

## **APILOT STUDY IN BOTSWANA'S CONSTRUCTION INDUSTRY ON DESIGNERS' WILL AND CAPACITY TO DESIGN FOR HEALTH AND SAFETY.**

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### **ABSTRACT**

Designer's role on health and safety (H&S) performance improvement is a subject that has received much attention than any other aspect relative to the designer. However, much research has been on the incorporation of H&S in designs and how designers influence H&S. There is little research on the designer's will and capacity to contribute to H&S performance improvement especially in Southern Africa and Botswana in particular. This paper seeks therefore to highlight this aspect as a way of addressing one of the barriers to H&S performance improvement

The purpose of this paper is to present findings of a small pilot study conducted among construction designers to establish their will or motivation and capacity to contribute to construction H&S in Botswana. A questionnaire survey was conducted among construction designers to establish willingness and capacity to incorporate H&S in their designs.

Findings on the will to contribute to H&S, relate to designers incorporating H&S in their designs, external influence to consider H&S and mandate from the client to consider H&S are presented. Designers' capacity relate to education and training and their experience on matters relating to H&S. The pilot study indicates an inadequate level of will and capacity for designers to consider H&S in their designs.

A better H&S performance improvement can only be achieved with the designer's active participation. Results from the survey on designers' will and capacity highlight the importance of considering this aspect of designers. Designers' will and capacity is inadequate and it shows in their inconsideration of H&S in current designs. A proposal is made to look at ways to improve designers' capacity as well as ways to motivate them to consider H&S.

### **Keywords**

Capacity, construction, designers, H&S, will

### **INTRODUCTION**

One of the efforts that have for some time been considered as a means to improve H&S on construction sites is the aspect of designing for safety. According to Gambetese et al (2005) designing for safety is an intervention identified by many as a breakthrough idea for improving construction site safety and which is gaining support in the construction industry.

Traditionally, H&S hazard mitigation measures have been implemented solely by contractors during the construction process and many believe that additional actions can and should be taken earlier in the project, during the planning and design phases (Hecker et al, 2005). Many researchers on H&S agree that H&S is not an issue that can simply be left to contractors alone. Designers must be involved (Behm, 2005; Hinze, 1999 and Suraji et al 2006). According to Hinze et al (1999), it is naive to suggest that designers have no role in construction H&S. Hinze et al (1999) maintains that decisions made by a designer have a direct impact on H&S of construction workers. Mackenzie et al (1999) also cited design decisions as being one of the causes of accidents on construction sites. A lack of full participation by designers in construction H&S can have a negative impact on the standard of H&S in the industry.

There are however questions as to whether designing for safety is a breakthrough idea for H&S interventions on site even though its popularity is gaining ground. A similar question on the viability of designing for construction safety was raised and investigated by Gambetese et al (2005). After this investigation, they concluded that designing for safety was a viable intervention for safety. However barriers currently exist which limit its implementation.

Having established that designing for safety is a viable intervention for H&S and compelled by the fact that designing for safety does not seem to be done in Botswana and indeed even in United States of America (Gambetese et al, 2005), the need to investigate designer's will or motivation and capacity to design arose. This paper therefore reports on findings from a pilot study on designers' will and capacity to design for H&S in Botswana's construction industry. This study is therefore complementary to all studies cited above but specifically to that conducted by Gambetese et al (2005).

## **DESIGNING FOR SAFETY**

When H&S is considered in the design of structures or when designs are appraised in terms of H&S, action plans are developed to ensure that risks are engineered out of the system before they are able to cause injury, disease, damage, or even loss of life on site. Behm (2005) defines design for construction H&S as being the consideration of site safety in the design of a project. Specifically this includes: modifications to the permanent features of the construction project in such a way that construction site safety is considered; attention during preparation of plans and specifications for construction in such a way that construction site safety is considered; the utilisation of specific design for construction safety suggestions; and the communication of risks regarding the design in relation to the site and the work to be performed.

Similarly, according to Hecker et al (2005), interventions to eliminate hazards before they appear on the jobsite are commonly known as designing for construction safety. Hecker et al (2005) explains that the foci of designing for construction safety efforts are typically the incorporation of construction knowledge in the design effort and consideration of safety early on and throughout the project. Equally, Hinze et al (1999) advocates for a holistic approach of designing for the entire life cycle of a project, including the construction process. He contends that effectively addressing construction safety issues means the designer must consciously assess the implications of each construction phase on safety as the facility is being built. In addition, he suggests that a thorough risk assessment of each design component should be done (Hinze et al, 1999).

