

PROJECT MANAGEMENT FORUM

**LEGENDS GOLF AND SAFARI RESORT,
LIMPOPO PROVINCE, 19 APRIL 2012**

**CONSTRUCTION HEALTH AND SAFETY (H&S)
AND
EPCM MANAGEMENT**

PROFESSOR JOHN SMALLWOOD

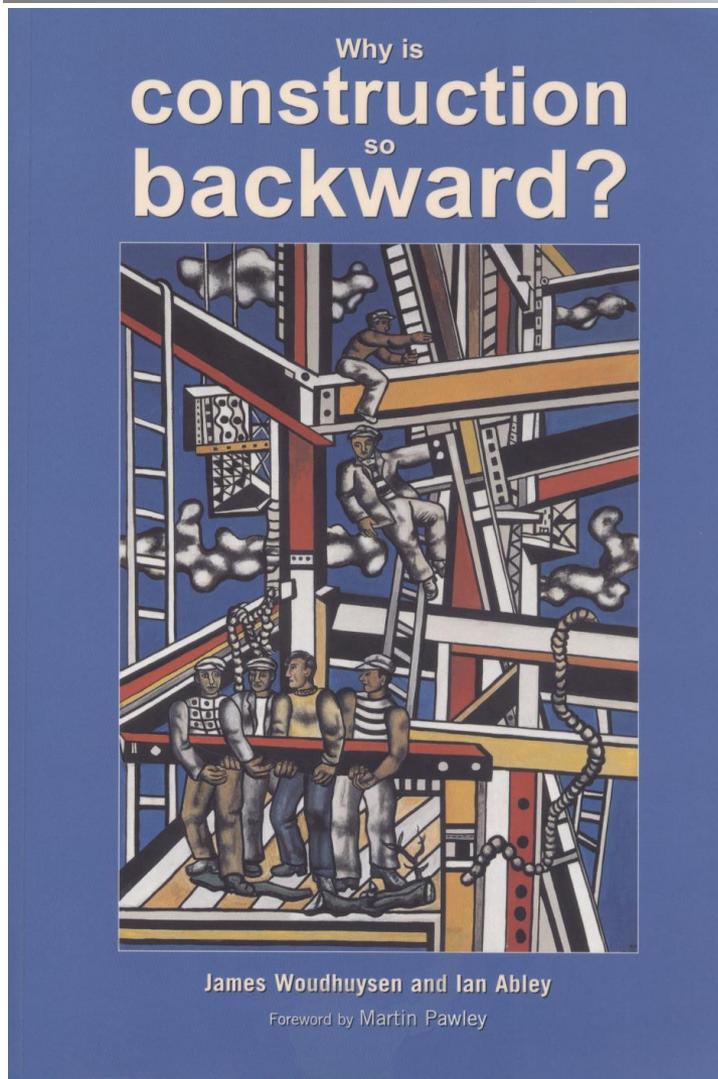
Issues (1)

- **Why is construction so backward?**
- **Introduction**
- **Challenges**
- **Designing for H&S**
- **‘Health & Safety’ (H&S) not ‘Safety’**
- **Safety → H&S → ergonomics → primary health promotion**
- **H&S is a value not a priority**
- **H&S is a line function not a staff function**
- **H&S is a profit centre not a ‘cost’**
- **H&S is about life or death not legislation**
- **Corporate social responsibility**
- **The role of religion in H&S**
- **Feng shui**
- **Surface competencies – core competencies?**

Issues (2)

- **Personality type**
- **Emotional quotient**
- **Respect for people**
- **Inclusive tertiary education**
- **Development and capacity building**
- **Competence**
- **Integrated multi-stakeholder project H&S plans**
- **Leading versus trailing indicators**
- **Roadmap**
- **Management of H&S and complexity**

Why is construction so backward?



Introduction (1)

Construction H&S occurs in a macro environment:

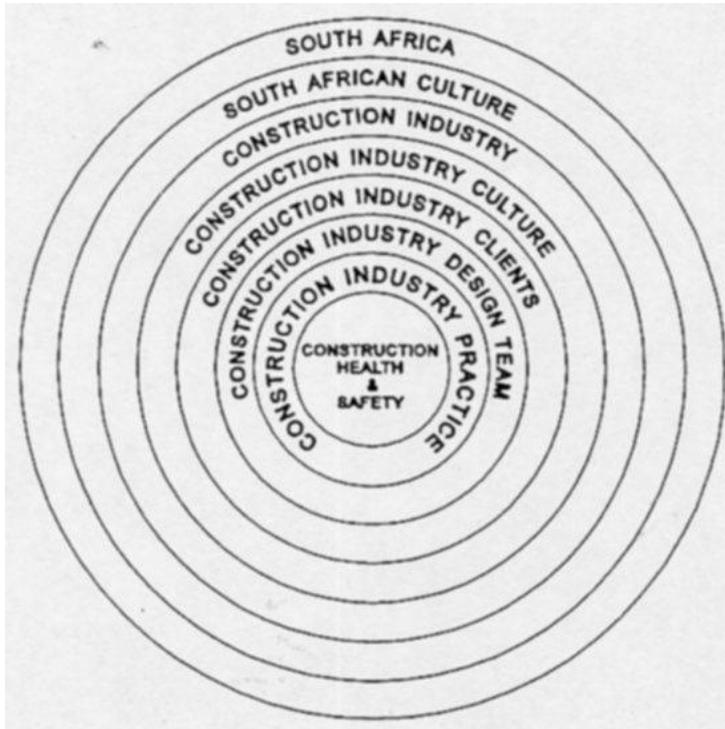


Figure 1: Construction H&S – the macro environment (Smallwood, 1995)

Introduction (2)



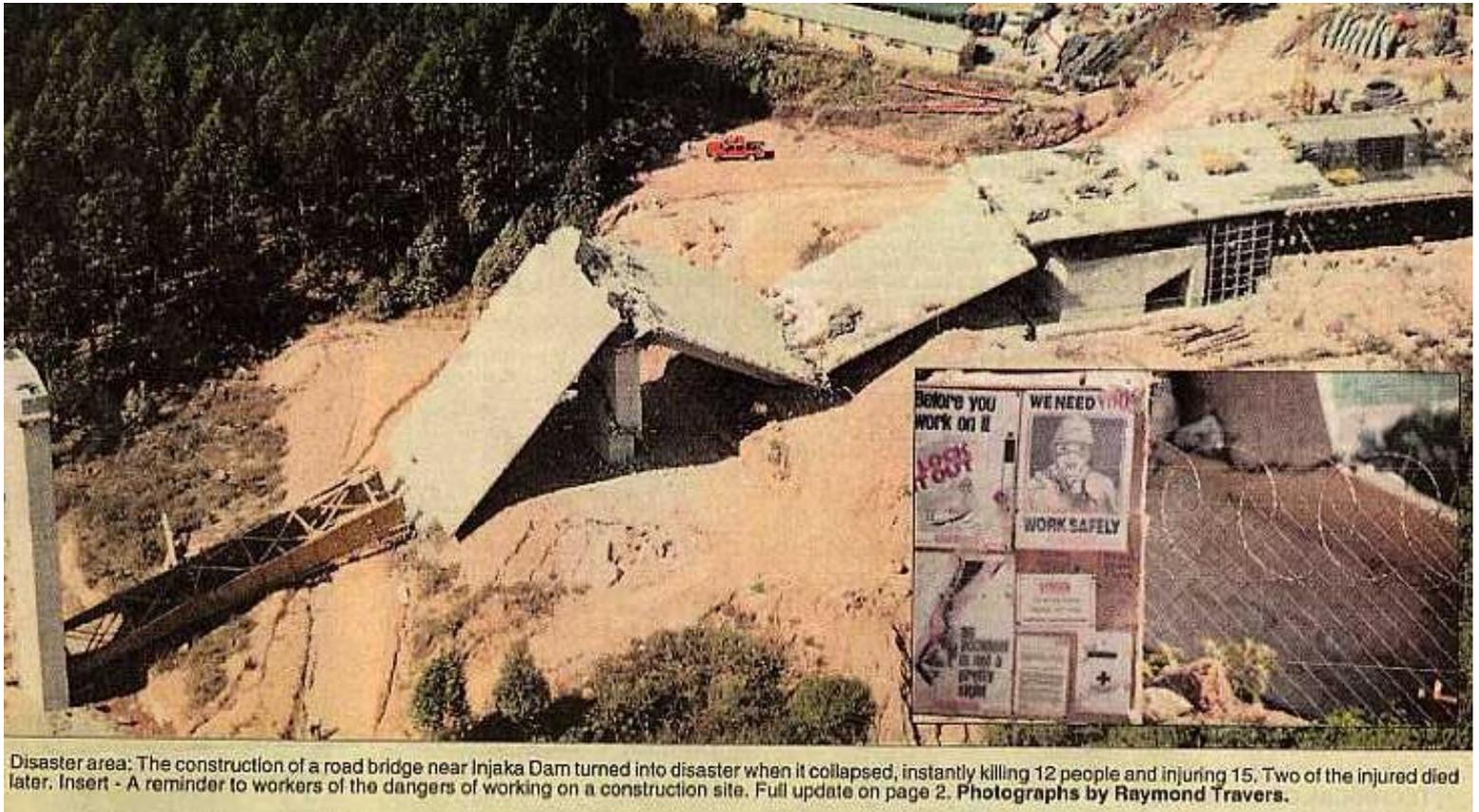
Pretoria North Shopping Centre slab collapse, October, 1996 (Davis, 1996)

