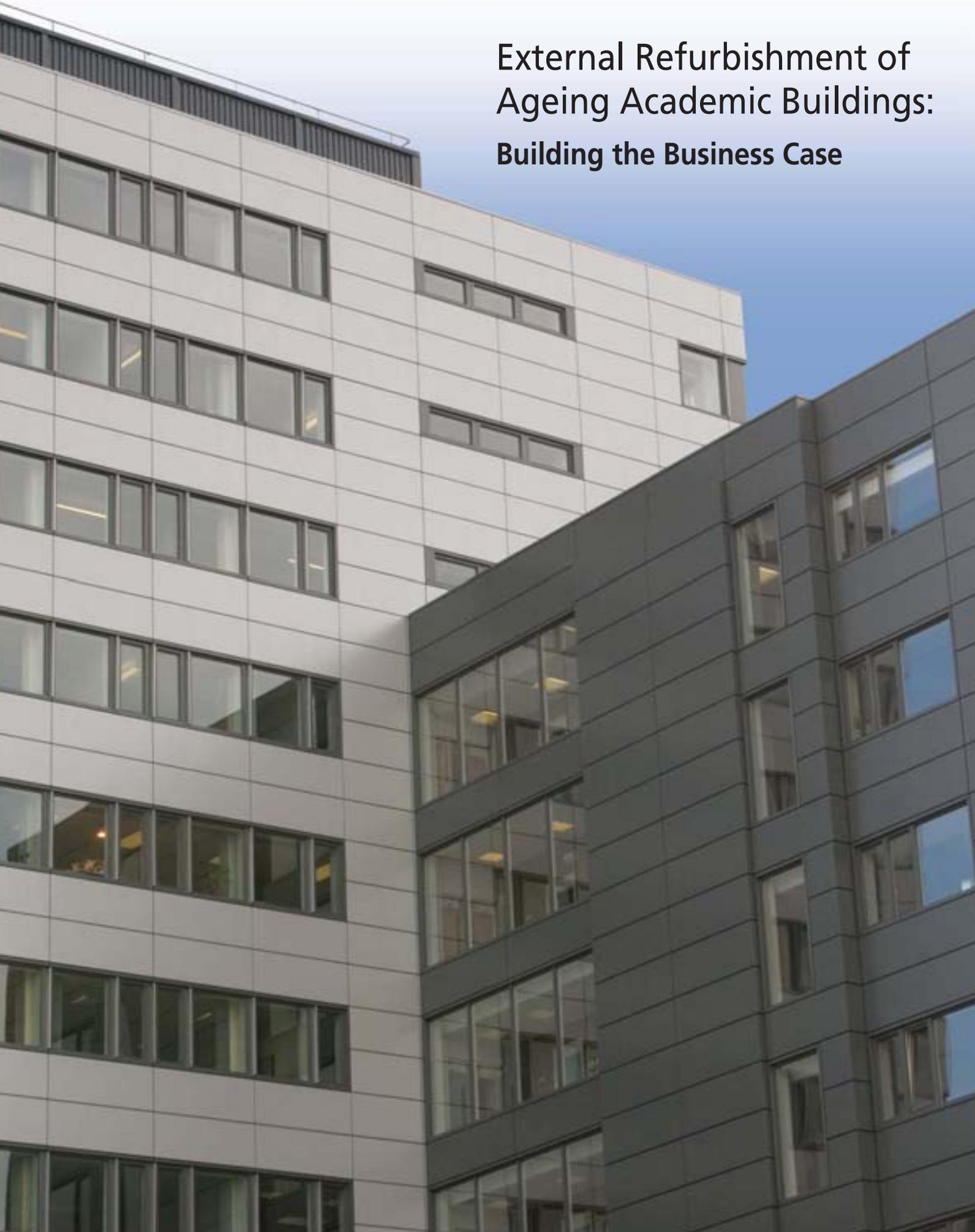


External Refurbishment of
Ageing Academic Buildings:
Building the Business Case





Cottrell Building, University of Stirling, before.



