Can do

Refurbishment

Commercial buildings of the 70s, 80s and 90s

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Considerable thanks to the research team comprising:
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Hilson Moran’s building services, structures and BREEAM assessment teams
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Executive summary

Why refurbish?

Reason not to refurbish?

Challenging preconceptions - Costs
- It is more expensive to refurbish
- There is less investment risk in new build
- Maintenance and whole life costs of a refurbished building are higher than a new build

Challenging preconceptions - Fabric
- Major structural modifications are not viable in a refurbishment
- Refurbishment of an occupied building is not an option
- Cores are permanent elements and expensive to reconfigure
- External fabric is not cost effective to replace
- Existing buildings are difficult to refit with modern systems
- A new build will provide a higher site density site

Challenging preconceptions - Services
- A new building will be more sustainable
- Replacing services is expensive and not as efficient as new build

Challenging preconceptions - Interior Design
- Improved floor plate efficiencies are not possible with refurbishment
- Non-demised space is not worth upgrading
- Staff well-being is improved in a new build solution

Refurbishment is a good option

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Example of the refurbishment process.

Refurbishment can take you from this ... .... back to this ... .... on to this.
Executive Summary

During times of economic growth the commercial office market demands new buildings that satisfy occupiers’ requirements and add value to the funding body’s portfolio.

While the market may slow in an economic downturn, occupying companies may well still need more space and want to refresh their offices to more accurately reflect their brand. They will also want to optimise their assets when their own organisations may well be going through a period of change and re-sizing.

The timescale for a clear end to the current economic downturn is unpredictable. Therefore an ability to respond very quickly to occupier demand offers a clear advantage. It is much quicker to refurbish existing stock and in many cases it offers clear financial benefit over new build option.

Existing buildings often benefit from car parking standards and other conditions which would be much more difficult to secure through a new consent, and avoid triggering Section 106 agreements.

In these times the availability of pre-existing built stock and refurbishment options can be very attractive to both occupiers and funders as they can offer:

- A lower development risk profile
- Return on investment seen in shorter period of time
- Improved rental and yield values at a minimum cost and capital investment
- Enhancements to a fund’s portfolio of buildings
- Enhancements to the design life of existing stock
- Retention of tenants
- Improvements to a building’s sustainability credentials
- Enhancement of the building’s brand
- Opportunities to increase floor area
- Programme benefits (up to 70% time saving)

This research paper has been compiled to consider the opportunities and to challenge some of the preconceived ideas that often see resistance to office refurbishment and favour new build.

In particular the research has addressed changes and upgrading of the building fabric and services, as well as the benefits of rebranding and floor space efficiency. It also facilitates a constructive debate that weighs up the merits of the retention and reuse of existing valuable building stock over new build, illustrated with successful examples.

This information can be used by owners of office buildings, developers, owner-occupiers and tenants considering refurbishment to help make key decisions at the earliest stages of a project development.
Level of commitment to refurbishment.

Example of Light Touch
- Communal areas upgraded
- Optimise core and toilets
- Resultant increase in lettable area
- New lighting and finishes to reception area
- Greater flexibility with the potential for subdivision increased
- General upgrade of building appearance

Example of Medium Intervention
- As Light Touch but with further additional changes
- New entrance features and enhanced branding
- Upgraded to current Building Regulations
- Additional floor space created
- Services upgrade

Example of Comprehensive Refurbishment
- As Medium Intervention but with further major changes
- External facade stripped back to frame
- New external materials extend design life to 25 years
- New canopy and entrance branding
- New core and services replacement throughout
- New branding
- Higher rental value targeted
Why refurbish?

During the inception of any project, there are many issues to be considered, before a refurbishment or new build strategy can be developed.

Refurbishment options can offer the following benefits:

**Planning issues:**
- Minimise planning risk
- Reduce risk of extensive Section 106 payments where additional area is created
- Retain higher car parking provision

**Budget, cost evaluation and programme:**
- Potential for greater profitability where the relationship between value and cost is less between new build than with refurbishment
- Overall capital expenditure for a refurbishment scheme is less, meaning less use of equity and project finance
- Speed of start on site means that the current market downturn can be taken advantage of
- The whole life / revenue expenditure per m² is improved by refurbishment and if extensive enough may allow the building to perform as a new build
- Professional fees may be reduced: in overall and percentage terms
- Programme benefits as the product is delivered to market more quickly
- The work may be done with tenants in occupation
- Proportionately greater tax benefits
- Certainty of delivery greater as planning risk is removed
- Removes statutory costs associated with a new build
- Less overall project risk than with new build

**Environmental issues:**
- Improve, enhance or replace building services
- Incorporate alternative approaches to conditioning workspace environments with more sustainable and environmentally friendly systems.
- Consider and target improved environmental credentials such as BREEAM and EPC’s.
- Improve the sustainable credentials of the asset
- Reduce energy and carbon emissions
- Improve cycle provision with showers/changing facilities
- Improve the energy use across the building’s design life
- Reduce energy costs to tenants over design life

**Lettable value:**
- Increase net lettable floor area to increase the asset value
- Rationalise communal cores to release net area and achieve current Building Regulations and BCO guidelines
- Convert plant area to lettable area
- Replan workspace layouts to optimise occupancy levels
- Explore alternative uses for building to enhance value
- Consider mixed-use and air rights development over existing surface car parking to enhance the value
- Maximise rental opportunities
- Add or extend floors
- Improve accessibility to all through enhanced DDA facilities
- Provide a more marketable and flexible office

**Physical issues:**
- Optimise floor to ceiling heights
- Incorporate modern lighting/ceiling systems
- Incorporate raised access floor systems
- Improve toilet provision
- Enhance or rebrand the business park, building or workspace.
- Improve the building’s appearance with new cladding and / or entrance features
- Improve circulation routes
- Increase column free area
- Introduce or enhance lift operation
- Address occupier needs and help secure new tenancy agreements
- Enhance the building to compete with local market
- Improve wellbeing for building occupants
- Incorporate anti-terrorism/security measures
- Improve the quality of the workspace environment
- Open up workspace to open plan layouts
- Possibility to increase structural loadings

**Occupier’s benefits**
- Occupiers can maintain their existing location and therefore can eradicate the expense and disturbance of an office move.
- The environment can be refurbished to suit their occupational needs and bespoke according to their building knowledge.
- The landlord and tenant negotiations maybe facilitated due to an existing understanding of each party.

**Flexibility:**
- Opportunity to introduce greater flexibility to facilitate multiple letting
- Provide for future tenant flexibility
Comparing the merits of the different levels of refurbishment, as well as appraising the benefits of refurbishment over new build (or vice versa) can be a daunting task. The key concerns include how far to take the redevelopment, the value this will achieve in the long run, the necessary levels of both internal and external improvement and how to avoid spending more than necessary to maximise return on investment.

A detailed appraisal of the building, market conditions, location, cost, value and the investor, developer or owner/occupier’s aspirations should help identify the degree of risk and the level of intervention that is appropriate to achieve this return. The four levels of intervention that are discussed in this document should be benchmarked against new build options. The appraisal for each option should outline the extent of the improvements to the building and relate them to an explicit £/m² rate to demonstrate the level of risk versus reward.

There are four options that this research considers that represent degrees of intervention into existing commercial building. These reflect many concerns raised as to how much or how little should be done to create a product of value that achieves the developer’s objectives. In short, is it worth it?

Initially, most concern is raised over the levels of refurbishment. A cost plan benchmarking the various options will provide a £/m² rate that can represent a tangible stepped improvement to the building.

**Option A - Light Touch**
This represents the lowest investment and risk, and delivers the least opportunity to generate value from the potential improvements to the building. It is a quick and relatively unobtrusive approach.

The scope of works within Option A includes decorating, changing carpet tiles, replacing ceilings, repairing and upgrading minor elements of the building, including servicing the building’s plant.

The public areas including reception, lifts and toilets are often the most outdated and therefore need the highest spend to achieve maximum impact and return, but this may be limited to redecorating. Office floor spaces are often the most heavily used areas and are particularly suited to the light touch approach as less effort is required to improve them.

Externally, little will change and the immediate impression will be that the building has undergone routine maintenance rather than a refurbishment, however reception and entrance rebranding can easily be included within light touch improvements and can have a significant impact on staff, visitors and potential tenants.

This approach could result in a limited increase in asset value but might be suited to a project where the retention of a tenant is of particular importance in the short or medium term before a more radical approach is required.

**Option B - Medium Intervention**
In short this would include the scope of works outlined in option A plus the replacement of building services in part of the building, cores, reception upgrades and a revised workspace strategy.

A ‘medium intervention’ would see the public areas and office floor spaces given a more significant overhaul with the replacement of materials, fixtures and fittings. This could include replacement of WC sanitaryware, new lighting, reception floor materials and entrance features. Replacement facilities for teapoints and upgrades to communications room facilities can also be achieved.

The level of refurbishment in option B may well be limited to works that fall below the threshold where a Building Regulation application would be necessary.
Option C - Extensive Intervention
This would include the works outlined in option B plus a full replacement of building services, some building fabric changes, possible extensions to the floor plates and the remodelling of cores and communal areas.

The enhancements should be carefully considered to commit only to the most appropriate improvements necessary to meet current Building Regulations standards and to future-proof the building for a further 15 - 20 years.

An ‘Extensive Intervention’ delivers an upgrade that takes a building though a further 15 - 20 year lifecycle, which should then represent an enhanced asset in the developer’s portfolio and enable it to complete with an average new build product in the local market.

