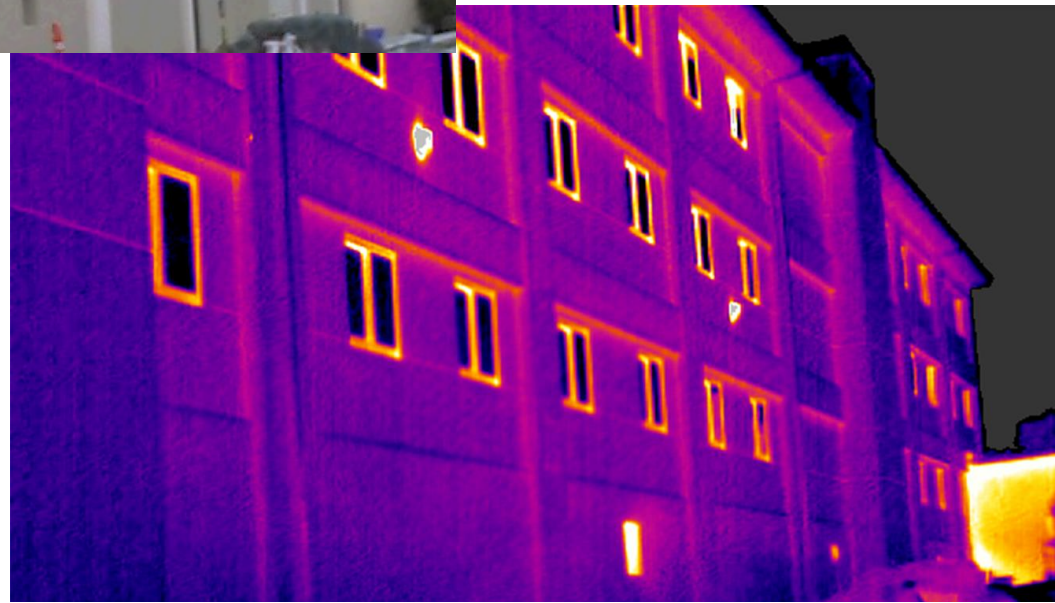


Barracks 630: A Deep Energy Retrofit Case Study at the Presidio of Monterey



59.7 °F

59.0

58.1

57.2

56.3

55.4

54.5

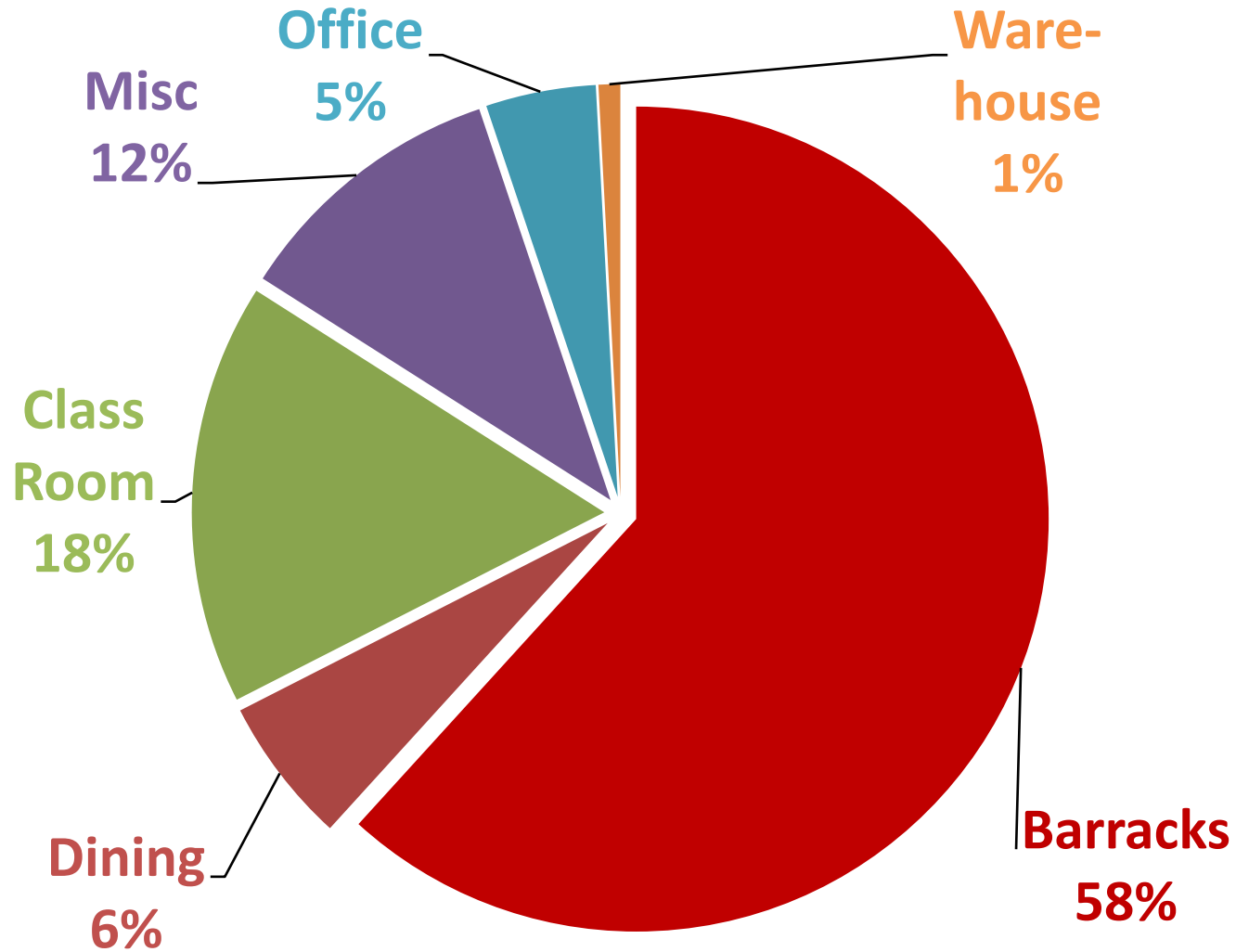
US Army Garrison, Presidio of Monterey



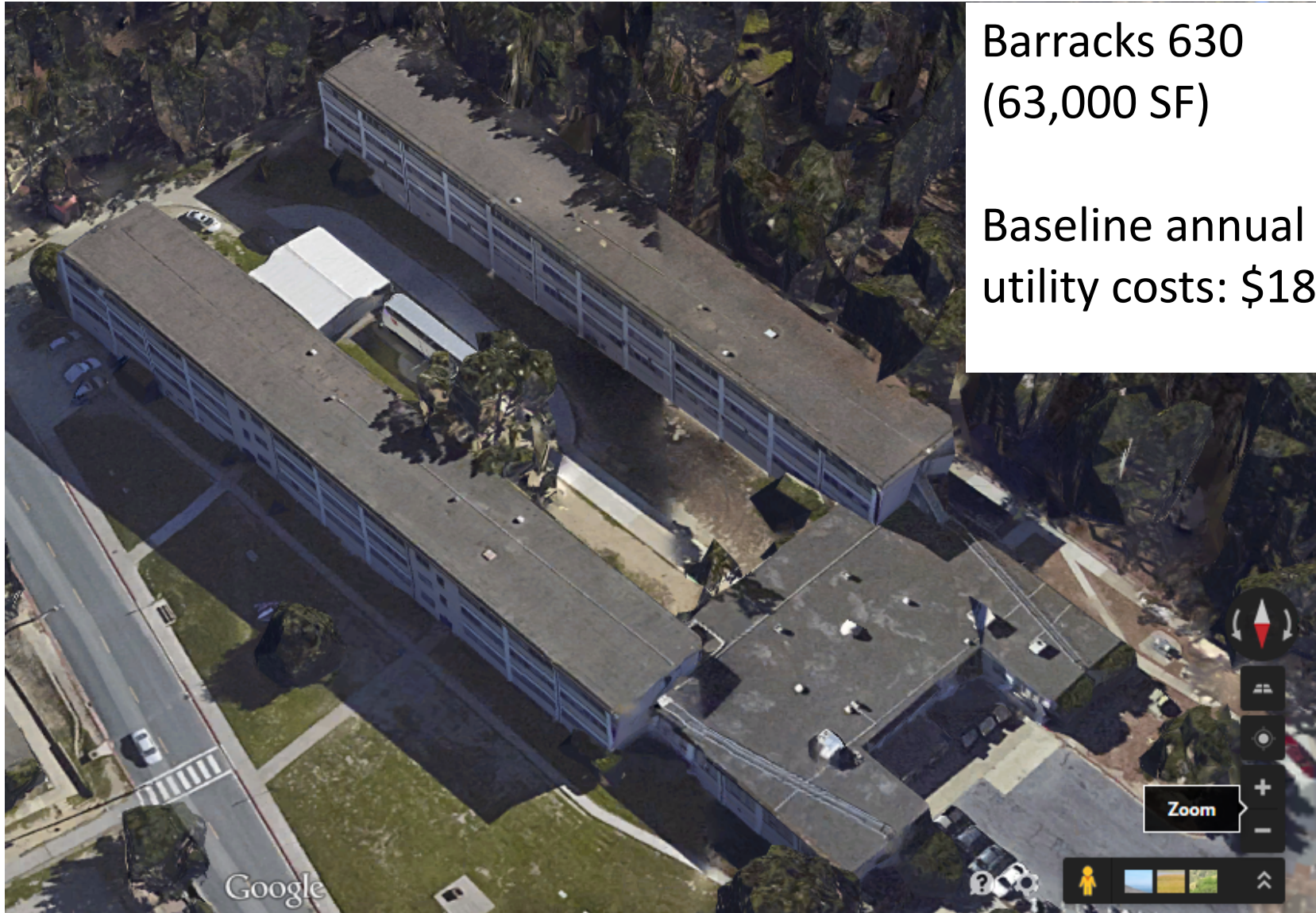
Barracks Natural Gas Energy Usage

Our barracks are significant energy users.

