

Curtain Wall Failures & Methods of Retrofit

Rob Wood, P.Eng.



Functions of a Curtain Wall?



Outer “skin” of the building.

1. Regulate the interior environment
2. Resist wind loads and other exterior forces
3. Architectural

Regulate the Environment





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Architectural





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Why do Curtain Walls Fail?



- Design Details
- Construction Details
- Finite Lifespan of Components



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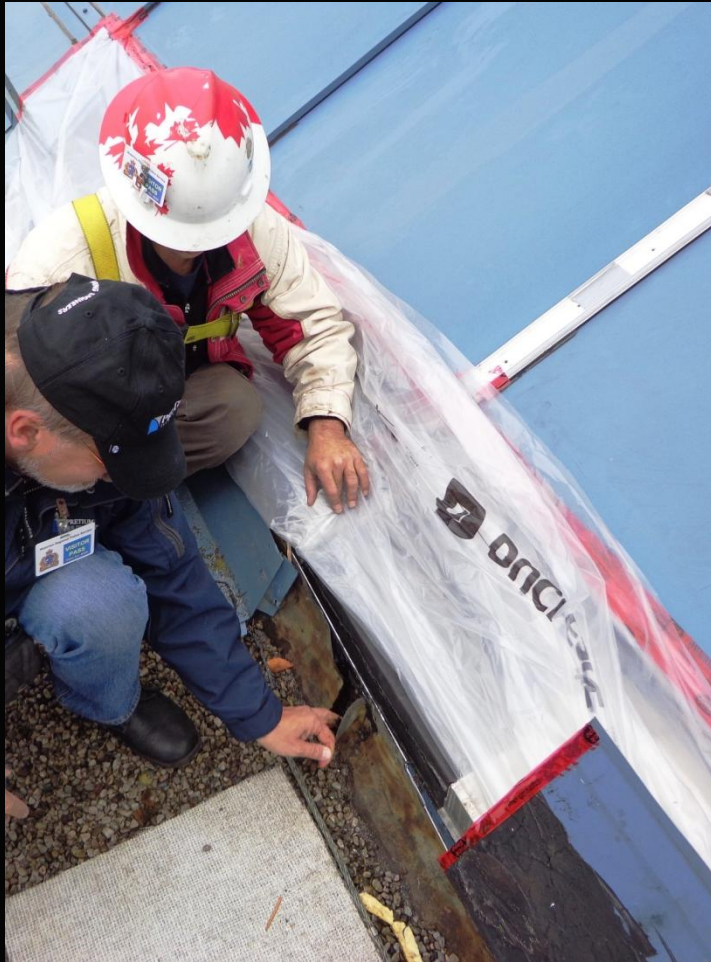
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Methods of Retrofit



1. Refurbish
2. Overclad
3. Reclad

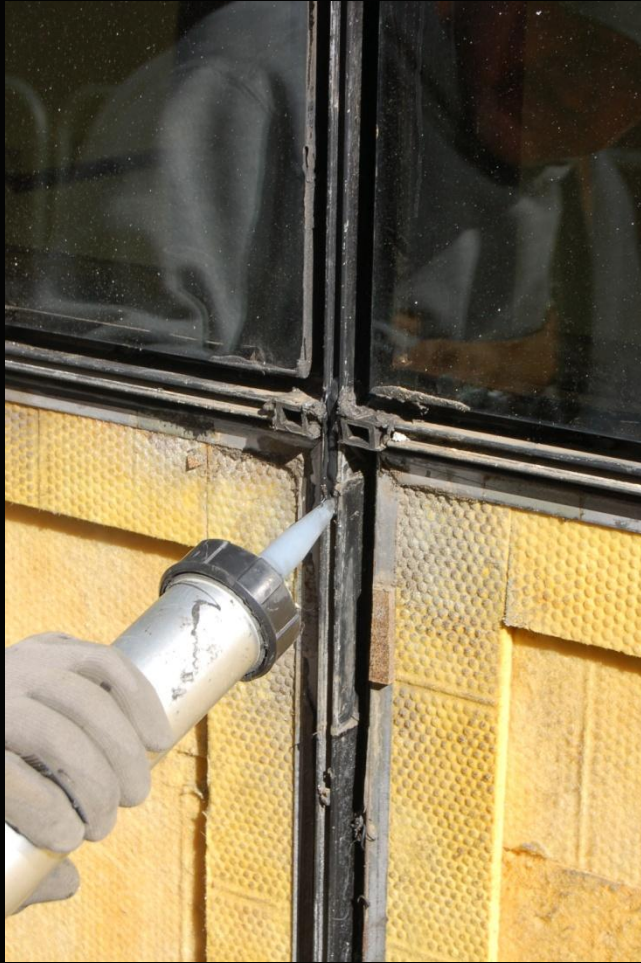
The Occupied Building Challenge



- Potential for extreme disruption to tenants
- Respect for tenanted spaces
- Life Safety
- Sequencing and Coordination
- Communication