Buildings that are multi-occupied are often suited to this approach.

Option D - Comprehensive Refurbishment
This option is the most comprehensive and expensive of the refurbishment options and carries the higher development risk. However, it creates the best opportunity to capitalise upon the improvement in asset value and associated increases in rent and aims to attract a wider base of potential tenants.

Option D includes the works outlined in the options A-C plus further development opportunities outside the building.

For a site that has a particularly high residual land value, major refurbishment options can be more financially viable than demolition and new build. The works will bring the building up to current standards and future proof it for 20-25 years. Option D considers fabric performance and the life span of materials as well as the running and maintenance costs of the fully occupied building.

Issues such as the relocation of the complete plantroom to optimise floor space, by using the previous plantroom areas, and the introduction of more efficient plant machinery at roof level or as new plant towers to the sides of building can be considered, subject to structural and planning limitations.

This level of refurbishment intervention and the associated levels of investment can extend the lifespan of a building by bringing all elements up-to-date and ensure the building is competitive with high value new build office accommodation in the local market. The whole building will be affected, so this option is most appropriate to an empty building or one at the end of its lease. The ability to extend the building and add floors is often considered at this level of refurbishment. In addition, development on land associated with the building, such as air-rights development above surface car parking, can be considered. This will enhance the value of the site and help deliver more area, potentially a wider range and mix of uses, and increased environmental credibility.

At the extreme end of ‘Comprehensive Refurbishment’, only the structure may be retained, with complete replacement of the exterior envelope, services, cores etc.

Summary
Whilst wiping away all that exists on site allows a clean slate, it potentially loses value in the site related to existing planning consents, car parking allowances and Section 106 considerations. It also increases development and financial risk.

Each of the above refurbishment options provides an opportunity to increase both the rental and asset value of an existing building, at differing degrees of risk, that can offer more return than demolishing the building and starting from scratch.
Cost comparators

Fig 1: Cost benefit - refurbishment vs new build

Fig 2: Cost benefit - refurbishment vs new build

Fig 3: Relative levels of refurbishment costs

Figures 1 - 3: Refurbishment vs new build indicative cost comparison

Demonstrating the percentage variance in construction costs for each of the intervention options.

Demonstrating the increase in costs relative to the increase in rental values, environmental benefits and degree of intervention.
There are a number of widely held views that inform the decision not to undertake a refurbishment project.

This document is structured around a series of common preconceptions, which are seen as challenges precluding refurbishment. Each of these preconceptions or challenges are outlined on the following pages and then followed by the ‘Can do’ approach demonstrating why refurbishment is a good option.

This research covers the prolific period of commercial office development across the UK from the 1970s to 1990s.

Many buildings constructed in this period were designed to last 25 to 30 years and are therefore now reaching the end of their life and coming to the market as redevelopment opportunities. This is forcing decisions to be made about the investment benefits of refurbishing the building relative to demolishing it and starting afresh.

Buildings built between the 1970s and 1990s are often defined by certain technical criteria and dimensional characteristics and have been impacted by incredible technological evolution over that period. These characteristics are identified in detail in the appendices and are key to the viability of refurbishment.

For the purposes of the research, three key types of commercial building have been identified, again these are discussed in detail in the appendices on page 40:-

A. ‘Urban Office’; buildings in metropolitan centres across the UK;
B. ‘Mid-Urban Office’; buildings typically associated with edge of town sites, and;

The benefits of refurbishment over new build discussed in each section are summarised on page 38.

Reasons why a project would not be refurbished can be complex and range from:

- Unsupported financial modelling
- The land can deliver a significant increase in lettable area with a new build option
- Local market drives new build solution
- Developer portfolio favours new build
- The existing building cannot be refurbished to a competitive level of quality.
- End user preference is for new build
- Difference in new build construction cost versus refurbishment cost is marginal, therefore preference is for new build.
“It is more expensive to refurbish”

**The challenge**

Office buildings need to work harder and more efficiently in order to demonstrate real added value for the developer and investor. Properties developed in the 1970s to 1990s, a climate where low density and high car parking standards were the norm, do not necessarily make best use of the space within the building, or indeed, the surrounding land.

Mid-urban and out-of-town offices are facing demands to intensify floor space and contribute to a more sustainable mixed-use agenda. In order to do this in a manner which minimises the cost of construction and professional fees, it is better to demolish and create a new, more efficient building.

**Can do**

**Market conditions**

The conventional approach to assessing the risk and rewards of property development is to carry out a rigorous financial appraisal with carefully considered input from a wide range of expertise within the client’s professional team.

Many development options may be considered during the appraisal process, before the team identifies the optimum choice that is likely to deliver the best capital investment return. Such options are likely to consider a mix of different uses and different design solutions, in parallel with considering whether a demolition and new build approach will offer greater potential value than a refurbishment approach.

The bespoke nature of construction projects, and the degree to which cost variation results from specification and design choices, makes generic comments on capital expenditure difficult. However, Figure 2 illustrates generic range costs per square metre for the four refurbishment options and compares these to three levels of new build rates. The comparison demonstrates that most refurbishments are less expensive in capital terms due to the extent to which existing building elements are retained.

The detailed work of the professional team will focus on identifying elements which may prove to be more expensive if refurbished, or where the introduction of new elements will be more costly than retaining existing elements.

It is to be expected that analysis of elements shows a degree of overlap between new build projects and refurbishment options C and D. This is precisely where the client and the professional team should focus in order to understand the tipping point of commercial viability, both at the time of construction and through the whole life of the building.

Analysts predict that the bottom of the current market cycle, in terms of tender pricing, will occur during the middle of 2010. If this view is accurate, and whilst there is still underlying inflation within certain construction related commodities and manufactured products, aggression within the industry to win work, secure turnover and retain labour resources, is currently leading to reducing tender levels overall.

Therefore, it is widely recognised that there will be a period of 12-15 months of deflationary pressure on tender pricing until new demand finds an equilibrium once again with supply. This means that a 24 month construction project that commenced in March 2009 and is due to complete in March 2011 may experience no net inflationary pressure to pricing at all. Put another way, any construction project that has a mid-point between now and the middle of 2010 should, in theory, have a negative fixed price adjustment.

In order for clients to maximise the benefit from the current market cycle it would therefore be necessary to compress the programme for project conception, permission to build, designing and procuring. This could well be achievable with less risk by refurbishing rather than rebuilding.
With the reduction in construction costs per sq m for refurbishment options A to D, the overall professional fee will reduce correspondingly. The research shows that reduced programmes and an abridged scope services afforded by refurbishment should yield savings in the overall fee percentages as follows:-

New build: 12.75 – 15%
Refurbishment options as outlined on pages eight and nine would bring the following overall reduction in fee:-

Option A – Light Touch: 6 – 9% reduction
Option B – Medium Intervention: 8 – 10% reduction
Option C – Extensive Intervention: 10 – 12% reduction
Option D – Comprehensive Refurbishment: 11 – 14% reduction

**Tax relief**
For refurbishment projects, additional benefits may also be realised in the form of tax relief.

Depending on the status of the client (e.g. UK tax paying business and landlord, or owner occupier), then typically for a refurbishment project a much higher proportion of the construction costs may qualify for tax relief. Furthermore, the average speed at which any tax relief will be realised should be faster.

The principal reasons behind this are that new-build projects tend to include a much larger amount of nonqualifying (for tax relief) structural elements such as foundations, external walls, roof and floors, than an equivalent refurbishment.

In addition, there is the potential to claim 100% tax relief for refurbishment works that are deemed repair and maintenance.

The client’s cost consultant will be able to provide estimates of qualifying costs for either new build or refurbishment options. Depending on how such tax relief is attributed within a client organisation, it is possible to take account of such relative tax positions when appraising the financial viability of the construction.
“There is less investment risk in new build”

The challenge

A refurbishment may not yield sufficient return from increases in asset and rental value to cover the substantial investment required.

Refurbishments are often complex projects and costs are difficult to control if unexpected replacement of materials and services is required. As a result of the complexity professional fees can be higher.

Can do

In a recession, that brings with it lower rents and higher yields, the commercial viability of a development is often further impacted when the land may have been acquired higher up the curve at a cost that is now not sustainable. Whilst a new build option may have been appraised to provide a residual land calculation for the purposes of buying the plot, the current economic situation may have dramatically affected predicted returns on cost or gross development value (GDV).

If the view taken is to sell the asset once the market has regained some strength, say in three to five years, then a refurbishment option might be worth considering, provided that there is sufficient belief that the product will be attractive to tenants and that a rejuvenated building with medium term life will result.

The economics depend on the relative values (rents and yields), and the estimated speed with which tenants take the space compared to the costs of delivering the space to the market. Refurbishments become more viable than redevelopment where the overall net lettable space is thought to be at its maximum (or at least very close to what could be achieved through a new planning permission).

Refurbishment will also be favourable where the gap between the construction costs of refurbishment and new build are relatively greater than the perceived difference in values, (i.e. the amount of the building that can be retained in the refurbishment whilst still ensuring a quality end product, keeps the costs per m2 at the lower end of the benchmark range).

There is no doubt that the pre-planning, pre-construction and construction periods are shorter for refurbishments compared to new build equivalent schemes. Presuming tenant demand exists upon completion and predictions of rents and yields become reality, then getting the enhanced rents (or perhaps any income at all if the building is currently not yielding any revenue) as soon as possible is likely to be a good thing.

