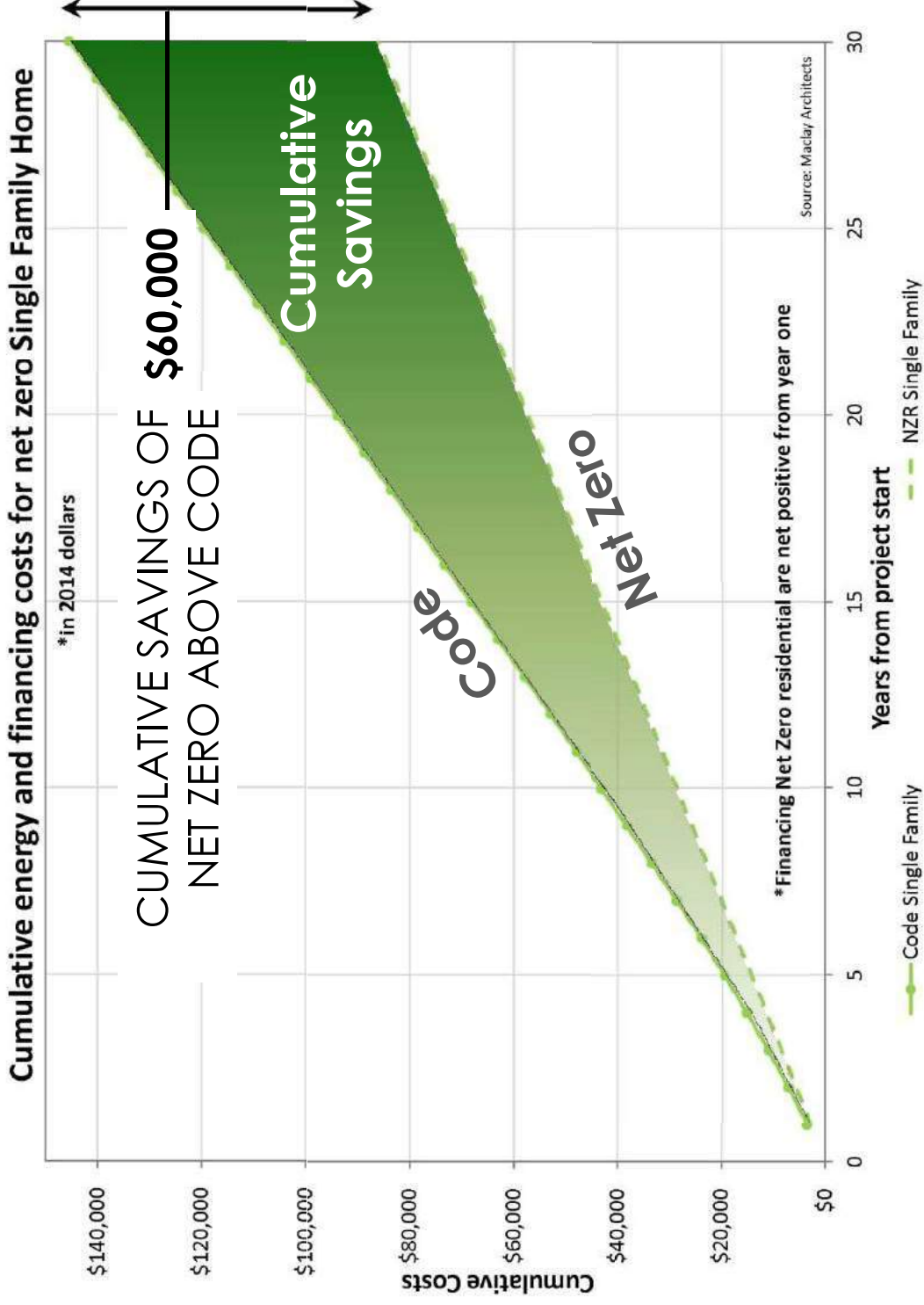


Single Family 30-year Costs



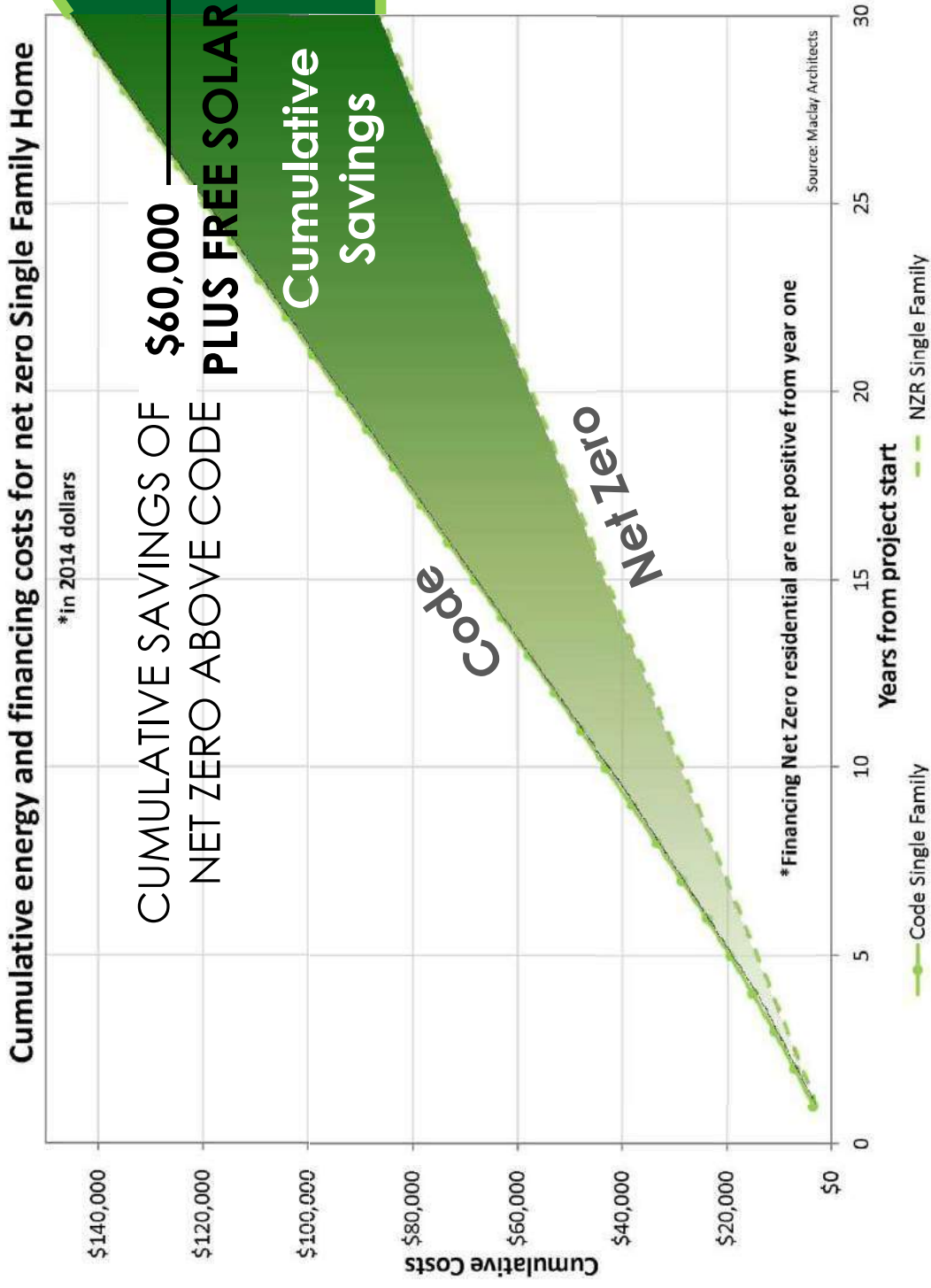
30-Year Cash Flow

- 30-Year savings



30-Year Cash Flow

- Savings after 30 years



Bennington Courthouse and State Office Building

- 65,000 SF Renovation/Addition



Bennington Courthouse and State Office Building

- 65,000 SF Renovation/Addition
- \$6 / sf additional cost



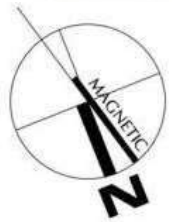
Bennington Courthouse and State Office Building

- 65,000 SF Renovation/Addition
- \$6 / sf additional cost
- 3% additional construction cost



Pre-existing conditions





- GRAPHIC KEY**
- NEW CONSTRUCTION
 - EXISTING CONSTRUCTION
 - REPLACEMENT PARKING
 - EXISTING PARKING