Introduction (3)



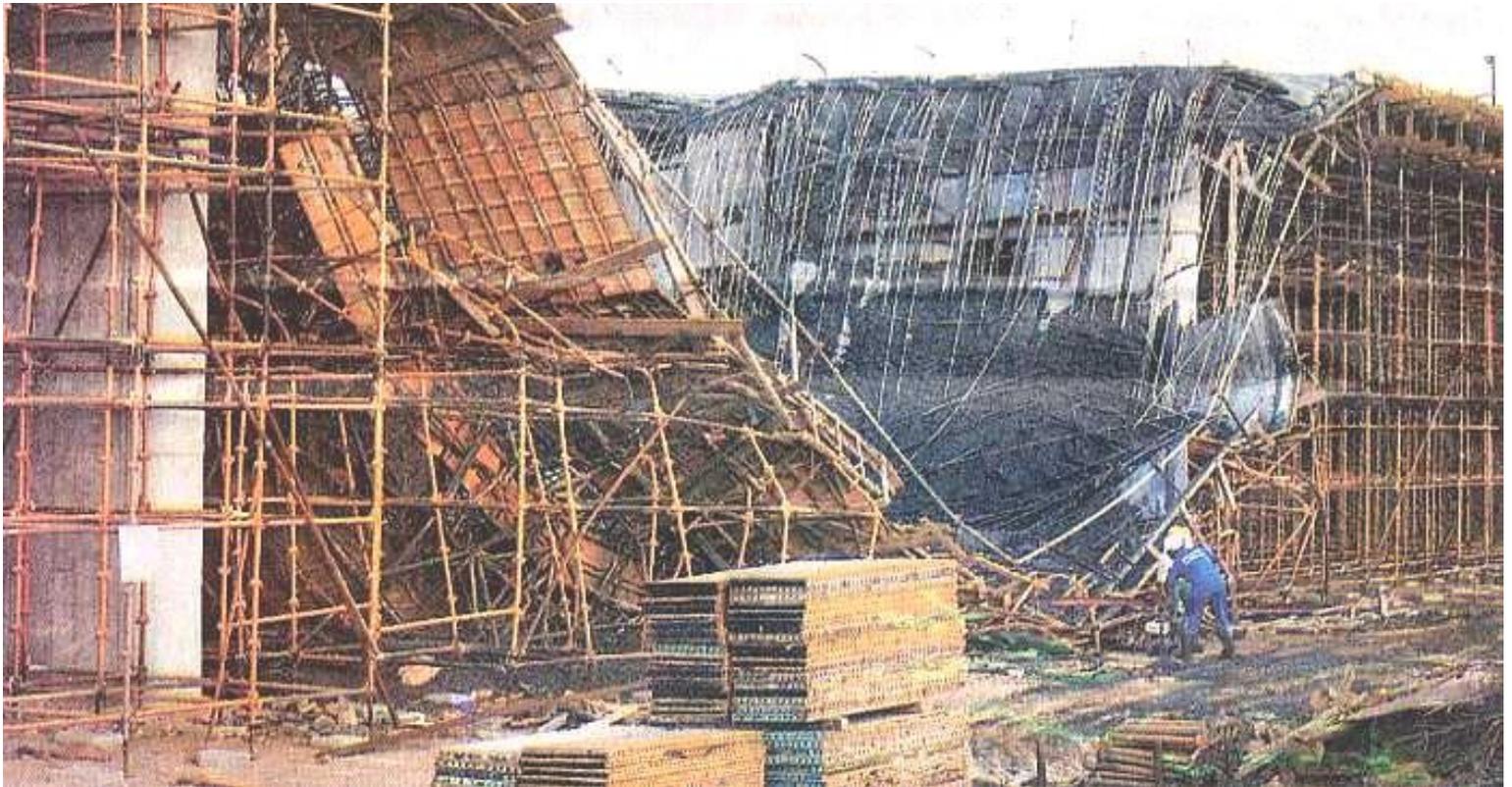
**Investec Office Complex scaffolding collapse, Sandton, August, 1997
(Prinsloo, 1997)**

Introduction (4)



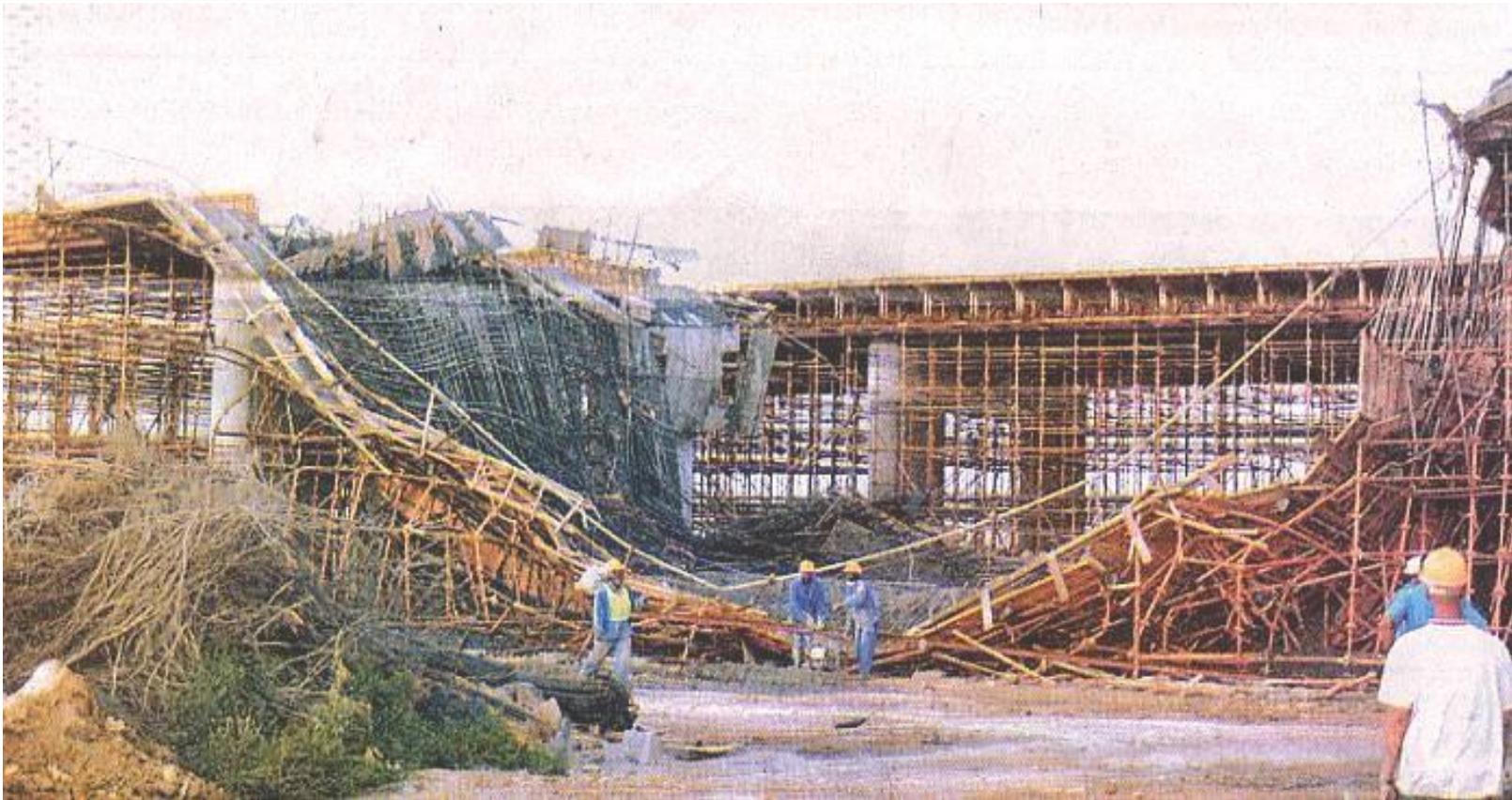
Injaka Bridge collapse, Mpumalanga, July, 1998 (Travers, 1998)

