

Development of a Holistic Environmental Brief for use as a Design-phase Building Environmental Assessment Tool

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The architectural brief is seen by architects as the most crucial part of the entire design process in terms of achieving high quality buildings. Environmental design strategies are considered as being of lesser importance[1]. It is proposed in this paper, that the use of an environmental brief to drive building design could be extremely effective in producing high environmental performance. Using the briefing stage to set out environmental criteria will allow the assessment of the building's performance throughout the various stages of the design process. This will be effective in ensuring that environmental design strategies are not compromised. The implementation of the environmental brief could be seen as more important in achieving a high level of environmental performance than the environmental design strategies themselves.

Some case studies of house projects have been undertaken in which environmental briefs were developed. The paper examines the brief development process using these projects as examples. This brief development fits into a wider research framework of the development of design-phase environmental assessment tools.

INTRODUCTION

The built environment is responsible for an estimated 45% of all greenhouse gas emissions.[2] It is during the design process where decisions are made which can have the greatest influence on reduction of the impact of the built environment. Of the stages of the design process, the brief can be seen as the most important part in ensuring the implementation of environmental strategies.[3] The importance of the briefing process is illustrated by Wittman in her article "*Architects' commitment Regarding Energy Efficient/Ecological Architecture*". [4] The article centres around a recent survey conducted by Wittman, exploring architects' awareness and commitment concerning environmental problems, their knowledge in energy efficient/ecological design and the barriers they perceive to be most important. An important finding from the data was that the brief is the factor that the largest number of architects consider to be the most important when commissioned for a new project. In comparison, environmental issues are only considered by 30% of respondents to be of the greatest importance. [5]

Creating environmentally responsible buildings entails paying careful attention to ESD principles at each stage of the design process. However, issues considered and decisions made at the briefing stage of the design process have the biggest impact with regards to the inclusion of ESD strategies. The greater emphasis on environmental issues at this stage to the process could ensure a greater level of sustainability. During the generation of a design from brief writing to schematic to construction documents, it becomes increasingly difficult and more costly to ensure a high level of environmental performance. As figure 1 shows decisions made at the briefing stage have the biggest impact on the design outcome and are made with the least effort. Placing an increased importance on decision making during briefing, or 'front loading' of a project increases opportunities for a greater level of sustainability at a lesser expense.[6] Attempting to implement environmental strategies further on in the design process when the design is well developed is more difficult and more costly, as it will inevitably affect and alter other decisions already made.

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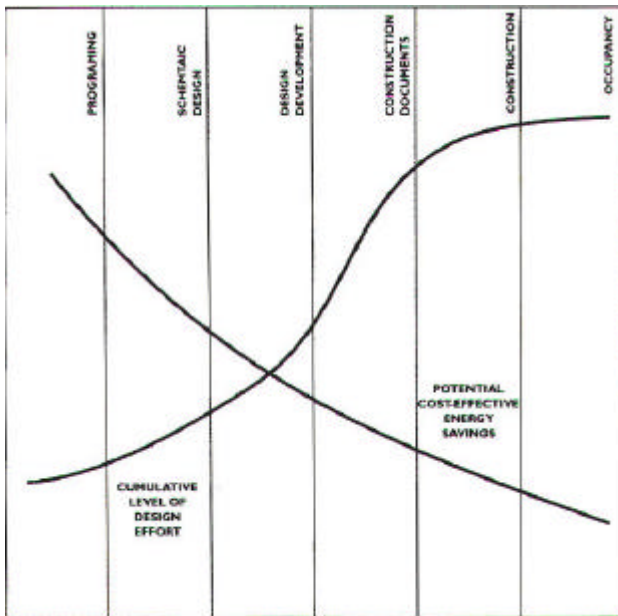


Figure 1: Effectiveness of decision making and cumulative effort at stages of the design process. [7]

RESEARCH BACKGROUND

The hypothesis of this research is that, if the environmental criteria are set when the brief is developed there is a better chance that they will be included during the design development stages.

