



the **Soft Landings Framework**

for better briefing, design, handover and building
performance in-use





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The *Soft Landings Framework* was authored by Mark Way of the Darwin Consultancy and Bill Bordass of the Usable Buildings Trust, with assistance from Adrian Leaman of Building Use Studies and Roderic Bunn of BSRIA. This 2014 edition includes minor amendments over the version published in 2009, notably a revised Table 1 to match the version in BG 45/2014 *How to Procure Soft Landings* and align with the guidance in BG 6/2014 *Design Framework for Building Services*. The Soft Landings Stage 2: Design worksheet, written for BG 45/2014, is also now included.

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Edward Cullinan Architects	

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Arup	Fielden Clegg Bradley Architects
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Located on a rural site on the edge of Bath, the headquarters for Wessex Water was designed to meet the company's long-term business plan. This placed sustainability at the centre of the company's operations. As a consequence, the project not only considered environmental issues but also a wide range of social and economic factors, such as staff interaction within the office, the relationship with neighbours, and the ability of the building to adapt to future change.

Throughout the project the client ensured that the end users were consulted to inform the brief and to respond to design development. Key members of the client's team included representatives of the facilities management and IT departments, all of whom engaged in debate and discussion on how to extract the best from the new building. This covered not only the initial period of occupation but also the flexibility required to accommodate future needs. Drilling down into all such operational issues ensured that there was a thorough understanding of how the building was intended to work. Incoming staff were advised of the operating principles and details of their new workspace.

The three year post-occupancy evaluation was conducted jointly by the client, design, construction and maintenance team.



Introduction



Why bother with Soft Landings?

Perhaps it was the 2009 bi-centenary of Charles Darwin's birth, rather than the recession, that prompted thoughts about evolution and survival of the fittest, but it struck me that his observations could equally apply to buildings.

As an industry, we have often seemed incapable of learning about the performance of our own creations, with the inevitable result that buildings regularly fail to meet their owners' operational expectations or, worse, are demolished less than a generation after their completion. For those outside the industry the idea of continual improvement - ploughing back the lessons from one completed project to the next - must be obvious but, with few exceptions, this is rarely done by an industry too obsessed by capital cost. Shortcomings in basic requirements such as comfort, energy consumption and adaptability are not only irritating and costly in their own right, but also undermine attempts to achieve high levels of sustainability.

There are reasons for optimism. The need for lower-carbon buildings is rapidly establishing a culture for measurement of energy that is a stone's throw from greater knowledge about performance in general. Systematic, post-occupancy evaluation is widely recognised to be a hugely important step in the right direction, but it needs to be linked to a rational methodology for assessing the briefing, design and commissioning stages. This is where Soft Landings comes into its own, closing the loop between design, construction, operation, feedback and into design again. As the title suggests, the *raison-d'être* of Soft Landings is to provide better buildings and a more effective service to the client. Particular thanks are due to Michael Dickson for encouraging its development and to Buro Happold for its financial support.

It became clear to me during the last major recession in the early 1990s that occupiers who had a choice due to the abundance of surplus property would always go for the building that was well considered and highly functional. The current recession is following a similar pattern, so surely the subtext for the industry should be to embrace the knowledge gained from performance assessment and turn it into competitive advantage. Only the best buildings will survive in the long term.

Rab Bennetts, Bennetts Associates, June 2009



Soft Landings was being developed with the support of the Director of Estates at the University of Cambridge while the Centre for Mathematical Sciences was being constructed. The phased development of the Centre and a 'no blame' attitude adopted by the client permitted a continual assessment of the emerging design in actual physical performance and user expectation.

Following completion of the first phase, a post-occupancy evaluation was carried out to measure the building performance of the recently occupied buildings. As part of this study an occupant survey and a full building pressure test was also conducted. Many of the results were incorporated into design changes for the subsequent building phases.

The final appraisal revealed that the occupants and the University viewed the project as a great success.



Contents

08	The birth of Soft Landings
10	Background to Soft Landings
13	Introduction to the procedure
16	Stage 1: Inception and briefing
18	Stage 2: Design development and review
20	Stage 3: Pre-handover
22	Stage 4: Initial aftercare
24	Stage 5: Years 1 - 3 Extended aftercare and POE
26	Appendix A: Example worksheets
	Stage 1: Inception and briefing
	Stage 2: Design
	Stage 3: Pre-handover
	Stage 4: Initial aftercare
	Stage 5: Extended aftercare years 1-3



The birth of Soft Landings

As an architect I used to design buildings, get them built, hand them over, and then move on to the next job. This was rarely the end of the matter: I had to respond to things that came up during the defects liability period, and help with the final account – routine procedures that had to be followed. Along with most of my fellow professionals, my post-handover connection with the building in use was largely reactive. However, I felt that the accumulation of experience could be put to better use if one could head off issues before they happened. This meant knowing more about the building in use.

In the late 1990s, as a project director, I found myself regularly calling in to check progress with the client at the tail end of a particularly leading-edge building RMJM had designed for a major pharmaceutical company. My team had put a lot of brainpower into the project and it would be a pity if this was undermined by the usual post-handover minor glitches that could easily be allowed to mutate into chronic problems. This happened to coincide with a prolonged user occupation programme and offered a golden opportunity to be around while staff were beginning to work there. I borrowed a typical office as a base and used its facilities just like any member of staff, while observing the building in use and the occupants at work.

This short period in residence was a transforming experience, providing major insights that I had suspected, but not experienced in thirty years of professional practice. I saw people not understanding how things were supposed to work, such as the BMS-linked solar blinds, and was able to explain the design intent to them. I could often spot things not working properly before the users did, such as over-zealous presence-detected lighting, head-off potential problems, and organise follow-up. I learnt about things that were good but which users didn't understand. I found well-intended design features that fell at the first fence when used by non-architects, in other words the average building user.

In a subsequent project at Cambridge University, David Adamson, the Director of Estates, asked me to give one of a series of lectures. It was around the time of the last financial crisis and there was much talk of hard or soft landing of the global economy (where clearly lessons are not learnt). I picked up the theme in my talk, and Soft Landings for buildings was born.

The Soft Landings research

David Adamson then wondered whether the approach might become more of a standard procedure, which resulted in the next stage of development. Supported by the University Estates Department I led a project guided by a panel of designers, project managers and client representatives that investigated what might need to be done. In time, we were joined by Bill Bordass of the Usable Buildings Trust (UBT), and the team drew on a rather similar idea known as Sea Trials, together with other recommendations from the PROBE series of post-occupancy surveys.

In 2004 we produced preliminary documentation, in the form of a scope of service document set for Soft Landings¹. Since then, team members and others have been applying parts of the service in some of their projects. The results have been insightful, but mostly restricted to the firms that were members of the original development team, and those in close touch with them.²

¹THE WORKSHEETS IN THE APPENDIX ARE FROM THIS SOURCE, WITH THE EXCEPTION OF THE DESIGN WORKSHEET

²THE AWARENESS-RAISING DOCUMENTS ON SOFT LANDINGS, PUBLISHED IN 2008 BY BSRIA AND THE USABLE BUILDINGS TRUST, INCLUDE EXAMPLES FROM TWO AWARD-WINNING BUILDINGS: THE MATHEMATICS FACULTY AT CAMBRIDGE UNIVERSITY, AND HEELIS, THE NATIONAL TRUST'S HEAD OFFICE IN SWINDON.



When we began, some expected us to come up with a completely new procurement process. The difficulty of this soon became apparent as a wide range of contracts and processes are already deeply embedded with standard forms, agreed procedures and so on. So, at best, Soft Landings was likely to be regarded as yet another process among many. Instead, we saw it as a golden thread which could run alongside any procurement process, improving the setting of design targets, the managing of expectations with a focus on outcomes, reinforcing activities in the weeks immediately before and after handover, and providing a natural route for feedback and post-occupancy evaluation.

Some were keen to explore whether financial penalties could be attached to the attainment of agreed performance targets. After considering this in some depth, we recommended against it, owing to the expense of setting-up a legally-defensible system, uncertainties about metrics, the difficulties in dividing any responsibility for outcomes between all the parties concerned (not least the occupiers and facilities managers), and the fact that the industry is (as yet) largely unfamiliar with the true in-use performance of the buildings it produces. Instead, we felt that Soft Landings needed to be undertaken in a spirit of learning and continuous improvement, or possibly with a financial incentive which would be easier to organise and to share out than a penalty. After a few years, designers and builders may have become sufficiently confident to be able to offer guaranteed performance. But to start with, we need to learn in a no-blame situation, otherwise onerous requirements may actually stifle the purposeful innovation that we need to produce better buildings with far fewer environmental consequences.

Next steps

With the challenges of more sustainable buildings now hard upon us, there has been increasing interest in scaling-up Soft Landings. In response to this, BSRIA offered support to me and the Usable Buildings Trust to help widen the scope and knowledge of Soft Landings by convening an industry group and helping to prepare a publication and an implementation plan. This *Framework* is the fruit of these efforts and sets the overall scene. Detailed development will be tailored to the needs of specific contexts.

