

External Refurbishment of High-Rise Social Housing

The need to adopt a high
quality, whole-life approach.





A 20 year old typical refurbishment project

Life expectancy 20-30 years, replacement already in progress, appearance unattractive.

Poor accommodation.



A 20 year old high quality refurbishment project.
Life expectancy 60 years, no maintenance required, appearance pristine.
Desirable accommodation.

EXECUTIVE SUMMARY

The UK's high-rise residential blocks are 40-50 years old and overcladding or externally refurbishing them has been ongoing for the last 25 years using either low-cost insulated render systems, mid-cost board systems or high-cost aluminium systems.

In order to meet 'Decent Homes 2010' standards high-rise social housing has recently and rapidly undergone a rolling programme of external refurbishment. Low-cost options are predominantly chosen, permitting widest possible use of available budgets to complete the programme of works and meet the deadline. More recently the Government's regeneration framework – "Transforming Places: Changing Lives" - emphasises the importance of providing quality social housing and also exhorts the requirement for environmental and social sustainability.

These two initiatives appear to be in conflict, the former requiring 'minimum standards' to be met urgently thereby encouraging the adoption of lowest cost solutions and the latter, which recognises the need for quality, guiding those providing social housing towards delivering 'high end' solutions.

In fact they do not conflict. Quality refurbishment meets both requirements in full because it is demonstrably the cheapest solution in the long-term and is the **only** solution to provide desirable, sustainable accommodation throughout its extended lifetime.

When considering external refurbishment of ageing, high-rise residential buildings, quality has been sacrificed for relatively small, near-term financial savings. Given the low probability that these high-rise buildings will be replaced, this approach is short-sighted and economically flawed. A more appropriate model when building the business case for external refurbishment is to consider a whole-life cost comparison between the different refurbishment options together with the 'in-service' quality of the option.

With the National Audit Office reporting that 15% of high rise stock still awaits refurbishment, this document demonstrates unequivocally, by both calculation and reference to past projects, that by adopting a whole-life approach, high quality refurbishment costs one third of the 'low cost option' because its in-service life is up to 3 times longer, during which time desirable accommodation is afforded at the lowest carbon cost to the environment.

Purpose

This document informs senior decision-makers in the social housing sector of the necessity to adopt a long-term, whole-life approach when considering how best to refurbish high-rise residential buildings and of the benefits that this approach confers.

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Business Case Summary

1. Why 'Whole-Life'?

Demographic, financial and environmental constraints compound to make it improbable that today's ageing, high-rise residential buildings will ever be demolished or replaced. It is therefore imperative when considering options for external refurbishment of existing stock that a long-term view is adopted. This new paradigm of 'whole-life approach' assumes that the existing building is retained and considers the projected life expectancy of the different external refurbishment options.

1.1 Business Case Summary

High quality refurbishment reflects a commitment from progressive, forward-thinking organisations to the provision of desirable accommodation which substantially improves lives for their tenants in the most economic and affordable manner. The whole-life business case should comprise the 3 elements of sustainability, ie economic, social and environmental considerations:

- **Economic**

Although the initial capital expenditure for high quality external refurbishment using aluminium rainscreen overcladding is more expensive than other options, it will last for up to 3 times longer than the cheapest alternative representing a whole-life cost-saving of up to 70% over 60 years. The system is highly adaptable and readily modified to simultaneously restrain, repair and protect the existing facade, encapsulate balconies and provide architectural features such as louvers, cornices etc, thus when entire project costs are fully considered it is often very close in capital cost to other options.

- **Social**

Unlike lower cost solutions, the aluminium rainscreen is a fixing-free facade that withstands close visual inspection. Its innovative design manages water run-off preventing pattern staining and ensuring surfaces remain clean in service, thus retaining desirability long-term for occupants. High quality finishes enable a wide range of colours and design concepts to be achieved creating stylish, contemporary accommodation.

- **Environmental**

Aluminium rainscreen cassette is the most environmentally-friendly option because it is manufactured from aluminium which is 65% recycled and the whole system is recyclable at the end of its extended 60 year useful life. The relatively low total carbon cost is thus spread over this long lifetime, unlike low-cost solutions which can be expected to last only 20 years.