Introduction (5)



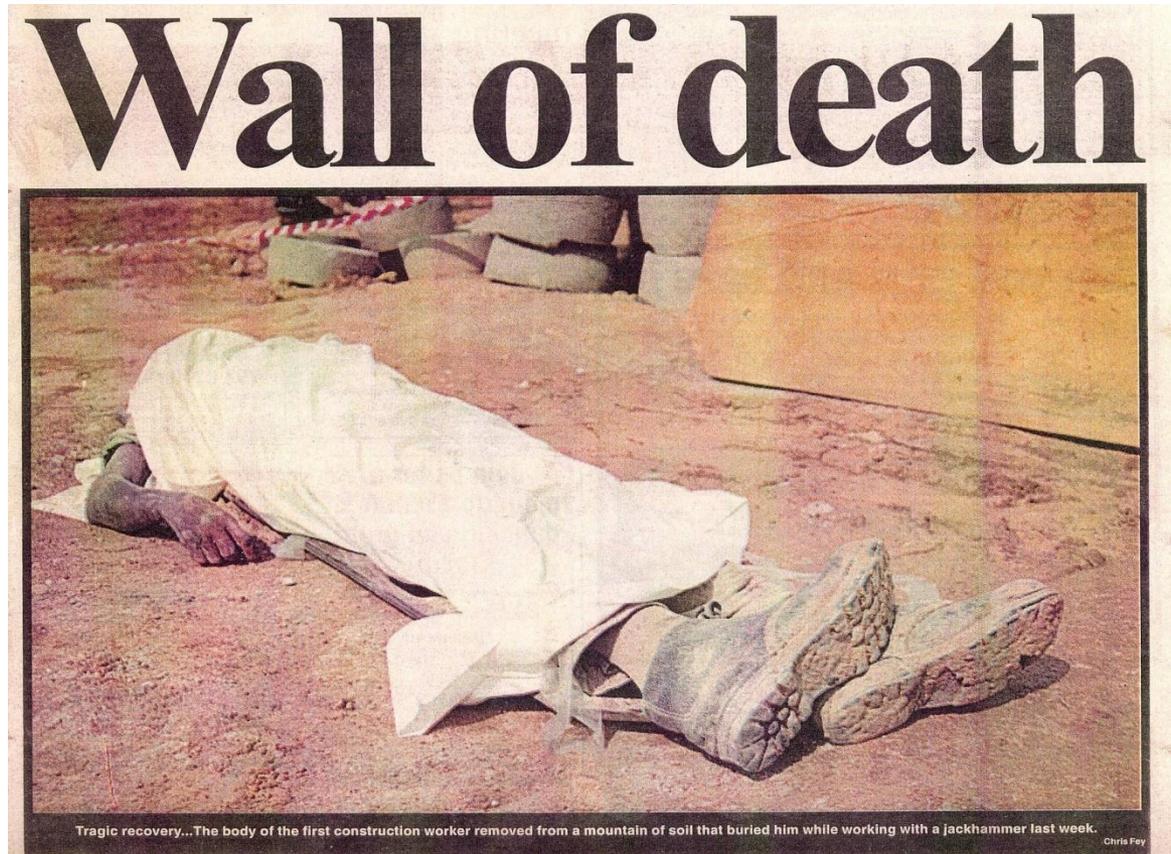
Coega Bridge collapse, Port Elizabeth, November, 2003 (Markman, 2003)

Introduction (6)



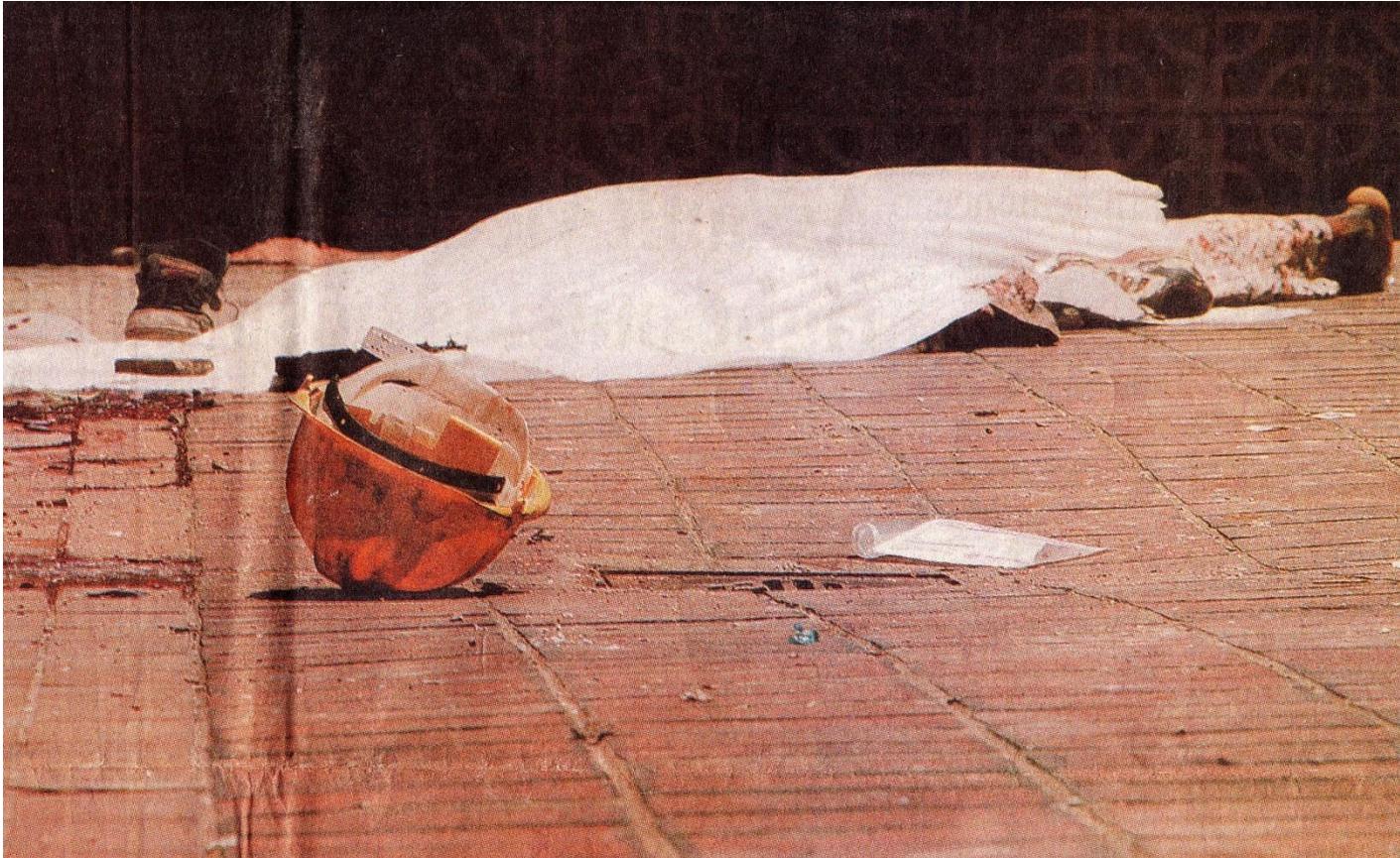
Coega Bridge collapse, Port Elizabeth, November, 2003 (Markman, 2003)

Introduction (7)



Wall (earth) collapse, Randburg, February, 1999 (Frey, 1999)

Introduction (8)



Suspended platform (scaffold) collapse, Hillbrow, February, 2001 (Safodien, 2001)

Challenges (1)



Coega Bridge collapse, Port Elizabeth, November, 2003 (Markman, 2003)

Challenges (2)

Public prosecutions director will decide whether to institute criminal proceedings



Coega Bridge collapse, Port Elizabeth, November, 2003 (Holmes, 2003)

Challenges (3)



Cleveland Bridge collapse, Johannesburg June, 2004 (Anonymous, 2004)

Challenges (4)



Cleveland Bridge collapse, Johannesburg June, 2004 (Anonymous, 2004)

Challenges (5)