The world is becoming aware of the need to reduce building energy use and carbon emissions. There is also growing interest in post-occupancy evaluation (POE). Less well-appreciated is the fundamental importance of integrated feedback, and the feed-forward of lessons learned into the construction and handover periods. These actions are central to ensuring that sustainable strategies work in practice.

I hope that this framework for Soft Landings will interest and inspire clients, designers, builders, occupiers and managers around the world, and will be of immediate practical utility to those who want to make building design and construction more performance-driven. It should help to narrow the credibility gaps that often yawn between expectations and outcomes. In the longer term, I hope that more detailed documentation and services will evolve to support the application of Soft Landings principles in a widening range of procurement processes by different people, in different sectors, and in different countries.

Mark Way, June 2009



Background to Soft Landings

There is a growing realisation that sustainability, energy efficiency and the overall performance of new and existing buildings needs to improve radically. Clients, governments, and society are looking to the construction industry to meet increasingly challenging targets: for owners as robust sustainable investments, to satisfy occupiers, and to tread lightly on the environment.

Unfortunately, the construction industry and its clients do not yet have the right structures in place to deliver these improvements reliably. Surveys of recently completed buildings regularly reveal massive gaps between client and design expectations and delivered performance, especially energy performance.

There are many reasons for this, including:

- Many designers do not take sufficient account of how occupiers use and manage buildings and the equipment they introduce¹.
- Achieved performance is becoming increasingly dependent on technology, which often needs careful attention if it is to work as intended. Pre-handover commissioning is seldom enough.
- Solutions that look good in design calculations can often prove to be too complicated to be manageable, both through the design and delivery process and particularly in use. Designers can easily forget that management is a scarce resource, as can those procuring clients who do not have a direct involvement in building operation.

Designing for manageability

A note by the Usable Buildings Trust (UBT)

The UBT's studies of buildings in use suggest that they fall into four main groups.

TYPE A: These are complicated, require lots of management to look after the complication, and get it. They can work well, but tend to be expensive to run and fragile, as their performance can collapse in bad times.

TYPE B: These are less complicated, require less effort to run, and are more robust. We need many more of these, particularly in the public sector, as high maintenance is ultimately unaffordable and unsustainable.

TYPE C: This is unfortunately where all too many buildings that aspire to be Type A end up. They are too complicated, need too much money and management to look after, and end up delivering poor value.

TYPE D: These buildings receive more care and attention than they deserve. They are procured, designed, built, operated and often occupied by dedicated enthusiasts. They can achieve excellent performance - and sometimes they are demonstration projects - but they are not necessarily replicable in the real world.

As a general rule, beware Type A, try to do more of Type B, avoid Type C, and question Type D.

An underlying problem is that designers and builders are normally employed to produce or to alter buildings, and are expected to go away as soon as the work is physically complete and handed over. They are seldom asked or paid to follow-through afterwards, to pass on their knowledge to occupiers and management, or to learn from the interaction. Consequently, the industry does not unlock all the value in the buildings it creates. Nor does it fully understand what it is creating, what works well, and what needs to be improved.

In the process, the industry is also missing opportunities for improving the knowledge base for its people, its organisations, and indeed for everybody. One might be tempted to blame the industry for this, but the causes are more deeply rooted, making it difficult for anybody to step far out of line.

The rigid separation between construction and operation means that many buildings are handed over in a state of poor operational readiness and suffer a hard landing, particularly – as often happens – when delays have led to the telescoping of the commissioning period. Problems can be worst where complicated or unfamiliar techniques and technologies are used and nobody can understand why, or what they need to do. If the problems are not dealt with rapidly, occupants' initial enthusiasm can easily turn into disappointment.

¹ FOR EXAMPLE, DESIGN ENERGY ESTIMATES OFTEN ONLY REPORT THE ENERGY REQUIREMENTS OF THE LOADS SUBJECT TO *BUILDING REGULATIONS*, AND EVEN THEN OPTIMISTICALLY. THE UNREGULATED AND OCCUPIER LOADS FREQUENTLY GO UNREPORTED.



Doing things differently

To meet these changing expectations, and to reduce the gaps between predicted and achieved performance, the design and construction professions must not only focus on technical inputs, but put much more emphasis on in-use performance strategies. The desired operational outcomes need to be considered at the very earliest stages of procurement, managed right through the project and reviewed in use.

This culture shift in the way buildings are delivered will require:

- Better and more direct understanding of how buildings are actually used and managed
- Integration of follow-through and feedback into clients' appointments and industry procurement processes
- Better review and reality-checking and fine-tuning during the procurement process
- Closer links between design, construction, operation, research and development, so that experience gained on all projects is rapidly internalised, digested and fed-forward to inform existing projects and future work.

The industry and its clients must move fast: especially to reduce greenhouse gas emissions, which otherwise threaten to trigger rapid climate change. The challenge is immense and time is short: buildings last a long time, but the industry changes slowly. The required alterations are radical, but we need ways of making an orderly transition from existing procedures to improved procedures.

The purpose of Soft Landings

Soft Landings can be used for new construction, refurbishment and alteration. It is designed to smooth the transition into use and to address problems that post-occupancy evaluations (POE) show to be widespread. It is not just about better commissioning and fine tuning, though for many buildings commissioning can only be completed properly once the building has encountered the full range of weather and operating conditions.

Soft Landings starts by raising awareness of performance in use in the early stages of briefing and feasibility, helps to set realistic targets, and assigns responsibilities. It then assists the management of expectations through design, construction and commissioning, and into initial operation, with particular attention to detail in the weeks immediately before and after handover. Extended aftercare, with monitoring, performance reviews and feedback helps occupants to make better use of their buildings, while clients, designers, builders and managers gain a better understanding of what to do next time. Soft Landings can run alongside any procurement process, potentially in any country. It also provides a natural route for POE and feedback.

Soft Landings provides additional support throughout the process, especially:

- During inception and briefing, to establish client and design targets which are better-informed by performance outcomes in use on previous projects. It also commits those joining the design and building team to follow-through after



handover and for project management to begin to allocate responsibilities for ongoing reviews of design intent and anticipated performance, and to prepare for the other activities required.

- Alongside the design and construction process, to review performance expectations as the client's requirements, design solutions, and management and user needs become more concrete and the inevitable changes are made. In addition the team must plan for commissioning, handover and aftercare, and involve the occupier much more closely in decisions which affect operation and management.
- In the weeks before and after handover. Although practical completion is important legally and contractually, with Soft Landings handover is no longer the end of the job, but just an event in the middle of a more extended completion stage. Before handover, the team prepares to deliver the building and its systems in a better state of operational readiness. When the occupants begin to move in, the aftercare team (or team member) will have a designated workplace in the building and be available at known times to explain design intent, answer questions, and to undertake or organise any necessary troubleshooting and fine-tuning. Both before and after handover, the design and building team will work closely with client, occupiers, and facilities managers to share experiences and smooth the transition into use.
- During the first three years of occupancy: to monitor performance, to help to deal with any problems and queries, to incorporate independent post-occupancy surveys (such as occupant satisfaction, technical and energy performance), and to discuss, act upon and learn from the outcomes. Achievements and lessons should then be carried back to inform the industry and its clients.



Introduction to the Soft Landings process

Why use Soft Landings?

Soft Landings helps clients and occupiers to get the best out of their new or altered buildings. It is designed to reduce the tensions and frustrations that so often occur during initial occupancy, and which can easily leave residual problems that persist indefinitely. At its core is a greater involvement of designers and constructors with building users and operators before, during and after handover of building work, with an emphasis on improving operational readiness and performance in use.

Soft Landings is not just a handover protocol. It also provides the golden thread which links between:

- The procurement process: setting and maintaining client and design aspirations that are both ambitious and realistic, and managing them through the whole procurement process and into use
- Initial occupation, providing support, detecting problems, and undertaking fine-tuning; and
- Longer-term monitoring, review, post-occupancy evaluation (POE) and feedback – drawing important activities into the design and construction process which are both rare in themselves and often disconnected.

Other important but less directly tangible benefits include client retention owing to the improved levels of service, greater mutual understanding between designers, builders, clients, occupiers and managers, education of design and project team members in what works well and what may be causing difficulties. It also helps to develop industry skills in problem diagnosis and treatment.

What is special about it?

Soft Landings is embedded in the entire procurement process from initial scope to well beyond project completion. Conventionally, buildings are simply handed over to the client and the design and building team walk away, never to come back, except to deal with snags or reported failures. By contrast, Soft Landings helps to:

- Minimise the chances of unsatisfactory performance by strengthening the vulnerable areas of traditional scopes of service, which too often result in occupier complaints downstream.
- Address and even pre-empt problems during the early occupation phase, by providing an on-site designer/contractor representative or team that can assist occupiers and management.
- Ensure that lessons from closer interaction with the occupiers – and from evaluating actual building performance in use – are learnt and shared to the benefit of all stakeholders.

