

37 2 Pricing For H&S On Construction Projects

38 As Motchar & Arditi [6] stated, the construction industry is characterised by extreme
39 competitiveness, with high risks and generally low profit margins when compared to
40 other areas of the economy. The competitive nature of the industry hinders H&S
41 performance [7]. Sumner & Farrell [8] remark that such competition has often forced
42 contractors to look for cost savings during the construction phase and such practice
43 leads to H&S being compromised.

44 Sumner & Farrell [8] argues that inadequate and poor H&S do not only affect other
45 project parameters, namely: cost, quality and schedule negatively, but the sustainability
46 of the environment as well. According to Smallwood [9] the construction industry is
47 perceived to be price driven. Projects are awarded on the lowest tendered price and not
48 enough consideration is given to other factors such as H&S, and quality. López-Alonzo
49 *et al.* [10] argue that making adequate provisions for H&S on construction projects
50 could yield benefits to the project.

51 Clients are responsible for safety implementation on a project. Consequently, we ask
52 how can the client ensure that the contractor has made adequate allowance for H&S
53 measures on the project if a standard pricing tool to measure such output is non-
54 existent?

55 For many contractors, H&S is priced as a line item in the Preliminaries and General
56 (P&Gs) section of Bills Of Quantities (BOQ) and not as an itemised trade showing a
57 breakdown of H&S costs even though studies by the CIDB [2], [8] and [12]
58 recommended that H&S costs should be itemised in the BOQ; be laid out using a
59 structured approach and be priced in a special section in the BOQ respectively.

60 A H&S pricing framework for construction projects will not only assist contractors
61 to make adequate provision for H&S on construction projects or client to ensure that
62 the contractor has made adequate allowance for H&S on said projects but to manage
63 and report on the H&S costs on the said projects. The lack of such pricing model makes
64 the accurate, adequate budgeting and controlling of H&S costs unlikely.

65 2.1 Personal protective Equipment (PPE)

66 PPE is defined as an article of clothing or accessory, that, when used correctly, will
67 create a barrier between a person and the H&S hazard to which they are exposed. It is
68 designed to reduce the adverse health effects [14]. A worker needs to wear a
69 combination of PPEs to have adequate protection against a combination of several H&S
70 hazards [14]. Unlike PPEs which protect a person from H&S risks at work, safety
71 equipments (SEs) are essential for the effective operations of work on site. For PPEs,
72 example of items to be pricing for should include: protective footwear, protective
73 clothing, hand protection, eyes and earing protection, head protection, fall
74 arrest/prevention; respiratory protection, reflective wear, special PPEs. Smallwood
75 recommends that one of the elements that need to be included in costing for H&S on
76 construction projects is the inspection of safety equipments [9].

77 2.2 H&S staffing and training

78 The cost of Health and Safety staffing should include training. According to the
79 Construction regulation 2014 “no contractor may allow or permit any employee or
80 person to enter any site, unless that employee or person has undergone health and safety
81 induction training pertaining to the hazards prevalent on the site at the time of entry”
82 [11]. Training and induction courses are therefore part of the safety cost in a project.

83 2.3 H&S programmes and activities

84 The cost drivers in this category encompass various activities and initiatives taken by
85 management within an organization to raise health and safety awareness and engage
86 with workers on safety matters in driving the successful implementation of H&S
87 objectives on a given project in order to achieve the desired outcomes. Amongst others;
88 the cost for H&S programmes and activities should include H&S audits, [15]; H&S
89 incentives and rewards [16]; H&S meetings [17]; accident investigation and reporting
90 [18]; H&S Branding [19]; security features [20]; emergency preparedness [21] and
91 insurance costs [22] Compensation for Occupational Injuries and Deceases Act [23]

92 3 The Study methods

93 We studied nine projects comprising civil engineering and building projects in two
94 different organizations. Data was collected through both interviews [31] and documents
95 analysis [32] in organisations with a reported good H&S records and expertise. The
96 interviewees included four were H&S Managers and a H&S executive. Their work
97 experience ranged between 10 and 25 years. The goal of the project was to establish the
98 costs of H&S on a project. The choice of projects used in the case study was based on
99 value and type. As projects are different in nature and have different requirements and
100 scope, such factors have an impact on H&S costs.

101 Data obtained were analysed using descriptive statistics, namely: frequency count
102 [33] percentage ratios [34] and rankings [35] Frequency count was used to identify the
103 most and least frequent H&S cost drivers found on projects (*Figure 1*). Rankings were
104 used to classify various cost drivers based on their FS in descending order.

105 4 Findings

106 The project values included in the study ranged between R31 million and R687 million.
107 In terms of duration, the shortest project period was 10 months and the longest 27
108 months .