1.1.1 Economic Sustainability

It is common practice when creating the financial model for refurbishment of occupied high-rise residential properties to limit financial assumptions solely to project costs, however this is an over-simplification. A more informed picture is reached when whole-life costs are considered.

Facades constructed using insulated render systems, high-pressure laminate board systems and aluminium cassette systems each have different capital costs and different life expectancies. Similarly there are a variety of window systems that can be integrated from uPVC to aluminium and composite aluminium/timber.

Whole-life costs consider the original capital cost and the replacement cost at intervals to reflect the life expectancy of these different systems. The following table models whole-life costs for a typical high-rise building using different cladding options over a 60 year time period. It assumes a modest compounded annual price increase of 2% per annum and shows the aluminium cassette solution to be the most economic by up to one third.

Whole-Life Costs

Table 1. Whole-Life Costs of Different Refurbishment Options

	Render	Board	Aluminium
Estimated Initial Project Cost (£m)	1.3	1.6	2.0
Refurbishment Life Cycle (Years)	20	30	60
Subsequent Refurbishment Yr 20 (£m)	1.9	-	-
Subsequent Refurbishment Yr 30 (£m)	-	2.8	-
Subsequent Refurbishment Yr 40 (£m)	2.8	-	-
Subsequent Refurbishment Yr 50 (£m)	-	-	-
Total Refurbishment Capex By Yr 60 (£m)	6.0	4.4	2.0
Cost Per Annum Over 60 years (£000's)	100	73	33

Using like-for-like whole-life costs, the rendered finish which carries the lowest cost per square metre and the lowest initial refurbishment project cost **actually costs three-times as much per annum over 60 years compared with a high quality aluminium rainscreen** because it will require refurbishing twice more within that same period. When a longer-term view is taken, the aluminium rainscreen delivers by far the lowest cost per annum.

Hyde Park
Sheffield, still
pristine 20 years
after high quality
refurbishment



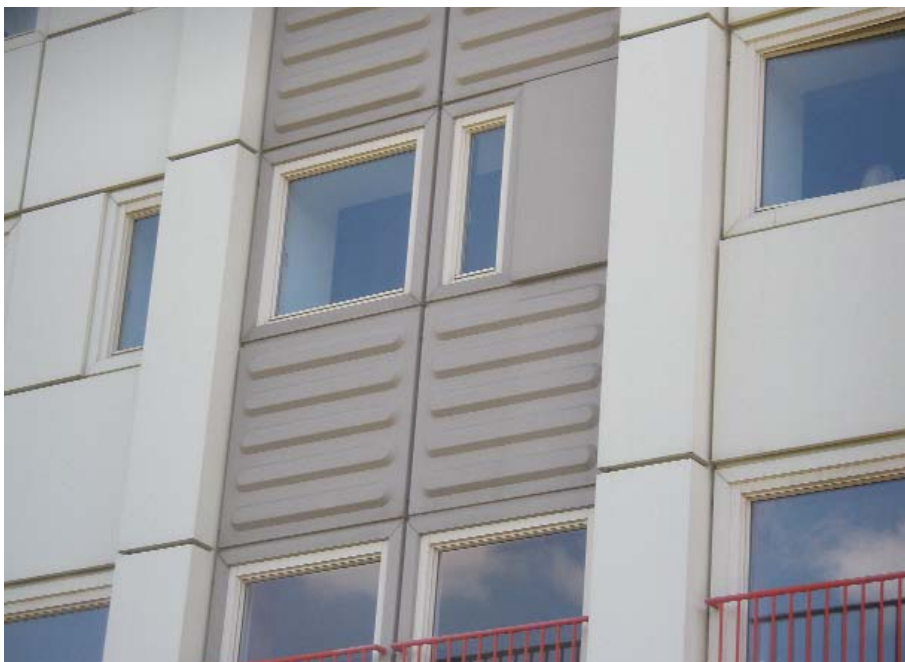
High Quality Refurbishment

1.1.2 Social Sustainability

A high quality external refurbishment creates attractive, desirable accommodation which retains its appearance and appeal for decades, thereby ensuring full building occupation.



The fixing-free facade withstands close inspection, manages water run-off preventing pattern staining, is very low maintenance and maintains a pristine 'in-service' appearance.