 - PROPOSED WALKWAYS
 - EXISTING WALKWAYS
 - GRASS
 - VEGETATION
 - PROPOSED GEOTHERMAL FIELD
- ENTRANCE KEY**
- 1. MAIN ENTRANCE
 - 2. SALTY POST
 - 3. DOC ENTRANCE
 - 4. PAVILE ENTRANCE



Bennington State Office Building

Existing



- GRAPHIC KEY**
- New Construction
 - Existing Construction
 - Revisiting Parking
 - Existing Parking
 - Proposed Walkways
 - Existing Walkways
 - Grass
 - Vegetation
 - ☒ Proposed Georeferenced File
- ENTRANCE KEY**
- 1. Main Entrance
 - 2. South Port
 - 3. DOC Entrance
 - 4. Parking Entrance

Bennington State Office Building

Option 3, Site Plan



New Option Surface Area Reduction:

31% on 5 sides

45% on 6 sides

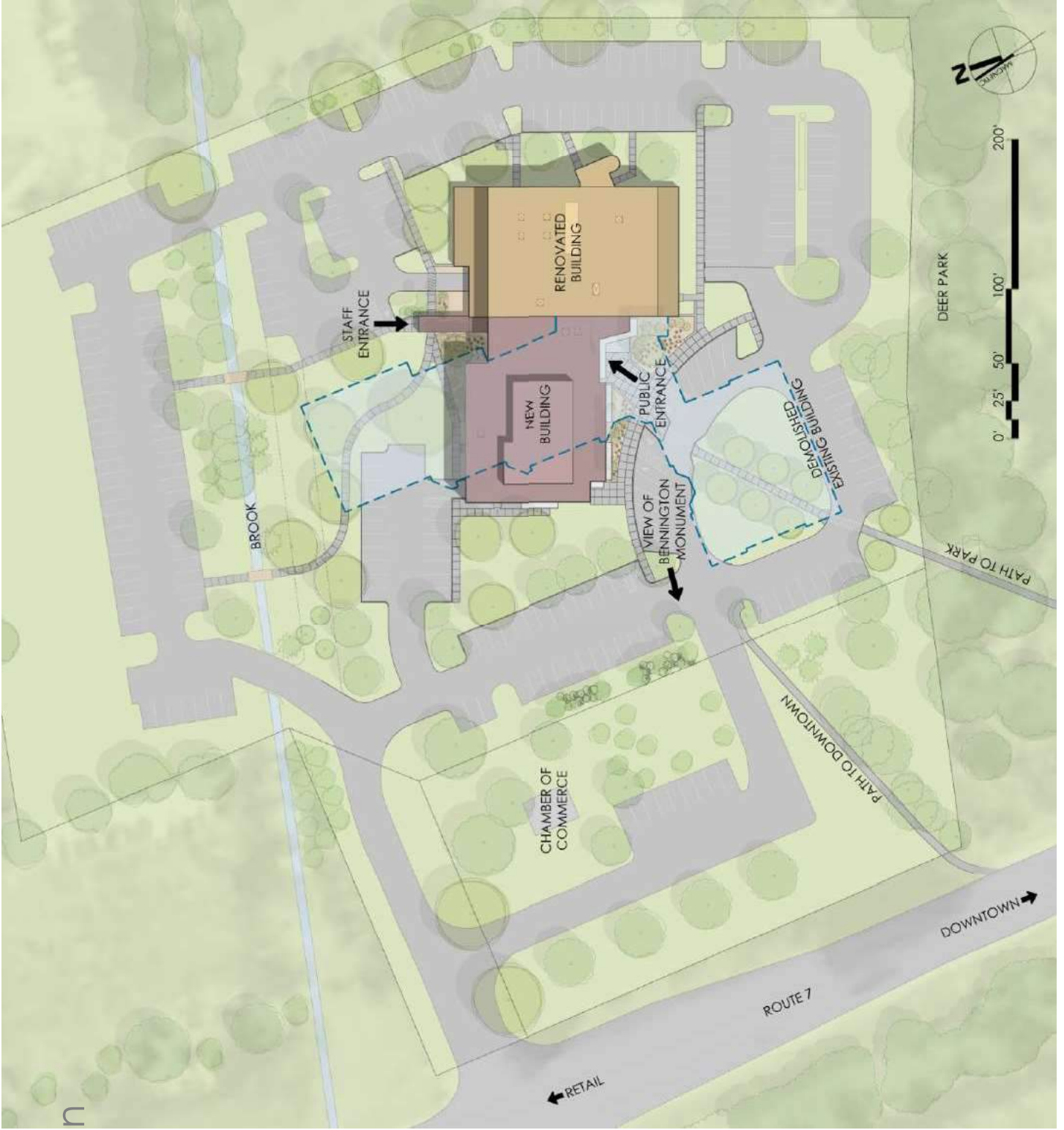
No increased cost

Cost:

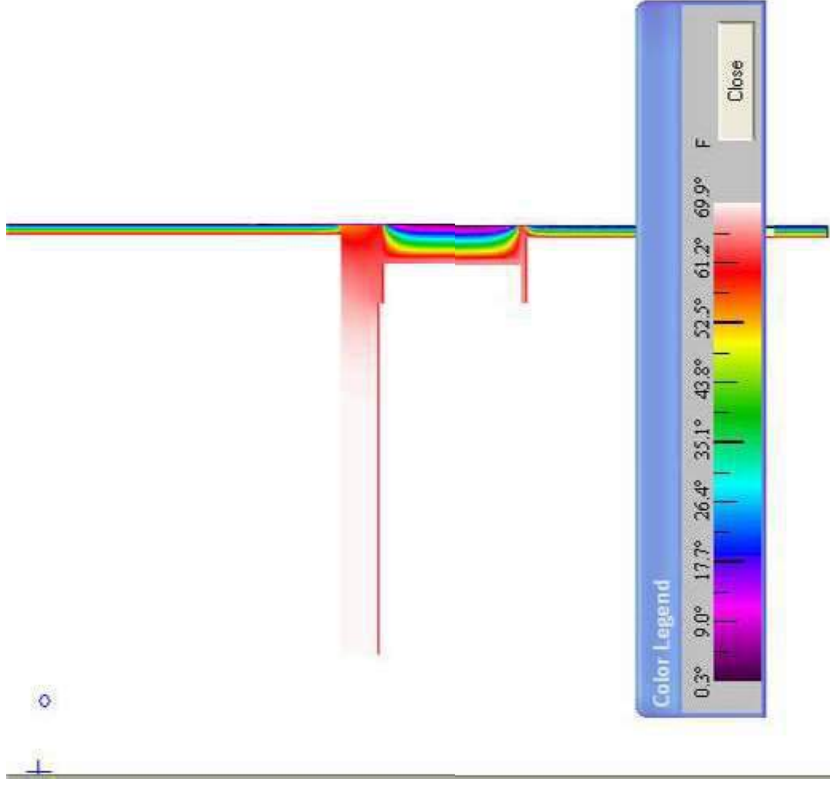
Massing Savings:

Infinite Return on Investment

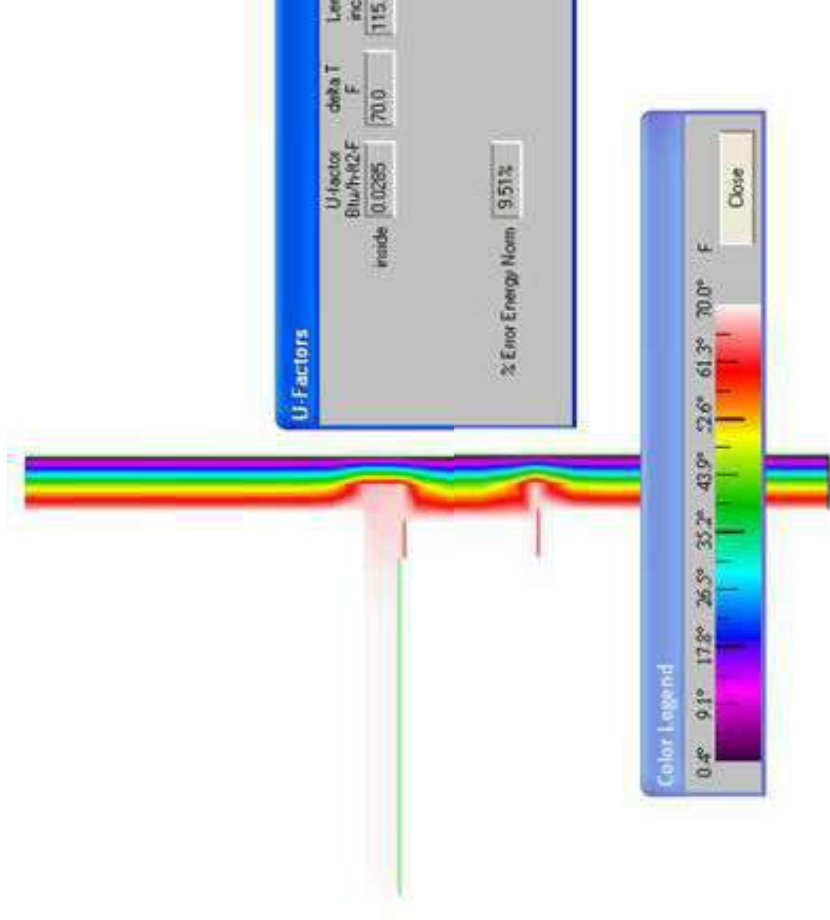
Site plan



Thermal diagrams



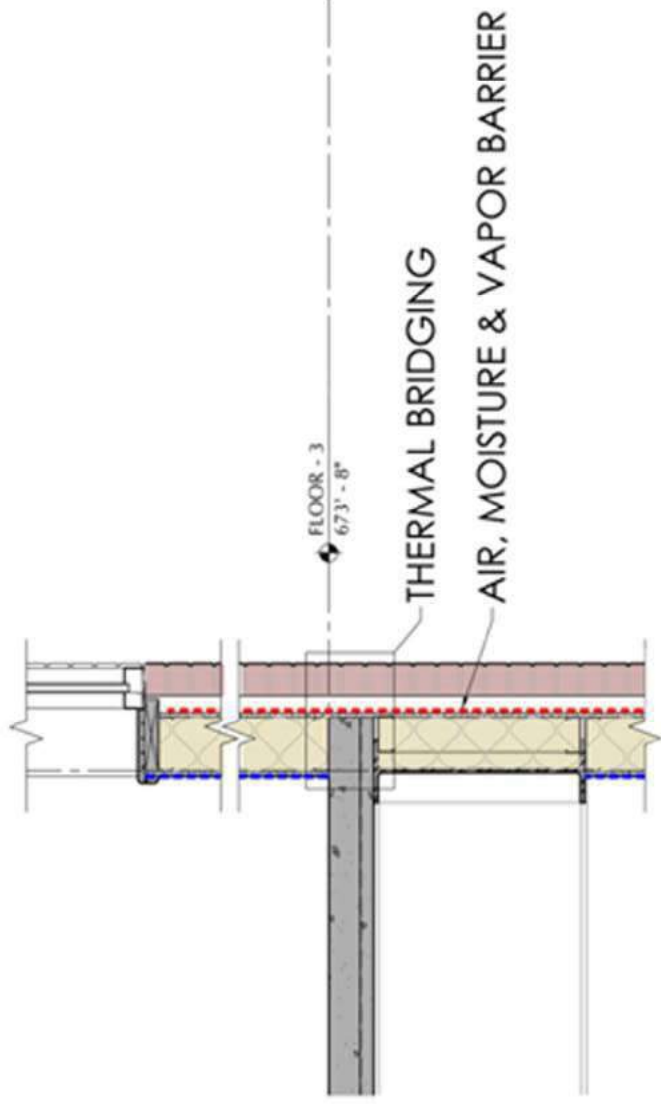
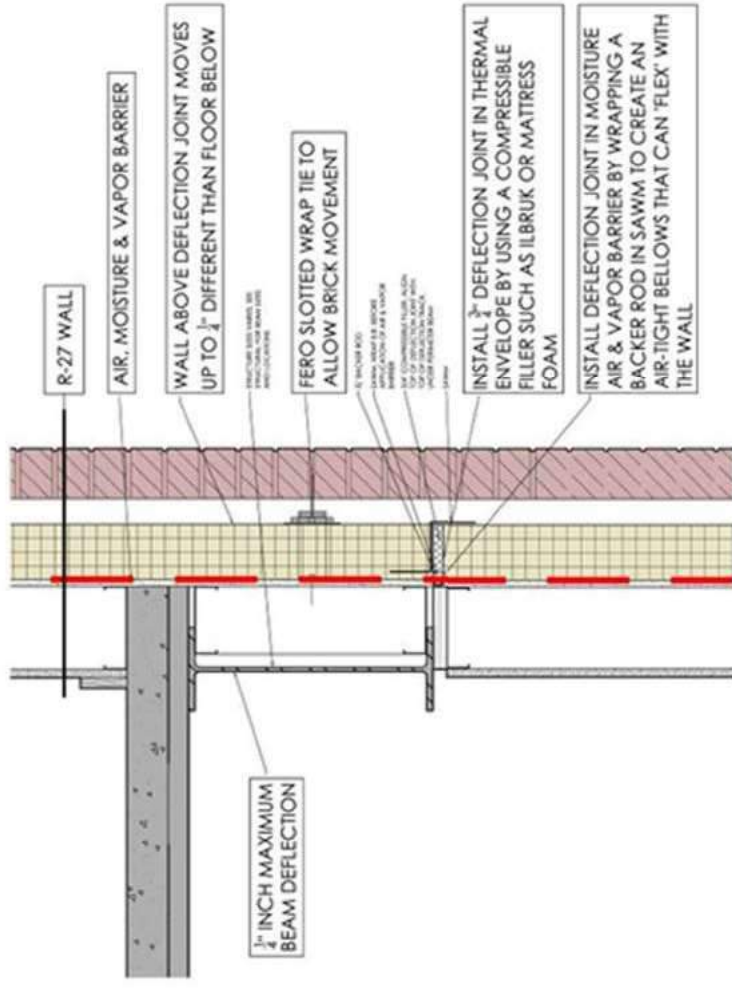
Existing Building Envelope

