Get It Right Initiative

A Guide to Improving Value by Reducing Design Error

Getting the Design Right

Improving Value by Reducing Design Error

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Every project needs a clearly defined intent, a consistent focus on outcomes and the project team to work seamlessly together and adopt the process of back-briefing.

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Increased investment in design reduces project error.

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A clearly defined and well managed design process should be established at the start of a project, and involve all key members of the project team.

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Foreword

The Get it Right Initiative is an organisation with a mission to tackle avoidable error in the construction industry. The initiative's single aim is to significantly reduce error and its associated consequences, and its members are united to build a better UK Construction Industry.

Early work focused on research into identifying the types of errors, their causes, and their costs, so that effective methods could be developed to avoid errors and minimise their consequences. The research included workshops, structured interviews and collection of quantitative data. The research summary and reports can be found at https://getitright.uk.com/research/.

A key outcome of this research was that a large proportion of errors in construction, costing the UK Industry billions of pounds a year, are rooted in deficiencies in design: designs that are uncoordinated, incomplete, miscommunicated, unintelligible, late, or just plain wrong. It was clear that a key priority was to address the causes of these deficiencies.

So it was with this in mind that members of the Get It Right Initiative, from across all disciplines, have collaborated to create this Design Guide: a set of twelve principal recommendations to improve value by reducing error, that can be applied to any project, particularly at its commencement and during early design stages. This is the product of their work, and a development of the brief synopsis which was published in July 2018.

The purpose of this guide is to share knowledge across the Industry as to best practice when approaching projects, with an aim to reduce error and increase productivity. It does not purport to be a ground-breaking report. It is a useful review and reminder of the key techniques that can be applied. The challenge is to apply these techniques in a consistent manner and to ensure that every project seeks to carry out these recommendations as a matter of routine. It will take determination and leadership to address them all.

The guide does not suggest preferred forms of procurement or contract to implement the recommendations, as experience has shown that with the right leadership, best practice can be delivered regardless of contract.

A theme that features throughout these recommendations is to stand back, analyse the situation and develop a consistent plan, and once that plan is in place make sure it is adhered to, or allowed to flex as situations change.

The themes highlighted in this guide apply to Clients, Designers, Contractors and Sub-contractors at all stages of the design process from conception to specialist detailed designs. We hope that you will find the approaches that we suggest to be useful tools in reducing error in the design process.

We would like to thank the dedicated organisations who participated in this work.

On behalf of the Get It Right Initiative

Tom Barton
Executive Director

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It is recognised that the delivery of projects is enhanced, and the number of errors reduced, when there is the right 'culture'. So, what is the right culture and how is it to be achieved? Contracts determine the nature of projects and certain forms of contract are designed to "enhance" the right culture but in the majority of cases projects are procured using "non-collaborative" forms of contract. The Industry needs to develop a collaborative culture of working, regardless of the form of contract.

Every project needs a clearly defined intent, a consistent focus on outcomes and the project team to work seamlessly together and adopt the process of back-briefing.

2. **Increased Investment:** Value from increasing investment in design

There is a multiplier effect resulting from the level of investment in design. Additional early investment will more than repay itself. Conversely, reducing investment in design will almost certainly increase out-turn costs and also have adverse technical outcomes leading to even greater costs or legal disputes.

Increased investment in design reduces project error.

3. **Robust Approach:** Establishing and maintaining the design process

A clearly defined and well managed design process will mitigate error. It requires the team to adopt some, or ideally all, of the following:

- Clearly defined roles and responsibilities
- Design delivered to an agreed plan of work
- Agreed milestones
- Strong leadership
- Well prepared brief
- Robust cost advice
- Change control
- Sufficient time for design evolution
- Continual client review and approval
- Peer reviews
- BIM
- Buildability reviews
- Design interface management
- Buildability reviews
- Design interface management

A clearly defined and well managed design process should be established at the start of a project and involve all key members of the project team.

4. **Collaboration:** Working with partners transparently, cooperatively and collaboratively

A collaborative working environment provides a team approach to getting things right. All members of the team do their best to help others to fulfil their responsibilities and are open about areas where they themselves are struggling.

Every project will benefit from collaboration, and effective collaboration will lead to more successful projects with fewer errors. It is up to Clients and leaders across all disciplines to act to enable collaboration to take place. The adoption of a Partnering Charter should be a key goal at the start of any project.

5. **Plan:** Project-specific plan of work

A comprehensive project-specific plan of work for design across all disciplines must be established and agreed before any appointments are finalised. Key consultants need to be involved in defining this plan, and it should include the scope of design for supply chain members who will have design responsibility. Whilst a plan of work can be aligned to any of the available standard plans it needs to be specifically crafted for the project in hand.

Develop a comprehensive project specific plan of work.

6. **Brief:** Needs and requirements of the brief

A well prepared brief will minimise design changes, and so reduce the knock-on construction errors and the associated cost increases and delays which follow. The brief should define project objectives and aspirations, be clearly communicated to the project team, and should follow these guidelines:

- A comprehensive brief will minimise design changes thereby reducing construction errors and their corresponding cost and programme implications.
- An effective brief defines project objectives and aspirations and should be supported with a Vision Statement.
- Sufficient time should be provided, dedicated to defining Client needs and expectations in collaboration with all relevant parties.

The briefing process is fundamental in defining Client needs and expectations and requires sufficient time to be completed in collaboration with all relevant parties.

7. **Information:** Coherent and well-communicated design information

Correct design information, well-communicated between Designers, Clients and Contractors, is integral to a successful project. A rigorous process for the production of design information is needed at the planning stage, and it should be based on the following:

- Agree the correct information (who, what, why, where, when)
- Consider how to communicate the information clearly
- Ensure outputs are reviewed before being issued, to spot potential errors and/or refine the design
- Check that outputs follow the agreed processes for creating and communicating information

Correct and well communicated design information is integral to successful communication between Designers, Clients and Contractors.

8. **Stakeholder Management:** Managing and informing everyone involved

Stakeholder management is the continuous, iterative process of identifying, analysing and engaging those with an interest in the project. It is integral to the design and delivery of all projects and indeed many researchers have cited inadequate stakeholder management as a cause of project failures, in construction and other industries.

Time invested in understanding stakeholder needs and the Client's sign-off and approval process is never wasted.

9. **Opening Up and Closing Down:** The value of not rushing ahead

Often, design change becomes necessary because the important thinking and decision-making processes have not been rigorously applied at the earlier stages in the design process. If the 'opening up' stage, is properly carried out, reviewed and approved before starting the subsequent closing down stage, fewer late design changes will be required and the opportunity for error is diminished.

'Opening-Up' and 'Closing Down' a project allows for all creative thinking and key decision making to be carried out and completed in good time prior to preparation of subsequent production information. This reduces the necessity for change and hence the opportunity for errors.

10. **Contractor Input:** A sense check from the Contractor's perspective

All projects will benefit from tapping into a Contractor's knowledge and experience of issues such as delivery, buildability and construction, at an early stage, before design options have been closed down. But frequently this process is prevented because of commercial rules, particularly those that govern the tender process. This can lead to design changes after tender award, resulting in avoidable errors as well as unnecessary waste.

All projects, regardless of the form of contract or procurement, would benefit from Contractor advice at the design stage. This should be encouraged and would lead to a reduction in design errors.

11. **Handover:** Passing on the baton successfully

The communication of design information should be relevant, convey the design intent and be clearly presented to all necessary recipients. The following should be considered:

- Provide clarity as to the purpose of design information when it is issued
- Carefully and clearly define design responsibilities for all parties
- Ensure that information is relevant, complete and comprehensive
- Organise reviews with specialist Designers and Sub-contractors in order to enable an effective handover

If a comprehensive set of information is produced at the handover stage and communicated and reviewed effectively, then the design is less likely to be misinterpreted, resulting in fewer errors.

12. **Guiding the Design Team:** Valued input from an Independent Principal Consultant

Appointing an Independent Principal Consultant to have accountability and to be the 'controlling mind' for the design process, from start to finish of the project, would greatly reduce the risk of design errors.

