THE REAL ESTATE HOT POTATO – CHALLENGES AND SOLUTIONS FOR WHOLE-BUILDING RE-CLADDING PROJECTS

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ABSTRACT

North American urban centres contain hundreds of mid-20th century mid- and high-rise buildings, many of which have cladding systems approaching the end of their design service life. There are many options available to building owners, including: continued maintenance; selective repair or replacement; large scale systems replacement, or; whole-building renewal and re-cladding. These interventions typically provide opportunities for extending the useful life of a building, addressing ongoing performance concerns, reducing energy consumption, improving occupant comfort, and updating a building's aesthetic.

Building renewal projects are subject to an array of market challenges: the 'Class' ceiling, static revenues, existing tenants and lease agreements, rent pressures, vacancy rates, capital expenditure forecasts, leasing partnerships, etc. Further, there are very few examples in the marketplace that demonstrate whether whole-building recladding projects have an attractive return on investment.

This session will provide an overview of the existing buy, hold, and sell approach – or "real estate hot potato" – that can leave buildings in a deteriorated state and owners at risk. We will analyze the building renewal 'decision arc' for existing building owners using case studies and will assess factors leading to building renewal such as risk mitigation, measured and predicted cladding deterioration, revenue generation, and improved aesthetics. This session will include information on the steps and processes used to move building renewal from an idea to implementation and will provide useful information to owners, designers, and contractors exploring opportunities in the building renewal market

INTRODUCTION

"It'll last forever!" How often have you heard this statement from a confident designer, consultant, or contractor? While this statement may express our aspirations, the reality is very different. Enduring buildings must be well designed, durably constructed, and regularly maintained – and maybe, just maybe they will last forever.

THE BUILDING LIFE CYCLE

The life cycle approach to building enclosure design is a well-worn, embedded in two relevant standards:

CSA S478: Guideline on Durability in Buildings (Canadian Standards Association, R2007) and CSA Z320: Building Commissioning Standard (Canadian Standards Association, R2016). These standards are useful during the design, construction, and commissioning stages for new developments and provide useful guidance for defining ongoing maintenance and repair activities. Other standards and processes such as ASTM E2018: Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process (ASTM, 2015) and Reserve Fund Studies provide useful guidance for assessing existing facilities and the prioritizing of funding for maintenance and repairs. Unfortunately, none of these provide the necessary framework for a nuanced evaluation of building enclosures that encompasses physical condition, anticipated future maintenance, market forces, and the occupant experience. Further, existing building studies such as condition assessments and reserve fund studies typically exclude exploratory openings or physical testing, which can leave large gaps in the knowledge necessary to contribute meaningfully to the decision arc of façade renewal.

As buildings age, it is important to look beyond reactionary repairs and 10- and 30-year capital forecasts, and to start analyzing opportunities for building renewal. Figure 1 (WSP Canada, 2016) illustrates a lifecycle approach to buildings and, at the center, a proactive management approach. Building owners need to understand existing asset condition and have a clear sense of their direction for the asset to navigate the façade renewal process. This process should encompass every building system, including: structural, mechanical, electrical, vertical transportation, and façade access; however, to simplify, this paper will focus