All above definitions on designing for H&S can be summarised by Hale et al's (2007) definition that design should include the design specification and requirements at one end and the instructions and procedures for use at the other. However, this conclusion also has implications for the definition of "design errors". Hale et al (2007) contend that we should not therefore talk of "design errors" but rather of errors in a specified step in the design process.

Safe design therefore means a design that allows and conditions, as far as feasible, safe use across the whole life cycle including demolition and disposal (Hale et al, 2007).

Design for safety therefore calls for an extensive knowledge on H&S as opposed to a mere general awareness of the subject.

## **CONTRIBUTION OF DESIGN TO ACCIDENTS**

Safety in design is driven largely by a logical conclusion that systems development begin with design and so design offers the earliest and hopefully the cheapest place to intervene and get it right (Frijters and Swuste, 2008; Hale et al, 2007 and Hecker et al, 2005).

According to Hale et al (2007), the factors that compel designers to consider H&S in their designs include:

- Ethical considerations and concern for the organisation's reputation;
- Liability claims resulting from damage and injury; and
- At a legal level it is an increasing emphasis on the liability of the designer for incorrect design decisions. However Hale et al (2007) contend that this liability is limited in most cases whether under strict liability or tort law systems, to what the designer has control of and can reasonably be expected to do.

Although design for H&S may be as a result of the above factors, benefits or the impact of designing for safety are well documented. The following selected studies reveal that design has an influence on H&S on construction sites.

- An investigation across aviation and nuclear industries by Kinnersley & Roelen (2007) confirmed that 50% of all accidents have root causes in design;
- Gibb et al (2004) in 47% of cases reviewed, changes in design would have reduced the likelihood of accidents;
- Behm (2004) found that design was linked to accidents in approximately 22% of the 226 injury incidents that occurred from the year 2000 to 2002 in USA's Oregon, Washington and California. He also found that 42% of the 224 fatality incidents in the USA from the year 1990 to 2003 were also linked to design;
- Hecker et al (2001) also identified elements in design, planning, scheduling, and material specifications as probable contributors to working conditions that pose risks to musculoskeletal injuries during the actual construction process; and
- UK's HSE examined 100 accidents and found that up to half of the accidents could have been mitigated through a design change (HSE, 2003).

According to Kirwan (2007), it is clear that the roots of accidents are sometimes at an early design stage. Accidents have their roots in the design process and this appears to be a common fact across all industries.

## **BARRIERS TO DESIGNING FOR SAFETY**

According to Gambetese et al (2005), some of the factors that have contributed to designers' lack of motivation to design for H&S and thus a barrier to H&S improvement include the following:

- Weak or absent regulatory requirements for designers to design for the safety of construction workers;
- OSHA's placement of responsibility on the employer (typically the contractor) in the USA;
- Liability concerns among architects and engineers;
- Narrow specialisation of construction and design;
- Limited availability of safety- in- design tools, guidelines and procedures;
- Limited preconstruction collaboration between the designer and the contractor due to the traditional contracting structure of the construction industry; and
- The limited education architects and engineers receive on issues of construction worker safety and how to design for safety.

The last point above poses even a bigger problem in designing for safety. There is little knowledge by designers on problems such as how the operation or construction will be undertaken (Kirwan, 2007). Kirwan (2007) argues that there is often little detail if any on the procedures to be followed or controller (person to implement the design) working practices proposed for the concept. This according to him amounts to a lack of a mature operational concept, one that is sufficiently detailed to allow safety hypotheses (e.g. what would happen if....?) to be answered (other than - well it depends how we operate or implement it'). This problem coupled with the requirement that safety assessment of new concepts requires incorporating expert judgements where data are not available or not representative. There is need therefore for designers to be adequately equipped in H&S (Kirwan, 2007).

Hale et al (2007) raises a further problem or hindrance to achieving a total design for safety. He argues that the nature of design as a distributed process raises the same sort of concerns as the division of labour that characterised the Taylorian approach to production and assembly line manufacture. This led to problems because no individual participant in the process has the overview of, or the sense of ownership for, the product being made. Such Taylorian production lines only work when there is a strong central planning and control function, which ensures this overview and the necessary communication and optimisation. Hale et al (2007) maintains that the

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same lack of ownership of the total design and the problems of interfaces between the different actors can be seen in the design process and thus pose a problem or barrier to H&S improvement.

