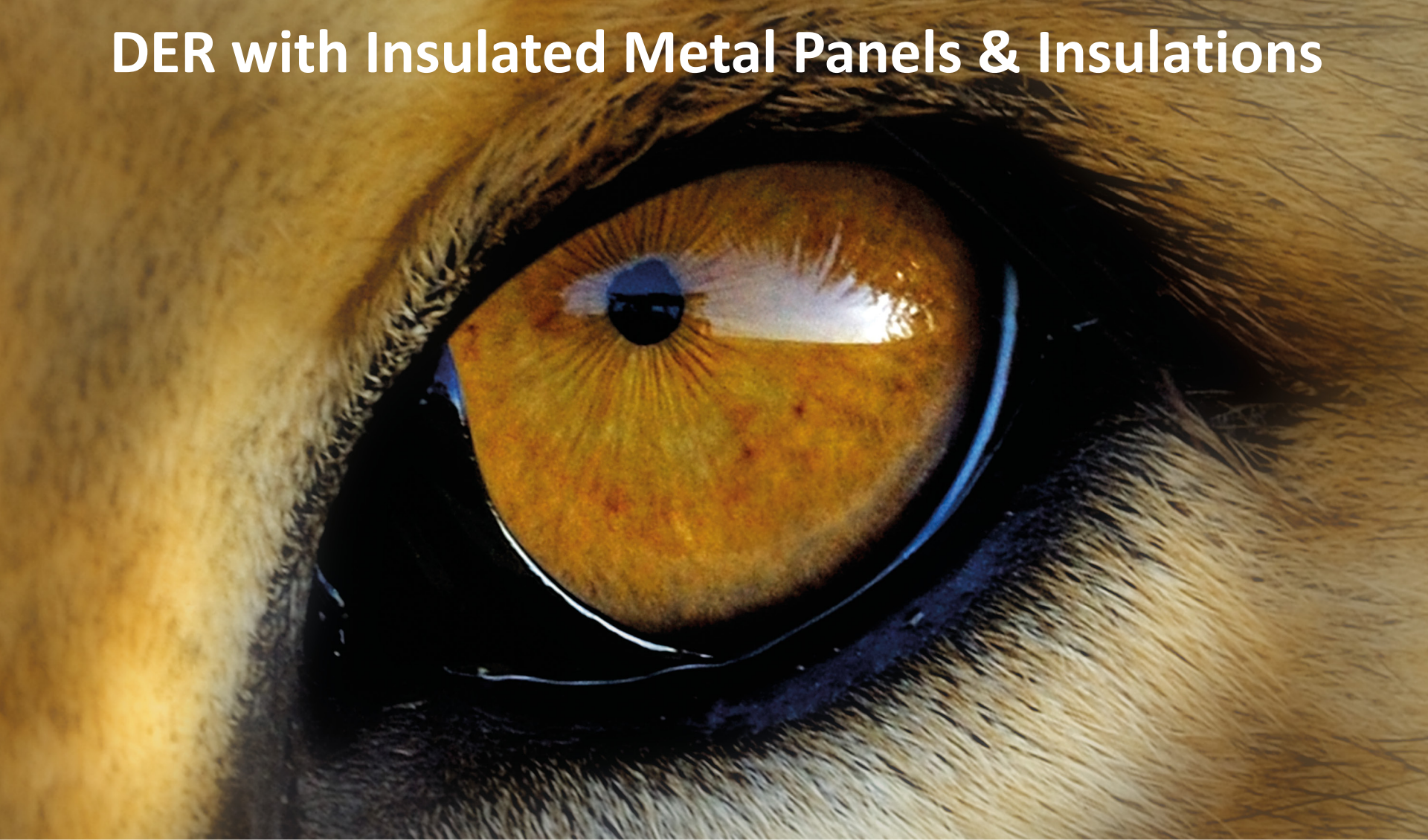


DER with Insulated Metal Panels & Insulations

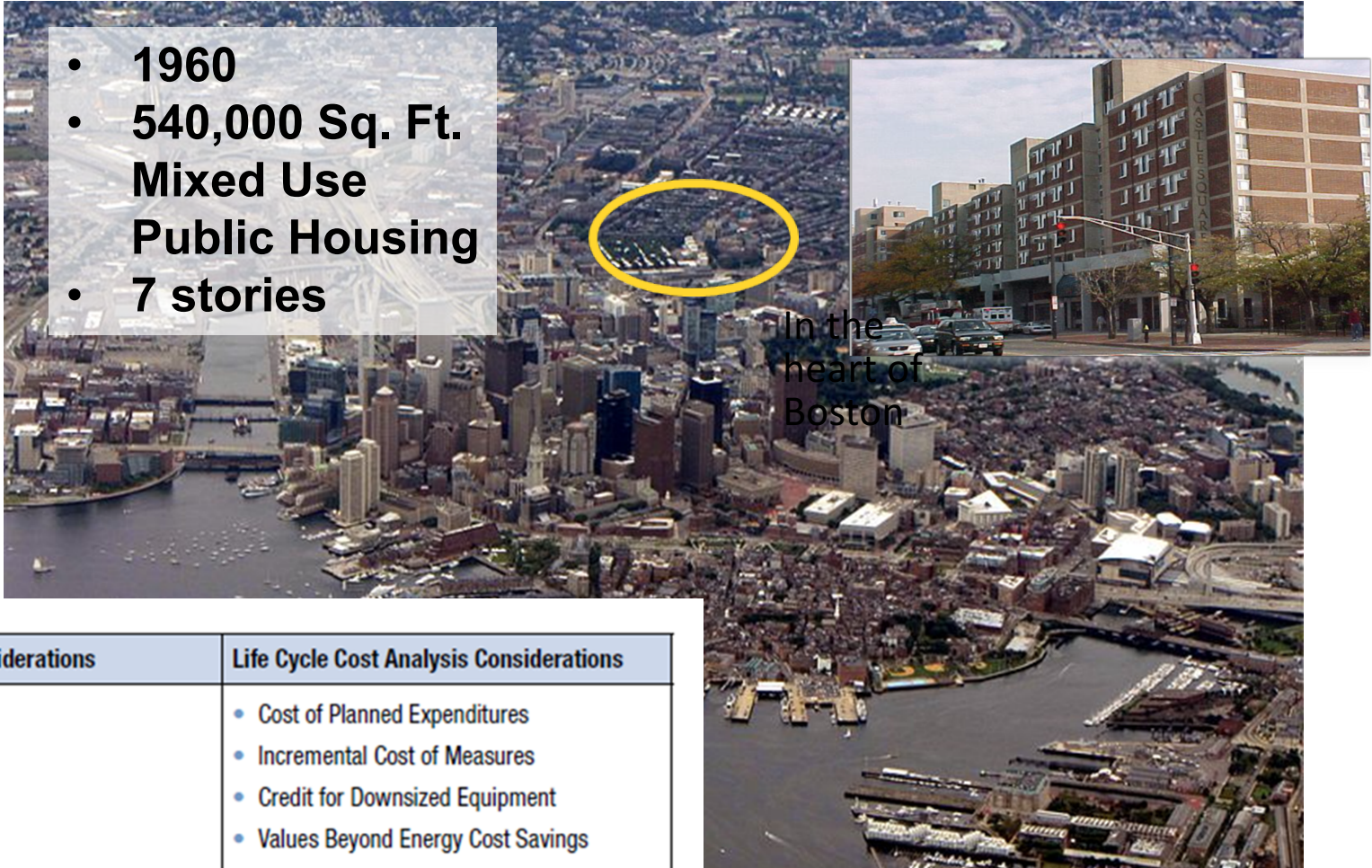


Paul Bertram, FCSI, LEED AP-BD+C
Director: Environment, Sustainability & Government Affairs
paul.bertram@kingspan.com



Castle Square Deep Energy Retrofit (DER)

- 1960
- 540,000 Sq. Ft. Mixed Use Public Housing
- 7 stories



Simple Payback Considerations

- Cost of Measures
- Incentives
- Energy Savings

Life Cycle Cost Analysis Considerations

- Cost of Planned Expenditures
- Incremental Cost of Measures
- Credit for Downsized Equipment
- Values Beyond Energy Cost Savings
- Inflation
- Incentives
- Energy Cost Savings