Low Quality Refurbishment

Low-cost overcladding such as the board finish below looks tired, dirty and unappealing to existing and future residents. With no inherent water management system and being faced-fixed, the surfaces quickly display pattern staining and will require replacement at least once before the high quality aluminium rainscreen approaches the end of its 60 year expected life.



External surfaces show extensive pattern staining within a few years of refurbishment, moss is growing above the window pod and the uPVC windows are already being replaced having been continuously maintained from time of installation.



Social Sustainability

1.1.2 Social Sustainability *continued*

The adaptability of high quality aluminium rainscreens permits considerable scope in design enabling building owners, tenants and planners to be collectively satisfied with the final appearance. Flexibility of high quality refurbishment enables the building's original design intent to be respected in full or radically altered if required.



Existing balconies can be retained



Existing balconies can be enclosed



Feature roofs can be added



Additional accommodation provided by penthouses



Environmental Sustainability



Before



After

The quality of the external cladding and transformation is similarly transmitted to the internal accommodation via fully integrated high performance windows which eliminate draughts and leaks associated with high-rise environments, reduce noise and allow safe cleaning from within the residence.

1.1.3 Environmental Sustainability

High quality refurbishment has the lowest environmental impact of all external refurbishment options and contributes most to carbon reduction and energy performance improvement:

- Aluminium rainscreen is manufactured from aluminium that is 65% recycled
- Composite windows come from sustainably-managed resources
- The whole system is 95% recyclable at the end of its anticipated 60 year life
- By comparison, board, render and uPVC offer much lower recycling potential with commensurately higher environmental impacts
- The carbon cost of high quality refurbishment is spread over its 60 year expected lifetime.
- Lower cost options need more frequent replacement requiring the carbon cost to be re-expended thus substantially adding to their environmental impact
- Energy consumption post-refurbishment is reduced by 70-80%.



Some of d+b facades' Design & Build projects

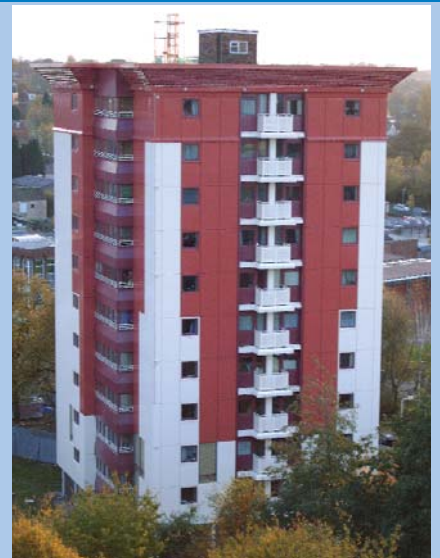
2. d+b facades' proven track record



all delivered **on time, within budget, with zero defects**



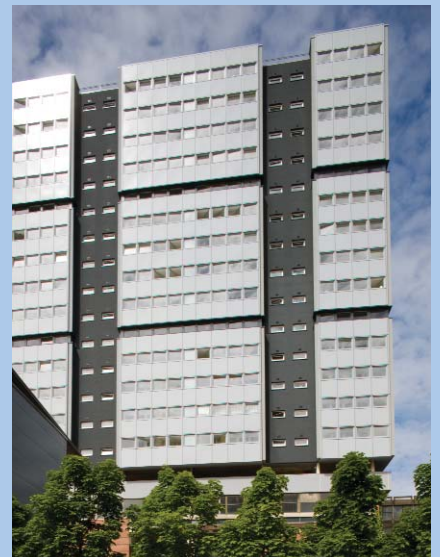
Before



After



Before



After



Before



After

Property Development

Before

3. The Pinnacle, Willenhall, West Midlands

This derelict high-rise residential building was purchased in 2004 by d+b facades SPV sister company, d+b developments, and completely redeveloped to new-build NHBC standards for onward resale to the open market. The new facade was the only option to satisfy rigorous NHBC requirements. The aluminium rainscreen with integral composite windows was selected despite being the highest capital cost option as it exemplified the do-it-once, properly, high quality refurbishment strategy for the development.

