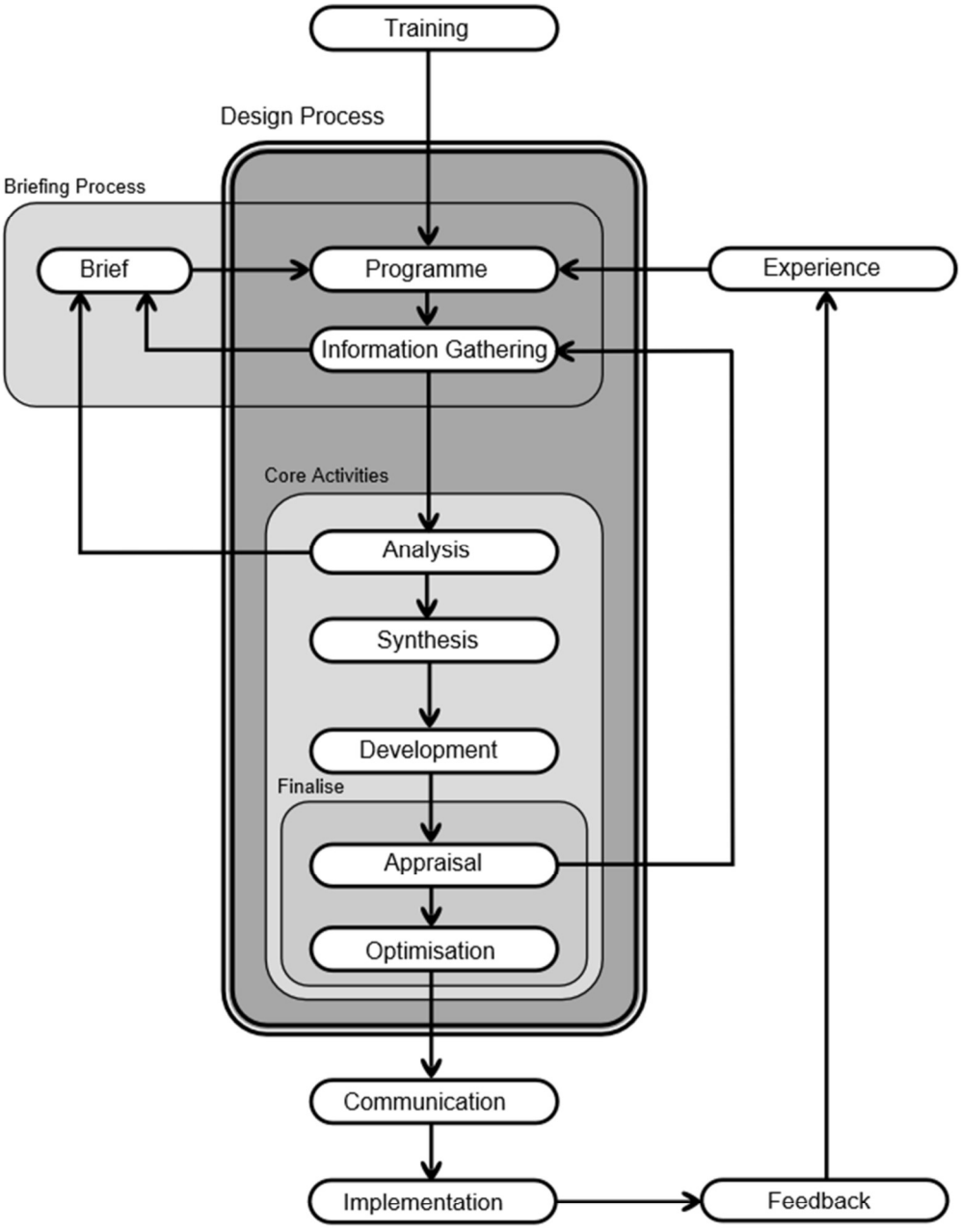

Design Process

Design Process.

Introduction.

You might, intuitively, produce a good solution, however without consciously, or subconsciously, following a process you may have difficulty providing an acceptable solution. You may also have difficulty in providing answers or reasons as to how and why the solution has been achieved and also in persuading others to accept it.

The design process covered here is one that contains some of the various techniques that, if utilised, can assist in producing acceptable architectural solutions in a systematic and logical way. The issues covered relate to design and directly related roles; the contractual, managerial, administrative and other roles of an architect are not included. However, the design process is not incompatible with these other roles and can fit well with organisational methods such as the RIBA Plan of Work.

