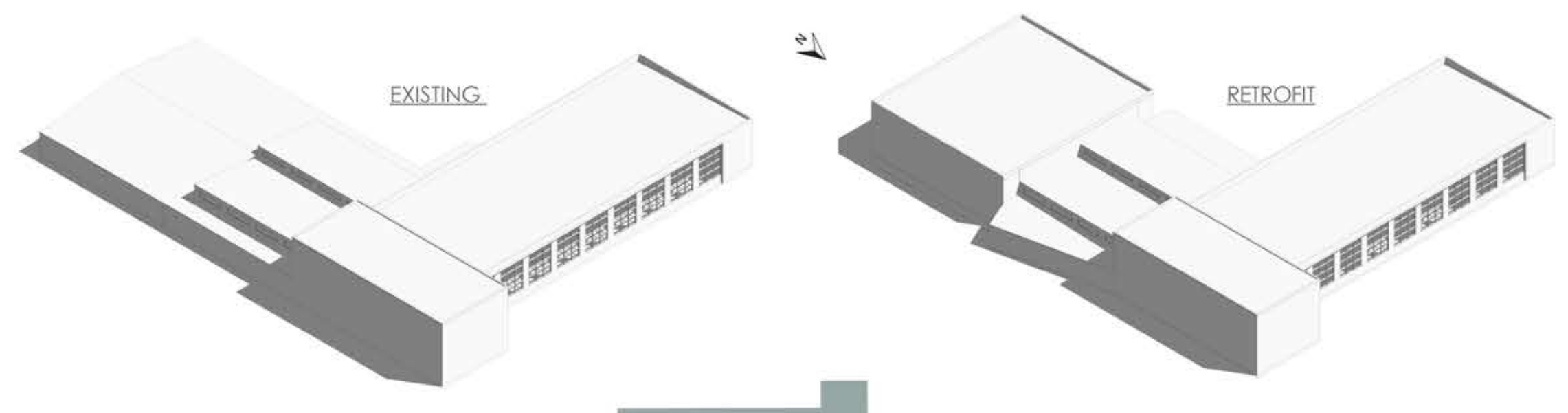


EXISTING RETROFIT FOR ENHANCED PERFORMANCE



Hacker is renovating Cruess Hall on the University of California, Davis campus. It is a 22,000 sf structure built in 1959. Over the years it has had many uses included being a meat processing plant and is to become a multi-use space which will include an auditorium and wood shop to name a few.