There are many barriers for architects to overcome to ensure that the inclusion of ESD strategies into the design process is not compromised. These barriers include cost, lack of information, lack of education, inappropriate legislation, aesthetic and philosophical constraints. [8] By the inclusion of all parties involved in the design process at the preliminary stages of the project, for example environmental scientists, engineers and landscape architects, the barriers to be overcome can be addressed by input from these specialists. A greater range of issues can be covered and integral relationships between environmental strategies can be established. This collaboratively developed information can then be used as a guide for the further stages of the design process.

With the inclusion of environmental criteria the design brief can become an environmental assessment tool. A traditional design brief is utilised in this way as is used to check whether the design is performing as required in terms of functional relationships, spatial requirements and other design parameters.

The essence of the research proposal is to add environmental criteria to the design brief. A comprehensive environmental briefing process, described in this paper, is being developed. The research methodology is based on the action/reflection model of architectural practice.[9] Two house projects, currently in the detailed design stage, were used in order to develop the briefing process. The success of these projects and of the environmental brief will be monitored and reported on at a later date.

The research to date has been focused at the domestic scale but the applications of the methods are hoped to expand both into larger scale housing development and to commercial application. As part of this ongoing research a survey is being conducted into how architects form and use their briefing documents. This survey is in response to the outcomes from the briefing process. It is hoped that through this, insight into current practices will be gained.

THE DESIGN BRIEF

The RAIA *Practice Notes* define a design brief as "a written statement which details the client's expectations and the functions of a proposed building. It should describe the facilities to be provided and the activities to be performed and also clearly identify the broad policies within which these are to be achieved in respect of time, cost and quality of the facility". [10]

The *Practice Notes* set out a comprehensive list of components required for a briefing document, shown below. An environmental brief must ensure consideration of all of these aspects while making explicit the environmental issues and or goals, in relation to each of the components. The components of a brief are listed in the Practice Notes as being:

- The client's vision statement for the project
- A definition of the scope and scale of the project including cultural, historical, technical and environmental requirements.
- Identification of the site, any specific requirements and regulations required by local authority or other statutory bodies having jurisdiction, and demographics.

- A schedule of accommodation and equipment.
- Function and functional relationships.
- Planning policies.
- A project program.
- The project budget and how it was conceived, and life cycle costing methodology.
- The client's management and administrative structure.
- Quality Assurance requirements.[11]

The Practice Notes state, "*The operational success of a building is directly related to the clear identification of the functions to be performed in the proposed building, resolved through good design process*".[12] It follows then, that by establishing a clear expression of environmental goals for a project in the brief, this will be related to the overall environmental success of a building.

DEVELOPMENT OF THE ENVIRONMENTAL BRIEF

The process of the development of an environmental brief was initiated by a lack of successful implementation of environmental strategies in previous house projects by members of the research team. The perceived problem was that these projects had a lack of initial comprehensive briefing in regards to the environmental goals. Definite goals and strategies had not been established from the beginning. There was not a reference point for the progress of the projects in order to maintain the environmental goals, which themselves were too vague.

The environmental brief as a checklist of environmental strategies has been put forward previously by Mitchell and Hyde.[13] The intended application of the checklist is that during the design process there is a document to refer to, which checks that the issues are being addressed. This method sees that the environmental brief becomes more of a fix up tool during the design development stages rather than firmly establishing the strategies initially. The purpose of the current research was to integrate this checklist with the traditional functional brief. It was anticipated that this process would form a comprehensive briefing tool which could ensure the incorporation of environmental

strategies, not only general environmental strategies, but also those specific to the projects, such as differences in site conditions and client tolerances.

THE PROJECTS

A series of meetings were held with each client. There were several barriers to the acceptance of environmental design which were discussed and dealt with.

The clients of both houses involved in the environmental brief development process were interested in environmental sustainability issues from the onset and were prepared to take on the responsibilities and lifestyle changes involved. This was an obvious advantage in developing high environmental goals.

As in any building project, budgets were set and environmental design strategies could not be added to the design cost, so they would have to be integrated into the total cost. It was perceived by the clients that cost was the biggest barrier to environmental design. The capital cost of an environmentally designed house is seen as being more than traditional building, as potentially it can be.

Another main barrier to the acceptance of environmental strategies on behalf of the client is the perception that a change of lifestyle is required. Clients seem to be accepting of environmental strategies and technology if they will be able to continue with only small changes to their lifestyle.

In dealing with these barriers, the first of four stages of the briefing process was the education of the client.

