



**‘FEEDBACK’ REPORT ON A STUDY OF
ROOFING HEALTH AND SAFETY (H&S)
CONDUCTED AMONG
ROOFING SUBCONTRACTORS (SCs)**

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DEDICATION

This report is dedicated to the improvement of roofing H&S.

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- those roofing SCs that responded to the survey;
- the UPE Research Committee for the granting of funds to the writer, thus enabling the research, and
- Louise Engelbrecht for the input of data for the purpose of data analysis, and her contribution to the typing and editing of the project.

ORIGIN OF THE REPORT

Donald Cosgrove was acknowledged for his initiation of the study. However, the study was initiated due to the MBA (CP)'s concern regarding the increase in the number of roofing related fatalities in the Western Cape.

SCOPE OF THE REPORT

This report has been compiled to provide feedback to both respondents and non-respondents to the survey conducted among the roofing SCs, and does not include the findings of a literature survey.

EXECUTIVE SUMMARY

H&S is not as important to roofing SCs as other project parameters, such as cost, quality, and time.

Between half and less than half of roofing SCs have written H&S related documentation available, and task specific H&S related interventions are undertaken more frequently than general H&S interventions. Safety belts / lanyards and harnesses constitute the most frequently used fall arrest systems (FASs) / personal protective equipment (PPE) used by roofing SCs.

Design has a substantial effect on roofing H&S through roof design, roof height above ground level, roof pitch, girder / truss and purlin / batten spacing, and material specification.

Overall project and organisation H&S culture, safe work procedures (SWPs), and supervision also have a substantial effect on roofing H&S.

Recommendations include the development and / or use of practice notes, guidelines, and SWPs by designers, employer associations, and roofing subcontractors, in addition to the raising of the general level of awareness relative to roofing H&S.

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1. SAMPLE FRAME

Initially, the sample frame was intended to include only roofing SCs that were members of the MBA (Cape Peninsula). However, due to the small size of the sample frame, it was decided to expand the sample frame to include roofing SCs that were members of the East Cape MBA, Gauteng MBA, and Kwazulu – Natal MBA. 47 roofing SCs were surveyed using a written questionnaire. 19 responses were received, which represents a response rate of 40.4 %.

2. FINDINGS

2.1 Analysis

The analysis of the data consisted of the calculation of descriptive statistics to depict the frequency distribution and central tendency of responses to fixed response questions to determine the degree of importance of various parameters, the frequency of intervention and use, and the nature of the effect of various aspects.

To rank fixed response items according to the central tendency of responses, importance indices (II) were calculated as follows:

- *Unsure; Not important / Never; Less than important / Rarely; Important / Sometimes; More than important / Often; Very important / Always* questions:

$$II = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4}{n_0 + n_1 + n_2 + n_3 + n_4}$$

Where $n_0 = \text{Not important / Unsure / Never}$, $n_1 = \text{Less than important / Rarely}$, $n_2 = \text{Important / Sometimes}$, $n_3 = \text{More than important / Often}$, $n_4 = \text{Very important / Always}$

- *Unsure; No impact; Minor impact; Near minor impact; Impact; Near major impact; Major impact* questions:

$$II = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{n_0 + n_1 + n_2 + n_3 + n_4 + n_5}$$

Where $n_0 = \text{No impact}$, $n_1 = \text{Minor impact}$, $n_2 = \text{Near minor impact}$, $n_3 = \text{Impact}$, $n_4 = \text{Near major impact}$, $n_5 = \text{Major impact}$

2.2 Findings

Table 1 indicates the importance attached to traditional and non-traditional project parameters by roofing SCs in terms of percentages relative to importance on a scale of 1 (not) to 5 (very), and a ranking based upon an II with a minimum value of 0, and a maximum value of 4.0. Given that all the project parameters have II values above the midpoint value of 2.0, the parameters can be deemed to be important to SCs. It is notable that eight of the nine project parameters have II values $> 3.2 \leq 4.0$, which indicates that they can be deemed to be perceived to be between more than important to very important / very important. It is significant that two of the top four ranked project parameters, namely quality and time (programme), are two of the three traditional project parameters. It is also significant that H&S achieved a ranking of seventh - however, it has an II value of 3.28, which is $> 3.2 \leq 4.0$.