Methods of Retrofit - Refurbish





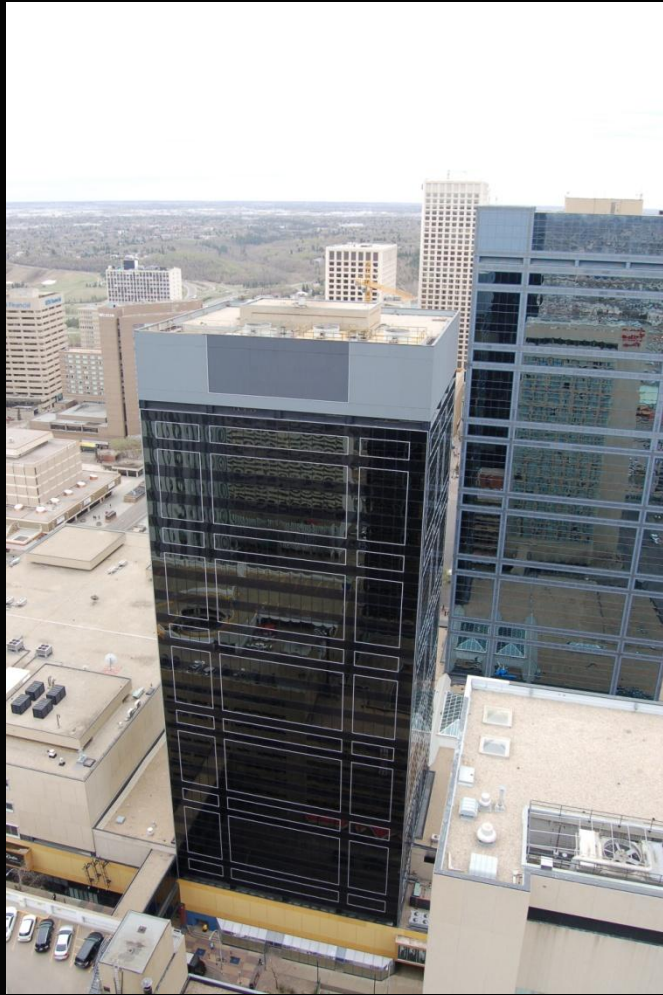
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Why Refurbish?

Advantages

1. Speed
2. Value / Cost
3. Low impact to tenants

Disadvantages

1. Least amount of architectural flexibility
2. Thermal upgrades limited by existing system

Methods of Retrofit - Reclad



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Why Reclad?

Advantages

1. Maximum architectural flexibility
2. Best thermal options

Disadvantages

1. Cost
2. Significant tenant disruption

Methods of Retrofit - Overclad



1. Constructed 1969
2. 25 floors, 380,000 GSF
3. 12 typical, 4 corner drops

CROWN

PROPERTY MANAGEMENT

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Tower

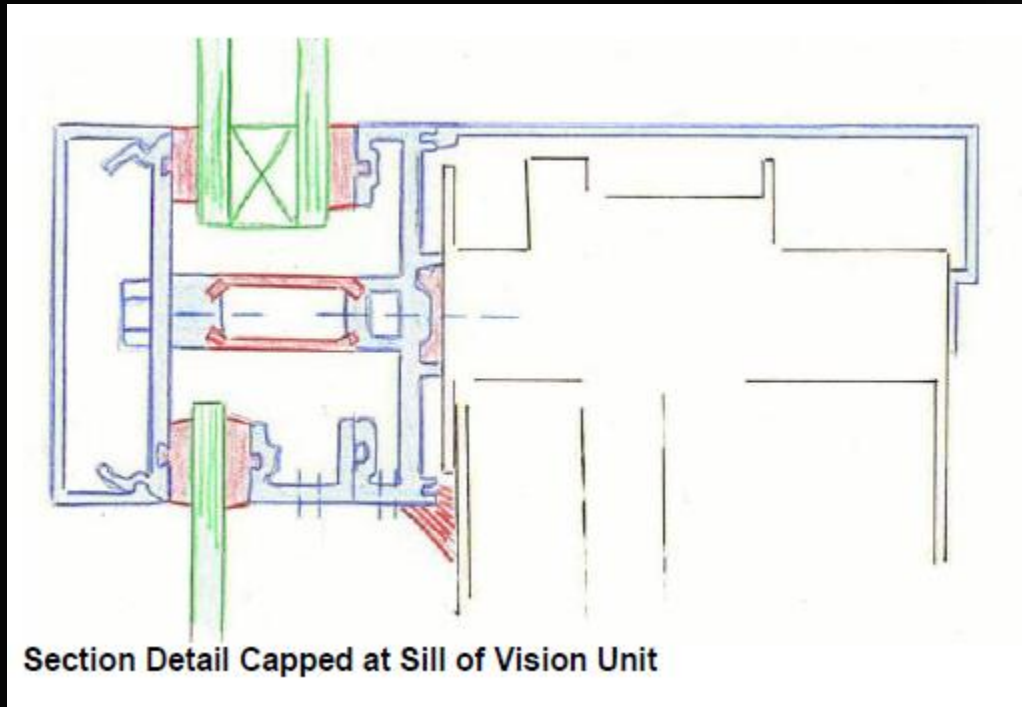
1. Single, interior glazed vision units
2. Unitized system
3. Installed prior to precast
4. Spandrel areas designed to be drained / vented
5. Face sealed post construction
6. Window film on interior