Exterior Superinsulation

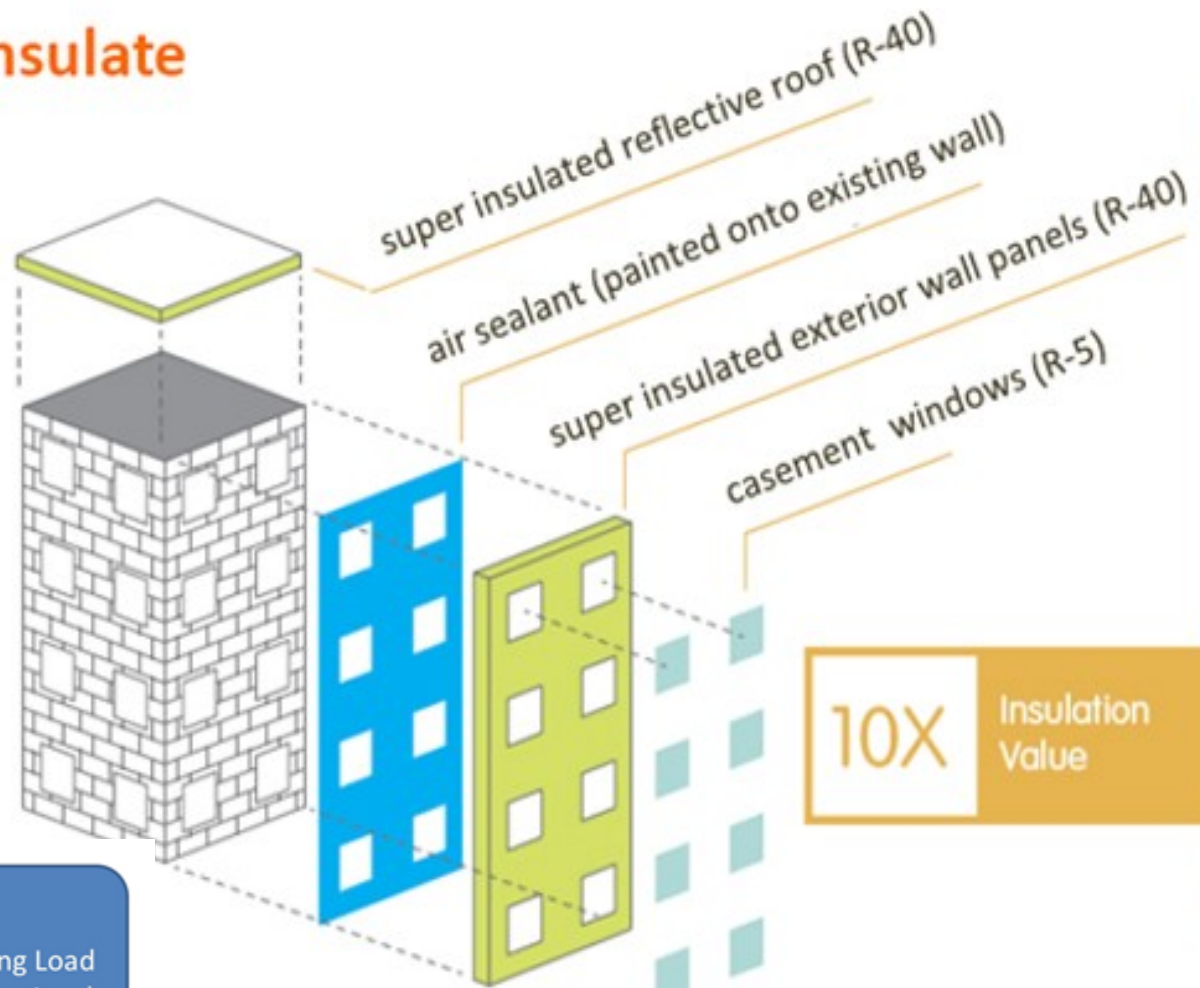
1 super insulate

72%
Energy Reduction
Target

Envelope
Improvement
30%

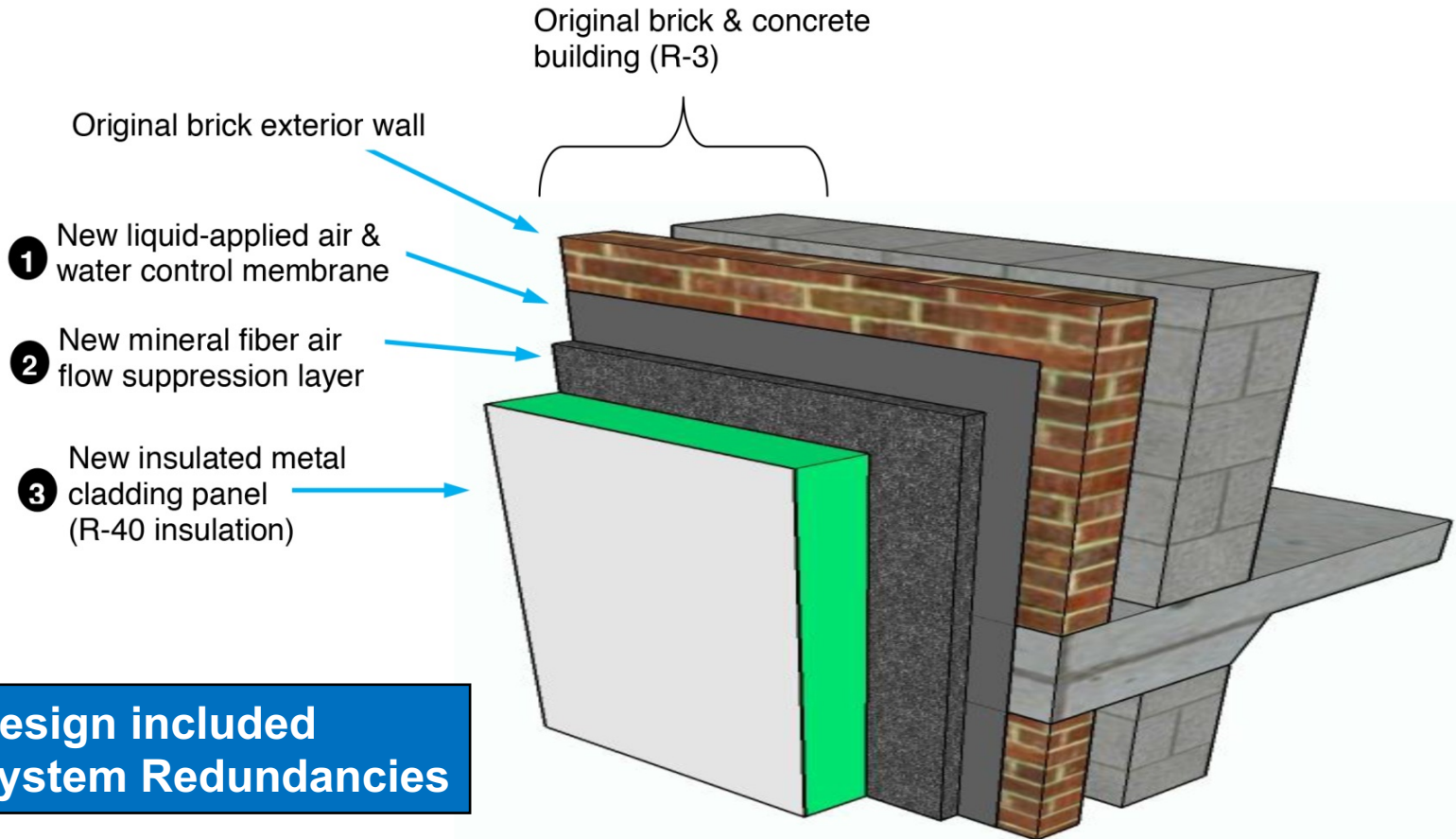
Enclosure Results
61% Reduction in Base Heating Load
68% Reduction in Base Cooling Load