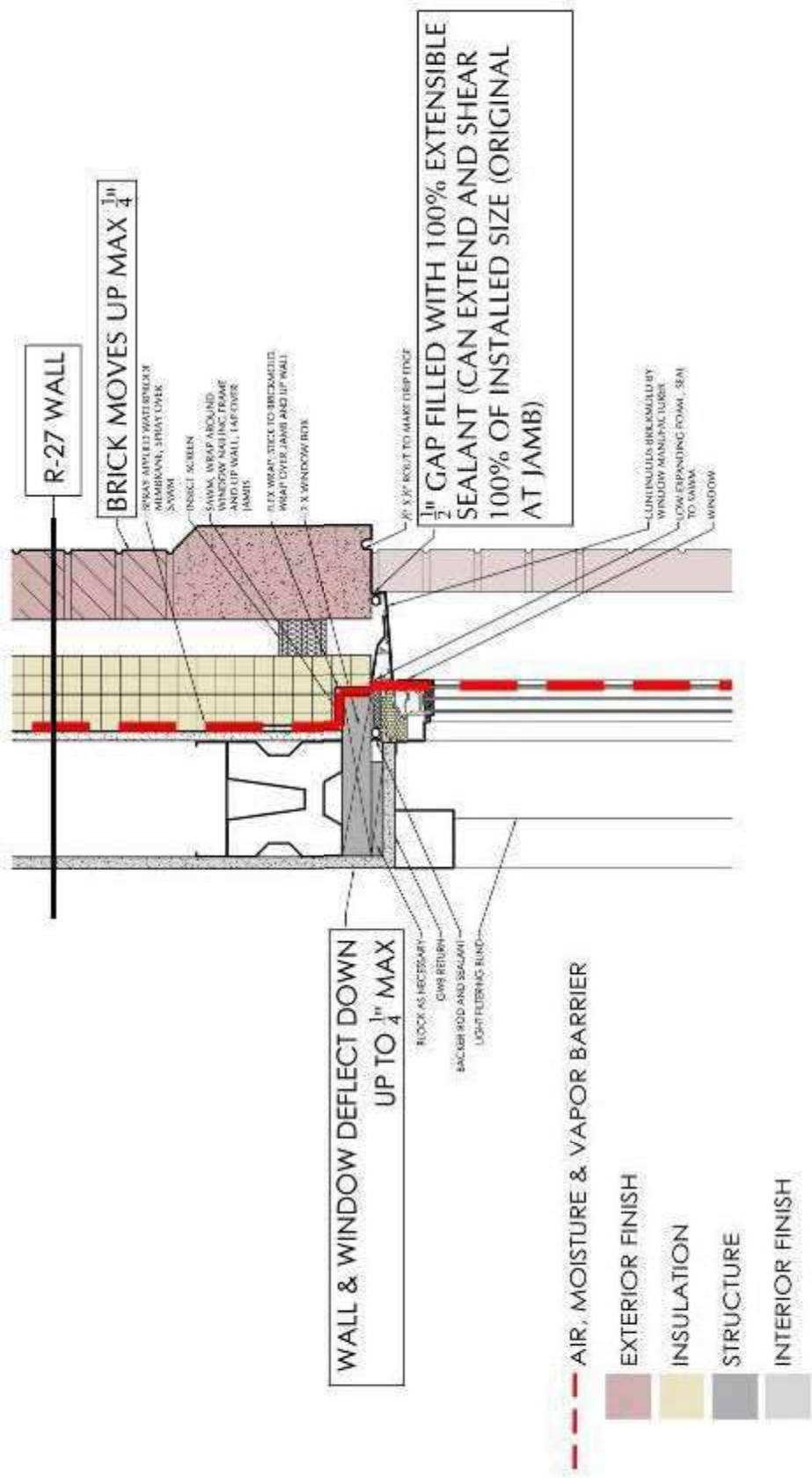


New Building Envelope

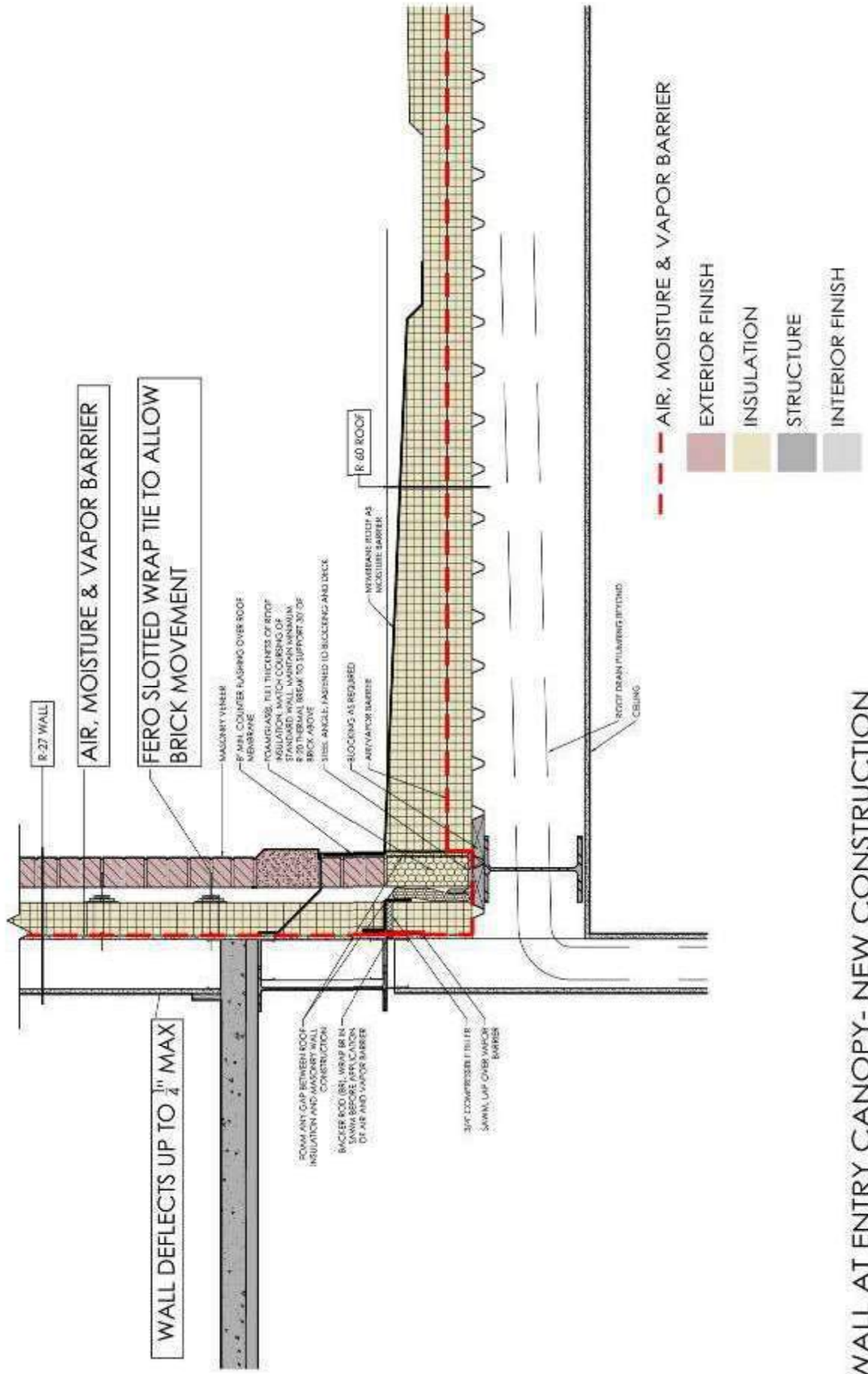
Floor slab details

-  VAPOR BARRIER
-  AIR, MOISTURE & VAPOR BARRIER
-  EXTERIOR FINISH
-  INSULATION
-  STRUCTURE
-  INTERIOR FINISH





2: WINDOW HEAD- NEW CONSTRUCTION



WALL AT ENTRY CANOPY- NEW CONSTRUCTION

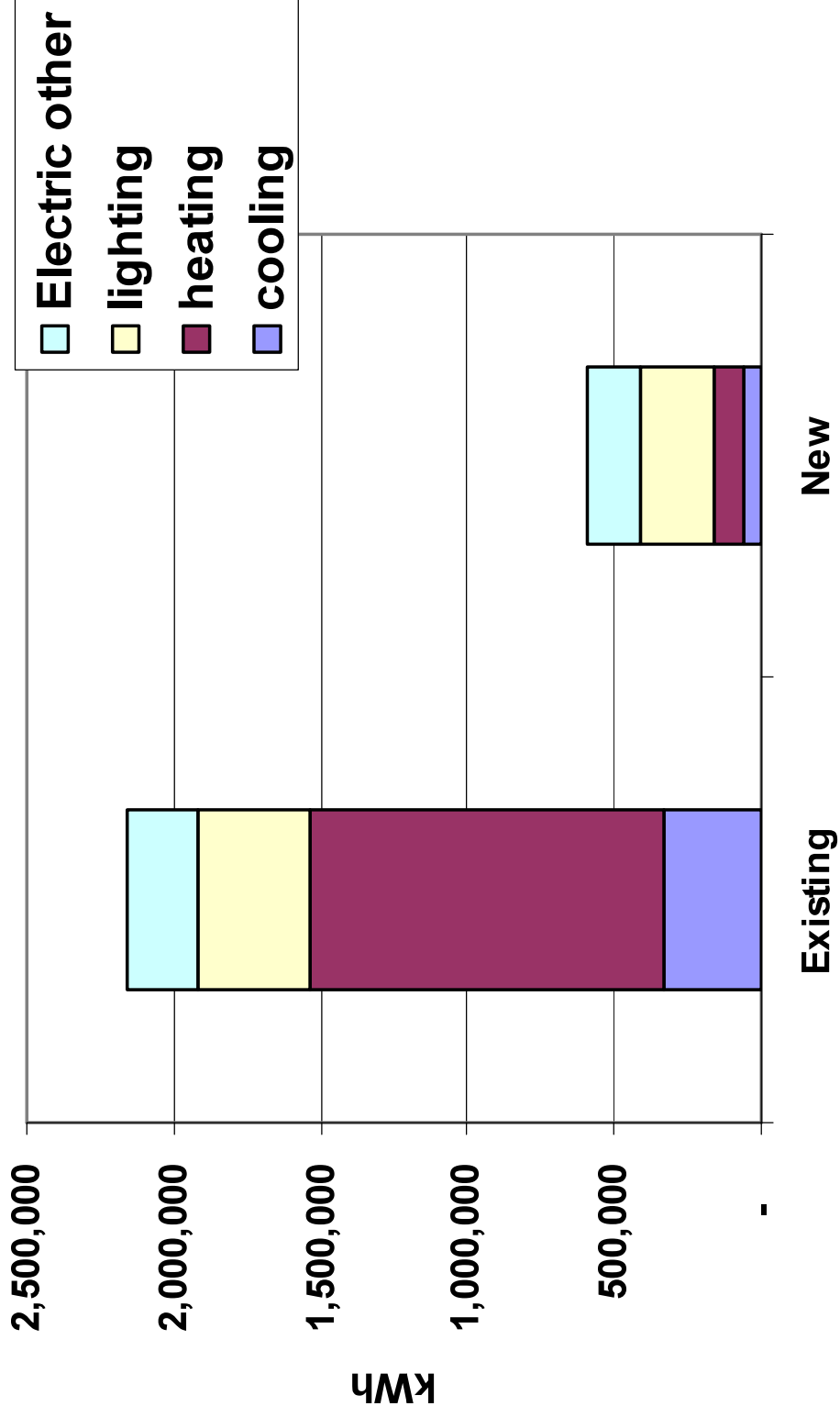
Progress Testing and Visual Inspection

- Hard hats off to Zoltan Horvath, clerk of the works! & Jon Haehnel, Zero by Degrees!



