

INTERNATIONAL SEEDS CONFERENCE 2016

SUSTAINABILITY ECOLOGY ENGINEERING DESIGN FOR SOCIETY

LEEDS, UNITED KINGDOM
14-15 SEPTEMBER 2016

**THE INTEGRATION OF DESIGN, PROCUREMENT, AND
CONSTRUCTION RELATIVE TO HEALTH AND SAFETY (H&S)**

DR CLAIRE DEACON AND PROF JOHN SMALLWOOD
NELSON MANDELA METROPOLITAN UNIVERSITY
SOUTH AFRICA

Introduction (1)

- **The issue of construction H&S has been a longstanding challenge for centuries**
- **Despite changes to legislation, research, and increased focus in developing and developed countries, to date, there has been no significant reduction in losses in the construction industry (Windapo and Oladapo, 2012; Construction Industry Development Board (cidb), 2009)**
- **H&S research and knowledge relative to integrating design, procurement, and construction in South Africa does not exist**
- **The risks relative to construction are a joint responsibility of all stakeholders involved in the process**
- **Workers are the downstream recipients of the industry, and are therefore directly affected by decisions relative to design, procurement, and construction**

Introduction (2)

- **Promoting workers' health and wellbeing advances the sustainability agenda:**
 - **The South African Green Building Council of South Africa (GBCSA) (2014) Green Star SA Socio-Economic Category Pilot of 2014 includes seven categories, No. 6 being 'Safety & Health'(S&H). There is a total of 13 points available, one point being relative to S&H**
- **The aforementioned amplify the need to investigate the relationship between design, procurement, and construction, relative to H&S - the needs relating to:**
 - **Expediting better practice H&S in terms of the integral life cycle approach**
 - **The construction sector's sustainability**
 - **Supply chain management (SCM)**
 - **The built environment, in terms of the building and civil engineering construction environments**

Review of the literature (1)

- **Introduction:**
 - **Historically, H&S has been the contractor's problem**
 - **European Council Directive of 25 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites (92 / 57 / EEC) introduced the concept of client and designer responsibility for construction H&S**
 - **Spawned the 1994 Construction (Design and Management) (CDM) Regulations in the United Kingdom**
 - **Amended 2015 CDM Regulations place responsibility on the client, principal designer, and principal contractor**
 - **With respect to South Africa:**
 - **Clients have duties which can be delegated to construction H&S agents**
 - **Designers also have responsibilities, in addition to the principal contractor and contractors**
 - **Clients and designers are responsible throughout all six stages of projects, whereas contractors are only responsible from tender stage, through construction, ending at 'close out'**

Review of the literature (2)

- In terms of the integration of design, procurement, and construction, the construction of the Olympic Park in east London is noted as a pinnacle of H&S success:
 - Clear leadership
 - Careful planning and implementation by the client
 - Integration of H&S in all stages of the project
- The benefits of Health and Safety in the construction life cycle:
 - Clients have greater influence over project standards where there is involvement in H&S on their part from project inception
 - Despite multi-stakeholder responsibilities being entrenched in South African legislation, there appears to be a lack of commitment to the inclusion of H&S in projects (cidb, 2009)
 - Gambatese (2013) notes that the earlier H&S is introduced into the life cycle the greater the influence on project risk reduction

Review of the literature (3)

- **Regulating construction Health and Safety:**
 - **The Construction Regulations were originally promulgated in 2003, and amended in 2014 (Republic of South Africa):**
 - **Implementation of a construction work permit (CWP) system, managed as a client requirement**
 - **Registration (statutory) of construction H&S practitioners: H&S Agents; H&S Managers, and H&S Officers**
 - **Limited knowledge relative to H&S has been identified in many undergraduate and post graduate education programmes (cidb, 2009)**
 - **H&S Officers study - barriers exist in their ability to ensure adequate H&S levels and resources on a project: exclusion from decision making, and managing the site; lack of knowledge; lack of authority, and employment on a part-time or a contractual basis (Smallwood, 2013)**