THE BRIEFING PROCESS

1. Education

The initial stage of the stage of the briefing process involved the education of the client about the environmental design possibilities, in general and specific to their respective sites. The focus was on attempting to alleviate misconceptions about the nature of environmental design. This stage established what the client would tolerate in terms of lifestyle changes but also reinforced the point to them that perhaps some change in lifestyle and

ideology was necessary to achieve a desirable environmental result.

In addition to this initial stage, the education of the client was directed at establishing terms of reference in relation to sustainability. It required a statement by the client of what sustainability represented to them. With this as a starting point, in collaboration with the research team a refined definition of sustainability was developed. In achieving this understanding, the broad environmental goals of the project could be established. The goals become the first point of reference for assessment during the later stages of the design process.

2. Development of Functional Brief and Environmental 'Wish List'

The second stage of the brief development process involved the clients developing and submitting their requirements in the way that a traditional brief would be developed. They outlined requirements for functional relationships, spatial relationships, aesthetics and the budget. The research team brought to the discussion an environmental checklist or 'wish list'. The wish list has been drawn from a potentially endless list of

possible environmental strategies. This is then tempered by the definition of sustainability and the environmental goals established in the initial part of the process.

3. The Joining of the Two Briefs

The two parts of the brief were then integrated and environmental design strategies were developed. Strategies were developed relating to four aspects of the design. They were:

- **Resource Producing Strategies** – strategies that involve generation of energy, water and food and the treatment and or reuse of waste.
- **Passive Design Strategies** – strategic responses to climate, site, context, aimed at minimising impact of the building in-use. (see figure 2)
- **Material Selection Strategies** – attempting to minimise impact of the building before its use. (see figure 3)
- **Construction Strategies** – on site building practices aimed at minimising the impact of the construction of the building.

Action	Reason	Diagram
Multi-storey or split levels	<ul style="list-style-type: none"> • To maximise the amount of N.E. facing façade and rooms that can be attached to it. • Minimises the ground area taken up – maximises open space. • Minimises surface area to volume ratio. • A single level plan becomes to story any way because of the sloping site. 	
Thin Plan	<ul style="list-style-type: none"> • Maximise the amount of rooms that are on the N.E. façade. • Maximise potential for cross ventilation • Minimise crossing of contours and therefore minimise the height underneath the house. 	
Orientate to site	<ul style="list-style-type: none"> • Site is orientated to northeast and this is a beneficial direction to 	

Figure 2: Example of the passive design strategies from the environmental brief. [14]

Primary Structure

Recommended Selection – Primary Structure

Timber Portal Frame – Glue Laminated or,

Reasoning

- Minimising existing site disturbance
- Minimising on site waste during the construction process
- Ease of construction
- Speed of construction
- Maximises volumes to maximise potential air flow
- Adequately allow functional spatial requirements
- Minimise embodied energy
- Materials from renewable resources
- Utilisation of small waste timber to produce larger elements
- Low embodied energy

Figure 3: Example of Material Selection Strategy from the environmental Brief. [15]

4. Cost Planning

The fourth stage of the brief development was the cost-planning stage. At this point, life-cycle costing and environmental cost-benefit analyses of the strategies were undertaken. Particular reference was made to the resource producing strategies which tend to be those which add considerably to the capital cost of the house.

The environmental cost benefit analysis was an attempt to illustrate to the client what the reductions

of impacts on the environment will be if the strategies are put in place. The quantitative data produced showed how the money spent will reduce the environmental impact of the dwelling.

The life cycle costing process illustrated how larger capital costs, due to the incorporation of environmental strategies, would lead to reduced operational costs over the lifespan of the house. An example of part of the analysis is seen in figure 4 below.

Strategy	Capital Cost	Life Cycle Cost benefit	Environmental Benefit
Photovoltaics	\$14,000	\$420 per year	1,400 kg/CO2/year
Rainwater collection	\$4,500	approx \$0	350kL of water per year
Solar Hot water	\$2,400	\$280 per year	700 kgCO2/year
Total per year		\$700 per year	2.1 tonnes CO2 + 350kL water
Total life cycle	\$20,900	\$35,000	105 tonnes CO2 + 17500kL water.