Predictive Energy Modeling per
LEED 2009 requirements



<http://www.castledeepenergy.com/>

Insulated Metal Panels Cladding



**Design included
System Redundancies**

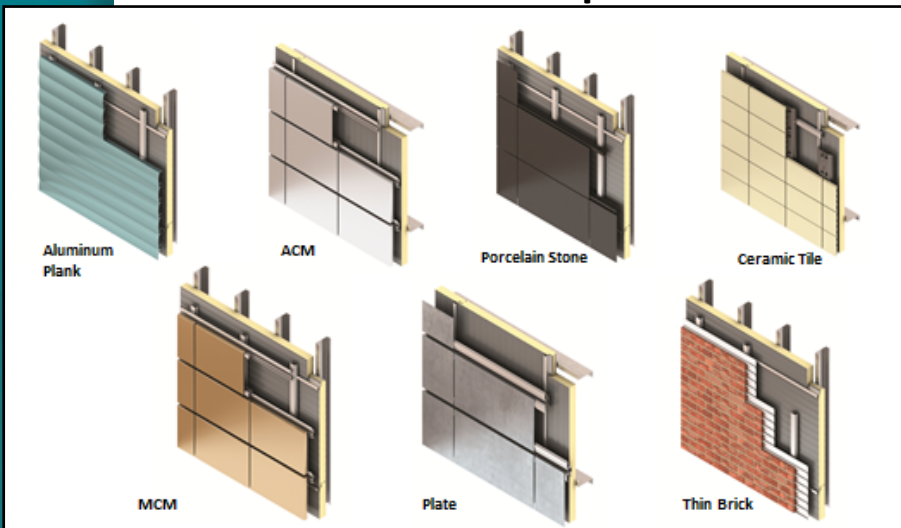
Building Science Corporation, www.buildingscience.com

Castle Square Insulated Exterior Wall System

Off-Site manufactured Single component system



Hundreds of Facade Options



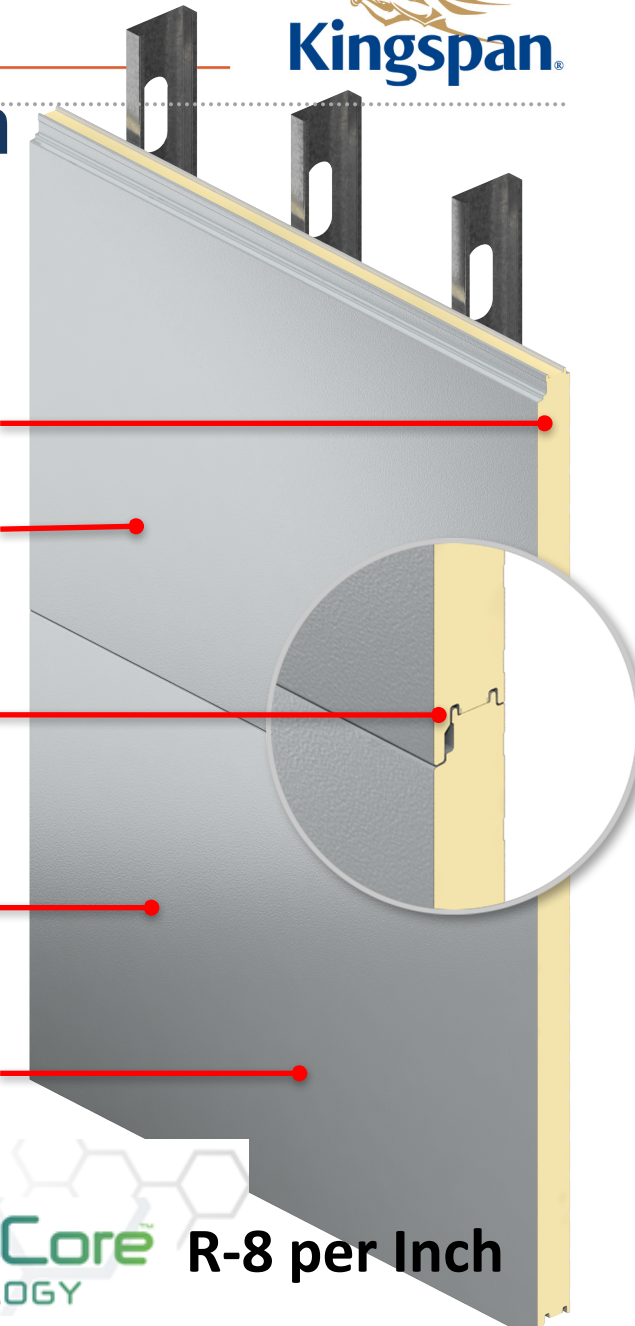
Continuous insulation
No gaps or pockets

Single component

Airtight joint
performance

Moisture/Vapor
resistant

Accelerated
build speed.