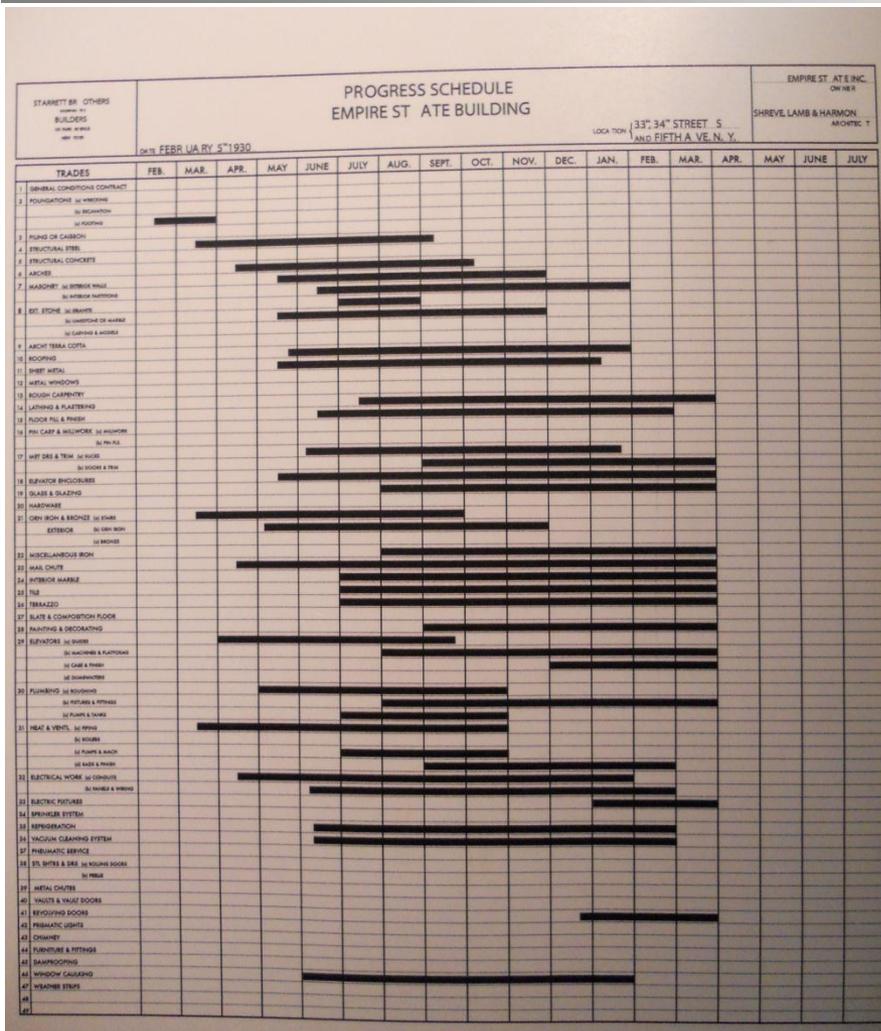
The struggle for H&S continues! (Lexus Nexus adapted by Smallwood, 2003)

Responses (1)



Empire State Building (Smallwood, 2011)

Responses (2)



Project programme, Empire State Building

Responses (3)



Trolleys, Empire State Building

Responses (4)



Trolleys, Empire State Building

Responses (5)



'Ladder' hoist, Delft, Netherlands (Haupt, 2004)

Responses (6)



Toolbox hoist, Melbourne (Smallwood, 1992)

Responses (7)



Pallet trolley, Port Elizabeth (Smallwood, 1991)

Responses (8)



Lowering of brick page over pallet, Port Elizabeth (Smallwood, 1991)

Responses (9)



Kerb lifter, United Kingdom (Godfrey, 2004)

Designing for H&S (1)



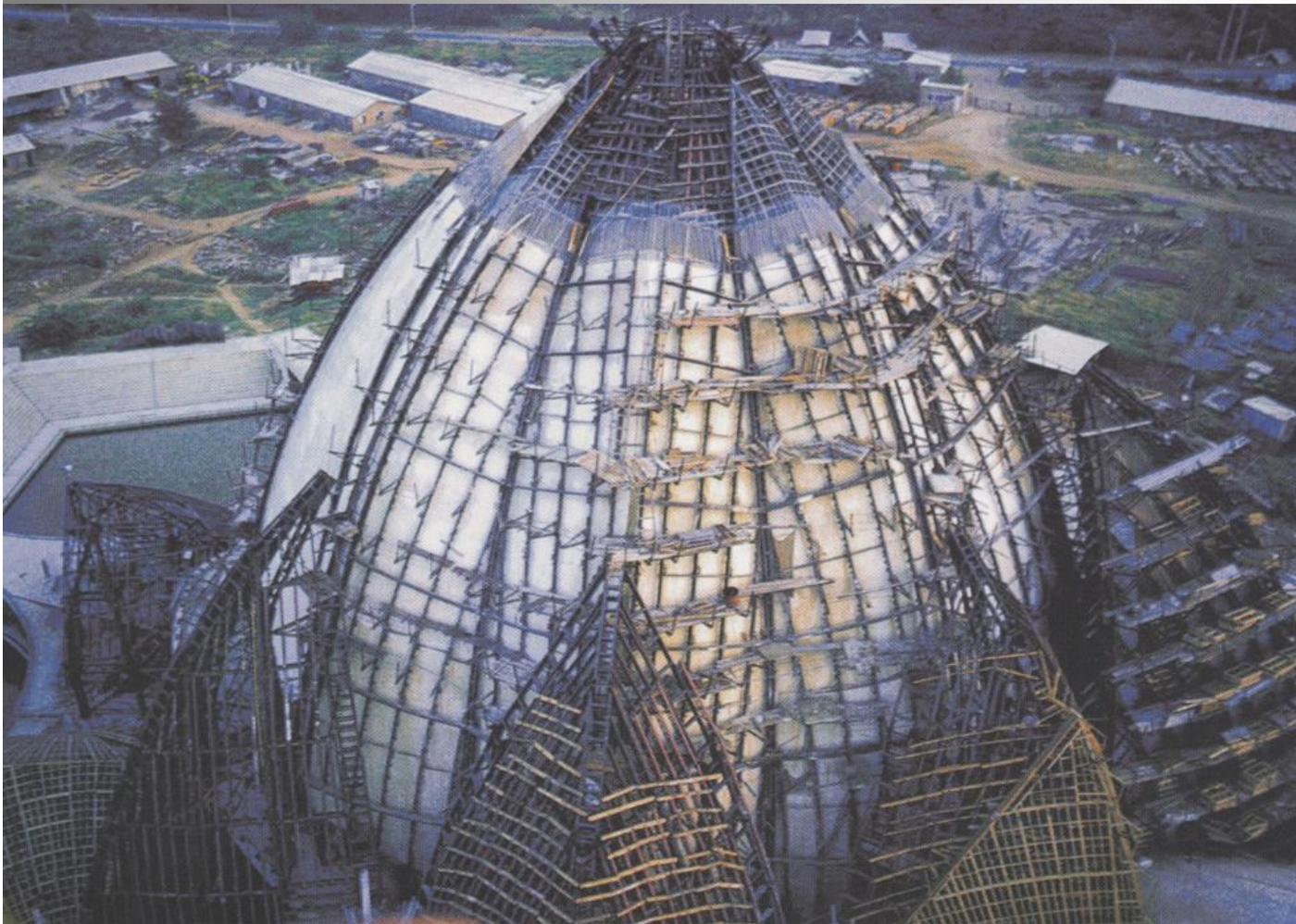
Bahia Temple, Delhi, India (Smallwood, 2005)

Designing for H&S (2)



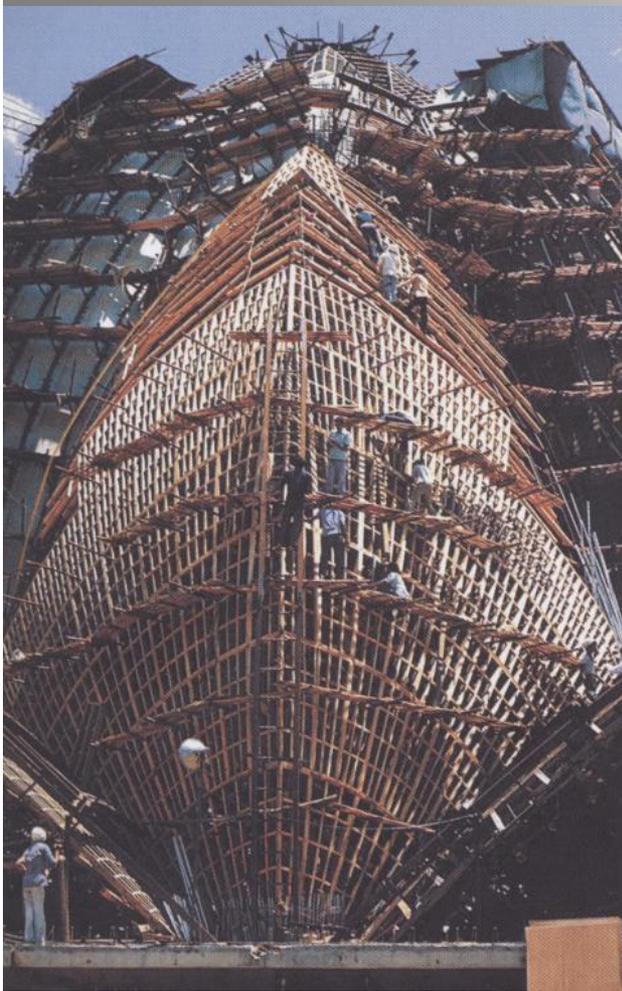
Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahia'is of India, 2002)