Introduction of an Independent Principal Consultant as the 'controlling mind' for design development is critical to ensure that design-related communications are robust, co-ordinated, and well managed.

Recommendations

1

Culture:
Getting the team culture right

It is recognised that the delivery of projects is enhanced, and the number of errors reduced, when there is the right 'culture'. So, what is the right culture and how is it to be achieved?

The Issue

Everyone knows that the most successful construction projects – in commercial, environmental and social terms – are those where all involved work as a team to achieve common goals, in an open and transparent way: projects where there is a real culture of collaborative working. The trouble is that most projects do not work like that.

Would you tell your Client that you are not particularly confident about delivering something that is within your brief? How confident would you be that your Client would accept the position and work with you to find the best solution? Or would you fear that your Client would dispense with your services and appoint someone else? Or, for example, if another supplier had problems which were jeopardising progress on the project, would you offer to help even it meant extra time or cost for you?

Such examples are all too prevalent, and are completely contrary to the culture of openness and transparency which makes for a successful project. With the right culture it is OK to ask, it is OK to say 'I don't know', it is OK to criticise (positively) and it is OK to add ideas even if they are outside your own organisation's normal brief.

Establishing a collaborative culture is the first challenge. There is no simple recipe for this, though one essential ingredient is clear leadership from the top, with a Client demonstrably committed to collaborative working. Choosing people and organisations with similar commitment can also help, as can choice of processes and systems that support the culture.

Sustaining a supportive team ethos is also part of the challenge. Relationships are formed initially with people, and people will work together and start to trust each other if they are in the right environment. The trouble is that, over time, people move on and so personal arrangements are constantly changing. This reinforces the point that for every project, large or small, the Client needs to be an active part of the team and to contribute to the process - including the role of "leader".

So how do we maintain all those good cultural facets of transparency, openness and honesty as team members change? It certainly helps if the culture is embedded within each organisation rather than relying on any one individual. But it needs more than this. Every construction project has a vast number of organisations involved so it is important to create a structure such that everybody involved in the project *believes* that they actually *own* the project, so that the needs of the project subsume the needs of the individual organisations involved.

Again there is no simple recipe for achieving this. Contracts determine the nature of projects and

certain forms of contract are designed to "enhance" the right culture, which can help. But most projects are procured using "non-collaborative" forms of contract, and some achieve the right culture in spite of this. The industry needs to develop a collaborative culture of working regardless of the form of contract.

Some argue for alliancing, and this can certainly be effective where circumstances allow alliancing to work. There are some really good examples of how alliancing (a formal collaboration between the parties who deliver the project) works well in delivering designs that fulfil everything that the Client requires. The challenge is that alliances take many years to grow to a maturity and for trust to be gained. Others argue that the whole industry should adopt the tenets of Project 13, the ICE Infrastructure Client Group's current initiative to establish a new approach to delivering the UK's infrastructure. (See https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Disciplines-Resources/Briefing%20Sheet/from-transactions-to-enterprises.pdf). But these changes may be a long time coming.

Appropriate forms of contract, alliancing and Project 13 are possible useful approaches to 'getting the team culture right', though both face difficulties and opponents. At its simplest, a system is needed where project team members are empowered to make decisions and take actions within their own areas of expertise, and where these decisions and actions work in unison with the thousands of other decisions and actions happening simultaneously throughout the project. The solution may just lie in an approach which has been tried and tested by the military over a long period.

Recommendation

It is suggested that Industry should consider applying the principles of "Mission Command", a style of military command developed by Prussia in the 19th century and subsequently adopted over much of the world, including NATO from the 1970s. This is a process which ensures that everyone is working to a 'centralised intent' but with 'decentralised execution'. This basically means that all parties have a shared clear vision of the end-state, but are trusted to make their own decisions within a clear framework.

Applying these principles to construction, every project should have:

Clearly defined intent
A clear intent which outlines what the project wants to achieve and why. This binds the entire project team together and then forms the benchmark for all subsequent decision making. It is normally expressed in terms of effects and desired outcomes. The intent should be in a language that all members of the project team (right down to labourers on site) will understand.

Renewed focus on outcomes
A change in mind-set so that the "outcome" is all that matters. For example even if the calculations are faultless, and the drawings are beautiful, they are a failure unless the element is actually built and handed over to the Client – and works! This approach will create the link to the real world of construction and delivery, and break down some of the organisational and contractual barriers identified.

Adoption of the process of back-briefing
Improving communication and mutual understanding by making it normal for project members to conduct back-briefing at an agreed time or stage. The person or people receiving information give a synopsis of the information they have just received. The person originally giving the information can then determine whether the message was received properly. If the repeated version is not the same as the original intent, the information or intent should be clarified.

Summary

Creating a collaborative culture is central to 'getting the team culture right' and can only be established if there is clear leadership from the top. Appointing organisations with similar commitments is also a pivotal step so that everybody involved in the project believes that they actually own the project. Once this basis is formed, each project should define the following:

- A clearly defined intent – what does the project want to achieve and why?
- Renewed focus on outcomes – the outcome is all that matters
- Adoption of the process of back-briefing – all project team members should carry out back-briefing at an appropriate time

2

Increased Investment:
Value from increasing investment in design

Design is the foundation of every project, and getting the design right is the foundation for success. Providing sufficient resources – both time and money – to do the design properly is crucial. There is a multiplier effect: additional early investment in design will more than repay itself; conversely reducing investment in design will almost certainly increase out-turn costs and also result in adverse technical outcomes leading to even greater costs or legal disputes.

The Issue

Design is not just about the project as a whole. It is also the foundation of every sub-element and every component that needs to be incorporated into the project. There is a huge web of interrelated design issues that contribute to the overall design of a scheme. A design failure in any one small component can have a major impact on the project as a whole.

For example, in the early 1970s there was a catastrophic failure of falsework supporting a concrete pour for a new M4 motorway bridge deck over the River Loddon in Berkshire. Several people, including the Engineer designing the falsework were killed. The cause of the failure was that web stiffeners had not been included in the design, which resulted in the webs failing due to the supports to the beams being eccentric to the webs. The cost of the stiffeners would have been a few pounds but they had not been included as there had been no consideration of the tolerances of erection.

In a more recent example, the Client for a well-known department store decided to appoint an inexperienced in-house M&E Design Team to design the services for a new multi-million-pound store in order to save on design fees. In the event the scope of the electrical services doubled yet the store still had to be completed by the original date with huge implications on cost and indeed quality: the cost of the electrical installation was four times the original estimate or twice the cost of what it would have been if the design had been carried out correctly in the first place.

In contrast, a recently completed football stadium provides a shining example of how additional investment in design (in this case, prompted by circumstances) can produce dividends. For funding reasons, the project was halted for a period before construction had started, providing time for the team to review and improve the design. This was a key factor behind the project's eventual extraordinary success.

Get It Right research has found that the Industry wastes 21% on error and that four of the top ten root causes of error relate to design. The cost of correcting error is made up of both the physical cost and the delay cost incurred in correcting that error. Allowing a design error to go uncorrected may avoid these costs, but can lead at best to additional costs elsewhere on the project or reduced performance of the completed project. At worst, it can lead to a serious failure.

The Get It Right research concluded that late changes to design are a fundamental root cause of error. Further analysis suggests that design should only be changed for one of two reasons:

- The Designers got the assumptions behind the design wrong, got the design itself wrong, or (for whatever reason) changed the design approach, so the design needs correcting. The Designers can only have got it wrong if they were not in a position to use the right resources and processes to eliminate change and therefore error. There might also have been errors in planning the design process interlinking the needs of the Designers in terms of information from third parties.

- The Client changed the requirements, either because as the design evolved, it became clear that the design was not meeting expectations, or the Client needed to change the requirements for political, value or legal reasons.

Investment in sufficient time and resources for design, together with using the appropriate processes during the design stage, should alleviate most of these issues. This would result in the only justification for late design changes being political, value or legal reasons.