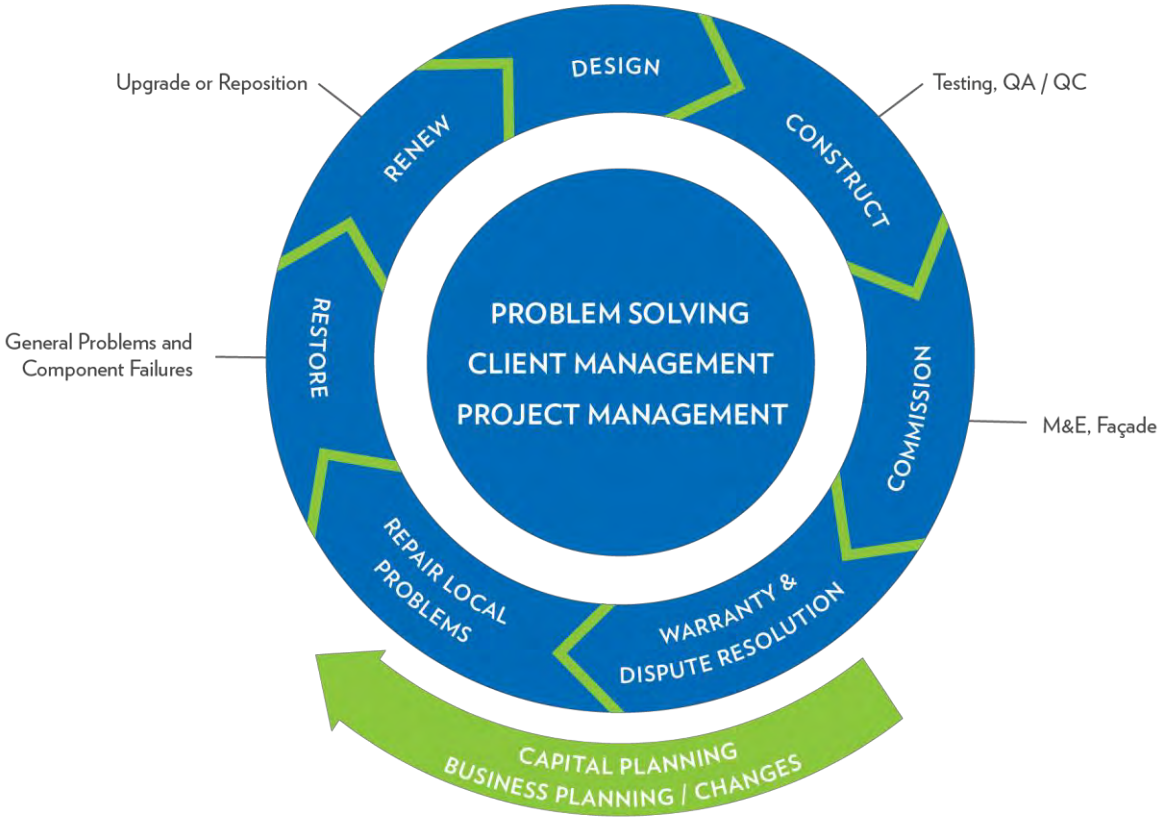

Figure 1: The Building Life Cycle

primarily on the building enclosure.

BUY – HOLD – SELL: THE HOT POTATO

Market forces such as capitalization rates, vacancy rates, Class categorization, and lease terms can be dominant in the journey toward façade renewal. Commercial real estate professionals see assets as a revenue tool: they are intended to make money. Capital expenses must be weighed against ongoing revenues, building value, and ongoing maintenance requirements.

Two key metrics help commercial real estate professionals evaluate existing buildings: Capitalization Rate (Cap Rate) and Return on Investment (ROI).

"Capitalization rate is the rate of return on a real estate investment property based on the income that the property is expected to generate. The capitalization rate is used to estimate the investor's potential return on his or her investment" (www.investopedia.com, June 2017). In other words, a building's cap rate is the net income (income minus expenses) expressed as a percentage of the initial purchase price. Income sources can include lease payments, rentals, and advertising, while expenses can include cleaning, maintenance, small repairs, and, in some cases, heating and cooling. Consider an asset with a net income of $7.5M. If this asset sells for $120 million, the Cap Rate is 6.25%; if the asset sells for $150 million, the Cap Rate is 5%. So, lower cap rates can signal higher asset valuation or lower net operating incomes – both of which can be directly related to building performance. Cap rates, however, are only a snapshot of valuation and primarily are useful when buying and selling a property.

Return on investment (ROI) is another tool used to evaluate whether a building is profitable and generating sufficient value for an owner. ROI includes the amount of principal loan repaid, reducing lending costs with time and further improving returns. The ROI approach can be particularly susceptible to manipulation via deferred maintenance since reduced expenses can show short-term increases on net income and higher apparent returns. ROI can be mistakenly applied to façade renewal in an attempt to justify the work based on quantifiable metrics such as energy savings. While such savings may occur, façade renewal is too complex to evaluate it by a single such metric. Lastly, neither Cap Rates nor ROI account for occupant comfort, lease rates, or building class but they do factor into resale and asset value.