UC DAVIS CRUESS HALL ENVELOPE ANALYSIS



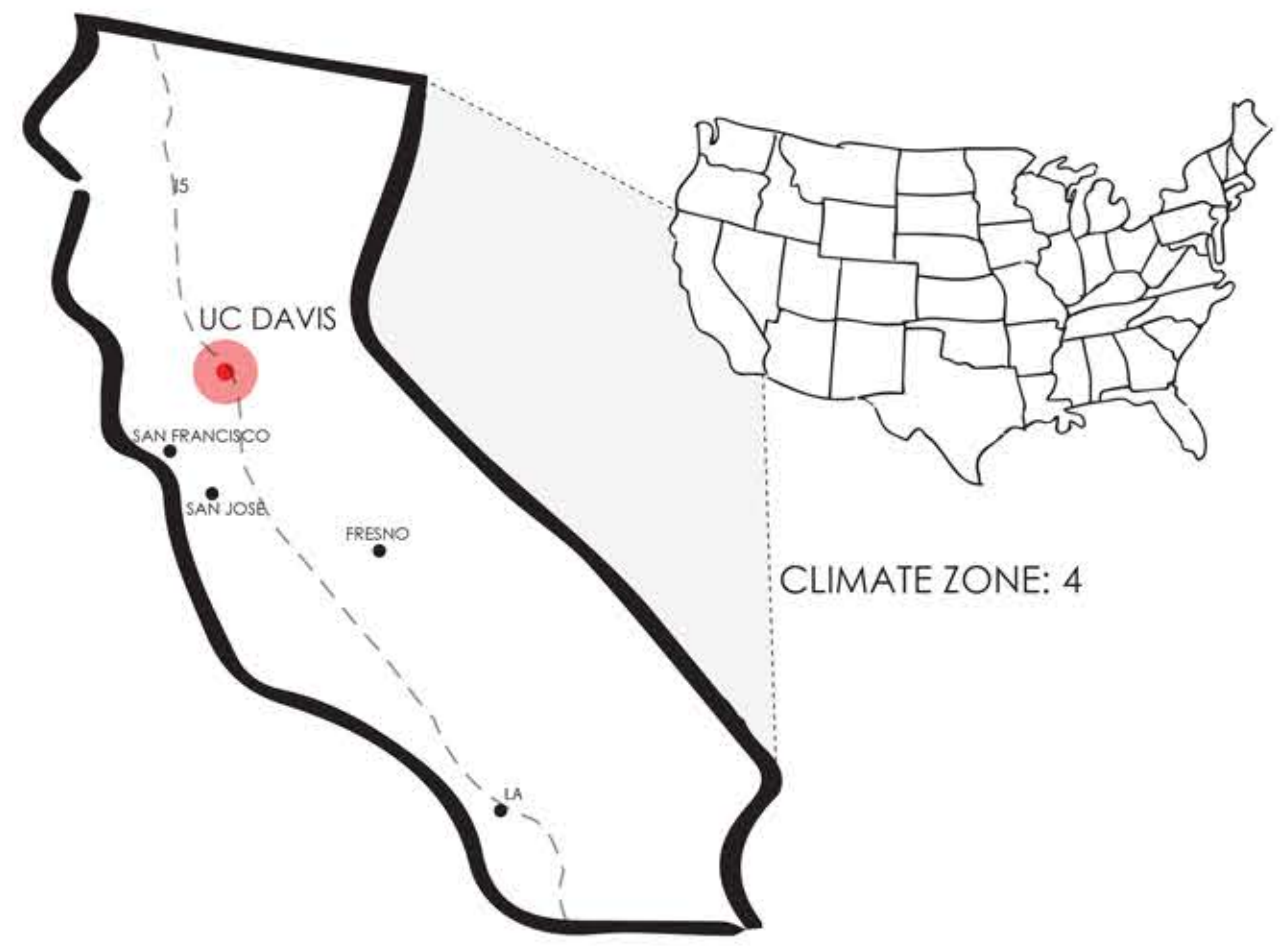
FACADE GLAZING:

- North Elevation = 49%
- East Elevation = 5.5%