Some simple arithmetic helps make the point about investment in design. Assume that design costs are of the order of 15% of the project cost, and that the current cost of error (as Get it Right research has shown) is 21%, and most of this is design related. Suppose that the time and money invested in design was uplifted by just 10% to 16.5%, then the investment would have more than paid for itself if it resulted in a 10% reduction in the cost of errors. In reality the improvement would probably be much greater, producing a return several times the level of the initial investment. This is the multiplier effect.

Recommendation

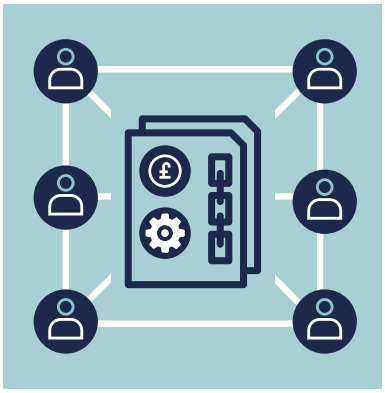
A key step to reducing the large numbers of design-related errors which are creating such large additional costs on construction projects is to invest sufficient time and resources into the design process. In almost every case, this means providing more time to get the design right before construction, and allocating more money to the design process.

Summary

Increased investment in design reduces project error. Time and money spent on design should be viewed as an investment which can produce high returns through reduced errors, with the following being considered:

- Late changes to design are a fundamental root cause of error
- Allowing design error to go uncorrected may reduce initial costs but can lead to additional costs elsewhere on the project or at the latter stages
- Increased time and resources are more likely to reduce error and maximise investment the multiplier effect

3



Robust Approach: Establishing and maintaining the design process

A clearly defined and well managed design process should be established at the start of a project and involve all key members of the project team. Having established the process the team must then apply the process rigorously.

The Issue

As GIRI research has established, many of the weaknesses in design which cause many of the errors in construction are rooted in a failure to properly define and agree the design process at the start of a project, and a failure to rigorously apply the process throughout the project.

GIRI has identified thirteen key issues relating to the design process which, if properly established and maintained, can significantly reduce project error. These are listed under recommendation below, and many are developed further in later sections of this guide.

The first priorities are to recognise the importance of a robust design process, and for the Client and Lead Designer to ensure that such a process is established at the start, understood and agreed by all key parties and implemented throughout the project.

Recommendation

The following thirteen recommendations, properly adopted, can significantly reduce design error. All are accepted industry good practice but in many instances they are not adopted.

Clear roles and responsibilities
As discussed in more detail in Section 5, kicking off the project with a team of people who understand their scope of services, roles and design responsibilities is key to avoiding misunderstandings.

Delivering design to an agreed plan of work
The project team should work to an agreed framework, such as (in the building sector) the RIBA 2013 Plan of Work, and the execution of the project should be developed on this basis (see Section 5). It is important to ensure that all parties are fully aware of the framework they are delivering their design to, and the requirements of that framework - whether RIBA for building, GRIP for rail, PCF for highways or any other Client-specific delivery model.

Establish milestones: 'Give Get' as a tool to encourage behaviour
Milestones (significant defined events during the life of a project) are important management tools. By carefully working them into professional appointments, they can be used to encourage beneficial behaviour across disciplines. Milestones should be crafted in such a way that organisations which achieve them receive some type of gain: the 'Give Get' principle (whoever achieves a milestone gets something in return).

Design leadership
Success on projects is not just down to process but due to teams having a common collaborative

approach to achieving the design objectives (see Section 4). Key to this is strong design leadership which should come from the Lead Designer supported by the Client.

Robust brief
The project brief is an evolving document. A Design Team cannot progress without, as a minimum, an outline brief that can be developed with the Client into a project brief before the start of concept design (ie, in building, by the end of RIBA Stage 2). The brief needs to be signed off by the Client and key stakeholders at the outset and must be used as a control document to refer back to, with any changes agreed, recorded and signed off by the Client (see Section 6).

Budget
In establishing the brief it is crucial to set up a process for satisfactorily testing the design against the budget at the key milestones. Specialists need to be involved early in order to get robust cost advice. Too often this is avoided because it is commercially sensitive and may be seen as favouring a particular Supplier or Contractor, but the current practice of not always involving specialists is simply not working (see Section 10).

Change control
Clarity is needed when changes are made to the design or brief. Changes should be managed in a clear and structured way where all parties have understood and assessed the implications of each change before endorsing it, and there is Client sign off. It is accepted that unless the change is major it is probably unrealistic to implement a change control process until the beginning of technical design (RIBA Stage 4 in building projects), although a process for considering all changes at whatever stage should be considered.

Allowing the right amount of time for the design to evolve
Periods for each design stage need to be realistic and recognise the complexities of the project and the procurement route. In order to achieve this, activities need to be planned and discussed between the key members of the project team taking account of any programme constraints. Allowance also needs to be made for Client reviews and approval periods.

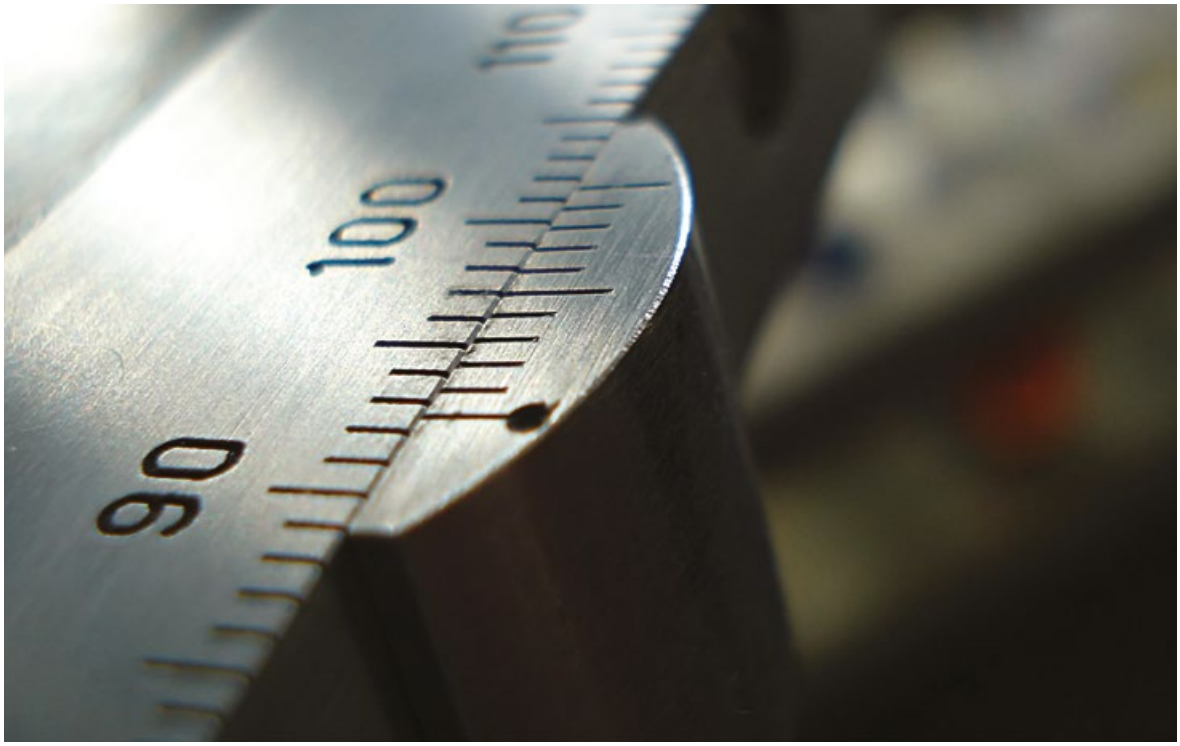
Planning for Client review and approval
Client review meetings should be set up throughout the design stages to validate the design and to obtain clear direction from the Client. This reduces surprises and misunderstanding when the end-of-design-stage information is issued (see Section 9). In addition, end-of-stage presentations (plus interim stage presentations if required) should be made to the key decision makers, clearly setting out any design or project issues that require resolution.

Peer reviews
At appropriate stages in the project it can be beneficial to facilitate design reviews by external parties to check that the design meets the brief and the correct level of detail has been achieved. This could be provided by one organisation or by individual design consultants (see Sections 10 & 11). Consideration should also be given to engaging with other groups, such as end users or the team that will operate and maintain the asset once occupied.