Figure 4: Example of the Life Cycle Costing Analysis of Resource Producing Strategies [16]

If the client is satisfied that the functional requirements are clearly defined, the environmental goals and strategies are clear, and the strategies can be accommodated by the budget, then the brief can be 'signed off' and the design process can progress.

If agreement has not been reached at this stage, the briefing process can continue on a process of refinement of the definitions and goals, the functional requirements and or the environmental strategies, with continual reference to the cost analysis, until the clients are satisfied with the results.

THE BRIEF DOCUMENT

The final brief document forms a solid point of reference for the later stages of the design process on two levels of environmental criteria. Firstly, the broad environmental goals are understood and secondly at a finer scale, the environmental design strategies are established.

Referring back to the list of components set out by the RAIA *Practice Notes*, it can be seen how the environmental briefing strategies would integrate into the overall structure of the design brief.

- The clients vision will now incorporate as an aspect, the desired environmental approach.
- The scope of environmental considerations will be incorporated within the scope of overall requirements.
- In relation to site requirements, detailed environmental analysis would be incorporated. Statutory requirements regarding the environment would obviously be made explicit.
- The schedule of accommodation and equipment will incorporate the environmental technology being used and the space required for it.
- Functional relationships are integrated with passive design strategies.
- Planning policies are also integrated with passive design strategies and with the use of active environmental systems.
- The environmental strategies especially those relating to building construction are integrated with all other into the timing of the project. Approvals processes may take longer because of

the non-traditional nature of environmental design at present.

- Integration of environmental strategies into the budget, as well as adding in environmental cost benefit and life-cycle costing for the environmental strategies.
- Integration of management procedures and operating manuals for the environmental technologies.
- The Possibility of Implementation of environmental standards of ISO 14000 in addition to the quality standards of ISO 9000.

A comprehensive brief, incorporating all of these aspects, would typically only be undertaken for larger projects. However, the development of a framework based on the points above would be beneficial as a reference for any project.

Both of the projects used in this research were passed on to other architects after the briefing process was complete. The success of the environmental brief will be tested in terms of its ability to guide the rest of the design process. It is unfortunate that the design architects for one of the projects were not involved in the briefing process. This is in conflict with the concept raised previously of 'front loading' which maintains the importance of having all of the consultants involved from the inception of the project. The success of these projects in terms of their environmental performance will be monitored during their development. The influence that the environmental brief had in ensuring the inclusion of environmental strategies into the completed houses will also be determined.

THE BRIEF AS A COMPREHENSIVE ASSESSMENT TOOL

The environmental brief becomes a reference point for the duration of the design process. At this stage of the research in this area, the environmental brief does not act in a rigorous and objective way which would allow environmental assessment.

It is anticipated that the environmental brief could be used to construct environmental performance criteria for more quantitative and thus objective assessment of environmental performance. The criteria should be rigorous in the environmental

performance specification, but should also be simple for the designer to assess during the design process. There is a trade off between the level of detail of assessment that can be done and the time and effort to be spent during the design process.

To be relevant in the different stages of the design process, varying degrees of detail in the environmental criteria specified in the brief are needed. As in the environmental briefing document described above, there were general, overall environmental goals which are particularly relevant for reference during conceptual design. A more comprehensive briefing tool would set quantitative, benchmarks for assessment to take place.

'Nested' under the broad goals are increasingly detailed criteria that are aimed at achieving the overall objectives. As part of a comprehensive tool these goals would be assessed using the same units of measure but in more detail. This would ensure that a continual and consistent assessment can take place as the design decision making becomes more detailed.

The GBTool building assessment software developed by Cole et al,[17] uses the concept of nesting of the environmental assessment criteria, creating several levels of detail for the assessment process aimed at post-construction assessment. It is this type of assessment, but aimed at the design phase, which is the direction for further work of the research team.

CONCLUSION

As part of an action/reflection model for architectural practice, the environmental brief becomes a very useful tool. It is part of the process of continual improvement that will lead to building design approaching sustainability. Constant improvement of environmental best practice will mean the continual updating of the assessment criteria contained within the brief and an ongoing redefinition of the environmental goals. Just as a brief should not be a static document through the design process,[18] briefing practice and design in general should not remain static if it is to keep up with best practice. This is particularly so in the field of environmentally responsible design.

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