Our research shows that the saving in overall programme time from the decision to commence to the completion of the product can be up to 24% quicker than the duration of a new build project. Furthermore, certain degrees of refurbishment may be possible ‘in occupation’ which critically allows landlords to maintain income generation (albeit at more modest levels) throughout refurbishment. This may have the effect of prolonging the duration of a refurbishment project, but the benefits usually outweigh these extra costs and of course it is desirable not to move a valuable tenant to another building. Even when this is intended to be temporary it can sometimes become permanent.

In certain markets (in geographic and product terms), rents may reduce much more quickly and to a greater degree than the fall in construction market prices and this may in itself inform the decision to consider various degrees of refurbishment.
**Risk Profiles**
The largest “negative” input in the development appraisal is the construction cost estimate.

The quantity surveyor advising on the project will be applying considerable expertise and market knowledge to formulate an estimate of the trade selling costs, the cost of managing and running the site, the mark-ups that must be recognised, the fixed price addition (if inflation during construction is anticipated) and the construction contingencies that are appropriate.

Every project involves risks of some sort. An important factor is to recognise these risks and the associated management and mitigation measures proposed to deal with them. For a new-build project, usually the significant risks lie in the excavation of earth and in dealing with the substructure installations, particularly piling.

With refurbishment options A to C such risks are nonexistent and only with the extensions that might be part of an option D refurbishment do they then appear. The complete redevelopment with the inherent potential of uncovering contaminants in the demolition phase (such as asbestos) means that cost and programme risk still exists. Arguably, extensive refurbishment, in this regard at least, is no more or less risky than new redevelopment. One exception to this might be where the building envelope is to be replaced and requires careful consideration of the integrity of fixing back to the existing structure with the associated building tolerances.

Of course, the progressive opening up of a building to take it back to the proposed starting point of refurbishment means, inevitably, the discovery of things that have not been anticipated or fully appreciated in the development appraisal model. To this extent, items of this sort still represent commercial risk and these need to be accounted for in a comprehensive and systematic approach to risk evaluation and management.

In refurbishment options A to C, options might be present to deal with contamination risk by encapsulating rather than complete removal and this may prove economically advantageous.

In addition to this, one must apply careful thought and experience to consider risk provision (that might be reflected by the application of a client, ex-contract, contingency), the likely movement in the rates and prices during the life of the contract (i.e. should additional risks of contractors claims be reflected in specific contingencies in recessionary / recovering markets? and the impact of procurement and how risk is shared between contractor and client.

Challenging preconceptions
Figure 4: The programming benefits of refurbishment
Illustrating the time benefits achievable in the various refurbishment options (outlined on page 8 and 9) when compared with a speculative new build project.
"Maintenance and whole life costs of a refurbished building are higher than new build”

**The challenge**

New buildings offer the capacity to specify the latest technology and therefore ensure the lifespan of fabric and building services is appropriate and maintenance costs are limited.

Refurbishment projects may not allow the inclusion of the most current systems and may offer limited scope to update due to restricted space.

**Can do**

As one would expect, operation and maintenance costs (revenue expenditure) should be optimised in a newly constructed building so they will match or exceed current Building Control requirements. The replacement of the building envelope and all engineering services in option D should mean that the resulting building performs almost as its newly constructed equivalent.

Refurbishment options C, B and A that progressively do less to the building fabric and the services installations, incur progressively more revenue expenditure, that is revenue expenditure has an inverse relationship with capital expenditure on refurbishments.

Whilst refurbishment options may not perform quite as well as a new build in terms of revenue expenditure, it is probably more relevant to understand the improvement in such costs relative to the performance of the existing building. With good professional team attention and pragmatic decision making it should be possible to make significant improvements in the whole life costs.

Where the intention is to hold a property asset indefinitely, it is critical to evaluate the proposed capital expenditure over time in order to understand the costs of periodic refurbishments, operation and maintenance cost and the point at which it will reach the end of its economic life.
“Major structural modifications are not viable in a refurbishment”

**The challenge**

The principle element of the building is its structure which is generally viewed as an element that cannot be readily touched. There is often a lack of detailed information on the existing structure and most is hidden behind finishes, making accurate determination of its capacity hard to ascertain, particularly when tenants are still in occupation. Often intrusive works are required to undertake surveys, best done during the strip out by which time decisions on the extent of a refurbishment have already been made.

There are also issues of warranties, the residual life of the structure and particularly the foundations where the structure is to be maintained and refurbished, rather than demolished and rebuilt.

Works to the structural frame may also be seen as expensive and time consuming, adding the potential risk of cost and programme escalation. The potential added value that structural work can bring means that it is an option that should be considered from the start.

**Can do**

Structural work can vary from minor alterations to suit revised services to major extensions and structural alterations. All will require assessment of the existing structure both in terms of its design capacity and its condition and durability. For any refurbishment this should form part of the due diligence prior to starting.

Infilling of risers or increasing floor load capacities for plant room can generally be achieved fairly simply and will have only localised impact on the frame.

The infilling of atria can provide economical space but will require more significant strengthening work. There are now a range of techniques for these such as installing new steelwork, strengthening by bolting or bonding plates or fibres to slabs and beams and encasing or wrapping columns which can increase the strength of the existing structures by 10%. The optimum solution can depend on access, clearances, finishes and costs.

Careful investigation is required to assess the capacity of existing foundations and the impact on them of any new loadings. New foundations may also necessitate underpinning to the existing which needs to be understood at an early stage of the project.

The removal of columns, downstand beams and even core walls can in some instances deliver a significant increase in floor area and a better quality of space.

Each case needs to be investigated on its merits but the identification of alternative load paths and strengthening of other structural elements can often provide a cost effective solution. A variety of options to release valuable net lettable area within reconfigured roof spaces and the relocation of plant to the roof above or plant towers can require comparatively little strengthening.

More drastically the roof can be removed and complete new floors added. The extent of column strengthening will depend on design loadings but with lightweight construction this may be limited to only the upper floors.

Where a building is to be reclad, additional floor space can often be obtained comparatively cheaply without increasing loads to the existing frame by extending sideways. Due to the increased floor to external wall ratio, this can also be part of a more sustainable approach where sunscreen design is integrated.

To increase tenant flexibility, new stairs between floors are often required. This can generally be achieved by the insertion of trimmer beams, though these may need to be sectioned for ease of installation.
The removal of plant floor areas to create new atrium space is generally a simple structural exercise, though one must be careful that backspans to remaining floors are not compromised. Although this can reduce lettable area, it can be effective in improving lettability and providing higher value space.

Whilst structural alterations require more careful design input to limit the impact on costs and programme, they provide the opportunity to deliver a greater range of flexible floor plates and offer potentially greater tenant flexibility. Structural alterations can thus considerably enhance values and returns. Where possible the removal of columns or walls coupled with revised framing and strengthening solutions can deliver cleaner floor plates that suit a wider range of tenant requirements including better space for call centre layouts, financial floor layouts or open plan workspaces reflecting contemporary interior design solutions. It can also facilitate better desk / workplace layouts across clear floor plates that are unencumbered by structural zones.

Creating new space, either with additional floors or by extending sideways as part of a facade replacement strategy, is highly efficient as almost 100% of space created will add to the net lettable area. The replacement of heavy concrete cores with lighter steel members and additional bracing can also reclaim valuable lettable area.

At the very extreme end of any refurbishment opportunity, the retention of only the structure is enough, in certain circumstances, to retain the valuable planning consent applicable to the original building thus retaining the attractive parking standards, density and building footprint.

In today’s market, a similar ‘new building’ would be more stringently constrained through the planning process to reduce parking, reduce density in some cases and attract the inevitable financial contributions associated with S106 planning decisions. There are a number of successful solutions across mid-urban and out-of-town locations where the fabric and internal arrangements of the building have been completely stripped away leaving just the frame and a wholly new building created around the existing retained structure.

The savings to programme are also significant with both the demolition and the construction shortened.

Good planning advice is essential in establishing how far the project can be stripped back before it is considered completely a new build, but numerous examples do exist whereby successful refurbishments have resulted in significant intervention.

Tax advice is essential, as it may also provide benefits towards many elements of the financial cost plan including relief on costs associated with the design team, through to significant elements of the refurbishment programme.
“Refurbishment of an occupied building is not an option”

Figure 5a-d: Strategy for refurbishing occupied buildings

a - Existing occupied building ready for refurbishment

b - Move tenants to newly refurbished floor, fit out the vacant floor and repeat the process until all floors have been successfully refurbished.

c - Construct new plant space on top of the existing roof and convert the roof space into additional lettable floor space.
When considering a refurbishment project for an empty building, the associated risk of refurbishment can be ring-fenced and undertaken without the complications of a building still under tenancy.

Most occupied buildings, however, would initially be considered as unsuitable for any level of refurbishment above the Light Touch option and the refurbishment of these buildings would usually be delayed, pending the end of a lease agreement which may arise three, five or ten years hence.

Retaining rental income is vital. Relocating tenants to temporary locations, whilst refurbishment work is undertaken, is costly for the tenant and also highly disruptive, interrupting continuity of work, destabilising existing staff and in extreme cases resulting in occupiers staying in the alternative locations rather than returning.

These reasons alone usually preclude many refurbishment contracts from proceeding and the building stock remains in either its unrefurbished state or only carrying out the Light Touch to decorate or repair.

Neither approach delivers the strategic upgrade necessary to provide longer term benefits to the running costs of the building or help extend the useful design life that would result in enhanced rental values. The ability to secure the long term occupation of tenants is also threatened.

In some cases, particularly in higher rise urban offices, where one or more floors may be vacant, a phased programme of refurbishment to upgrade the space may be viable.

