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12 What to produce at the end of the conceptual design process

At the end of the conceptual design process, you will have produced a large number of sketches, calculations and had many conversations. Much of this information will have been formative in the development of the design, but won't be used in the final concept or going forward. So, at the end of the conceptual design process, it is useful to pull everything together. Reflect on the process and articulate not just the final outcome, but the reason that you have ended up there and the route you have taken. Each project is different, but most will require at the end of the process a report with some drawings appended. As the design solidifies, this may also be a good time to look forward and finalise fees, programme and any critical specification items. Of course, these may all change again at the next stage, especially as you go through the planning permission process, but it is important to start the conversations.

12.1 Stage 2 report — the only output our client looks at

In the design office you will have generated a large amount of information. But let's be honest, the client is never going to see that. They will, however, look at the Stage 2 report. From our perspective, the report is simply a summary of the work to date. From their perspective, they have paid thousands of pounds for you to carry out the concept design work — there is no hole in the ground, no structure to be seen, all that they get is the report. It is important to realise that while for you the report may not be of great significance, for the client it is the only tangible outcome at this stage of their financial investment. It is important that the report is tailored to them. It should contain all the information they need, in a way that is accessible for them. It should avoid being overly technical but at the same time, when key decisions are required, it should plainly spell them out. It is also worth noting that at this stage, many aspects may still be unresolved e.g. the quantity surveyor (QS) may be expecting two schemes, so that they can cost them both. This may be the first time the client has seen the loading requirements. Ideally, they should be given the right information to decide, and these decisions should then be adhered to throughout the rest of the design process.

12.1.1 The importance of communicating the design

Several parties have an interest in the Stage 2 report:

- The client will want to know what they are getting
- The architect will want to make sure the design is coordinated and considered
- The QS will want enough information to cost the project, and possibly a number of different options
- The building services engineer will want to ensure that adequate allowance has been made for plant rooms and loading, and that the design accounts for services penetrations. They may also want to ensure adequate thermal mass is available
- You will want to capture the design process, the reason for the decisions you have made e.g. why a movement joint was placed on the gridline that was chosen and not somewhere else, and the agreed way forward with the client

There are two options to this situation:

1. We write a single detailed report for everyone. For some client's this is not just a suitable approach, it is what they will be expecting. For other clients, the wealth of information may make it difficult to understand what the report is saying, and they may not understand the decisions they are being asked to make.
2. Produce a simple report. This still covers the major information, and outlines the decisions and choices the client needs to make, but does not contain all the technical information. We would still recommend you capture all this information, but it may well be in the form of a 'design philosophy', which can either be included as an appendix, or shared with key members of the design team, and not included in the official report.

Either way, following the completion of Stage 2, you will want to consider creating a design philosophy. This document will contain much of the same information as in your Stage 2 report in the first instance. However, its purpose is slightly different. The aim is to inform anyone picking up your calculations of the underlying approach, assumptions and information. It should be a live document, that is updated as and when new information comes to light, or when a change is made in the approach. Ultimately, it should be sent, along with your calculations, to Building Control (in the UK) for their review, and should provide them with a thorough overview of your approach to the design.

Alongside the design philosophy (which can be a rather weighty document), you may want to consider including a face sheet. This is a single page summary of the design approach, and outlines the key information e.g. structural form, ground type, foundations and method of stability. This may be particularly helpful for quality assurance reviews where, in a single page, the reviewer can see what you are doing and where the design challenges lie.

12.1.2 How to make reports accessible and professional — a 'style guide'

Before considering anything else you will need to know whether:

- you are working to a set format for the project (often dictated by the architect)
- you are working to a set format dictated by your own firm who may have a series of agreed work templates
- you can create your own template

If you can create your own template, you have a number of simple decisions to make:

Portrait or landscape?

This one is simple. Design reports look and read better in landscape. I don't know why, almost everything else in life works better in portrait (books, magazines, manuals — although Lego instructions work better in landscape). It will also enable easier integration with the drawings in the appendix. Frustratingly, a design philosophy will work better in portrait, as it will later sit at the front of the pages of calculation. So, if you include a design philosophy, you will need to consider whether to create it now in landscape, and later convert to portrait, or whether to print it two pages to a page so it still fits the report format.

A3 or A4?

A Stage 2 report should be A3 so that the drawings can be appended while still at a sensible scale (A1 drawings scale to A3). However, the report will often be printed at A4 so it needs to be readable at this smaller scale.

Of course, on very large projects where A0 drawings are required, the drawings don't naturally scale to A3. However, A2 is an impractical size for a report and at A4 the drawings will be so small (four times smaller than the original scale), that it is hard to imagine anyone will be able to read them. We would therefore suggest that, while it may feel clumsy, A3 should be used in this situation as well.

One, two, three or four columns of text?

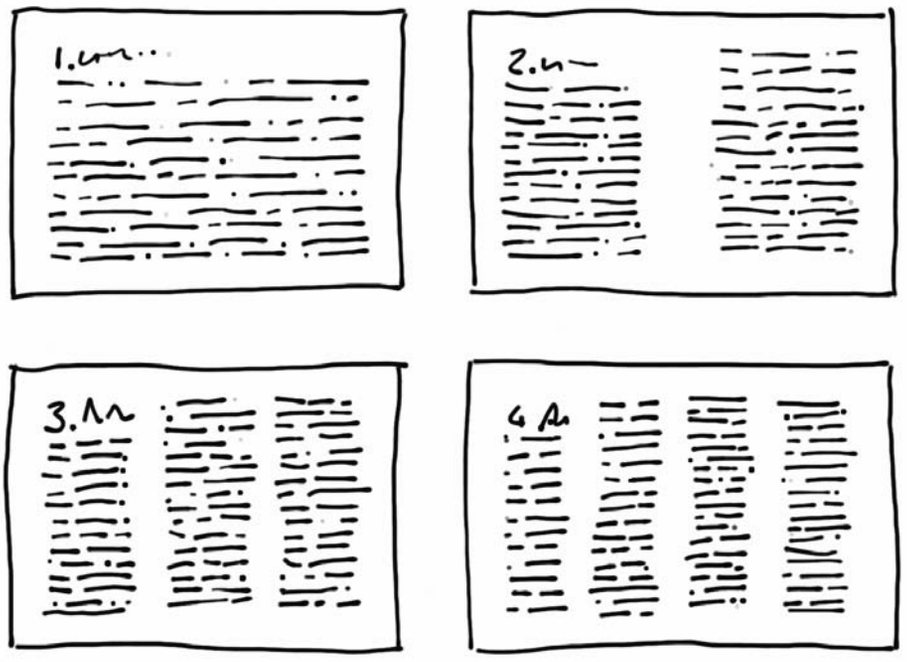
This is a matter of opinion. These are my views but you are welcome to disagree.