IPN **QuadCore**™ R-8 per Inch
TECHNOLOGY

IMP Wall with Façade Rain Screen



Window Sill Condition

Window system (not by Kingspan)

Backer rod and sealant (not by Kingspan)

Membrane flashing with upturned ends to form end dams (by mason)

Metal flashing with drip end set in sealant (by mason)

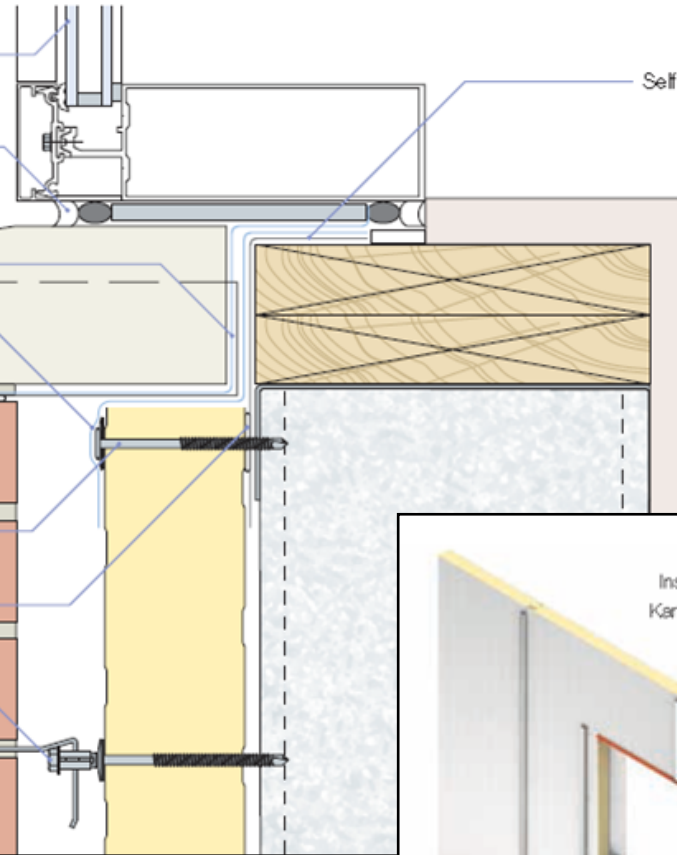
1/4" - 14 pancake through fasteners with 1 1/8" bonded washer (as required for wind load)

Set panel in continuous butyl sealant

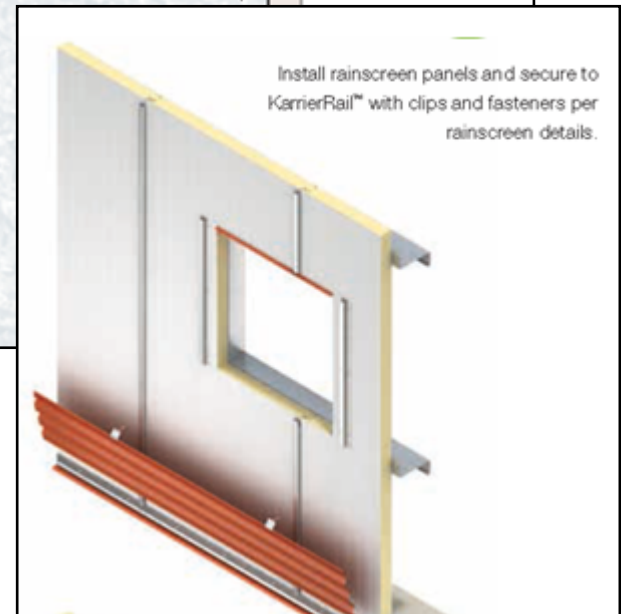
Brick tie - HB wing nut with pintle (spacing to be determined by the engineer of record)

Facing brick (not by Kingspan)

Self adhering membrane (not by Kingspan)



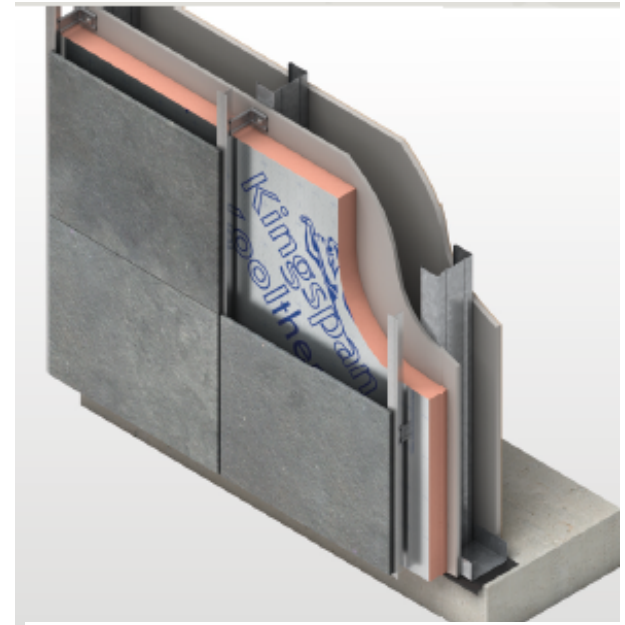
Install rainscreen panels and secure to KarrierRail™ with clips and fasteners per rainscreen details.