Cottrell Building, University of Stirling, after.

EXECUTIVE SUMMARY

The mission of Estates Departments is to efficiently deliver high quality facilities and services which are compliant and meet the present and future needs of the academic institution, thereby supporting the primary objectives of the Corporate Plan. With recent cuts in educational budgets, the challenge is to execute a progressive estates strategy commensurate with delivering best-value from diminishing public funds.

More than 40% of University estates' buildings were constructed in the 1960's and 1970's and many of these buildings now offer sub-standard accommodation which is unacceptable and inconsistent with institutional goals. Undesirable dated building stock is rapidly approaching the end of its useful life as determined by lack of demand, becoming non-compliant with legislative environmental requirements for reduced carbon emissions and/or uneconomic to operate and maintain.

Estates Departments have three options available to them for ageing buildings:

- Leave and maintain
- Demolish and rebuild (replace)
- Refurbish

Leaving and maintaining old stock does nothing to address the contemporary challenges facing institutions and compromises their ability to deliver the Corporate Plan. Rising energy costs and age-related structural deterioration mean that these undesirable buildings will become economically and environmentally unviable.

Replacement of ageing buildings has a huge environmental impact, releasing embodied carbon from demolition and increasing the estate's overall carbon footprint as a result of new-build. Large scale capital projects are costly, carry high risks and in the present economic climate are no longer an appropriate mechanism for dealing effectively with ageing building stock.

External refurbishment delivers the building performance requirements of a new-build equivalent for typically 10-15% of the cost and has low environmental impact. Thus it is the only option which fulfils all the economic, environmental and social criteria of sustainable development. In meeting its obligations to support the strategic aims of the establishment's Corporate Plan, the Estates Department should consider refurbishment of ageing academic buildings as the preferred option.

Procurement of external refurbishment is complex and the procurement mechanism chosen will directly influence the speed, cost and efficiency of the process by up to 40%. These potential savings can only be fully realised by first acknowledging the specialist nature of the work and then adopting a different approach to that used traditionally in the wider construction industry (**as advocated in the Egan Report - 'Rethinking Construction'**) by appointing a specialist lead consultant very early in the process. The competitive tender process for this early appointment will still meet legislative requirements but greater selection emphasis can be placed on proven track record of success in this specialist field. Competitive compliance and early appointment of the whole specialist delivery team are thus dovetailed and will ensure that costs are minimised and the whole delivery process streamlined and expedited.

Purpose

The purpose of this document is to collate and present all the arguments for refurbishment in a clear, cogent and transposable manner from which the document's recipients can create a tailored, compelling business case, specific to their building and institution, which can be shared with key stakeholders in the influencing and decision-making processes.

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1. Strategic Fit

The institution's Corporate or Strategic Plan articulates its mission and aims including the high level strategic objectives which cascade down to the academic faculties and administrative departments responsible for underpinning and delivering it. Whilst institution-specific, all Corporate Plans include commentary on academic standards of teaching, learning and research, meeting the challenging and changing needs of society and industry, communicating the significance, purpose and benefits of their activities, concepts of innovation and entrepreneurship etc.

Importantly, all Corporate Plans also include aims to:

- Attract the best students and those most likely to benefit from further or higher education
- Attract and retain staff of the highest calibre
- Become financially sustainable
- Provide high quality facilities appropriate to the institution
- Create an environment conducive to learning
- Comply with environmental, safety and health legislation
- Enhance the student experience
- Ensure high levels of student satisfaction
- Establish an internationally recognisable brand
- Evolve with the changing higher education national agenda

Fulfilment of many of these aims is directly linked to the Estate Strategy which provides a framework for accommodation planning in its broadest context and describes the present and future facilities required to deliver the Corporate Plan. In considering maintenance, improvement and development of the estate, its environmental performance, proposed capital programmes, preferred development options etc, the Estate Strategy has a vital role to play in delivering many of the aims of the Corporate Plan.