- Assuming you are working in landscape, there is no situation where you should use one column of text. If you have a table which takes up almost the whole page and need a couple of sentences above/below it, they should still be in multiple columns or on a separate page. A single column of text looks unprofessional and is exhausting to read

- For most of my professional career, I produced reports with two columns of text. Looking back at them now, I think they look a little lazy. Two columns of text look a lot like two pages printed side by side. While it is better than one column, it is still not the preferred approach
- Three columns of text works. It looks good, feels professional and provides flexibility for formatting. I would, given the choice, always use three columns of text
- Four columns of text are too busy. It looks cramped and a little messy. Lines of text become short, which leads to either messy paragraphs or strange gaps in the text if you justify it

In order of preference I would say three, two, four, one but, in reality, I don't see a situation when either four or one would be required (Figure 12.1).

Figure 12.1: Columns of text

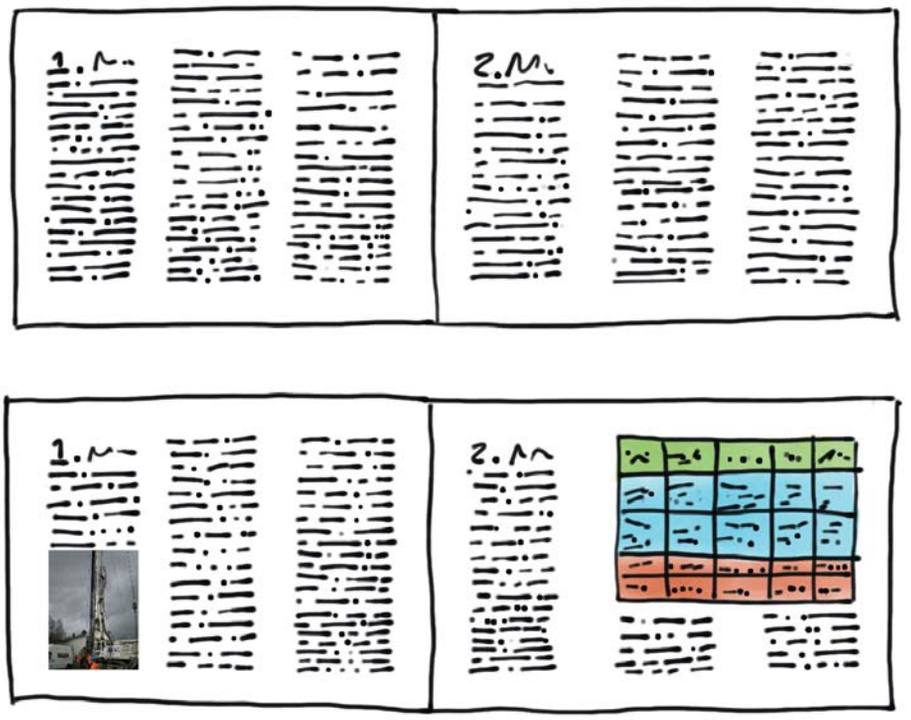


The use of imagery

A report absolutely must contain images. In fact, I would be so bold to say that every page must have an image of some sort. For many clients, the first thing they will do when they pick up a report is flick through it and look at the images. Occasionally (and frustratingly), they may only look at the images. The images need to tell the story of the design. They don't all have to be professional renders, and they don't all have to show the final design. Particularly difficult is finding good images of foundations or drainage. But, even here, we can draw the client in. We can either use photos from other projects e.g. highlighting the use of piles versus strip footings, or include hand-drawn and annotated sketches that reinforce the design. Likewise, for health and safety, an image may seem hard to come by, but a process diagram showing how the risks were reviewed or even images of your ISO 9001 and 14001 certificates will help break up the text, and make the report seem more inviting. When planning the report, plan what images will go where. Have some sketches of the building from different vantage points that you can add on pages where there really isn't a great image otherwise.

Tables can also be used — they may not feel like images but the careful use of colour in a table can have a similar effect on the reader (Figure 12.2).