BIM
Technological advances are rapidly changing the way design is being carried out and in the past few years the take up and understanding of BIM has been growing exponentially. It is now becoming the norm across all sectors and the efficiency benefits (if used correctly) from being able to visualise, understand and resolve coordination issues, are now widely recognised. It is GIRI's view that BIM to Level 2 should be adopted as a minimum, at both the design and construction stages.

Designing for construction
Another key finding of GIRI's research is the frequent lack of consideration of buildability during the design process. There can be several reasons for this including poor understanding of construction processes by Designers, or a lack of time to develop the design. It is recommended that the design beyond the concept stage (from RIBA Stage 3 in building projects) specifically addresses buildability as a project requirement and ideally is reviewed by specialist Designers and Contractors. This could either be by informal consultation or as part of a pre-construction services agreement (see Section 10).

Design interface management
Finally, there are often design issues arising due to scope gaps between elements of works. These interfaces will often arise between different works packages, for example between infrastructure works and building works or perhaps even between different types of materials, such as elements of a façade. It is important to set out in the scope of packages (often a Contractor's responsibility) where interfaces arise and to define where design responsibilities begin and end. It is also important to allow enough time for Sub-contractors with design responsibility to further develop the design interface.



Summary

A robust design approach should be adopted at the beginning of the project and involve key members of the project team. It requires the team to adopt some, or ideally all of the following:

- Clearly defined roles and responsibilities
- Design delivered to an agreed plan of work
- Agreed milestones
- Strong leadership
- Well-prepared brief
- Robust cost advice
- Change control process
- Sufficient time for design evolution
- Continual client review and approval
- Peer reviews
- BIM
- Buildability reviews
- Design interface management

It is essential that the team then applies the processes rigorously and faces up to the issues as they arise and does not postpone resolution of issues because they are in the “too difficult” category.

4

Collaboration:
Working with partners transparently, cooperatively and collaboratively

A collaborative working environment provides a team approach to getting things right. All members of the team do their best to help the others to fulfil their responsibilities, and are open about areas where they themselves are struggling. Every project benefits from collaboration, and collaborative working helps to reduce errors.

The Issue

Evidence over many years has demonstrated that "traditional" type procurement has consistently struggled to deliver satisfactory outcomes, and that the construction industry as a whole therefore suffers in terms of both efficiency and quality when compared with other industries. This is largely because all the parties are concentrating more on protecting their own commercial and other interests than on the success of the project as a whole.

Collaboration means "to work with another or others on a joint project". The key word here is "joint" and it implies that those collaborating have a joint objective on a project. To have a joint objective requires an alignment between participants, such that successful outcomes for each party result in a successful project as a whole.

Success for one project participant is, more often than not, different from another, so at the outset there must be a clear understanding of each party's success criteria. The Client's brief should set out clearly the requirements and constraints which define success (see Section 6). All participants (including third party Stakeholders, Designers and Contractors) need to be equally clear as to their measures of success.

and each other's

It does not necessarily follow that there needs to be complete alignment across all areas as long as it is fully understood how and where some objectives might differ. As an example: on the appointment of a Contractor for a particular project, the Client's project manager explained to the Contractor that there was complete alignment between all parties in terms of safety, quality and programme but there was a difference in the two parties' objectives in terms of valuations. The Contractor's aim was to maximise the valuation under the terms of the Contract whilst the Client's aim was to minimise the valuation. He added that, as long as everybody understood the areas of alignment and non-alignment, the project would be a success, as indeed it was.

It is necessary to discuss and agree how the various success criteria can be aligned if possible. This is where collaboration moves distinctly away from "traditional" procurement routes and requires a level of trust that is uncommon in hard price, lowest cost contracts.

The alignment process requires a careful analysis of the individual motivations and what positive incentives can be set up to encourage unity. Again, due to the individual success criteria, the motivations and incentives will be different

for each party. There are, however, already available project structures which go towards setting up the right environment.

Recommendation

Successful collaboration requires, first of all, an appreciation by all parties of the benefits of working collaboratively, together with active leadership from the Client to ensure that collaborative working is established and maintained throughout the project. There are various ways in which collaborative working may be encouraged.

Partnering is an approach to the management of construction contracts that encourages collaboration between the parties. The core rationale behind partnering is to generate co-operation and collaboration so as to engender trust rather than competition between the parties. Partnering arrangements can be put in place so as to impact positively on all parties involved in a project, including the Client, Contractor, Sub-contractors and Consultants.

Recent standard forms of contract, NEC and GC Works for instance, have incorporated arrangements which encourage collaboration to a certain extent. This can be a great help, but contract forms alone cannot ensure proper collaboration: for example, some partnering terms are difficult to enforce, either because the extent of the duty is unclear or because an agreement to agree is not enforceable in common law.

Partnering is sometimes criticised because of the difficulty of establishing common interest between the Client on the one hand, and the Contractor and other suppliers on the other. There is some force to these criticisms. However, they overstate the inevitability of commercial conflict, which all too often is a destructive force rather than a creative one for the UK construction industry. They also fail to recognise the behavioural benefits partnering arrangements can bring to projects.

The concept stands for an important aspiration that parties should act in the common interests of the project in question and of the other project parties. This is a refreshing approach and discourages selfish behaviours amongst project parties. At its best it also achieves an overall result that would not be achieved by contract arrangements that characterise projects as a zero-sum game, where what one party gains is matched by what another party loses. It is possible for parties to agree some partnering obligations that are binding, whilst adopting other partnering provisions that are intended to be aspirational.

Pre-project commencement workshops between senior representatives and the circulation of a 'Partnering Charter' are beneficial, regardless of contract. The same can be said for the ambition to foster a spirit of partnership in completing the project for the common good. Partnering encourages cooperation and openness between Client, Design Team and Contractor.

Summary

Every project will benefit from collaboration, and effective collaboration will lead to more successful projects with fewer errors. It is up to Clients and leaders across all disciplines to act to enable collaboration to take place. The adoption of a Partnering Charter should be a key goal at the start of any project, and the following should also be considered:

- Adopt an appropriate form of contract
- Establish a project 'structure' which encourages collaboration
- Define each team member's project success criteria which should be aligned with those of others if possible
- Introduce pre-project commencement workshops on-site between senior representatives

5

Plan:
Project-specific plan of work

A comprehensive project-specific plan of work for design across all disciplines is a key component of the appointment process and should be established and agreed before any appointments are finalised.

The Issue

Committing to a construction project is a significant investment for any Client. Appointing the professional team is the first milestone. Whether for one-off Clients or seasoned Developers, this milestone is a significant one and is one that needs to be based on openness and mutual trust. The professional team is selected on a number of criteria including relevant experience, ability, capability and of course fee.

GIRI research found that the information provided to competing design teams varies considerably: some project enquiries have considerable detail, others have very little on which to base fee proposals. Priced submissions can vary significantly. And with staff costs, training, overheads, operating efficiencies and profit margins broadly comparable between firms of the same design discipline (they need to be comparable for market competitiveness), the variance in fee would suggest that level of service or quality/completeness of design deliverables could be the variant. Therefore, clarity at this stage is essential.

GIRI research also found that misunderstandings and misaligned expectations about what is and is not included in the scope of services, leads to gaps in design and in coordination of information.

This in turn can affect the whole design and construction phases of the project. Re-working, waste, delays and increased costs often follow.

Clarifying roles and responsibilities has become more important as a result of an increasing number of specialist Designers and Contractors taking on a management role, and the supply chain becoming more engaged in the design process. Different Consultants may be appointed to work on different parts of the design or at different RIBA stages (for buildings), and every part and phase should be designed with the best outcome for the project, as a whole, in mind.

Recommendation

For any construction project GIRI suggests that ideally the following information should be made available by the Client at the beginning of the project.