If the estate is poorly maintained, uninspiring in appearance, provides sub-standard accommodation, delivers unacceptable environmental performance or its developments are uneconomic, the Estate Strategy will have failed the institutional Corporate Plan. Consequently, of the three options for ageing buildings considered in this document only two, demolish and rebuild or refurbishment, are worthy of detailed consideration as only these two can make a positive contribution to the high level aims of the institution.



2. Option appraisal for ageing academic buildings – leave and maintain, demolish and rebuild, refurbish

2.1 Leave and Maintain

Since original construction in the *circa* 1960's, major advancements have taken place in materials and building standards transforming the energy-efficiency of buildings, for example insulation standards alone have improved eight-fold. Many academic buildings of this period are single glazed with poor thermal performance of the building fabric and are thus increasingly expensive to heat as the cost of energy continues to rise rapidly.

Since their construction, materials used in the original façade will have been subject to considerable deterioration permitting water ingress and air infiltration. This results in growing annual maintenance and servicing costs and often a backlog of maintenance work for many Estates Departments already struggling to keep buildings operational even at minimum levels of performance requirements. In more severe cases it gives rise to health and safety compliance risks as eroded facades begin to crumble. Just maintaining buildings incurs significant expenditure and does nothing to generate additional income to support this work.

The underperforming façade also contributes to a correspondingly poor internal environment. Lack of insulation means that buildings are frequently cold in winter and uncontrolled solar gain makes them hot and stuffy in summer. Internal dampness is a common problem where water ingress has taken place through degradation of the façade. This creates poor learning, teaching and living conditions for students and staff alike.

The result of this combination of escalating costs of heating and maintenance is that without intervention the asset value to the estate is continually being eroded and the life expectancy of these buildings is rapidly diminishing. Many are approaching the point where they will become uneconomic to run either through prohibitively expensive energy consumption and/or there is lack of demand for such sub-standard accommodation.

Facades that appear tired in appearance are also unappealing to prospective students and adversely affect their recruitment. It is also recognised that today's students are much more environmentally aware with a stronger social conscience and will be examining their potential University's green credentials. High energy utilisation as a result of ageing buildings correlates directly with a high carbon footprint and this is increasingly unacceptable to many.

In summary, leave and maintain, the 'do nothing' option, should be totally disregarded on all economic, environmental and social grounds.



2.2 Demolish and Rebuild (Replace)

If option evaluation and decision-making are unconstrained, to demolish and rebuild an ageing building might appear to be the most desirable option to progress. Unless precluded by site-specific constraints, replacement fulfils many of the economic, environmental and social requirements of sustainable development. However, there are many other considerations under which to demolish and rebuild is highly undesirable.

- **FINANCIAL**
 - High financial cost of demolition and rebuilding
 - Decanting costs to temporary accommodation (where available)
 - Disruption costs to ongoing academic activities
 - A common feature of ageing buildings is the presence of hazardous materials such as asbestos. Removing these materials compliantly adds substantially to the overall cost of the demolition and rebuild option
- **ENVIRONMENTAL**
 - The embodied energy of the existing building is lost. Even for poorly insulated buildings of the 1960's and 70's, this amounts to c.12-15% of the building's life-time's energy and is likely to give an overall carbon gain to the entire project
 - The embodied energy of the new building will be a carbon burden increasing the Estate's carbon load at a time when a priority agenda item for Further and Higher Education is carbon reduction
 - Not all materials from demolition will be recyclable, adding further to the project's negative overall environmental impact
 - The processes of deconstruction and rebuild are highly carbon-intensive
- **PLANNING**
 - Planning constraints may impact upon the building's ultimate design
 - The process of seeking planning consent for such large scale projects is time-consuming and expensive
 - New-build projects carry a much higher risk of not gaining planning approval at all
- **DISRUPTION**
 - Disruption to ongoing activities will be high
 - Ongoing activities during construction may have to be suspended
 - For inner-city demolition and construction there will be considerable disruption to neighbouring businesses
- **COMPLIANCE**
 - Wide-ranging health and safety risks during demolition and rebuild
 - Ageing buildings carry a high probability of containing hazardous materials which require specialised and expensive health and safety procedures
- **TIMESCALE**
 - Long project delivery timescale from concept through to completed building
 - Operational carbon savings will not be quickly realised
- **RISK**
 - Demolish and rebuild projects carry a high risk of cost and time over-runs.