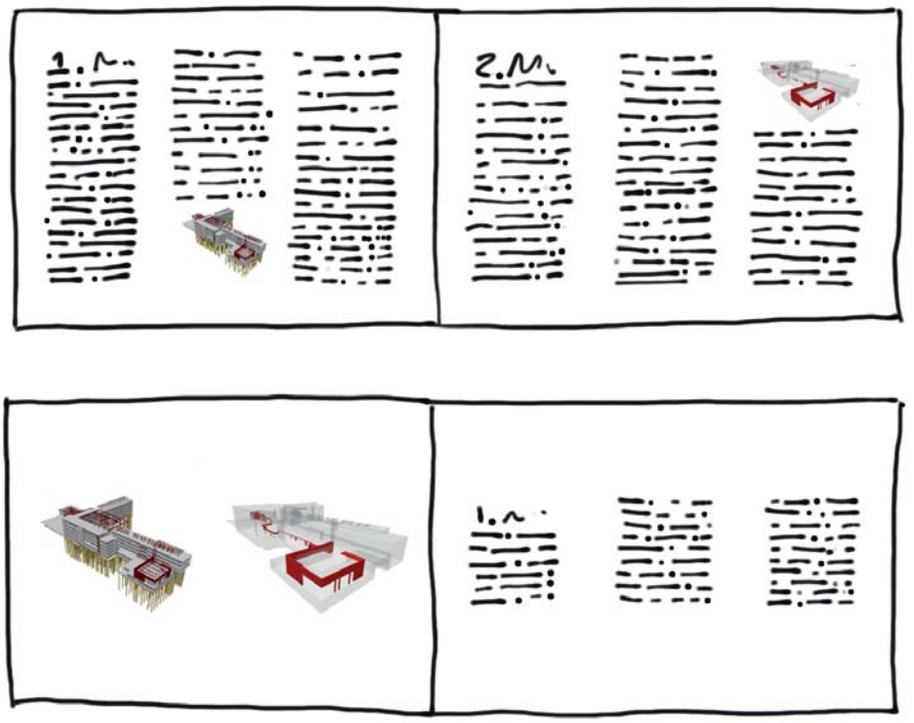
Figure 12.2: Use of imagery



The position of an image

Images can either be interspersed through the text, or have their own page — or you can do a bit of both. My personal preference is to always have images on the left and text on the right, with additional images within the text when necessary (Figure 12.3).

Figure 12.3: Position of images



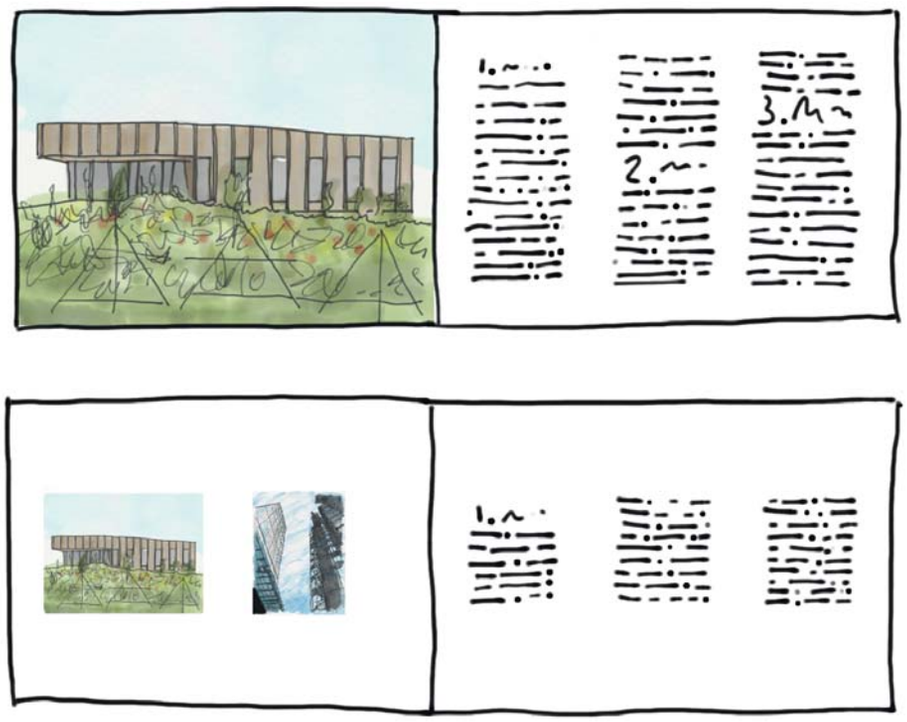
Formatting

When it comes to formatting, less is definitely more. Avoid congested headers and footers. A page number is useful. I am not convinced any other information is — the client already knows it's a Stage 2 report, that you are the engineer, the project name and are probably not too concerned about what your internal admin project number is. Avoid too many font types and sizes, and having too many heading levels — this book uses four (1, 1.1, 1.1.1 and level four has no number, and generally that should be adequate. Above all else, avoid using text boxes and other fussy devices, especially the automatic shadow feature. It may be useful once or twice to highlight something really important e.g. a key decision the client needs to make, but overuse makes the report look less professional.

White space

Don't be afraid of white space. White space used well will enhance the report, not make it seem lightweight (Figure 12.4). Have a look in a few modern photography books to see how they use white space to increase impact. This is important for both text and imagery. For images, think about the size it needs to be, and don't be afraid to make it that size and have white space around it. An A3 image will need to be of very high quality and resolution to work at that size. You may have a nice render of the project that you want to use that works, but you may have a couple of hand-drawn sketches, which when blown up lose much of their aesthetic charm. Generally, hand-drawn images look better shrunk down or at the same size rather than blown up. With text, allow each page to hold a few ideas rather than ram it full of information. If the section on foundations only requires half a page, space it out so that it is in three approximately equal columns with white space around it. Don't try and cram in half the next section as well.

Figure 12.4: White space



At university, you are often required to produce work to a set page length, encouraging you to fit as much information as you can on each page. Now you are producing professional reports, there is no page limit. A 40-page report, which is 50% white space, will read much better than a 20-page report with 0% white space.

