Barracks 630: A Deep Energy Retrofit Case Study at the Presidio of Monterey
US Army Garrison, Presidio of Monterey
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)

131 kBTU/SF
26 kBTU/SF, 80% decrease
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

- EIFS finish 2-1/2" thick rigid polystyrene insulation (R12), encapsulate edges with backwrapped reinforcing mesh & base coat.
- Liquid applied continuous water-resistant and air barrier coating.
- 5/8" glass fiber mat face! gypsum board exterior sheathing.
- Continuous sealant.
- Window per schedule.
- Solid surface window sill.
- 1/8" max. caulk bead, color to match solid surface.
- Caulk over backing rod.
- Existing fully grouted reinforced 8" CMU.
- Liquid applied continuous water-resistant and air barrier coating.

Air Barrier Section - Wing A
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...

Extruded Aluminum Snap On Cap

Fibreglass Pressure Plate

Foam In Place

Sills Bedded In Continuous Sealant (adhere to 3/A304 for sill layout details)

Prefinished Aluminum Sill Flashing Complete With Drip Deflectors

Membrane Over Continuous Anchor Angle and Return and Seal Behind Curtain Wall Pressure Plate

Lap New Membrane Over Existing 6" Minimum and Return To Air Barrier At Interior Studs By OTHERS
This is what we got.
Window Mock-up
¼” gap around window
Backer rod in gap
Caulk serves as our air barrier
Construction QA – Air Leakage Testing

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

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

From Showers

1000 gal. Collection Tank

To Toilets

2000 gal. Storage Tank

Treatment System
GW piping and venting, non-potable supply lines
Non-potable water - labeling
Electric & Water meters by floor
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