32% of our square footage but 58% of our gas usage



Barracks 630



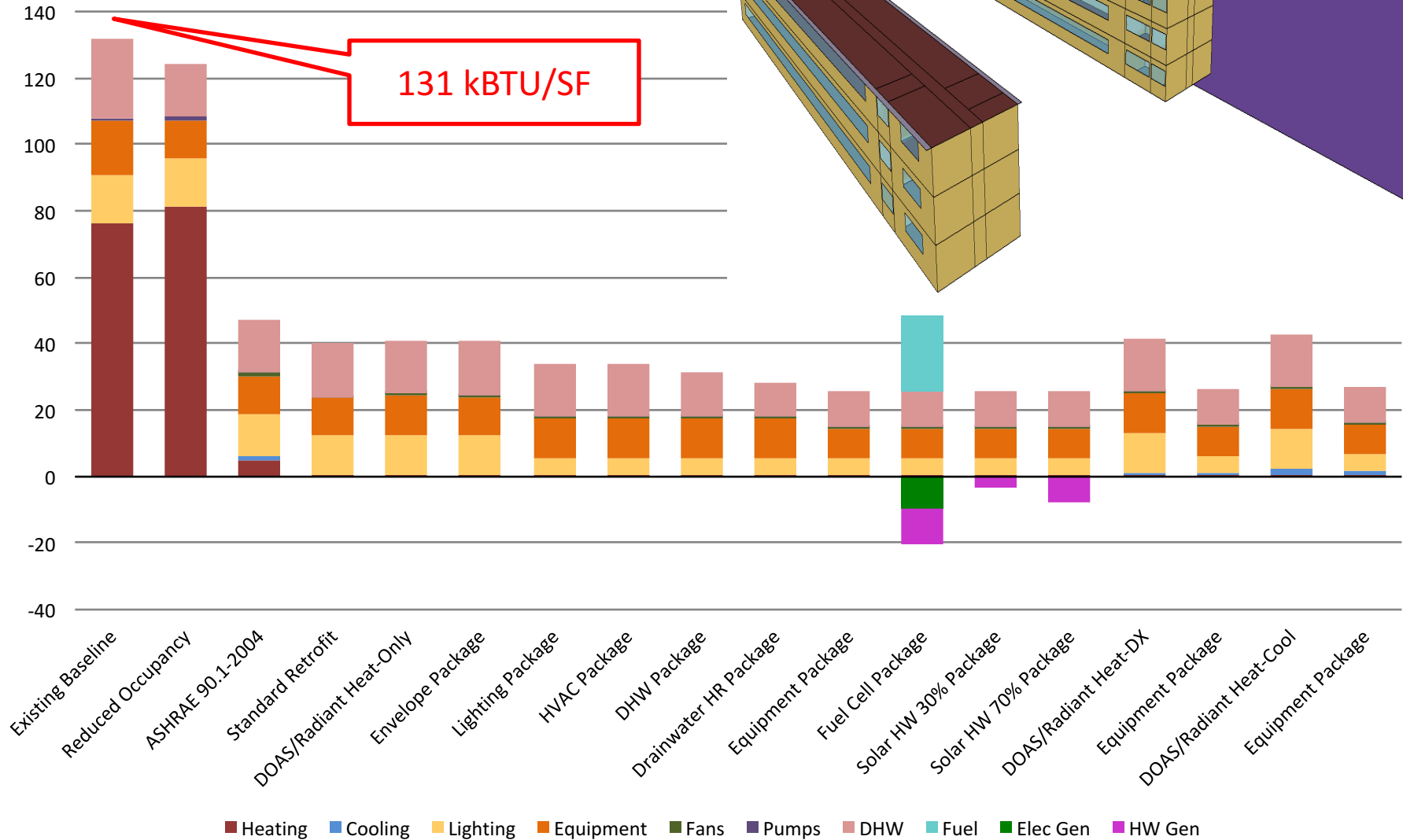
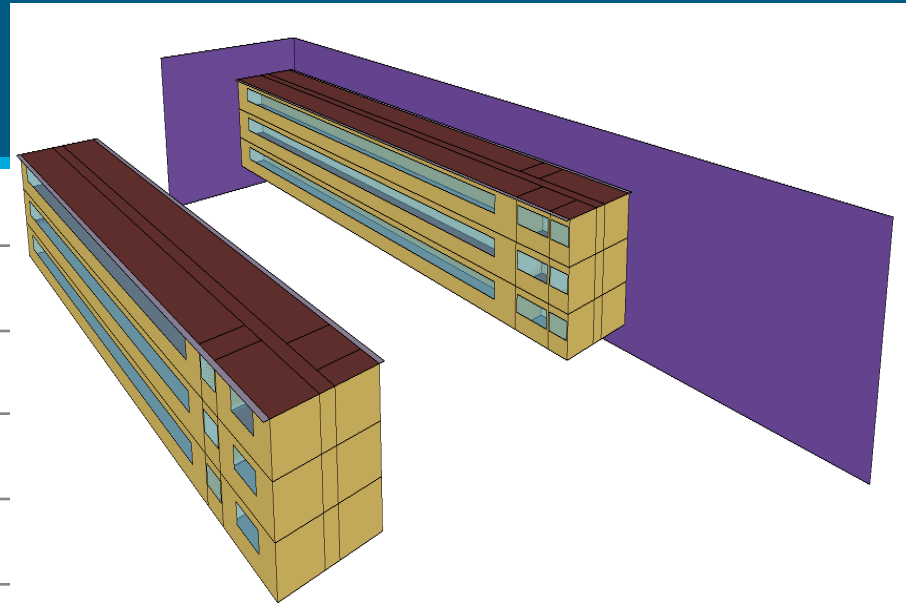
Barracks 630
(63,000 SF)

