

Towards Net Zero

a collaborative approach to decarbonising housing and increasing social value

Paper I – A framework for effective collaboration

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This paper is the outcome of a collaboration between four leading housing design practices aimed at facilitating the shared endeavour between all members of project teams involved in renovation or development of new housing. It covers the context for our work and proposes a framework for clients and consultants to follow.

A companion, Paper II, proposes a social research based questionnaire as well as professional and technical processes for post occupancy evaluation.



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Hazelhurst Court by Levitt Bernstein

SECTION 1: INTRODUCTION & SUMMARY

Collaborating for Zero Carbon outcomes

Four practices specialising in housing design, HTA Design (HTA), Levitt Bernstein Architects (LBA), Pollard Thomas Edwards (PTE) and PRP Architects (PRP), are collaborating to enhance our delivery of design and other services to housing clients, with the intention of supporting them in the process of decarbonising their development and renovation programmes.

The practices recognise the challenge for businesses to reduce emissions by the 2050 target for a net UK zero economy, a process that we are undergoing ourselves. We recognise that housing contributes 20% of the nation's climate emissions. We aim to make a proactive contribution, working with our clients to help them achieve net zero themselves by ratcheting up building performance.

We aim to help our clients achieve a programme of stretching but achievable and measurable targets for environmental sustainability and human wellbeing with a focus on the decade until 2030, on the premise that improvements need to start now, and deliver significant progress soon if we are to achieve net zero in the final two decades leading up to the 2050 deadline.

Central to our proposal is an ambition to work with clients to create an effective feedback loop which will test how well our joint effort succeeds in achieving the targets identified. Our aim is to create a structure enabling information, data and learning to be shared between the practices, participating developer clients and with professional organisations, particularly the RIBA which provides an overarching structure for the work.

Benefits for Clients – financial

We have identified a number of potential advantages for housing clients to be derived from collaboration with design teams in the process we propose:

- More accurate forecasting of business expenditure in face of rising operating costs.
- Reduced whole life operating costs as buildings are more efficient and cheaper to run.
- Mitigation in risks of non-compliance with future regulation.

- Shared development of a useful knowledge resource platform.
- Supporting net zero business models and Environmental, Social and Governance (ESG) (3) funding compliance.

Benefits for Clients – customer/consumer/brand/PR

In addition, we believe that there are further business benefits that may accrue from clients' participation:

- Increased brand credibility and reputation.
- Greater insight and clarity of clients' own environmental and carbon footprint.
- Demonstrable leadership ahead of business-as-usual approaches.
- The opportunity for recognition and promotion of exemplar building portfolios.
- Increased levels of resident satisfaction from improved building performance and commissioning.
- Reduced levels of dissatisfaction and discomfort driven by the focus on quality and commissioning.

Why involve building designers?

We believe achieving the benefits set out above demands the combined attention of client, consultant team, contractors and subcontractors as well as clients' housing management and facilities management teams. The understanding of the professional team in design and specification is clearly fundamental to successful achievement of challenging targets. Similarly, clients should benefit from sharing information, building knowledge and skills accruing as a result of participation in the process.

Further benefits include:

- Improving designers' understanding from client & user perspective.
- Minimising the cost of non-compliance.
- Improving the chances of right first time solutions.
- Reducing the performance gap (see below).

SECTION 2: THE CONTEXT

The Climate Change Act

The UK Government's Climate Change Act of 2008 established legally binding carbon "budgets", essentially targets to reduce emissions compared to 1990 levels in successive steps: by 51% in 2025, 57% in 2030 and 100% in 2050. The 2050 zero carbon target was enacted as a law in the Climate Change Act 2050 Target Amendment Order of 2019 (1). In that year the UK Government declared a Climate Emergency and so too did the RIBA. The housing sector, which contributes 20% of the UK's climate emissions, must make a significant contribution to these savings.