Table 1: Degree of importance of various project parameters.

| Project parameter | Response (%) | | | | | II | Rank |
|------------------------------|----------------|------|------|------|------|------|------|
| | Not Very | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | |
| Quality | 0.0 | 0.0 | 0.0 | 21.1 | 78.9 | 3.79 | 1 |
| Productivity | 0.0 | 0.0 | 0.0 | 42.1 | 57.9 | 3.58 | 2= |
| Time (Programme) | 0.0 | 0.0 | 0.0 | 42.1 | 57.9 | 3.58 | 2= |
| Client satisfaction | 0.0 | 0.0 | 5.3 | 31.6 | 63.2 | 3.58 | 2= |
| Main contractor satisfaction | 0.0 | 0.0 | 5.3 | 36.8 | 57.9 | 3.53 | 5 |
| Cost | 0.0 | 5.3 | 5.3 | 26.3 | 63.2 | 3.47 | 6 |
| H&S | 0.0 | 0.0 | 16.7 | 38.9 | 44.4 | 3.28 | 7 |
| Worker satisfaction | 0.0 | 0.0 | 15.8 | 42.1 | 42.1 | 3.26 | 8 |
| Environment | 5.6 | 11.1 | 33.3 | 16.7 | 33.3 | 2.61 | 9 |

Written H&S rules predominate among types of documentation roofing SCs have available. Less than half of the SCs have written safe work procedures (SWPs), a written H&S policy and a documented H&S programme (Table 2).

Table 2: Extent of H&S related documentation.

| Documentation | Response (%) | | |
|-------------------------------------|--------------|------|------|
| | Unsure | No | Yes |
| Written H&S rules | 5.9 | 41.2 | 52.9 |
| Written safe work procedures (SWPs) | 11.1 | 44.4 | 44.4 |
| Written H&S policy | 5.9 | 52.9 | 41.2 |
| Documented H&S programme | 5.6 | 61.1 | 33.3 |

Table 3 indicates the frequency roofing SCs undertake interventions in terms of percentages relative to importance on a scale of never to always, and a ranking based upon an II with a minimum value of 0, and a maximum value of 4.0. Reference to H&S upon instruction to execute a task predominates among the interventions. Given that the top three ranked interventions have II values above the midpoint value of 2.0, the interventions can be deemed to be prevalent. It is notable that the interventions ranked 4th, 5th and 6th have II values below the midpoint value of 2.0, which indicates that they cannot be deemed to be prevalent. II values: $> 0.8 \leq 1.6$ indicate that an intervention can be deemed to be undertaken between never to rarely / rarely; $> 1.6 \leq 2.4$ between rarely to sometimes / sometimes, and $> 2.4 \leq 3.2$ between sometimes to often / often.

Table 3: Frequency of H&S related interventions.

| Intervention | Response (%) | | | | | | II | Rank |
|---|--------------|-------|--------|------------|-------|--------|------|------|
| | Unsure | Never | Rarely | Some-times | Often | Always | | |
| Reference to H&S upon instruction to execute a task | 0.0 | 0.0 | 16.7 | 5.6 | 38.9 | 38.9 | 3.00 | 1 |
| 'Toolbox talks' (discussions regarding H&S) | 0.0 | 10.5 | 5.3 | 31.6 | 31.6 | 21.1 | 2.47 | 2 |
| Project H&S plans | 0.0 | 5.6 | 27.8 | 27.8 | 27.8 | 11.1 | 2.11 | 3 |
| H&S induction | 0.0 | 21.1 | 21.1 | 26.3 | 21.1 | 10.5 | 1.79 | 4 |
| H&S meetings | 0.0 | 31.6 | 5.3 | 36.8 | 15.8 | 10.5 | 1.68 | 5 |
| H&S training | 0.0 | 21.1 | 26.3 | 36.8 | 10.5 | 5.3 | 1.53 | 6 |

Table 4 indicates the frequency roofing SCs make use of fall arrest systems (FASs) and personal protective equipment (PPE) in terms of percentages relative to importance on a scale of never to always, and a ranking based upon an II with a minimum value of 0, and a maximum value of 4.0. Safety belts / lanyards attached to static lines, and safety harnesses attached to static lines, predominate among the FASs and PPE. Given that the top two ranked FASs and PPE have II values above the midpoint value of 2.0, their use can be deemed to be prevalent. It is notable that the other FASs and PPE have II values below the midpoint value of 2.0, which indicates that their

use cannot be deemed to be prevalent. II values: $> 0.0 \leq 0.8$ indicate that an intervention can be deemed to be undertaken between never to rarely; $> 0.8 \leq 1.6$ between never to rarely / rarely; $> 1.6 \leq 2.4$ between rarely to sometimes / sometimes, and $> 2.4 \leq 3.2$ between sometimes to often / often.