Baseline annual
utility costs: \$180k

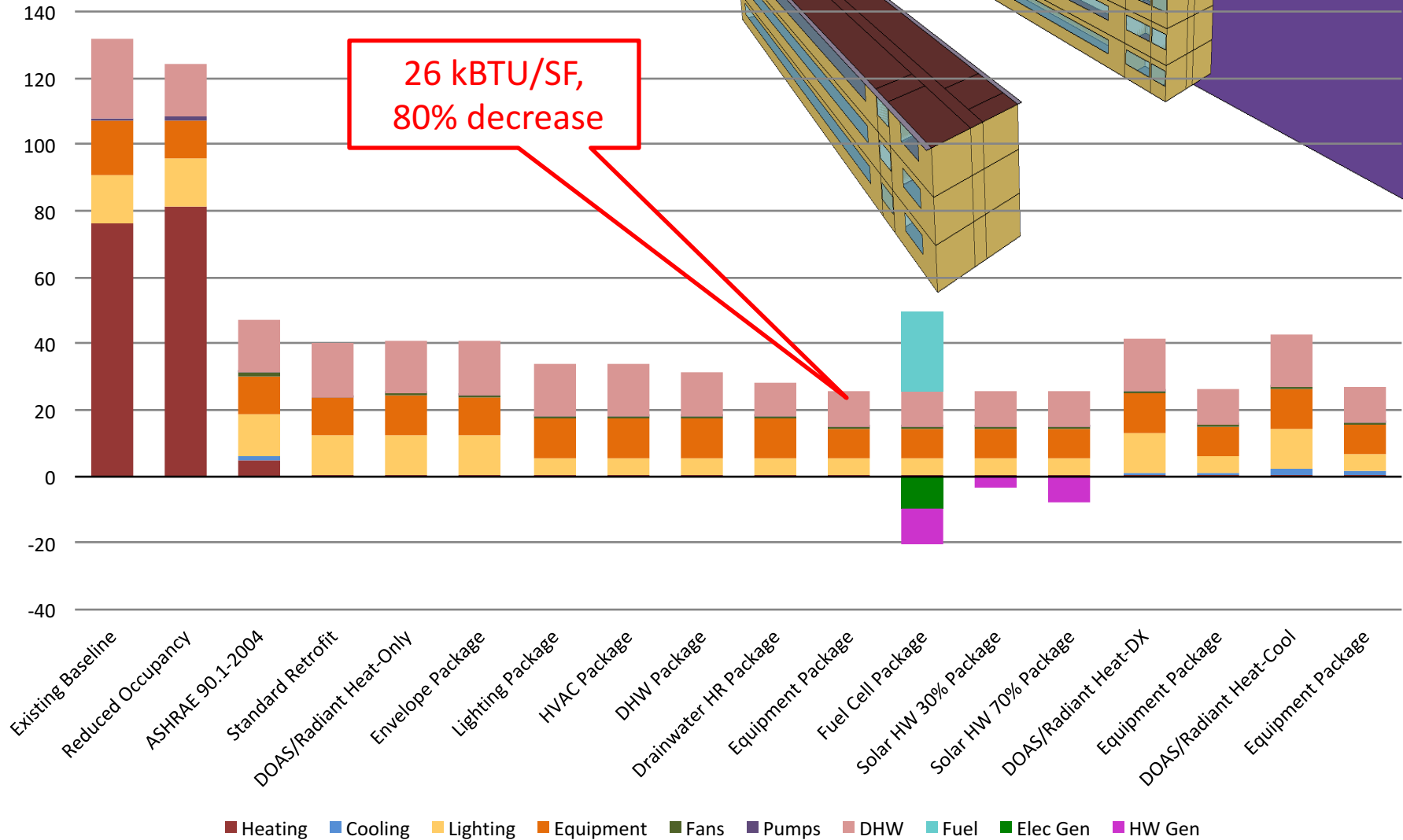
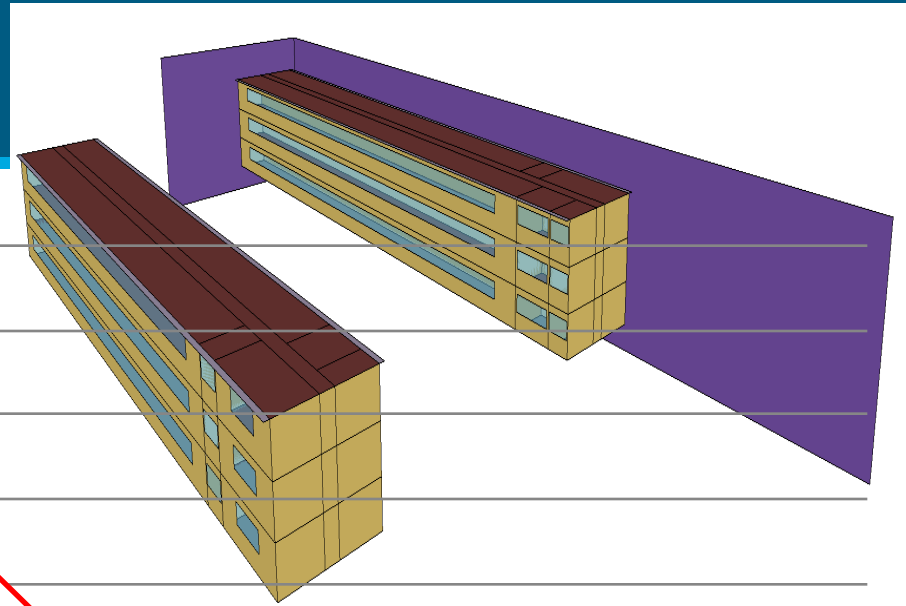
630 Barracks



Energy Modeling (Site Energy)



Energy Modeling (Site Energy)



How do you reduce EUI by 80%?

- Continuous air and thermal barriers
- Dedicated outside air w/ heat recovery wheel
- Low-temperature radiant heating
- High efficiency boilers
- Heat recovery on drain lines