However, even when homes are designed to the highest environmental standards, there is a significant gap between the intended and actual performance. The European Council for an Energy Efficient Economy reported in 2019 on a study (2) investigating the magnitude and extent of the difference between predicted and measured energy performance – the so called energy performance gap – of 92 low energy dwellings in the UK.

The overwhelming majority – 13 out of 14 Passive House and 35 out of 43 non Passive House dwellings – did not meet the predicted energy use, demonstrating a performance gap of 22 kWh/m²/year and 45 kWh/m²/year respectively.

The shortcomings in the reliable predictability of performance can be put down to uncertainty in three main areas:

1. **Environmental** – uncertainty in weather prediction under changing climate.
2. **Design, Specification & Workmanship** – in the procurement of building elements.
3. **Behavioural** – patterns of occupation and use of buildings and environmental systems.

The interactions between design, specification, operation in use and facilities management are indissoluble so that all those involved in all aspects of building lifecycle must collaborate to overcome the performance gap.

Governments are setting targets for radical improvement in sustainable outcomes now, long before the development industry is capable of achieving them. In the private sector, socially responsible investment, ESG (3) funds are looking for ways to satisfy investors' ethical standards. This requires that the industry works across a broad front taking into account social value and sustainability in its widest sense, as well as environmental performance.

Time is short so there must be an emphasis on obtaining better understanding of currently available solutions (rather than new technologies) that work well, and which do not. That means acquiring, aggregating and disseminating information and data using broadly based and practically deliverable post occupancy evaluation.

Soft Landings

Soft Landings has been developed over many years, principally by leading architects and BSRIA, a UK-based testing, instrumentation, research and consultancy organisation, to help the client and design team deliver better outcomes. Soft Landings is a framework within which other tools with a commitment to building performance evaluation, graduated handover, and post occupancy evaluation can sit. Here is how RIBA describes Soft Landings:

'An outcomes-based design approach will help resolve the now well-known gaps between design intent and in-use performance across a range of metrics and deliver real and lasting reductions in carbon emissions by reinforcing the feedback loop between briefing and outcomes. It complements mandatory requirements under Government Soft Landings, for UK and devolved governments to carry out post-occupancy evaluation (POE) on all centrally funded public buildings and education projects, with the aim to reduce energy and running costs, and enhance health and wellbeing.' - Gary Clark. December 2019. RIBA Sustainable Outcomes Guide. (4)

The application of Soft Landings is covered in greater detail in the RIBA Plan for Use Guide (10) which in summary recommends that project teams use the following combination of steps to ensure that better outcomes are achieved:

Step 1. Define sustainable outcomes during briefing.

Step 2. Use one (or more) of the sustainability certification tools to ensure compliance.

Step 3. Adopt the Soft Landings Principles as a basis for reality-checking outcomes and building handover.

Step 4. Verify sustainable outcomes through Post occupancy Evaluation (POE).



Knights Park, Pollard Thomas Edwards



Velux house, HTA Design LLP

RIBA Sustainable Outcomes Metrics

The following section is taken from the RIBA Sustainable Outcomes Guide (4). It sets out the parameters and targets for achieving environmental sustainability in development.

1. Net Zero Operational Carbon Dioxide emissions (kWh/m²/y and kgCO₂e/m²/year)

The carbon dioxide produced as a result of the production and use of the energy from fossil fuels consumed for the day-to-day operation of the building or structure, including Low/zero carbon renewable energy technologies both on and off-site, plus recognised offset schemes where essential. As principally defined by CIBSE TM 54 Evaluating Operational Energy Use of Buildings at Design Stage, 2013, or Passivhaus PPHP.

Target – Net Zero for new buildings and retrofit buildings.

2. Net Zero Embodied Carbon Dioxide (kWh/m²/y and kgCO₂e/floor area m²)

The carbon dioxide produced from the energy used in the extraction, fabrication and transportation from place of origin of the materials used in the construction, including recognised carbon offset schemes. As principally defined by RICS Whole Life Carbon Assessment for Built Environment, 2017.

Target – Net Zero for new buildings and retrofit buildings including offsetting.