Despite the above barriers, the overall conclusion is that the design stage is all important for achieving a lasting safe system. The almost 50% 'residual' rate for design contribution to accidents suggests that designers, safety and human factors, personnel and other stakeholders need to work closer together to bring this rate down, and therefore prevent more accidents (Kinnersley & Roelen 2007). However questions arise as to how this can be achieved.

## **DESIGNING FOR SAFETY AS AN INTERVENTION**

Consideration of H&S in design of facilities is a very significant step in working towards H&S performance improvement. Kirwan (2007) argues that since accidents often have their roots in design, the sooner safety starts the better. In particular, hazards or hazard causes identifiable early on may become more difficult to find or correct later, with the risk that they become latent errors in the system design. In Europe as a result, building designers have a legal obligation to take working conditions throughout the project into account in their designs. The obligation contained in Directive 92/57/EEC is now incorporated in most EU Countries' legislation.

Although designing for safety has not been widely adopted by many designers, Gambetese et al, (2005) contend that designing for H&S is a viable intervention in construction. However they noted various barriers that currently limit its implementation including: the structure of the construction contracting process; a lack of knowledge and acceptance of the concept; designer education, training and construction experience; competing project objectives; and motivation to implement the concept (Gambetese et al, 2005).

Notwithstanding the above barriers, designers can have an impact on a significant number of injuries and fatalities by considering construction H&S in their designs (Weinstein et al, 2005).

One of the benefits noted by Kirwan (2007) of an early involvement by designers is that it will lead to designers also thinking about H&S from the start rather than thinking that it is something that comes later and not their job or concern. Other residual benefit which is very important and has a lasting impact and influence on H&S is the new culture that is created. According to Kirwan (2007), H&S culture can be enhanced by early consideration of H&S in the design process. Not only do the designers become more exposed to safety and its mission and practices but other stakeholders from the project managers to contractors taking part in early simulations, realise that H&S is being addressed in a useful way and thus reinforcing its importance for all concerned and its continual presence throughout the entire system life cycle.

However in order for designing for safety to be effectively used as an intervention, albeit not on its own, the following interventions in the sections below need to be considered.

There is need to address procurement systems. Gambetese et al (2005) noted that the type of project delivery method can impact the extent to which H&S is addressed in the design. The forms of project delivery essentially alter the roles played by the different parties and most importantly the allocation of responsibility (thus liability) is also redistributed. According to Gambetese et al (2005), the traditional design-bid-build approach and others of a similar nature keep the parties apart and there is presumably no payback for the designer to address construction worker safety. This way, the designer is a stand-alone entity and as an isolated entity, designers often revert to their traditional role of not getting involved in addressing safety (Gambetese et al, 2005).

Where there is no existing organisation with a powerful central role in managing the parallel design processes, there is then a task for government or such other client in bringing together the players in the design process to define and coordinate their roles (Kirwan, 2007). This view is supported by Hale et al (2007) and explains that for designs within the diverse systems with many uncoordinated players, the issues of responsibility for predicting risks and making choices to control them is very important and is sometimes identified. However according to Hale et al (2007) the allocation of responsibilities and above all the possibility of checking and enforcing that those responsibilities are carried out is almost nonexistent. Hale et al (2007) further acknowledge that the best practice for coping with this issue is bound to differ across different systems but argued that there should be more explicit attention to this question in the sectors with less developed design processes.

The above is supported by Gambetese et al (2005) who also contends that the owner is the key to getting the designer involved in the safety process because the owner can alter the way the

project should be procured and address specific issues regarding safety in the contract as well as the coordination.

In addition to all above, opportunities must be created for designer-constructor interaction in the course of specific projects (Cosman, 2004). Weinstein et al (2005) established that trade contractors provide valuable input in design and programming and to a certain extent; other team members rely on trade contractors for practical advice on how to modify the design to make it safer.

Further, designers must also be convinced of the role they have to play through university and continuing education and industry wide campaigns. Cosman (2004) argues that action needs to be focused on resolving the discontinuities between the knowledge about design implications on H&S, the skills to deliver better designs and the drivers affecting the scope and conduct of design activities. Design review by designers with H&S knowledge can lead to enhanced safety outcomes even within more traditional design-bid-build procurement methods (Weinstein et al 2005).