Soft landings helps to bring things together

Many techniques of project feedback and post-occupancy evaluation (POE) are aimed at one particular stage of a project or to suit a single discipline or element such as building services engineering. Many are used solely in the post-occupation phase when it is too late to tackle the strategic problems that originated in briefing, design and project management. Soft Landings provides a process carrier for these techniques, so helping to unite all disciplines and all stakeholders and to extend the procurement process beyond handover.



As POE becomes more routine, findings and benchmarks from previous POE surveys can be used to help calibrate client and design expectations. Where practicable, results from these surveys can also provide metrics that allow these expectations to be tracked from briefing, through design development, construction and commissioning, and into operation.

How do contractual duties change?

Soft Landings extends the duties of the team before handover, in the weeks immediately after handover, for the first year of occupation¹, and for the second and third years. In order to improve the chances of success, it reinforces activities during the earlier stages of briefing, design and construction. The overall objective is better buildings, with better performance which matches more closely the expectations of the client and the predictions of the design team.

Soft Landings creates opportunities for greater interaction and understanding between the supply side of the industry and clients, building users and facilities managers. It helps everybody concerned to improve their processes and products, and to focus innovations on things that really make a difference.

Is there a standard scope of service?

Soft Landings procedures are designed to augment standard professional scopes of service, not to replace them. They can be tailored to run alongside most industry standard procurement routes² to create the most appropriate service to suit the project concerned.

Major revisions to industry-standard documentation are not necessary. The main additions to normal scopes of service occur during five main stages:

1 Inception and briefing to clarify the duties of members of the client, design and building teams during critical stages, and help set and manage expectations for performance in use.

2 Design development and review (including specification and construction). This proceeds much as usual, but with greater attention to applying the procedures established in the briefing stage, reviewing the likely performance against the original expectations and achieving specific outcomes.

3 Pre-handover, with greater involvement of designers, builders, operators and commissioning and controls specialists, in order to strengthen the operational readiness of the building.

4 Initial aftercare during the users' settling-in period, with a resident representative or team on site to help pass on knowledge, respond to queries, and react to problems.

5 Aftercare in years 1 to 3 after handover, with periodic monitoring and review of building performance.

The following sections outline the content of the five stages in Soft Landings. Each section includes a checklist that summarises the specific activities in the particular stage, with notes (*in italics*) on things to consider and pitfalls to avoid.

¹ IN THE UK, THE DEFECTS LIABILITY PERIOD (DLP) USUALLY FINISHES ONE YEAR AFTER PRACTICAL COMPLETION AND HANDOVER.

² FOR EXAMPLE (IN THE UK), THE JCT 2 STAGE CONTRACT FORM. IT CAN BE EMPLOYED ON A RANGE OF OTHER PROCUREMENT ROUTES FROM CONSTRUCTION MANAGEMENT THROUGH TO PRIVATE FINANCE INITIATIVE (PFI) OR PRIVATE PUBLIC PARTNERSHIP (PPP).



Table 1: How Soft Landings aligns with the 2008 and 2013 editions of the RIBA *Plan of Work* and the workstages of BSRIA BG 6/2014 *Design Framework for Building Services*. This workflow table has been revised to make it compatible with other Soft Landings publications. It also includes reality-checking worksteps (shown in green) as outlined in BSRIA BG 27/2011 *Pitstopping – BSRIA’s Reality-checking Process for Soft Landings*. Additional guidance is freely available from www.softlandings.org.uk and www.usablebuildings.co.uk.

RIBA 2008 Stages		RIBA 2013 Stages	CIC stages 2012	Soft Landings	Soft Landings supporting activities	BSRIA BG 6/2014 <i>Design Framework</i> pro-formas
		0 - Strategic definition	0 - Strategic definition			0 - Strategic activities
A	Appraisal	1 - Preparation and brief	1 - Preparation and brief	Stage 1. Briefing: identify all actions needed to support the procurement	Define roles and responsibilities	1 - Preparation
B	Design brief				Explain Soft Landings to all participants, Identify processes and sign off gateways	
C	Concept	2 - Concept design	2 - Concept design	Stage 2. Design development: to support the design as it evolves	Review past experience. Agree performance metrics. Agree design targets	2 - Concept
D Design development		3 - Developed design	3 - Developed design	Scheme design reality-check	Review design targets. Review usability and manageability	3a & 3b - Developed design
E Technical design						
F1	Production information	4 - Technical design	4 - Technical design	Technical design reality-check(s)	Review against design targets. Involve the future building managers	4a, 4b & 4c - Technical design
F2						
G	Tender documentation	Information exchanges will vary depending on the procurement route and building contract. Designers can create a bespoke Plan of Work for the client’s chosen procurement route in order to set out specific tendering and procurement activities for each stage.		Optional tender stage reality-check	Include additional requirements related to Soft Landings procedures	
H	Tender action			Tender award stage reality-check	Include evaluation of tender responses to Soft Landings requirements	
J	Mobilisation	5 - Construction	5 - Fabrication design		Confirm roles and responsibilities of all parties in relation to Soft Landings requirements	5 - Construction
K	Construction to practical completion					
		Stage 3. Pre-handover: Prepare for building readiness. Provide technical guidance				
		Post-handover sign-off review. Ensure all outstanding reality-checked items are complete and system is signed off and operational				
L1	Post-practical completion	7 - In Use	7 - In use	Stage 4. Aftercare in the initial period: support in the first few weeks of occupation	Incorporate Soft Landings requirements	7 - In use
L2				Stage5. Years 1 to 3 Aftercare: Monitoring review, fine-tuning and feedback	Set up home for resident on-site attendance	
L3					Operate review processes. Organise independent post-occupancy evaluations	



Stage 1: Inception and briefing

Briefing is the most crucial stage of procurement. If it is not done well, it is all too easy to sow the seeds of future misunderstanding and discontent.

A common problem is to put too much emphasis on the intended product, at the expense of the general background, performance requirements (both qualitative and quantitative), and the processes by which solutions should be developed and tested. The more time that can be made available for constructive dialogue, the greater the likelihood of success.

To obtain the greatest value from Soft Landings, the expectations and performance targets that emerge from the briefing process should be arrived at within a well-structured, logical and recorded context. However, for various reasons it may not always be possible to give the briefing stage all the time it deserves at the outset. Consequently, Stage 1 of Soft Landings also establishes tasks, responsibilities and review procedures that allow the brief to be re-examined in response to new findings, and to help ensure that critical issues are not lost along the way.

NOTES ON BRIEFING AND DESIGN BRIEF MANAGEMENT

by Adrian Leaman, Arup and Building Use Studies

Post-occupancy reviews often reveal major differences in performance between ostensibly similar buildings. For example, energy use can be higher by a factor of two or three, while self-assessed productivity scores from occupant surveys can differ by 15–20 percentage points. In the best buildings, high levels of occupant satisfaction and good energy performance often go together. The unifying reason is usually that good committed people with good processes are able to achieve good all-round outcomes which enable multiple objectives to be met. By encouraging design brief management Soft Landings will help to ensure that this happens.

An effective briefing process needs to seek clarity in three main areas:

- The context for the project: the client's goals, the site and neighbourhood, environmental objectives, and wider social, economic and environmental trends and how the building should adapt to them.
- The qualities of the solution: the client's ends. Commonly included are space requirements and relationships, operational characteristics, indoor environment, mechanical, electrical and information services, costs, and image. Interest in building and environmental performance has been growing rapidly, but there still tend to be major differences between expectations and outcomes. Soft Landings helps teams to improve clarity of purpose, attention to detail, and include follow-through and feedback arrangements.
- The implications of the solution. The implications of the above become expressed in the emerging building design. However, what this really means in terms of performance is often less clearly examined, or examined under modelling assumptions rather than in relation to real life. How will people actually use it? How will it affect organisational effectiveness? Who will be needed to manage it? What if the building (or part of it) is no longer needed?

As a design develops, the emerging solutions should be tested against the brief, and *vice-versa*, as insights, opportunities and sometimes constraints emerge that may not have been envisaged when the brief was originally formulated. The tests should include:

- A review of the assumptions. Has the context changed? Does physical representation of the requested qualities cause the client to have second thoughts? Have all the stakeholders been properly identified?
- Checks on the needs and demands of the proposed solution. Post-occupancy surveys reveal that buildings can easily become too complicated, sometimes in the name of labour-saving automation. If not carefully evaluated, this can make things difficult for their users, expensive to operate and maintain, and demanding of management time. The quest for simpler solutions can be rewarding.
- Tests of the design expectations. Designers are not users, though they often think they are, so designers can easily make optimistic assumptions about user behaviour. If design intent is not clear to users, it can be difficult for the building to perform as intended. A widespread problem is where user interfaces to manual and automated controls are poorly considered, specified, located or signposted.
- Review of likely and actual outcomes. Soft Landings supports this, with regular reviews of client and design expectations during procurement; and by monitoring, fine-tuning, post-occupancy evaluation and feedback once the building is occupied.



STAGE 1 CHECKLIST: INCEPTION AND BRIEFING

B1. Define roles and responsibilities

Roles and limits of responsibility must be spelt out clearly from the very beginning. If nothing else, this will highlight any gaps. Sometimes the project leader may also need to review how well certain individuals are suited to their assumed roles. It is not enough to have the right job titles: individuals also need the right mix of ability, experience and temperament.