3. Sustainable Water Cycle (m³/person/year)

Analogous to operational carbon dioxide, the amount of mains water used in the operation of the building including the offset by use of greywater or recycled water to reduce mains water consumption. As principally modelled by England and Wales building regulations water calculator.

Target – To achieve 40% reduction in potable water use per person per day.

4. Sustainable Connectivity and Transport (kgCO₂e per km per person per annum)

The purpose of this outcome is to measure the resultant carbon impact of the travel of occupants and visitors to and from site or building to a local transport hub or local retail and community facilities. As principally defined by BREEAM 2018 Transport Credits.

Target – To achieve net zero carbon emissions per person per day

5. Sustainable Land Use and Biodiversity (increase in new flora or fauna species on site)

The intention is that this outcome should be used as a measure of actions taken to maintain, protect and improving the flora and fauna on site.

As principally defined by BREEAM 2018 bio-diversity credits, Urban Green Factor, London Plan.

Target – To achieve net positive species impact and 0.3-0.4 urban green factor on all new sites.

6. Good Health and Wellbeing (various metrics)

This outcome includes key variables of internal occupant health and well-being, including Indoor Air Quality, Daylight, overheating, acoustic comfort, responsive controls, and physical contact to outside. As principally defined by CIBSE TM 40, 52, and 59, Good Homes Alliance overheating guidance and/or WELL Building Standard v2 Preconditions, 2019.

Target – To achieve good indoor health metrics as per 2030 challenge, including CIBSE TM 40, TM 59 Overheating Avoidance

7. Sustainable Communities and Social Value (various metrics)

The intention of this outcome is to measure the positive impacts of good placemaking on a local community.

As principally defined by RIBA Social Value Toolkit, 2019.

8. Sustainable Life Cycle Cost (£/m²)

To ensure a holistic outcome with regards to economic sustainability, the intention is to use Government Soft Landings requirement for measuring operational costs of buildings.

As principally defined by ICMS Global Consistency in Presenting Construction and Other Life Cycle Costs, 2019.

RIBA 2030 Climate Challenge

The RIBA has developed the 2030 Climate Challenge (6) as a set of voluntary performance targets for operational energy use, water use and embodied carbon in consultation with other professional UK construction bodies. The framework sets out a challenging but achievable trajectory to realise significant reductions necessary by 2030 in order to have a realistic prospect of achieving net zero carbon for the whole UK building stock by 2050. The 2030 Climate Challenge provides a framework for achieving target outcomes under the first three headings above and contributes to the calculation of life cycle costs, the final heading set out in the RIBA Sustainable Outcomes Guide.

RIBA has set RIBA Chartered Practices a challenge of achieving the following reductions as soon as possible and before 2030:

1. Reduce operational energy demand by at least 60%, before UK offsetting.
2. Reduce embodied carbon by at least 40%, before UK offsetting.
3. Reduce potable water use by at least 40%.
4. Achieve core health and wellbeing targets.

All four practices have signed up to the RIBA's 2030 Climate Challenge. This requires us to collect data on our projects and report the prescribed metrics annually, including other best practice health related metrics; Overheating, Daylight and Air Quality (Levels of CO₂, VOCs and Formaldehyde).

The Social Value Toolkit

The Social Value Toolkit provides a useful framework for establishing social value outcomes of development. The 2012 Public Services (Social Value) Act (7) requires that public procurement can secure social and economic benefits for a wide range of stakeholders, essentially a tool to obtain better value for money. It encourages engagement with the market or community to be served, aiming to encourage better service provision and find innovative solutions.

Social value is usually measured in relation to services, rather than goods or works - including development. But in 2017 the UK Green Building Council (UKGBC) launched its Cities Programme (8), which aims to create productive new partnerships between city policy-makers and the built environment industry that will catalyse the delivery of sustainable places. The UKGBC considers assessment of social value in procurement of development crucial to meeting the evolving needs and aspirations of the ultimate customers - the people that use the places and spaces created. The aim is to deliver places that allow communities to thrive, and which protect and enhance our natural environment.