- Solar Thermal for 70% of domestic load
- Grey-water harvesting and re-use

630 Barracks - Rendering



630 Barracks – 90% complete



Haz-Mat and interior demo



Exterior framing and sheathing



Exterior vapor barrier



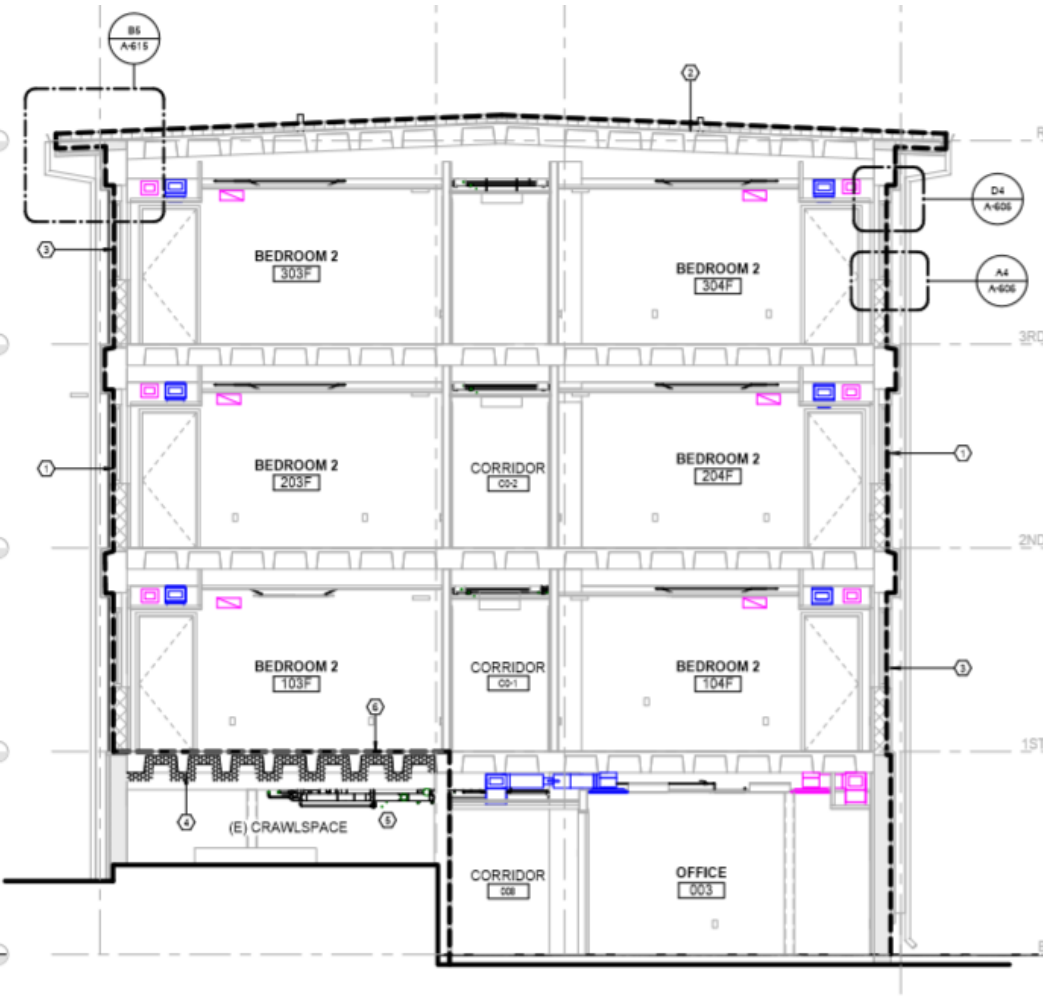
Exterior insulation and plaster



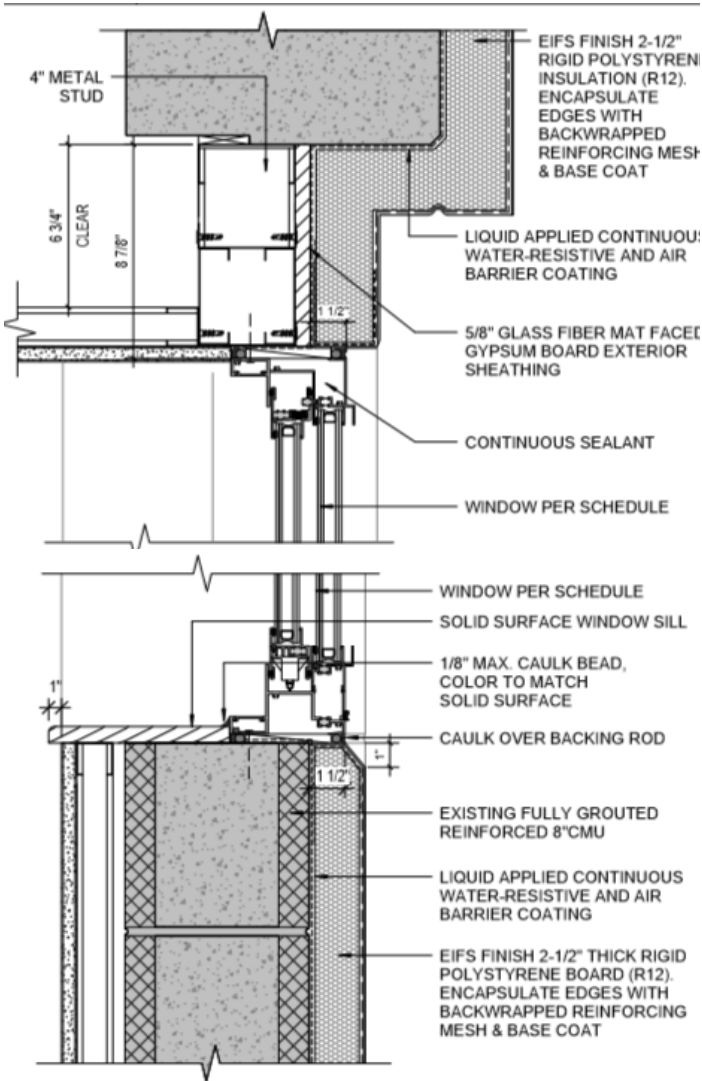
Finish coat of plaster



Thermal Barrier



B4
A-701
AIR BARRIER SECTION - WING A
1/4" = 1'-0"



Air Barrier and Continuous Insulation



Labor intensive process for exterior insulation



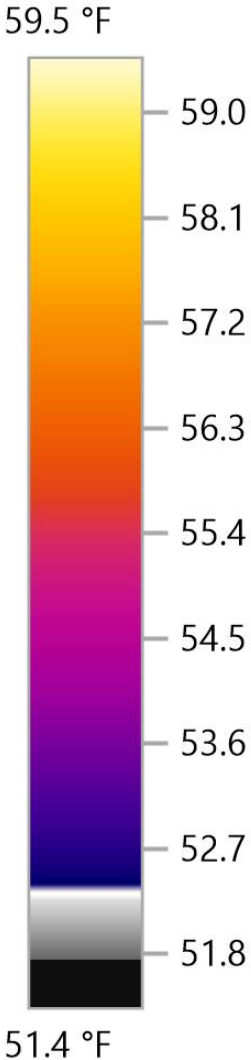
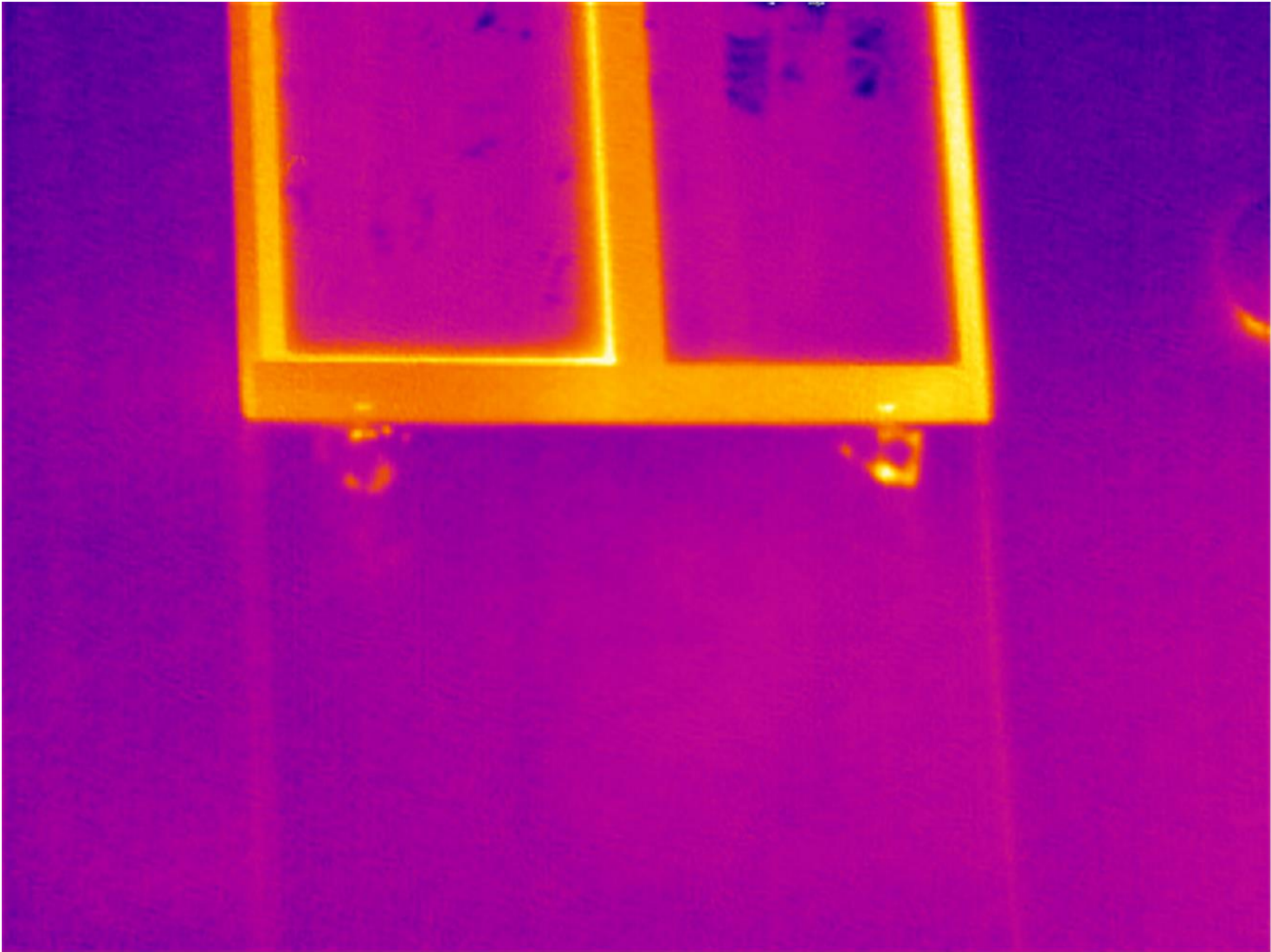
Rasping of exterior insulation