Option appraisal

Ellison E Block, University of Northumbria post-external refurbishment.

2.3 Refurbishing the Building Envelope

For most ageing academic buildings, refurbishing the building envelope will deliver wide-ranging benefits to both the academic institution and the building users. In every respect refurbishment meets the highest principles of sustainable development without the drawbacks and risks of the demolish and rebuild option.

Whilst it is recognised that each business case will be building- and institution-specific, the generic benefits of refurbishment have been arranged in clusters below enabling them to be easily transposed into a format which can be shared with stakeholders. Collectively they provide the persuasive 'tool-kit' necessary to construct a compelling business case. By arranging in this way, it allows those involved in building the business case to tailor information to reflect the interests of a particular audience and emphasise those key elements most relevant to their specific building.

2.3.1 The Financial Case

The financial case may be built incorporating elements relating to initial capital expenditure, ongoing costs once the building is commissioned and future revenue generating potential.

| BENEFITS OF REFURBISHMENT | |
|---------------------------|---|
| CAPEX | <ul style="list-style-type: none"> • Capital expenditure is much lower, typically 10-15% of the cost of an equivalent new-build • Repayment of capital from energy savings alone can be achieved in 18 years or less • Whole life cost is extremely attractive as refurbishment will extend the useful life of the building by the new-build equivalent. The new envelope is fully integrated with the existing building providing structural stabilisation to the whole building thus extending its longevity • Refurbishment of multiple buildings permits capital to be phased in-line with budgetary constraints or financial availability, allowing individual buildings to be completed and commissioned unlike the all-or-nothing replacement option • The capital cost will be reflected in increased asset value, thereby improving the balance sheet which can be leveraged for future borrowing capability. Improved operational assets are also improved financial assets. |
| ONGOING COSTS | <ul style="list-style-type: none"> • Refurbishment can be delivered whilst the building remains in full use; there are no decanting costs unlike the replacement option • Improved thermal performance reduces annual heating costs by 70-80% • Maintenance spend is almost eliminated. The rainscreen surfaces are self-cleaning and any deterioration of the existing façade is covered when the building is entirely overclad |



financial case continued

| BENEFITS OF REFURBISHMENT | |
|---------------------------|--|
| REVENUE GENERATION | <ul style="list-style-type: none"> • Enhances the brand giving rise to financial sustainability through corporate recognition and increased national and international competitiveness • Improved quality of accommodation gives potential for increased accommodation rental income • Greater commercial appeal to the growing conference market and other vocational uses will generate additional income supporting the financial case for the project's capital expenditure |

2.3.2 The Environmental Case

Environmental considerations are at the very top of the academic agenda, not only for reasons of legislative compliance but also through heightened social conscience. The mitigation of carbon emissions has become a key element of sustainable development and all academic institutions have signed-up to the Carbon Reduction Commitment (CRC) developing institution-specific targets.

| BENEFITS OF REFURBISHMENT |
|---|
| <ul style="list-style-type: none"> • Maintains and recycles the embodied carbon of the existing building making a first-year carbon-saving contributing significantly towards achieving carbon reduction targets • Achieves at least the same level of building performance as that of an equivalent new-build with the same corresponding level of operational carbon efficiency • Energy consumption post-refurbishment will be reduced by 70-80% reducing carbon emissions by the same amount • Predominantly recycled materials are used in construction of the new building envelope which themselves are 95% recyclable at the end of their useful lives • Refurbishment projects have a much smaller embodied environmental impact than demolish and rebuild projects • Aluminium rainscreen and NorDan replacement windows are highly durable thereby extending the refurbishment lifecycle to new-build equivalence • Many buildings from the 1960's and 70's contain hazardous substances such as asbestos within the existing envelope. Overcladding does not disturb these materials and they remain contained <i>in situ</i> when the new envelope is constructed over the top • Refurbishment has a much lower environmental impact assessment than the replacement option: considerably lower impact from overall site operations, limited waste materials for disposal compared with demolition, insignificant environmental pollution compared with construction |