The methodology for our approach to social value driven POE is derived from HTA's work with the Social Value Working Group at the RIBA organised by Professor Flora Samuel from the University of Reading. HTA Design collaborated with others in the development of this toolkit from its initiation in late 2017. The Social Value Toolkit (SVT) questions, published by the RIBA in October 2019 (9), provide a library of questions stemming from research of wellbeing measures by others (10) and extensive deliberation amongst the partners and advisory group members developing the toolkit. It provides the foundations for design professionals to assess a growing interest in measurable long term well-being impacts as a result of design intervention in the built environment. The purpose of the toolkit is for architects to demonstrate Social Value in the places and buildings they design. This is a challenge at present as longitudinal data collected from completed build environment projects do not tend to be collected across the board and there is no standardised approach.

High level outcomes for the SVT are:

1. Freedom
2. Connecting
3. Active Lifestyles
4. Positive Emotions

With additional questions relating to Participation, where relevant.



New Garden Quarter, Pollard Thomas Edwards

SECTION 3: THE PROCESS

Post Occupancy Evaluation

The RIBA published an updated version of its Plan of Work in 2020 (10). This places post occupancy evaluation during Stage 6 (handover) and 7 (use) of the plan as critical to optimising in-use performance. RIBA now requires all architects to promote POE to clients as a core service. The institute identifies a graduated approach to POE:

Level 1. Light Touch Review, to obtain rapid feedback on performance and occupant satisfaction and to identify opportunities for fine-tuning. With the assistance of other design and building team members, the Architect will ideally do this during RIBA Stage 6, by the end of the 12-month defects period. Some independent input is desirable but not essential.

Level 2. Diagnostic Assessment, normally by independent evaluators during Year 2 of occupation, to verify performance and review any issues discovered, including those identified at Level 1.

Level 3. Detailed (Forensic) Investigations, if necessary by independent evaluators, to identify and where possible resolve any significant and persistent performance issues. These can start at any time, but should ideally be completed by the end of Year 3

A collaborative methodology for POE

The methodology proposed in this paper is not the only approach to POE adopted by the four practices. All currently undertake less structured POE as well as much more detailed research on individual projects or for specific clients, often in collaboration with academic establishments. However, our shared endeavour here is to promote much more consistent and wide ranging application of POE enabling benchmarked performance, aggregation of data and structured feedback and learning. We believe POE should be built in affordably to the project lifecycle so as to become second nature for architect and client alike.

We recognise that most of our clients already undertake surveys of building occupants for a variety of different reasons including experience of sales or letting, building management, repairs service, identification of snags and so on. Whilst our shared objective is consistency of data, our objective is to build on the work already undertaken by our clients and avoid duplication. We envisage that in the case

of each project surveyed the standard methodology described here would be tailored to avoid residents being asked the same questions twice. Ideally the approach would be harmonised into one process with guarantees as to the confidentiality of data in accordance with General Data Protection Regulation (GDPR). We have assumed that collaborating clients will cover the GDPR implications of the joint feedback process we are proposing.

The following process involves a sequence of post occupancy evaluation exercises in four levels, beginning with observation (including some door knocking), followed by questionnaires to investigate occupants' relationship with building and place. This qualitative analysis will be followed by a more technical monitoring process of building performance. Finally, an optional diagnostic stage is suggested for occasions where POE reveals the necessity for remedial action.

Staged Post Occupancy Evaluation

The process we propose has been devised by the four practices and agreed as a shared, deliverable response to the principles of sustainable development set out in preceding sections. The proposed POE stages are:

- Step 1. Initial visit for observational survey and door knocking
- Step 2. Questionnaire
- Step 3. Environmental monitoring
- Step 4. Optional Diagnostic stage

We propose that these enquiries about building performance and environmental wellbeing are integrated with those carried out by building owners or managers which we assume will be focused more on quality of service. The objective would be to ensure residents are not asked the same questions twice. The detailed draft of a proposed questionnaire is available as a separate paper.