To ensure that the design reflects operational needs, it is important to involve the client's facilities management team early on, ideally with the individuals who will take over the installed systems. If staff are not yet appointed (for example, because the building will be sold on, or operations outsourced), then independent advice will often be desirable.

B2. Review past experience

Past experiences of team members and others will benefit the briefing, design, and construction process, and allow better and more realistic targets to be set. The project manager should seek to elicit all relevant experiences - good and bad - in a spirit of openness. These will be hugely beneficial to the project.

B3. Plan for intermediate evaluations and reality checks

The programme should incorporate opportunities for intermediate evaluation workshops. These will help to ensure that stakeholders are fully engaged as the design develops and that input from key users is obtained and not lost along the way. The workshops will help to flush out misconceptions on all sides. Topics will also come up which may seem incidental at the time but which can help to identify and sometimes to resolve decisions on things which might otherwise be overlooked, or taken for granted.

B4. Set environmental and other performance targets

The processes of target setting, prediction and measurement will highlight the need for roles and expertise on the client side. Clients may not have anticipated some of the skills and activities required. Targets will normally have to satisfy the criteria of being unambiguous, measurable and of some value. An independent occupant questionnaire survey will normally be a standard part of Stage 5: Years 1 to 3 Aftercare. The results should be benchmarked against the database of the survey providers, and published.

B5. Sign-off gateways

Premature decision-taking can blunt innovation. However, there will be no chance of optimum success if one leaves too many loose ends for too long. Sign-off gateways create the structure for fixing decisions. Gateways are both entry and exit points, but different criteria may be applied depending on entry and on exit, after which the requirements will be more binding on all parties.

B6. Incentives related to performance outcomes

For the environmental and other targets set in B4, the team needs to agree how to measure performance in use, and what action is appropriate if anything falls short. A suitable action might be for the design and building team to agree to follow-up any shortcomings and to suggest how performance might be improved.

SUPPORTING NOTES

Clarity on the client side is absolutely essential, particularly in defining responsibilities, identifying the chain of command and agreeing the decision-making protocols. If any independent advisers are involved, it is important to clarify what authority they have, and that everyone in the project team is aware of it.

Teams should identify a Soft Landings Champion who has the responsibility to ensure that the Soft Landings process is developed to suit the project, and that it is followed through the entire procurement process and on into the building's use. Ideally the client's champion should be mirrored on the project team side. There may also be other nominated champions further down the contractual chain. The champions should also ensure that Soft Landings principles take their proper place as part of the routine management of the project and are properly resourced. Champions need to be people who have an interest in the in-use performance of the building, and who are likely to be on the team for the full duration of the project, for example the client representative, the job architect, or the project manager.

Communication between designers and facilities managers can be difficult owing to their often very different perspectives. It is unlikely to happen automatically, so the client's project manager needs to make sure that it does. If not, senior clients and designers may well have ideas that in practice prove to be too complicated, or too difficult to look after. As unmanageable complexity is often the prime cause of occupant dissatisfaction with the indoor environment (and of excessive energy use), it is vital to address complexity problems by designing for usability and manageability, either simplifying the solutions or increasing the levels of facilities management budget and skills.

Where quantified targets are not practicable, for example owing to the difficulty of calculation, or a lack of suitable metrics, qualitative indicators (for example, on a scale of good practice - best practice - innovative - pioneering) can be useful guides in helping to calibrate client aspirations, and to revisit them during design reviews. A suitable action might be for the design and building team to agree to follow-up any shortcomings and to suggest how performance could be improved.

Some people would like to see financial incentives, such as a bonus to the design and building team for meeting certain performance levels. Penalties for falling short are more contentious and could be expensive and complicated to make legally bulletproof. A requirement to investigate and report may be preferable.



Stage 2: Design development and review

Once a project team has adopted Soft Landings at Stage 1: Inception and briefing, then design development, technical design, production information and tendering will proceed much as usual. However, people will need to bring a somewhat different approach to the process. In particular:

- Everyone joining the client, design and construction teams will need to be made aware that Soft Landings is in operation and commit to adopting its principles.
- All team members will be encouraged to obtain and contribute insights from the performance-in-use of comparable projects.
- Client and design targets will be informed by actual performance in use, reviewed at intervals as the project progresses, and have any adjustments agreed and signed-off.
- Requirements for independent post-occupancy evaluation (POE) services will need to be verified. To assist comparability and transparency, where appropriate and practical, the same metrics should be used for the design targets and what the POE will measure.
- The design process should include reality-checking workshops, including reviews by experts in building performance.
- To accompany the design data, an illustrated narrative will be developed on how the building will work from the point of view of the manager and the individual user. This can evolve into the technical and user guides that will be issued to managers and occupiers at handover.
- Close attention needs to be given to the usability and manageability of the proposed design solutions, and in particular moving parts, electrical components and their control interfaces. Where the occupiers are known, their facilities managers and user representatives should be involved in reviewing the proposals and commenting not just on the design intent but also on the details of the management and user interfaces, including the equipment selected and its location.
- Suitable preparations must be made during design and construction to plan, programme and resource the critical periods in the weeks immediately before and after handover.

To make sure that all angles are covered, tender documentation may require unfamiliar interventions by other design team members.

Photo: David Bleicher/BSRIA



There are hundreds of these room control devices in a business park development. They are not labelled and most of the occupants have no idea what they do, except that presumably they turn something up and down (the lights, the heat, the air?) and that there is an over-ride button that does something.

Poor user interfaces like this are commonplace in modern buildings, with adverse effects for comfort, energy use and patience alike.

By undertaking reality-checks and addressing user, management and maintenance requirements, and following up issues that arise in use, Soft Landings aims to make this poor design a thing of the past.

For more examples of controls usability problems and ways to avoid them, download *Controls for End Users – a guide for good design and implementation* free from www.bsria.co.uk/bookshop



STAGE 2 CHECKLIST: DESIGN DEVELOPMENT

D1. Review past experience

It is important to design for buildability, usability and manageability. From the earliest stages of a project designers and clients must think realistically about the budget, the construction skills and resources needed to turn ideas into a physical reality that suits the occupiers and doesn't demand too much of them.

D2. Design reviews

Review can be undertaken as part of normal design meetings. However, well-organised peer reviews (with independent experts at key stages in the design) can be effective in helping to pinpoint issues that may prove problematic. They will also help to identify solutions which may have been tried elsewhere.

Design reviews and the like should include a cross-section of people with different jobs and levels of seniority. Otherwise, valuable perspectives on aspects of building usage and operation may emerge too late, and the design will be compromised. For example, natural cooling strategies have too often been undermined when security staff insist on closing night ventilation openings or insurance policies require it. The openings could have been designed differently had these concerns been identified earlier.

D3. Tender documentation and evaluation

The requirements related to Soft Landings procedures need to be incorporated as part of conventional contract documentation.

The evaluation of submissions from the lead contractor, key sub-contractors and suppliers must include an assessment of their understanding and acceptance of the Soft Landings procedures. Any shortfall must be rectified and the arrangements clarified prior to final acceptance and instruction to mobilise.

A detailed worksheet has now been developed for Stage 2 Design Development. Note that D3 Tender documentation and evaluation has become D6 in that worksheet.

SUPPORTING NOTES

At the simplest level this can be detailing for airtightness, making sure that lamps can be reached and changed, and that electrical connections are provided for window actuators. At a more complex level, it might be digital communications between separate environmental systems. In particular, interfaces to controls must be well thought-through in relation to the technical requirements and their intelligibility to management and a range of different users.

Designers must also consider the budgets and technical expertise the occupier is likely to be able to devote to maintaining and repairing the building, controlling its technical systems and internal environment and resourcing its facilities management services.

Design review meetings require sensitive preparation and chairing if they are to be constructively critical. Timing is important: reviews are best undertaken when options are relatively clear, allowing discussion to be focused, but with solutions not so well crystallised that the design team finds it difficult to respond to important comments.

At these and other meetings, designers should not sell design themes and solutions too forcefully, as clients, managers and users may then be reluctant to offer their comments and to share their experiences of buildings in use. This may deny to the project the benefit of the management experience and user insights that are often crucial to a building's ultimate performance.

Design reviews may benefit from being independently facilitated. A trained facilitator can unlock tacit knowledge that may otherwise not surface. A good facilitator should also be experienced in dealing with design team egos, and ensure that even timid voices are heard.

Ensure that the requirements of Soft Landings are thoroughly written into the scope of the contract.

Go to Appendix A for the Stage 2 Design Development worksheet



Stage 3: Pre-handover

The main purpose of the pre-handover stage is to help to ensure that by the time the building is handed over it is not just physically complete, but ready for operation. A building readiness sub-programme therefore needs to be developed in good time, and well ahead of the start of commissioning work. Activities by the design and building team must also include static commissioning (such as inspections of airtightness details, checks of window opening devices and linkages, and envelope pressure tests). Commissioning of building services needs extending to include, for example, natural ventilation, renewable energy systems, metering installations and effective user interfaces. Great care needs to be given to demonstration, training and documentation. Proposed activities by the client and occupier also need to be reviewed, such as staffing, operation and maintenance contracts, and move-in plans including fitouts where relevant.