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Option 2. Overclad, QAL / BVDA Report, Mar-2012



- Skimming adapter to existing frame
- Rework backpans
- 2012 (BVDA) recommendation
- Scoped site investigation

Mockups, Dec-2012



1. 4 types of IGU, spandrel glass, snap cap

Final Selection

IGUs:	Bronze HS, Clear Solarban 60 (3) Temp
Spandrels:	Signal Grey
Caps:	Champagne

Original



Rendering, Jan-2013



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Detailed Investigation, Apr-2013





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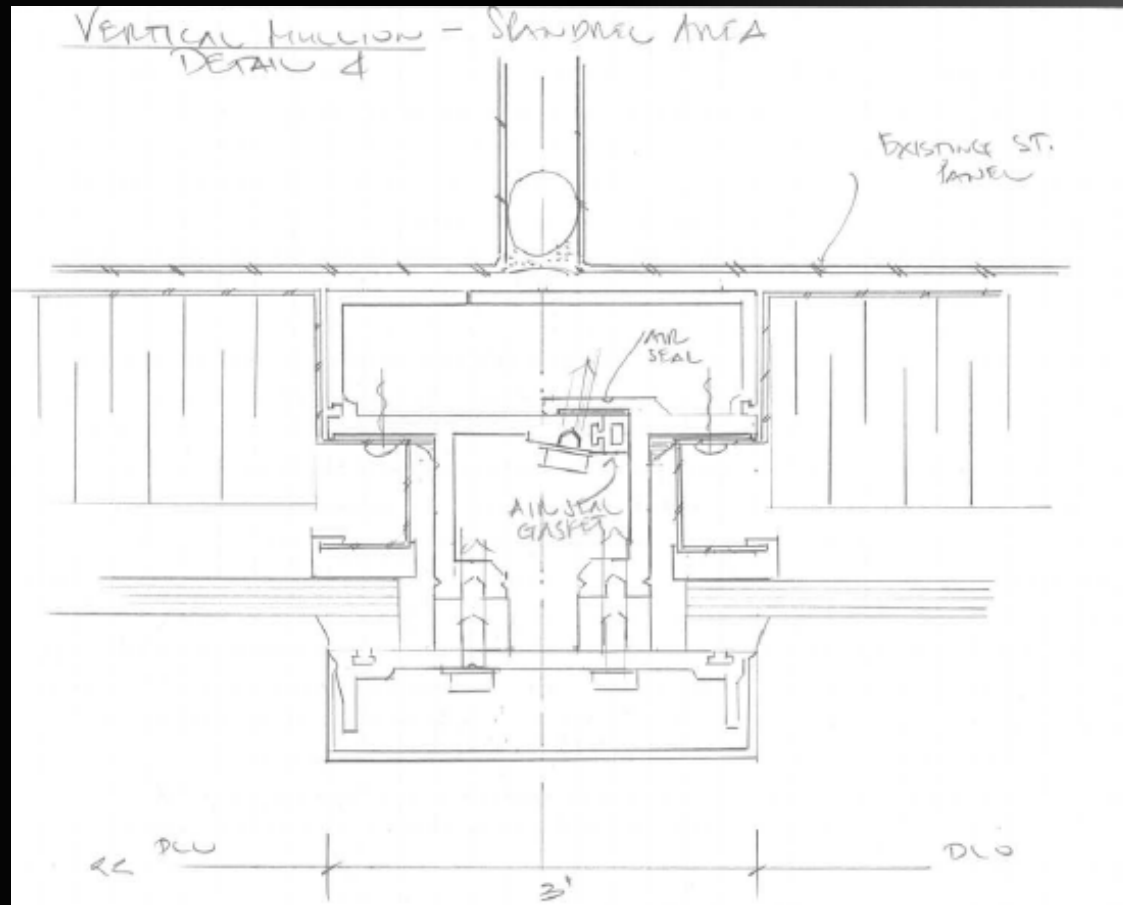
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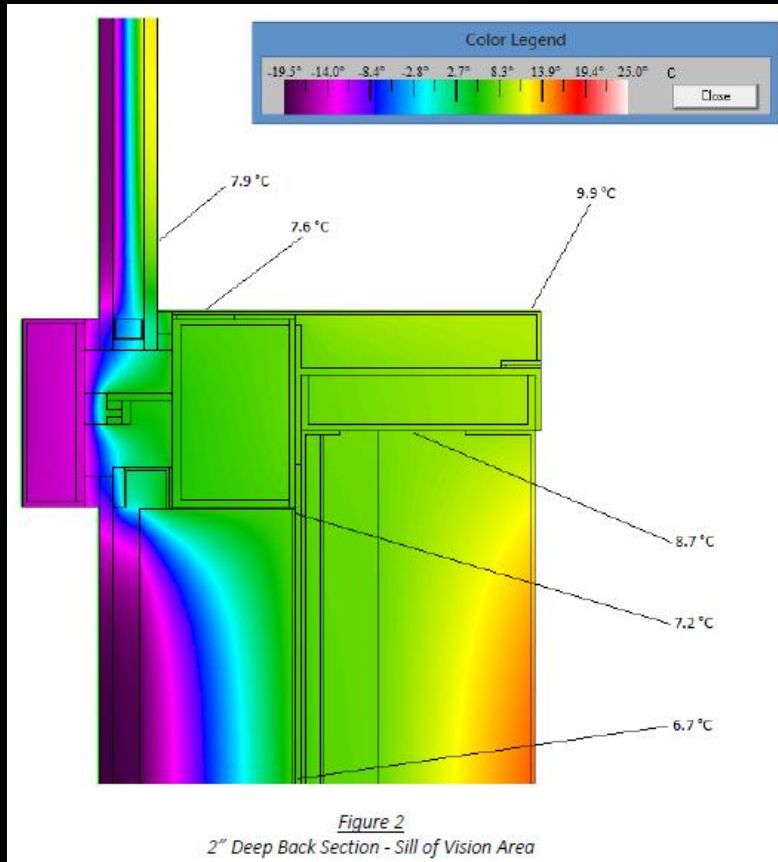
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Design Revision #03: 23-APR-2013