Background

Owned by Walsall Council, the building, originally known as St Mary's Court, had stood empty for several years and suffered from the negative social consequences of sub-standard accommodation. The Council had already demolished similar buildings, however St Mary's Court had two important distinguishing features - it stood alone rather than in a cluster in a well-defined parcel of land and its location, close to the town centre, was in an area identified for regeneration. Consequently Walsall Council decided to sell the building for redevelopment.

Buildings of this type and period are frequently over-engineered from a construction perspective. Appraisal by d+b facades' engineering partner, Waterman Group, confirmed that the building was structurally sound and could readily be remodelled both internally and by the addition of a penthouse. St Mary's Court was purchased in 2004 whereupon the company undertook the complete refurbishment as both developer and principal contractor.



After



Design and Delivery

d+b facades faced the same considerations as those responsible for refurbishing social housing. Complete the project as cheaply as possible taking a near-term view or deliver a high quality refurbishment providing attractive, desirable accommodation, meeting the highest standards of sustainability by adopting a whole-life approach? For all the reasons set out in the Business Case (Section 1.), the latter option was chosen.

The design included a new building envelope comprising aluminium rainscreen and high specification aluminium-clad timber windows. Six penthouse flats were added featuring a new gull-wing roof profile. CAD perspectives were prepared in-house of how the building would look along with different colour treatments. With full Council co-operation, planning consent was granted at the time of completion of purchase. Internal remodelling of dividing walls modernised the layouts to provide open plan living accommodation and 2 bathrooms per 2 bed dwelling offering c.75m² of accommodation per unit.

Full NHBC certification and building control approval was easily achieved for each of the 94 flats.

The building, renamed The Pinnacle, was regenerated from a derelict tower block into a high specification property containing 94 flats including the addition of 6 new penthouse flats within 50 weeks. It was completed in April 2005 and was opened by the Lord Mayor of Walsall, Mike Bird.

Key Design Features:

- **Warranty** - The building was examined by consulting engineers from Waterman Group prior to purchase and before undertaking works. They were also retained to supervise structural aspects of the design as the building was being developed. Waterman's provided an independent, insurance-backed warranty to cover the existing fabric and the new build elements of the construction
- **NHBC Certification** - The entire building and the individual flats within are each covered by their own NHBC certificate. This is an equivalent 'new build' certificate normally applicable only to individual residential accommodation
- **Penthouses** - Six new penthouses were created using a combination of steel framework and full height window units situated under a striking gull-wing roof
- **Thermal Performance** - Rockwool insulation was fitted to the external faces of the entire building prior to overcladding with aluminium rainscreen and an air gap maintained between the two materials, surpassing current building regulations for thermal performance
- **Windows** - High performance windows supplied by NorDan UK Ltd exceed current building regulations. Timber is selected from renewable stock and the aluminium cladding is smelted using hydropower
- **Fire Compartmentation** - Fire breaks are provided horizontally and vertically in the rainscreen overcladding to compartmentalise the building and prevent fire spread
- **Building Plot** - The car park area was constructed from clay blockwork and features barrier-controlled entry. Sensitive landscaping adds to the aesthetic.

