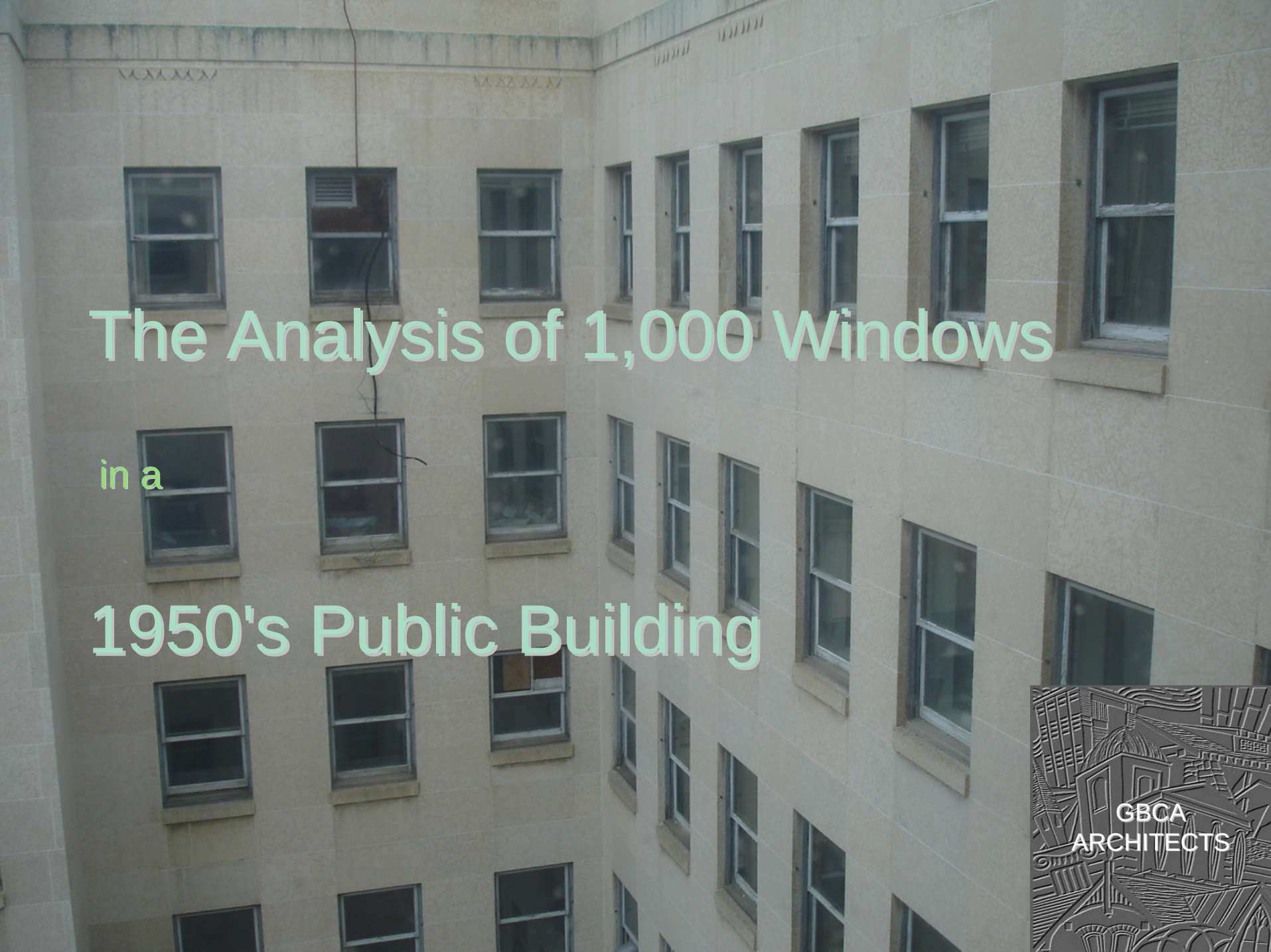
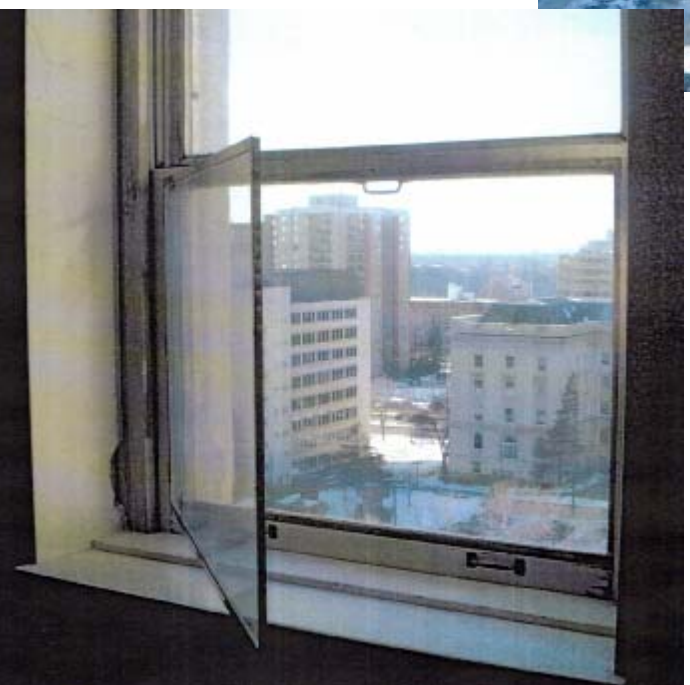