Review of the literature (4)

- **Built environment professionals:**

| Project Stage | Yes (%) |
|--|---------|
| Stage 1: Project Initiation and Briefing | 0.0 |
| Stage 2: Concept and Feasibility | 66.7 |
| Stage 3: Design and Development | 57.1 |
| Stage 4: Tender Documentation and Procurement | 28.6 |
| Stage 5: Construction Documentation and Management | 71.4 |
| Stage 6: Project Close-out | 28.6 |

Table 1: Percentage of six statutory councils' (7 BEPs) identity of work that include reference to H&S interventions (Deacon, 2016)

Review of the literature (5)

- **H&S and stakeholder involvement:**
 - **Contract documentation makes minimal, if any, reference to H&S, other than a cursory note that requires statutory compliance (cidb, 2009; Wells and Hawkins, 2010)**
 - **The construction process is made more complicated by industry driven activities**
 - **Prescriptive legislation, industry standards such as supply chain management (SCM), procurement practices and related requirements are typical examples**
 - **In South Africa, the procurement practices and requirements in the public sector are set by the Department of Public Works (DPW), with particular financial controls applicable at national, provincial, and district level**
 - **The National Treasury is the overarching organ of state, each of the provincial departments and other public entities controlled by the DPW are required to provide and maintain infrastructure (cidb, 2010)**

Review of the literature (6)

- **Procurement and H&S:**
 - **The Infrastructure Delivery Management System (IDMS) in South Africa is a model describing the processes that make up public sector infrastructure management, used in various ways to implement projects (cidb, 2010)**
 - **Use of procurement as an instrument to promote improved H&S practices has received minimal attention, and where guidelines exist, there is limited attention to improving H&S standards through the procurement route (Wells and Hawkins, 2010)**
 - **Clients are being increasingly held responsible for H&S on projects, with shared responsibility among all stakeholders:**
 - **Terms of procurement need to ensure that H&S is taken seriously**
 - **Client's interests need to be safeguarded**
 - **Many contracts make vague and general reference to H&S**
 - **'Making adequate provision for H&S' needs to be assessed during the adjudication process (Wells and Hawkins, 2010; RSA, 2014)**

Review of the literature (7)

- **Designing for H&S:**
 - Hecker *et al.* (2006) contend that H&S through design is a fundamental principle of H&S
 - ‘Designing for H&S’ - one of the designing for constructability principles
 - Most notable designing for H&S approaches appear in the UK, the USA, and Australia, where literature indicates that, if applied, at the appropriate time, have a positive impact on the outcome on the project, such as the east London Olympic Park (Schulte *et al.*, 2008; Gambatese, 2013; Smallwood, 2015)

Research – Aim and objectives

- **Aim: to identify the extent of integration of design, procurement, and construction relative to H&S**
- **Objectives - to determine:**
 - **The procurement practices at provincial and district levels of a public department**
 - **The levels of H&S competence and confidence among construction stakeholders regarding H&S**
 - **The ability to apply procurement processes**
 - **The design and construction aspects, as well as the statutory requirements applicable across the six stages of construction**

Research – Method and sample strata (1)

- **Action research (AR) using focus groups (FGs) among construction stakeholders at provincial and district levels of a public department involved with building and civil engineering projects in the Eastern Cape, South Africa**
- **Descriptive surveys were also conducted**
- **ATLAS.ti, a computer software programme that analyses qualitative data, was used to analyse the transcriptions for the research**
- **Three FGs - a total of 31 participants that included the primary researcher, and the client co-ordinator who attended each FG:**
 - **The first FG was held at district level - BEPs consisting of an architect, quantity surveyor, building inspector and a number of construction H&S practitioners from the client and contractors**

Research – Method and sample strata (2)