Regardless, what does any of this this have to do with façade renewal? I call it the real estate hot potato: deferring maintenance to improve short-term asset valuation or ROI, hastening the onset of façade deterioration.

Some Owners may view their asset as a long-term hold, electing to implement a significant capital project such as façade renewal; some may view their asset as a land placeholder, choosing to implement minor short-term capital projects until sale or redevelopment is viable; some may not have a definite long-term plan, choosing to maintain the building in a safe condition and re-evaluate façade renewal options at a later date. But let there be no mistake: every existing building you see is a case study in façade renewal waiting to happen.

The following three case studies are not technical reviews; rather, they provide real-world examples of different approaches to an asset depending on the Owner's position for the property.

Case Study 1 – Commercial Office – Maintain & Hold Example

This building occupies a prominent urban site and is located next to a major commuter hub. The building has been in the Owner's portfolio for approximately 15 years and is adjacent to a large contiguous urbanized land area under the same ownership. Table 1 provides a summary of the project, including a brief service history.

Table 1: Project summary - Case Study 1

Project History	
Date of construction:	Early c1980s
Enclosure system:	Aluminum-framed curtain wall, minimal thermal break, EPDM sheet horizontal expansion joint
Vision units:	6mm clear outer lite with reflective low-e on surface #2, 12mm air-filled cavity with aluminum spacer, 6mm clear inner lite, fully captured
Spandrels:	Insulated metal back pan, air cavity, stainless steel composite panel cladding, hung from vision sill mullion and laterally restrained
Service history (pre 2006):	Delaminating panel skins identified c1995; retrofit fasteners installed to secure panel skins c1999; retrofit fasteners failing and panel skin deformation occurring; low rate of IGU failure.

The Owner required a cladding assessment in response to continued deterioration of the cladding panels. The deterioration generally consisted of fasteners becoming dislodged, panel skins becoming deformed, and panel skins continuing to delaminate. The assessment identified several key findings:

1) 10% - 15% of the original fasteners used to secure the panels to the horizontal pressure plate were loose.
2) The original fasteners provide secondary panel skin securement on the top and bottom horizontal returns of the flat panels but not on curved corner panels. The internal skin-securement fasteners on the curved corner panels were failing.
3) Approximately 20% of the retrofit fasteners were missing or loose.
4) The retrofit fasteners were restraining the normal movement of the panels since they were installed above and below the movement joint.
5) The curtain wall system, IGUs, back pans, insulation, and stack joint membrane were in serviceable condition.

Based on the assessment, a securement plan was developed to address safety concerns at the curved corner panels. Other elements of the cladding system, including the flat cladding panels, IGUs, spandrel back pans,

and insulation generally were in serviceable condition and not identified as requiring immediate repair. Loose and missing fasteners were addressed on an ongoing basis during regular cleaning and panel securement was monitored.

With immediate concerns addressed, the Owner was able to evaluate whether re-cladding or façade renewal were viable options for this site and whether other aspects related to the occupant experience could be addressed. A subsequent re-cladding study included options for improving daylighting, improving views to the exterior, addressing cooling capacity concerns, and significantly extending the service life of the cladding system.

The study developed several retrofit scenarios based on HVAC limitations, thermal performance, energy performance, comparative daylight analysis, and schematic 3-D renderings. The following four options were presented to the client:

1) Maintain:
   a) Re-secure existing system and install new fasteners where missing
   b) Remove the retrofit fasteners, seal defunct holes, and install new fasteners to reinstate the design intent (i.e. allow differential movement)
2) Selectively Replace: Replace the stainless steel cladding with similar looking metal panels (not including IGU replacement, which was anticipated within the next 10 years)
3) Fully Renew: Replace the stainless steel cladding with similar looking metal panels and replace the solar reflective IGUs with optically clearer IGUs while maintaining necessary solar control
4) Re-Clad: Replace the curtain wall system to provide new metal panels and a larger vision area with optically clearer IGUs

Table 2 summarizes each option and comments on how each option addresses client-directed priorities:

Table 2: Re-cladding options summary table.