The Analysis of 1,000 Windows
in a
1950's Public Building
GBCA
ARCHITECTS

Issues

- Major redevelopment of a public building in western Canada
- Heritage considerations of minimum intervention, reversibility, and preservation of heritage character
- Building Envelope issues of thermal performance, maintenance, and appropriate performance
- LEED issues of recycling, performance
- Costs, timing and construction management issues
- Need to complete the project in a timely way, risk of delays, issu weather and build-ability



Design

Wood windows with hinged and screw-attached sull sashes to provide double glazing

Windows were repairable. Of 1084 units, only 10 were in very poor condition

Thermal performance slightly lower than modern aluminum units

GBCA
ARCHITECTS

Condition

Windows were repairable. Of 1084 units, only 10 were in very poor condition

Original estimates suggested repairs to sash would be in the order of $2,000 each. Final costs approached $4,000 including removal and reinstallation

GBCA
ARCHITECTS

Procedures

Detailed examination of all units

Removal of two units for testing removal and for mock-up repairs

GBCA ARCHITECTS

Life-Cycle Analysis for Window Options

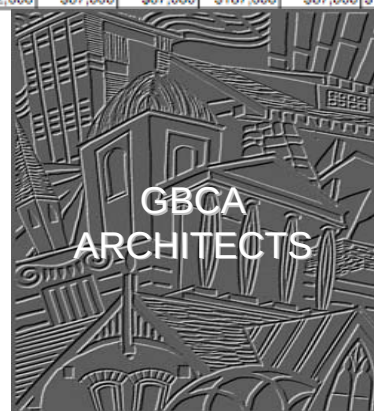
Procedures

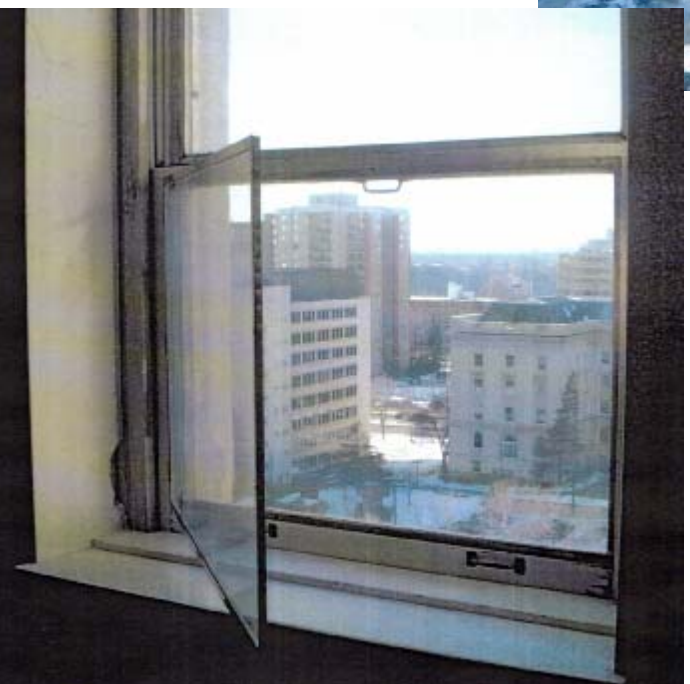
Activity	YEAR 0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36	37-38
EXISTING REFURBISHED WINDOW																				
1. Capital Costs																				
1.1 Removal and repairs of existing window sash																				