1. A short description of the scheme – to include:
   - Objectives/purpose/use
   - Client outline brief
   - Anticipated scope based on financial viability
   - Budget
   - Known constraints
   - Anticipated procurement route

2. An outline programme of the works showing design stages and construction phase duration

3. A draft Design Responsibility Matrix (DRM) to include:
   - The relationship between each design discipline and the responsibility of each designer
   - The design interfaces between designer and specialist sub-contractor designer/ installer

4. Proposed appointment terms

5. A co-ordinated Scope of Services document – to include:
   - The duties at each stage of the project for each design discipline
   - The expected level of design by each design discipline
   - The deliverables and details expected at each design stage milestone
   - The design deliverables format including CAD and BIM requirements

The Scope of Services document should be visible to all design disciplines at an early stage so that these relationships are understood at the outset.

In ideal circumstances, the above information would be readily available, and in part defined with contributions from the design team, but this is unrealistic on most projects. What is essential is that the design team is aligned by a coordinated Design Responsibility Matrix and RIBA Plan of Work (or equivalent) which are specific to the project. For building services engineering, the BSRIA BG6 document provides exemplar deliverable drawings for each project stage but the RIBA and ICE do not provide equivalents.

There is therefore even more reason for a project-specific plan of work to be prepared, to include scope and deliverables by specialist designers and supply-chain members and, most importantly, to be agreed by all parties.

(Sections 3, 6, 7, 9 and 11 contain relevant related information).

Summary

A comprehensive project-specific plan of work for design across all disciplines must be established and agreed before any appointments are finalised. Key Consultants need to be involved in defining this plan, and it should include the scope of design for supply chain members who will have design responsibility. Whilst a plan of work can be aligned to any of the available standard plans, it needs to be specifically crafted for the project in hand. The following should also be considered:

- Project enquiries should contain comprehensive and unambiguous information so that design Consultants' fee proposals are comparable and reflect the level of service required
- Roles and responsibilities of all Designers and Contractors needs to be clearly defined
- Scopes of services should be shared between all Designers at the outset of a project
- The Design Team should be aligned by a coordinated Design Responsibility Matrix and RIBA Plan of Work (or equivalent)
- Introduce pre-project commencement workshops on site between senior representatives

6

Brief:
Needs and requirements of the brief

A well prepared brief will minimise design changes, and so reduce the knock-on construction errors and the associated cost increases and delays which follow. The brief should define project objectives and aspirations and be clearly communicated to the project team. The briefing process is fundamental in defining Client needs and expectations and requires sufficient time to be completed in collaboration with all relevant parties.

The Issue

The project brief aims to set out the Client's needs and expectations and informs the Design Team of the project requirements. It is the most crucial part of the project process. If the brief does not reflect these considerations then misunderstandings can lead to design changes being required later on. Even if the number of items overlooked or not clearly defined in a brief is minimal, these omissions can still lead to errors in the design with much greater impact on cost and programme at the construction stage because they are often only discovered late in the project.

The format and content of a brief is influenced by a number of factors including Client organisation, project type and complexity, although there are common themes which every brief should address. The following paragraphs provide suggestions which will overcome common pitfalls made at the briefing stage.

It is important to understand that the brief is the question the project has to answer. It should not be overly prescriptive (by, for example, defining the type of structural frame for a building). Rather, it should clearly define the project requirements considering all aspects (including for example the use or uses of the project, sustainability goals, or futureproofing considerations) and not be limited to purely cost-focussed targets. Clients also need to understand that the brief will adapt and develop as the project progresses.

There is a difference between briefing and the product of that process - 'the brief'. The briefing process is just as important as the brief, and should unite the Client body and Design Team. It should give form and structure to what it is that the Client wants to achieve, which may only be a vague notion at the start. Unless there is a comprehensive evaluation of the Client's requirements, including not just the project itself but also how it will subsequently be used, then the brief will not reflect Client expectations. Therefore, it is vital that sufficient time is provided for briefing and the associated evaluation. Input from all parties can help to remove the division between "Client" and "service provider" and form a collaborative team mind-set and collective project ownership.

On major projects with experienced clients, the Client should initiate and lead the briefing process: otherwise, the Client should encourage the lead designer to do so. In this scenario the Client will be assisted by the Designer's relevant experience and continuity will be maintained throughout the briefing and design stages. It is also important at the early briefing stage to define an approach as to how the brief will be developed, which will also be influenced by the type of Client organisation. Larger organisations may have a number of stakeholders requiring a longer consultation process, as it is imperative that the requirements of all parties are recorded and their relevance assessed. The stakeholders need to be identified and then engaged with (see Section 8). It is equally important to determine who the key individuals are and who makes the decisions, and (so far as possible) these should be consistent throughout the briefing and design stages.

Depending upon the Client organisation and project type, it can also be useful to define a Vision Statement at the outset. This should set out clear objectives and aspirations, and will ensure that everyone involved in the project understands its goals.

Recommendation

A well-defined brief and comprehensive briefing process are essential for every project. How these are established may be influenced by a number of factors, as discussed above, but the following structured approach, based on the RIBA Plan of Work 2013 for building projects, is provided as a useful example, adaptable for any type of project:

1. Initial engagement – determine key individuals within Client team and agree consultation process
2. Develop strategic brief (Stage 0) – define scope of project which should involve relevant members of the project team
3. Initial project nrief (Stage 1) – consider and define spatial requirements, project outcomes, site information and budget
4. Final project brief (Stage 2) – revisit the brief during this stage of work, update as necessary and signoff project brief
5. Project brief update (Stage 3 post-planning submission) - There may be benefit in revisiting the final brief after planning consent, as associated conditions may require changes to the scheme.

During the above process the brief should be presented to the Client at the end of each stage to avoid misinterpretation and to make sure expectations are met. It is also an opportunity for the Client to reassess their requirements. At the end of the process the Client should present the brief back to the project team to ensure that the content is fully understood and correct (see Section 1).

Design teams have a responsibility to regularly review their designs against the brief and provide constructive input to the briefing process as outlined above. A competent design Consultant should have processes in place that independently review the relationship with the Client, understanding of the brief, service provided and value added to the Project. If design teams frequently test and review themselves against these considerations, this can help to improve the quality of the work produced in accordance with the Client's expectations as well as reinforce relationships. Clients should seek evidence of these processes when selecting members of the Design Team.

Standard model forms are available for briefs. However each project is unique, so model forms run the risk of removing the thought process, resulting in aspects of the brief being overlooked. The model forms should be used as guidance for developing the brief documents, and bespoke versions should be created.

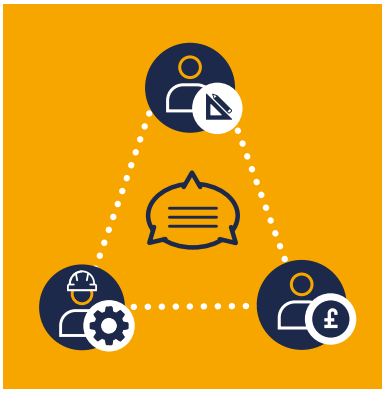
Summary

The briefing process should be carried out comprehensively, within an adequate timeframe and involve the key members of the project team. The brief should follow these guidelines:

- A comprehensive brief will minimise design changes thereby reducing construction errors and their corresponding cost and programme implications
- An effective brief defines project objectives and aspirations and should be supported with a Vision Statement
- Sufficient time should be provided, dedicated to defining Client needs and expectations in collaboration with all relevant parties
- The project team should ensure that the brief deliverables reflect, and can adhere to, internal quality assurance procedures
- The development and delivery of the brief needs to be appropriately planned

7

Information:
Coherent and well-communicated design information



Design information, and its successful communication between Designers, Clients and Contractors are essential aspects of any construction project. Drawings are the traditional method of communicating design intent or documenting a design for other project team members. But there are many other ways of conveying information that should not be overlooked. Reports, specifications, notes, emails, text messages and software for managing programmes are also ways the design team shares important information, and all need to be executed with rigour.

The Issue

Get it Right research cites missing, wrong, irrelevant or poorly communicated design information as a major cause of error. And the broad range of design information, as outlined above, serves to compound the issue. Everyone knows a story of an easily-made error having big consequences - a hidden drawing layer, a mistyped number in a spreadsheet, an unclear instruction conveyed in a quickly typed email. A seemingly small error in design information can have a disproportionately greater impact. Therefore, good quality design information together with the clear communication of this information between the project team is an integral part of any successful project.