Property Development



The Pinnacle, Willenhall,
developed by d+b facades

4. Concept Design

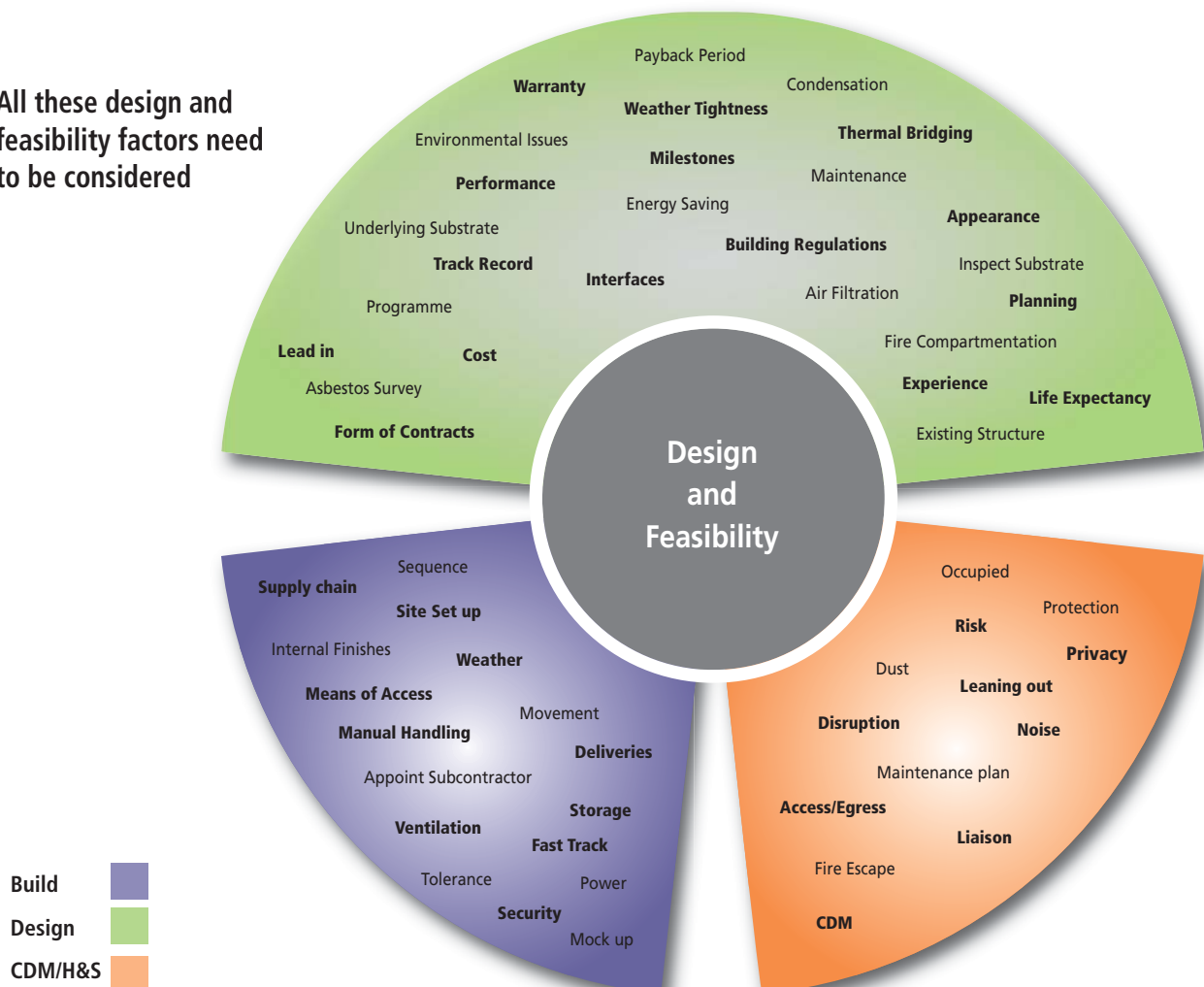
The importance of achieving good concept design at the outset cannot be overstated – it is fundamental to overall project success. Design and build specialists recognise the importance of early reconciliation of the many complex issues and considerations, shown below, that embody good concept design.

The appointment of a specialist lead consultant with a proven track record of success in delivering overcladding projects is essential.

d+b facades' design expertise, combined with practical technical and engineering knowledge developed from decades of experience, enables us to work closely with client teams at these very early stages to fully explore and understand their needs and aspirations. We then translate this into good concept design which is deliverable.

Design excellence is a core competence at d+b facades and our designs are fully warranted in conjunction with Waterman Consulting Engineers for a period of 20 years. We take single point responsibility from design through to installation.

All these design and feasibility factors need to be considered



Optimising Procurement

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

Design and build overcladding services are highly specialised, complex and remain difficult to procure through traditional mechanisms despite strong recommendation to the contrary by the Egan Report 'Rethinking Construction'.

This watershed report exhorted the importance and benefits of a reduced system of tendering. In ensuring that clients receive value for money, the report states "the answer lies in comparison between suppliers and rigorous measurement of their performance. With quantitative performance targets and open-book accounting, together with demanding arrangements for selecting partners, the Task Force believes that value for money can be adequately demonstrated and properly audited".