One of the first steps in contemplating the refurbishment of an occupied building is to commission a strategic approach as to how a phased and well managed strategy could deliver the aspirations of all parties involved in the project.

Tenants are one of the key elements to this and early discussions should be encouraged to establish a direct communication between occupier and owner or agent. Communication and open dialogue can be assisted by clear graphic representations of the opportunities provided by the differing levels of refurbishment.

Where commercial sites are located in high density urban locations and integrate a mix of uses, as increasingly seen in sustainable developments, the upper office floors can still be refurbished in isolation of the adjoining mixed uses.

Figure 5 (a-d) indicates an ideal strategy whereby a vacant floor can be utilised as part of the refurbishment programme to deliver a phased upgrade to the building whilst maintaining tenant occupation, business continuity and minimal disruption.
Core and floor plate reconfiguration

- Large reception area relative to the size of the building
- Toilets accessed from the office and therefore communal corridor is required in net internal area (NIA) for multi-let scenarios
- Dated presentation
- Cellular office layout
- Poor net to gross ratio

Figure 6: Core reconfiguration

- Intelligently positioned cores allow for maximum flexibility and future sub letting.
- Size of reception reduced and net internal area (NIA) reclaimed
- Core replanned around existing service risers
- Clean floor plates presented to market
- Service risers rationalised and NIA increased
- ‘External area’ reclaimed as NIA
- Building rebranded
- NIA increased by 10%
- WC provision meets current standards
“Cores are permanent elements and expensive to reconfigure”

**The challenge**

The structural nature of cores means it is complex and expensive to consider changing them for a relatively limited return.

**Can do**

The full potential value of a refurbishment may be lost if bold decisions on core redesign are not fully considered.

Where major refurbishment is envisaged, changes to the structural core can be very worthwhile, especially where significant lettable space can be gained. Whilst the works may be difficult and expensive, the resultant value released may well justify the costs incurred.

Changing from a concrete to steel core can reduce structural member sizes, leading to more efficient use of space and service distribution. Changes to facades, may enable the introduction of perimeter bracing to reduce lateral loads and thereby enable structural core changes. In many floor plates, primary cores can be reduced by the introduction of secondary non-structural cores.

Around main structural cores there is normally a soft core of service risers, toilets, cleaners rooms and tea points. Requirements for these can change over the life of a building and through imaginative design significant beneficial change can be made, comparatively simply, by partition demolition, floor void infill and rationalised replanning.

The provision of unisex toilets, to replace existing generous facilities, can release valuable floor area either as net lettable gain or to improve service riser arrangements and/or incorporate new IT requirements. There is frequently over-provision of riser space for replacement systems.

All of these possible changes can generate improved space efficiency and net area increase.

Following are the potential gains:

- Reclaim inefficient riser area
- Provide flexibility for future fit-out
- Increase lettable area
- Modernised standards
- Efficient space utilisation
- Ability to subdivide floors efficiently to cater for multi-occupancy
- Mini piling rigs and under pinning techniques can enhance foundation capacity
- Enhanced flow through the floors
- Potential to increase natural light through the floor plates
- More efficient WC and lift configuration to match current provisions for higher occupancy standards
Fabric enhancement

‘U’ value of the facade improved
Solar control added as appropriate
Running costs reduced
Creation of a more comfortable working environment

Consequential improvement in accordance with Part L2B of the Building Regulations graphically explained.
(Tables 1 and 7 refer to Building Regulations Part L2B)

Figures 7: Improving thermal performance
Figures 8: Assessing improvement to thermal performance
“External fabric is not cost effective to replace”

The challenge

The refurbishment of the exterior of a building through amendments or replacement of external cladding systems is usually considered a difficult and expensive element to refurbish and last on the list of potential value adding opportunities.

Many commercial buildings utilise polyester powder-coated aluminium curtain walling and associated glazing elements that were widely procured during the 1980s. This fabric generally specified a minimum 25 years design life. Today, nearly 30 years later, the units’ thermal and glazing properties fair less well than new systems and performance requirements.

Can do

Whilst concentrating upon revitalising the internal elements of an office building can readily demonstrate opportunities to increase rental income (thus paying for the refurbishment programme), such opportunities are often not maximised through a reluctance to address the building’s exterior.

However, floor area can be significantly increased by relocating the external skin outwards. In addition the skin of the building can help improve its overall thermal performance and contribute to a reduction in power consumption and running costs and therefore its overall sustainable credentials.

Buildings that have undergone major refurbishment programmes, including changes to the envelope, are generally perceived as having been comprehensively ‘rebranded’ and in some cases are thought to be new build.

In conjunction with new building services, such as the insertion of chilled beams or reversion to naturally ventilated office space, the traditional ‘closed box’ curtain walling solution can accommodate new openable windows and a more flexible envelope.
“Existing buildings are difficult to refit with modern systems”

**The challenge**

The planning grids and storey heights of buildings constructed between the 1970s and early 1990s prevent the introduction of the latest building services and ICT systems.

**Can do**

Buildings throughout the study period generally adopted a 1.5m planning module. Consequently, cladding or curtain walling systems can readily be replaced with standard modern systems.

Storey heights of buildings constructed throughout this period are generally sufficient to enable a range of optional ventilation and conditioning systems to be considered. Solutions including natural ventilation, displacement ventilation, chilled beams, fan coil units or mixed-mode may all be considered.

The introduction or change in depth of existing raised floors may also enable floor distribution systems to be incorporated. Similarly, exposing existing concrete soffits as chilled ceilings may be appropriate where storey heights are less generous.

It may well be possible to increase floor / ceiling heights by the introduction of more compact, space efficient service runs, thereby reducing ceiling void depths and increasing floor to ceiling heights.

Example: The refurbishment of a 67,000 sq ft 1970s office building to a grade A speculative office in the heart of the West End.

Achievements

- Gross floor area increased by 15% to provide a 40% increase in net area through the removal of low level perimeter air conditioning zones.
- Very shallow overhead four pipe fan coil unit systems introduced whilst still maintaining flexibility for extensive CAT B fit-out to occur.
- Raised access floors introduced for better space planning.
- Relet as headquarters office to a major tenant
- Rental value increased
“A new building will provide a higher density site”

The challenge

The value of the site can only be maximized by demolishing and rebuilding. Refurbishment of buildings that were built in a time of lower density standards do not allow the same gains as a new build.

Can do

The inherent value of existing town planning consents, associated with the site or building, may be lost if a new build option is pursued instead of refurbishment.

Optimising asset value by a new, higher density, development comes with the risk that planning consent may not be secured for part or all of the desired increase. Options such as rebuilding higher or over surface parking both come with additional construction and planning costs, and increased development risk.

New build may also incur potentially expensive Section 106 payments, which on average adds 7% to the development cost. Typical refurbishment projects do not incur these costs.
Sustainability

Figure 9a-c: BREEAM ratings for refurbishments

**a - Environmental improvements achievable relative to the level of refurbishment**

BREEAM Refurbishment Graph

**b - BREEAM credits**

This diagram shows the weighting in each category and identifies the minimum credits required to reach each BREEAM rating.

**c - Comparison of new build vs refurbishment relative to the targeted EPC rating**

This diagram shows the various EPC ratings A-C comparing new build against refurbishment. It shows how it is easier to achieve more CO2 credits for a refurbishment project over a new build proposal, which will ultimately contribute to a more sustainable solution.
Challenging preconceptions

“A new building will be more sustainable”

The challenge

It is difficult and not cost effective to upgrade an existing building to achieve a higher BREEAM rating and there is insufficient increase in asset and rental value to warrant doing so.

Can do

Targeting a BREEAM rating for a building that can be refurbished may seem an unnecessary and expensive exercise.

BREEAM addresses wide ranging environmental and sustainability issues and gives developers and designers the opportunity to improve the environmental credentials of their buildings.

In major refurbishment BREEAM is designed to assess the provision, extension or alteration of thermal elements and / or building services and fittings. However, BREEAM is not designed to assess a minor refurbishment of an existing building.

The assessment awards credits according to the performance of the building against specific criteria. The refurbishment of a building will be assessed against the following:

- Management
- Health and wellbeing
- Energy
- Transport
- Water
- Materials
- Waste
- Land use and ecology, and;
- Pollution

Some BREEAM credits are more readily available for major refurbishment compared with new build, e.g. credits can be awarded for the reuse of building elements.

Energy Performance Certificates

Energy Performance Certificates (EPCs) are required for all new and refurbished buildings. Certificates will be issued to grade the energy performance of a building on a scale from A to G. There are two types for commercial buildings: asset certificates and operating certificates.

Asset certificates will measure the intrinsic energy performance of the building based on its design. Operating certificates will measure how the building is managed and actually performs. Asset certificates will have to be renewed every ten years and shown on points of sale, lease and lease renewal. Operating certificates will be renewed on an annual basis and apply to buildings with a usable floor area greater than 1,000 sq m.

EPCs should allow prospective tenants the ability to differentiate good from poor performing buildings. If a building’s energy performance can be measured then it can be managed and priced. Higher performing buildings should attract a rental premium, thereby increasing the business case for improving the energy efficiency of refurbished buildings.
Replacement service options

- Perimeter induction unit occupying valuable NIA
- Dropped service bulkhead in ‘notional’ corridor limits flexibility.
- Exposed concrete slab providing mass and stabilizing daytime temperature
- Suspended up/down low energy lights (LG7)
- Ceiling Slab Lined with phase change material
- Cooling terminal provided for internal rooms via d.c. Fan drives
- Natural ventilation mixed mode
- Externally ventilated ‘climate facade’ offering low G-value, Low U-value and high light transmission.
- Flat ceiling provides flexibility and uniformity
- Super slim line FCU system installed to ceiling void.
- Net lettable floor area reclaimed at perimeter.