- South Elevation = 7%
- West Elevation = 0%
- No skylights or roof glazing

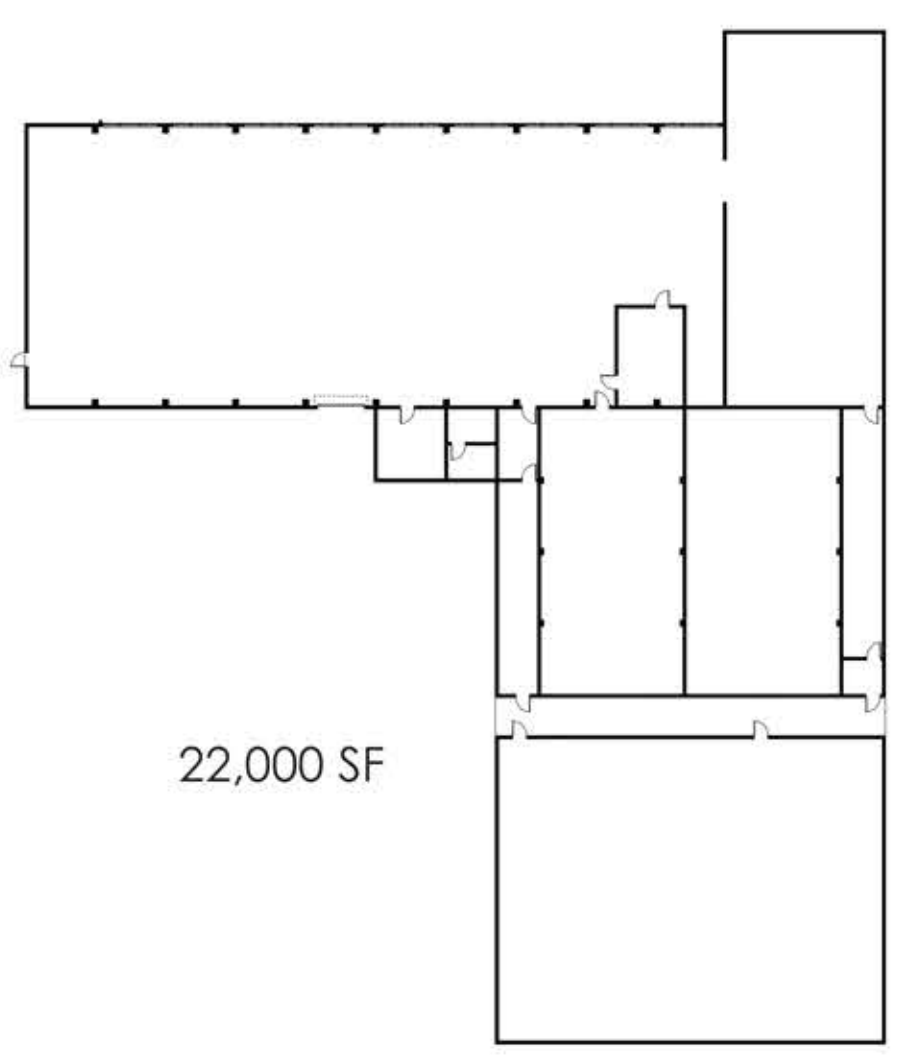
OCCUPANCY:

Occupied 9 months out of the year. With full 100% occupancy during weekdays from 8am-5pm and 50% occupancy from 5pm-9pm to account for night classes. On weekends light occupancy ranging from 10-25% is assumed for shop use.

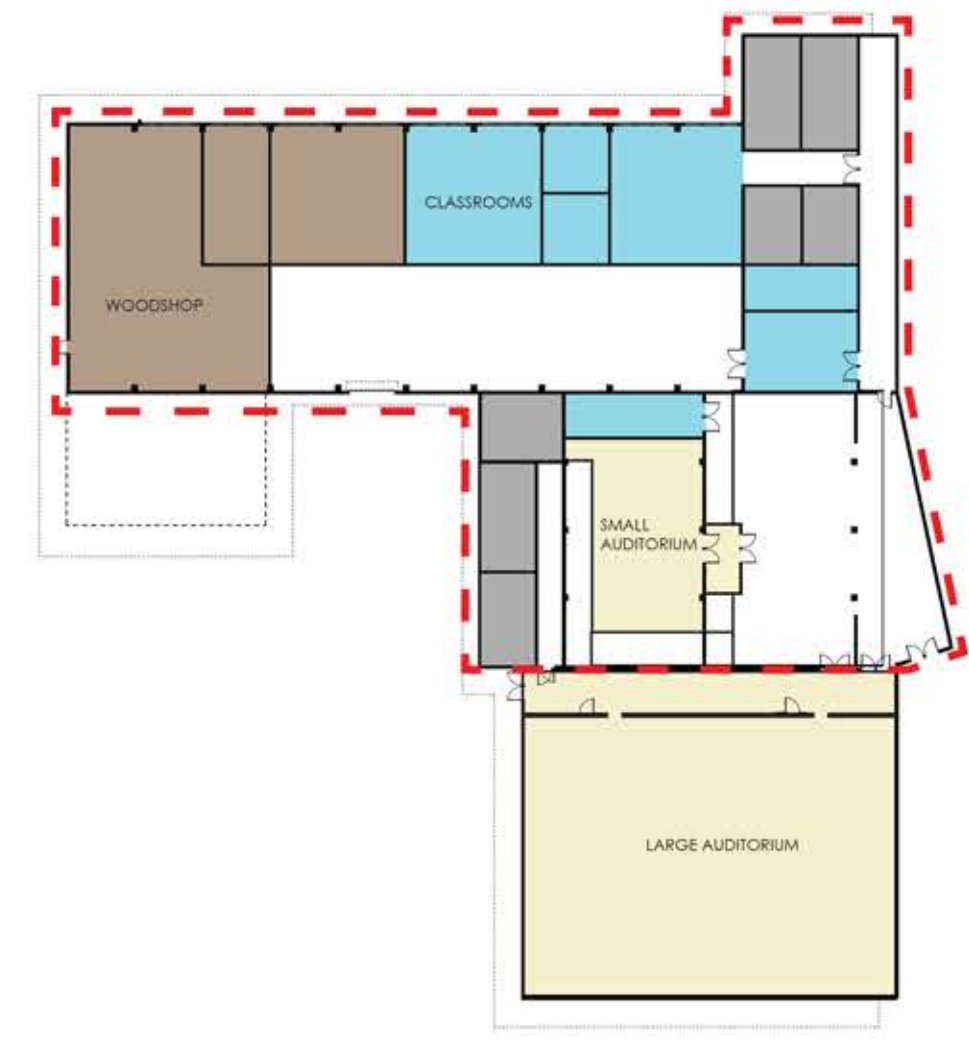
LOCATION: CALIFORNIA



EXISTING CONDITIONS:



RETROFIT WITH NEW CONSTRUCTION:



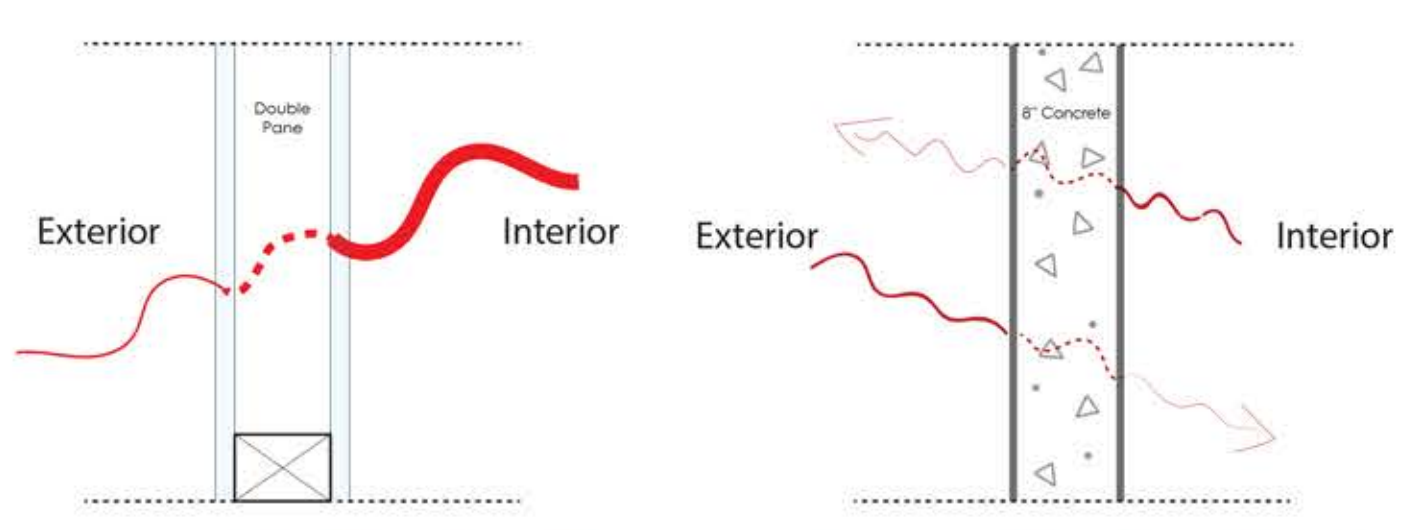
TESTING RETROFIT OPTIONS

| Category | Option 1 | Option 2 | Option 3 | Option 4 |
|-----------------------------------|---------------|---------------|---------------|---------------|
| WALL INSULATION | R4 55 EUI | R11 52 EUI | R24 50 EUI | R38 50 EUI |
| ROOF INSULATION | R9 49 EUI | R22 43 EUI | R37 41 EUI | |
| WINDOW GLAZING | 56 EUI | 55 EUI | 55 EUI | |
| OPTIMAL PERFORMANCE BUNDLE | 36 EUI | | | |
| BEST VALUE | 38 EUI | | | |

WHAT IS BEING MEASURED?