It is essential that the client's management team takes over the operation of the building in a timely fashion. Problems that occur after handover can often be traced back to insufficient understanding by the occupier's staff of technical systems (particularly building services) and their user interfaces, or where solutions have been developed without enough understanding of user and operator requirements. Too often, buildings start their operational lives with too few operating staff, who are not sufficiently trained, know little about the design intent, have had no opportunity to attend a demonstration, and are unfamiliar with the systems provided and how to use them.

To avoid problems, the project team should take more care in design and specification and to pay more attention to the contractor's proposals for commissioning and handover. They will also need better understanding of operator skills and requirements and better arrangements for demonstrating interfaces and systems properly to operating staff before handover. The time spent will lay the foundations for future co-operation.

Applying Soft Landings to different property models

Shell, core and fit-out

In some buildings, particularly rented ones, spaces are handed over in an unfinished state, to be fitted-out by others, or for specialist purposes.

It is vital that design intent is made clear to fitout team, with rules on what to do and what to avoid. It is also important for the original design team to review fitout proposals thoroughly, but with a quick turnaround as tenants will be in a hurry. Otherwise, major problems can easily arise, particularly affecting control systems and HVAC services, especially for more innovative designs which may have characteristics unfamiliar to the fitout team.

Rented buildings

In speculative buildings (apart from pre-lets), it is more difficult to maintain the continuity that is the hallmark of Soft Landings owing to a lack of information on the occupier and the delays that can occur between the physical completion of the building and the arrival of the first tenant. Reviewing fitouts by incoming tenants does not form part of core Soft Landings activities. However, clients for such projects should consider appointing the original design team to do reviews of this kind.

Clients play a vital part in ensuring building readiness. If they leave staffing too late (as they often do), problems with initial performance can be virtually guaranteed. However much the designer and constructor do to help, resolution is nearly impossible if there are no good operators available on site.

A design and construction team is often told very little about how the occupier intends to move themselves into the building. As a result, occupiers can easily make incorrect assumptions about how ready the building will be to receive them, and what access and services will be available. This in turn can cause clashes and disappointments while the move is under way, and sour initial user experiences of their new or altered building. With Soft Landings, designers and builders need to be involved with the occupier's logistics planning, if only to a small extent.

Even in the best-managed projects, the commissioning period can get squeezed, owing to delays outside the control of the design and building team, and an occupier's business requirement for a non-negotiable handover date. Soft Landings will help to reduce the effects of any such slippages as the continuity it provides between the pre-handover and aftercare stages makes it much easier for any outstanding commissioning activities to be continued after handover.



STAGE 3 CHECKLIST: PRE-HANDOVER

P1. Environmental and energy logging review

Responsibilities and routines for data recording must be agreed and related to the targets that are established. These roles and responsibilities need to be coordinated with the building's logbook and its metering strategy.

P2. Building readiness programme

This building readiness programme needs to be prepared well in advance of move-in. Site completion and commissioning activities need to be coordinated, training activities written, and other records finalised. This should include the setting-up of energy meters, their recording accuracy, their reconciliation with fiscal meters, and the verification of data recorded by any energy monitoring software.

P3. Commissioning records check

Commissioning records should include energy data where available (such as true power consumed by fan motors, not just current readings). There should also be a programme for post-completion commissioning and fine-tuning.

P4. Maintenance contract

Ensure that the contract is appropriate and that the service is in place immediately after handover.

P5. Training

Adequately trained operation and maintenance staff must be in place before handover. They will need proper familiarisation and training about the building and its systems in good time – not at the last minute.

P6. Building management system interface completion and demonstration

A demonstration to the building operators of the building management system (BMS) and any allied controls helps to ensure that the systems are familiar, operating appropriately, and that staff have some understanding of how to use and fine-tune them. These actions will identify any need for additional work.

P7. Migration planning

The occupier's move-in programme needs to be coordinated with the design and building team. A small involvement of the design and building team in the occupier's logistics planning can help minimise the upsets that can easily arise if moving-in operations clash with site activities, for example if an access is obstructed, a lift is not available, rooms or services are being finished off, or screeds are hardening and are therefore initially unable to support heavy loads.

P8. Aftercare team home

The occupier must provide a visible and accessible workplace in the new building for the aftercare team from day one. The size and complexity of the project will determine whether the presence is permanent or at specified hours, and whether by one or more people.

P9. Compile a guide for occupants

A simple guide for occupants will help them understand the design intent and use the building effectively. It will complement the required O&M manuals and logbook, within which a copy of the user guide should be filed.

P10 Compile a technical guide

The technical guide should provide a succinct introduction for the facilities management team to help to smooth the transition to local operation. Ideally, it will have been developed in the course of design and construction, so that at any stage in the project people can find a clear description of how the systems in the building are supposed to work.

P11. O&M manual review

The team should review the content of the O&M manual with the facilities manager, who should sign it off when it is complete and acceptable.

SUPPORTING NOTES

Written material must also be available in time, but should be organised to make revisions easy in the light of initial experience and fine-tuning.

Operating staff will be happier to take ownership of the installation when they are comfortable with the design concepts, understand their roles, and have commented on interface development.

Soft Landings representatives must make themselves visible to the occupants of the building. Staying off-site or hiding in the contractor's hut will defeat the objective.

The guide should be completed in good time, with input from facilities management staff and user representatives if possible. It may well need revisions after operational experience is gained. It will save time by reducing the number of questions when the building is first occupied, and the complaints that arise from misunderstanding or misuse.

Guidance for occupiers and managers need revising after in-use operational experience has been gained.



Stage 4: Initial aftercare

Tips for a technical guide

The building's technical guide explains to the owners and operators (not the individual users) how the building and its systems work, and the performance that is expected. This guide is not the same as an O&M manual, which contains far more detail.

As well as meeting any statutory requirements, the technical guide should incorporate the mandatory Logbook on Building Services and the strategy for energy metering in accordance with prevailing technical guidance from BSRIA and the CIBSE. Where applicable, it should also fulfil the requirements of the environmental rating scheme used, such as LEED, BREEAM, or Ska (for refurbishments).

Even though it may be technical in nature, the guidance should be written in plain English.

The service during the initial aftercare period is intended to help the occupiers to understand their building, and the facilities managers to operate its systems. The aftercare team is there to provide information and support, to respond to any questions that arise and to investigate any problems that emerge. It is important that the building's facilities or management team is properly resourced, so they have the skills and time to take advantage of this service. Soft Landings will not work properly if the occupiers think they can sit back and leave things to the aftercare team.

During the initial aftercare period, one or more members of the design and building team will be present on site for typically four to six weeks immediately after move-in. After this initial period, the residential presence of design and construction team members will taper off, but periodic reviews will continue, as outlined in Section 5.

The size and complexity of the project and the occupants' move-in timetable will determine how much time will be required, over what period, and for how many people. It could be as little as one day per week, but much will depend on what actually happens once the occupier moves in.

One of the team should act as the main point of contact for overall liaison. This will usually be the architect, but that depends on the project. Building services and commissioning engineers always need to be closely involved and readily available, because many initial queries are often related to the use and performance of unfamiliar mechanical, electrical and control systems and environmental control strategies.

The aftercare team must be visible, with a workplace in a readily-accessible location and not hidden away. Team members must work not just with the facilities management team, but be accessible to everyone. Occupants must therefore be told that the aftercare team is operating, what it will be doing, where it will be, and when. The times of residence need to be regular (such as every morning, or every Tuesday) so everybody knows what to expect.

Tips for an occupants' guide

A guide for building occupants is a practical method of informing individuals about a building's systems and procedures.

There are no strict rules on content or style, but ideally the guidance must be written for lay users, should avoid using technical jargon, be illustrated to assist comprehension, and be available in both electronic and printed form.

The content should include information on general features of the building such as security, safety and access, and environmental features (including energy and water efficiency and waste management). It should also cover principles of design and operation, particularly where the environmental systems rely partially or wholly on local controls for heating, lighting, cooling, and ventilation.

Other issues that may be important to cover include furniture, space use and cycle storage, and where to go for help and more information.

Team members must make themselves available to deal pre-emptively with queries and misunderstandings. The observations they make, the questions they answer, the responses they get and the insights they derive will help prevent minor problems developing into longer term chronic irritants for the occupants and the client alike. Their period of residence also provides an opportunity to observe and learn from initial feedback and problem-solving.

Visibility also includes sessions at which the aftercare team describes the building and its systems to groups of occupants as soon as possible after they move in, and introduces them to the guide for occupants (see box). The aftercare team will also provide news on issues, problems and progress, normally via the occupier's intranet.

Aftercare is not an administrative exercise nor should it be a superficial attempt at marketing. Instead it should be a proper professional service. Where it is done effectively it will generate a lot of goodwill. Being seen to be on the side of the users helps a lot – and ensures a meaningful invitation to the official opening.