Insulation / Air Sealing Options

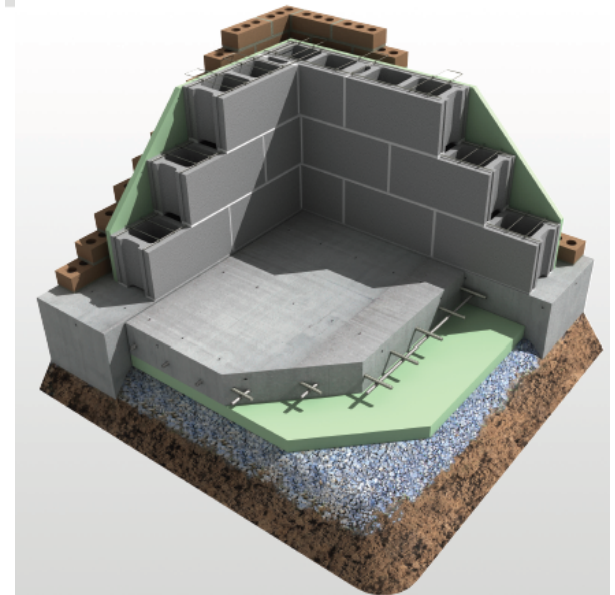


- **Rigid thermoset phenolic insulation** –
 - Thermal conductivity as low as 0.020 W/m·K

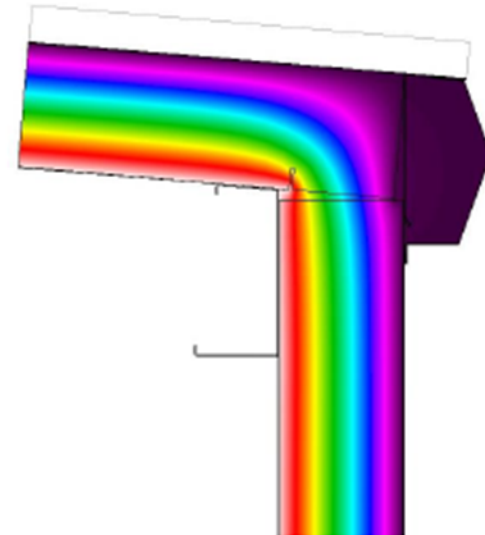
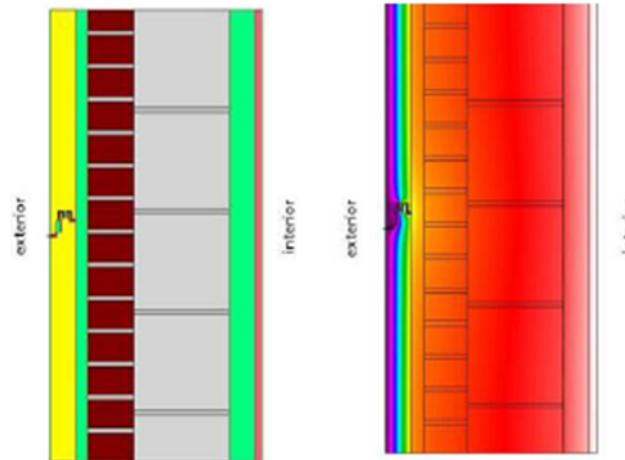
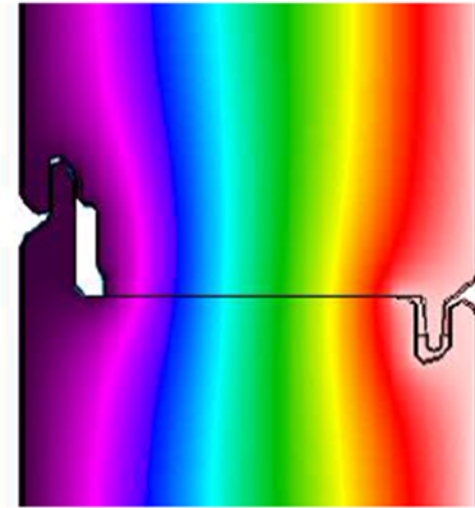
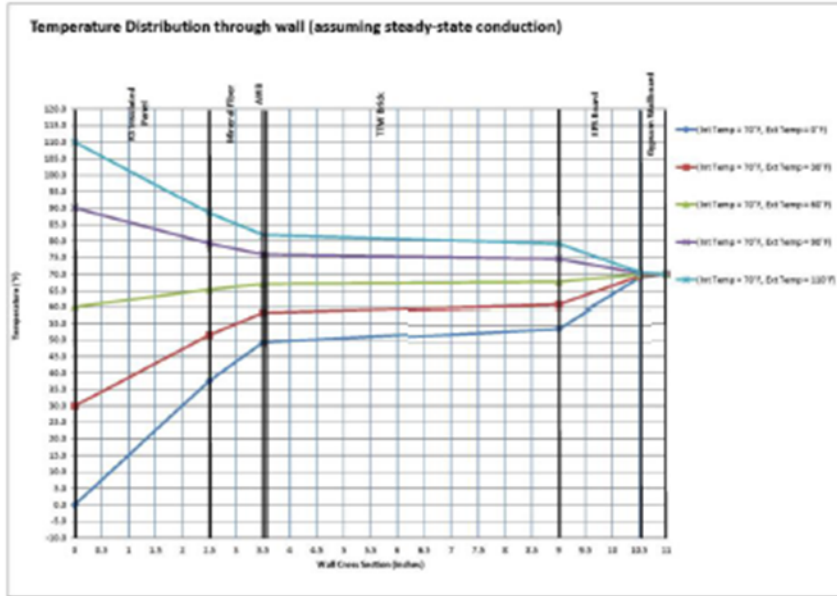