Thermal Analysis #02: 10-Jun-2013



	2" Deep Back Section	3" Deep Back Section
Minimum interior surface temperature	6.7°C	8.1°C
Maximum interior relative humidity without formation of condensation	31%	35%
U-Value (Btu/h-ft ² -F)	0.2623	0.2615
Impact on budget	2 %	5%

On-Site Mockup: 27-Jul-2013



Lab Testing, Aug-2013



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Full Scale Construction: 27-Sep-2013



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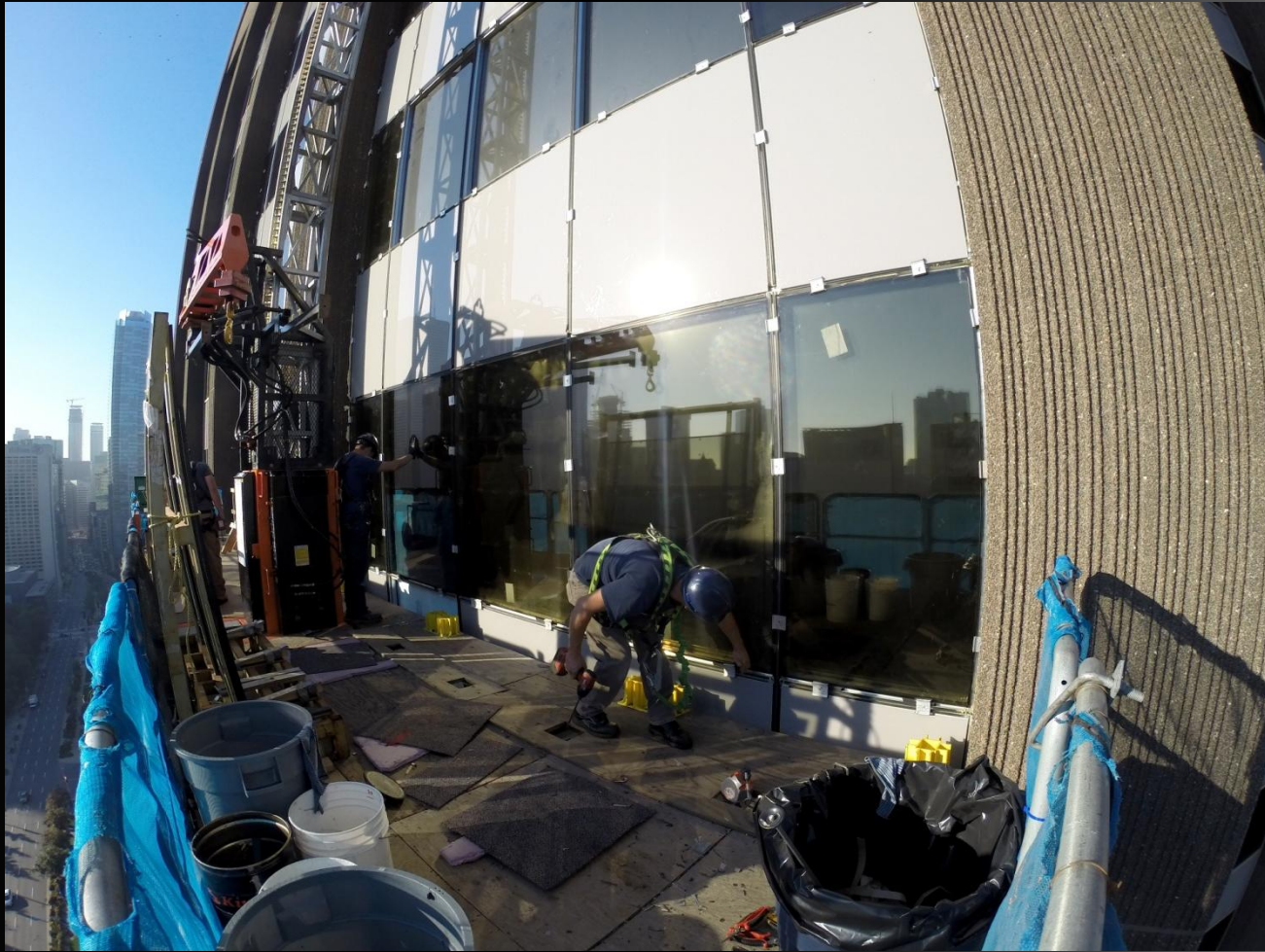
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Why Overclad?