It is a process that starts with lots of questions and hopefully ends only with answers and solutions. '*From requirements to reality.'*

A design process is not one that should necessarily be rigorously followed, nor is it one that is applied once only, it is a cyclical and iterative process that is constantly applied throughout the differing stages from concept to detail and component design and then though construction and into occupation and use. It will involve loops, spirals and shuttles within the process at any stage.

The process does not necessarily dictate solely a rational approach. There is a place for both logic and intuition at all stages of the process.

The design process does not end when the design is completed and approved. It should continue until the '*key is handed over'* and beyond. A building in use will inform you and others and will enable benefits to be taken from the experience.

You need a sense of proportion when applying a design process. All projects go through each basic stage, even if sub consciously, but the depth adopted will depend upon the project. The application of a process will vary depending upon the size and complexity of a project and external requirements, such as time and cost, but in all cases the principle features are worth following.

In some instances, you may have sufficient knowledge and experience not to need further data collection and also be able enough, without resort to a process, to produce an instant perfect solution. Can you rely on this? Some parts of the guidance in the process may be too specific. You chose how much of the suggestions to adopt

.

Design Process.

Brief.

The inception of a project starts with a client's brief, or your own desire to achieve an aim. Rarely will an initial client's brief be a full one. Clients will probably need assistance in developing the brief and the Information Gathering part of the process will assist with this.

Programming.

Planning and organising the process.

Start a project diary.

Determine who does what and when and how much time should be spent on the process, so that resources, including those of others involved, are used efficiently, effectively and timely. This will also assist in implementing a Design Process. Take account of cost and time restraints and other external influencing factors. This programming should include the involvement of the client and other design team members.

Determine how much research to carry out. Use your basic knowledge, gained from training and experience, to help decide the way forward but do not be afraid to venture into the unknown. You do not want to be faced with unwelcome surprises late in the process, especially too late.

Decide how to relate to the possible requirements of a Feasibility Study and then the requirements of Sketch Design, Final Design and Production Drawings, each of which is normally completed before the next begins. Consider the communication requirements at each of these stages.

Some outcomes are required before much research can be carried out, such as Feasibility Studies, but even in these instances a mini process is beneficial. First research the relevant major factors that influence feasibility before preparing and then presenting the study. Any early studies should be qualified, particularly with regard to research carried out.

When working on a large project with several other consultants of differing disciplines, a programme will help convey intent and maintain focus with all working to achieve the designer's aspirations.

Programming first, often avoids disastrous preconceptions. *'Fools rush in where angels fear to tread'*.

Keep a sense of proportion and stick to relevant issues. You would not apply a full-blown Design Process to a small house extension nor consider its regional or national context.

Information Gathering.

All the relevant factors that will, in any way, influence the design.

- Factors relating to the Clients requirements:
  The Clients brief including schedule of activities, indicating requirements of each in terms of environmental standards, space, services, furniture and fittings. Client's requirements regarding cost and timescales. Research and advice may be necessary to assist the client in developing the brief.

- Basic factors relating to the site or for requirements for a site if site not yet established.

- Where the site has been selected, research the relevant contextual factors covering as appropriate:

  Scope – Physical, Economic, Social, Cultural and Policy.
  Range – Site, Locality, Region, National, Global.
  Time – Past, Present, Future.

  The physical nature of the site will be of particular relevance. Topography, connectivity and transport facilities are normally import.

- Factors particular to the building type.

- Factors relating to client, building users and other stakeholders including design and aesthetic standards.

- General factors:
  Statutory requirements.
  Environmental standards.
  Anthropometrical and ergonomic standards.
  Specification standards.
  Sustainability issues.

- Factors relating to individual designer or office.
  Office standards, details, specifications, theoretical, economic and performance standards.

- Economic and time factors.

Many check lists and briefing guides are often available to assist with this part of the process.

Assimilate the information gathered. Organise and record the information. Check that all appropriate sources have been researched.

Analysis.

'Making the strange familiar.'

Rationalise and organise. Make sense of all the information, prioritise and establish relevance. Identify values and constraints that are imposed, required or desired.

Identify the quantitative parameters and variables and their values. Determine their relationships and set the criteria that can or should be used in the design.