XPS

GENERAL PURPOSE INSULATION FOR ROOFING, WALL AND FOUNDATION APPLICATIONS REQUIRING 40 PSI MINIMUM COMPRESSIVE STRENGTH



Thermal/Hygrothermal Analysis Design Assist by IMP Manufacturer



core

Effective R-value = 14.375 (hr-ft²·°F)/Btu

Deep Energy Retrofit with & without Shell

Gas	Midrise (Deep Energy Retrofit)			Midrise (No Shell)		
		Therms	\$1.53		Therms	\$1.53
Baseline Gas Consumption - Heating (2008)		78,024	\$119,377		78,024	\$119,377
Savings from Enclosure	60%	47,654	\$72,911	23%	18,514	\$28,326
Roof Insulation	3%	2,591	\$3,964	3%	2,591	\$3,964
Exterior Super Insulation	33%	26,018	\$39,808	0%		
Air Sealing (Air sealing provides two benefits 1) energy savings and 2) eliminates smells between units. Energy benefit shown here results mainly from the exterior shell in the midrise. (No Shell scenario, some of air sealing benefit is not achievable)	8%	6,245	\$9,555	4%	3,123	\$4,777
Windows	14%	11,167	\$17,086	14%	11,167	\$17,086
Doors	2%	1,633	\$2,498	2%	1,633	\$2,498
Savings from Mechanical (Due to efficiency improvements)		8,016	\$12,264		7,744	\$11,849
Ventilation		5,300	\$8,109		5,300	\$8,109
Heating System Upgrade (Boilers can't run in condensing mode as often in the no shell scenario which reduces overall heating efficiency)		2,716	\$4,155		2,444	\$3,740
TOTAL Heating Savings (Gas)	71%	55,670	\$85,175	34%	26,258	\$40,175

Cost of Super Insulated Shell

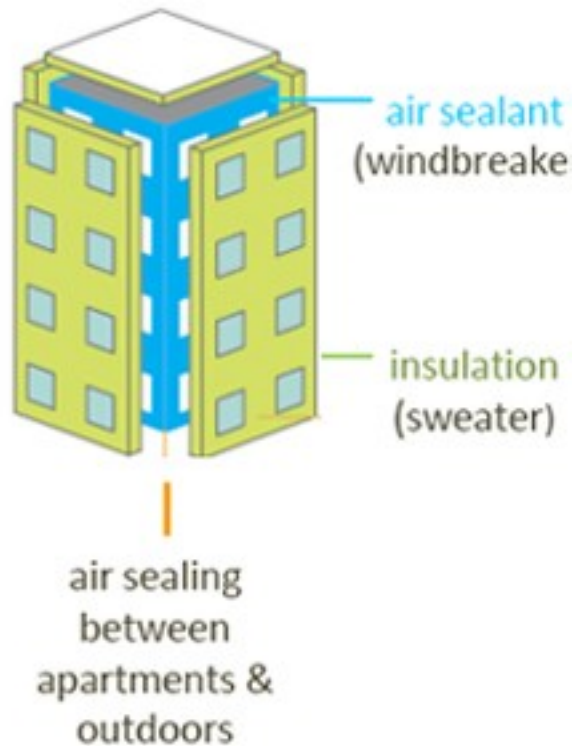
Cost of the Super Insulated Metal Panel Shell

	Total Costs	Costs per Sq Ft.	Costs per Apartment
Total Cost – Super Insulated Shell 72,00 Sq. Ft. – wall area	\$2,499,000	\$34.71	\$13,016
Cost Breakdown			
Air Vapor Barriers	\$125,000	\$1.74	\$652
Metal Panel Furring - Materials	\$145,000	\$2.01	\$755
Metal Panels Furring Labor	\$175,000	\$2.44	\$915
Mineral Wool Suppression - Materials	\$108,000	\$1.50	\$563
Mineral Wool Suppression - Labor	\$72,000	\$1.00	\$376
Metal Panel Systems - Materials	\$1,040,000	\$14.44	\$5,417
Metal Panel Systems - Installation	\$620,000	\$8.61	\$3,229

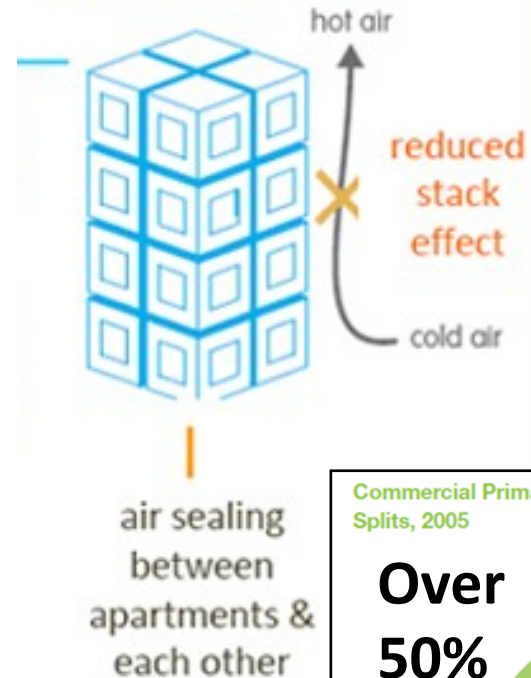
Note: Avoided Masonry Repairs - \$300,000