STAGE 4 CHECKLIST: AFTERCARE

The aftercare checklist covers the initial period of occupation, typically four to six weeks after handover.

A1. Resident on-site attendance

Confirm who will be there, where and when.

A2. Provide workplace and datacomms links

The occupier must provide an appropriate and well-located workstation for the aftercare team.

A3. Introductory guidance for building users

The occupier's representative should organise informal user meetings as soon as possible after the building has been occupied. The size of the meetings and who exactly should go will depend on the size of the project and the nature of the occupying organisation. The prime purpose is for the aftercare team to explain why they are there, to present key information on how the building operates, introduce the guide for occupants, and answer questions. Anticipate the need to hold at least two meetings.

A4. Technical guidance

The purpose is to smooth the transition of responsibility from the project team to the client's facilities management team. It should help them gain a good understanding of the building, and be able to take full authority over operating and fine-tuning its systems. The ground will have been prepared in the pre-handover stage, but further support may often be necessary in the light of issues that emerge over the first weeks of operation, and to accommodate new people arriving as part of the move.

A5. Communications

It is important that users are kept informed of progress on operational issues; for example via regular newsletters or other bulletins.

A6. Walkabouts

Members of the Soft Landings aftercare team (preferably those most familiar with the design intention and the controls systems) should roam the building informally on a regular basis to examine the building in use, observe occupation and spot emerging issues. Walkabouts can be combined with other visits as appropriate. They should make spot-checks with instruments if necessary: these also provide opportunities to discuss with individuals their experience of the building, its systems and the indoor environment.

SUPPORTING NOTES

Aftercare team members should have good people skills, a hands-on approach to problem solving, and continuity with the project. The leader will often be an architect, with essential regular support from the team, in particular the building services contractor and commissioning team, and the mechanical and electrical designers.

In addition to responding to day-to-day comments, allow for two dedicated meetings with facilities management representatives to explain systems and discuss their views.

Keep communications simple, not too technical and easy to update. The occupier's intranet, a website or a similar service can also be effective and time-efficient. Fortnightly updates will usually suffice.



Stage 5: Years 1-3 Extended aftercare and POE

Once the initial aftercare period is over, the Soft Landings service moves from regular visits to periodic reviews. The aftercare team is there to provide insights, review performance, and help the users and operators to get the best out of their building, not to run it on their behalf. Responsibility for operation and provision and initial review of routine information (such as BMS logs and meter readings) must lie firmly with the building's facilities management team.

In Year 1, the primary focus should be on settling everything down, making sure that the design intent is well understood, identifying any problems, and logging usage and change. There may well also be a need to fine-tune systems, particularly lighting controls and hvac systems, in order to optimise effective and energy-efficient operation and to take account of occupant feedback and changes in weather and occupancy.

In Years 2 and 3 the reviews become less frequent, concentrating on recording the operation of the building and reviewing performance. By then the facilities management team should be fully in command of the building's systems, be dealing with all problems (usually without reference to the design and building team). They should also be collecting and reviewing their own data, and refining their operational strategies. The Soft Landings process will have helped them to overcome any initial difficulties.

The aftercare period will also include a number of (preferably independently conducted) post-occupancy surveys. The type, coverage, method and timing of these surveys will depend on what has been agreed for each project. Where the design and building team has committed to undertaking an occupant survey or surveys, and following-up on any problem areas, the brief should include suggested survey timings. In general terms:

- The timing of the first occupant survey depends on the project. It is best to wait until occupants have experienced one full heating and cooling season. Phased handover, phased occupation, or additional fit-out works may also justify a delay beyond 12 months. The Soft Landings team need to judge carefully the point at which survey results are likely to reflect the building's steady pattern of operation. Performing the first survey too soon may mean the results have too many caveats to be of much value.

Alterations to the building

The aftercare service in Years 1 to 3 assumes that the building continues to be used in general accordance with its design intent. It does not anticipate major alterations in occupancy or space planning. However, sometimes the owner or occupier may need to make significant physical changes to all or part of building, or to its use.

In the past, owners and occupiers have often embarked on such changes without appreciating the adaptability potential that the designer may have provided and the constraints that may also exist. The Soft Landings team's knowledge of both the design potential and its performance-in-use will help to inform the occupier's decision-making processes, and may allow before-and-after comparisons to be made.

A readily available, up-to-date, evidence base will improve insights and outcomes and sustain a positive relationship with the design and building team.

- Occupant focus groups held in the initial aftercare period can provide valuable initial reactions and help to target early action. However, these can also be held prematurely, particularly if initial teething problems are still fresh in the memory. Focus groups can also be dominated by a vocal minority who set the agenda on behalf of the others who may be more meek. Focus groups therefore need to be properly facilitated and the results used with caution. Combining focus groups with occupant questionnaires can lead to survey fatigue.

- Year 3 is the best time for a second survey to summarise the occupants' views on the long term performance of the building. It allows enough time for the building and its systems to have settled down, for fine-tuning in year 2 to have had an effect, and for any initial problems to be long past.

Everybody involved in the extended aftercare service will gain valuable information and insights. This feedback will help the building to work better and the client and occupiers to get the best out of the design. The feedback also provides valuable intelligence that all those involved will take back to their work, their organisations and the industry. This in turn will help to improve the goods and services they and the industry provide and make sure that their future efforts are targeted more accurately on the things which will really make a difference.



STAGE 5 CHECKLIST: YEARS 1-3 EXTENDED AFTERCARE

The activities below are repeated each year, though at a reducing frequency (see Appendix A).

Y1. Aftercare review meetings

Once the initial period of intensive aftercare is over, regular meetings should continue in order to review progress with the user representatives and facilities management. The frequency of meetings will depend on the project. Intervals of 3-4 months may be appropriate in Year 1, decreasing to six months in Years 2 and 3.

Y2. Logging environmental and/or energy performance

The facilities manager must take the lead in monitoring energy consumption and usage. Logging provides the basis for comparison with the energy plan and will assist fine-tuning of the systems. The frequency will depend on the extent of sub-metering and the provision of any energy data-gathering, monitoring and analysis software running on the building management system.

Y3. Systems and energy review

A written review of overall energy and systems performance is desirable. Six-month intervals will normally be adequate, though some can be done remotely and much of the rest combined with activities Y1 and Y4.

Y4. Fine tune systems

Seasonal changes and any particular issues emerging (for example from environmental and energy monitoring and occupant comments) will dictate when this needs doing and whether it needs repeating. The facilities management team and commissioning engineers may need to be involved as well as the building services contractor.

Y5. Record fine-tuning and usage change

Dependable comparison of actual and forecast performance will be impossible unless the facilities manager records changes routinely. The O&M manuals and building logbook will also need updating to reflect alterations to systems and equipment and any changes to standard control settings and operating schedules.

Y6. Communications

Updates to newsletters and websites will be less frequent, and may cease before the end of Year 3 if felt appropriate.

Y7. Walkabouts

As in the first weeks of occupation, when on-site members of the design and building team must not just do technical things and attend meetings. They must also take the opportunity to walk around the building, make observations and where possible discuss performance with occupiers, management and maintenance staff. This provides opportunities for spotting actual or emergent changes which may go unrecorded, and may otherwise compromise performance or not make the most of the latent potential in the design.

Y8. Measure environmental, energy and human factors performance

A key part of the annual end of year review is to compare recorded performance with the design targets. The performance metrics can be a mix of scientific data, statistical data, and anecdotal feedback. The most informative performance feedback may come from occupant stories rather than hard data. Independently-curated occupant surveys (held not less than 12 months apart) help to put energy consumption and other scientific data into a human and operational context.

Y9. End of year review

An annual meeting is required to review the general and environmental performance of the building. This also allows all parties (client, design and building team, users and facilities managers) to maintain a positive relationship and decide any change in focus for the next year. The final review at the end of Year 3 provides a well-structured wrap-up of lessons learned, and an opportunity to celebrate success and prospects for future collaboration.

SUPPORTING NOTES

Several key actions can be combined on one visit.

Monthly reviews of energy performance would be a minimum, but much more frequent checks will often be rewarding. For example, logs of half-hourly electrical consumption can indicate whether equipment is coming on too early; or being left on unnecessarily overnight, at weekends, or over holiday periods. A change in energy use patterns can also give early warning of equipment failure or underperformance and permit rapid corrective action. Such logging can also help to determine the effects of operating systems differently. The designers may be able to log consumption directly via the BMS but this must not replace the facilities management monitoring responsibility for routine monitoring and review.

In order to make meaningful comparisons between forecast and actual energy use, it will be essential to understand how control and operation differs from the assumptions made at the design stage.

Combine walkabouts with other visits as appropriate. Every three months is a good baseline. See and be seen.

This activity can be combined closely with Y3 above.

The review at the end of Year 1 can be coordinated with the defects liability period sign-off, and can also allow any performance targets for future years to be re-visited in the light of experience.



Appendix A: Example worksheets

These generic worksheets were developed as part of the original Soft Landings research, and have formed part of the background to writing this *Framework* document.