Figure 10: Replacement services options
"Replacing services is expensive and not as efficient as new build"

The challenge

The extent of upgrade or replacement to a building’s services can have the biggest single impact on the viability of any office refurbishment project.

The introduction of replacement services is seen as one of the most complex and challenging aspects of office refurbishment and is often very intensive, impacting on all areas of tenant demises.

It is often one of the areas which by virtue of space allocation make existing buildings fall short of BCO guidelines.

Can do

The refurbishment of building services can vary in scope as follows:

A. Light Touch
   This can include the cleaning, overhauling, retesting and commissioning, of an existing system.

B. Medium Intervention
   As above but new lighting, diffusers and grilles, sanitaryware and other visible building services components can be added.

C. Extensive Intervention
   As above but replace building services systems to similar layout as existing and increase ceiling height, reclaim net lettable floor area. Introduce better sustainability and energy features.

D. Comprehensive Refurbishment
   As above but replan core, extend, reclad, move plant, review renewable energy options. Where site wide opportunities are available ground source heat pumps and labyrinth cooling can also be considered.
Sweating the asset

Figures 9 and 10: Improvement of floor plate efficiencies
The challenge

The disruption to existing tenants of a heavy refurbishment programme can often prevent it being pursued as an option.

Landlords may regard the office floor as a given and not question rationalisation of various items such as core reconfiguration and structural alterations due to the cost. Equally tenants in occupation may regard a move to newer premises as an easier option than refurbishing their existing spaces. They may not be aware of the opportunities that an updated space planning and workplace strategy could bring to their business. The refurbishment and upgrade of 70s, 80s and 90s buildings is borne out of a need to create 21st century contemporary office environments, promoting creativity and free-flow of ideas. This is not just derived from better workspaces, but from a new ethos of communicative and interactive space. A column free office space optimises these opportunities.

Can do

From the 1970s the trend has been towards more open-plan office environments. Traditional cellular offices have slowly been replaced over the years to create more flexible and reconfigurable space.

These endeavours for flexibility have been driven across many business sectors by both cost and the need for enhanced communication. Typical 70s and 80s office space is set out on a 1.5 m grid, which has restricted space planning to a particular layout, albeit open plan or cellular. The age old trend of row upon row of desks is proven not to support good flow of information and ideas and increasingly a more informal arrangement of furniture and break-out spaces is important to support modern day business.

The other trend associated with the latest BCO guidelines is towards higher density space planning of 1:8 or 1:10 m², with typical desk footprints reduced to a rectangular 1600 x 800 or even smaller 1400 x 800. We can therefore see the emergence of a tighter and more efficient office floor, but only if the structure and building services support these. An additional opportunity for some workspace re-planning is to link floors with localised communication stairs to support flow of people and ideas. These can be seen as a feature or landmark when designed sympathetically into the overall refurbishment program.

A successful refurbishment can respond to all of these contemporary workplace issues by opening up and providing responsive and flexible environments, both in terms of mechanical and electrical services and structure. This gives businesses more choice and flexibility in how they space plan their workforce, and encouraging break-out and communication spaces. These spaces are easily re-configurable to accommodate any eventuality and can therefore, increase occupancy on the floor making it far more efficient in terms of £/sq ft.

Additionally, allowing for the overall floor space to be sub-divisible provides the opportunity, depending on market forces, for any of the landlord’s and tenant’s future options to be delivered.

The relationship of the core, floor plates and cladding must be considered, so as to provide the ideal space, depth, day lighting, external awareness and fit-out options. A contemporary workspace strategy and rationalisation of an open office environment is significantly beneficial to tenants, employees and the market place.
Before refurbishment dated entrance area

New glazed intervention

Welcome light and bright area.
“Non-demised space is not worth upgrading”

The challenge

Reception areas are transient spaces which typically do not have ownership or any brand identity in multi-tenant buildings; they are seen as neutral pass-through spaces.

Refurbishing reception areas can cause substantial disruption to incumbent tenants, visitors, and employees alike, and can increase security, access and health and safety risks. Poorly managed reception refurbishments can result in loss of business and staff. In addition, general disruption to services and access routes from reception spaces to stairs and lifts can often preclude anything more than a Light Touch approach.

As a non-demised space that does not directly provide revenue, reception area improvements are often considered questionable financial investments. Consequently, a ‘make-do’ approach is often accepted as the easy choice with the Light Touch approach generally undertaken.

Can do

The appearance of the public areas or non-demised spaces should leave a lasting memory and a positive message to both visitors and employees.

Usually, the first areas that potential tenants view are reception areas and WCs. These are vital in attracting occupiers to let the space, particularly in multi-tenant buildings, where the opportunity for an occupier to control the quality of design and decoration in their demised spaces is limited. The design of the reception and other common areas - including lift cars and lobbies - says a great deal about their company.

The opportunities for refurbishing reception and entrance spaces are enormous. As this area represents the “welcoming smile” of the building, a well refurbished arrival space symbolises a contemporary, well-positioned workspace and is a positive reflection of the occupying business. It can, therefore, add substantial benefits to their brand.

Commonly, reception areas are draughty, badly lit spaces with little consideration for acoustics. Through the refurbishment design process all of these negative aspects can be addressed including opening up areas to create double-height, and more impressive, voluminous spaces.

Attention to design detail is paramount from an interior fit-out perspective, from the desk, to the artwork, to the seating selection. All this will collectively create the right buzz to entice companies to occupy the space. All areas should be considered, from the entrance lobby to circulation space around the building, to the redesigned core facilities.

Corporate signage should have a clear rationale to allow occupiers a sense of ownership within the space and give their visitors a clear wayfinding solution through to their demise.

For effective retention and recruitment, refurbished office accommodation should present attractive modern facilities to both existing and potential employees.

Visitors who experience the well designed, rebranded, modern office environment will be given a subliminally positive image of the company occupying the building and this will in turn raise the overall value of the building for the investor and developer.
Occupier benefits

- Refurbished office space
- Open Plan Work Space
- Staff Cafeteria
“Staff wellbeing is improved in a new build solution”

The challenge

Demoralised staff and poor performance can often be attributed to a poor working environment. An outdated building with poor services, lighting and workspaces can undermine staff productivity and therefore the success of an organisation. This can result in companies deciding to relocate to better facilities, but can also cause the failure of such businesses leading to the total loss of rental income. There is therefore a sound basis for a developer to be actively involved in ensuring the wellbeing of their occupiers.

There are a number of developers who actively challenge tenant fit out design to provide the very best working environments. In addition the buildings are designed to reflect the aspirations of developer and occupier alike.

It is also argued that refurbishment programmes offer many challenges that impact negatively on employees, who are forced to endure work going on around them.

Can do

It is evidenced that new build or refurbished offices that promote best practice in workplace strategies, and actively provide the best working facilities and conditions, promote strong, healthy, positive and productive staff and increase morale and retention rates. A well considered workspace strategy that optimises floor plates, can introduce new approaches to working methods and deliver new facilities for new or existing staff. Newly refurbished receptions, communal areas and office environments produce a feel good factor that can create a positive social benefit.

A sustainable, naturally lit, remodelled environment will support business ideals and vision, which supports retention, as well as attracting key personnel to the business. A feeling of wellbeing has been proven to reduce sick days, enhance productivity, motivation and loyalty. A remodelled building gives staff a sense that they are valued and are worthy of investment and thereby contributes to overall responsible corporate governance.

A tenant who has had landlord support specifically to meet their requirements will prove to be a loyal occupant of the premises.

Staff productivity increases in workspaces that have been well executed and refurbishment programmes can be combined with best practice interior design solutions.

Credits are awarded for enhancing the health and wellbeing of occupants as well as proximity to natural daylight. All of these would give an enhanced BREEAM rating.

Shareholders of occupying companies, as well as the shareholders of the developer and funding institutions and other key stakeholders, recognise that improved building stock enhances portfolio value, increases environmental credentials and improves rental values.
“Refurbishment is a good option”

The preconceptions discussed over the preceding pages illustrate how the development and construction industries have, in many instances, questioned the validity of refurbishment as opposed to new build solutions.

Summarised below are some of the key findings of this research. They are grouped into the primary objectives sought when carrying out any redevelopment opportunity, and demonstrate the benefits for the key stakeholders.