1.2 Repair of existing wood window frame (in-situ)																				
1.3 Supply and installation of a new interior sash																				
1.4 Supply and installation of new sealant (int. & ext.)																				
2. Operating Costs																				
2.1 Energy consumption												$0	$0	$0	$0	$0	$0	$0	$0	$0
3. Maintenance Costs																				
3.1 Ext. touch-ups														$100,000					$100,000	
3.2 Ext. sealant replacement																				
3.3 Int. window repainting																$250,000				
3.4 Replacement I.G. unit																				
3.5 Gasket replacement (weather stripping sull sash)																$75,000				
3.6 Ext. window cleaning												000	$55,000	$55,000	$55,000	$55,000	$55,000	$55,000	$55,000	$55,000
3.7 Int. window cleaning												000	$32,000	$32,000	$32,000	$32,000	$32,000	$32,000	$32,000	$32,000
Sub-Total												000	$87,000	$187,000	$87,000	$752,000	$87,000	$87,000	$187,000	$87,000

Repairs of two units (one sealed the other operable)

Analysis report

1. LEED points by keeping existing windows and avoid
2. Coefficient of expansion for aluminum is greater than wood





The Heritage Perspective

Retention would preserve heritage character, be considered a minimum intervention and be re-useable into the future

Thermal performance only slightly lower than modern aluminum units

However, building was not designated and therefore had minimal heritage protection

GBCA ARCHITECTS

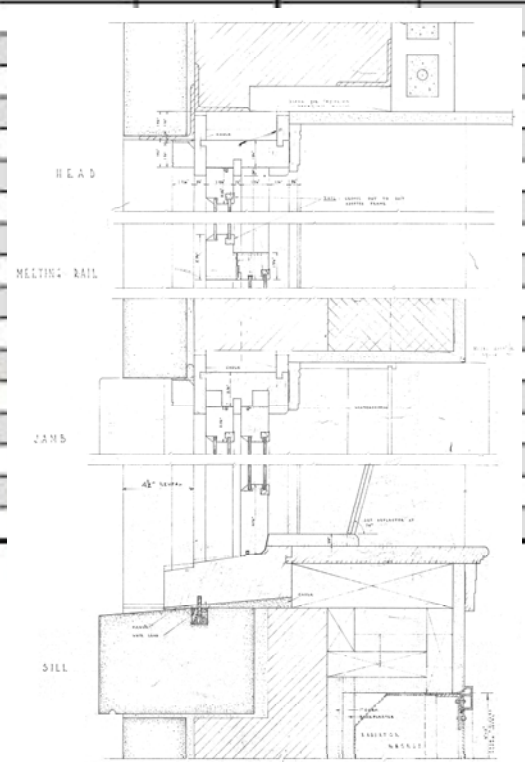
Building Science Perspective

TEMPERATURE GRADIENT - OPTION 1 (EXISTING WINDOW ASSEMBLY)