109 **Table 1.** H&S cost drivers

Item No.	Cost Drivers	Reference
1	PPEs	[14]
2	H&S Personnel	[11, 12]

3	Safety Equipments (SEs)	[9], [24]
4	H&S induction & training	[25]
5	H&S Inspections	[1]
6	H&S Audits	[11, 26]
7	H&S Incentives	[16]
8	H&S Meetings	[11, 27]
9	Accident investigations and reporting	[28]
10	H&S Medicals	[11,14]
11	H&S Signage	[29]
12	H&S Campaigns	[2]
13	First Aid	[21]
14	H&S Promotions	[30]
15	H&S Branding	[19]
16	Security features	[20]
17	Emergency Preparedness	[21]
18	Insurance costs	[22]

110 Document analysis revealed that the actual expenses on H&S elements ranged from
 111 R900 thousand for a R30 million project and about R34 million for a 650 million project
 112 (Table 2). In terms of the actual expenses on H&S and the project value ratios, it was
 113 found that the actual costs ranged between 2% and 5% (Table 3). It was also observed
 114 that projects with a value of R500 million and above had a higher H&S expense to
 115 project value ratio. These projects had a ratio of 4% and above. Of interest, however a
 116 R31 million value for project C had about 3% of its project value on H&S provisions.
 117 On average on building projects, the percentage spent on H&S equated to 3% and 4%
 118 on civil engineering projects.

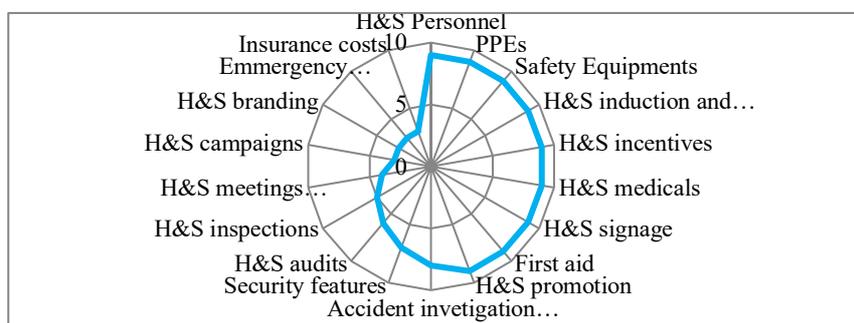
119 Nine elements were found to be the most frequent in all projects with a frequency
 120 score of 9 (See figure 1). These included: H&S personnel, PPEs, induction and training,
 121 incentives, medicals, signage, first aid and H&S promotions. Investigations were
 122 ranked second with a frequency rate of 8. Security features was ranked third at 7. H&S
 123 audits were ranked fourth at 6. H&S inspection was ranked fifth with a frequency rate
 124 of 5. In sixth position were expenses to do with H&S meeting with frequency of 4. H&S
 125 campaigns, H&S branding, emergency preparedness and insurances were ranked last at
 126 3.

127 It was observed that projects with higher values also had a higher H&S expense for
 128 the project compared to those with lesser value. H&S costs were found to be directly
 129 proportional to the project value. Considering all elements being equal, it was observed
 130 that for projects valued below R500 million, had H&S expenses of between 3% and 4%
 131 Projects valued above R500 million, had H&S expenses of between 4% and 5%. Thus,
 132 the higher the project value, the higher the cost of H&S.

133 **Table 2.** H&S expenditure ratios

Item No.	Project Names	Project Budget Expenditure	H&S expenditure	% ratio
1	Project A	R400 000 000.00	R9 553 995.79	2.39%
2	Project B	R195 000 000.00	R5 203 248.74	2.67%

3	Project C	R31 500 000.00	R957 454.78	3.04%
4	Project D	R630 000 000.00	R25 690 909.42	4.08%
5	Project E	R500 000 000.00	R20 688 493.19	4.14%
6	Project F	R687 000 000.00	R33 664 777.73	4.90%
7	Project G	R86 000 000.00	R2 680 986.22	3.12%
8	Project H	R72 000 000.00	R2 410 426.05	3.35%
9	Project I	R372 000 000.00	R14 791 563.62	3.98%



134

135 **Fig. 1.** H&S elements priced for on construction projects136 **4.1 Findings from interviews**

137 Interview participants acknowledged that with the lack of a standardised pricing
 138 model, clients in the CI cannot ensure that H&S measures are adequately provided for.
 139 Participant 3, a Safety, Health and Environmental manager said:

140 *“There is no method for pricing for H&S in the construction industry. A pricing tool*
 141 *is non-existent. How do clients adjudicate for H&S? How can the costs of H&S be*
 142 *managed on projects?”*

143 We found that most participants itemised the cost of health and safety on their
 144 projects as opposed to using percentages as such method is considered not accurate.
 145 According to the participants, itemised costing approach for H&S, is better and cost
 146 control can be achieved. Participant 5, argued that the cost of H&S should be itemised
 147 in the BOQ in order to manage expenditure and report adequately.

