

GIRI - Problems of Errors in Design (Buildings) and what we should do about it

The following note was written by Hugh Ferguson & Ed McCann based on discussions at the GIRI Design Working Group in October 2017.

There were many surprises that came out of our research into errors in the construction industry. One of the most startling was that many of these errors, 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. And these deficiencies are most marked in building, where the number of designers, contractors, trades and suppliers tends to be greater than on infrastructure projects.

In the survey, the 'top six' most significant root causes of error on buildings were found to be (in order): inadequate attention paid in the design to construction; inadequate planning (from task through to project level); late design changes; poorly coordinated and incorrect design information; ineffective communication between team members; and poor interface between management and design.

The same point came through with the comments of some of the building trades contractors surveyed. 'Poor initial design and incorrect specification lead to costly errors' said one. 'Main contractors have, in the main, lost the skills required to successfully manage the supply chain – from placing the order – through design and delivery' said another. And from a third: 'The quality and timing of design information we receive from the professional teams is at an all-time low'. The latter comment picks up a point which came over strongly in the survey, at least anecdotally: that the problem is far worse than it was a generation ago.

Since no-one had appreciated just how big a part design problems play as causes of error in construction, it is not surprising that the issue has so far failed to attract as much attention as it deserves. To put things right, the first step is to unpick where things are going wrong.

The arrival of these difficulties has coincided with the widespread adoption of design-and-build (D&B) procurement which now accounts for a large majority of the UK's building projects. Not that there is anything wrong with design-and-build per se. There are at least three very good reasons for its adoption. It provides the client with a single point of responsibility – the building contractor – rather than having it split between architect, other designers, contractor, and specialist suppliers; it can increase cost certainty by getting real pricing of materials and components and proper consideration of method-related costs; and involving contractors in the design process should lower costs and save time by ensuring that 'buildability' is properly considered and that 'value engineering' is done. The logic is compelling, the UK market has largely settled on this model, and the trend is not about to be reversed.

One might expect that by now the design process, behaviours, responsibilities and workflows would have adjusted to the new reality. But in many cases they have not. Instead, the changes have produced a series of unintended consequences, which have had the effect of destabilising the process.

Once upon a time the architect was – unequivocally – the lead designer, the person who would pull together all the detailed drawings and specification on which the contractor would tender, the coordinator of all design information on the project from the start through construction to the finish.

All may not have been perfect, but by and large, each person on the project knew his (or her) place, had the right training and experience to do his job, and expected the same from those around him. There was an unambiguous chain of responsibility. Under D&B, responsibility to the client for the design is switched from the architect to the contractor at some point in the project process – usually after preliminary design has been prepared but long before detailed design has been completed.

To illustrate the unexpected consequences of these changes, let's take the not-entirely-hypothetical example of a £100M building with several thousand drawings. With the switch of responsibility, 'Dave the contractor's Design Manager' finds himself with a much enhanced role. In the old days his principal task was to ensure that construction drawings were complete and issued on time, but now he is doing design coordination across a team of consultants and suppliers and he is expected to make important design decisions about which he may have limited experience.

Poor decisions (by Dave in this case) will usually need to be unpacked and rectified resulting in much confusion and delay.

Meanwhile 'Andy the Architect' now finds himself employed by the contractor, who is applying commercial pressure to contain Andy's fees. Andy now has little motivation to refine and coordinate the detailed design – and no motivation at all to inspect the works thoroughly and point out errors: on the latter issue, this suits Dave just fine.

Andy's progressive retreat from the business of building results in him doing less and less practical designs and removes a useful quality control element from the construction phase.

One day 'Chris the Commercial Manager' comes into Dave's office and says: 'Look, these Italian toilet bowls costs a bomb – why can't we use these ones from Kazakhstan, they look much the same?' 'Hmm' replies Dave 'the Employer's Requirements don't say much on the question of toilets, and after all we are responsible for design....'.

Two weeks later Dave breaks the news to Andy, who throws a fit, telling him that the toilet bowls were the core of his 'Vision' and the reason the building was going to win the Stirling Prize. 'Sorry about that' says a bemused Dave 'but Chris has just bought 1000 of the Kazakh ones, and what's wrong with papier-mâché toilet bowls anyway?'

Andy calls up 'Clive the Client' in tears telling him the 'Vision' is down the pan, and that he refuses to have his name anywhere near the job. Clive cancels his booking for the Stirling Prize and decides that in future he will get a set of Employer's Requirements that specifies everything 'important' down to the last blob of mastic.

So next time, Clive gets Andy and the professional team to produce a set of Employer's Requirements that fully controls all of the 'visible parts', but leaves the design co-ordination and all of that tricky M&E stuff to the contractor: after all, surely they can do all that, and by now Andy and the team have forgotten all they ever knew about design coordination. And so the 'Design and Build' contract has become the 'Design (a bit) and Dump (a lot)' contract.

This highly dysfunctional situation leads those involved to retreat into their silos, protecting their own positions rather than working for the good of the project as a whole.

Whereas design moves from the general to the specific starting with a holistic system approach to the detailed components, buildings are put together as a series of separate often siloed systems ie from the specific to the general. Many contractors fail to understand the interconnectivities and

when seeking to optimise cost or program, focus on one system without considering the impact on the whole. The problems created by designers' ignorance of the build process have in many cases been replaced by problems created by contractors' ignorance of the design process!

Overall, it is clear that the quality of design information is not as it needs to be if we aim to minimise errors in construction.

There are no quick-fix solutions. In particular, simply reverting to appointing the contractor only after detailed design has been completed would be a backward step, as all agree that early contractor involvement can provide great benefits. But there are areas emerging on which the industry should concentrate to secure improvements:

- Responding to the challenges of design-and-build, and in particular, defining with clarity who is responsible for leading and coordinating design at every stage.
- Bursting into the 'silos' in which people tend to entrench themselves, and finding ways to encourage them to work together for the good of their project.
- Addressing the manner and timing of the communication of design information, with the emphasis on what the receiver needs to know rather than on what the designer wants to say.
- Creative ways of introducing designers to how things are built without requiring years on site, and vice versa for contractors.
- Shifting the training of construction professions so that they become more skilled in contingency planning, and better able to respond positively when 'stuff happens'.
- Some more research to gain a better understanding of what is causing these problems with design.
- Allowing more 'up front' time so that design can be done logically and completely before construction.
- Where clients are not experienced developers, encouraging their professional advisors to take trouble to educate them so that they can make informed decisions.