Our suggestion is that the initial observational and door knocking process set out in Step 1 should be included as the baseline minimum process agreed in all terms of appointment and allowed for in consultants' basic terms of appointment.

Steps 2 and 3 would be bid an additional service. We invite comments on the suggestion that this service would be routinely proposed by the practices on all projects undertaken but we recognize that individual circumstances apply and that there are a number of variables that would impact the resource requirements and cost of the exercise. It may also be that clients prefer this service to be undertaken in whole or in part by third parties. In that case, it would be desirable for the data sets to be comparable and the results to be shared with consultants.

Step 4 would only be required in specific and possibly rare circumstances, and so the basis for this as well as the participants engaged would be entirely bespoke.

More details on the format of the proposed questionnaire are attached in an appendix: *Towards Net Zero 2050 – a collaborative approach to decarbonising housing and increasing social value. Paper II – proposed questionnaire.*

Monitoring, recording & sharing data

All four practices involved in this collaboration benefit from the availability of in-house environmental assessment expertise. Even so, some clients prefer independent service providers to assess environmental performance. In that case, it is important that external consultants are briefed appropriately and appointed to deliver the inputs required for the RIBA 2030 Climate Challenge and to contribute appropriately to POE.

Similarly, all four practices employ professionals well versed in community engagement and associated field work. None of the activities proposed in Steps 1 and 2 of the POE process require specialist expertise. Indeed, the opportunity to see projects inhabited and in use, as well as direct exposure

to feedback from residents and managers is certainly beneficial for the design teams responsible. Otherwise, there are a number of specialist consultancies able to do this work.

In the interests of consistent data collection the four practices share a proforma that allows for the data requirements of the RIBA Climate Challenge, acts as a prompt for appropriate actions at key stages and can be used by practice management to monitor its progress towards delivering net zero carbon projects. This tool records project details including practice personnel and four key monitoring stages:

1. **Plan of Work stages 0-1. Strategic Definition, Preparation and Briefing**
 - Ensure appointment covers POE.
 - Establish brief for identified outcome criteria.
 - Check whether appointment of (internal or external) sustainability consultant.
2. **Plan of Work stages 3-4. Spatial coordination, Technical design**
 - Record data for predicted outcome criteria.
 - Check the environmental objectives accord with the RIBA 2030 targets.
3. **Plan of Work stage 5. Manufacturing and Construction**
 - Check for a specification capable of achieving the predicted outcome criteria.
 - In the case of Design & Build Contracts, check that the contractor client has adopted the requirements of Stage 1.
4. **Plan of Work stage. 6 - 7 Handover and Use in occupation**
 - Check that Plan of Work Stage 6 and 7 POE processes have been programmed and committed.
 - Record achieved data obtained of actual outcome criteria.
 - Record social value data.
 - Periodically share anonymised data with RIBA Climate Challenge programme.
 - Feedback report to clients and design team.



Feedback

The RIBA Climate Challenge was announced in 2019 and the Institute began collecting comparable data from the 300 or so practices that had signed up by 2021 in December of that year. It is therefore early days to suggest significant feedback from the exercise. Obviously, the more participants in the process the better the mapping of performance will be and the better informed we will be for the lessons learned. Every project will benefit from an individual feedback report, clients and consultants will learn with successive experience and, owing to the RIBA's collection of anonymized aggregated data, the industry as a whole will improve understanding of effective means of meeting the longer term objective of a net zero industry by 2050.

Feedback on the process will take the following forms:

- Individual project reports.
- Aggregated data supplied to the RIBA, analysis and publication of which is awaited.
- Management information to provide information on practice contribution to mitigating the climate crisis.
- Shared data, best practice and lessons learned between the four practices and their participating clients.
- Internal feedback to project teams, through individual project review, themed analysis and CPD.

SECTION 4: DEFINING SERVICE OFFERINGS

Pro forma letters of appointment & contracts

The four collaborating practices would appreciate client input on approaches to terms of appointment for the work set out in this proposal. Some example letters are included here.