The worksheets now cover all five stages of the Soft Landings process. A worksheet for Stage 2: Design, not available for the first edition of the *Soft Landings Framework*, was written for BG 45/2014 *How to Procure Soft Landings*. It is therefore now included within this edition of the *Soft Landings Framework*.

For each activity outlined in the *Framework*, clients, project managers and design and building teams can use the worksheets to help them identify the actions required, who should initiate them and who needs to participate. The participants can then agree how they propose to carry them out, and assign responsibilities for doing so. The worksheets include notes to assist implementation.

Teams may wish to use a similar format to assist their project management, by recording what they have decided to do, who is responsible, the actions agreed, and the programme for undertaking them. They can also identify techniques to be used, who may need to be brought in for specialist support or advice, when and how post-occupancy surveys should be carried out, and so on.

Do not attempt to use the generic worksheets exactly as written. You will need to think how the concepts should be applied to suit the requirements of your particular project, for example different forms of procurement and contract. The initiator of certain tasks may also differ from project to project, as may the participants. For example, if the team includes specialist advisors on, say, acoustics or information technology, they might be selected to lead (or otherwise participate) in certain activities.

Go to www.softlandings.org.uk for up-to-date downloads of worksheets in Excel and PDF, together with advice, support and guidance on Soft Landings techniques and applications. The Usable Buildings Trust website www.usablebuildings.co.uk also contains useful supporting material.

BSRIA runs a Soft Landings User Group whose members are developing and sharing best practice. For more information go to www.bsria.co.uk/information-membership/events/networks/soft-landings/

Stage 1 worksheet example: Inception and briefing

Stage	Action	Purpose	Initiator	Participants	Scope of duties	Notes
B1	Define roles and Responsibilities Teams should identify a Soft Landings Champion for the full duration of the project	To review individual roles, highlight any gaps and clarify the scope of individual's responsibilities	Client	Design team Constructor The Soft Landings champion can either attend all meetings, or nominate rapporteurs for all Soft Landings stages	Client: Issue a list that states clearly the roles and scope of responsibilities	Roles and limits of responsibility must be clear from the start. If nothing else, this will highlight any gaps and, possibly, the unsuitability of individuals in their assumed roles. Titles are less important than an individual's ability and temperament. While the focus is often on the supply-side (the design team and constructors), it is equally important that the roles and responsibilities in the demand-side client team are equally well defined. The team should involve the project sponsor, Soft Landings Champion, building users representative, facilities manager, client advisors, and the project manager.
B2	Review past experience	To identify past experience (good and bad) which may benefit the design and construction and the soft landing process	Client and design team	Design team Client Constructor User representative Facilities manager	Agree which issues need to be taken into account	Include feedback for reality checking, quality assurance and awareness of constraints, past experience and past performance. What has worked before in similar situations? Third party involvement may be helpful in unearthing this information.
B3	Intermediate evaluation programme	To ensure stakeholders are engaged in the process and that input from key users is not lost along the way	Design team	Design team Client Constructor User representative Facilities manager	Include evaluation and decision points in design programme	Intermediate evaluation workshops during the early design stages are very effective in flushing out misconceptions on all sides. They ensure stakeholders are fully engaged in the process and that input from key users is obtained and is not lost along the way. In particular the workshops will help to incrementally fix decisions on the many smaller (but still important) issues during this stage.
B4	Set environmental performance targets	Ensures that the actual performance of key issues is realised	Client and the design team	Constructor User representative Facilities manager	Agree subjects, target(s) and appropriate measurement methods	All targets should be unambiguous, measurable and of some value. The setting of environmental and energy targets (whether with some financial incentive or not) raises a number of issues that need consideration: <ul style="list-style-type: none"> • The design solution must be within the ability of the users to control it • There will be a greater dependency on a good BEMS, effectively used • Common sense must be applied to averaging out expectations. Ideally, the processes of target setting, prediction and measurement should be able to identify the roles of client requirements, design solutions and user and management behaviour in achieving the desired outcomes. The level of expertise within the client body to maintain and control the internal environment needs clarification at the start of the early design stage, so that design for manageability can be realistically undertaken. The individuals who will take over the installed systems must be involved.
B5	Sign-off gateways, including reality checks	Creates the structure for fixing decisions	Client and user representative	Client User representative Design team Constructor Independent reviewer(s)	Agree decision makers and criteria for sign-offs	Sign-off gateways create the structure for fixing decisions. The following questions should be addressed at each gateway: Is the strategic brief being met? Are intermediate evaluation decisions incorporated? Have risks been assessed and are they acceptable? Is it still what is wanted? Are targets likely to be met? Are we ready to move on to the next stage?
B6	Incentives including independent occupant surveys	Incentivises both the demand and supply sides of team	Client	Design team Constructor	Decide form of incentive. Agree targets and define measurement criteria	An independent occupant survey provider should be appointed early, based on a proven, robust survey methodology, and the ability to benchmark the results against a relevant dataset.

Stage 2 worksheet example: Design

Stage	Action	Purpose	Initiator	Participants	Scope of duties	Notes
D1	Continue building revisits for specific design options, and use the findings to inform design decisions	To refine the design in the light of information from feedback of other relevant projects and/or properties owned by the client	Client	Client Design team Facilities/premises managers Maintenance personnel Constructor (where appointed) End-user representative(s)	Building revisits, talks between property managers and maintainers and the design team. Checklists created of both well-functioning and dysfunctional systems, and occupant experiences. Tie-in findings with project reality-checking procedures	Building revisits can generate checklists of technical and non-technical watch points. The checklists can be used to refine the client requirements, to inform the design brief, and to provide insights for reality-checking meetings throughout the construction process. It is vital to engage with facilities and maintenance people. They can be very insightful about construction details, items of plant, commissioning, and end-user experiences. Some effort may be required to persuade them to take part in discussions as they may not be used to it. Issues should be recorded in such a way that the feedback doesn't get forgotten as the design develops. An operational risk register may be a useful working document, particularly for those joining the project later.
D2	Review design for buildability, commissionability and maintainability	To ensure that the design concepts can be built, commissioned and operated successfully	Constructor	Client Constructor Design team Project manager Key sub-contractors (or proxies) Cost consultant Facilities manager Commissioning manager Maintenance personnel End-user representative(s)	Identify key sub-contractors to attend pre-contract, or find proxies. Tie-in outputs with project reality-checking procedures	The review process may be a single meeting or a series of meetings. If time and budget only allows for one review meeting, its timing will be crucial. It will be of little value if the meeting occurs before the main contractor, M&E contractor and commissioning manager have been appointed. Deliberations and decisions should be related to the cost plan, and any cost implications discussed with the client and cost consultant. The in-use performance implications should be made clear, agreed by all, approved by the client, and recorded in the project documentation.
D3	Review design for usability and manageability	To review the design from the perspective of those who will control and manage the building after handover, and to identify how the environmental control needs of end-users will be met	Lead designer or constructor	Client Constructor Design team Project manager Facilities/premises managers Maintenance personnel Controls specialist (or proxy) Commissioning manager M&E contractor	Identify gaps in knowledge and spot specific risks for building management and end-users. Determine the end-user control systems. Tie-in findings with reality-checking (see D4)	The review process may be a single meeting or a series of meetings. A workshop can still be useful even where time and budget restrictions only allow for one review meeting, but expectations will need to be realistic. Controls usually play a significant role in usability and manageability. Where the controls company has not been appointed, efforts should be made to find a proxy. Many controls companies will be jump at the chance to give pre-contract advice.
D4	Undertake the reality-checking process started in the Briefing stage worksheet and import the outcomes from B1, B2 and B3.	Chose a reality-checking process and reality-check selected elements (see notes)	Project manager	Client Project manager Design team Selected sub-contractors or proxies End-user representative(s)	Duties in line with the BSRIA process BG 27/2011 <i>Pitstopping</i> . Create RASCI* charts, or similar	BSRIA BG 27/2011 <i>Pitstopping</i> describes a process for reality-checking, the process whereby the project team gives specific elements closer attention during design, construction and installation. Outputs from reality-checking should inform the activities for the pre-handover, handover and aftercare stages. It is important to create the right conditions for reality-checking. The required honesty, openness, and critical analysis by attendees won't come easy. People will buy into it if the first meeting is a success.
D5	Revisit and update early performance targets	To ensure that targets remain realistic and appropriate	Lead designer or constructor	Client Project manager Constructor M&E contractor Design team Facilities manager BREEAM/Ska adviser (optional)	Identify and describe the performance targets, such as energy, environmental, social and other performance targets (such as water and embodied energy). Review, and communicate to all relevant parties	By their nature, early energy targets generated for planning compliance are simplistic and do not require designers to break down energy consumption by end-use. Soft Landings requires the project team to develop more detailed models of the building's energy and environmental performance, including unregulated (plug-in) power loads and hours of operation. Early modelling will use notional values, but these can be progressively refined during later Soft Landings stages. The team should use tools that can be understood by facilities managers (such as Excel charts). Facilities teams should inherit the spreadsheets after handover. They should be updated over time, and used to inform formal post-occupancy evaluations.
D6 (B3 on page 19)	Incorporate Soft Landings requirements in tender documents, and evaluate tender responses and results from interviews	To ensure that contract requirements are worded to reflect outputs from reviews	Project manager	Client Project manager Lead designer Constructor M&E contractor	Create contract documents, review and sign-off in accordance with design review and reality-checking findings. Review tender responses against requirements	The review and reality-checking decisions need to find their way into sub-contract tender documents, which should be evaluated by the designers before going out to tender. A process also needs to be set up to review the tender submissions and results from tender interviews. Some sub-contracts will be more important than others. The increasing preponderance of specialist sub-contracts that include bespoke controls systems will need extra attention to ensure the vendors' systems will satisfy the requirements.
D7	Iterate between stages D1 to D4 during the design process as required. The sequence, number of iterations and participants will depend on the procurement route					

*RASCI. A simple matrix for those in a team who need to be either held Responsible, Accountable, Supported, Consulted or Informed about a particular topic. Window motors, for example, require people to specify, install, commission and witness their testing.