148 **Table 3.** H&S cost elements

Item No.	Category	Cost components
----------	----------	-----------------

1	PPEs	footwear, clothing, gloves, eyes and earing protection, hard hat, fall arrest strap; mouth mask, reflective wear,
2	Induction & Training	On PPE ; emergency response; crane/machinery operations; accidents investigation & reporting; first aid; special training
3	SHE personnel	Managers; Officers (Site based); first aiders;
4	Medicals	Entry & exit medicals; cost of consultation
5	Site Security	Fencing, site enclosure; access control; site illumination;
6	Safety Equipments	Fire extinguishers; harnesses; cones; alarm canisters; flags; speed bumps/humps; breathalysers; ladders; scaffolding; lifelines;
7	Welfare, wellbeing	Accommodation; transportation; skips; food; bins; ablutions; eating & cooking area; cleaning equipment; storage; cleaning personnel.
8	Signage	Warning, directional prohibitory signs; mandatory; emergency traffic control signs (i.e.: speed limits, Stops blocks, etc.) signs
9	Administration	SHE file; Permits approval; Police clearance; Inspection & audits;
10	Investigations & reporting	Direct costs
11	Insurances	COVID, Insurance premiums
12	Sundries	awards; branding; incentives

149 5 Conclusions

150 The study aimed at identifying key H&S pricing elements on construction projects. In
 151 order to achieve the said objectives, it was imperative to identify the cost drivers that
 152 should be considered when pricing for H&S and how much should be allowed for. H&S
 153 cost drivers presented in the findings are regarded as the minimum to be priced for if it
 154 at all H&S performance can be assured and monitored on construction projects.

155 From the findings, it was evident that contractors itemised the cost of H&S on their
 156 projects even though such breakdown is not included as a trade in the BOQs. With the
 157 lack of a standardised pricing model, each contractor has its own way of pricing for
 158 H&S, which makes it difficult for client to adjudicate and ensure that contractors have
 159 made adequate allowance for health and safety measures on their projects as required
 160 by the Construction Regulations [11].

161 With regards to budget, health and safety costs on projects were found to be directly
 162 proportional to the project values. Higher H&S specifications will have an impact on
 163 H&S cost compared to projects with lower specifications. Since projects are driven by
 164 clients, it was also observed that clients had an indirect impact on H&S cost on projects.
 165 An H&S minded client would have a higher H&S specifications, thus affecting H&S
 166 costs

167 **References**

- 168 1. HSE (2015) "Health and Safety Statistics: Annual Report for Great Britain". HSE, London
- 169 2. Construction Industry Development Board (CIDB) (2009) Construction Health and Safety
- 170 in South Africa: Status and Recommendations, CIDB, Pretoria.
- 171 3. International Labour Organization (ILO) (2009). Facts on Health and safety at work. ILO,
- 172 Geneva.
- 173 4. Yilmaz, F. and Çelebi, U.B. (2015). The Importance of Safety in Construction Sector: Costs
- 174 of Occupational Accidents in Construction Sites." *Business and Economics Research*
- 175 *Journal* 6(2): 25-37 .
- 176 5. Rikhardsson, P. (2005). Accounting for Health and Safety costs: Review and comparison
- 177 selected methods. Proceedings of the Business Strategy and the Environment conference",
- 178 University of Leeds, September 2005.
- 179 6. Mochtar, K. and Arditi, D., (2001). Pricing strategy in the US construction industry.
- 180 *Construction Management & Economics*, 19(4), 405-415.
- 181 7. Cole, T.R.H (2003). Reform of Occupational Health and Safety: Final report of the Royal
- 182 Commission into the Building and Construction Industry, Vol.6.
- 183 8. Sumner, S. and Farrell, P. (2003). The influence of clients on health and safety standards in
- 184 construction. Proceedings of the 19th Annual Association of Researchers in Construction
- 185 Management (ARCOM) Conference, University of Brighton, Vol. 1: 193-202.
- 186 9. Smallwood, J. J. (1999). The Role of Health and Safety in Project Management. *Regional*
- 187 *African Project Management*, Project Management Institute South Africa (PMISA), South
- 188 Africa, 3 – 5 November 1999: 1-16.
- 189 10. López-Alonso, M., Ibarrondo-Dávila, M.P., María Carmen Rubio-Gámez, M. C. and
- 190 Muñoz, T. G. (2013). The impact of health and safety investment on Construction Company
- 191 costs. *Safety Science* 60: 151–159.
- 192 11. Republic of South Africa (2014), Construction Regulations, Pretoria, South Africa.
- 193 12. Smallwood, J. and Emuze, F. (2014). Financial Provision for Construction Health and
- 194 Safety (H&S). *Construction Research Congress 2014: Construction in a Global Network:*
- 195 *1881-1890.*
- 196 13. Bokor, Z. (2010). Cost drivers in transport and logistics. *Transportation Engineering*, 38(1):
- 197 13-17
- 198 14. HSA (2010). Tips, Tools and Practical Advice to easily implement Health and Safety in
- 199 your workplace, Fleet Street Publications (Pty) Ltd
- 200 15. Innes, J. (2009). Health & Safety Auditing. Available from:
- 201 <http://www.hs.edu.au/businessedition/kaleidoscope->
- 202 [html/Readings%20OHS%20Cert%20IV/Health%20and%20safety%20auditing.pdf](http://www.hs.edu.au/businessedition/kaleidoscope-).
- 203 (Accessed on 19 November 2016).
- 204 16. Musonda, I. and Pretorius, J.H.C. (2015). Effectiveness of economic incentives on clients'
- 205 participation in health and safety programmes. *Journal of the South African Institution of*
- 206 *Civil Engineering* 57(2): 2-7
- 207 17. Kikwasi, G.J., (2008), Client involvement in construction safety and health. In Proc.: CIB
- 208 W099 International Health and safety Conference: 14th Rinker International Conference, 9-
- 209 22.