Table 4: Frequency of use of fall arrest systems (FASs) and personal protective equipment (PPE).

| FASs / PPE | Response (%) | | | | | | | II | Rank |
|--|--------------|--------------|-------|--------|-------------|-------|--------|------|------|
| | Unsure | Not possible | Never | Rarely | Some -times | Often | Always | | |
| Safety belts / lanyards attached to static lines | 0.0 | 0.0 | 0.0 | 15.8 | 36.8 | 31.6 | 15.8 | 2.47 | 1 |
| Safety harnesses attached to static lines | 0.0 | 0.0 | 5.3 | 15.8 | 47.4 | 15.8 | 15.8 | 2.21 | 2 |
| Tool belts | 0.0 | 0.0 | 31.6 | 15.8 | 31.6 | 15.8 | 5.3 | 1.47 | 3 |
| Life lines | 0.0 | 0.0 | 31.6 | 10.5 | 42.1 | 15.8 | 0.0 | 1.42 | 4 |
| Guard rails to perimeter / edges | 0.0 | 0.0 | 38.9 | 11.1 | 33.3 | 5.6 | 11.1 | 1.39 | 5 |
| Inertia reels | 0.0 | 0.0 | 50.0 | 27.8 | 11.1 | 11.1 | 0.0 | 0.83 | 6 |
| Safety nets | 0.0 | 0.0 | 57.9 | 31.6 | 10.5 | 0.0 | 0.0 | 0.53 | 7 |

Table 5 indicates the impact twenty-one aspects have on H&S in terms of percentages relative to 'No' and on a scale of 1 (minor) to 5 (major), and a ranking based upon an II with a minimum value of 0, and a maximum value of 5.0.

The aspects tabled were extracted from literature based upon their influence and impact on both general and roofing H&S. Essentially the aspects can be divided into six categories – an asterisk * indicates that the aspect can be related to more than one category:

- Design: roof design (irregular); roof pitch (high); height above ground level (high); girder / truss spacing (far)*; profile of roof covering (deep)*, and span of roof covering (long)*;
- Materials: profile of roof covering (deep)*; span of roof covering (long)*; mass of roof covering (heavy); edge of roof covering (sharp); method of fixing roof covering (complex); girder / truss spacing (far)*, and purlin / batten spacing (far);
- Culture (client, designer and contractor): H&S = cost, quality and time (project focus on H&S);
- Culture (contractor): site management commitment to H&S;
- Management systems: safe work procedures (SWPs); H&S induction, and H&S training;
- Site management / supervision: Overall project supervision; first line supervision of roofing, and wearing of PPE by roofers, and
- Elements: wind speed (high); precipitation / rain, and temperature (extreme).

Given that the II values of all the aspects are above the midpoint value of 2.5, they can all be deemed to have an impact on H&S.

It is significant that the top five ranked aspects have II values $> 4.17 \leq 5.0$, which indicates that they have between a near major to major impact / major impact on H&S. The following categories are represented: elements (1st and 2nd); design (3rd); site management / supervision (4th), and management systems (5th).

Those aspects ranked from 6th to 14th have II values $> 3.34 \leq 4.17$, which indicates that they have between an impact and a near major impact / near major impact on H&S. The following categories are represented: site management / supervision (6th and 9th); culture (contractor) (7th); design (8th); culture (client, designer and contractor) (10th); material (11th, 13th and 14th), and elements (12th).

Those aspects ranked from 15th to 21st have II values $> 2.51 \leq 3.34$, which indicates that they have between a near minor impact to impact / impact on H&S. The following categories are represented: design (15th, 17th, 20th and 21st); management systems (16th and 17th), and material (19th, 20th and 21st).

Table 5: Effect of various aspects on roofing H&S.