12.1.3 Content — what's in and what's out?

In simple terms, the report should cover three things:

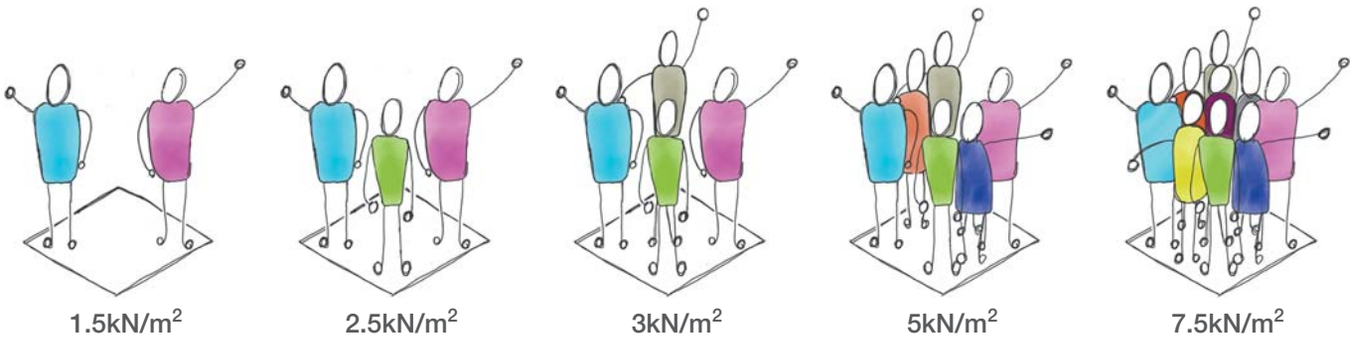
- The brief
- The design process
- The proposed solution/s

The brief — what the client asked for, what they are getting and why they differ

As outlined in Chapter 5, there are occasions when the engineer is required to produce or co-create the brief. If you have produced the brief, it is essential that it is articulated at the start of the Stage 2 report, as this will act both as a measure of the success of the proposed design (remembering that the brief and the design have developed in tandem), and act as a benchmark for the design going forward, which can be especially useful when faced with cost escalation. It may be that the brief is deterministic, or that it has some softer requirements which cannot be summarised in numbers. In this situation, don't be afraid to use exemplars to try and capture the ethereal nature of what the client is after.

If you have co-created the brief, it is likely that the architect will outline it in their Stage 2 report. It may then be useful to either input into their report or, where technical decisions have been made or need to be made, make it clear to the client that this is the case, and that they are effectively signing up to a brief by agreeing these elements. Examples include loading, design life and limits of deflection and vibration. Often, the client will look to our technical judgement on these issues, so helping them make sense of the information can be useful e.g. showing how the number of people in a m^2 equates to different variable actions (Figure 12.5), or suggesting they visit some offices to experience the bounciness of a CLT timber and precast concrete floor.

Figure 12.5: Differing numbers of people in $1m^2$

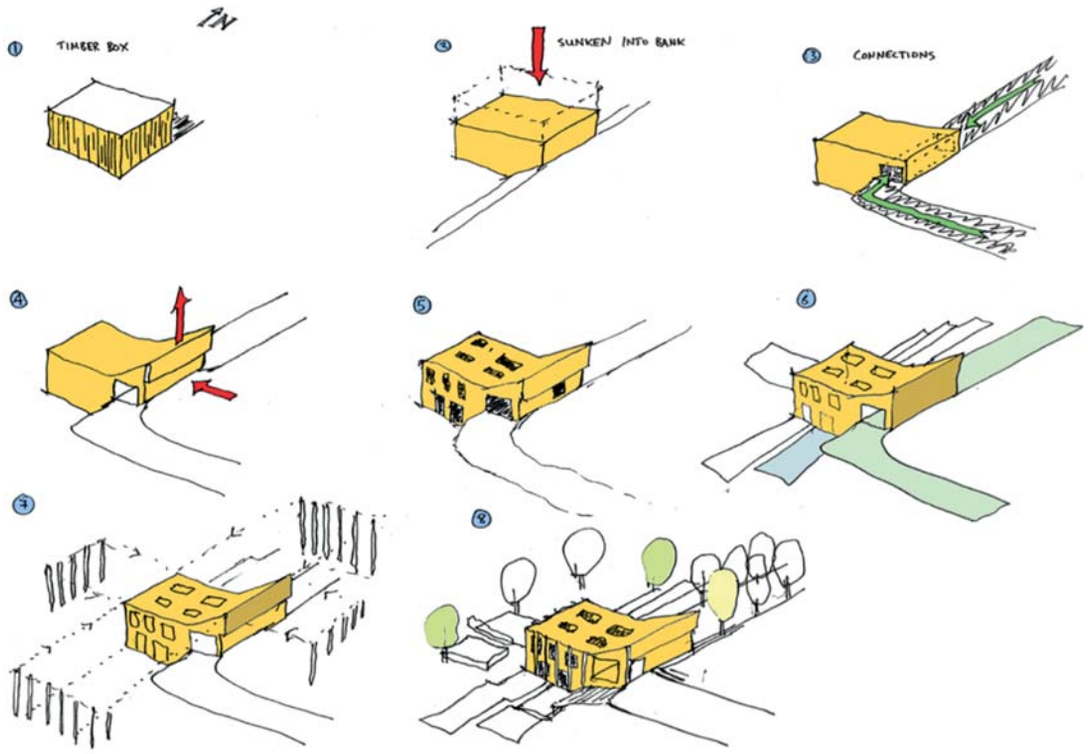


Documenting the design process to provide a rational response to the brief

Whether you have created the brief, co-created it or are simply working to a pre-defined brief, it is important to try and capture the design development. This may be done in isolation, as an engineer, but it is most powerful when the whole design team works together to document the process. This acts in two ways:

1. It helps establish the reason for the design and avoids reviewing and going over the same processes later in the project, bearing in mind that on most projects, multiple people will work on them, and that while ideally a single person will see a project through from beginning to end, in reality it is likely, especially on large projects that take years, that no one person will be involved from start to finish.
2. It is a way of demonstrating to the client the effort that has been put into producing the elegant design they now see. In my experience, architects are much better versed at going through this process, but that does not mean that we shouldn't also do it and, with practise, we will also be able to articulate the design process. This can often be achieved through a series of simple schematic drawings with supporting text (Figure 12.6).