## **PILOT STUDY**

A pilot study was conducted to try and establish designers' will and capacity to design for H&S in Botswana.

Senior partners of Architectural and Engineering consulting firms registered with the Botswana Institute of development professions (BIDP) were selected for participation in the study. It was deemed suitable to interview senior partners of the registered firms because they are employers and also ascribe to certain norms demanded by their professional body. There are ten (10) registered architectural and engineering consulting firms on the current list that are based in Gaborone, Botswana. All firms were selected as participants to the study.

A structured questionnaire was used to collect information on a number of projects that these firms have been involved in, on whether H&S was one of the project deliverables, on the frequency with which their clients assign the responsibility of managing H&S to them as well as on whether they consider H&S in designs and what the motivation has been on designing for H&S if at all it had been done before. Most questions in the questionnaire were based on a five point Likert rating scales of frequency, agreement or importance. This method was considered appropriate for this type of a study. However, a more multifaceted and rigorous methodology will be followed in the next phase.

Questionnaires were administered by way of email to 10 senior partners of BIDP registered consulting firms. Results from the questions were compiled and analysed against what literature informs. Based on this analysis, conclusion and recommendations have been reached.

Out of the 10 questionnaires that were sent, 8 questionnaires were returned. This represents an 80% response rate.

Although a BIDP website list of registered consulting firms was used, it is acknowledged that there are many consulting firms that are currently practicing and provide services to many organisations including the Government. The sample used therefore may not be representative of all consulting firms in Botswana. The generalisation of findings of the study to the entire spectra of consulting firms in construction is therefore limited considering the small sample size. However, for the purpose of this pilot study, it will give an indication of what the will and capacity is regarding the concept of designing for H&S in the construction industry.

## **FINDINGS**

The survey instrument had three sections which comprised of questions on motivation for H&S design, capacity of designers to design and also questions on the current practice regarding H&S design.

### **Motivation**

The following factors identified from literature were considered to be motivators for designers to design for H&S:

- Legal requirements;
- Community requirement;
- Professional ethics;

- Client emphasis;
- Status of H&S deliverable on the projects;
- Inclusion of H&S in client briefs; and
- Client mandate to designers on H&S.

An evaluation of the factories Act of Botswana reveals that it is not necessarily a requirement for designers to design for H&S. Findings from the questionnaire survey also found that four of the respondents never really designed for H&S. Actually, only one of the respondents cited legal requirements as the reason for designing for H&S. Further, none of the respondents cited requirements by their professional body as well as the communities in which projects were undertaken (Table 1.0). One of the respondents cited personal conviction as reason for doing so whilst none cited the number of accidents in the industry.

**Table 1.0** Motivation for designing for H&S

Motivation	Response(No.)
Never really designed for H&S	4
Legal requirement	1
Requirement by professional body	0
Requirement by communities	0
Requirement by municipal councils	2
Personal conviction	1
Number of accidents	0

The other motivation for H&S design is the level of importance placed on H&S by the client. Respondents indicated that of the projects that they had been involved in the last three years, none of them had H&S as an important deliverable. Further, four of the respondents felt that clients considered H&S not to be important or just fairly important. Responses on the question of the extent to which H&S is highlighted in clients' briefs were that three respondents felt that there was a moderate emphasis on H&S. As can be seen in Table 2.0, six of the respondents indicated that clients mandated them to ensure that contractors complied with the H&S regulations. Only one of the respondents cited design for H&S as one of the mandates from the clients whilst the other respondent indicated that they had never received any mandate concerning H&S on the project.

Designers also perceived that they do not really benefit from a better H&S as much as the other parties do. According to designers, contractors ranked first followed by clients, all stakeholders and lastly designers (Table 3.0).

**Table 2.0** Clients' mandate to designers

Mandate	Response (No.)
Design for H&S	1
Ensure compliance of contractors	6
Conduct H&S inspections	0
None	1

**Table 3.0** Perceived party's benefit from H&S (1 not & 5 very much)

Party	1	2	3	4	5	Rank index	Rank
Contractor	0	0	1	1	6	3.625	1
Client	1	0	3	0	4	2.750	2
All stakeholders	0	2	3	3	0	2.125	3
Designer	4	3	1	0	0	0.625	4

## Designers' capacity and practice

Designers' capacity to design for safety relates to the amount of enablement that they have and the confidence. The following knowledge areas were assessed in order to inform on designers' capacity to design for H&S:

- General H&S awareness;
- Adequate knowledge on H&S to enable designers to design, manage, assess H&S risks, advice clients and take full responsibility; and
- Specialised training on H&S.