$$EUI = \frac{\text{Energy Use}}{\text{Intensity}} \text{ sf/yr}$$

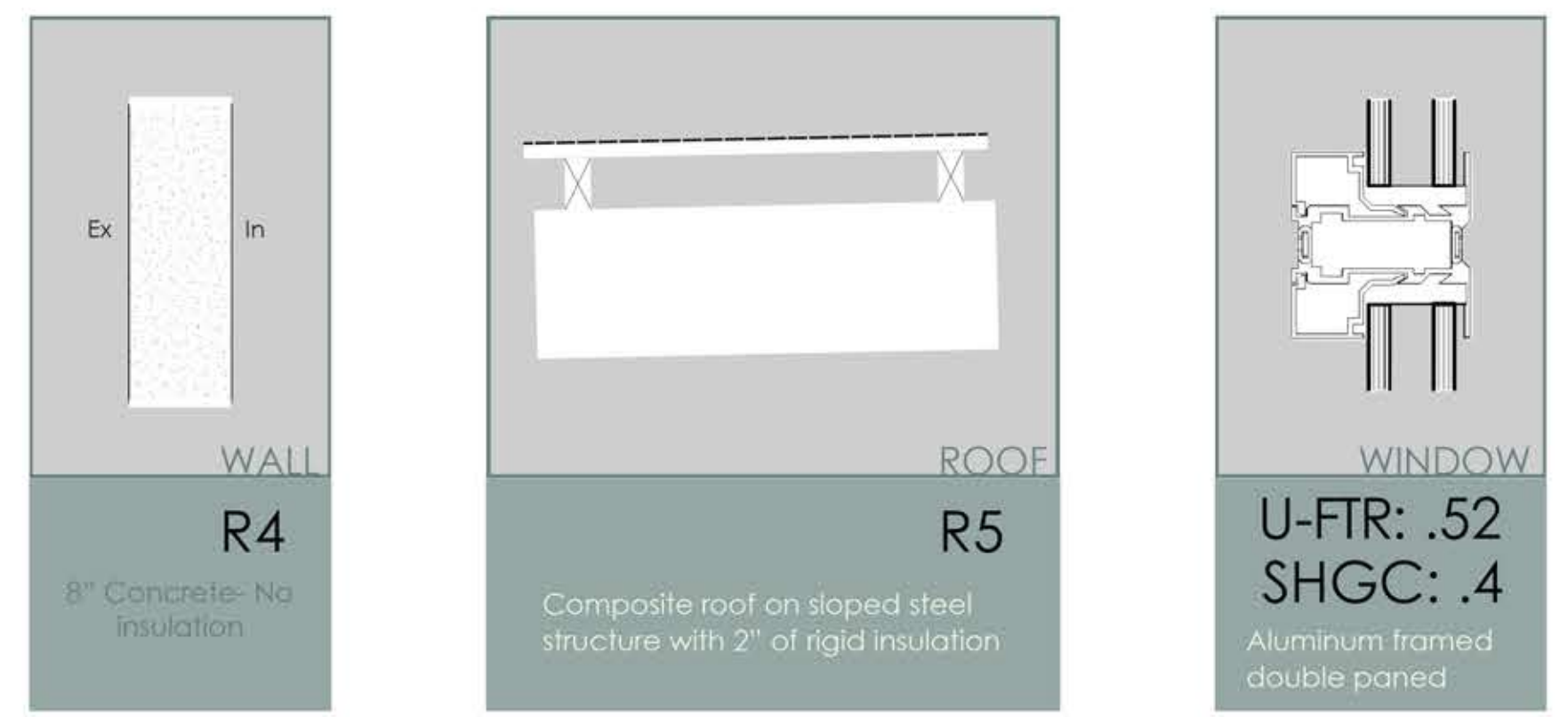
$$\text{ANNUAL ENERGY USE} \div \text{TOTAL SF} = \text{EUI}$$



$$U_{\text{Value}} = \frac{H E A T}{L O S S}$$

$$R_{\text{Value}} = \frac{H E A T}{R E S I S T A N C E}$$

EXISTING ASSEMBLY



Annual Energy Consumption: 1,171,069 kBtu
EUI: 56

OPTIMAL ASSEMBLY



Annual Energy Consumption: 948,598 kBtu
EUI: 36