The ethos of sustainable development pays little or no attention to the important issue of embodied carbon, instead focusing almost exclusively on reduction of operational emissions, ie the carbon consumed once the building has been commissioned. Embodied carbon represents a significant proportion of total carbon utilisation over the course of a building's useful life, c.12-15% even for poorly insulated ageing buildings typical of the 1960's and 1970's era, and needs to be addressed.



By retaining embodied carbon, refurbishment of the building envelope delivers large 'first year' carbon savings compared with the demolish and rebuild option which would take many years to generate equivalent savings through improved operational performance alone. Furthermore, in addition to the saving of embodied carbon, a refurbished building envelope delivers the same level of thermal performance as that of a new-build and consequently the same level of insulation-derived operational carbon savings.

2.3.3 Social Case

Academic institutions operate in a competitive marketplace. They are competing to recruit the best students and those most likely to benefit from further and higher education, competing for the best staff, competing for funding and competing for national and international recognition. The appearance of the estate and the quality of accommodation it provides impacts upon its ability to compete effectively.

Providing modern, high quality, desirable accommodation is fundamental to enhancing the student experience as well as staff retention. There is also growing awareness by those responsible for academic administration of the value and importance of brand recognition - enhancing the institutional brand has become an important part of the Corporate Plan. Refurbishment of buildings can rapidly transform an estate's appearance, contributing to this recognition and reputation as a progressive, forward-thinking, inspirational organisation.

Many institutions created in the 1960's and 70's have examples of buildings which have become iconic, strongly associated with the institution and with civic relevance. In these circumstances there will be a strong desire to retain such important historical connections, something which replacement does not permit. Refurbishment provides a unique mechanism through which these iconic buildings can be improved to equal the best standards of accommodation available today whilst being sympathetic to their original appearance.

BENEFITS OF REFURBISHMENT

- Transforms the external appearance creating aesthetically-attractive and contemporary buildings
- Provides an estate and accommodation conducive to supporting the highest levels of learning, teaching and research
- The internal appearance is transformed as a result of new window linings, a choice of materials and different colour finishes
- Improved quality of the internal environment – warmer in winter, reduced solar gain in summer, minimal noise intrusion, improved ventilation, elimination of draughts and water ingress
- Aids in attracting and retaining the best students and staff
- High quality accommodation enhances the student experience and increases levels of student satisfaction
- Inspiring buildings create greater levels of national and international recognition, growing the institutional brand
- Innovative design of self-cleaning water run-off channels ensures longevity of as-new appearance free from pattern staining



Marple Hall School,
Stockport post-external
refurbishment.

Option appraisal

2.3.4 Delivery Case

Compared with replacement, the refurbishment option can be delivered much faster from concept stages through to commencement of on-site activity and ultimately the final commissioned building. The new envelope is constructed forward of the existing façade therefore the building remains in full use during refurbishment with minimal disruption to building users and eliminating any requirement to decant. With the majority of the components pre-fabricated offsite, the refurbishment option has cost- and time-certainty and is low risk.

BENEFITS OF REFURBISHMENT

- Installed whilst buildings remain in full use with minimal disruption to building users
- New envelope and replacement windows are installed forward of the existing envelope ensuring that the building remains water-tight at all times and occupants are never exposed to the external environment
- Minimal disruption to ongoing adjacent University activities
- The rainscreen is fully fabricated off-site, windows are delivered to site fully-manufactured and pre-glazed, window linings are flat-packed for delivery to site: this ensures rapid project delivery with cost- and time-certainty
- All projects are delivered on time, within budget and to the standards of quality expected with zero defects.
- Refurbishing the existing building envelope avoids the risk of cost and time over-runs often associated with demolish and new-build projects
- Large refurbishment projects with multiple buildings lend themselves well to being phased if required to further minimise disruption to everyday university activities
- On-site activities can commence within a few weeks of the project receiving authority to proceed
- Planners welcome refurbishment projects which expedites the planning process and reduces the potential for consent being withheld
- Design and build specialists take single point responsibility from design through to completed building