Designing for H&S (3)



Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahia's of India, 2002)

Designing for H&S (4)



Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahia'is of India, 2002)

Designing for H&S (5)



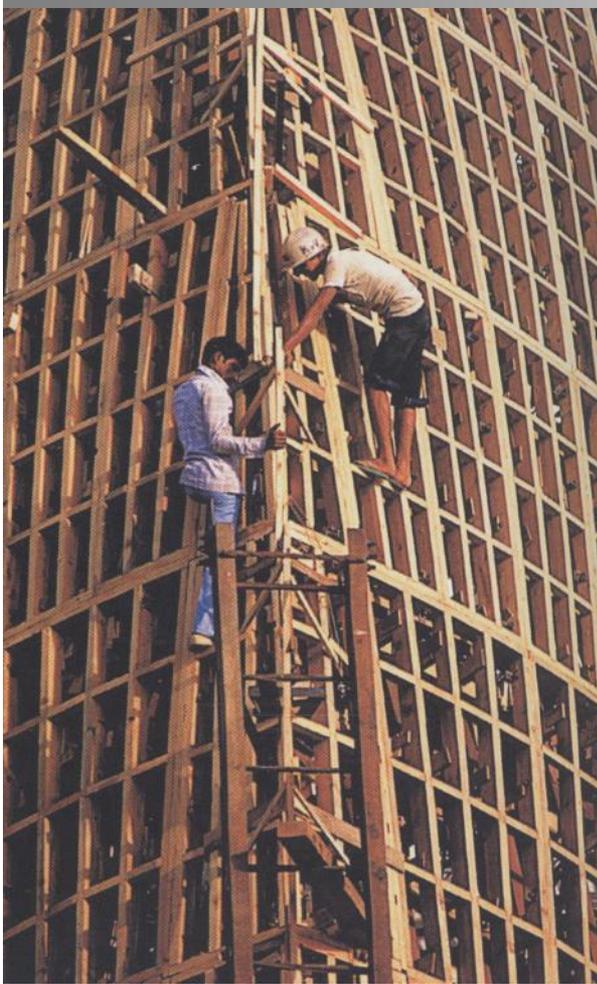
Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahi'is of India, 2002)

Designing for H&S (6)



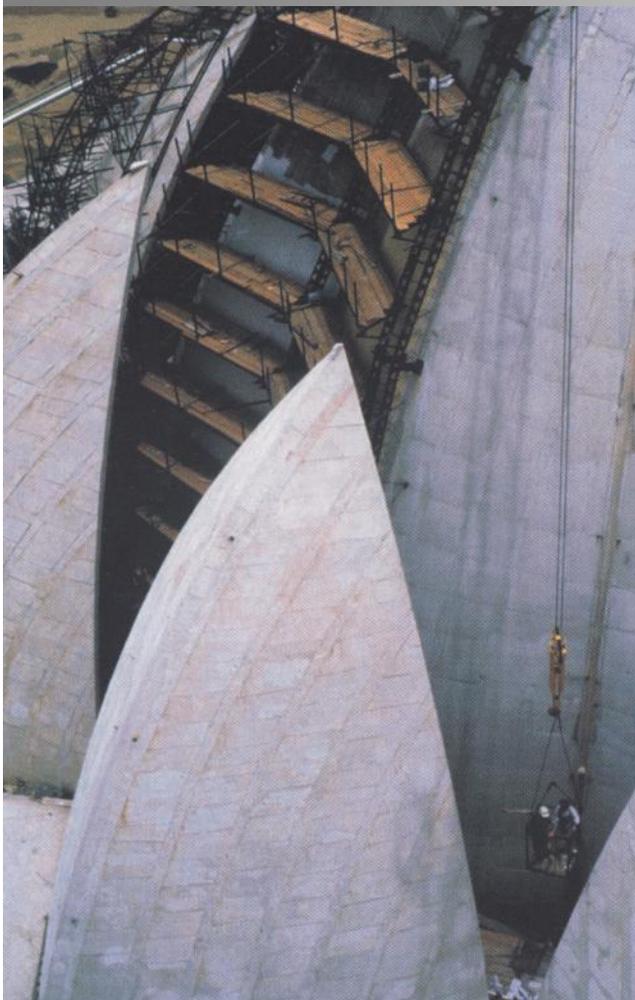
Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahi'is of India, 2002)

Designing for H&S (7)



Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahias of India, 2002)

Designing for H&S (8)



Bahia Temple, Delhi, India (The National Spiritual Assembly of the Bahia'is of India, 2002)

Designing for H&S (9)



Good Hope Centre, Cape Town (Deacon, 1997)

Designing for H&S (10)



Plank and hollow-block composite slab, Plettenberg Bay (Hamp-Adams, 1994)

Designing for H&S (11)



Pre-cast pre-stressed hollow core slab section (SA Builder Bouer, 2004a)

Designing for H&S (12)



Pre-cast pre-stressed hollow core slab section (SA Builder Bouer, 2004b)

Designing for H&S (13)



Precast concrete stair flights, Port Elizabeth (Smallwood)

Designing for H&S (14)



Precast concrete stair flights, Port Elizabeth (Smallwood)

Designing for H&S (15)



'Bush-hammered' concrete, Port Elizabeth (Smallwood)

Designing for H&S (16)



Thermal Lance, Mount Road Police Station, Port Elizabeth (Smallwood, 1987)

Designing for H&S (17)



Congested ceiling space, Cape Town (Smallwood, 2004)

Designing for H&S (18)



Congested ceiling space, Cape Town (Smallwood, 2004)

Designing for H&S (19)



Porte Cochere, Nelspruit Airport (Smallwood, 2004)

Designing for H&S (20)



Light fittings, Porte Cochere, Nelspruit Airport (Smallwood, 2004)

Designing for H&S (21)



'Melting' mastic asphalt, Canal Walk, Cape Town (Smallwood, 2000)

‘Health & Safety’ (H&S) not ‘Safety’

- **Still an emphasis on ‘safety’**
- **Lack of expertise**
- **‘Safety Officers’**
- **Occupational health (OH) issues exceed safety issues**

Safety → H&S → ergonomics → primary health promotion (1)

- **In terms of legislation and better practice a spectrum has evolved from safety**
- **Occupational health (OH) issues exceed safety issues**
- **Muskuloskeletal disorders (MSDs) contribute substantially to injuries, absenteeism, and lost workdays**
- **Primary health (PH) issues are interrelated with OH issues e.g. smoking and substance abuse**
- **Workplace is an ideal environment to address PH issues**

Safety → H&S → ergonomics → primary health promotion (2)

Problem	II				Rank			
	GCs	SAIB	Workers	Mean	GCs	SAIB	Workers	Mean
Chemicals:								
Acids / Alkalis	0.44	1.44	0.63	0.84	28	21	23=	25
Bitumen / Pitch / Tar	0.94	0.82	0.30	0.69	22	28	28	28
Epoxy-resins	0.83	1.07	0.56	0.82	23	25	26	27
Fumes:								
Metal cutting	1.73	2.00	1.23	1.65	14=	1=	20	16
Soldering / Welding	1.35	1.85	0.63	1.28	19	15=	23=	19
Waterproofing	0.75	1.11	0.63	0.83	25	24	23=	26
Mineral wools	0.25	0.78	-	0.52	29	29	-	29
Oils / Petrol	1.73	2.00	1.72	1.82	14=	11=	14	13
Vapours (Adhesives / Paints / Solvents)	1.42	1.82	1.61	1.62	17=	17	16	17
Cold	1.06	1.00	1.36	1.14	20	27	19	22
Dusts:								
Asbestos	0.65	1.56	0.39	0.87	26	20	27	24
Block / Brick	2.06	2.56	1.95	2.19	11	3	12	12
Cement	2.65	2.70	2.46	2.60	1=	1	10	4
Concrete	2.50	2.30	2.28	2.36	4	8=	11	10
Quartz	0.78	1.06	1.71	1.18	24	26	15	20

Table 1: Occupational health problems according to management and workers (II: 0-4) (adapted from Smallwood and Ehrlich, 1999) (Part A).