- The second and third groups were held at provincial level - mainly professional engineers, contractors, a quantity surveyor, and construction H&S practitioners from industry and the client
- Those involved with the procurement processes were invited, but none attended any of the FGs
- Originally, 11 questions were planned for each FG, as time was limited to two hours per group - due to time constraints, the questions were reduced to 8
- Analysis of the data revealed three broad themes: (1) Stakeholder competence in H&S; (2) Procurement practices, linking H&S to the 6 Stages, and (3) Procurement, H&S and the Construction Work Permit

Research – Results (1)

- **Theme 1: Stakeholder competence in H&S:**
 - *(Excerpt) ... I don't see the need for an H&S officer being involved till even stage 3 because what's the input going to be? You know we all know what materials are flammable blah blah blah.... what input is the officer going to have in the design stage? Many architects I know - I am not defending them, don't even think about that. People die, fall off scaffolding and blah blah blah. Ok, well, that's one of those things, if you have to build, you have to build it. But when you do design, things are of such a nature you have to think how you have to put things together. But I dunno. I still don't think we need the H&S officer.*
 - **The construction H&S categories indicated in general that they were confident, and had a high level of competence (LoC), but do not get appointed at the appropriate times**
 - **The participants mostly indicated confidence to work and advise at all stages of construction, which is a pre-requisite for professional registration with the SACPCMP, and the related IDoW**

Research – Results (2)

- The issue of late appointments was repeatedly raised across all three groups, and the H&S categories related their frustration at the ‘loss’ of opportunity to reduce risk on the project
- **Theme 2: Procurement practices, linking H&S to the 6 Stages:**
 - In most cases the H&S participants noted that they are only appointed during stages 3, 4, and even stage 5. Stage 6 is not included as there was no discussion regarding construction H&S involvement
 - In summary:
 - There is H&S involvement in a ‘fragmented’ manner, or varying degrees of compliance
 - The ‘gaps’ in the procurement of construction H&S for legislative compliance places the client at risk should there be any accidents or fatalities that could be linked to the lack of inclusion during design

Research – Results (3)

- The information which is provided to the province or districts clearly have no information regarding risk from National Treasury
- **Theme 3: Procurement, H&S and the Construction Work Permit:**
 - The H&S participants' responses indicated they could assist with the submission of appropriate documentation, and the processes that could reduce the risk and potential project costs and delays
 - The lack of knowledge regarding the statutory permit requirements from SCM and procurement requirements was noted as currently increasing the risk to the client and the project, leading to increased project costs and potential delays
 - The need for policies, procedures and guides for all stakeholders clearly impacts on further support or actions relative to H&S from the SCM and procurement aspect

Research – Results (4)

- **The effect of the lack of the information is the late appointment of the H&S stakeholders - increases project risk as indicated in the previous themes**

Discussion (1)

- **Competency is lacking among all disciplines in the construction sector relative to H&S**
- **A range of barriers are present across the built environment, in terms of practice**
- **SCM and procurement occur in a ‘silo’, with the focus on complying with the IDMS requirements, and largely excluding H&S – however, the SCM and National Treasury requirements are all met**
- **The critical findings support the notion of the lack of competency and LoC, regarding H&S and / or the six stages among the BEPs**
- **The BEP participants indicate a high LoC in their own disciplines, but not in terms of H&S**
- **All of the BEPs indicated no formal training in H&S at undergraduate or post graduate level**

Discussion (2)

- **Similarly, construction H&S practitioners, indicated a relatively high LoC in H&S, but not across all of the six stages as they apply to projects**

Conclusions (1)

- **Increased project risk due to the LoC**
- **The BEPs who are responsible for ensuring and who in many cases represent the client, and application of the IDMS cannot fulfil all obligations if they are not recognised**
- **Similarly, the construction H&S categories cannot influence design or any critical H&S issues if not involved at the appropriate stages**
- **H&S involvement could, therefore, be described as occurring in a ‘fragmented’ manner, which results in varying degrees of statutory compliance**
- **Projects and stakeholders are at risk due to the lack of competence relating to H&S and hazard identification, and the lack of appropriate or late procurement of construction H&S practitioners**