Figure 12.6: Design development produced for a Stage 2 report



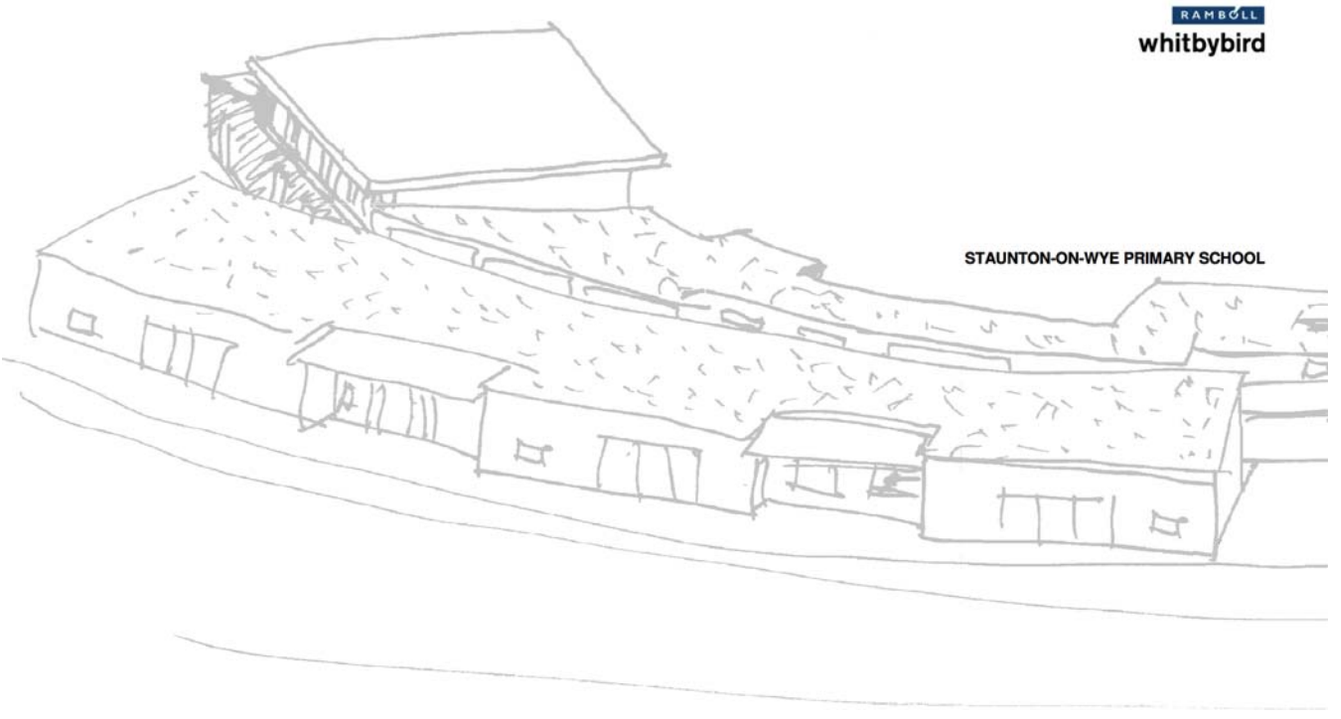
Stage 2 report checklist

Below is a list of Stage 2 content which we would use when writing reports and design philosophies. The list is intentionally quite extensive and we would not cover everything, only what we consider important at each stage. These are typical issues to consider, and are provided not as an exhaustive list but rather to aid you in structuring and considering the content of your report. Each design will be different and will therefore include different elements of this list.

Preliminaries

1. Front cover.
   This is a chance to show off the design. Consider carefully the image you want to place on the cover. It should work with the architects and enhance what they do. It should also be suitable for the client. Figure 12.7 shows two examples — a large university project where a 3D CAD line drawing was produced, and a primary school, where a simple quick hand-drawing was used. Both are intended to engage with the client, but consider the client's background and expectations.
2. Table of contents.
3. Introduction/description of project.
4. Key project contacts (this is useful information to provide upfront, but could also be placed in an appendix).
5. Responsibility for overall design.
   It is good to make sure everyone is clear on the design responsibility. Depending on the client, it may be good to include early, so that they are clear what is included in the report and, more importantly, what is not. For some clients, this may feel very contractual, and may be in the appendix, or even issued as a separate document.
6. Health and safety, including any site risks e.g. asbestos.
   Health and safety is a key concern and therefore should be at the front of the report. However, the information should justify this prime position. If the project and therefore the health and safety are generic, it may be more useful to cover this later. This section should also include reference to the risk register. The risk register is a live document and should be continuously updated. It should be included as an appendix in its latest form with the Stage 2 report, to ensure the rest of the design team, the client, and anyone else involved in the project are aware of the risks.

Figure 12.7: Front cover designs



Design development

7. Brief development.
   This section should capture the development of the brief. It may be necessary to write it with the design development, depending on how much interaction there was, and how much this can be rationalised into two separate components.
8. Design development.
   Articulating the design development is helpful both practically and to demonstrate the thought process to the client.
9. Finalised brief.
   If you are producing the brief, this should be captured here.

Final design

The final design should be clearly articulated and rational. While the process of arriving at the design is often anything but linear, a logical framework to show the final design is important. This should start with existing information, then go through the structure, starting at the ground and working up. There are a large number of sections listed here — not all are relevant for every project and caution should be taken not to say too much and lose the client in the detail. If there is a danger of doing this, one approach is to create a design philosophy in tandem, which captures the information that you don't want to include in the report, but is still important to articulate. The list is not exhaustive, but is hopefully a useful starting point:

10. Site information.
    - Location
    - History
    - Description— to include access considerations
    - Geology and hydrogeology
    - Summary of site investigations (including previous, if any)
    - Soil and groundwater profile
    - Sulphates and chlorides
    - Trees
    - Radon
    - Contamination
    - Environmental assessment summary
    - Requirements for further investigation

11. Existing buildings/structures.
    - Condition
    - Age
    - Structural design
    - Key concerns
    - Opening-up works required to resolve concerns
    - Plan for re-use
    - Demolition

12. Substructure design.
    - Foundations
    - Ground floor construction
    - Basement
    - Waterproofing
    - Retaining structures