2.3.5 Design and Flexibility Case

External refurbishment of building envelopes has developed considerably providing a wide range of finishes, materials and colours facilitating the creation of a building with strong visual appeal. Design flaws of the original building's facade can readily be corrected whilst retaining a sympathetic connection with the original intent. Because of the innovative design of rainscreen panels, they can be individually demounted and altered to take account of future changes in building use, for example transformation of teaching rooms to laboratory space.

BENEFITS OF REFURBISHMENT

- Design and build specialists provide a 20 year warranty for completed works
- Panels are fully demountable providing adaptability to meet future changing requirements of building use and minimising costs associated with those changes
- A wide array of finishes, materials and colours is available
- Offers a fast-track route to address shortcomings of the original building design

3. Exemplification of refurbishment: James Parsons Building, Liverpool John Moores University

The James Parsons building is representative of university estates buildings constructed in the 1960's & 70's.

- Structurally sound
- Has undergone a rolling internal refurbishment programme since original construction
- Building services have been updated in keeping with the above
- Complies with Health & Safety regulations
- Original building envelope, single glazed and poorly insulated



Exemplification of refurbishment

Key features Pre-External Refurbishment:

- Visually unappealing to potential students
- Sub-standard accommodation to existing students and staff
- Low brand image and appeal to corporate partners
- Poor internal environment
- Expensive to heat
- Expensive to maintain
- High carbon emissions
- Low asset value
- Limited life expectancy



**Liverpool John Moores
University
James Parsons building
Phase 1**

Programme 44 weeks

Contract value £3.4m

Delivery On time, within budget, zero defects



Exemplification of refurbishment

Key features Post-External Refurbishment:

- An inspiring, contemporary appearance
- High quality accommodation
- High appeal to potential students and corporate partners
- Excellent internal environment
 - warmer in winter
 - reduced solar gain in summer
 - reduced noise intrusion
 - better light
 - improved ventilation
- Heating costs reduced by up to 80%

- Maintenance costs almost eliminated
- Carbon emissions reduced in proportion with heating costs
- Increased asset value
- Life expectancy increased by 50-60 years and comparable to new-build

External refurbishment Projects:

- Minimal disruption
- Installed whilst buildings are fully occupied with no loss of teaching days
- High quality, low-cost solution
- Rapid delivery from concept through to completed installation
- Economically, environmentally and socially sustainable



Before



External refurbishment transforms the quality of the interior.

After



James Parsons Building, Liverpool John Moores University

During



Warmer in winter, reduced solar gain in summer, reduced noise intrusion, better light, improved ventilation.

After





4. Optimising procurement of refurbishment will deliver cost savings of up to 40%

Procurement of new-build projects and the competitive tender process under which it is undertaken are traditional purchasing processes within the construction industry. Although complex in nature, the mechanisms and routes of procurement are well understood by all parties involved as are the rules and procedures that govern it.