Conclusions (2)

- **Inadequate and inappropriate levels of H&S on projects during the life cycle as a result, linking the lack of H&S to the high levels of fatalities, injuries, and diseases**
- **Tertiary BEP construction H&S education is inadequate**

Recommendations

- **A need for H&S to be included in the tertiary education of BEPs**
- **Further research regarding the role of the integration of the SCM and National Treasury and H&S is needed within the sector**
- **Promotion with clients and National Treasury is required to ensure consideration with H&S statutes**
- **The dissemination of research findings and workshops among voluntary associations (VAs) within the built environment as CPD could assist with increasing H&S knowledge, and the understanding of the roles of construction H&S practitioners**
- **The application of the recommendations will further assure a level of sustainability within the sector**

References (1)

- **Construction Industry Development Board (cidb). 2009. Construction Health and Safety in South Africa Status and Recommendations. Pretoria. cidb.**
- **Construction Industry Development Board (cidb). 2010 Inform Practice Note #22a. cidb Infrastructure Gateway System – Stages, 2. Available from:
<http://www.cidb.org.za/publications/Documents/Practice%20Note%2022a.pdf> (Accessed 22 October 2015)**
- **Deacon, C.H. 2016. The Effect of the Integration of Design, Procurement and Construction relative to Health and Safety. Unpublished PhD (Construction Management) Thesis. Port Elizabeth: Department of Construction Management, Nelson Mandela Metropolitan University.**

References (2)

- Gambatese, J.A. 2013. Prevention through Design (PtD) Project 1: Benchmarking Management Practices related to PtD in the US and UK Final Report – Activity 2: Assess the Effects of PtD Regulations on Construction Companies in the UK. National Institute for Occupational Safety and Health (NIOSH).
- Green Building Council of South Africa (GBCSA). 2014. Green Star SA Socio-Economic Category Pilot Design and Socio-Economic Category Pilot as Built 2014. Second edition. Cape Town: GBCSA.
- Hecker, S.F., Gambatese, J.A. & Weinstein, M. 2006. Designing for construction safety in the US: Progress, needs, and future directions. In: Proceedings of the 16th Triennial Congress of the International Ergonomics

References (3)

- Association, Maastricht, The Netherlands, 10-14 July 2006,
D:\data\pdfs\art0563.pdf
- Republic of South Africa. 2014. No. R. 84 Occupational Health and Safety Act, 1993 Construction Regulations 2014. Government Gazette No. 37305. Pretoria.
 - Schulte, P.A., Rinehart, R., Okun, A., Geraci, C.L. & Heidel, D. S. 2008. National Prevention Through Design (PtD) Initiative. Journal of Safety Research, 39, 115 – 121.
 - Wells, J. & Hawkins, J. 2010. Promoting Construction Health and Safety through Procurement: A briefing note for developing countries. London: Engineers against Poverty. Institution of Civil Engineers (ice).

References (4)

- Windapo, A. & Oladapo, A. 2012. Determinants of Construction Firms' Compliance with Health and Safety Regulations in South Africa. In: S.D. Smith (ed.) Proceedings 28th Annual ARCOM Conference, Edinburgh, United Kingdom, 3-5 September 2012. Association of Researchers in Construction Management, 433-444.

References (3)

- Association, Maastricht, The Netherlands, 10-14 July 2006,
D:\data\pdfs\art0563.pdf
- Republic of South Africa. 2014. No. R. 84 Occupational Health and Safety Act, 1993 Construction Regulations 2014. Government Gazette No. 37305. Pretoria.
 - Schulte, P.A., Rinehart, R., Okun, A., Geraci, C.L. & Heidel, D. S. 2008. National Prevention Through Design (PtD) Initiative. Journal of Safety Research, 39, 115 – 121.
 - Wells, J. & Hawkins, J. 2010. Promoting Construction Health and Safety through Procurement: A briefing note for developing countries. London: Engineers against Poverty. Institution of Civil Engineers (ice).