- Design parameters – measurable, physical characteristics of each element in the design such as its area, length, location and number of such elements and so on.

- Independent variables – properties of the system over which the designer has no control, such as physical and mental characteristics of people, state of national economy, vagaries of climate and

- Dependant variables – all properties of the system that depend upon the other two categories, such as the number of inhabitants, population densities, journey times, capital and running costs and so on.

Determine the general design criteria, qualitative and quantitative, which can, or should, affect the design.

Set tests and sieves to be used when appraising the solution. Prepare performance specifications.

Identify the problems, challenges, opportunities and risks.

Factors may be analysed mathematically, graphically or by models. Create charts, graphs and diagrams to display the rationalised and organised data. Group together the elements with common characteristics.

Grouping and sub-grouping can be in many forms such as requirements, relationships, interactions or characteristics:

Functional.
Environmental - light, heat, orientation, ventilation, acoustics.
Flows and Circulation.
Daylight/Sunlight.
Servicing requirements.
Structural characteristics.

Identify design problems requiring the use of Repetition, Evolution or Innovation.

Repetition - the solution will be precisely the same as a previous solution.

Evolution - in which the solution will optimise on different factors from previous solutions, but may represent no overall improvement.

Innovation - in which the problem is solved in a new way, which may represent a significant all-round improvement.

A useful tool in the analysis of the data and the development is a 'purpose and user requirement study'. This can be started at the inception of the project and extended as the information is gathered and further extended during analysis by helping to determine relationships, organisations, groups and detail requirements.

If not started, begin a Design Statement. This is a useful tool for recording basic data and criteria to be applied and can describe development and how the criteria have been met. Regularly updated can be used at all the appropriate of presentation and approval.

Synthesis.

'Making the familiar strange.' 'Ideas generation and evaluation'.

Commence the ideas generation and partial solutions for functions/activities and relationships, and the site, leading to form and layout; evaluating results as you proceed.

Initially consider decisions that will have most impact on the solution. In some instances, this will require detailed consideration of small elements of the project; particularly when there are a large number of these or similar elements.

Move from logical analysis to creative thought. Analysis can be related to synthesis by the method used for generating solutions. Some methods range from algorithm to chance.

- Algorithm – a procedure by which the solution is generated automatically from given data.

- Ratio – in which the solution is generated by a quantitative relation with previous solutions (for example, a large Greek temple is similar to a small one, except that all dimensions have been scaled up in the same ratio).

- Deduction – in which a particular solution is generated with reference to a general rule (for example, a building system establishes a set of rules by which any given building may be generated).

- Induction – in which particular solutions are taken as evidence for a general rule (for example, the derivation of a system from one-of prototypes).

- Analogy – use of principle that when objects agree in some respects they probably agree in others (for example, Le Corbusier draws analogies between the shell of a crab and the roof of his chapel at Ronchamp).

- Metaphor – transfer of properties from one object to another which otherwise cannot be described, for example, the property of fundamental particles that their position and velocity can never be determined simultaneously has been transferred to architecture to account for buildings which will change in use; 'indeterminate architecture'.

- Chance – use of probability or accident.

In general terms, 'repetitive design' will be achieved largely by algorithm and ratio, 'evolutionary design' by deduction and induction, 'innovatory design' by analogy, metaphor and chance.

Innovation may be invoked by use of the following techniques:

- Check lists – in which carefully chosen stimulus words are used to trigger off responses which may lead to the progressive modification of an object in design. Typical question might be, 'What happens if we make it bigger, smaller, turn it round, or upside down'.

- Interaction charts – one way of using such check lists might be to list the elements of the design down the left-hand side of a chart, plotting questions across the top, and filling in the answers in the resulting cells. This would produce an interaction chart rather different from those used in analysis of brief but one on which many variations can be worked on simultaneously.
- Morphological charts – in which various design elements are listed with several solutions to each. Single variations are then chosen from each element to form a new solution.

- Psycho-analytical methods, including:

    - Brainstorming.
    - Synectics – a method of identifying and solving problems that depends on creative thinking with the use of analogy.

        - Personal analogy – If I were this beam how would I feel?
        - Direct analogy –
        - Symbolic analogy – e.g. a ratchet described as 'dependable intermittency'.
        - Fantastic analogy – blow your mind.

Divergence and Convergence.