| Aspect | Response (%) | | | | | | | II | Rank | |
|---|--------------|-----|-------------|------|------|------|------|------|------|-------|
| | Unsure | No | Minor | | | | | | | Major |
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| Wind speed (high) | 0.0 | 0.0 | 0.0 | 5.3 | 0.0 | 15.8 | 78.9 | 4.68 | 1 | |
| Precipitation / Rain | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.8 | 63.2 | 4.63 | 2 | |
| Roof pitch (high) | 0.0 | 0.0 | 0.0 | 5.3 | 15.8 | 21.1 | 57.9 | 4.32 | 3 | |
| First line supervision of roofing (close) | 0.0 | 5.3 | 0.0 | 0.0 | 10.5 | 47.4 | 36.8 | 4.28 | 4 | |
| Safe work procedures (SWPs) | 0.0 | 0.0 | 0.0 | 5.9 | 17.6 | 29.4 | 47.1 | 4.18 | 5 | |
| Overall project supervision (competent) | 0.0 | 0.0 | 0.0 | 0.0 | 21.1 | 47.4 | 31.6 | 4.11 | 6 | |
| Site management commitment to H&S | 0.0 | 0.0 | 0.0 | 16.7 | 11.1 | 22.2 | 50.0 | 4.06 | 7 | |
| Height above ground level (high) | 0.0 | 0.0 | 5.3 | 5.3 | 21.1 | 26.3 | 42.1 | 3.95 | 8 | |
| Wearing of PPE by roofers | 0.0 | 0.0 | 0.0 | 10.5 | 31.6 | 31.6 | 26.3 | 3.74 | 9 | |
| H&S = cost, quality and time (project focus on H&S) | 0.0 | 0.0 | 0.0 | 11.1 | 38.9 | 16.7 | 33.3 | 3.72 | 10 | |
| Edge of roof covering (sharp) | 0.0 | 0.0 | 0.0 | 11.8 | 35.3 | 35.3 | 17.6 | 3.59 | 11 | |
| Temperature (extreme) | 0.0 | 0.0 | 0.0 | 21.1 | 31.6 | 21.1 | 26.3 | 3.53 | 12 | |
| Mass of roof covering (heavy) | 0.0 | 0.0 | 11.1 | 5.6 | 33.3 | 27.8 | 22.2 | 3.44 | 13 | |
| Method of fixing roof covering (complex) | 0.0 | 0.0 | 0.0 | 15.8 | 42.1 | 31.6 | 10.5 | 3.37 | 14 | |
| Roof design (irregular) | 0.0 | 0.0 | 16.7 | 5.6 | 22.2 | 38.9 | 16.7 | 3.33 | 15 | |
| H&S induction | 0.0 | 0.0 | 0.0 | 37.5 | 37.5 | 0.0 | 25.0 | 3.13 | 16 | |
| Girder / Truss spacing (far) | 0.0 | 0.0 | 16.7 | 11.1 | 27.8 | 38.9 | 5.6 | 3.06 | 17= | |
| H&S training | 0.0 | 0.0 | 0.0 | 43.8 | 25.0 | 12.5 | 18.8 | 3.06 | 17= | |
| Purlin / Batten spacing (far) | 0.0 | 0.0 | 15.8 | 15.8 | 31.6 | 31.6 | 5.3 | 2.95 | 19 | |
| Span of roof covering (long) | 0.0 | 0.0 | 15.8 | 5.3 | 63.2 | 5.3 | 10.5 | 2.89 | 20 | |
| Profile of roof covering (deep) | 0.0 | 0.0 | 10.5 | 31.6 | 47.4 | 10.5 | 0.0 | 2.58 | 21 | |

3. SUMMARY

H&S is between more than important to very important / very important to roofing SCs. However, it is not as important as the traditional project parameters of cost, quality and time.

Roofing SCs generally do not have written H&S related documentation available.

Reference to H&S upon instruction to execute a task and ‘toolbox talks’ predominate among H&S related interventions.

Safety belts / lanyards and harnesses attached to static lines predominate among FASs / PPE used by roofing SCs.

Design, materials, culture (client, designer and contractor), culture (contractor), management systems, and site management / supervision all affect roofing H&S.

4. CONCLUSIONS

H&S is not as important to roofing SCs as other project parameters. However, this could be attributable to the general importance attached to H&S by all industry stakeholders. Further, the II value and consequent ranking of ‘H&S = cost, quality and time (project focus on H&S)’ in terms of

the effect of various aspects on roofing H&S, reflects the importance of a project environment that is complementary to H&S.

The predominance of reference to H&S upon instruction to execute a task and ‘toolbox talks’ in terms of H&S related interventions, indicates a preference for task specific, as opposed to general H&S interventions i.e. the ‘mechanics’ as opposed to the ‘dynamics’.

Design has an effect on roofing H&S through roof design, roof height above ground level, roof pitch, girder / truss and purlin / batten spacing, and material specification. The mass, edge characteristics, span, profile, and method of fixing of materials all have an effect on roofing H&S. Although wind speed and precipitation predominated in terms of the effect aspects have on roofing H&S, certain characteristics of a roofing material such as length, can compound the difficulty of roofing while high wind speeds prevail. Designers should consider the potential influence of the elements on roofing H&S when designing, detailing and specifying.

An optimum project H&S culture reinforced by optimum site management commitment to H&S is complementary to and a pre-requisite for roofing H&S – clients, designers and general contractors (GCs) can and do play a major role in roofing H&S. SWPs accompanied by optimum first line supervision and overall project supervision, and reinforced by site management commitment to H&S, will assure H&S while roofing.

5. RECOMMENDATIONS

5.1 Designers:

Design related professional associations should:

- Raise the level of awareness with respect to the role of designers in roofing H&S, and
- Evolve related practice notes.

5.2 Employer associations:

Employer associations should:

- Evolve guidelines for roofing H&S, and
- Assist roofing SCs with the development of roofing SWPs.

5.3 General contractors (GCs):

GCs should monitor and enforce the use of roofing SWPs by roofing SCs.

5.4 Roofing subcontractors (SCs):

Roofing SCs should:

- Conduct H&S induction on every project;
- Always make use of roofing SWPs, and
- Ensure that there is adequate supervision.