Five of the respondents indicated that the knowledge they have on general H&S awareness is average. A similar number of respondents indicated that H&S knowledge adequate to enable them manage a project as well as provide advice to clients is average. It was however interesting to note that over 60% of the respondents indicated that their H&S knowledge to adequately design for H&S was above average. As can be seen in table 4.0, three of the respondents indicated that their H&S knowledge to adequately design for H&S was above average whilst two of the respondents indicated that it was excellent. Regarding taking full responsibility, four respondents indicated that their knowledge was below average and the other four indicated that it was simply average.

On whether any member of their organisations had received specialised training in H&S, five of the respondents indicated that they had whilst three indicated that they did not have. However seven of the respondents indicated that they did not have a specific person or section that was responsible for H&S. Four of the respondents also indicated that they had never really designed for H&S.

**Table 4.0** Designers' knowledge in H&S

Knowledge area	poor	Below Ave.	Ave.	Above Ave	Excellent	Rank index	Rank
Adequate for design	0	2	1	3	2	2.625	1
General awareness	0	0	5	2	1	2.500	2
Adequate to asses H&S risks	0	2	2	3	1	2.375	3
Adequate to manage H&S	0	1	5	2	0	2.125	4
Adequate to be able to advice clients	0	1	5	2	0	2.125	4
Adequate to cost for H&S	0	3	3	1	1	2.000	5
Adequate to take full responsibility	0	4	4	0	0	1.500	6

## DISCUSSION

### Designers' will / motivation

The will or motivation for designers to address H&S in their designs stems from both internal and external factors. Internal factors include both what designers perceive to be benefits to themselves and their organisation as well as personal conviction on the cause. External factors include those factors that in a way compel designers to consider H&S in their designs.

An evaluation of responses on whether designers felt that they benefited directly from a better health safety record revealed that they actually considered contractors to be the parties that benefitted more directly from a better H&S record. Designers considered themselves to be the least beneficiary and thus ranked last (Table 3.0). It can be argued that because designers did not feel that they benefitted directly from a better H&S, can be reason enough not to some extent motivate them to design for H&S. It is argued that motivation is much more likely to be driven by perceived direct benefits from designing for H&S to them, other than anything else. In this case however, designers consider contractors, followed by clients, other stakeholders and lastly designers to have direct benefits from a better H&S. It can also be argued that it is no wonder



much responsibility and focus is placed on contractors. Actually four of the respondents in this survey, equating to 50% felt that designers should not be held responsible for site safety.

Findings on what enthused designers to design for safety also revealed that personal conviction on the cause did not rank highly. Only one respondent cited personal conviction as the cause for designing for H&S whilst about 50% of the respondents indicated that they had never really designed for H&S (Table 1.0). Taking for example two pillars supporting a beam to represent benefits as one pillar and personal conviction to represent the other pillar and the beam to represent motivation to design for H&S, collapsing of one pillar or a compromise in its character may result in the coming down of the beam - in this case the motivation. Both pillars need to be in a good state and to an acceptable standard without compromise to their characteristics. Lack of personal conviction is as much important as perceived benefits. It is argued that motivation or the will to design for H&S would be highly compromised if one of the support factors collapse or one of its characteristics is compromised.

A number of external factors that would motivate designers were highlighted earlier in literature and include legal, professional bodies', community and local authority's requirements, client emphasis during the briefing, client mandate to designers and to some extent the current practice. Findings showed that designers are not obliged to design for safety. Client emphasis of H&S in the design brief and the mandate given to designers does not seem to be adequate enough to persuade designers to design for safety. Focus seems to have been placed on contractors as six of the respondents equating to 75% indicated that the client mandate to the designers was for them to ensure that contractors complied with H&S regulations (Table 2.0). Only one respondent indicated that their clients had mandated them to design for H&S. A clear mandate from clients for designers to specifically design for H&S is a great motivation.