A technique that could be used in parallel with other techniques is Divergence and Convergence (explorative – evaluative) to assist with creating an acceptable design, particularly an innovative solution. Divergence – exploring a wider range of search for interpretation of the problem and for solutions to it.
Convergence – evaluating rather than exploring, techniques which reject as quickly as possible divergent ideas which do not give evidence of leading eventually towards 'an optimal solution'.

Consider if form should follow function or even, particularly in extensions, if form should follow form or in some instances if function should follow form.

Development.

'Development of the complete design.'

The development, refinement and combination of solutions to create an overall form and layout that respond to its requirement and its context.
(For more on requirements of context see Appendix A)

Develop the proposals taking account of the purpose, the functional, environmental and activity requirements together with the form and aesthetics.

The nature of the design will vary according to the ranking of social, economic, technical, aesthetic, political and metaphysical factors. The organisation of the parts can be influenced by or occur in any of the following ways, individually, or in combination.

By Planning:
- Environmental zoning
- Functional zoning
- Symbolic sequence or route
- Functional sequence, flows or route

Understanding the relationship and impact on each other between form, organisation and order and to space, function and use will lead to a greater appreciation of the art of architecture and, will assist in creating harmonious, coherent, legible and/or consistent compositions.

Resolving access/egress and circulation, connectivity and permeability requirements are likely to be significant in creating and developing the design.

Take account of structural forms and enclosure requirements.

Take account of the contribution that adjoining buildings may have. How much this should influence the design is a much-argued topic but nevertheless the degree of influence should be considered. The adjacent buildings may affect the massing, form, articulation, colours, texture and materials. There are many ways of responding such as harmonious links or contrast.

There are few techniques that can assist in the design of a building; there are however certain recognised relationships and organisations of space and form that, if the implications and impact of the function and use on the expression and design are understood, will lead to a greater appreciation of the art of architecture and will assist in creating harmonious, coherent, legible and consistent compositions.

There are also a number of principles that can be utilised to create order in an architectural composition and also there are a number of proportioning systems and regulating lines that if applied to the dimensions and relationships of form, space and elements will help produce harmonised, consistent and expressive compositions.

Spatial relationships:

Interlocking spaces
Adjacent spaces.
Spaces linked by a common space.
Space within a space.

Spatial organisations:

Centralised	A central dominant space about which a number of secondary spaces are grouped.
Linear	A linear sequence of repetitive spaces.
Radial	A central space from which linear organisations of spaces extend in a radial manner.
Clustered	Spaces grouped by proximity or the sharing of a common visual trait or relationship.
Grid	Spaces organised within the field of a structural or other three-dimensional grid.

Forms

Regular
Irregular
Formal transformation
- Dimensional
- Subtractive
- Additive Forms - organised similar to spatial relationships:
  - Centralized
  - Linear
  - Radial
  - Clustered
  - Grid

Ordering principles - in many respects are similar to types of form and organisation of forms:

Axis	A line established by two points in space and about which forms a spaces can be arranged.
Symmetry	The balanced distribution of equivalent forms and spaces about a common line (axis) or point (centre).
Hierarchy	The articulation of the importance of a form or space by its size, shape or placement, relative to other forms and spaces of the organisation.
Rhythm/Repetition	The use of recurring patterns and their resultant rhythms, to organise a series of like forms or spaces.

Datum	A line, plane or volume that, by its continuity and regularity, serves to collect, gather, and organise a pattern of forms and spaces.
Transformation	The principle that an architectural concept or organisation can be retained, strengthened, and built upon through a series of discrete manipulations and transformations.

When resolving the technical details decide what influence the established design principles should have over the detail and visa versa.

Detail can be used to provide expression and articulation; it can also be used for decoration or relief.

Appraisal.

'Logical analysis of creative thought.'

Appraise both logically (rationally) and intuitively. Assess solution against the brief, the information gathered and results of analysis; and your own value judgements. Evaluate results. Appraisal is an important element in quality assurance control.

Take a quantitative and a qualitative view in relation to the brief requirements, analysis criteria and performance specifications

Check that all requirements have been included and that relationships are correct and that design requirements have been satisfied. Functional, statutory, environmental and economic requirements should be checked. The various solutions, partial solutions, components etc. should be systematically appraised at the relevant stages.

The appraisal should be relative to the stage reached thus reducing time recapping and time on decisions for the future.