Ensuring all design information is correct and clear is a challenge not to be underestimated. Design information must be appropriate for different audiences with different needs.

As the design evolves, many updates or revised versions will be issued. The planning, production and checking of information do not always receive the careful attention they deserve, and would benefit from a more rigorous and methodical approach. This approach should be agreed at the outset of the project for each stage (see Sections 3 and 5).

Teams should not assume that existing quality assurance processes will always identify incorrect or unclear design information. A Lead Designer may check the information, and this may be supplemented by checks carried out by Contractors or Suppliers. But alternative procedures to verify information should be considered which are not solely reliant on these checks. The ‘controlling mind’ (Section 12) or independent reviewers (Sections 9 and 10) could fulfil a key role by agreeing a plan with the project team and checking design information.

Recommendation

To ensure that all design outputs have a strong user focus and to maximise the opportunity to spot design errors in the office or on site before they become construction errors, a plan should be introduced at the outset consisting of four key steps - Agree, Communicate, Produce and Check – as described in more detail below. Designers should seek feedback from Clients and construction teams about what works well and adapt their plans and guidelines accordingly.

1. Agree what is the correct information (what, who, why, when, where)
To establish **what** is the 'right' information, it can be helpful to clarify **who** is the audience for the information, **why** they need the information, **when** the information is needed and being issued (acknowledging the need to issue information to help progress the design as well as the potential for this to cause errors) and **where** the audience will view and interpret the information (in an office or on site for example).

Design information can be shared for different reasons at different stages of the design process and it is important that this is understood by the project team so that information is correct and never misused. For example, it must be clear whether information is issued for Client feedback, for Designers and Contractors to work out if the parts of the design are buildable, or for Contractors to build from. Information that is not correct, or is misused, is a potential cause of error.

Design information must be updated as the design develops and should always be correct at the end of a stage and at other agreed milestones, or outstanding design issues should be recorded. Any amendments to submitted information should be undertaken cautiously to ensure that all related information is reviewed and corresponding amendments carried out. Information quantity should also be monitored, as too little or too much information can also cause errors.

2. Communicate the correct information clearly
Design information should be clearly communicated: easy to understand, easy to check and hard to misinterpret. Feedback should be sought from those receiving design information to check its clarity. The project team will find it helpful to refer to 'benchmark' drawings, for example those produced by BSRIA (see Section 5), or previous projects to ensure there is a consensus about what is the 'right' information at each stage of the design process. This can aid discussions about how to ensure clarity.

3. Produce the outputs while spotting potential errors/refining the design
Production is an opportunity to spot errors: the process of producing design outputs offers a chance to refine the design and spot potential errors. When Designers produce their own drawings, there is likely to be a deeper understanding of the design intent. Therefore, when technicians produce drawings, it is important that they are part of the team rather than a resource shared between projects. Technicians should be briefed carefully and should have the ability to spot potential errors through training, site visits or their experience. Sufficient fee must be budgeted for Designers to undertake full checks covering dimensions, annotations, interfaces and so on (see Section 2).

4. Checking that the produced outputs are coherent with steps (1) and (2)
All Design Team members should agree a checking process as part of the project plan. Key deliverables at the end of stages or at agreed milestones should be subject to rigorous in-house checking: this may comprise both internal reviews (by those part of or removed from the project) and external peer-reviews by members of another organisation (see Sections 10 and 11). The implementation of BIM should make it easier to detect some potential errors at the later design stages, although it is unlikely to highlight errors at the early stages when the design is less-well resolved. Finally, the team should agree a definition of what 'complete' is and ensure everyone understands it.

Summary

Correct design information, well-communicated between Designers, Clients and Contractors, is integral to a successful project. A rigorous process for the production of design information is needed from the planning stage, and it should be based on the following:

- Agree the correct information (what, who, why, where, when)
- Consider how to communicate the information clearly
- Ensure outputs are reviewed before being issued to spot potential errors and/or refine the design
- Check that outputs follow the agreed processes for creating and communicating information
- The development and delivery of the brief needs to be appropriately planned

8

Stakeholder Management:

Managing and informing everyone involved

Stakeholder management is the continuous, iterative process of identifying, analysing and engaging those with an interest in the project. It is integral to the design and delivery of all projects and indeed many researchers have cited inadequate stakeholder management as a cause of project failures, in construction and other industries.

The Issue

Failure to engage properly with all stakeholders from the outset of a project runs the risk of stakeholders 'appearing' and creating rework during design and delivery. This can, and frequently does, lead to avoidable design errors.

A good stakeholder management process is an integral factor in determining whether the project objectives are achieved. On construction projects, the full benefits of stakeholder management have yet to be tapped because the process can struggle with addressing such issues as the impact of procurement routes, internal stakeholder collaboration, responsibility for stakeholder management and project life cycle.

Even creating a simple list of construction project stakeholders is challenging, and attempts to do so have been criticised for producing lists which are either too short or too long. Too long, and the process can become unnecessarily complicated and cumbersome. Too short, and stakeholders are missed out and can 'appear' too late in the process with the potential to adversely affect design or construction. If anyone with an interest, real or perceived, is considered an important stakeholder then their involvement should be carefully reviewed and agreed.

In the early stages of a construction project, a good start is to consider both internal and external stakeholders according to the following established definitions:

1. Internal stakeholders are part of the Client organisation or in legal contract with the Client (potentially subdivided by whether they are demand side or supply side). Examples include the Client's parent body (if the Client is a subsidiary), tenants, members of the organisation's board or department heads;

2. External stakeholders have a direct interest in the project though not necessarily having direct contracts with the Client, and they may be subdivided into public and private sector. These include planning authorities, neighbours or architectural societies.

It is important to identify all stakeholders involved in the Client's approval process so that a stakeholder who must sign off a particular project or element is not missed.

Recommendation

Identifying, engaging with, and maintaining engagement with key stakeholders is essential to running a project efficiently, and in particular, to avoiding late design changes and their associated errors. The following three-step process is recommended:

1. **Identify stakeholders:**
   Comprehensive and early identification of internal and external roles.

2. **Analyse, map/group and prioritise:**
   Assess the 'status' of all stakeholders, their concerns, the associated risks and mitigation actions which might be required, and highlight stakeholders with less experience of construction projects that are to be managed closely. Tools such as a power/interest matrix or a responsibility matrix (RACI or its variants) may be applied.

3. **Design and deliver an Engagement Plan:**
   Produce communication and consultation plans informed by analysis, mapping/grouping and prioritising. Templates and guides linking categories of stakeholders to a method of engagement should be considered, and a single point of contact for each stakeholder should be assigned.

The three steps must be started early enough to ensure communication and consultation is conducted when it is most useful to decision makers. They must also be revisited and updated periodically, both to monitor changes to a stakeholder's importance during the course of the project, and to monitor roles and people moving on. Those external stakeholders who have the right to approve specific issues (eg a local authority planning department) should be treated in the same way as internal stakeholders, to ensure appropriate consultation can be facilitated.

It is particularly important to identify the accountable person within each organisation who will make a final decision or grant approvals (see Section 6). Illustrating and agreeing the process with the Client should be mandatory at the beginning of a project to ensure that it can be clearly communicated to the whole project team (see Sections 3 and 5) and properly integrated with other project planning methods: for example, collaborative planning should be considered (see Section 4). However, if the process looks too complicated, it probably is too complicated and should be reconsidered. It is also essential to revisit the process as design and construction progress.

A universal process for all construction projects is hard to imagine. If a 'standard' process is adopted, then it is critical that it is applied and adapted intelligently. For smaller, simpler projects a less formal, less rigorously documented stakeholder management process led by the Design Team is likely to be the norm. But for large or complex projects, professional third-party managers or facilitators may be appointed to focus on stakeholder engagement. As a starting point, the three-point plan as described above would benefit every project, and time spent understanding stakeholder needs and the Client's sign-off and approval process is never wasted.