**The outcome: developers’ benefits:**

- Reduced capital expenditure in terms of construction costs and professional fees, when compared to new-build projects
- Reduced programme which through preliminaries saving can contribute to reduced costs and a quicker introduction to the market place
- Potential to increase floor area and therefore rental income
- Improved rental and yield values at minimum cost/capital expenditure
- Improved portfolio of better stock of buildings
- Quicker letting in a particular market cycle
- Enhanced design life of existing stock
- Improved revenue expenditure and, potentially for option D refurbishments, a comparable performance to that of a new build solution
- Overall capital expenditure requirements are less for a refurbishment scheme: less equity and project finance
- Reduced risk profile for lighter refurbishment options
- The whole life/revenue expenditure per sq m will be improved by the refurbishment and if extensive enough may allow the building to perform as a new build
- Certainty of delivery is greater by removing planning risk
- Removes statutory costs that are applied with a new build solution
- Less overall project risk
- Optimised rental values
- Speed of starting on site means that the current market downturn can be taken advantage of
- Greater availability of tax relief (subject to certain conditions)
- Approx 7% saving on development costs through removal of Section 106 costs
- Potential retained tenancy
- Preserve valuable car parking standards
- Ensure longevity of building stock
- Can be completed with tenants in occupation where a phased approach to relocate floors is feasible
- Lower development risk profile depending on which option chosen
- Programme benefits (between 70-14% time savings)
Refurbishment is a good option

The outcome: tenant and occupier benefits:
- Inefficient riser areas can be optimised resulting in increased lettable area
- Provide greater flexibility for future fit-out
- Upgraded accommodation to current standards
- More efficient space utilisation
- Ability to subdivide floor efficiently to cater for multi-occupancy
- Potential to increase natural light
- More efficient WC/lift configuration to match current provisions for higher occupancy standards
- Increased ceiling heights
- Omission of perimeter heating units thus providing more NIA
- Rebranded reception setting the scene for contemporary efficient office space.
- Can provide improved circulation through the building
- Allows for compliant DDA entrance areas
- Enhancement of the building’s brand
- Introduction of more regular planning grids

The outcome: environmental benefits:
- Lower annual energy costs
- Reduced carbon footprint
- Better BREEAM and EPC ratings
- Rationalisation of plant size and depths to provide more NIA and better/compliant floor to ceiling heights
- Improved sustainability credentials
- Allows for well conditioned light and bright space
- Can allow incorporation of modern overhead ventilation systems
- Increase ceiling heights
- Eliminate bulkheads
- Introduction of suspended floors
- Opportunity to improve, enhance or replace building services
- Can incorporate alternative approaches to conditioning workspace environments with more sustainable and environmental systems
- Introduce opportunities to revert to natural ventilation with openable windows
Appendix -1
Office building categories

This research has been carried out by considering office developments in three distinct location categories:

**Urban Office**  buildings typically seen in metropolitan centres across the UK.

**Mid-Urban Office**  buildings typically associated with edge of town sites and

**Out-of-Town Office**  buildings typically located on commercial Business Parks associated with motorway junctions or transport nodes, and corporate HQ buildings located on self-contained rural or semi-rural locations.

Each of the building categories exhibit characteristics typical of their respective locations and with which the property industry is generally familiar. The research summarises these characteristics, and identifies typical constraints and opportunities from which considered evaluation of refurbishment and new build options can be undertaken.

**A - The Urban Office**  is generally characterised as follows:-

- Taller (four or more storeys)
- Corporate lets
- Larger floor plate up to 21 metre deep space
- Tight urban sites with little room for construction
- Rights of light affecting adjoining properties
- Few car spaces as constrained by site dimensions and locations
- Higher construction costs reflecting metropolitan tenant requirements
- Higher rental costs reflecting the urban location and tenant typology

1970s the Urban Office generally characterised as follows:-

2.7 metre to 3.5 metre floor to floor (9’ floor to floor)
In the 1970s Perimeter Low Level Systems (induction units) and central drop false ceiling bulkheads were quite common. Generally these systems can be replaced with overhead slim line systems with the associated reclaim of perimeter net lettable floor area, higher flat false ceilings and the incorporation of a raised access floor. Building Regulations and the London Building Act and Fire regulations also applied to ‘tall’ buildings.

1980s the Urban Office generally characterised as follows:-

3.1 metre to 3.75 metre floor to floor.
In the 1980s generally VAV all air systems were common. These can now be replaced with modern systems resulting in reduced central plant space, reduced riser space and reduced false ceiling void depth resulting in increased ceiling height and improved environmental credentials.

1990s the Urban Office generally characterised as follows:-

3.5 metre to 4.2 metre floor to floor
In the 1990s VAV and FCU systems were common. These can generally be replaced in less headroom space, whilst also incorporating low energy/low carbon, sustainable modern systems.

**B - The Mid-Urban Office**  is generally characterised as follows:-

- Generally two to four storeys
- Corporate and local tenants looking outside of metropolitan centres to attract suburban employees
- Large floor plates of 15 metre to 18 metre depth
- Mid Urban sites within town centres or edge of town locations
- Mid range construction costs to appeal to city / town centre tenants
- Mid range rental costs reflecting mid-urban locations

1970s the Mid-Urban Office generally characterised as follows:

Two to three storeys maximum with plant in a pitched roof
Smaller floor plates circa 10 - 40,000 sq ft
Generally 12 - 15 metre deep space with central column solutions
Doughnut design was common place
Car parking standards of approximately 1/20 sq m GEA
Medium construction values reflecting mid-urban location
Medium rental levels reflecting mid-urban location
Appendices - Office building categories

1980s the Mid-Urban Office generally characterised as follows:-
- Generally two to three storeys maximum with plant in a pitched roof
- Smaller floor plates circa 20 - 50,000 sq ft
- Generally 15 metre deep space with central column solutions
- Some 'Doughnut' and 'U' shaped design space
- Car parking standards generally 1/25 sq m GEA
- Medium construction costs reflecting Mid Urban location
- Medium rental values reflecting Mid Urban location

1990s the Mid Urban Office generally characterised as follows:-
- Generally three to four storeys maximum with plant in roof
- Smaller floor plates circa 40 - 75,000 sq ft
- Generally 15 metre deep space with central column solutions.
- 'U' shaped layouts or linear designed space
- Car parking standards generally 1/30 sq m GEA
- Medium construction values reflecting Mid Urban location
- Medium rental levels reflecting Mid Urban location

C - The Out of Town Office generally characterised as follows:-
- Two to three storeys office with plant in roof
- Loose layouts with buildings surrounded on two to three sides (sometimes completely surrounded) with car parking all at grade.
- Well landscaped

1970s the Out-of-Town Office generally characterised as follows:
- Generally two to three storeys maximum with plant in/on roof
- Smaller floor plates circa 7.5 - 40,000 sq ft
- Generally 12 - 15m deep space with central column solutions
- Doughnut design was common place
- Car parking standards approximately 1/20 sq m
- Lower construction costs reflecting out of town location
- Lower rental costs reflecting out of town location

1980s the Out of Town Office generally characterised as follows:-
- More typically three storeys maximum with plant in/on roof
- Small to mid-size floor plates circa 10 - 50,000 sq ft
- Generally 15m deep space with central column solutions
- Car parking standards approximately 1/25 sq m
- Lower construction costs reflecting out of town location
- Lower rental costs reflecting out of-town location

1990s the Out-of-Town Office generally characterised as follows:-
- Usually three storeys maximum with plant in/on roof
- Mid size floor plates circa 25 - 50,000 sq ft
- Generally 15m (some 18m) deep space with central column solutions
- Car parking standards approximately 1/30 sq m
- Lower construction costs reflecting out of town location
- Lower rental costs reflecting out of town location
Overview

Through the 70s, 80s and 90s the specification of building elements and services was driven by changes in legislation, product development and business needs which can be summarised as follows:

- Changes in town planning regulations led to the creation of the office/industrial unit which was the foundation of business parks
- Changes in Building Regulations have required increasingly high levels of insulation, enhanced fire protection and the provision of improved access for all
- Changes in client business requirements with more open plan and less cellular space, combined with the growth of IT needs requiring raised access floors, more power and fully wired up (or the capability of wired up) floor plates
- Changes in comfort control levels and the growth of air conditioning emerged

Building Specification Evolution

The response to these changes over time is reflected in specification changes summarised below:

Urban 70s
- Construction: simple frame, some load bearing
- Module: mostly 4 feet
- Heights: low, medium rise, floor to floor minimum, barely more than domestic
- Frame: mostly concrete
- Cladding: brick stone, ribbon widows very limited curtain walling
- Services: simple no raised floors minimal ceiling zones natural vent, some 4 pipe fan coil, limited insulation
- Features: limited to entrance hall or hq's or city

Urban 80s
- Construction: more complex, most load bearing frame
- Module: moving to 1500 mm, some still at 4 feet, a few at 1200mm
- Heights: high rise common, higher floor to floors
- Frame: mostly concrete some steel and composite
- Cladding: curtain walling precast and masonry
- Services: limited raised floors more floor boxes, ceiling zone for light and vent louvered light fittings, some a/c, some 4 pipe fan coil limited insulation

Urban 90s
- Construction: mix of types and spans
- Module: mostly 1500mm some 3000mm
- Heights: floor to floor now includes full raised floor, larger on the ground floor, larger ceiling void for vent and lights.
- Frame: concrete and steel composite
- Cladding: full curtain walling some all glass some with spandrels of stone or panels
- Services: full a/c VAV or VRV

Mid Urban 70s
- Construction: simple, cheap and low rise
- Module: various linked to structural frame
- Heights: modest
- Frame: steel or concrete
- Cladding: industrial with ribbon widows
- Services: very limited no raised floors, natural vent, opening windows
- Features: emphasise on simplicity

Mid-Urban 80s
- Construction: simple but more business park, low to medium rise
- Module: mostly 1500mm
- Heights: Allow for reasonable floor to ceiling and adequate ceiling void.
- Frame: Steel or concrete
- Cladding: industrial with ribbon widows
- Services: simple, some a/c, mostly 4 pipe fan coil
- Features: layout range of building sizes to give maximum letability
Mid-Urban 90s
- Construction: as simple as possible, medium rise, possible decked car parks
- Module: 1500mm
- Heights: allow for raised floors, full ceiling voids, large floor void on ground
- Frame: mostly concrete, some steel. Floors composite
- Cladding: curtain walling
- Services: full a/c 4 pipe fan coil in some, full power and IT in the floor, full ceiling void with vent and Cat 2 light fittings
- Features: well finished entrance and toilets, landscaped exterior

Out-of-Town 70s
- Construction: simple small scale load bearing
- Module: 4 feet or to suit frame
- Heights: domestic
- Frame: none
- Cladding: load bearing brickwork
- Services: simple, no a/c

Out-of-Town 80s
- Construction: more complex use of mixed materials
  - Module: mostly 4 feet, some 1500 mm
  - Heights: increasing to allow for services
  - Frame: mostly steel some concrete
  - Cladding: domestic, industrial mix
  - Services: some power in floors, natural lighting

Out-of-Town 90s
- Construction: medium to high rise, mix of frames
  - Module: all 1500mm
  - Heights: full height to allow for services
  - Frame: concrete and steel with some composite
  - Cladding: mix of curtain walling, load bearing and industrial
  - Services: mostly raised floor, some floor boxes, cat 2 lighting, some a/c comfort cooling

Building and Other Statutory Regulation Evolution

The Building Regulations 1964
Legal documents based on previous By-Law requirements. Based upon the Railways Office Shop Premises Act that set the standard for fire escape, toilets and space standards. Many continue in the workplace regulations to this day.