Public bodies must comply with the Public Contracts Regulations 2006 if they procure works, including refurbishment works, where the cost of such works exceeds the value threshold set by the Regulations, presently £3,927,260 (net of VAT).

Where the value of works fall below this threshold the public body is not obliged to follow the requirements of the Regulations regarding full EU market tendering and may adopt an individual approach, providing contractual principles such as transparency and equal treatment are followed. The legal position is thus clear – the Regulations merely provide **guidance** for procurement of works below the value threshold.

In order to optimise the procurement process and achieve best value:

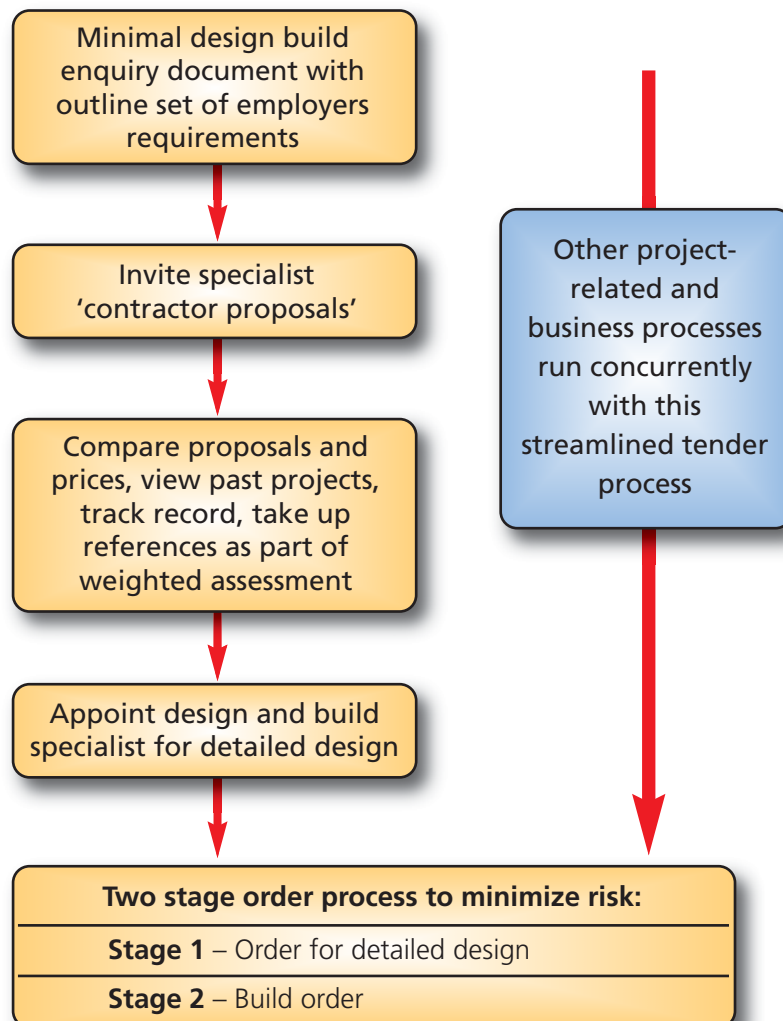
- It is vital that design and build of external refurbishment projects is recognised as complex and specialised work and that a non-traditional approach to its procurement is required.
- This new paradigm for procurement requires that the delivery team, including the design and build overcladding specialist, should be assembled at the outset, thus ensuring all aspects of the delivery process are considered and reconciled at concept stage.
- It is highly recommended that the phased procurement model shown schematically opposite 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 prior to obtaining planning consents
2. Tenders are evaluated against appropriate criteria including proposals, experience, track record, references, price etc, thereby permitting direct comparisons to be made and those with relevant expertise identified
3. This process can be expedited at little cost to the client resulting in early appointment of the design and build specialist and assembly of the whole design team
4. A two-stage order process for design followed by construction further reduces client risk.

Other project-related activities can run concurrently with this streamlined process, saving time and money and decreasing risk.

Saving up to 40%



This optimised procurement model delivers:

- Fully integrated designs at pre-planning stage
- Cost, programme and delivery certainty from concept to completion
- Cost and time savings prior to commencement on site
- Enhanced client control in selection of the specialist Design Build contractor
- Best value from public funds.