Air Sealing Exterior/Interior

2 air seal

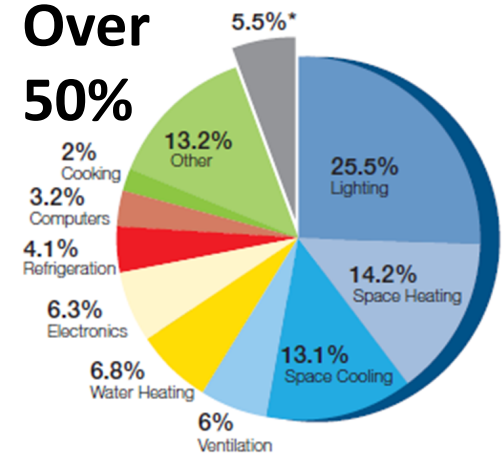


compartmentalization



Commercial Primary Energy End-Use Splits, 2005

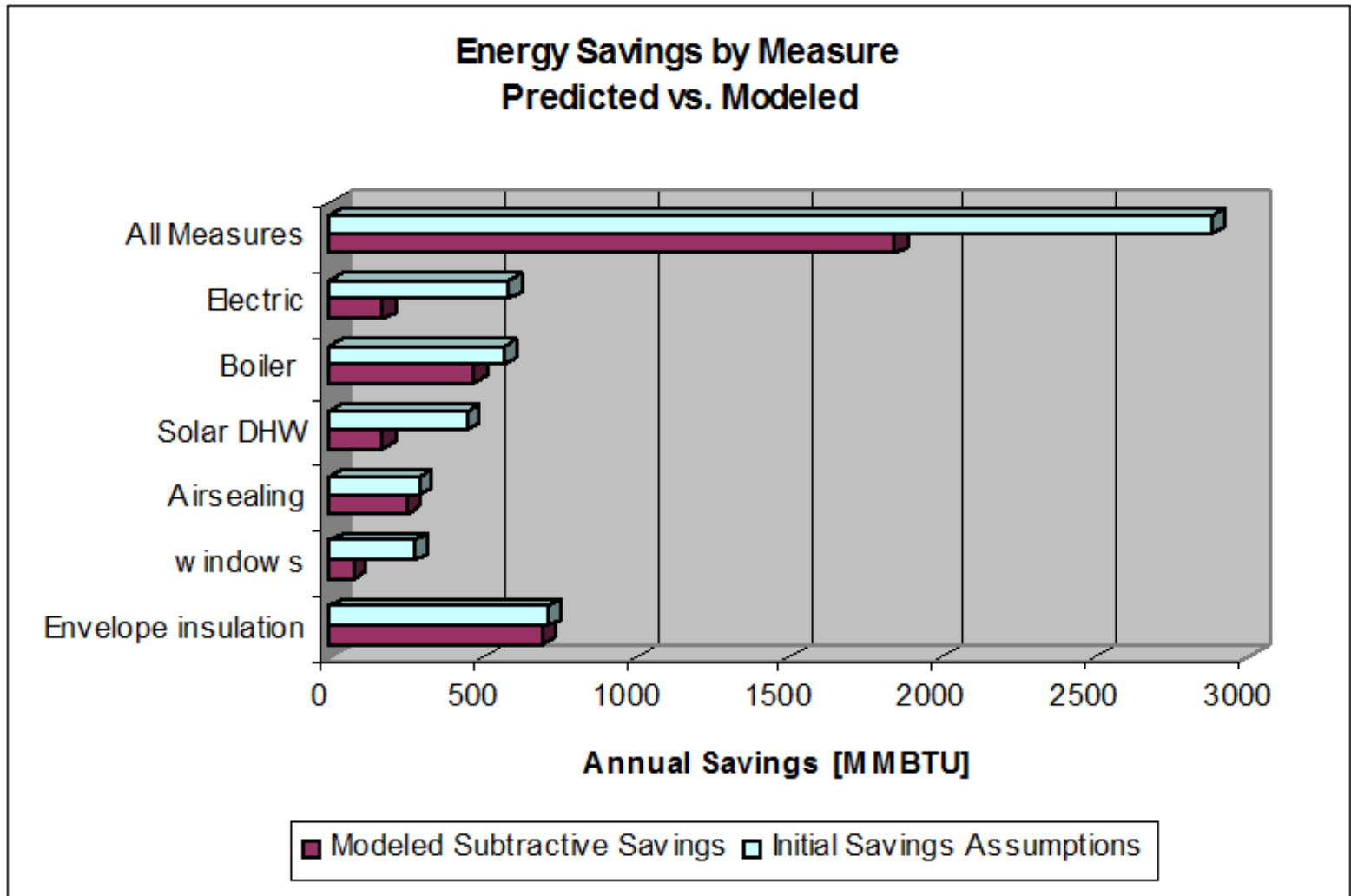
Over 50%



3. Right Size

Energy Conservation Measures after designing envelope and air sealing

Actual Energy Savings vs. Modeled



Payback Period

Deep Energy Retrofit	Incremental Cost
Roof insulation	\$45,000
Exterior wall insulation (72,000 square feet wall area)	\$2,200,000
Glazing (13,000 square feet of glazing)	\$74,000
Apartment Air Sealing	\$160,000
Mechanical-Heat/Hot Water	\$254,000
Ventilation	\$132,000
Solar thermal	\$600,000
TOTAL Incremental Cost	\$3,460,000

Gas/Electric Annual Savings: \$182,000

19 Years

Occupancy Use Impacts



- Thermostat temperature
- Windows
- Commissioning 1 Year after completion
- Building Use NOT as Design Intended



Castle Square a repeatable scalable DER model

Copies of the Castle Square White paper are available upon request

paul.bertram@kingspan.com – Mobile: 386-785-3063

Product information, Details, Specifications

available at: www.kingspanpanels.us;

www.trustgreenguard.com/