Summary

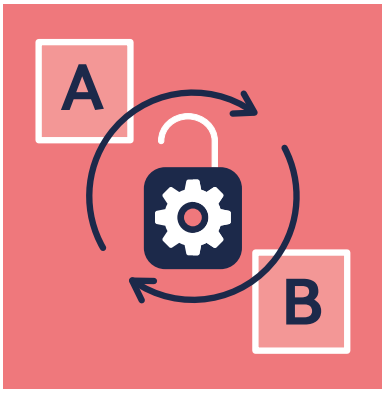
Successful stakeholder management will build and maintain support for a project provided that the outcomes are clearly explained to, and understood by, the stakeholders. In particular, it will avoid late interventions by stakeholders which frequently lead to design changes and associated errors. Time invested in understanding stakeholder needs, and the Client's sign-off and approval process, is never wasted. The following guidelines should be adopted:

- Identify all internal and external stakeholders relevant to the project
- Analyse, group and prioritise stakeholders against appropriate criteria
- Produce an Engagement Plan to facilitate communication and consultation
- Review the above process regularly and update as necessary
- Identify the accountable person within each organisation who will make the final decision or grant approvals

9

Opening Up and Closing Down:

The value of not rushing ahead



Often, design change becomes necessary because the important thinking and decision-making processes have not been rigorously applied at the earlier stages in the design process. If the 'opening up' stages, are properly carried out, reviewed and approved before starting the subsequent closing down stages, fewer late design changes will be required and the opportunity for error is diminished.

The Issue

The nature of design evolves as a project progresses. It starts with an idea or concept for the project that is being considered. This is followed by a great deal of creative thought or "blue sky thinking", usually by a very small Design Team working closely with the Client. This is the 'opening up' process. Then comes an examination of options and honing of the design into a workable solution. Finally, the chosen solution is turned into production information – the 'closing down' process.

GIRI research has indicated that in many instances design changes (which subsequently lead to errors) become necessary because thought processes and decision making processes have not been rigorously applied at the appropriate stage in the design process.

At the start of the 'opening up' process, the Client typically assembles a group of experts to prepare a Business Plan pertinent to the proposed scheme. This plan establishes (both qualitatively and quantitatively) the 'key vision': what the Client wants to achieve, aspirations, key risks/ opportunities and any high-level assumptions about the proposed scheme.

The next stage involves frequent and regular meetings during the development of options. Different options are considered, with the qualitative and quantitative output of the dialogue leading to refinement of proposals. At this point there comes a need to commence the process of 'closing down' (gradually fine tuning the various options) in order to deliver a robust, buildable and affordable design for submission to planning authorities and the preparation of production information.

Confidence in the opening up and closing down process allows the Design Team to develop the design and subsequently to develop production information to allow procurement and eventually construction.

Conversely, failure to properly carry out and complete the process can, and frequently does, lead to avoidable design changes down the line.

These failures can include allocating too little time, money and importance to the early design stages (see Section 2), or not properly concluding and 'signing off' each stage before moving to the next. For example, during 'blue sky thinking', it is quite appropriate for many wacky ideas to be generated, most of which will be quickly rejected; but if a bad idea is signed off and is only discovered at detailed design stage, then the scale of design change required can be massive.

Recommendation

The difference between the opening up and closing down stages should be recognised and identified. Sufficient time, resources and priority should be attached to each, particularly to the 'opening up' stage of creative thought and 'blue sky thinking'.

At some point during the 'opening up' stage, a Business Plan should be produced. This should contain sufficient detail to enable executive review, comment and sign-off and needs to demonstrate that it has been tested against the key visions of the project. The Business Plan should be sufficient to inform the appointment of Designers and project team, whereby the plan can be developed into a suitable design brief (see Section 6).

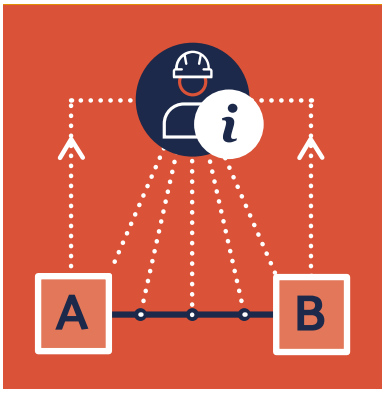
This should be followed by regular dialogue meetings as options are developed. It is important that these meetings test and challenge the brief through positive exchanges and discussion, and the behaviours at dialogue meetings are therefore critical to the success of this process. Participants need to be positive, open minded, appreciative, free-flowing with ideas, questioning, challenging, innovative, explorative and encouraging (see Section 1).

Summary

The concept of 'Opening-Up' and 'Closing Down' a project allows for all creative thinking and key decision making to be carried out and completed in good time prior to preparation of subsequent production information. This reduces the necessity for change and hence the opportunity for errors. The process can be improved by:

- Providing sufficient time, resources and priority to the 'opening up' stage
- Testing the developed design brief against the key visions
- Participants need to contribute to the process by being positive and open minded but question and challenge if necessary

10



Contractor Input:
A sense check from the Contractor's perspective

All projects will benefit from tapping into a Contractor's knowledge and experience of issues such as delivery, buildability and construction techniques, at an early stage, before design options have been closed down. But frequently this process is prevented because of commercial rules, particularly those that govern the tender process. This can lead to design changes after tender award, resulting in avoidable errors as well as unnecessary waste.

The Issue

The design process involves the identification and exploration of a number of different options in order to reach the best solution. But often Design Teams spend too long working up design options that may appear sensible in design terms, but contain fundamental flaws in terms of buildability, delivery or construction. As a consequence, resources are used up on unnecessary work when those resources could be better deployed to work up the design that is actually going to be developed.

The issue has been made worse by the use of computer software, which makes it easier to explore options, but does not require the Designer to establish how to build something before committing to a particular solution. Moreover, fewer Designers these days have sufficient knowledge and experience of construction (partly due to Design and Build procurement and designers not being novated) to make judgements about buildability themselves, so time and effort is wasted on pursuing design options that are subsequently shown to be slow, expensive or impossible to build.

However it can be very difficult to obtain contractor input at the early stage of the design process. If a Contractor is appointed early through some form of 'early contractor involvement' then it can be difficult to ensure that Contractor's price is competitive; and there are concerns that if a Contractor is consulted before tender, then this will lead to an unfair or uncompetitive tender process.

Recommendation

Contractors, with their knowledge and experience of delivery, buildability and performance, should be involved in all projects at an early design stage, regardless of the form of procurement.

This may involve appointing the Main Contractor early, so that their expertise may be harnessed during the process of developing and refining the design. Or it may involve appointing a Contractor on a consultancy basis to assist the design team.

We recommend that as a minimum on every project the Client should appoint a suitable Contractor (or Contractors) on a formal basis with the appropriate caveats, to consult with the Design Team so that the Contractor becomes integral to the process as the design develops.

As part of their role, they could undertake design reviews to verify that all Designers have fulfilled their duties, in particular in meeting the Client's requirements and the specified level of design information required (see Section 5).

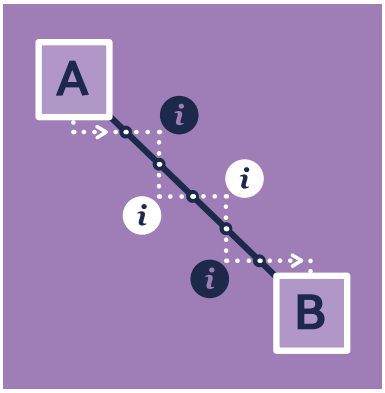
Designers' duties as described in their scope of services should be made available to the Contractor in order to allow the design to be challenged if it falls short of satisfying the agreed requirements at a particular project stage. Whilst this might be seen as controversial, over time it could help regulate the level of quality of designs, and hence reduce errors.

Summary

All projects, regardless of the form of contract or procurement, would benefit from Contractor advice at the design stage. This should be encouraged and would lead to a reduction in design errors. One means of achieving such involvement would be to engage Contractors to undertake design reviews at various stages. A Contractor's input as part of this process could:

- Be on a consultancy basis to assist the design team
- Assess designs against delivery, buildability and construction considerations
- Verify that designs meet the requirements of a particular stage or that Designers have fulfilled their duties as described in their scope of services

11



Handover:
Passing on the baton successfully

Failure to communicate design intent adequately to specialist Designers, Contractors and Sub-contractors can have major consequences. If a comprehensive set of information is produced at the handover stage, and communicated and reviewed effectively, then the design is less likely to be misinterpreted, resulting in fewer errors.