Attribute	Option 1	Option 2	Option 3	Option 4
Risk Mitigation	Low	Moderate	High	High
Tenant disruption	Low	Moderate	Moderate	Significant
Aesthetics	Low	Moderate	High	High
Maintenance requirements	High	Moderate	Low	Low
Implementation	Rapid	Rapid	Phased	Phased
Daylight Improvement	None	None	Significant	Significant
Thermal Improvement	None	Low	Low	Low
Energy Savings	None	Low	Low	Low

Service Life * Excluding IGUs ** mid-life IGU replacement	1a: 3-5 yrs 1b: 5-8 yrs	20-30 yrs *	20-30 yrs	40+ yrs **
Capital Cost (Estimated)	1a: $300K 1b: $2M	$15M	$25M	$38M
Ongoing / Future Costs (Estimated)	1. $20K / yr for inspection 2. $2.5M/yr for 6 years for IGU replacement 3. $15M for future recladding	$2.5M / yr for 6 years for IGU replacement	None planned for 20 years	None planned for 20 years

Based on the options presented, the client determined that their preferred approach was Option 1b. With the exception of the cladding fastener issues, the building enclosure was performing satisfactorily, the IGUs were in serviceable condition, and the building is well tenanted. These factors contributed to the decision to delay potential recladding; the decision arc for this property includes potential for future redevelopment or site intensification.

Case Study 2 – Commercial Office – Façade Renewal Example

This study involves two adjacent high-rise office buildings, located in the financial core of a large urban centre. The buildings have been in the Owner's portfolio for many years and occupy a portion of a large urban site containing two other buildings and a recently-completed new high-rise office tower. Table 3 provides a summary of the project, including a brief service history.

Table 3: Project Summary - Case Study 2

Project History	
Date of construction:	Tower 1: Mid c1960s Tower 2: Late c1970s
Enclosure system:	Aluminum-framed curtain wall, minimal thermal break, back-pan deflection interface at stack joint
Vision units:	6mm grey-tinted outer lite, 12mm air-filled cavity with aluminum spacer, 6mm clear inner lite, fully captured
Spandrels:	Insulated metal back pan, air cavity, 3mm thick aluminum cladding panel, hung from vision sill mullion and laterally restrained

Service history (pre 2012):	Water infiltration, high rate of IGU failure, localized panel deterioration (failed clips)

The Owner requested a detailed cladding assessment in response to ongoing performance issues such as water infiltration, IGU failure, and cladding panel deterioration. The assessment included an interior and exterior visual review, exploratory openings, infrared thermography, and frost-point testing of the glass in accordance with ASTM E576: Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position. The assessment identified several key findings:

1) Approximately 25% of the panels reviewed had retrofit fasteners for securement.
2) Approximately 5% of panels exhibited some movement indicative of loose or detached securement clips.
3) Backpan corrosion and evidence of water infiltration was prevalent at Tower 1. Back pans were in satisfactory condition at Tower 2.
4) Approximately 30% of original IGUs had failed; remaining IGUs had a predicted remaining service life of up to 10 years.

Based on the assessment, the Owner recognized that the current maintenance strategy of selective IGU replacement for both towers was insufficient: current IGU replacement rates were below the rate of failure; the short remaining service life for IGUs would mean 100% replacement in the next 5-10 years; the cladding panels were aged and retrofit fasteners had negatively affected their appearance, and; chronic water infiltration required face sealing and periodic maintenance or holistic retrofit.

The context of the towers further influenced discussions regarding cladding renewal. Over the past 10 years, upgrades had been conducted on several neighbouring buildings, including: re-cladding to two adjacent towers, redevelopment and restoration of an adjacent mid-century mid-rise, restoration of an early 20th century masonry office block, and the construction of a new all-glass, Class AAA high-rise commercial office building. Within this context, the existing buildings appeared ripe for re-cladding since re-cladding would provide a renewed visual aesthetic and could be designed to address all of the ongoing performance concerns.