COMPONENT	#	R (SI)	R/RT	SUMMER ▲T	SUMMER T	WINTER ▲T	WINTER T
EXTERIOR T							-32.00
EXT. AIR FILM	1	0.030	0.088			4.76	
							-27.24
6mm Glass	2	0.010	0.029				
							-25.6
15mm Air space	3	0.170	0.500			27.00	
							1.35
2-3mm Glass (sull sash)	4	0.010	0.029			1.59	
							1.24
	5					0.00	
	6						
	7						
	8						
	9						
	10						
	11						
INT. AIR FILM	12					19.06	
INTERIOR T							22.00
TOTAL						54.00	

Total R (Imperial)

EXTERIOR TEMPERATURE:
INTERIOR TEMPERATURE:
RH %
DEW POINT:



TYPICAL WINDOW DETAILS

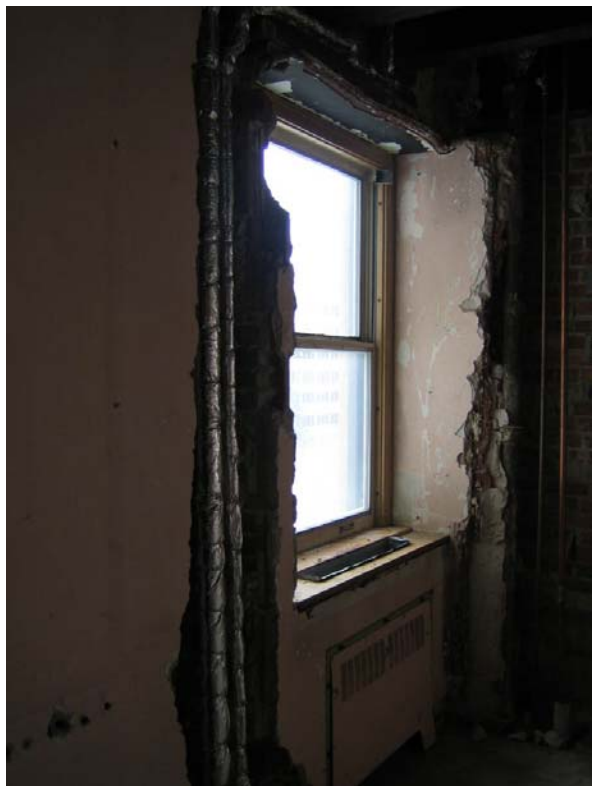
Lower thermal efficiency than modern windows

Risk of hidden defects

Difficulty in connecting to exterior wall air barrier system

Unknown life span

Unfamiliarity with performance of heritage assemblies



The LEED Perspective

Saving existing would divert approximately 25 tons of material from landfill

Thermal performance might be less than for new units

A taker was found for the sash units thus diverting sufficient material from landfill to allow for 1 LEED point

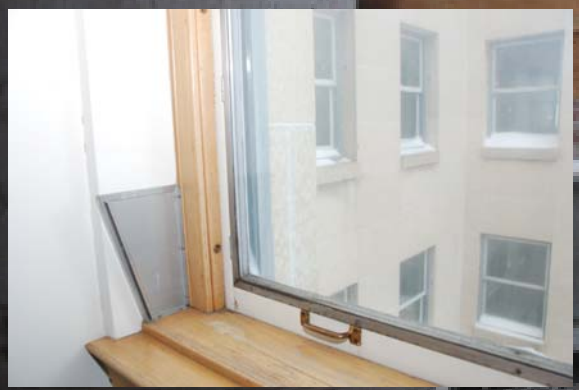
GBCA
ARCHITECTS

The Construction Management Perspective

Schedule to repair windows on buildings could not be met

Insufficient trades in community to do repairs of this magnitude

Risk of warranty issues related to repaired units



GBCA ARCHITECTS

Project Management Perspective

Risk of slowing project to a point causing potential subsequent political risk of abandonment

Long term maintenance a concern due to operating costs and staff availability

Perception that modern units would perform better than heritage units

GBCA ARCHITECTS

Outcome

Windows will be replaced with modern multi-glazed units

Design of new units under way to be similar to appearance of original windows

Cost, labour availability, cost of maintenance, and risk avoidance major reasons

Lack of heritage designation, and lack of appropriate LEED scoring system contributed to decision

GBCA
ARCHITECTS