Fire Precautions Act 1971
Brought in to enhance fire safety after a number of serious fires and requiring certificates from the local fire service.

Health and Safety at Work etc 1974
The enabling Act that started a raft of health and safety legislation.

Building Act 1984
Major revision to The Building Regulations with the introduction of Approved Documents giving examples of compliance. Included protected areas, escape distances and compartmentation requirements.

The London Building Acts 1930 to 1982
Most repealed when the 1984 Building Act came in to being. Some remain, Section 20 Fire and Volume Section 21 Uniting of Buildings, Temporary Buildings Section 29 -31, Fire Escape Section 34, to 37 Dangerous Structures Section 70.
The Workplace Regulations 1992
Driven by a European Directive for more control over the workplace as part of a raft of health and safety legislation covering workstations, display screens, manual handling.

The Disabled Discrimination Act 1995
Since its introduction, a vast range of further provisions has been introduced covering all aspects of provision for the disabled. However the Act is a principle, actual measures may be as part of the built environment or managerial or procedural. Definitive built solutions to satisfy the act are impossible.

The Construction Regulations 1996
Driven by a European Directive intended to enforce safer construction sites.

The Fire Precautions Act (Workplace) Regulations 1997
Driven by a European Directive to enhance precautions for workplaces. Requires the production of a risk assessment for the workplace testing and checking of fire precautions measures including building, equipment and escape procedures. Random inspection by the fire authority where possible.

The Building Regulations 2000
Included fire regulatory reform order 2005 which attempted to amalgamate the various sections of fire requirements. Owners and managers of buildings become responsible for fire safety. Fire Service no longer obliged to issue certificates or inspect.

Local Acts of Parliament
May cover fire precautions, access for fire fighting, especially over 18.3 m, foul and storm drainage and construction of retaining walls.

CDM 1994
Health and Safety requirements for the whole construction industry.

Building Services Evolution

Building Regulations - current regulations in place today.

From the 1970s to current times the popularity of systems has changed from perimeter induction unit systems to VAV through FCU’s, Direct Refrigerant Systems (VRV) to chilled ceilings, chilled beams, natural ventilation and displacement systems.

Systems are generally more compact and therefore space can be reclaimed to net lettable floor area.

The Building Regulations Part L, “Conservation of Fuel and Power” has increasingly become more stringent with the resultant reduction in energy and carbon emission an increasingly important factor resulting in minimising annual fuel costs.

Environmental and sustainable requirements for incorporated into buildings are now common place with legislations calling for these improvements.

The assessment methods of BREEAM, Code for Sustainable Homes and LEED are correspondingly becoming very common in today’s expectations.
Town Planning Regulation Evolution

Following is a summary of planning regulation change over the three decade review period:

1970s
Planning criteria prevalent in the 1970s which affected the design of commercial buildings was as follows.

Car parking Ratio - An average of 1/20m² would have ‘generally’ applied to out of town commercial locations which equated to surface car parking covering an average of 40% of the plot parcel.

The likely financial contributions associated with planning approvals applicable at this time would have amounted to approx £300,000 based upon a 100,000 sqft commercial building in Central London (for instance).

1980s
Planning criteria prevalent in the 1980s which affected the design of commercial buildings was as follows.

Car Parking Ratio - An average of 1/25m² would have ‘generally’ applied to out of town commercial locations which equated to surface car parking covering an average of 35% of the plot parcel.

The likely financial contributions applicable at this time would have amounted to approx £750,000 based upon a 100,000 sqft commercial building in Central London (for instance)

1990s
Planning criteria prevalent in the 1990s which affected the design of commercial buildings was as follows.

Car Parking Ratio - An average of 1/25m² - 1/30m² would have ‘generally’ applied to out of town commercial locations which equated to surface car parking covering an average of 30% of the plot parcel.

The likely financial implications, arising from Section 106 and Section 278 contributions during the 90s, would have amounted to approx £1 million, for a 100,000 sq ft commercial building in Central London.

BCO Guidelines

The following appendix identifies how the BCO guidelines have moved office design on from the early 90s when the BCO first began to produce guidance into best practice.
### Evaluation Criteria

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Key Design Parameters</strong></td>
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<tr>
<td><strong>Site Density</strong></td>
<td><strong>Site Density</strong></td>
</tr>
<tr>
<td>Parking</td>
<td>Provide Access control - Layout for ease of surveillance</td>
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<tr>
<td></td>
<td>Rigorous access control - Layout for ease of surveillance - suitable levels of illumination</td>
</tr>
<tr>
<td>Floor Plate Efficiency</td>
<td></td>
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<tr>
<td>Building Plan Depth</td>
<td>15-18m is ideal</td>
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<tr>
<td></td>
<td>15-18m is ideal</td>
</tr>
<tr>
<td>Column Grid</td>
<td>6m, 7.5m and 9m - 9m optimum - 12m still produced quality environment - below 6m less viable 6x6m grid not recommended</td>
</tr>
<tr>
<td></td>
<td>6m, 7.5m and 9m - 9m optimum - 12m still produced quality environment - below 6m less viable 6x6m grid not recommended</td>
</tr>
<tr>
<td>Planning Grid</td>
<td>1.5m - appropriate to standardise on this dimension</td>
</tr>
<tr>
<td></td>
<td>1.5m - appropriate to standardise on this dimension</td>
</tr>
<tr>
<td>Core Elements and Stairs</td>
<td></td>
</tr>
<tr>
<td>Lavatory Calculation</td>
<td>1:14sqm NIA based on 120% pop (60/60 split) 1:14sqm NIA based on 100% pop (when unisex toilets are provided)</td>
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<tr>
<td></td>
<td>1:14sqm NIA based on 120% pop (60/60 split) 1:14sqm NIA based on 100% pop (when unisex toilets are provided)</td>
</tr>
<tr>
<td>Use of Atria</td>
<td>Circulation, Café, Exhibition - requires additional fire safety systems if used for general office area</td>
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<tr>
<td>Building Section</td>
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<tr>
<td>Ceiling / Lighting zone</td>
<td>150mm</td>
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<tr>
<td></td>
<td>150mm</td>
</tr>
<tr>
<td>Floor-to-ceiling height</td>
<td>2600-2750mm</td>
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<tr>
<td></td>
<td>2600-2750mm</td>
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<tr>
<td>Raised floor zone</td>
<td>150mm (increase for underfloor ventilation while ceiling service zone decreases)</td>
</tr>
<tr>
<td></td>
<td>150mm (increase for underfloor ventilation while ceiling service zone decreases)</td>
</tr>
<tr>
<td>Envelope - Design Life</td>
<td>60-year life is commonly assumed - appropriate to set a design life for components</td>
</tr>
<tr>
<td>Thermal Insulation</td>
<td></td>
</tr>
<tr>
<td>Structural Systems</td>
<td></td>
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<tr>
<td>Finishes</td>
<td>&quot;Too often, elaborate and individual designs, using expensive and unique materials, have been evolved in areas of the building where they are not warranted&quot; Offices: vinyl cloth or emulsion paint on plasterboard walls. For suspended ceilings, use of either mineral fibre or metal that are easily demountable. Lavatories: Ceramic floor tiles to walls and floors with laminate cubicles and vanity units provide perfectly satisfactory and functional level of finish.</td>
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</tr>
<tr>
<td>Key Performance Criteria</td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td>Flexible space capable of sub division and multi-occupancy of different sizes</td>
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<tr>
<td></td>
<td>Provide a building that can vary during its life</td>
</tr>
<tr>
<td>Occupancy Standards</td>
<td>1:10/sqm NIA standard but accepted that few buildings are this densely populated.</td>
</tr>
<tr>
<td></td>
<td>1:10/sqm NIA standard but accepted that few buildings are this densely populated.</td>
</tr>
<tr>
<td>Comfort</td>
<td>Natural ventilation - 8-12 litres per second per person - design for good draught free cross ventilation - thermal modelling to predict performance - correct orientation, shading, thermal mass and fenestration to minimise heat gain</td>
</tr>
<tr>
<td></td>
<td>Natural ventilation - 8-12 litres per second per person minimum filtration EUS - maximise benefit from passive methods of climate control. Local noise may dictate a sealed façade - mechanical ventilation and cooling may be required. Orientation to admit useful daylight and avoid unwanted glare or solar gain. Window design should take advantage of useful heat while reject unwanted gains. Solar shading. Make realistic assessment of heat gain within office space. Optimise daylight. Determine expectation of occupants. Internal temperatures 24º summer 22º winter</td>
</tr>
<tr>
<td>BREEAM</td>
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<td>Statutory Regulations</td>
<td></td>
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<tr>
<td>Occupancy factors for means of escape</td>
<td>1:10-12m² NIA</td>
</tr>
<tr>
<td></td>
<td>1:10-12m² NIA</td>
</tr>
</tbody>
</table>

45% for Business Parks | Plot ratios of 45%, once commonplace now generally exceeded achieving 55%. | Plot ratios for non urban space achieving 50%. Plot ratios for urban sites generally a lot higher.