Bennington Court and Offices

Actual Existing and Modeled Proposed



TOTAL ENERGY USE ALL SOURCES, existing building fossil fuel converted to kWh
 Note: disaggregation of existing electric use very approximate

Building Performance

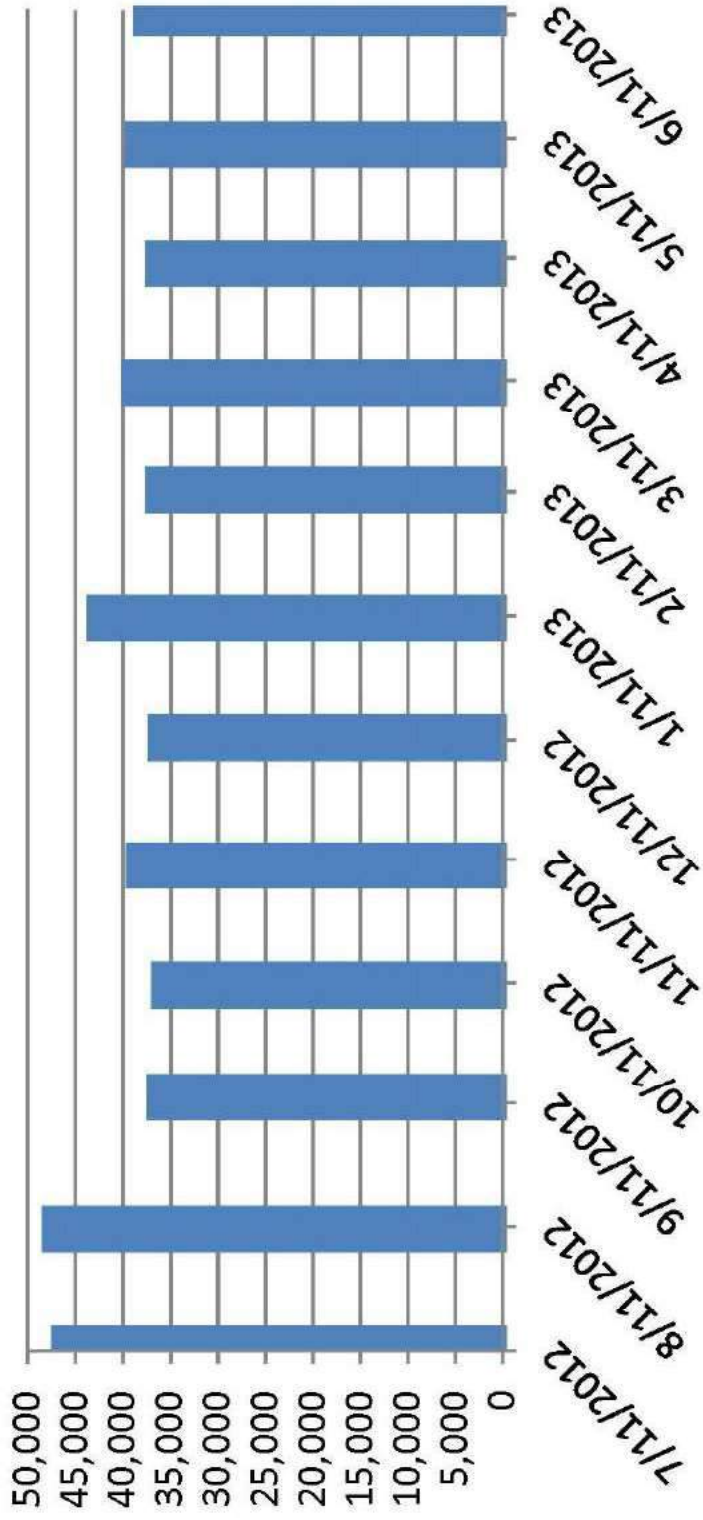
July 2012-June 2013 = 459,052 kWh and 1,084 gallons of propane