Safety → H&S → ergonomics → primary health promotion (3)

Problem	II				Rank			
	GCs	SAIB	Workers	Mean	GCs	SAIB	Workers	Mean
Ergonomic:								
Bending / Twisting the back	2.46	2.30	3.34	2.70	5	8=	1	2
Climbing and descending	2.65	2.63	3.16	2.81	1=	2	3	1
Handling heavy loads	2.56	2.44	2.87	2.62	3	4=	8	3
Reaching away from the body	2.19	2.22	3.08	2.50	8	10	4	7
Reaching overhead	2.15	2.41	2.98	2.51	9=	6	7	6
Repetitive movements	2.21	1.89	3.22	2.44	7	13=	2	8
Use of body force	2.15	1.85	3.01	2.34	9=	15=	5	11
Vibration	1.85	1.59	1.57	1.67	13	19	17	15
Heat	1.42	1.89	1.88	1.73	17=	13=	13	14
Illumination (Poor)	1.00	1.30	1.21	1.17	21	23	21	21
Noise	2.04	2.44	2.66	2.38	12	4=	9	9
Sun exposure	2.40	2.37	2.99	2.59	6	7	6	5
Ventilation (Poor)	0.56	1.41	0.90	0.96	27	22	22	23
Wet or damp work	1.44	1.74	1.44	1.54	16	18	18	18

Table 1: Occupational health problems according to management and workers (II: 0-4) (adapted from Smallwood & Ehrlich, 1999) (Part B).

Safety → H&S → ergonomics → primary health promotion (4)

Aspect	Response (%)			Rank
	Yes	No	Don't know	
HIV & AIDS	88.9	12.2	6.7	1
Sexually Transmitted Infections (STIs)	86.7	4.4	8.9	2
Tuberculosis (TB)	84.4	6.7	8.9	3=
Alcohol abuse	84.4	6.7	8.9	3=
Drug abuse	78.6	9.5	11.9	5
Smoking	75.0	9.1	15.9	6
Family planning	69.0	17.5	16.7	7
Epilepsy	63.4	14.6	22.0	8
Healthy eating (Nutrition)	61.0	14.3	26.8	9=
High blood pressure (Hypertension)	61.0	19.5	19.5	9=
Family violence	58.6	14.6	26.8	11=
Stress	58.6	14.6	26.8	11=
Sugar diabetes (Diabetes)	56.1	14.6	29.3	13
Cancer	51.3	14.6	34.1	14
Controlling weight (Obesity)	47.5	22.5	30.0	15
Worms, family illnesses e.g. Measles	45.0	14.6	37.5	16

Table 2: Perceived benefits to employees from addressing various health related aspects (Deacon and Smallwood, 2003).

Safety → H&S → ergonomics → primary health promotion (5)

Benefit	Response (%)			Rank
	Yes	No	Don't know	
Better general health	88.9	6.7	4.4	1
Prevention of disease	88.6	9.1	2.3	2
Lower absenteeism	75.6	12.2	12.2	3
Improved productivity	69.7	16.3	14.0	4
Enhanced quality	65.8	22.0	12.2	5
Prevention of injuries	61.6	33.3	5.1	6
Lower stress levels at work	57.5	30.0	12.5	7
Enhanced schedule (program)	47.3	31.6	21.1	8

Table 3: Perceived benefits to employers from addressing various health related aspects (Deacon and Smallwood, 2003).

‘H&S is a value not a priority’

- **Priorities change from day to day**
- **Inclusion of H&S as a value will ensure:**
 - **Optimum status**
 - **Not negotiable**

H&S is a line function not a staff function

- **H&S is a project parameter as are cost, development, environment, productivity, quality, and time**
- **People are the most important resource**
- **Construction H&S is an integral function**
- **H&S is the catalyst for the synergy between H&S and the other parameters**
- **Therefore all planning and related interventions need to integrate H&S with the other parameters**

H&S requires a team effort

- **Not just the ‘contractor’s problem**
- **Certain disciplines are still in denial despite Section 10 of the OH&S Act (1993) and the Construction Regulations (18 July 2003)**
- **Designers are in a unique position – hierarchy of risk control**
- **Project managers ditto – must integrate design, procurement, and construction in terms of H&S**

H&S is a profit centre not a 'cost'

- **6.5% of the value of completed construction in the USA (The Business Roundtable, 1995)**
- **8.5% of tender price in the UK (Health & Safety Executive, 1997)**
- **Based upon the value of construction work completed in the year 2002, namely R 56 343m (South African Reserve Bank, 2003) the total COA could have been between 4.3% (R 2 401.2m / R 56 343m), and 5.4% (R 3 041.5m / R 56 343m) (Smallwood, 2004a)**
- **Cost of prevention is between 1% and 2% (Smallwood, 2004a)**

H&S is about life or death not legislation

- **People are the most important resource and constitute assets**
- **Injuries, fatalities, and disease constitute defects**
- **Legislation constitutes the minimum requirements**
- **Would an employer not address H&S if there was no H&S legislation?**
- **H&S is ultimately a corporate social responsibility**
- **Workers are customers of management and supervision**

Corporate social responsibility (1)

- **“Mechanism for entities to voluntarily integrate social and environmental concerns into their operations and their interaction with their stakeholders, which are over and above the entity’s legal responsibilities.”
(Standards Australia International, 2003)**
- **Motivators for H&S: legal considerations; moral / religious beliefs; ethical issues; humanitarian concerns and a respect for people; a desire for sustainability; compliance with national and international standards; a desire to reduce the costs of accidents / incidents; the desire to reduce organizational risk; adherence with total quality management principles; support of local industry OH&S and image initiatives, and the pursuit of better practice**

Corporate social responsibility (2)

- **Triple Bottom Line (TBL) reporting requires organisations to report their performance in accordance with a range of financial, environmental and social indicators. OH&S performance is an important component of these social indicators**

The role of religion (1)

- **The common thread of all religions is ‘I am my brother’s keeper’**
- **There is both an explicit and implied link between H&S and religion**
- **Explicit link:**
 - **Manifests itself through the belief that work is a deed of spiritual value, which requires justice and equity, dignity of labour, and removal of hardship**
 - **Importance of sustainability of the environment**
 - **Inter-relationship between religion and morality and values, and the resultant influence on behaviour is a further manifestation**

The role of religion (2)

- **Implied link manifests itself in the underlying principle of all religions, namely the ‘golden rule’, ‘do not unto others what you would not have them do unto you’ – would you like to have your life compromised as a result of inadequate H&S on the part of someone else?**
- **All religions explicitly and imply the need for human life and the environment to be respected and preserved**

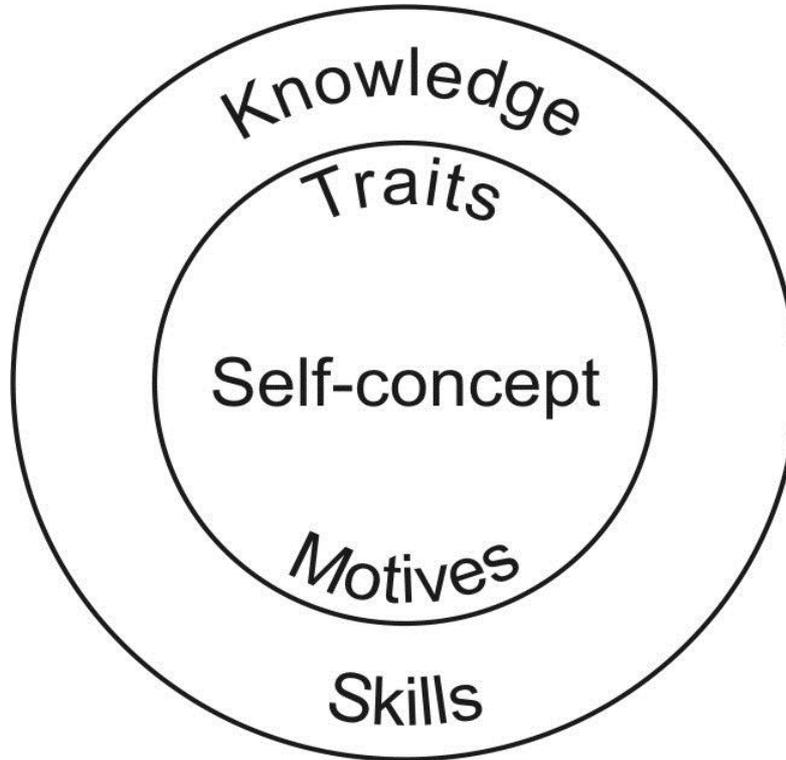
Feng shui (1)