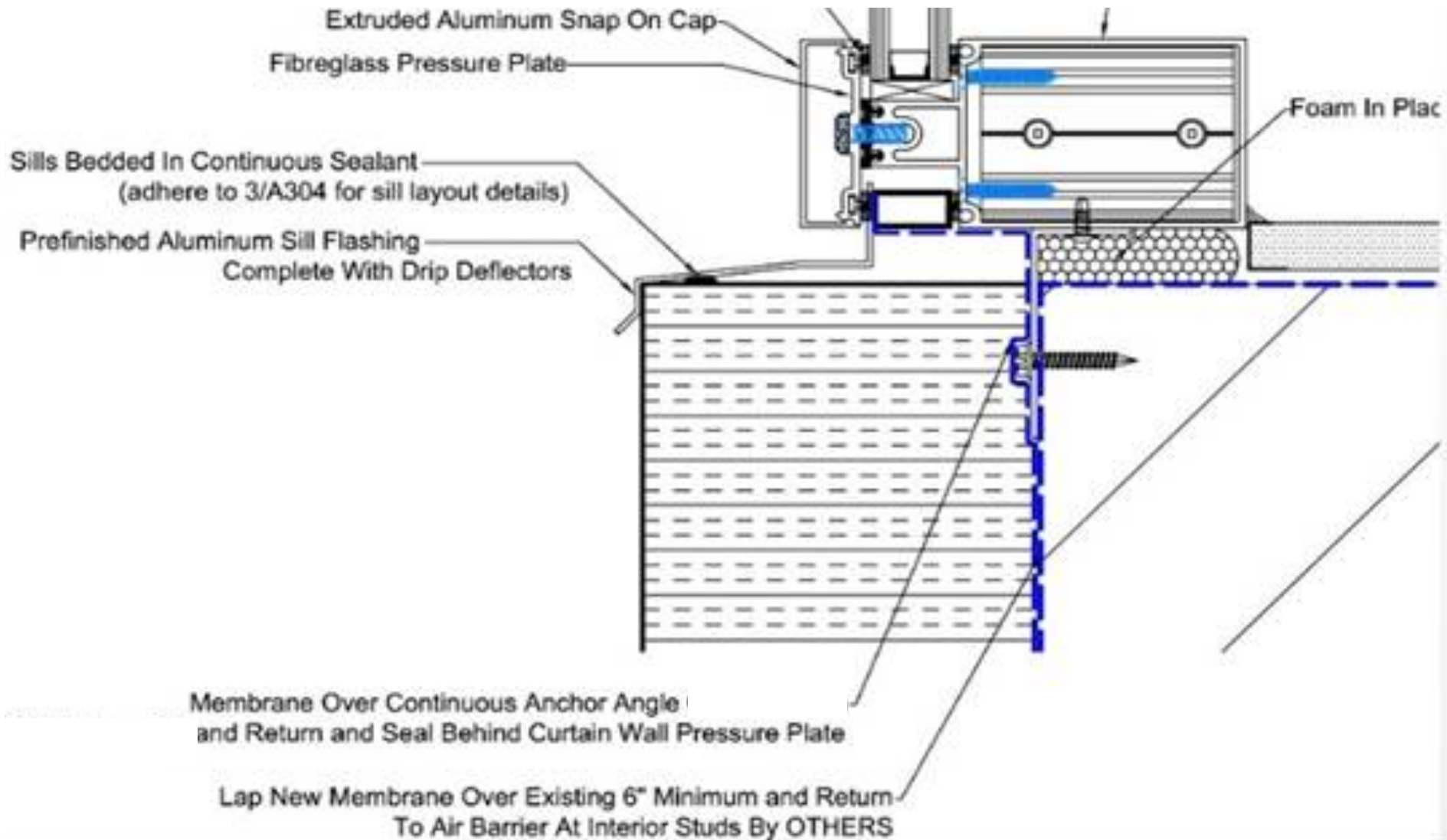
Under-floor insulation in crawlspace



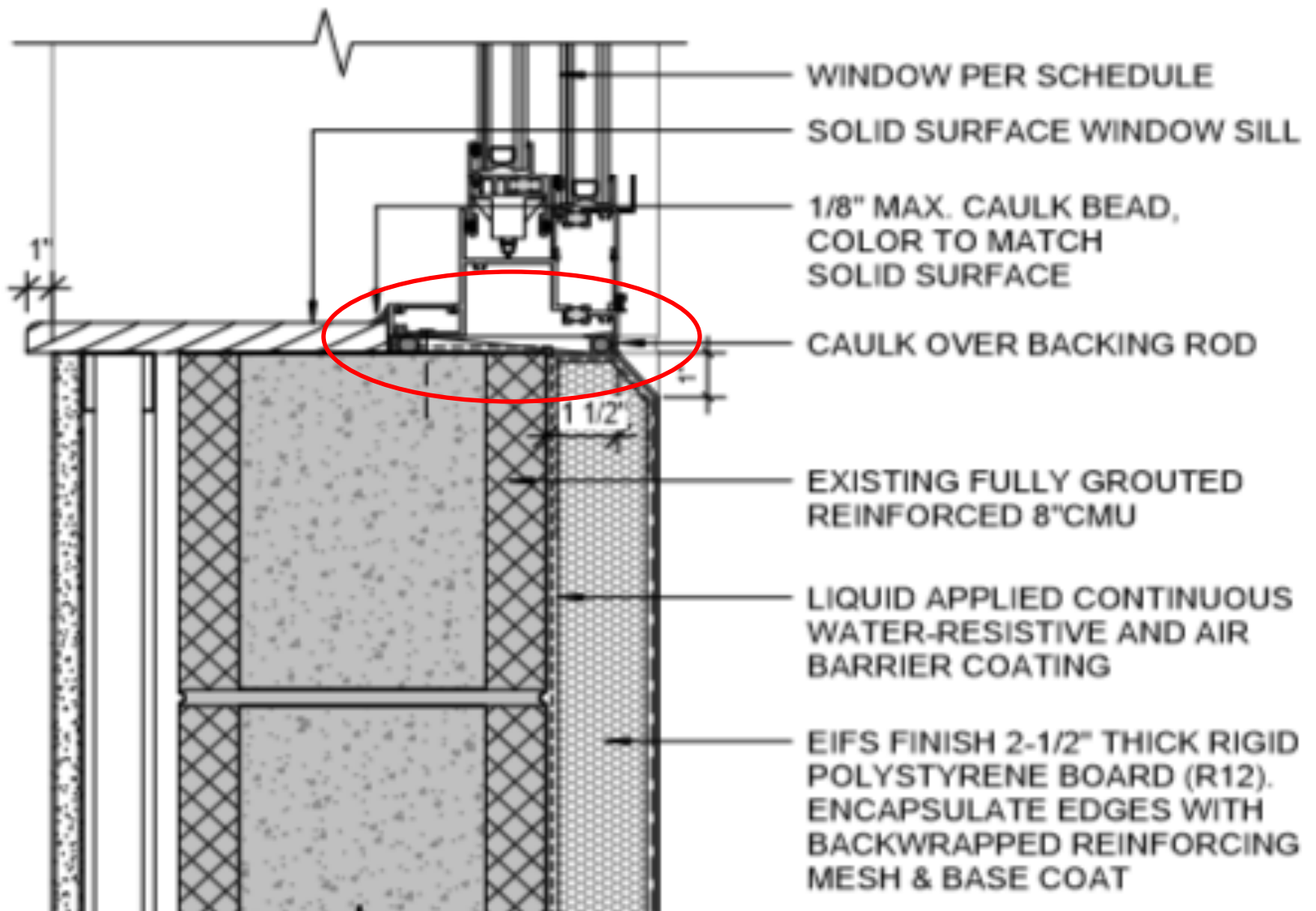
Windows



This is what we wanted...



This is what we got.



Window Mock-up



1/4" gap around window



Backer rod in gap



Caulk serves as our air barrier



Construction QA – Air Leakage Testing



**US Army Corps
of Engineers**_®
Engineer Research and
Development Center

air barrier
abaa
association of
america

U.S. Army Corps of Engineers Air Leakage Test Protocol for Building Envelopes

Version 3 - May 11, 2012

Air Leakage Test



Air Leakage Test Results

	Required	Combined Average	Pass/ Fail
Actual Leakage (CFM) @75 Pa	< 11,578 CFM		Pass
Actual Leakage Rate / SqFt (CFM/SqFt) @75 Pa	.15 CFM /SqFt	.092 CFM / SqFt	Pass
Effective Leakage Area (SqFt)		5.4 SqFt	
Pressure Exponent (n)	.45 < n < .8	0.68	Pass
Air Leakage Coefficient (CFM/Pa*n)		386.3	
Squared Correlation Coefficient	R² > .98	0.9982	Pass