A major capital project such as overcladding requires extensive investigation, careful planning, detailed financial analysis, and, in most cases, patient tenants.

To address the technical challenges related to overcladding, a detailed investigative and design process commenced followed by tabletop and in-situ mock-ups to determine how overcladding could be achieved with minimal disruption and within the desired aesthetic.

The investigative work included a detailed surveying of the existing cladding systems, assessing details at transitions to adjacent assemblies, exploratory investigations of embedded anchorage, evaluating the capacity of existing framing systems, modeling anticipated wind loads via wind tunnel testing, and testing for the presence of designated substances.

In addition to the technical challenges of designing an overcladding system, the Architect designed new

details for how the overcladding would resolve at areas outside the scope of work, including, ground floor lobbies, roofs, and adjacent abutting buildings. Consideration was also given to re-cladding the penthouse at one tower to strengthen the visual connection to the renewed façade.

Concurrent to this technical effort, the Owner's team analyzed several financial aspects of the project. The Toronto Downtown vacancy rate for Q1 2017 is 4% and availability rate is 6.8% (Colliers International, June 2017). Both have trended up since Q1 2016, which reflects the completion of several major new office towers in this region. Despite increasing vacancy and availability rates, completion of new buildings, and ongoing construction of additional new buildings, rental rates in Toronto Downtown have remained stable since Q1 2016 (Colliers International, June 2017). In this context, it appears that a slight increase in rent could be achievable without disrupting tenant stability. Further, a renewed façade could contribute to retaining existing tenants or attracting new tenants who may otherwise select space in a newer building. This renewal project may help to stabilize rents in these aging buildings as they appear more and more dated within their surrounding context.

The final step in evaluating the viability of overcladding involved obtaining firm pricing. During the design process, several vendors were consulted and indicative pricing was obtained; however, the Owner needed final confirmation on the total project cost prior to committing to the work.

To obtain competitive pricing, the design documents were prepared by the consulting team and tendered as a design-build project. The process of developing design documents for a design-built process also revealed some unique aspects to overcladding and working on existing buildings.

The Architect and cladding consultant worked closely to translate the desired design aesthetic into technically-feasible solutions. For example, aesthetic requirements such as joint sizes, glass sizes, glass types, frame colour, sealant and gasket colour and location, sight lines, etc. were reconciled with building movements, tolerances, existing frame plumb-ness and square-ness, building creep and shrinkage, thermal expansion and contraction, etc.

Once the team was comfortable that a technically-feasible solution could be achieved, much of the detail was stripped out. The design-builders were presented with the aesthetic and performance requirements as well as a concept of a viable solution. This approach allows the design-builder to develop their own unique and innovative solution while meeting the aesthetic and performance requirements. This approach also puts the onus on the design-builder to be fully responsible for the design solution, reducing the Owner's risk.

In addition to the design concepts, the design-build documents included the performance requirements, existing building assessment reports, test reports, wind studies, etc. Design-Build proponents were permitted to conduct limited investigations via swing stage to evaluate existing building conditions first-hand to help reduce uncertainties and improve pricing. All told, competitive tendering yielded pricing that was 20%-30% lower than earlier indicative pricing with each bidder providing their own unique solution for the project.

This project highlighted the extensive amount of information required to develop a re-cladding or overcladding solution. All told, the concept design presented to the design-builder is the culmination of approximately two years of work by the designers and approximately five years of extensive site

investigation data. The decision arc for this project included considerable site context with the development or redevelopment of buildings in the immediate area, the risk to existing rental rates and vacancies, and a need to address ongoing performance concerns.

Case Study 3 – Commercial Office – Maintain Example

This study involves a large site with two commercial office buildings linked by a low-rise podium, located in the midtown area of a large urban centre. The buildings have been in the Owner's portfolio for approximately 3 years and are adjacent to a large potential development site. In general, the site is underdeveloped based on current density patterns in this city. Table 4 provides a summary of the project, including a brief service history.