As an adjunct to its Climate Challenge programme, RIBA has published a document entitled, 'How to Talk to Clients about the RIBA 2030 Climate Challenge' (11).



Officers Field, HTA Design LLP

This includes the following suggested wording for an introductory letter:

Re: Project Name and RIBA 2030 Climate Challenge

Dear Sir or Madam,

We are delighted to be working with you on [Project Name]. Your brief sets ambitious aspirations that we will address as we progress through the coming work packages, commencing with Stage [insert RIBA Stage].

As discussed in our last meeting/email/workshop [delete as appropriate], as an RIBA Chartered Practice we take our commitment to sustainable development seriously and have signed up to the [RIBA's 2030 Climate Challenge](#). As part of the RIBA Challenge, we are committed to attempt to meet ambitious but achievable energy, water and embodied carbon performance targets on our significant projects. We believe that [Project Name] falls within this remit and has the potential to be an exemplar scheme.

The benefits of adopting the RIBA Challenge targets include more accurate forecasting of operating costs since the targets are performance targets of actual use; demonstrable leadership ahead of business-as-usual construction approaches; mitigation and removal of risk of non-compliance with future regulation and future mandatory performance declaration and addressing building portfolio's role within net zero business models.

It is important to clarify that the RIBA Challenge does not seek to replace or replicate a sustainability or an environmental assessment. There is no associated certification procedure. Instead, the RIBA Climate Challenge presents a set of performance outcome targets for projects to aim towards. Therefore, the Challenge has only two requirements for signatories: the first is to attempt to achieve the targets. (There is no penalty or consequence for projects that miss the Challenge's voluntary performance requirements.) The second requirement is to submit anonymised project data.

Clients are therefore requested to provide actual energy and water usage data one year after project completion via the project architect to the RIBA. These figures should be taken from energy/water meter readings (or energy/water bills) for the building over a year so that both winter and summer seasons feature in the calculation. Clients are asked to make this information available to project architects, whose responsibility it is to submit the data report.

We therefore ask you to sign and date the attached letter of commitment and return to us by [insert date]. With the letter you are committing to provide energy and water data of [Project Name] after the first operational year of the scheme. The data shall be provided on the understanding that it will be anonymised.

Yours sincerely, [Sign and dated]

Alternatively, practices may prefer to include the offer of Climate Challenge and POE services within an inclusive fee as part of overall appointment. A suggested wording for this is extracted from one of our practice's standard appointment letters here:

RIBA 2030 Climate Challenge

At xxxxxx, we are committed to doing all we can to mitigate the climate emergency and we hope you share that priority. We have signed up to the [RIBA 2030 Climate Challenge](#) which provides helpful targets for us to aim for with you, particularly on energy use, embodied carbon and water consumption in buildings.

Our fee proposal includes for the time necessary to make the relevant calculations and recommend strategies for you to consider, in line with the RIBA 2020 Plan of Work. This also means carrying out a basic Post Occupancy Evaluation with your support at completion (Stage 6 of the Plan of Work) and the

fee for this and report of findings is also included. We hope you agree that this is desirable and will join us in the effort to prevent climate change.

The suggested additional service in Steps 2 & 3 might be described in a separate proposal described as follows:

In addition to our basic service working with you to establish and monitor key environmental outcome data throughout the project lifecycle, with a light touch Post Occupancy Evaluation at Plan of Work stage 6 (handover), we strongly recommend a more thoroughgoing process evaluating performance of the building in use between six months and three years after occupation.

This process involves following up the initial evaluation with a representative sample questionnaire and remote monitoring of environmental performance using web enabled monitoring devices. In this way, a great deal more information can be obtained with reasonable statistical significance to establish the degree of compliance of actual outcomes with design objectives. This more detailed evaluation would be fed back in a report and the anonymized data contributed to the RIBA 2030 Climate Challenge programme to help meet their objective of aggregated data of overall development industry performance.

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