Resulted in down-sized Mechanical Systems

Five 1,000,000 BTUH Boilers



Two 500,000 BTUH Boilers

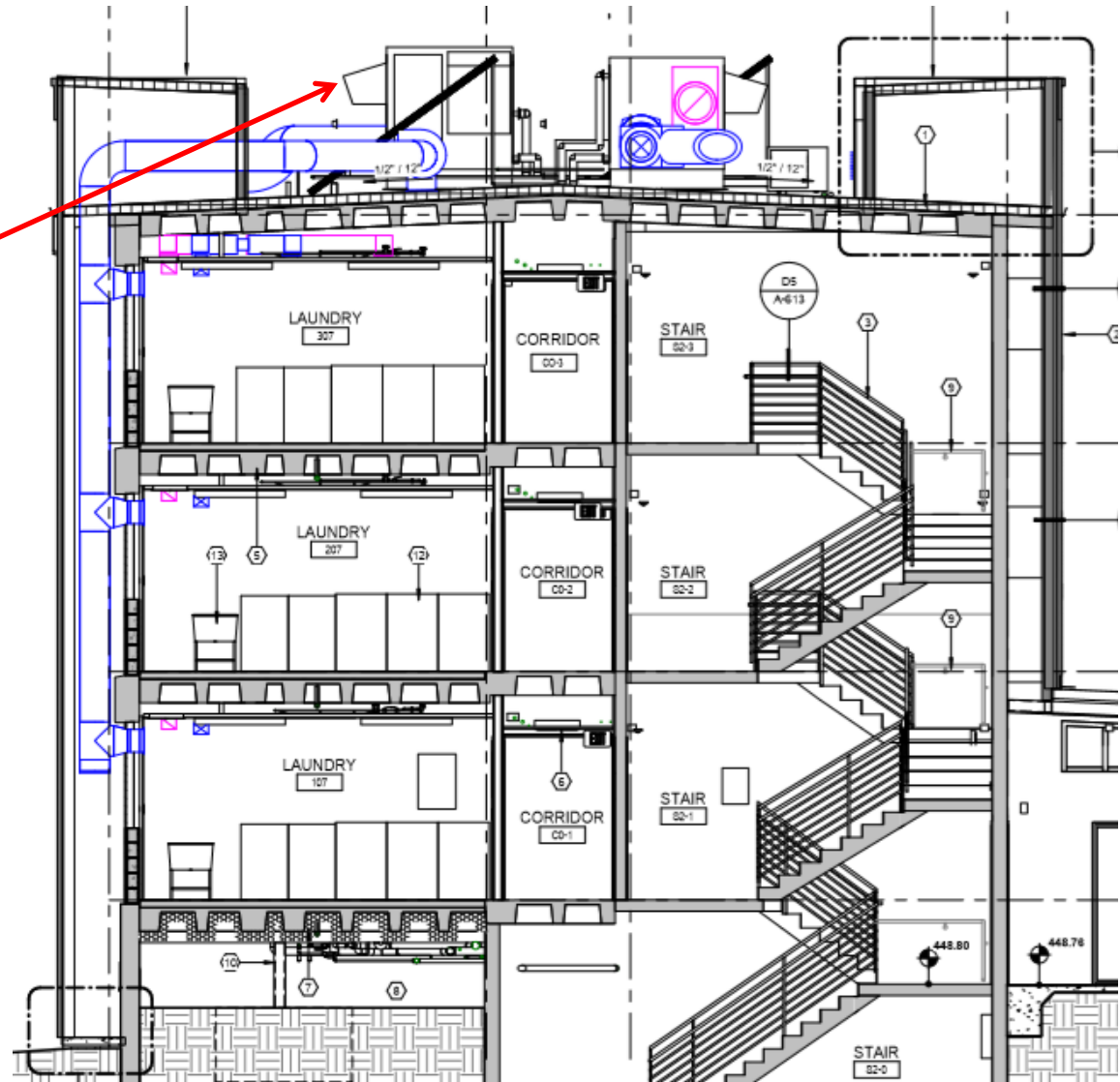


Mechanical Systems

Dedicated Outdoor Air System (DOAS) on roof

Exterior ducting inside insulated chases

Radiant Heat Ceiling Panels

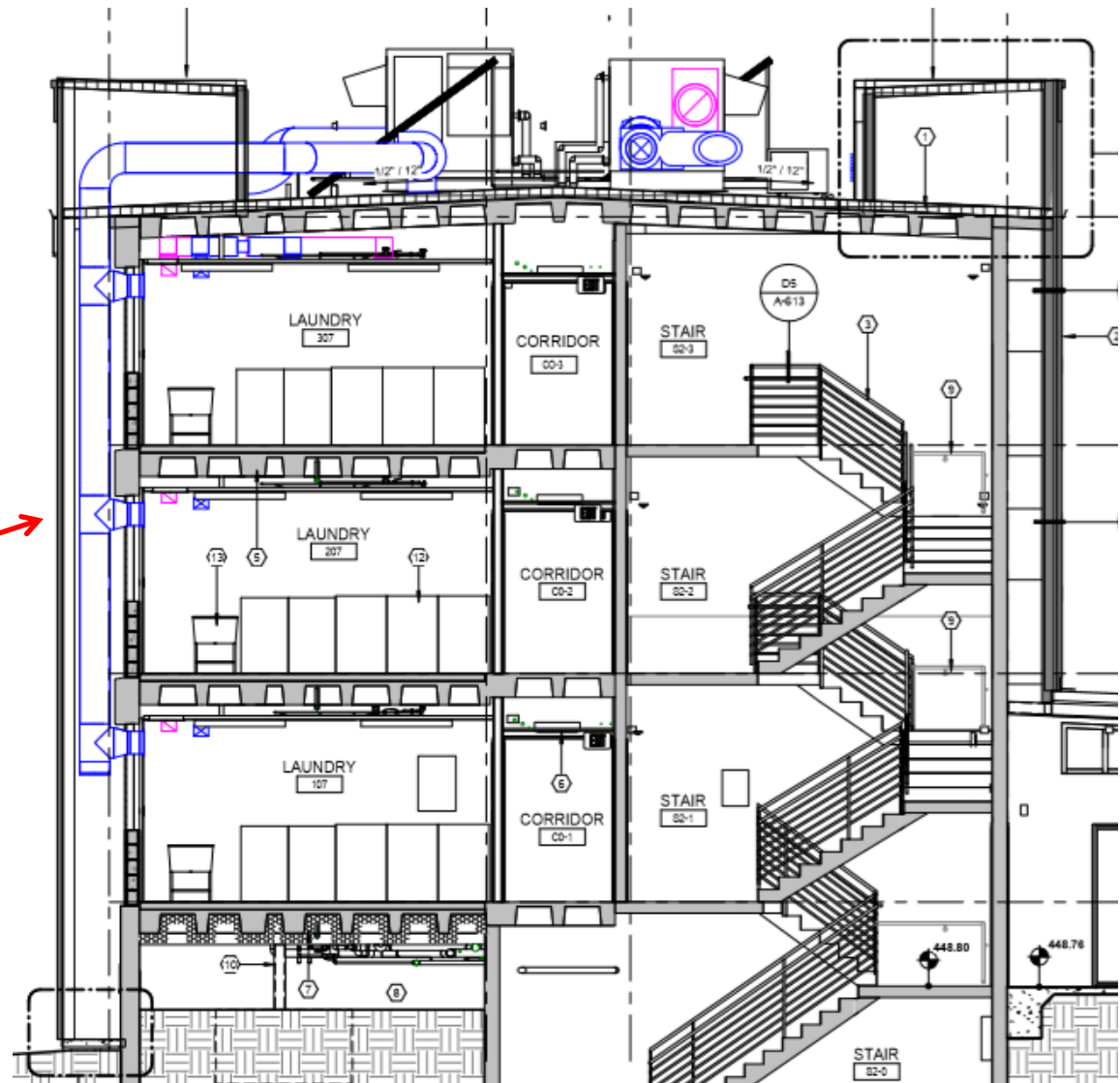


Mechanical Systems

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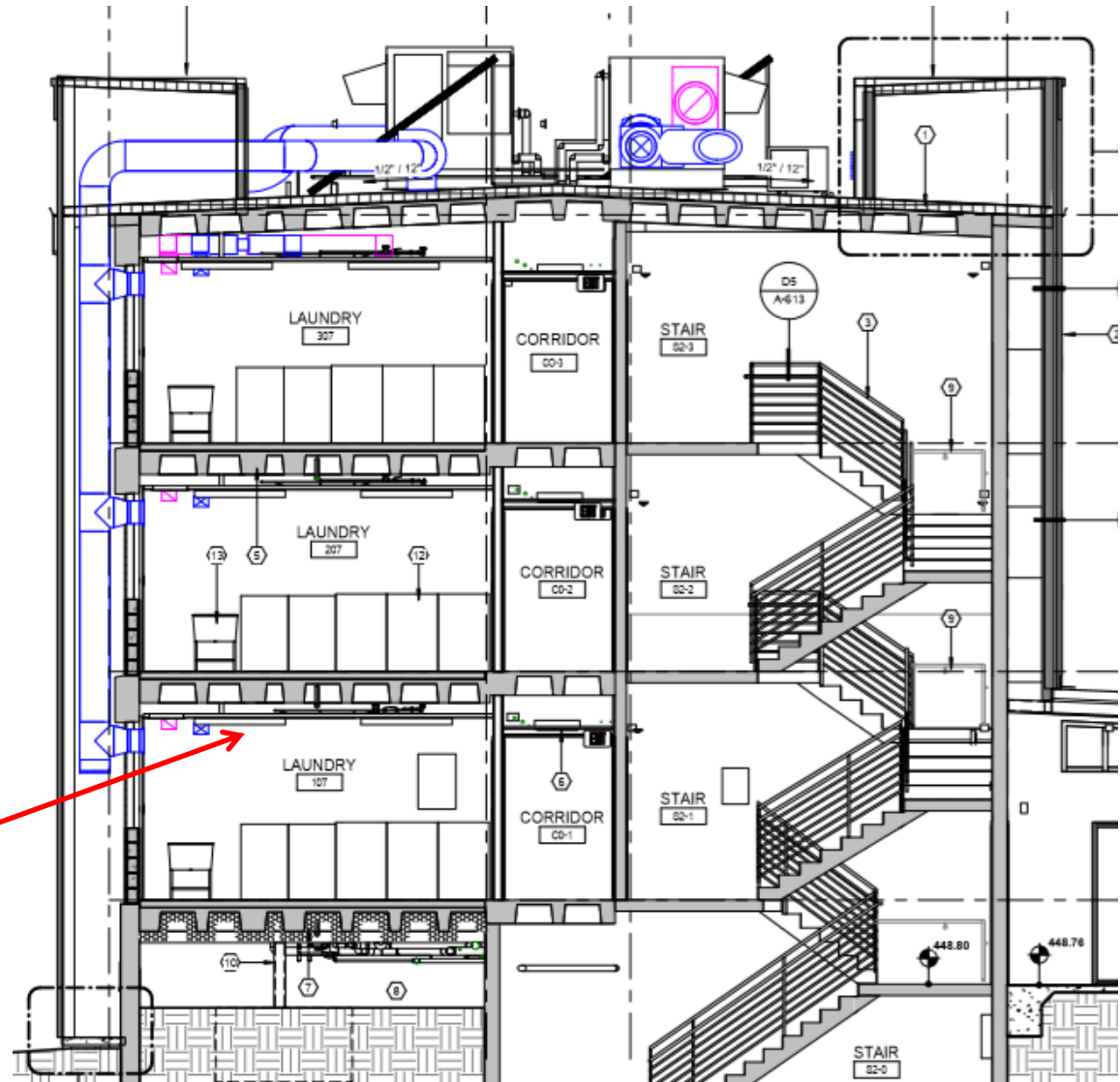