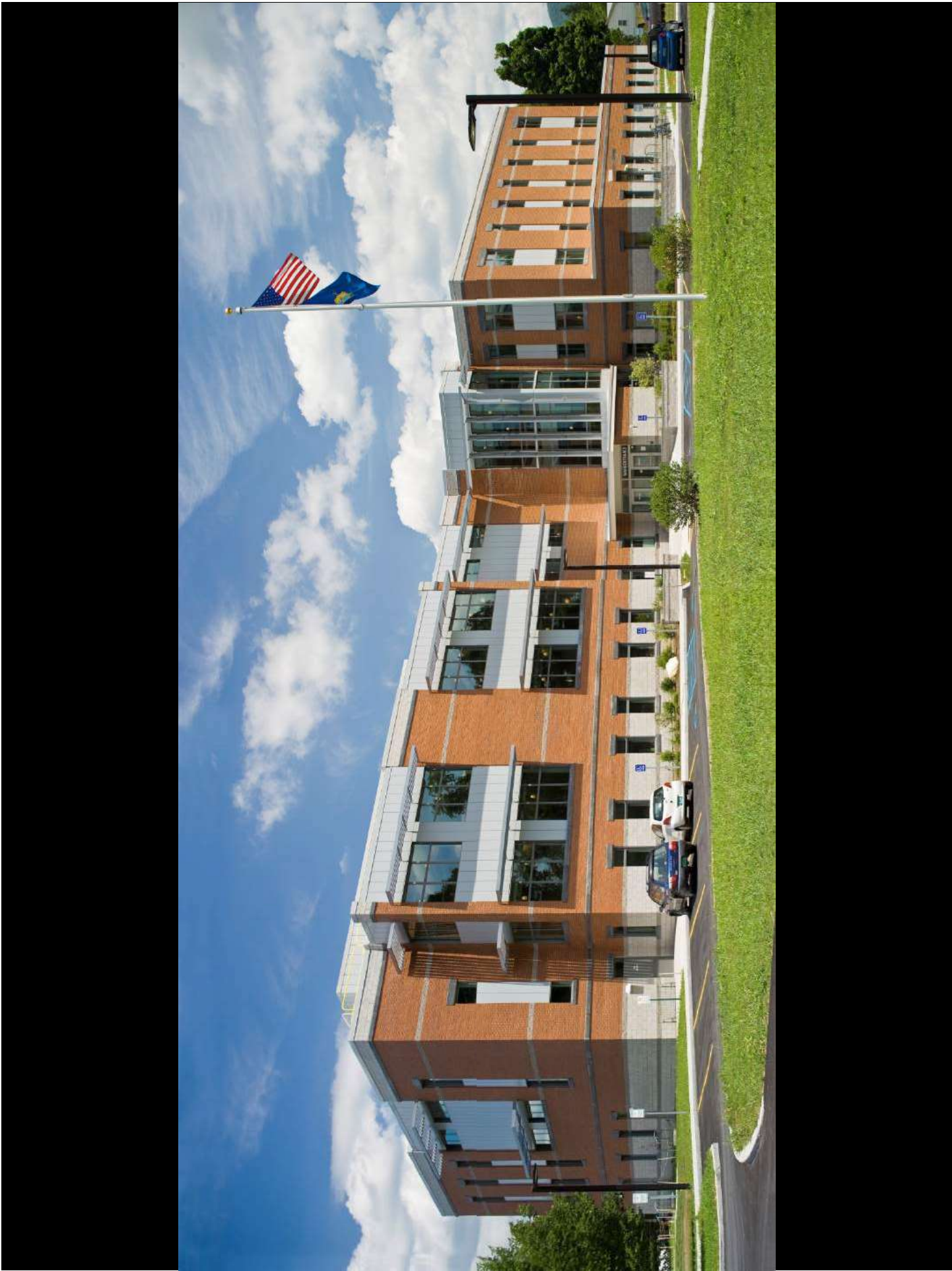
if all electric: 488,113 kWh per year

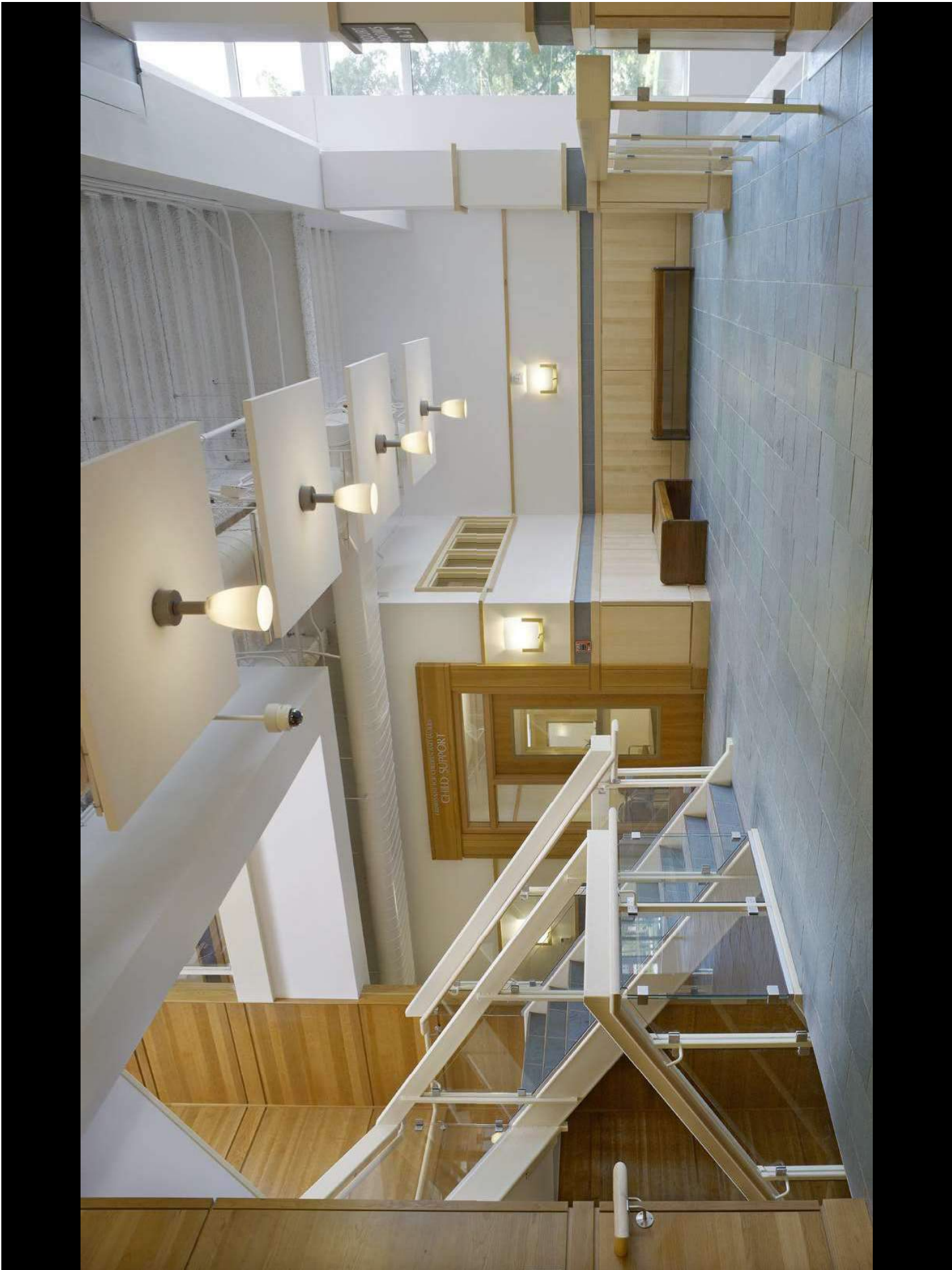
Total = 1,664,715 kBtu/year

EUI = 25.6 kBtu/sf-yr

kWh per month







EUI – Comparison and Metrics