- **“The ancient Chinese art of living in harmony with the environment.” (Webster, 1998)**
- **Translated from Chinese, feng shui means wind and water**
- **Living in harmony means health, well-being, success in work, personal happiness, and spiritual growth (Gerstung and Mehlhase, 2000)**
- **In order to achieve this it is necessary to strengthen the positive forces and avoid the negative forces**
- **Ch’i is the term used to refer to positive forces and sha ch’i, the negative forces**
- **A survey of 32 construction workers indicates potential for the application of feng shui principles on construction sites (Smallwood, 2006):**

Feng shui (2)

- The positioning of various functional points and areas have on the wellness of people on site, in particular, ablutions
- Various aspects have on the wellness of people on site, in particular: noise; type of building; lighting levels; temperature; location of site, and housekeeping
- The positioning of various functional points and areas have on overall project performance, in particular, site office, but also entrance
- Various aspects have on overall project performance: housekeeping; major plant, and organisation of work area

Surface competencies – core competencies? (1)



(Sanghi, 2004)

Surface competencies – core competencies? (2)

- **Surface:**
 - **Knowledge** - information regarding content
 - **Skill** - ability to perform a task
- **Core:**
 - **Self-concept** - values, aptitude, attitude, and self-image
 - **Traits** - self-confidence, team player, and handles ambiguity
 - **Motives** - focus on client success, and preserves organization / personal integrity

Surface competencies – core competencies? (3)

Criteria of performance are superior performance and effective performance, the issue being that only some competencies can predict performance. Thus competencies are divided into two categories (Sanghi, 2004):

- **Threshold (surface): these are required to be minimally effective**
- **Differentiating (core): these distinguish superior from average performers**

Personality type (1)

Jung's theory of personality includes the elements (Pierce, 2005):

- Psyche
- Self
- Ego
- Persona
- Shadow
- Complexes
- Libido
- Progression
- Regression
- Extroversion
- Introversion
- Individuation
- Self-actualisation

Personality type (2)

- **Two main personality types: Type A (intense and highly motivated) or Type B (laid-back and content)**
- **A strong potential exists for causality or association between risk-taking and reactive personalities and increased injury experience (Pierce, 2005)**

Emotional Intelligence (1)

- **“Capacity for recognising our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships.” (Goleman, 1998)**
- **Competencies – 4 clusters:**
 - **Self-awareness: understand one’s emotions, strengths, and weaknesses**
 - **Self-management: manage one’s motives and behaviour**
 - **Social awareness: understand what others are saying and feeling**
 - **Social skills: obtain desired results from others**
- **15 Attributes / States:**
 - **Self regard: The ability to look at and understand, respect and accept oneself**
 - **Emotional self awareness: Ability to understand ones thoughts, feelings and emotions**

Emotional Intelligence (2)

- **Assertiveness:** Express feelings, beliefs, thoughts in a non-destructive way, not using anger and temper
- **Independence:** Be self reliant, do not need anyone to tell them what to do, can stand and work alone, lead
- **Self actualization:** Realize ones potential, strive to reach what one wants to, in the right career, being fulfilled
- **Empathy:** To emotionally read others, feel for them as if in their shoes (different from sympathy)
- **Social responsibility:** Co-operate, contribute to ones social group, being involved, caring for team, society
- **Interpersonal relationships:** Maintain satisfying relationships, getting along with others
- **Stress tolerance:** The ability to withstand adverse and stressful situations without falling apart
- **Impulse control:** Ability to resist or delay an impulse, drive or temptation to act (e.g. anger, eating, drugs, shopping)

Emotional Intelligence (3)

- **Reality testing: Ability to assess the correspondence between what is experienced (subjective) and what in reality exists (having accurate assumptions)**
- **Flexibility: Ability to adjust ones emotions, thoughts and behaviours to changing situations, manage change and new ways of doing things**
- **Problem solving: Ability to identify, define problems and implement effective solutions**
- **Optimism: Ability to look at the brighter side of life, maintain a positive attitude**
- **Happiness: To feel satisfied with ones life, enjoy oneself, have fun**

Respect for people (1)

- **One of the three principles of ‘Rethinking construction’ in the United Kingdom**
- **Principle due to the role of people**
- **Poll conducted by pollster YouGov in the UK (Construction Manager, 2003):**
 - **Where would you like to work and why?**
 - **Building sites ranked second out of seven places in terms of where people would least like to work**
 - **‘Work is physically exhausting’ and ‘sites are exposed to the elements’ predominated among eleven**
 - **Followed jointly by ‘sites are dangerous’ and ‘the work culture is harsh / aggressive’**
 - **Then ‘building sites are dirty’**

Respect for people (Lack of) (2)



Contents of portable toilet, Humansdorp (Pierce-Jones, 2006)

Respect for people (Lack of) (3)



Contents of portable toilet, SEP (Smallwood, 2007)

Respect for people (Lack of) (4)



Lockers, SEP (Smallwood, 2007)

Respect for people (Lack of) (5)



Strapped 'down' worker (Mtola, 2008)

Respect for people (Lack of) (6)



'Outdoor dining', SEP (Smallwood, 2007)

Respect for people (7)



Mess facility, Sancti Spiritus, Cuba (Smallwood, 2007)

Respect for people (8)



Canteen, Kings Cross underground station project, London (Smallwood, 2002)

Respect for people (9)



Showers, Kings Cross underground station project, London (Smallwood, 2002)

Respect for people (10)

Aspect	Response (%)						II	Rank
	Unsure	Very poor	Poor	Average	Good	Excellent		
Provision of appropriate materials	0.0	0.0	9.1	27.3	63.6	0.0	2.55	1
Employment contracts	0.0	0.0	18.2	27.3	45.5	9.1	2.45	2
Provision of plant and equipment	0.0	0.0	18.2	36.4	45.5	0.0	2.27	3
Occupational safety	0.0	0.0	27.3	27.3	45.5	0.0	2.18	4
Mechanisation	0.0	0.0	9.1	72.7	18.2	0.0	2.09	5
Promotion	0.0	0.0	9.1	81.8	9.1	0.0	2.00	6
Workplaces	0.0	9.1	9.1	63.6	18.2	0.0	1.91	7=
Constructability of design / details	0.0	9.1	18.2	45.5	27.3	0.0	1.91	7=
Limited manual handling	0.0	9.1	27.3	27.3	36.4	0.0	1.91	7=
Occupational health	0.0	0.0	45.5	27.3	18.2	9.1	1.91	7=
Housekeeping	0.0	9.1	27.3	36.4	27.3	0.0	1.82	11=
Environment	0.0	9.1	27.3	36.4	27.3	0.0	1.82	11=
Employment practices generally	0.0	0.0	36.4	54.5	9.1	0.0	1.73	13=
Supervision (inter-personal skills)	0.0	9.1	27.3	45.5	18.2	0.0	1.73	13=
Optimum time for activities	0.0	0.0	36.4	54.5	9.1	0.0	1.73	13=
Provision of information	0.0	9.1	18.2	63.6	9.1	0.0	1.73	13=
Primary health promotion	0.0	18.2	18.2	45.5	9.1	9.1	1.73	13=

Table 4: Rating of the South African construction industry relative to production workers in terms of various aspects (II = 0-4) (Part A) (Smallwood, 2004b)

Respect for people (11)

Aspect	Response (%)						II	Rank
	Unsure	Very poor	Poor	Average	Good	Excellent		
General development	0.0	0.0	54.5	27.3	18.2	0.0	1.64	18
Skills training	0.0	0.0	63.6	18.2	18.2	0.0	1.55	19=
Provision of personal protective equipment (PPE)	0.0	9.1	54.5	9.1	27.3	0.0	1.55	19=
Traffic safety during work	0.0	18.2	27.3	36.4	18.2	0.0	1.55	19=
WHBs (ablutions)	0.0	20.0	30.0	30.0	20.0	0.0	1.50	22
Induction (general)	0.0	0.0	63.6	27.3	9.1	0.0	1.45	23=
Sustainable employment	0.0	27.3	18.2	36.4	18.2	0.0	1.45	23=
Appropriate remuneration	0.0	9.1	45.5	45.5	0.0	0.0	1.36	25=
Recognition	0.0	9.1	45.5	45.5	0.0	0.0	1.36	25=
Ergonomics	0.0	9.1	63.6	9.1	18.2	0.0	1.36	25=
Toilets (ablutions)	0.0	18.2	36.4	36.4	9.1	0.0	1.36	25=
Changerooms	0.0	18.2	54.5	18.2	9.1	0.0	1.18	29=
'Off-the-job' H&S	0.0	18.2	63.6	0.0	18.2	0.0	1.18	29=
Soap (ablutions)	0.0	45.5	9.1	36.4	9.1	0.0	1.09	31=
Canteens / Mess rooms	0.0	27.3	45.5	18.2	9.1	0.0	1.09	31=
Showers (ablutions)	0.0	45.5	18.2	27.3	9.1	0.0	1.00	33
Towels (ablutions)	0.0	54.5	9.1	27.3	9.1	0.0	0.91	34