Appraisal should not only consider the solution on its own but also its relationship with the site and in the relevant context. Consider the relationship between 'form' and 'context' as in building to surroundings (urban context), building to site, or extension to existing.

Intuitive appraisals can require rational explanations to support them, either because they are not understood or because they can be over simplistic. The fact that you like or dislike a solution is not a sufficient judgement.

Key features of an appraisal used by others when assessing proposals for a development and its context normally include the following and can range from the use required, to detailed appearance. Use. Amount. Layout. Scale. Landscaping. Appearance.

Aesthetics can often be appraised, not only by assessing against the brief and design criteria but also by describing the solution in terms of qualitative and, or, comparative analysis. Use of the following words may assist.

Articulation	Colour	Conflict	Contrast	Direction
Expression	Form	Grammar	Harmony	Hierarchy
Language	Legible	Line	Massing	Materials
Coherence	Pattern	Proportion	Relationship	Rhythm
Scale	Style	Texture	Vocabulary	Unity

Identify 'added value' – beneficial features, spaces or experiences that were not requested or expected. E.g. An open staircase landing overlooking a large entrance hall that can be used as a speaker's platform. An instance where *'Function follows form'.*

Highlight deficiencies for further action. Evaluate advantages and disadvantages, the positives and negatives, of solutions and partial solutions against priorities.

At the final appraisal the associated parts of the Design Statement can be completed providing details describing the proposals and as to how the design criteria have been dealt with.

Optimisation.

Optimise the design to ensure that all parts contribute to the fullest possible extent. Refine details and add finishing touches.

Communication.

The intercommunication methods between design members should be decided at the beginning of the process.

Consider how others will evaluate the design solution including those providing necessary approvals and present accordingly to explain the proposals. Presenting the proposals can happen at various stages normally with a minimum content requirement.

Take account of information for quantifying content, procuring contractors, ordering materials etc.

Production of reports along with scheme proposals will be a regular feature. The design process and its records, including the Design Statement, will be a valuable source of information and a useful method of presentation.

Consider the strategy of presentation – 'ease in gently' or 'in your face'. Logical approaches lead others towards the solution.

Using a design process will make communication easier. Having reasons for the design solution, presented in a logical way, will demonstrate a full understanding of the problem and provides an explanation for the proposals. This is more likely to lead to an acceptance of the proposals and remove or reduce opposition.

A very useful method of communicating the solution through the various stages is by a model or computer three dimensional views or at least three-dimensional sketches. Perhaps, initially, a simple block model, possibly showing no more than size and location on the site, then developing into a more detailed skeletal model showing form and spatial layout, with more detail as the stages progress.

Models, along with computer produced three dimensional flybys are perhaps the most easily understood presentation, especially for those who have difficulty appreciating drawings.

By presenting the scheme in ever increasing detail at each stage the client understands the proposals and builds up trust and hopefully an acceptance of the decisions made so far, especially when backed up with explanations and reasons. This assists the process because there is less likely hood of having to reconsider initial decisions and helps concentrate on the stage reached. It also helps to remain focussed on the stage reached without having to cover old ground as these will, hopefully, have been previously accepted or devoting too much effort on decisions for the future.

During the use of this approach the client or each member of the client organisation may, in their mind, be dressing up the model as he thinks it is going to look – some with stone and mouldings, others in steel and glass. Perhaps only you will know what it is going to look like. A benefit of this approach is that the final look is less of an issue because there should be an understanding and acceptance as to how it has been arrived at. Using progressive presentation is likely to mean that changes at any stage, particularly the last, are less disruptive as they should only relate to the stage reached.

Fully detailed sketch design drawings can create problems for the future. They often show detail that has not been fully considered and that is not liked, resulting in the whole scheme being rejected despite the fundamentals being sound. They can create inappropriate preconceptions and hinder proper development of the proposals.

Implementation.

Complete the proposals including any outstanding details and information for approval or to show compliance with appropriate regulations.

Provide information to enable the cost of the project to be finalised and the construction process to be programmed. Provide information to construct the project, including sourcing, procuring, assembling, delivering, erecting and finishing; all the activities necessary to produce the final product including checking, testing and inspecting. The results of the checks, tests and inspections may lead to reconsideration of earlier decisions and therefore may initiate an earlier part of the Design Process.

Feedback.