Energy Use Intensity Comparison (kBtu/sf-yr)			
Typical Existing Office	Existing Facility	Code Compliant	Net Zero Ready (actual)
92	113	39	26

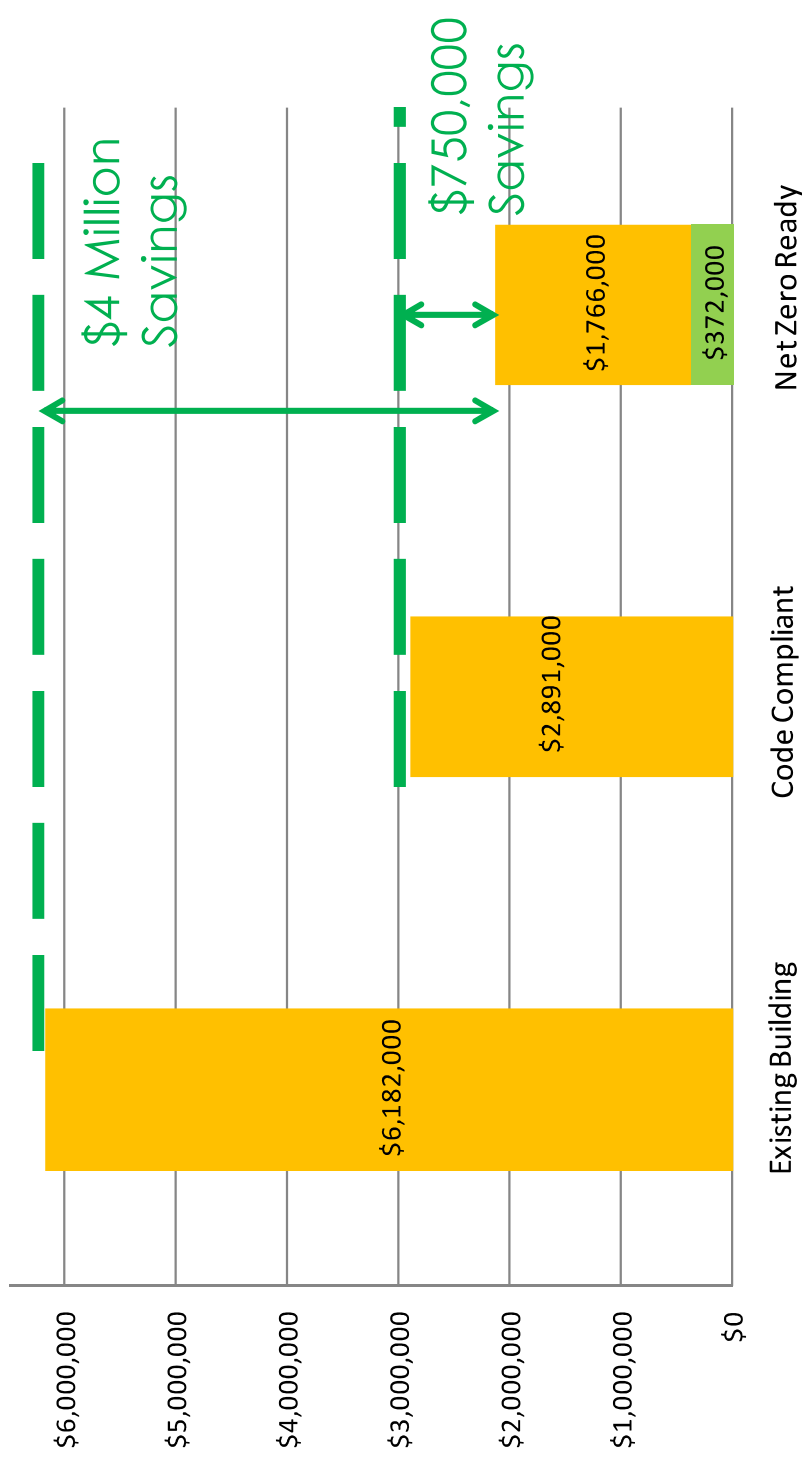
Cost estimate- Total Additional Capital Cost