As for the prevailing culture as a vehicle for motivation, findings showed that four of the respondents, about 50% of designers had not necessarily designed for H&S on their past projects. Not designing for safety on a project or actually on all previous projects has a negative impact on motivation to design for the subsequent projects. This creates and perpetuates a culture of not designing for H&S. Further, seven of the respondents indicated that they did not have a dedicated person or section that was specifically responsible for H&S. A positive H&S culture seems to be lacking in most of the organisations included in this study.

## **Capacity**

Capacity to design for safety is an important factor in designing for safety. Capacity has to do with competence. Competence to design for H&S is attained by obtaining knowledge through tertiary education and or through specialised training on the subject. An assessment of current knowledge by designers on various aspects of H&S revealed that most of the designers that were interviewed do not possess knowledge that is adequate for them to be described competent to design for H&S. On average almost 68% indicated that their knowledge on various aspects of H&S was average or less (Table 5.0). This response is also in agreement with responses on the level of knowledge possessed by designers to take full responsibility on H&S. Four of the respondents equating to 50% indicated that their H&S knowledge to take full responsibility was average and the other 50% indicated that it was actually below average (Table 4.0). This though appears to be contradictory to responses on whether respondents themselves or any other member of staff from their organisation had specialized training in H&S. Five respondents indicated that at least one member of staff in respondents' organisations, had received specialized training in H&S. It is argued that a person having received specialized training will certainly not possess average or below average of the required knowledge on the subject area. However, the contradiction could probably be explained by the fact that this particular question also referred to other staff members whilst questions on what knowledge respondents possessed referred to respondents only.

**Table 5.0** Average response of average and below average of knowledge

Knowledge area	Response (No.)
General awareness	5
Adequate for design	3
Adequate to cost for H&S	6
Adequate to manage H&S	6
Adequate to asses H&S risks	4
Adequate to be able to advice clients	6
Adequate to take full responsibility	8
<b>Average %</b>	<b>68</b>

Further, five of the respondents indicated that their knowledge on H&S general awareness was average. However, most respondents indicated that they possessed adequate knowledge to enable them design for H&S (Table 4.0). This response was interesting as more than 60% described their knowledge fit for general awareness of H&S to be average and or below average. It is therefore ironic that more than 60% respondents considered their knowledge to be adequate to design for H&S. Actually this is also contradictory to their other response on whether they possessed H&S knowledge adequate to take full responsibility and advice their clients. Table 5.0 reveals that six of the respondents equating to 75%, indicated that their knowledge was either average or below average.

Capacity also has to do with capability. Capability is the means by which a certain goal or task is achieved. In terms of designing for H&S, means could be having a specialized section or person in an organisation that can ably design for H&S. Seven of the respondents indicated that they neither have a specific person nor a section that is responsible for H&S. Designing for H&S is also a highly specialized design aspect. It is argued that it is not every designer that is able to design for H&S. In the absence of a specialized section or person, it is highly unlikely that an organisation would have the capacity to design for H&S. It is no wonder, 50% of the respondents indicated that they had never really designed for H&S in their past projects (Table 1.0).

## CONCLUSION AND RECOMMENDATION

Literature informs that for designers to be motivated and be described to have capacity to design for H&S, designers should:

- Have received training in H&S;
- Have extensive experience on H&S design and supervision;
- Be compelled to design for H&S by the legal framework and personal conviction;
- Be compelled by a positive H&S culture in both client and designers' organisations;
- Receive a clear mandate from the client on designing for H&S;
- Be aware of the status and impact of accidents in construction industry; and
- Have a strong conviction that H&S should be their responsibility in as much as it is every stakeholder's responsibility.

The pilot study on designers' will and capacity revealed that:

- Most of the time, designers are not mandated to design for H&S;
- The motivation for designers to design for H&S is low or lacking;
- The legal framework, professional bodies and the community requirements do not compel designers to consider H&S in their designs; and
- Most designers' lack the requisite knowledge on H&S to adequately design for H&S.

Findings from this pilot study seem to suggest that designers will or motivation and capacity to address H&S in designs is inadequate. Designers are a very important party to achieving a higher standard on H&S on construction sites. It follows therefore that means have to be devised to improve designers' capacity as well as motivate them to continuously consider H&S in their designs. One consideration, of which this pilot study is part, is an investigation into the client centred model to improve H&S and thus have issues to do with designers dealt with in this model.

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