The d+b facades System

6. Features of the d+b facades' system include:

• Energy Conservation

The d+b facades system will typically surpass present U-value standards demanded by building regulations by more than 30% thereby substantially reducing ongoing heating costs and carbon emissions

• Sustainability

We recycle dated buildings using 65% part-recycled materials that are 95% reusable at the end of their useful life thereby exceeding environmental and sustainability obligations and objectives

• Ease of Assembly and Installation

The rainscreen system is fully fabricated off-site enabling rapid on-site installation, ensuring cost- and time-certainty

• Self-Cleaning

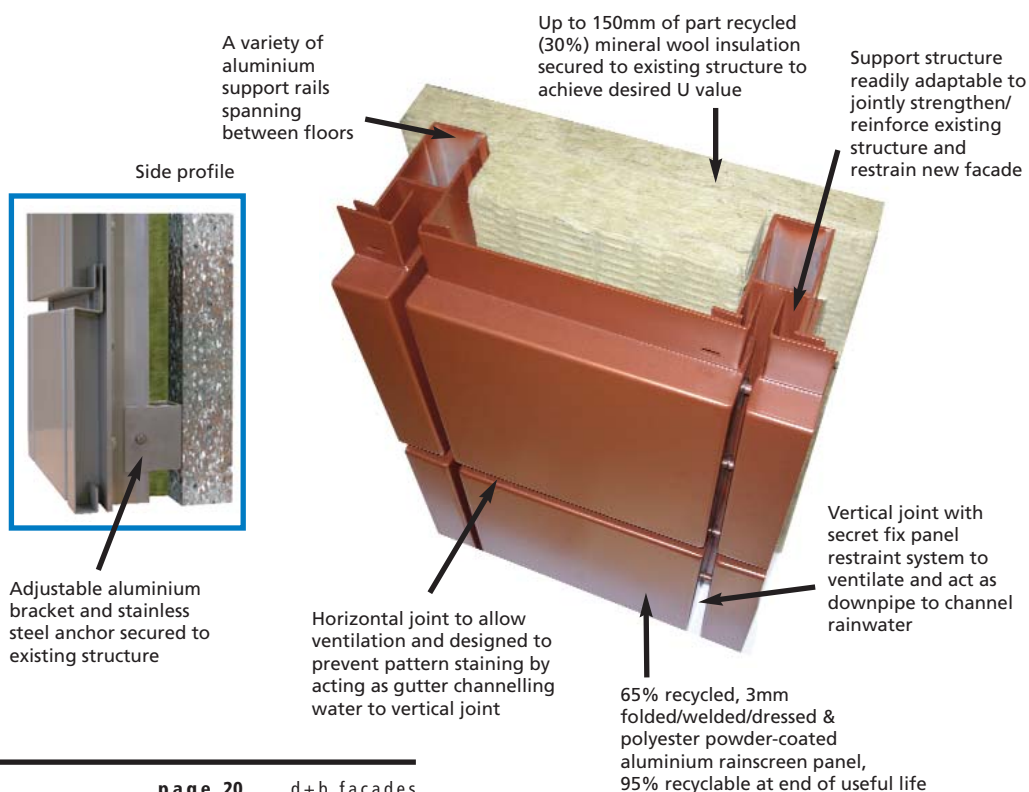
The innovative design includes a water management system permitting all surfaces to be self-cleaning. This maintains the as-new appearance for much longer, preventing pattern staining and greatly reducing future maintenance costs

• Flexibility

All panels are individually demountable providing future adaptability and minimising additional costs associated with any future changes, balconies are easily encapsulated or retained and enhanced and the support structure is readily adapted to ensure loads are transmitted directly to the structure in a safe manner

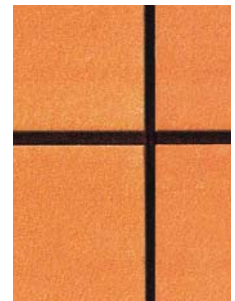
• Aesthetic Appeal

Fully welded and dressed panels have hidden fixings and withstand close inspection. They are provided in a wide range of shapes, finishes and colours enabling the external envelope to be configured to suit the client's requirements.