1.25 for Business Parks | 80-85% (NIA/GIA) (based on 2-4 storeys). Urban buildings may be lower at 75%. | The response delivering deep plan and shallow plan building recognised - Range between 12.0m - 21.0m

80-85% (NIA/GIA) (based on 2-4 storeys) | 13.5m - 21.0m | 13.5m - 21.0m

13.5m-21m Europeans favour narrow space with 15-18m common to max depth of 21m | Window to window or atrium (not core) 13.5 - 21.0m | Window to window or atrium (not core) 13.5 - 21.0m

7.5m - 9.0m | 7.5m - 9.0m | 7.5m - 9.0m

1.5m standard Suggestion of European Standards of 1.35m co-ordinating with ground floor/ basement parking. (1.2m grid suggested as UK interpretation of this) Planning grid typically expressed externally to facilitate partitioning of perimeter offices. | A 1.5x1.5m planning grid is the preferred standard in the UK. Suggestion that European Standards of 1.2m/1.35m co-ordinating with ground floor/basement parking. | A 1.5x1.5m planning grid is the preferred standard in the UK. Suggestion that European Standards of 1.2m/1.35m co-ordinating with ground floor/basement parking. More common in Europe than in the UK where facade is fully glazed columns should be pulled in by 350mm for maximisation of NIA.

1:25 for Business Parks | 80-85% (NIA:GIA) (based on 2-4 storeys) | 80-85% (NIA:GIA) (based on 2-4 storeys)

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1:25 for Business Parks | 80-85% (NIA:GIA) (based on 2-4 storeys) | 80-85% (NIA:GIA) (based on 2-4 storeys)

100mm | 100mm (including ceiling thickness) | 100mm (including ceiling thickness)

2600 - 3000mm | 2600 - 3000mm | 2600 - 3000mm

150mm o/all | 150mm o/all | 150mm o/all. When used for air distribution this may increase to 300 - 500mm or if highly serviced then depth may increase to an o/all of 300 - 500mm.

Roofs 0.25W/m2k Solid sections of exposed walls 0.45W/m2k Windows/personnel doors and roof lights 3.3W/m2k Vehicle access and similar large doors 0.7W/m2k | Ref to Building Regs L2 Conservation of Fuel and Power 2002 | Ref to Building Regs L2 Conservation of Fuel and Power 2002

Replaceable elements - <60years (Double glazing 20 - 25yrs) | Replaceable elements should last less than the service life of the envelope (Double glazing 20 - 25yrs) | Building envelope should function for 25 years without requiring major maintenance . Glass units should not be replaced within the first 20-25 years. Depending on climatic conditions liquid applied sealants require replacing after 15-20 years.

Refrigeration and air conditioning - liquid applied sealants - replacement every 15 years. | “Too often, elaborate and individual designs, using expensive and unique materials, have been evolved in areas of the building where they are not warranted” Offices Emulsion paint on plasterboard walls. For suspended ceilings, use either mineral fibre or metal ceilings that are easily demountable. Lavatories: Ceramic floor tiles to walls and floors with laminate cubicles and vanity units provide a perfectly satisfactory and functional level of finish. As per 2000 but adds “This does not seek to limit the quality of design, and it is accepted that richer materials may be used in public areas of the building in particular the entrance hall”Toilets: hard non porous finishes used wherever there is a requirement for regular cleaning.

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All building elements must include suitable access for cleaning, maintenance and replacement of damaged components. A cleaning and maintenance strategy should be developed during initial design.

1:10sqm NIA standard but accepted that few buildings are this densely populated. 1:12 - 1:17 seen as conventional density. (Exception of task-based activities e.g. Call Centres). | 1:12 - 1:17/sqm NIA standard. (Exception of task-based activities e.g. Call Centres). Accepted Standard 1.6sqm | 1.8 - 1.13 sqm NIA

BREEAM 98

Open plan offices exceeding 60sqm: 6sqm/person Other offices: 7sqm/person Accepted Standard 1.6sqm Accepted Standard 1.6sqm based on NIA
Appendix - 4 Case studies

Case study 1 - Urban office building: Central London
Case Study 1 - Urban Office Building

The total refurbishment of this 1970s office building alongside the Thames in central London comprises over 13 floors, plus basement.

Known as Sea Containers House, this vacant building went through an extensive refurbishment programme of 47,000 sq ft over the top 3 floors.

The refurbishment included major structural alterations resulting in increased lettable floor area, major M&E replacement, complete rationalisation of the cores and the rebranding of the reception areas through to the office work space and new meeting rooms.
Case study 2 - Mid-urban office building: Maidenhead, Berkshire
The works to refurbish this 1980s building included:

- Removal of one complete structural bay and adjoining single storey light industrial facility
- Removal of external fabric, including brickwork and glazing
- Removal of cores including lifts and staircases

- Removal of interior finishes throughout
- Retention of structural frame and floors
- Infill of voids in slab where staircases and lifts had been removed
- Making good to fire rating etc of retained steel frame
- Extension at slab edges to accommodate proposed edge/façade details
- Coordination of new wing with retained frame
Case study 3 - Out-of-town office: Maidenhead business park

Before
- Dated park environment
- Good location
- Dropping market appeal.

During refurbishment
- During refurbishment
- New contemporary architecture
- Addition of further floor increasing overall floor area

After
- Completed contemporary interpretation
- New market interest
- Represented as new contemporary commercial offer.
Three buildings at this business park are being extensively refurbished. Only the main structures have been retained with additional office accommodation being created within each building at roof level. The key elements of refurbishment include:

- Removal of roof and plant space
- Removal of external fabric, including brickwork and glazing
- Removal of cores including lifts and staircases
- Removal of interior finishes throughout
- Retention of structural frame and floors
- Infill of voids in slab where staircases and lifts have been removed
- Making good to fire rating etc of retained steel frame
- Extension at slab edges to accommodate proposed edge/façade details
- Additional floor added
- New café building provided
The British Council for Offices’ (BCO) mission is to research, develop and communicate best practice in all aspects of the office sector. It delivers this by providing a forum for the discussion and debate of relevant issues. Established in 1990, the BCO is Britain’s leading forum for the discussion and debate of issues affecting the office sector. Its members are all organisations involved in creating, acquiring or occupying office space, whether architects, lawyers, surveyors, financial institutions or public agencies.

The BCO works to advance the collective understanding of its members, enabling them to work together to create more effective office space. In addition to its national programme of events, research and publications, the BCO also runs regional chapters in Scotland, the North, the Midlands and the South West and Wales. These chapters provide additional meeting points for members through programmes of technical visits, seminars and networking events. The groups also allow members to focus on issues of special local concern.

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Scott Brownrigg is an international architecture, interior design and town planning practice working across a number of private and public sectors. It has extensive experience in designing and delivering quality commercial office space, both as new build and refurbishment, for some major corporate clients.

We believe that refurbishment projects, with the unique challenges they present, require a team approach and a response that addresses the individual characteristics of the building. We focus on achieving a balance between commercial insight and design excellence, recognising the positive benefits this combination can bring to refurbishment and new build projects.

Our award-winning interior design team has worked on many varied and exciting commercial interior projects and is renowned for its attention to detail and the delivery of a high standard of service on every project.

The practice has received numerous design, sustainability and commercial awards and is working on some of the UK’s largest projects. It is consistently rated in the top 20 of the country’s leading architectural practices.

Hilson Moran is a leading firm of engineering consultants providing a comprehensive range of services in connection with the built environment. Active in all sectors of the construction market, we undertake new buildings, fit-outs and refurbishments in the public and private sectors. We are proud to have been responsible for some of the world’s largest and most innovative buildings.

We have been responsible for numerous refurbishment projects for property developers and building occupiers. We know the development market and the ingredients that make sound financial investments for developers and funders. The importance of nett to gross ratios, rental values, programme, buildability and affordability are thoroughly understood and we have a detailed appreciation of market expectations and standards. We regard sustainability and energy efficiency as essential to all developments and lead the way through research and design to the greener buildings of the future. Hilson Moran applies the most modern design techniques to all of its projects, and aims to be the preferred choice of clients seeking assistance with the design and procurement of quality buildings.

Gardiner & Theobald LLP is one of the longest established and most reputable and recognisable names in cost and project management in the Industry. The firm is well known for its extensive work in the development and refurbishment of office projects and has amongst its portfolio of completed buildings some of the world’s most renowned projects and clients.


The firm’s scale, approach and philosophy means that it can equip its talented staff with sophisticated systems for cost data capture and manipulation. The integrated platform of service delivery ensures quality, consistency and accuracy throughout the firm’s operations and projects wherever in the world they are required. We strive to drive value and seek, through our creative and innovative contribution, solutions that avoid the dumbing down of inspiring built architecture.