- 210 18. Kartam, N. A., Flood, I. and Koushki, P. (2000). Construction safety in Kuwait: issues,
211 procedures, problems, and recommendations.” *Safety Science* 36(3): 63-184.
- 212 19. Musonda, I. and Haupt, T. C. (2011). “Identifying factors of health and safety (H&S) culture
213 for the construction industry”, Proceedings of the 6th Built Environment Conference, 31
214 July-2 August 2011, Johannesburg, South Africa
- 215 20. Farinyole, O., Odusami, K. and Adewunmi, Y. (2013), Theft and Vandalism Control
216 Measures on Building Sites in Lagos, Nigeria.” *Journal of Engineering, Project, and*
217 *Production Management* 3(1): 9-21.
- 218 21. Wells & Hawkins, (2009), Promoting Construction Health and Safety through Procurement:
219 A briefing note for developing countries, ICE, London.
- 220 22. Babu, A. and Kanchana, (2014). S. Role of insurance in construction and infrastructure
221 projects. *International Journal of Civil Engineering and Technology (IJCIET)* 12:206-210
- 222 23. Republic of South Africa (1993), Compensation for Occupational Injuries and Diseases
223 (COID) Act , South Africa.
- 224 24. Sawasha, E., Naoum, S. and Fong, D. (1999). Factors affecting safety performance on
225 construction sites. *International journal of project management* 17(5): 309-315.
- 226 25. Hinze, J. and Gambatese, J. (2003). Factors that influence safety performance of specialty
227 contractors. *Journal of construction engineering and management* 129(2): 159-164.
- 228 26. Allli, B.O. (2008). *Fundamental principles of occupational health and safety*, 2nd Edn, ILO,
229 Geneva.
- 230 27. Bizzell, S. G. (2008). Safety practices of small to medium-sized construction firms,
231 unpublished Doctoral dissertation, University of Florida
- 232 28. Sadus, A. M. V. and Griffiths, S. (2004). Marketing strategies for enhancing safety culture.
233 *Safety Science* 42: 301-619.
- 234 29. Hymel, P. A., Loeppke , R.R., Baase, C. M., Burton, W. N., Hartenbaum, N. P., Hudson, T.
235 W., McLellan, R. K., Mueller , K.L., Roberts, M.A., Yarborough, C.M. and Konicki, D. L.
236 (2011) “Workplace health protection and promotion: a new pathway for a healthier and safer
237 workforce.” *Journal of occupational and environmental medicine* 53(6): 695-702.
- 238 30. Kothari, C.R. (2004). *Research Methodology: Methods and Techniques* (2nd ed.), New Age
239 International Publishers, New Delhi
- 240 31. Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative*
241 *Research Journal*, 9(2): 27-40
- 242 32. Dawson, C. (2002), *Practical Research methods: A user friendly guide of mastering*
243 *research*, 5th Ed, HowtoBooks, Oxford
- 244 33. Kumar, R. (2011) *Research Methodology: A step-by-step for beginners*, 3rd edition, SAGE,
245 London.
- 246 34. Saunders, M., Lewis, P. and Thornhill, A. (2009), *Research methods for business students*,
247 5th Edition, Pearson Education Limited, Edinburgh Gate, Harlow Essex CM20 2JE,
248 England.