The Issue

When handing over information, for example drawings, specifications, BIM models or schedules, Designers do not always ensure that the information is both appropriate and correct; even a small error at this stage can have big consequences.

Information is sometimes produced without properly considering who the intended audience is, and without any prior consultation; a drawing to communicate a design option to a Client will not be the same as a drawing for a worker on site. There may not be a common understanding within a team about what the team is expected to deliver at each stage. Missing, withheld, hard-to-access or difficult-to-interpret information slows down design and delivery, as Requests for Information (RFIs) are issued and replied to. This in turn can, and frequently does, result in errors. Furthermore, one of the most valuable resources on a project is time, and wasting time is not only costly in terms of resources, but also has a knock-on effect on the project programme.

For example, with Design and Build contracts on building projects, with the increasing use of BIM, design models are sometimes discarded following handover to the Contractor, and the Contractor starts again from scratch. The reasons for this are several but may include:

- The Consultant's model may not always align with the specification. As specifications take precedence over drawings, the contractor feels it is safer to start again to ensure correctness
- The Consultant passes design duties on to the Contractor, which necessitates changes to the design model
- Consultants' designs are not coordinated together across the various disciplines
- Tender designs are not updated when issued for construction with changes that have come about during the negotiation period

As a result of any or all of these deficiencies, the Contractor will issue a series of RFIs. But by that time, the Design Team has often been scaled down as some individuals have moved onto other projects, or the design fee has been depleted, so the time to resolve the issues is further extended, and the opportunities for error increased.

Recommendation

Great care must be taken at handover of design to ensure that the information being communicated is clear, accurate and appropriate for the intended audience (see Section 7).

This starts with clarity of who is expected to do what. A project-specific plan of work for each discipline should be developed before any design commences (see Section 5).

Also, clarity and a shared understanding of the design responsibilities of the Contractor, Sub-contractors and specialist Designers can remove ambiguity. Gaps or duplication can create muddled thinking and unnecessary effort. The completion of standard forms, such as the BSRIA BG6 matrix for building services, goes some considerable way to assisting this.

To ensure a successful handover, a design review with specialist Designers and Sub-contractors at a workshop would enable an effective 'passing of the baton'. It would help to define the workload left to be undertaken by the Designers and assist in ensuring sufficient resources are made available to complete the duties stipulated.

Summary

The communication of design information should be relevant, convey the design intent and be clearly presented to all necessary recipients. The following should be considered:

- Provide clarity as to the purpose of design information when it is issued
- Carefully and clearly define design responsibilities for all parties
- Ensure that information is relevant, complete and comprehensive
- Organise reviews with specialist Designers and Sub-contractors in order to enable an effective handover

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Guiding the Design Team:

Valued input from an Independent Principal Consultant

Appointing an Independent Principal Consultant to have accountability and to be the 'controlling mind' for the design process, from start to finish of the project, would greatly reduce the risk of design errors.

The Issue

Design is typically an iterative process involving numerous communications, be they verbal, written, or drawn. Communications which on the face of it appear simple can be misinterpreted. The more participants or interfaces there are in the process, the more complex it becomes, and the greater the probability that misinterpretations will occur. This results in any number of participants or stakeholders making decisions which are flawed. Typically it is merely a question of time before problems are discovered and corrective actions are required. Unfortunately these situations, however seemingly simple or minor, can have disproportionally large consequences.

Furthermore, contractual relationships make the whole thing considerably more complex as they influence the ability and opportunity for Designers to do the right thing. Time is money and if a company is losing money, how motivated will it be to provide the best service it can and, in particular, to help remedy the effect of errors by other parties?

So when the consequences of a design error start to surface, it can be a big problem – with cost, programme, reputation, and even individuals' jobs under threat. Typically, a meeting is called with the various Designers and Sub-contractors, and everybody is of course pointing the finger at each other. Naturally, nobody wants to take the blame, and they all probably think it wasn't them anyway. Everybody has a contract to do certain things and all believe they have discharged their duties and it wasn't their responsibility to check each other's designs for mistakes. The lawyers can be called in, but there will be gaps or ambiguities in the contracts, and the lawyers will argue for ever, whilst money is haemorrhaging and the project is on hold.

These design errors can come from a wide variety of sources. It is by no means unusual for designs, particularly at an early stage, to be underpinned by assumptions, which may subsequently turn out to be flawed: this may be for any number of reasons such as lack of survey data or the design of other disciplines not being fully developed. More importantly a specialist Designer may have excluded an aspect of the overall design from his commission, and this may not be obvious to, nor expected by, the Main Contractor. For example, a scaffolding structure may need restraint from an existing building and the designer has noted, perhaps in small print, that fixings are to be validated or designed by others.

It is therefore essential that design assumptions and exclusions are clear and transparent. Incorrect assumptions can lead to adoption of sub-optimal

and/or unsafe design solutions. Design assumptions must be validated, particularly those with high impact. Design exclusions must be addressed and co-ordinated as failure to do this may have significant implications.

Control of design and of changes to design were once the responsibility of the 'Lead Designer'. However, changing roles, increases in complexity and the number of parties involved, and (in building projects) the widespread adoption of Design and Build contracts has meant that the Lead Designer is not always able to exercise clear overall responsibility throughout design and construction. An alternative approach may be required.

Recommendation

Too often lack of discipline and robustness allows decisions to be delayed or never made, error to remain un-corrected and a blame culture to arise as to who is responsible for what.

To help mitigate these issues, the introduction of a "controlling mind" would ensure that design-related information and communications are robust, co-ordinated, and controlled. Moreover, that at each gateway (or milestone) the design does not proceed to the next stage until all of the appropriate checks have been made and decisions have been resolved (see Section 11). The controlling mind would also ensure clear accountability to make sure that the right communications have happened, been demonstrably understood, assumptions have been resolved, and that there are no gaps. This should reduce a very significant risk.

We describe this role as the Independent Principal Consultant (IPC), which may be challenged by some, clients included, especially if extra fees must be expended. Indeed, this role is unlikely to be required if all the other recommendations in this Design Guide are followed. However, the appointment of an IPC should be considered at the outset of a project, particularly when sizeable or challenging. This may be just one person or, depending on scale and complexity, could be a team of people with the requisite skills and experience to manage the risk and ensure success. Nevertheless the IPC must: be independent of the Client and the other main Consultants, have the confidence of the Client and be given sufficient authority, and act from start to finish.

Summary

Introduction of an Independent Principal Consultant as the 'controlling mind' for design development is critical to ensure that design-related communications are robust, co-ordinated, and well managed. Such an appointment would reduce the number of design errors and mitigate their consequences. The role would also ensure that:

- Designs do not proceed beyond a milestone until all relevant checks have been carried out
- The right communications have happened, are understood and that there are no gaps

Furthermore, the IPC:

- Could involve an individual or team depending on project scale and complexity
- Must be independent of Client and Consultants, be provided with authority and be involved from start to finish
- Is NOT the Lead Designer. The Lead Designer is responsible for controlling the Design and the quality of the Design

Next Steps

We hope that you find this guide to be a useful tool to support the design process.

A key philosophy of the Get It Right Initiative is that we should all learn from our mistakes by sharing those mistakes and the appropriate solutions across the Industry. We are sure that this guide can be improved with experience and use, so we are hoping that you will provide feedback with your comments and suggestions.

The Design Working Group that worked on the guide will be meeting to consider how the Initiative can further help to improve the design process. It is planned to update this guide on an annual basis.

The Get It Right Initiative welcomes your feedback on this Design Guide. Please email your comments to info@getitright.uk.com and include your company name and job title.

In accordance with GDPR legislation your email to us indicates your consent to GIRI collecting your name, email address, company name and job title. For more information on our privacy policy and how we protect your data please visit: https://getitright.uk.com/privacy/

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