Mechanical Systems

Dedicated
Outdoor Air
System
(DOAS) on roof

Exterior ducting
inside insulated
chases

Radiant Heat
Ceiling Panels



Dedicated Outside Air Units



Heat-recovery wheel



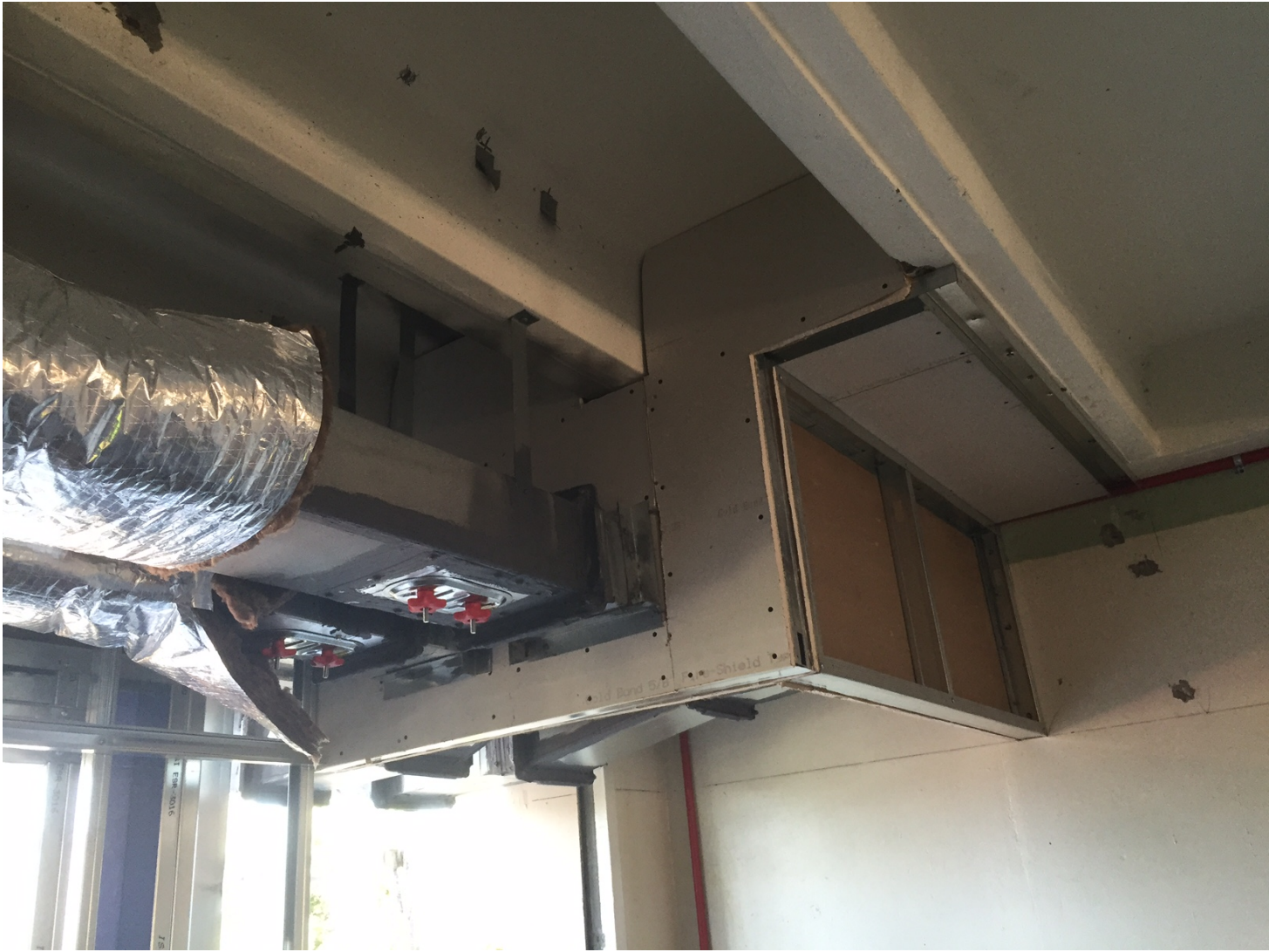
Exterior Ducting



Exterior Ducting



Fire Dampers



Ductwork enters building – low beam clearance



Ductwork along perimeter – soffit needed



Duct Leakage Testing



Duct Air Leakage Test



Radiant Panel in each bedroom



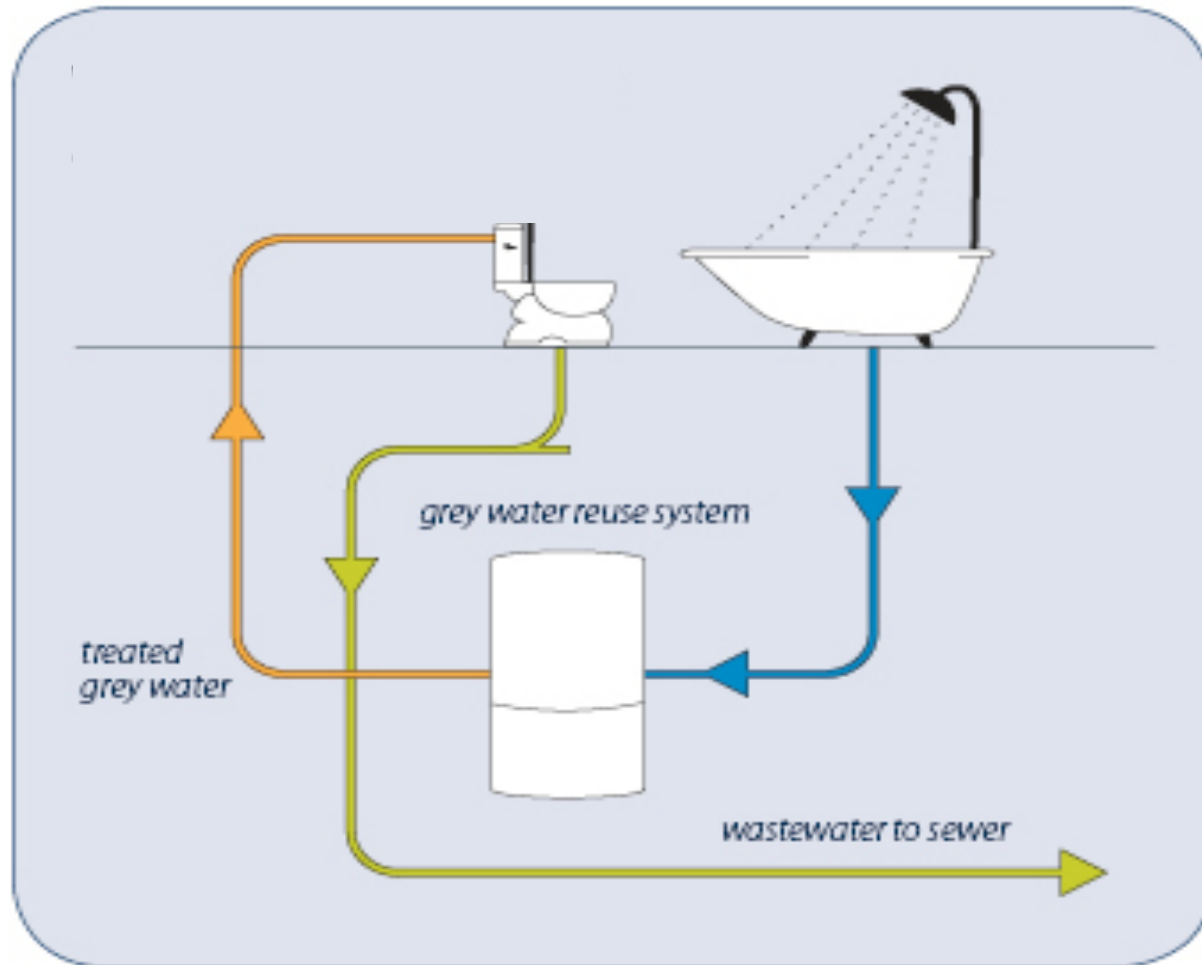
Solar Thermal System and Stratified HW tanks