13. Superstructure design.
    - Movement strategy and movement joints
    - Lateral stability
    - Materials
    - Perimeter wall construction
    - Internal walls

- Upper floor construction
- Stairs
- Roof construction
- Disproportionate collapse/robustness/tying loads
- Construction/demolition considerations — special considerations only
  For complex structures, it is important to demonstrate at least one viable form of construction. This is not to say that this is the way it must be built, but by showing one viable method of construction, we are showing it can be built. If we are unable to show a single way it can be built, it is likely that it cannot be built, and we need to reconsider the design
- Phasing — if affecting design/construction e.g. temporary stability

14. Underground drainage.
    - Existing surface water drainage
    - Existing foul water drainage
    - Proposed surface water drainage (including drainage strategy for planning)
    - Proposed foul water drainage

15. Design criteria.
    - Design life.
      For buildings, this is typically 50 years. It is useful to explain to the client that this does not mean that the building will fall down after 50 years, rather at the end of 50 years, it is important to reassess the loading for the next 50 years, and to carry out a condition survey and that significant maintenance may be required. It is important to make this clear, as there is much misinformation about the design life of buildings. I have heard prominent architects say that the design life is how long a building will stand up. This is much like saying you will need to scrap your car when it has its first MOT after 3 years.
    - Deflection limits and vibration
    - Design loading
    - Fire protection
    - Corrosion protection, material grades
    - Temperature range for external structure or structure exposed to large variations in temperature
    - Design codes and standards and other references

16. Sustainability.
    As noted in Section 5.1.2 the sustainability aspirations of the client can be difficult to articulate. It is therefore important to do so in a way they can understand and that they can dispute if necessary. Remember that the Stage 2 report is not the end of the process, but a marker as we move into the next stage.

    The consideration of sustainability (and health and safety, for that matter) should not be limited to a single section, but should be embedded across the report. This section is a space to summarise the sustainability, cross-referencing the sections where it is mentioned, and also provides a space to cover approaches going forward e.g. the use of BREEAM with input onto suitable credits.

17. Summary and next steps.
    It is important to articulate what you require the client's input on. If further investigation is required, this should be reiterated here so that the client can assess the cost. If decisions are required, these should be articulated here. Often a report is issued and the lack of response from the client is taken as passive agreement of its contents. However, it is much better to ask questions, and these should ideally be closed and in one of two forms e.g.:
    - Option A or option B — would the client like a steel or timber frame?
    - Yes or no, we have suggested that the building is designed for an office loading of 2.5kN/m^2 which will limit future usage to offices and residential — is the client happy with this limitation?

By asking explicit questions, it is quite possible that a larger conversation will follow, but it is useful to be specific, rather than ask vague questions, such as: Is there anything in the report you would like to change? These conversations should then help you to finalise the conceptual design, choose a single solution and progress onto the detailed design.

12.2 Drawings

Alongside the report, a series of drawings should also be produced. At this stage, they can be hand-drawn or CAD. This decision will depend on the type of project, the expectation of the client, and the approach taken by other members of the design team. It is difficult to produce a well-considered set of CAD drawings when the architect is still producing felt tip pen sketches, especially if these are vague.

It is also worth considering mixing-up CAD drawings and hand-drawn sketches. This provides the advantage of the drafts person doing the 'general arrangements' (GAs), while the engineer produces sections and details. This can be advantageous, as the conceptual design process is fast-paced, with changes occurring right up to the moment of issue.

12.2.1 BIM

BIM is discussed extensively in engineering, and there are some advantages, even at the concept design stage. At this early stage, the focus is on information-sharing and the use of the architect's 3D spatial models, to enable quick setting-out of the structure. While this is one facet of BIM, it is unlikely that BIM in its fullest sense will be used with full collaborative working across all the members of the design team. However, the use of 3D models does offer obvious advantages. The risk is that in the perceived precision of this method, due consideration is not given to items such as tolerance, connection sizing and long- and short-term deflection. It is therefore important that these criteria are conveyed alongside the 3D model.

Every practice will have a different view of whether it is too early to use a BIM methodology, and the decision to do so will be a function of the project size, complexity, and whether other members of the design team are also prepared to start the process at this early stage.

One obvious advantage is the use of immersive technology and/or animations. While drawings are adequate for professionals to visualise the proposed buildings to many non-technical clients, a series of lines on a page are difficult for them to conceptualise as their building. Simple 3D models, that they can explore, will help the client better understand what they are getting. However, there is an obvious increase in work to produce this, which should also be considered.

Another advantage of creating 3D models is that we can quite quickly extract material quanitites that can be used to calculate approximate values for the embodied carbon and energy for different options, which can then be reported to the client.

12.2.2 What to include

When pulling together your Stage 2 report, you will want to think carefully about the drawings you create. At this early stage, there will be a number of unknowns, so you don't want to provide a complete set of CAD drawings that look ready for construction. At the same time, you want to include enough information that the scheme can be costed — especially if you have two or more solutions on the table and want to cost them both. It is important to walk the line between being too conservative and ruling an option out based on cost, and being too optimistic and making an unviable option appear viable. At this stage information is key. Both in terms of what we do know, but also what we don't know and any suitable allowance that could be made. The following is a brief list of the types of drawings you might want to include, and what information you may want to present. However, every project is unique and you will want to work out exactly what information you want to include.

Notes drawing

Many companies have a standard notes drawing. It can be tempting to include one at the front of our drawings, but we need to ask what information is really needed. The danger of providing an A1 sheet covered in small text is that no one will read it. If there are a few key messages that don't obviously fit on any other drawings, a notes drawing can be useful, but avoid losing the key messages in all the other text. Generally, I would try not to include a notes drawing at this stage.

GAs (Plans)

GAs are essential — they set out the building design. Every page should include grids and a scale, which despite the note that we should not scale off the drawings, will enable approximate costing to take place. We then need to

convey both the substructure and superstructure design. It is worth creating more drawings with less information on, than trying to pack lots of levels of information on one drawing, especially if you are drawing by hand e.g. for the substructure, rather than put everything on one drawing, consider splitting into piles, foundations and ground floor slab. This will ensure everything is clearly visible.