Aluminium Rainscreen

Versatile and economic, it is used primarily to overclad existing buildings. Finishes can vary from anodised to any RAL colour.



Terracotta and Panel Systems

Natural clay tiles available in a range of modules and colours. Generally supported by a secondary framework. We also provide and install panel system cladding.

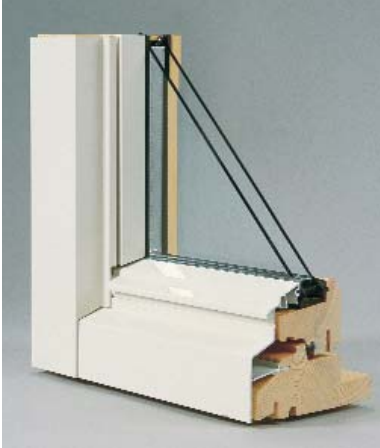


Curtain Walling

Total wall construction mainly of double-glazed units supported on an aluminium framework.



The d+b facades System



Alu-Clad timber window



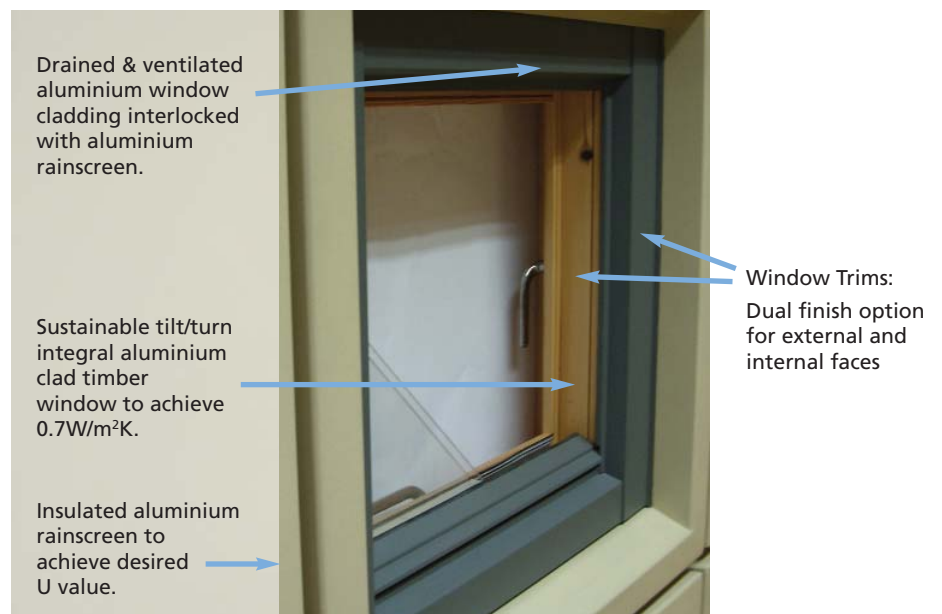
Window replacements transform the internal living space with improved ventilation, solar, thermal and acoustic control, can be safely cleaned without leaning out and are maintenance-free.

Windows

We use composite aluminium-timber as our window of choice which surpasses all UK performance requirements, is fully compatible with our rainscreen system and readily integrated.

Features of windows include:

- **Longevity**
The aluminium outer-skin will last for as long and perform the same as the adjacent rainscreen, protecting the very strong internal timber construction which in turn provides the surplus strength required for the window to perform in the severe, exposed, high-rise conditions
- **Energy Conservation**
They have very high thermal specifications and can achieve a U-value of $0.7\text{W/m}^2\text{K}$, the standard product achieving $1.2\text{W/m}^2\text{K}$. This represents a 45% betterment of that required to meet current building regulations with proportional savings in heating costs and carbon emissions
- **Project Delivery**
The windows are delivered to site fully manufactured and pre-glazed enabling rapid installation, minimising on-site time and ensuring certainty of on-time project completion
- **Window Linings**
These are prefabricated, flat-packed and delivered to site in either uPVC or MDF allowing rapid installation with minimal disruption to occupants and building users
- **Aesthetic Appeal**
Dual colour options/finishes are available for the external and internal faces of the windows to co-ordinate with the finish of our overcladding system.







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