Building Component	1. Code Compliant Building	2. Net Zero Ready building/GSHP	Added Cost	Added Cost	
Envelope	Windows	Double-glazed windows		\$30,557	
		Vapor barrier only		\$39,000	
	Air/Vapor Barrier	Install 2" of rigid insulation under slabs		\$32,500	\$209,097
		Install 3" of rigid insulation on exterior face of wall framing		\$22,500	
		Insulate seismic joint between new and existing wings to R-9		\$22,500	
		Standard detailing of steel support for exterior sun shades		\$8,000	
		Standard detailing of steel relieving angles for brick veneer		\$14,000	
		6" isocyanurate on the roof		\$40,040	
	Mechanical	Commissioning	Full envelope commissioning & blower door testing	\$27,000	\$163,000
		Solar Hot Water	Solar Hot Water System installed	\$31,000	
HVAC		High-efficiency Ground Source Heat Pump HVAC replacement	\$105,000		
Total Added Cost			\$372,097		
Total Added Cost Per Square Foot			\$5.72		
Total Added Cost As A Percentage Of Total Construction Cost			2.76%		

20-year Present Value

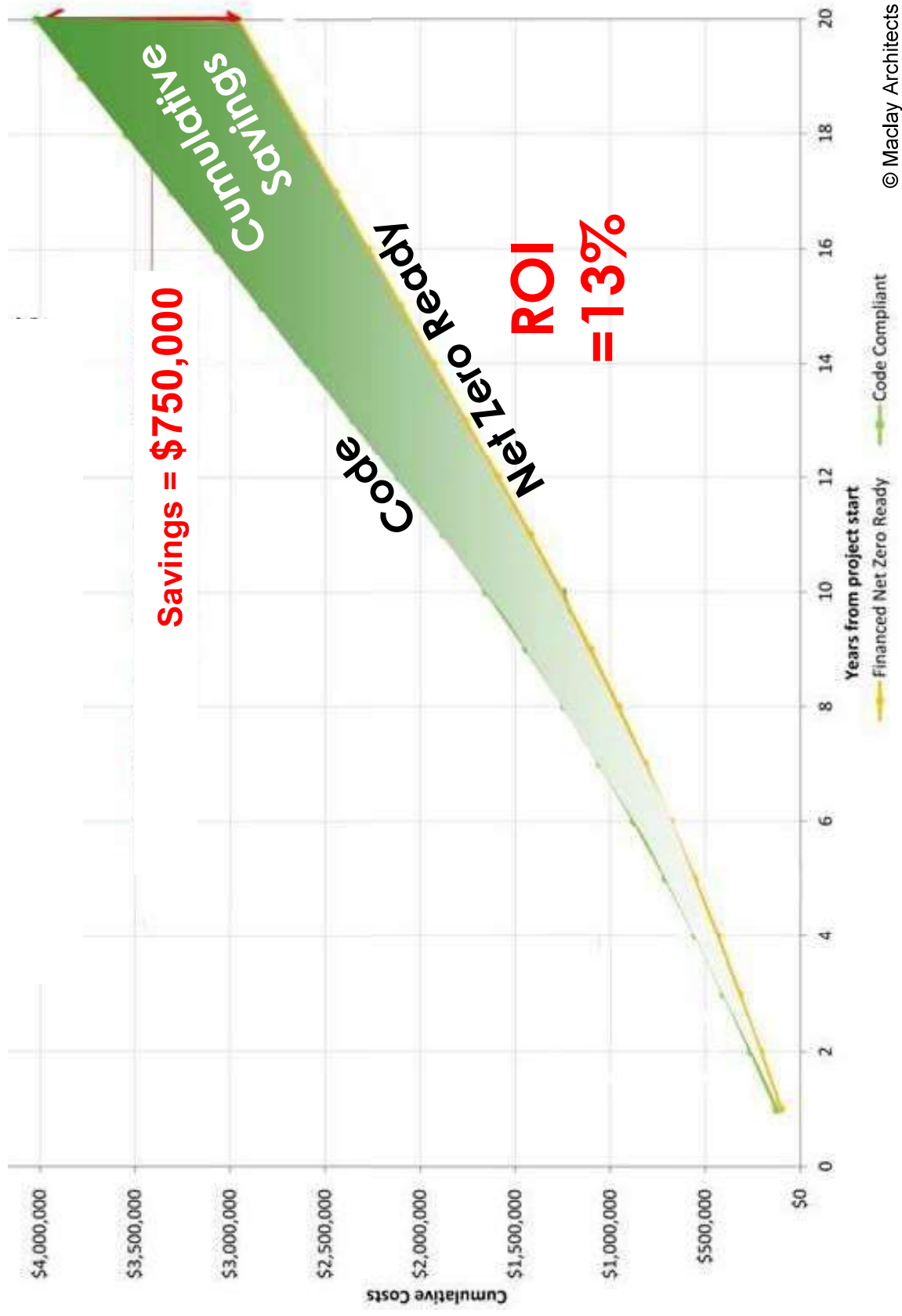
Financial Analysis

20-Year Present Value of Operating and Additional Capital Costs for Energy Improvements



■ Additional Construction Cost ■ NPV of Operating Costs

Cumulative Savings of Net Zero Ready vs Code



Paradigm Shift



**CASH
FLOW**

PAYBACK