Advantages

1. Minimize tenant disruption
2. Customizable
3. May be only technically feasible option
4. Less cost than relcad

Disadvantages

1. Technical risk
2. Relies on structural integrity of existing system

TORONTO CITY HALL



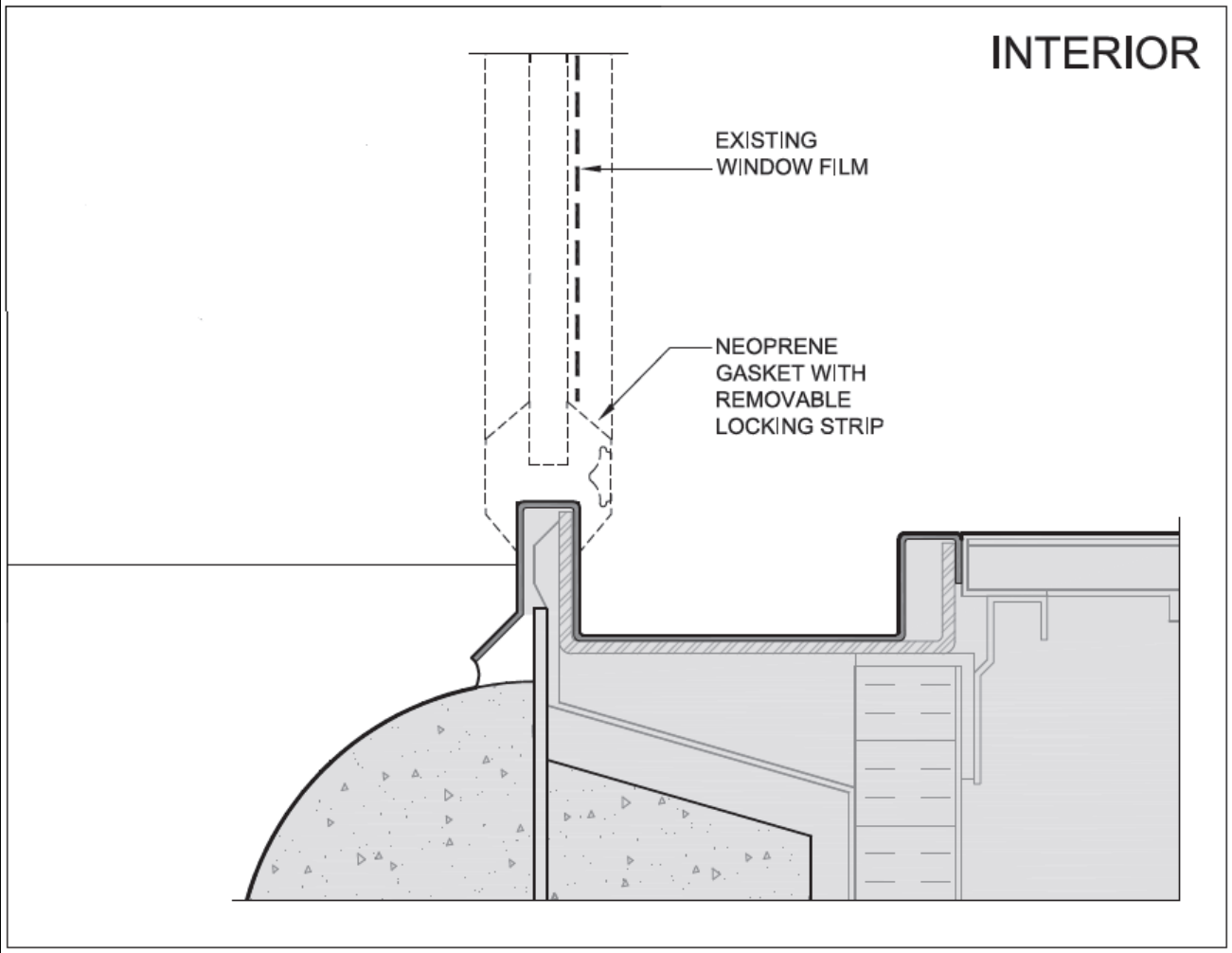
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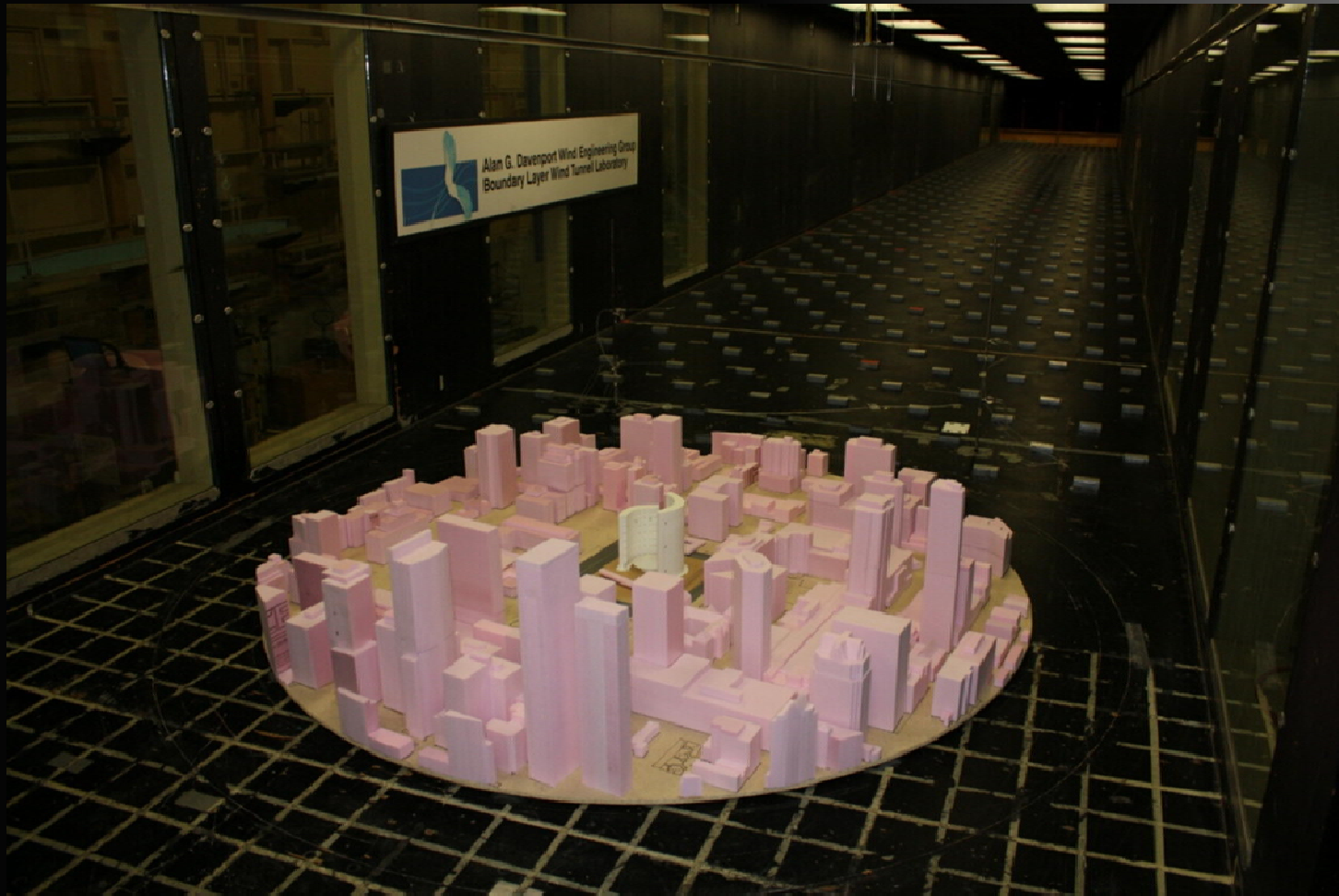
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Evaluation Criteria