For foundations, provide approximate pile sizes, bearing in mind you probably haven't carried out a site investigation yet. Similarly, we need foundation sizes, ground beams and a ground floor slab, with edge thickening around the perimeter where necessary and possibly an upstand.

For the superstructure, include a limited number of beams and columns to give an approx. volume/weight of structural material. At this stage, the piece count will be more important than the exact specification. Try and show trimmers, cladding support and other steels, not just primary beams — this is particularly relevant at roof level, where you will almost certainly have a parapet and may need a beam at roof level and another beam at the top of the parapet. Mark the slab thickness (whether *in situ*, precast, timber etc.), and clearly label the stability system. Where there is complexity e.g. a mezzanine or half-landing, you may want to do a small GA of this area beside the main GA, or you may just want to note that in this location there will be beams at half-landing level, as well as at floor level. It can also be useful to have a TOS (top of steel) or TOC (top of concrete) on the drawings. Typically, we can provide one value with any variation noted by the beam. We may not have the level relative to the OS datum at this point, so we can measure it from our own datum, possibly the ground floor level, at this stage.

It is also essential that the stability system is marked onto the GA. This has hopefully been agreed across the design team, but may raise some coordination issues. It should be clear what the system is, any design considerations, and any areas where floor penetrations may be impractical, as they prevent transfer of load from the slabs to the stability system. This can be particularly important if you are using walls or bracing around risers to provide the stability.

Any risks that have been highlighted during your risk assessment should ideally also be marked on the GAs and clearly labelled to ensure everyone is aware of them. This doesn't replace the risk assessment (some risks won't be relevant to the GAs), but increases the chances of everyone seeing them. Ensure you mark on the location of any relevant sections and elevations so that they can be easily referenced from one drawing to the next.

Sections

You don't need to draw every section, but a few key details will be useful, especially if they are unusual e.g. exposed connections, moment connections, complex arrangements, steps in level and movement joints. It may also be worth choosing one or two beams and drawing sections through them, showing how the slab connects, and what the tolerance and deflection will be. Providing this information early on will prevent difficult discussions later. A few typical ground sections showing upstands, edge thickenings and wall/column connection details will be helpful. This is also a good place to show what goes on below the slab, especially if you need insulation, or some form or void-former. We would suggest that every project has a minimum of two section drawings — one for substructure and one for superstructure. Depending on the scale of the project, you may want a section drawing for each level, but often at this stage you will be simply duplicating information.

Elevations

Elevations can be very helpful, but I would suggest are a 'nice to have', rather than a necessity at this stage. Most GAs with levels (at this stage measured from the ground floor slab rather than OS datum) will be adequate in confirming the elevations. However, where there is a high level of complexity e.g. a split level or a complex folding roof, elevations can be very useful. We may also find a 3D sketch helpful to articulate highly complex geometry.

Drainage

At this stage, it is useful to provide a drainage drawing (or two). This should summarise what we know about the belowground information e.g. existing manhole locations, buried services etc. We can also highlight areas of uncertainty and how we propose to resolve them, where we want CAT scans and where we want CCTV surveys of drains. We can also start to show how we plan to link our new building into the existing drainage, what strategies are available for SUDS, where we may be able to use permeable paving, where we can add belowground water storage etc. It is particularly helpful if we can then draw foundations, and especially pile layouts, over the top of this information to avoid potential clashes at this early stage.

Geotechnical information

It is unlikely at this stage that you will have carried out a site investigation, but hopefully as part of this report you have started to think about what information you need, and where best to place trial pits, boreholes and soakaways. You may want to include a drawing to show the client the proposed locations for these works, so you can discuss the implications on their site.

In addition, it may be useful, as a record, to include a drawing showing the ground model as you currently understand it, based on the desktop study. It is important to state that this information is preliminary, but it will act as a good record as you progress the design.

Constraints diagram

A constraints diagram can be a very helpful and powerful source of information. This should collect all the different constraints information into one place. This may include, but is not limited to:

- Site boundaries
- Site access
- Any limitations on access, either during construction or in use. This could include neighbouring land that cannot be over-sailed by cranes
- Any in-the-ground information — including all belowground services, known obstructions, other major belowground infrastructure e.g. tunnels and other environmental belowground constraints e.g. in Bath, where there is a natural aquifer, there are limits on belowground works
- All trees with protection orders and any root protection zones
- All existing buildings – including zones where foundations cannot go, or need to be very carefully designed to avoid altering existing load paths
- All existing buildings that are being demolished and the phasing of this works — often demolition requires other sections of a job to be complete and, until this is the case, the buildings need to remain operational
- Any construction operational constraints e.g. noise, traffic movements, vibration (air-borne or ground-borne), or general limitation on site work hours
- Any other constraints you may be aware of

Construction sequencing

On some projects, the construction sequencing is critical to the success of the project. Whether phasing of the construction and demolition works, or for the construction of an element of the building which requires works to be carried out in a particular order, in order for the design to work. This may be covered by your report, or may not be required, but where this information is critical, it is worth including a drawing to outline the proposed sequencing, and any implications it will have on cost, especially in the form of delays on site and temporary works.