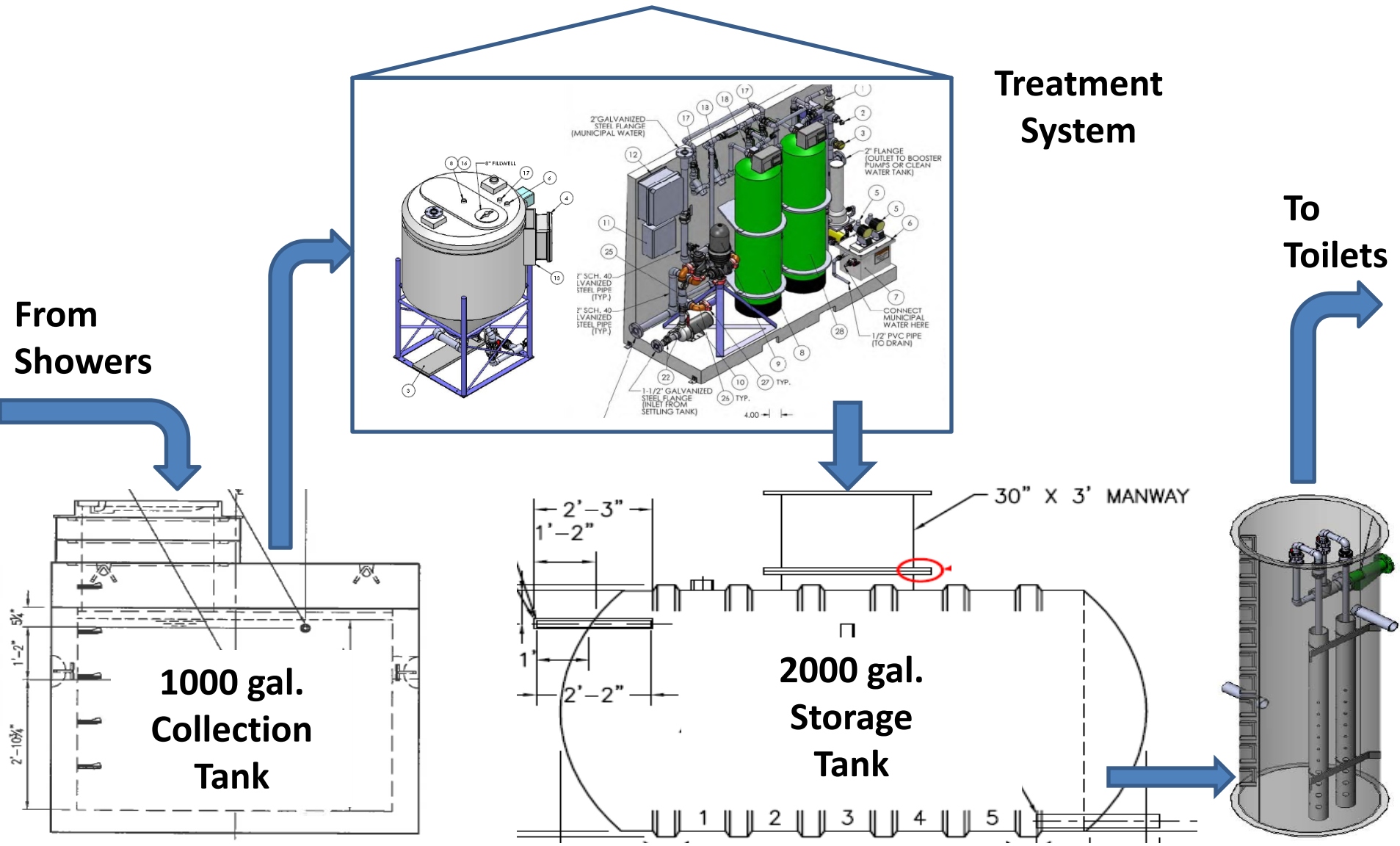
Grey-water Heat Recovery



Grey-water Harvesting & Reuse



Grey-water Harvesting & Reuse



GW piping and venting, non-potable supply lines



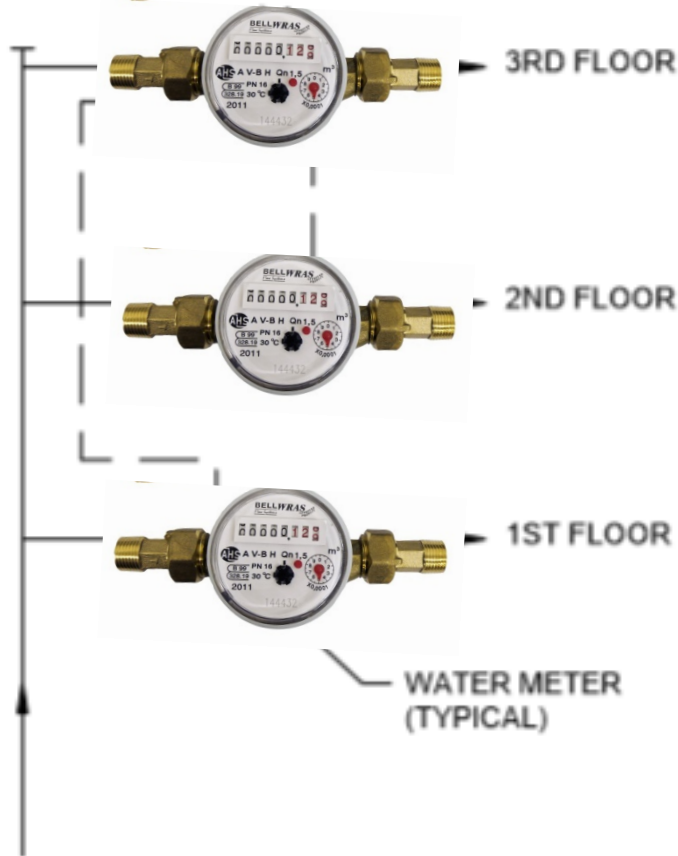
Non-potable water - labeling



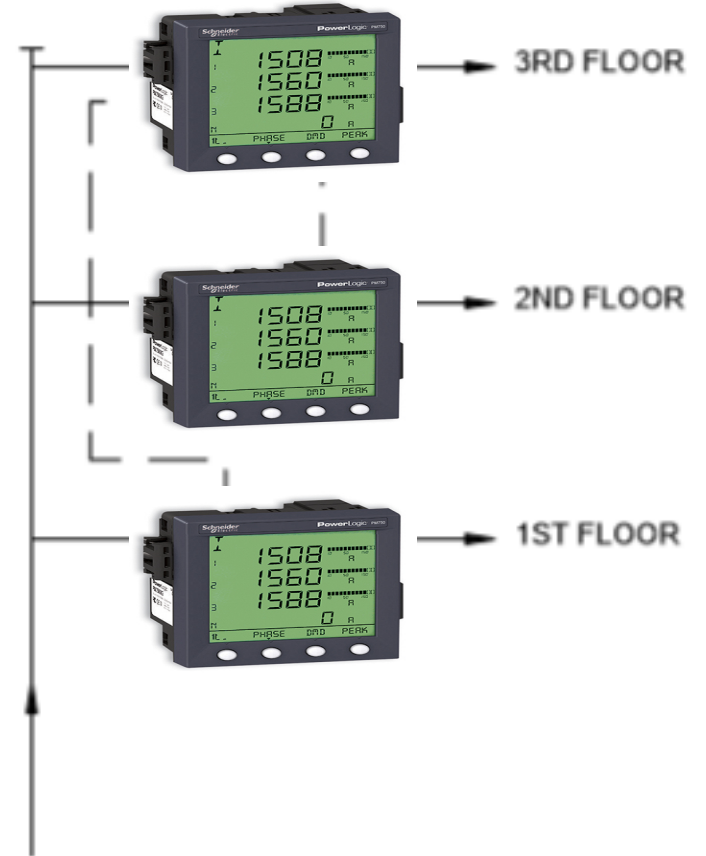
Electric & Water meters by floor

CONTROL WIRING (TYPICAL)

BACNET



BACNET



Contact info:

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831-917-7155