Provides valuable information not only for you but for all others.

Assess use, function, technical, performance, maintenance, economics and reasons for success and failure.

Feedback will be a continuous process after design has finished and can continue into many years of the building's life, with many instances that can lead to changes even before the building is finished.

Conclusion.

The design process described here is not one which inhibits or leads towards a particular forms or styles of architecture. On the contrary, if used properly the process enables and encourages all approaches to be explored.

To approach perfection the process needs to apply to building, site and context. Considering a building in isolation or a building and site without considering the wider context is likely to lead to an unsatisfactory solution, particularly in urban design, social and political terms.

At every stage in the process, record where you are at and how you have got there. This will be useful for historical purposes and will provide information for the client and others, and will provide information for the production of a Design & Access Statement. Production of records is an essential part of quality control and, regretfully, a useful safeguard against litigation.

A Design & Access Statement is now needed as part of many planning applications to explain to those having to make decisions on applications why the solution is the way it is proposed. In this context be careful of the statement *'There are lies, dammed lies and Design Statements'.*

Start the Design Statement at the Brief Stage and add to it as the process proceeds. Preparing the Design Statement later could become Post Rationalisation of the design and having to seek reasons as to why you have done what you have done, rather than referring to back to the process and the reasons arrived at, at the time. Identify the features and opportunities that can or should affect the solution and also cover how these features have been dealt with.

Design Process is part of an overall process of producing architecture. It is the main part and should dictate all other related activities, otherwise it becomes construction.

Design Process can be used as a design teaching aid to define the activities involved and to relate them in an appropriate sequence. Whilst the final product is often the only matter to be considered in a real situation, in an academic environment it is not only the final product that is considered but

also the process and presentation. A Design Process enables checks on what activities have been used, in what order they have been used.

Students should be aware that, even if a design process is not taught or expected, evidence of use of an acceptable process will support your work.

In an academic situation the use of a design process can act as a qualitative and quantitative judgement on a student's work. A design process can be used as a teaching aid to explain and regulate the activities involved in design and the normal sequence of activities.

Process

Was a process used? Was the application of process appropriate and suitable? Range of application. Depth of application

Research

Range of research. Depth of research. Quality of research

Techniques

Appropriate. Effective

Does solution follow from application of process?

Credits

Little in this paper come from my original thoughts neither is the approach suggested new. The bulk of the contents of this study come from papers and articles produced by:

Geoffrey H Broadbent.

L Bruce Archer

RIBA publications.

AJ articles.

Footnote

The process needs to take account of the advent of Building Information Modelling (BIM). In many ways the process as defined here is capable of taking on board BIM but it needs checking. The Programming stage perhaps should refer to it and it should be absorbed in other stages.

Appendix A

Response to context.

The response should be in relation to the influence the context may or could have. The extent and type of response to context can have a wide-ranging impact on the scheme and can affect the brief. The consideration of the extent an influence should have, could range from, no impact or to substantially controlling the design. Potential influence on the project can be detected as early as the brief e.g. a building may be a need to overcome the local weather conditions, but influence will mainly be established in the Information Gathering and Analysis stages.

In the Analysis stage the potential influence that each section of the gathered information may have should be identified and where appropriate included within the criteria or performance specifications. In addition to influence from the social, cultural, economic and policy context that may affect the use and size of a project, there are several physical parts of the context that can affect the appearance. This physical influence can be in varying forms and range, from the site, the adjoining properties, to the wider context. The wider context mainly influencing the building's form and the local and adjacent context potentially influencing most elements of the design.

The appearance of the building mainly comes from meeting the requirements of the project including its technical requirements but also the appearance may be affected by its context and the influence it may have.

If, and how, this influence is responded to is a regularly argued issue. Should a new building respect or ignore its surrounding? This should be determined in the Analysis stage and reviewed as the design develops. There are some clear instances where the influence will require a response, such as where the proposals contribute to:

- ‘Place making’, such as squares, where a building, or buildings, help define a space.
- In or near to a collection of similarly designed buildings.
- Conservation Areas.
- Street scenes.
- Next to Listed building
- Next to an important building.

The extent and the type of influence will depend upon the particular circumstances. The better the quality of the adjacent building design the greater the likely influence. The type of response to the influence can lead to acceptable solutions that range from harmonious to even contrasting relationships. Competing designs are unlikely to be successful.