12.3 Cost proposal

While a fee was hopefully agreed at the start of a project, the project is often so ill-defined at the conceptual stage that the fee is, at best, provisional going forward, and is often not agreed beyond the end of Stage 2. It is therefore important to agree a fee with the client for the future stages of the project. A fee can take on one of three forms:

- **Hourly rate** — the client pays for every hour the engineer and other staff works on the project. While at first glance this appears fair, clients are often reluctant to accept this approach except on very small projects, as they have little control over the fee and are unable to budget for it
- **Lump-sum** — the client agrees a fee in advanced for the project. While, in theory, this approach is fair, if the project cost rises (and therefore the amount of work increases), the consultant loses out. Clients are often keen to agree a lump sum, but consultants tend to avoid it. In theory, if the project cost goes down, the consultant benefits but this is much less often the case
- **% cost** — this is similar to a lump-sum, except that if the project costs rise/fall, so does the fee. Most UK projects are carried out on this basis. There are still issues, especially around the final costing of projects and the associated fee, but generally both the client and consultant are happy to work on this basis. As a percentage of construction costs, the civil and structural design fee will typically vary between 0.8–2%

The calculation of fees should be carried out by a director, considering the breadth of issues raised through the conceptual design. A crude percentage table is provided in Section 5.2.1. These fees should not be part of the Stage 2 report, but should be discussed in parallel with the submission.

The breakdown of work and how much we would like to be paid at each stage is also important to agree. Ideally, as consultants, we would like to be paid before we do the work (or at least invoice before, bearing in mind quick payers will pay within 30 days, with many large clients stipulating payment terms of up to three months). The client, however, would much rather pay the full fee at the end of the project. In reality, the RIBA provides guidance on fee levels which are summarised in Table 12.1. Along with the fee, this schedule should also be included with a breakdown of fees on a monthly basis. Some clients will ask for a small retainer (3–10%), which they will only pay after a set period after the completion of the project. This is to ensure that any problems that arise following practical completion are taken seriously, and fixed quickly by the consultant.

Table 12.1: Typical breakdown of fees across the duration of a project

RIBA stage		Typical fee	Typical work/tasks
1	Preparation and briefing	5%	Civil and structural input will be fairly limited at this stage. Typical input would be to identify and confirm the client's requirements, and possible constraints on the development. Prepare studies to help inform the client and support decision to proceed and possible procurement routes. Identify others to be engaged in the project
2	Concept design (this is complete at the end of Stage 2)	15%	Working alongside the architect to develop and prepare outline proposals. These might include preliminary materials selection, initial grids and locations of vertical structure
3	Spatial coordination	20–30%	Prepare detailed proposals including grids, detailed material selection, element sizes. Information to inform the cost plan, including identifying key aspects which the design has not yet considered in any detail
4	Technical design	25–30%	Complete detailed design, including all final element sizes, details sufficient for coordination of all components of the project
5	Manufacturing and construction	15%	Produce all detailed design drawings and specifications. Coordination with specialists, submit calculations and drawings to Building Control (in the UK). Review shop drawings and submittals
6	Handover	10%	Site visits and progress reports. Responding to requests for information (RFIs). Updating drawings to 'as-built' (if applicable). Review shop drawings and submittals. Issue sketches where needed to clarify design
7	Use	3–10%	Issue of 'as-built' information for health and safety folder

The final fee should, of course, add up to 100%. Ideally you want to try and make the fee greater at the start of the project and less later, although this will be subject to negotiation.

As with the percentage fee, we would not recommend you create a fee schedule on your own, but that you do it with your director. However, producing a starting template is helpful, as they can advise on where the percentages should be increased and decreased.

12.4 Programme and 'information required schedule'

Some projects will have a clear programme, even at the very earliest stages of a project e.g. a school which needs to build four new classrooms before the start of the next academic year. Most won't have a clear end date at this stage, and will expect to pause the project at different points e.g. while planning permission is granted and finances confirmed. It is unlikely that you will need to produce a full programme at this early stage. That doesn't, however, preclude you from both considering the programme and discussing it with clients. Projects with long drawn-out programmes often cost more to design than those which happen quickly, and this should be considered in the fee proposal.

Along with a programme, an 'information required schedule' (IRS) is a very helpful document. At their worst, they can be seen as a highly contractual document but, at their best, they can generate an honest conversation about delivery dates and what is needed when. This is particularly important when prefabricating structure, as the long lead-ins may require information on the aboveground structure to be produced by the full design team, long before substructure details are required. When used well, an IRS generates conversations about both 'what is needed when' but also the level of detail required. While it is early to produce a full-blown IRS with every package of work listed, a simple IRS that outlines the lead-in for the substructure, superstructure and external works can be very helpful. The IRS can be non-date specific, instead providing the information in terms of weeks prior to construction. This will still help flag up potential information problems, and will highlight to the client when they need to make final decisions.

12.5 Specification

At the end of Stage 2, it is far too early to consider creating a specification for each material used on the project. However, it may be useful to create a single-page outline specification. The main focus of these documents is to capture anything unusual which will have a major impact on program or cost. A simple example is the use of ground granulated blast-furnace slag (GGBS) in concrete, which slows down the rate that concrete sets, so inclusion, especially of high percentages for aesthetic/environmental reasons may extend the strike time of your concrete. You do not need to provide a full concrete specification outlining all tolerances etc. at this stage, but highlighting the intention to use this material, especially to the QS, who will be costing the project, and therefore accounting for site costs due to programme, is helpful. At this stage, I would suggest either creating an outline specification which captures this, or highlighting this information on the drawings. The second option is preferable, as it is more likely to be considered as you enter the next phase of the project.

12.6 Scope of works

As you start to think about the more detailed stages of the project, it is important to check your scope of work. You need to think about two things:

1. Does the scope match what you believe you are doing? Are you being asked to carry out design beyond your area of expertise? Do you have the resource and ability to deliver the work, or do you need to consider employing subcontractors to deliver specialist portions?
2. Are there any gaps in the scope across the project? This can be particularly important on smaller jobs, where the design team is much smaller and maybe doesn't include all areas of expertise. While conversations at this stage can be tricky around scope gaps, especially if you are not offering to fill them or want to be paid more for the work, they are much trickier when you have an irate contractor and client standing in a field, trying to understand why no one designed the drainage under the foundations (which are now cast). It is therefore important to ensure this has been considered. If you are not sure, you should seek advice from your directors who should be able to provide the information required. Most large consultancies have scope of work documents which detail what they will always do, what they can do (for a fee) and what they categorically cannot do. These are a useful starting point.