Stage 3 worksheet example: Pre-handover

Stage	Action	Purpose	Initiator	Participants	Scope of duties	Notes
P1	Environmental and energy logging review	To clarify responsibilities and the scope of energy logging and review	Facilities management	Design team Constructor	Review and agree routine for future logging. Integrate with the requirements of the Building Logbook	The energy and environmental plan and the targets set earlier will influence logging demand. Soft transfer of data will help reduce visits by the design team
P2	Building readiness programme	To ensure coordination to site activities, and witnessing by the designer and/or client representative	Constructor	Design team, Client, Constructor, User representative, Facilities manager	Provide updated sub-programme in good time ahead of any commissioning start	Essential if the building readiness team are to be effective. Static commissioning (such as inspections, airtightness checking, and window operation) should be included
P3	Commissioning records check	To verify adequacy of records	Facilities manager	Design team, Constructor Facilities manager	Include evaluation and decision points in design programme	Include energy performance checks
P4	Building services maintenance contract	To ensure there are no gaps in support, post-handover	Facilities manager	Design team Constructor Facilities manager	Agree subjects, target(s) and appropriate measurement methods	Important in helping to avoid confusion of roles and responsibilities post-handover
P5	Training programme	To ensure adequately trained operation and maintenance staff are in place, pre-handover	Facilities manager	Facilities manager Building services maintenance contractor	Agree decision makers and criteria for sign-offs	As P4. Designers also need to be open to the views of operational staff
P6	BMS interface demonstration	To demonstrate operation and fine-tuning of systems	Design team	Design team, Constructor User representative Facilities manager Building services maintenance contractor	Decide form of incentive. Agree targets and define measurement criteria	As P4. Operational staff also need to be involved in interface development, specification and review where possible
P7	Migration planning	To coordinate move-in with site continuing activities	User representative Facilities manager	Design team Constructor	Set up meetings	It's important that the design team and constructor are not left out of the loop during user logistics planning
P8	Aftercare team home	To provide visible and accessible home for the aftercare team during the initial post-handover phase	User representative Facilities manager	Design team Constructor	Arrange suitable workplace with datacoms links	Essential if the aftercare team is to be effective
P9	Compile building users guide	To help building users to better understand and operate the building efficiently in the manner envisaged by the design team	Design team	Client User representative	Compile guide in book form. Content to include information on local hvac and lighting controls, energy and water efficient features, security and access, furniture, space use, cycle storage, and the principles of design and operation.	The guide should be written clearly and avoid overuse of technical jargon. Illustrations aid comprehension. The guide should be made available in hard and electronic formats. Consult the facilities team and building users on content. File a copy in the O&M records. Be prepared for revisions after operational fine-tuning
P10	Technical guidance	To smooth transitions to local operation by the client's facilities management team	Design team	Facilities management specialists	Provide a building operations technical guide. Relate to the Building Logbook. Liaise with the facilities manager over content	Copy filed in the O&M records and/or the building logbook
P11	O&M manual review	To check content of the O&M Manuals	Facilities manager		Verify content and sign off	Should be coordinated with P4, P5, P9 and P10

Stage 4 worksheet example: Initial aftercare

Stage	Action	Purpose	Initiator	Participants	Scope of duties	Notes
A1	Resident on-site attendance	Spot, respond to, and help to deal with emerging issues	Design team Constructor	Design team Constructor	Team members resident in the building for (n) days per week	The number of days per week will depend on the size and complexity of the building. Team members should have good people, practical capability and continuity with the project
A2	Provide workplace and datacomms links	To give resident team members a visible home within the new building	User or client representative	User representative, client representative	Set up and make available prior to actual handover	See pre-handover actions. The workplace must be available from the first day of occupation
A3	Building use guidance	To introduce users to how their building operates, and the use of local controls. This stage is useful for obtaining feedback	Design team Constructor	Typical user groups	Participate in (n) focus groups of building users to present key information. Introduce the building user guide and discuss views and queries	Anticipate at least two meetings. See pre-handover actions. Mention the helpline and/or newsletter
A4	Technical guidance	To smooth transition to local operation by the client's facilities management team	Design team Constructor	Building facilities management representatives	Participate in (n) meetings with the facilities management representatives to introduce content of the technical guidance, and explain systems and discuss views	Anticipate two meetings. Ideally, this should have already happened during the pre-handover stage
A5	Helpline/newsletter	To encourage local feedback and communicate status of issues	Design team User representative	Building operator and user representatives. Constructor	The design team to set up a simple bulletin board, possibly linked to the client's intranet, for e-mail dialogue and posting of information updates. The user representative should aim to update the website or newsletters fortnightly and to moderate user comments	Keep this simple, not too technical and easy to update. It's best if the newsletter or helpline is available electronically
A6	Walkabouts	To spot emerging issues and observe occupation usage	Design team Constructor	If required: the users, the maintenance team, and the commissioning engineers	Roam building informally on a regular basis. Make spot checks with instruments if necessary	Combine with other visits as appropriate. See and be seen

Stage 5 worksheet example: Extended aftercare Years 1-3

Stage	Action	Purpose	Initiator	Participants	Scope of duties	Notes
Y1	Aftercare review meetings	Review progress	Design team Constructor	Design team Constructor Client representative User representative	Participate on on-site meetings	Four to six meetings in the 10 months following weeks 1-8 should be adequate
Y2	Log and review energy use	To provide the basis for comparison with the energy plan and to assist fine-tuning of systems	Facilities representative	Design team	Facilities representative to monitor and forward-read every (n) weeks. Design team member to review readings every (n) weeks	The frequency will depend on the extent of sub-metering and the quality of the BMS links. Monthly readings should be a minimum. the design may be able to log consumption directly via the bms, but this must not replace the facilities manager's monitoring
Y3	Systems and energy review	To monitor overall energy usage and systems	Design team Facilities representative	Design team Facilities representative Client representative User representative Maintenance team	Participate in review meeting every (n) weeks	Six-monthly is suggested. This activity may need to be more frequent, though some can be done remotely and much of the rest absorbed into stages Y1 and Y4
Y4	Fine-tune systems	To adjust systems for seasonal change and any emergent usage patterns	Facilities manager	Design team Constructor Facilities representative	Carry out fine-tuning at month(s)	The frequency will depend on seasonal timing and any particular emergent issues. The maintenance team and commissioning engineers may sometimes need to be involved
Y5	Record fine-tuning and changes of use	To help progressive changes	Facilities manager	Design team Constructor Facilities representative	Record changes to systems in the building logbook and add to the O&M Manuals	Essential for accurate comparison of forecast energy use
Y6	Helpline/newsletter	To encourage local feedback and communicate status of issues	Design team	Facilities and user representatives	Update every (n) weeks	A monthly update should be adequate
Y7	Walkabouts	To spot emerging issues and observe occupation usage	Design team	Constructor	Roam building informally on a regular basis	Every two months is a good baseline; combine with other visits as appropriate. See and be seen
Y8	Measure environmental and/or energy performance	To compare actual against forecast targets	Design team Constructor		Measure performance to agreed programme	Use to inform the end of Year 1 review meeting agenda
Y9	End of year review	To review overall building performance	Design team Constructor	Design team Constructor User representative Facilities representative Client representative	Participate in annual meeting	Coordinate with the end of defects liability sign-off. This is also the opportunity to decide any change of focus for the coming year

Soft Landings why bother?

Soft Landings:

Provides a unified vehicle for engaging with outcomes throughout the process of briefing, design and delivery. It dovetails with energy performance certification, building logbooks, green leases, and corporate social responsibility.

It can run alongside any procurement process. It helps design and building teams to appreciate how buildings are used, managed and maintained.

It provides the best opportunity for producing low-carbon buildings that meet their design targets. It includes fine-tuning in the early days of occupation and provides a natural route for post-occupancy evaluation.

It costs very little, well within the margin of competitive bids. During design and construction, Soft Landings helps performance-related activities to be carried out more systematically. There is some extra work during the three-year aftercare period, but the costs are modest in relation to the value added to the client's building.

Most of all, Soft Landings creates virtuous circles for all and offers the best hope for truly integrated, robust and sustainable design.



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