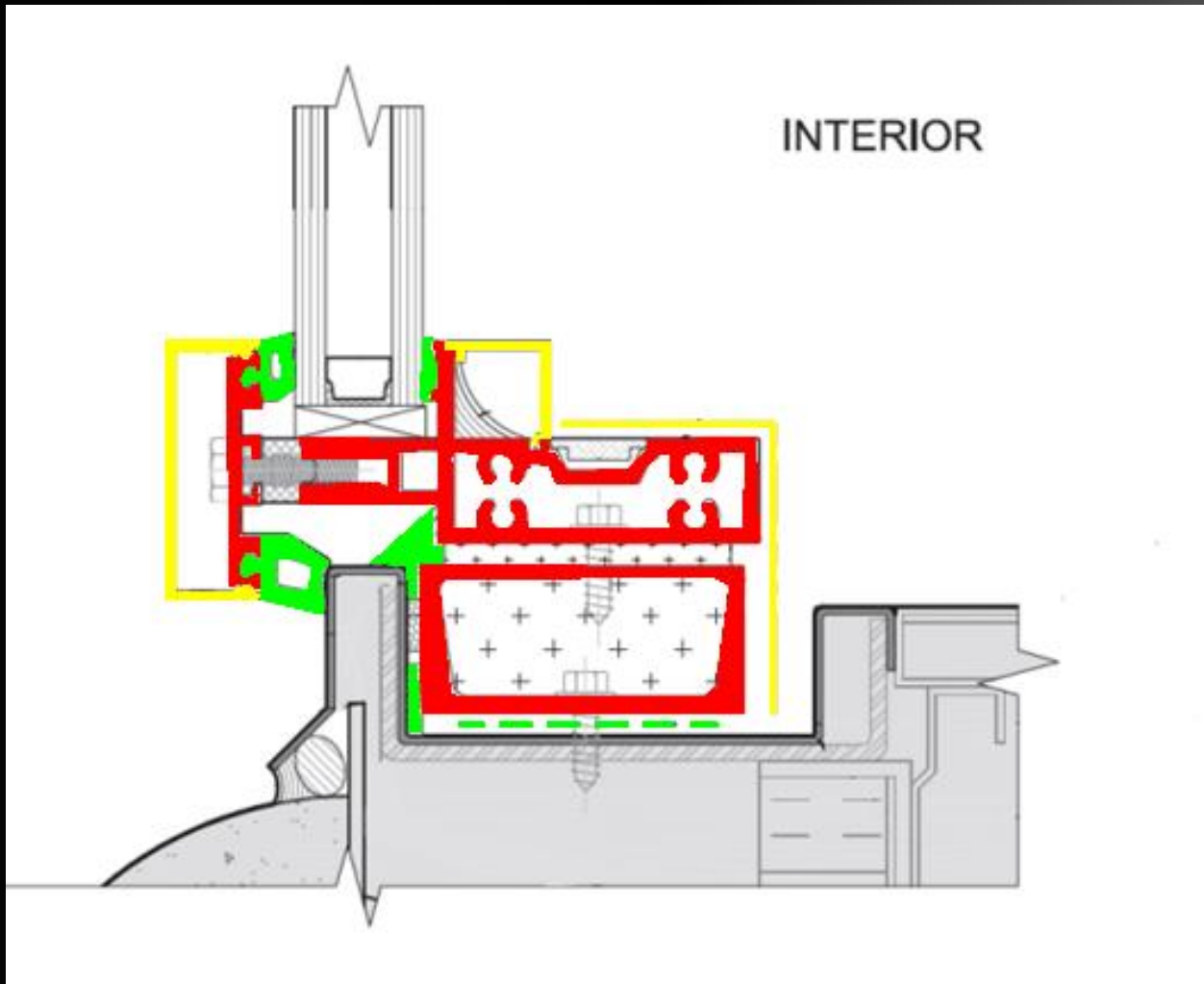


- Safety
- Heritage
- Lifecycle Cost
- Replacement Cost
- Thermal Performance
- Technical (Air, water)