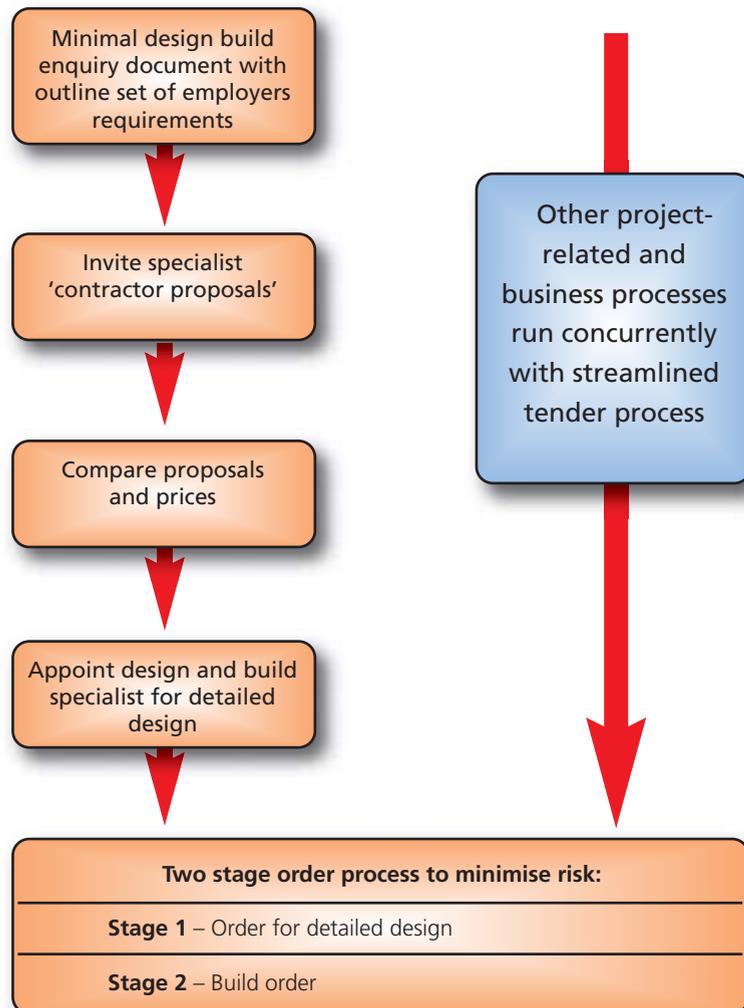
Design and build services are highly specialised, equally complex and, for the most part, continue to be purchased through these same traditional routes. However, because of their specialist nature they are not well understood by those involved in their procurement, either by those on the client-side or by main contractors seeking to sub-contract the refurbishment works. In the highly competitive marketplace of construction, selection of the main contractor is still based principally on price, **despite strong recommendation to the contrary by the Egan Report 'Rethinking Construction'**. The same criterion is then used by the main contractor when sub-contracting the external refurbishment works without recognising the specialist nature of what is required. The result is that the design and build specialist is working to a largely fixed design for a fixed price with no prior involvement leading to a less than optimal solution, uncertain project delivery and the risk of leaving the client with an unsatisfactory product which fails to meet expectations.

- **It is vital that design and build of external refurbishment projects is recognised as complex and specialised and that its procurement requires adoption of a different, non-traditional approach.**
- **In order to deliver an optimal solution comprising all the potential benefits in full and representing best value, it is essential to appoint a specialist lead consultant with a proven track record of success in delivering building envelope refurbishment projects. This will probably be outside the normal framework agreements.**
- **Equally important in this new paradigm for procurement is that the design and build specialist should be engaged much earlier in the procurement process. It is highly recommended that the phased procurement model shown schematically below is adopted wherever possible.**

In this new model for procurement:

1. A simple design and build enquiry document is tendered at a very early stage in the process, often in advance of planning consents.
2. Tenders undergo a weighted assessment for price, proposals, experience, track record, references etc.
3. This competition at the outset allows direct comparison between proposals and identifies those with relevant expertise
4. The process can be completed quickly at little cost to the client resulting ideally in an early appointment of the specialist as part of the design team
5. A two stage order process for design then construction can further reduce client risk.

Other project-related activities can run concurrently with this early tender, streamlining the overall process, saving time and money and decreasing risk.



Appointing a specialist lead consultant early will:

- deliver cost savings of up to 40% through a turn-key, packaged approach of complementary professional services compared with the accumulated professional consultancy fees of more traditional procurement methods
- provides a concept design which is deliverable
- provides a concept design which is fully warranted
- results in the most economic refurbishment solution to meet client needs and expectations
- has cost-certainty and ensures delivery of 'best-value' from public funds through being able to accurately transpose build costs from one project to another
- saves time and money on the tendering process, streamlining procurement
- optimises project delivery - minimises offsite timeline prior to project commencement and on-site build time.



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