Table 4: Rating of the South African construction industry relative to production workers in terms of various aspects (II = 0-4) (Part B) (Smallwood, 2004b)

Respect for people (12)

Aspect	Response (%)						II	Rank
	Unsure	Very Poor	Poor	Average	Good	Excellent		
Respect for people	0.0	0.0	18.2	54.5	27.3	0.0	2.09	1
Empowerment	0.0	0.0	40.0	30.0	30.0	0.0	1.90	2

Table 5: Rating of the South African construction industry relative to production workers in terms of respect for people and empowerment (II = 0-4) (Smallwood, 2004b)

Inclusive tertiary education

- **Construction management programmes address H&S to varying degrees**
- **Architectural, civil engineering, interior designer, and quantity surveying programmes address construction H&S between not at all to a limited extent**

Development and capacity building (1) (Introduction 1)

- **10 NMMU BSc (Construction Studies) students undertook structured vacation work as part of a pilot project on three WBHO East Cape projects:**
 - **Gonubie Shopping Centre, East London**
 - **Kingsway Mall, Port Elizabeth**
 - **Moffat on Main, Port Elizabeth**
- **14 Focus areas:**
 - **Administration**
 - **Contractual / Quantity Surveying**
 - **Material technology**
 - **Contract planning**
 - **Surveying**
 - **Estimating**
 - **Quality**

Development and capacity building (2) (Introduction 2)

- **Occupational Health and Safety**
- **Human Resources**
- **Technical and temporary works**
- **Plant and equipment**
- **Training and continued education**
- **Management skills**
- **Civil engineering structures and roles**

Development and capacity building (3) (Groups 1)



Gonubie Shopping Centre Team: Malibongwe Skendle, Prince Lufu, Micheal Fletcher, Andrew Venter, John Smallwood, Zusakhe Mahonono, Nqabomzi Dyani

Development and capacity building (4) (Groups 2)



Moffat on Main Group: Nqabisa Mali, Jim Boggess, Thandi Gitywa, Ncumisa Balley, John Smallwood

Development and capacity building (5) (Groups 3)



Kingsway Mall Group: Olufemi Ajayi, Justin de Klerk, Brink Botha, John Smallwood, Michael Mbundwini, Ruan Adlam, Mark Bower

Development and capacity building (6) Conclusions

- **Specific:**
 - Increase in knowledge relative to knowledge areas
 - Enhancement of skills
 - Improvement in understanding and appreciation of the functions in an organisation
 - Improvement in understanding and appreciation of the functions and activities of management work
 - Enhancement of core competencies
 - Improvement in understanding and appreciation of the project parameters
 - Improvement in understanding and appreciation of the construction process and activities
- **General:**
 - The three-week vacation programme was a success
 - A structured programme is necessary
 - Positive mentors are critical

Competence

- **Recent research findings indicate that Client Appointed H&S Agents are not competent *per se***
- **Underpinning knowledge in the built environment is a pre-requisite to manage or advise regarding construction H&S**

Integrated multi-stakeholder project H&S plans

- H&S specifications are not project specific and do not schedule residual design risks
- Consequently H&S plans do not respond per se to risks and residual risks
- A coordinated approach to projects is required
- Recent research findings indicate that this is not the case
- Integrated multi-stakeholder project H&S plans are required

Leading versus trailing indicators (1)

- Trailing indicators measure failure
- Leading indicators indicate likely performance

Leading versus trailing indicators (2)

Benchmark	GCs		PMs		Mean	
	II	Rank	II	Rank	II	Rank
Written H&S policy (available)	3.42	1=	3.13	2	3.28	1
Written H&S rules (available)	3.42	1=	3.06	3=	3.24	2
Percentage of supervisors which have attended a H&S course	3.16	10=	3.19	1	3.18	3
Documented H&S management system/programme (available)	3.16	10=	3.06	3=	3.11	4
Percentage of workers which have attended a H&S course	3.11	12=	3.06	3=	3.09	5
Percentage of management educated in H&S	3.11	12=	3.00	6	3.06	6
Frequency of H&S inspections	3.11	12=	2.94	7=	3.03	7
Project H&S plans (available)	3.32	4=	2.69	9=	3.00	8
Disabling injury incidence rate (DIIR)	3.26	6=	2.69	9=	2.98	9
Frequency of H&S site meetings	2.74	17	2.94	7=	2.84	10
Cost of prevention (COP) (Rand)	3.26	6=	2.25	12	2.78	11
COP as a percentage of value of construction (%)	3.26	6=	2.13	13=	2.70	12
Direct cost of accidents (CO) (Rand)	3.37	2	1.94	15=	2.66	13=
Percentage activities for which safe work procedures are available	3.00	16	2.31	11	2.66	13=
Total COA as a percentage of value of construction (%)	3.11	12=	1.75	18	2.43	15
Total COA (Rand)	3.32	4=	1.50	19=	2.41	16
Indirect COA (Rand)	3.26	6=	1.50	19=	2.38	17
Medical aid incidence rate (MAIR)	2.53	18	1.94	15=	2.24	18
Modified severity rate (SR)	2.47	19	1.89	17	2.18	19
Fatality rate per 100 000 workers	2.16	20	2.13	13=	2.15	20

Table 6: Overall potential usefulness of potential H&S benchmarks according to GCs and PMs (II: 0-4) (Smallwood, 2001).

Roadmap

- **Respect for people**
- **Change the way we design, procure, and construct**
- **Compliance → better practice**
- **Optimum tertiary built environment education**
- **Competent emotionally intelligent people**
- **Integrated multi-stakeholder contributions to H&S**

Management of H&S and complexity

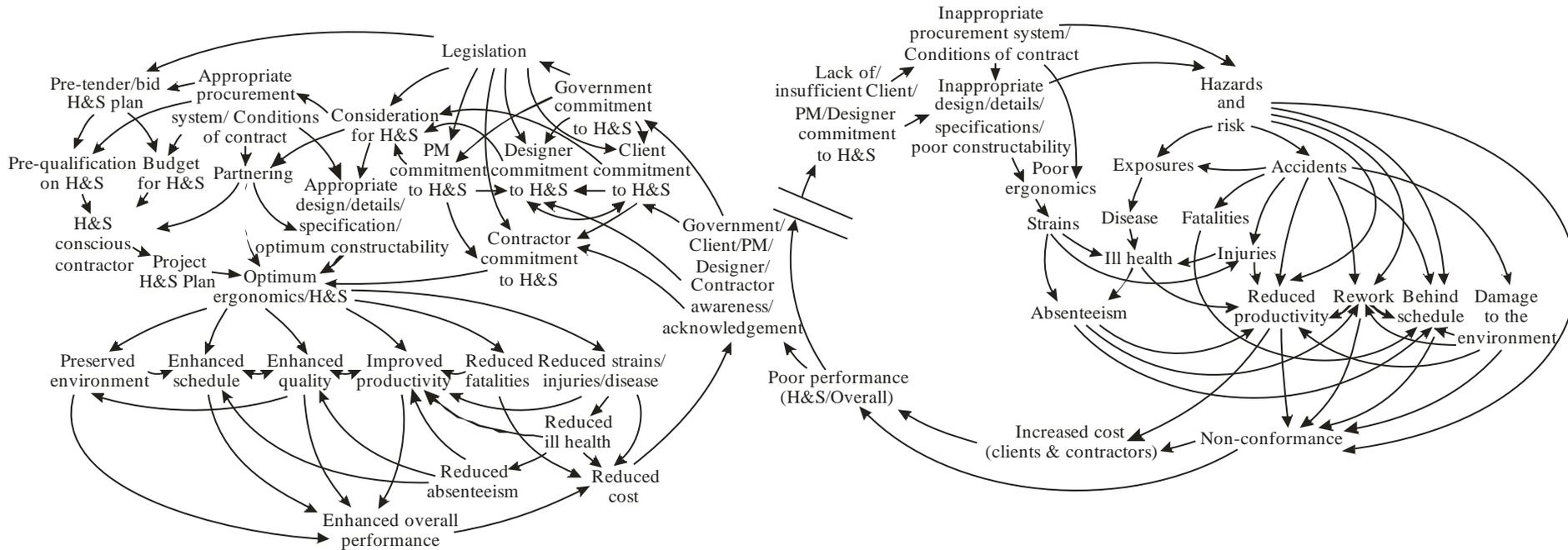


Illustration 1: The holistic role of project managers (PMs) in H&S and the role of H&S in overall performance.
(Smallwood, 2005)

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