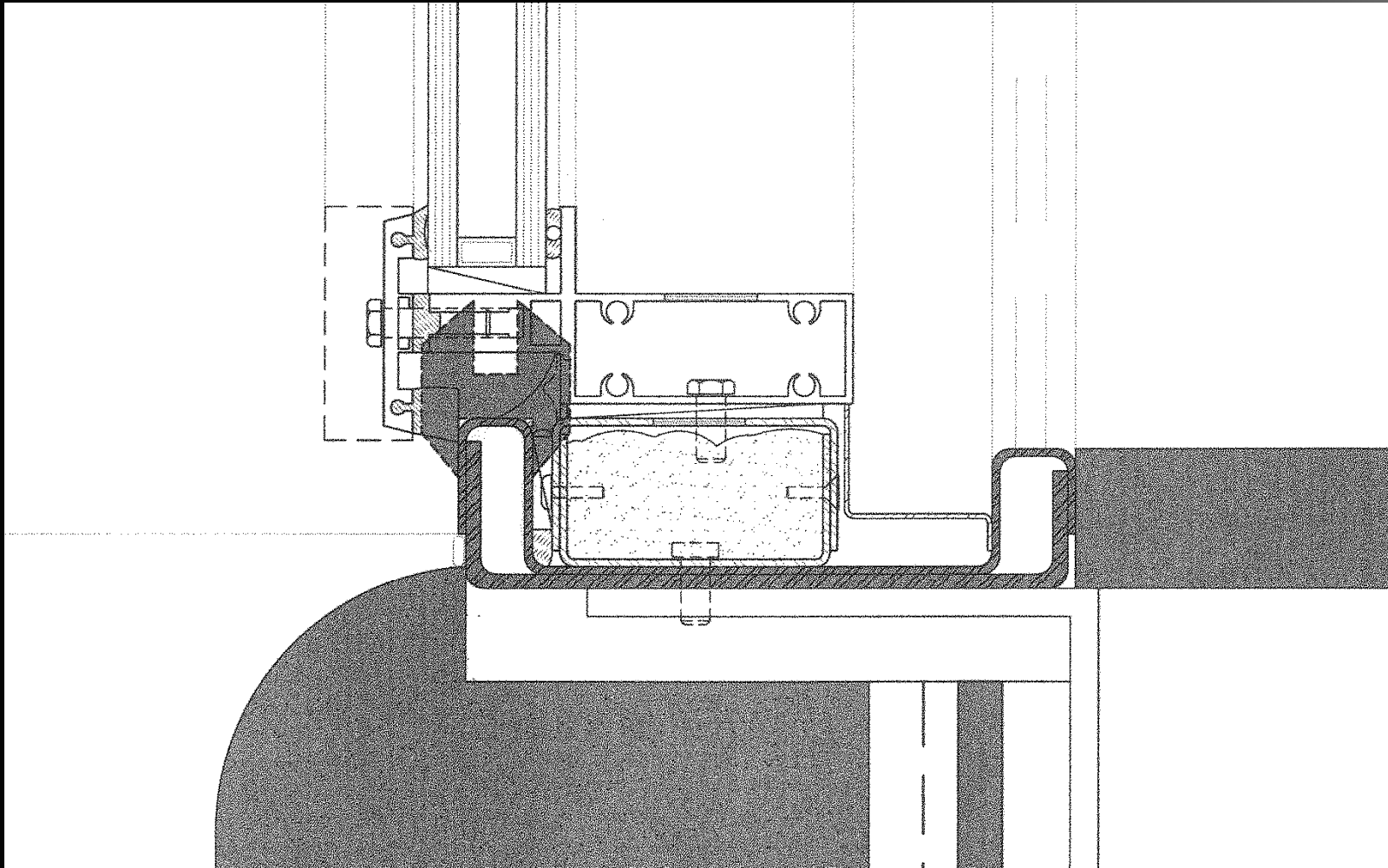
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Projected Benefits?



- Annual saving 800,000 kWh and 10,000 klbs of steam
- Equivalent to eliminating 1,900 tonnes of greenhouse gases each year
- Reduced environment related complaints by over 90%

Questions?