Table 4: Project summary - Case Study 3

Project History	
Date of construction:	Tower 1: Early c1960s Tower 2: Early c1970s
Enclosure system:	Aluminum-framed curtain wall, localized precast cladding on Tower 1
Vision units:	6mm clear outer lite, 12mm air-filled cavity with aluminum spacer, 6mm clear inner lite, fully captured
Spandrels:	Single lite, back painted spandrel glazing, fully captured. Tower 1 includes insulation adhered to spandrel glazing with no backpan assembly; Tower 2 includes an insulated backpan assembly
Service history:	Face sealing

The Owner required a detailed cladding assessment of this newly acquired asset to help understand how the cladding condition may affect the near- and long-term development plans for this site. Our work was aimed at determining the composition of the cladding systems, identifying moisture management and thermal performance, summarizing functional defects, and determining the remaining useful life for cladding assemblies. The Owner was considering long-term maintenance requirements under a 'hold' mandate, which would retain existing cladding elements or a redevelopment mandate, which involve significant changes to the structure and/or cladding. In addition to the cladding assessment, we conducted a structural analysis for vertical expansion and partial demolition and 10- and 30-year capital forecasts to help frame redevelopment discussions.

The assessment included a document review, structural analysis, interior and exterior visual review, and exploratory openings. The assessment identified several key findings:

1) Tower 1 experiences periodic spandrel glass breakage. Tower 2 was face-sealed in the early 2000's in response to reports of water infiltration. Internal drainage channels are blocked.
2) Tower 2 has spandrel-integrated HVAC delivery, contributing to air leakage. Tower 2 has deteriorated weather seals and blocked internal drainage channels.
3) The IGUs in both buildings have reached the end of their theoretical service life but replacement rates are low.
4) With moderate reinforcing, Tower 2 could accommodate approximately 5 to 8 additional storeys.

This project is nascent and is included here to highlight an inflection point: the preferred direction for cladding maintenance or renewal is highly dependent on the Owner's plans for the asset. A desire for full-building renewal for Tower 1 may lead to a path of temporary hazard mitigation and eventual tower demolition – or to cladding demolition and re-cladding. A desire to renew or 'top out' Tower 2 may lead to a path of temporary water leakage control while implementing a plan for re-cladding, integrating the new vertical expansion.

CONCLUSION

The decision arc to façade renewal is often protracted: extended investigative periods, technical and logistical challenges, non-technical experiential realities, financial analyses, changes in ownership, temporary hazard mitigation, and interim repairs. Cladding specialists can also deploy creative solutions to extend the life of commercial cladding systems for years and allow Owners to delay their decision on renewal – or to sell the building and move on to different opportunities. All along, there are many things that can complicate the decision to execute.

Is it worth executing a $30M re-cladding if the building is valued at $150M? How does the work affect future value or protect existing values in the context of adjacent new developments? Can the market support lease rate increases to improve paybacks on cladding improvements? Will improved aesthetics, performance, and occupant comfort reduce vacancies or help in retaining existing tenants? Can we develop full-building renewal strategies to integrate HVAC and drive down energy consumption, costs, and carbon?

Two of these cast studies represent engagement with the same existing owners, managers, developers, and maintenance staff over a 10+ year timeline. The third case study provides a glimpse of a site at the beginning of their decision arc – and there are many questions left to answer. Ultimately, they all highlight the necessity for accurate and consistent reporting, technical rigour, creativity, and a necessary understanding of Owner-driven redevelopment realities. They demonstrate how interim solutions can address ongoing performance issues while permitting future potential redevelopment or re-cladding. And they provide a sound perspective on the processes and technical challenges in realizing renewal.

REFERENCES

CSA S478: Guideline on Durability in Buildings, Canadian Standards Association, R2007

CSA Z320: Building Commissioning Standard, Canadian Standards Association, R2016

ASTM E2018: Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process, ASTM, 2015

The Building Life Cycle, WSP Canada, 2016

Greater Toronto Office Market Research & Forecast Report, First Quarter 2017, Colliers International, June 2017