THE FEDERATED EMPLOYERS' MUTUAL ASSURANCE COMPANY MVA WORKSHOP

PORT ELIZABETH, 18 SEPTEMBER 2018

MOTOR VEHICLE ACCIDENTS (MVAs) DURING CONSTRUCTION

PROF JOHN SMALLWOOD

PROFESSOR, DEPARTMENT OF CONSTRUCTION MANAGEMENT
NELSON MANDELA UNIVERSITY

Personal journey (1)

- Smallwood, J.J. (2002) Traffic accidents contribute substantially to fatalities in construction. *SA Builder*, September, p. 9.
- Smallwood, J.J. (2002) Traffic safety in construction, *MBA Bulletin*, 1 October, p. 3.
- Smallwood, J.J. (2002) Traffic safety in construction: The deadly iceberg, *Safety Management*, November / December, p. 8.
- Emuze, F.A. and Smallwood, J.J. (2012) Construction Motor Vehicle Accidents in South Africa: Preliminary Findings. In: *Proceedings of CIB W099 International Conference 2012: Modelling and Building Health and Safety*, 10-11 September 2012, Singapore, pp. 203-208.

Personal journey (2)

- Emuze, F.A. and Smallwood, J.J. (2013) Construction Motor Vehicle Accidents in South Africa: Causes and Impact. In: *Proceedings of the 29th Annual Association of Researchers in Construction Management (ARCOM) Conference*, 2-4 September, Reading, UK, pp. 311-321.
- Smallwood, J.J. (2018) Motor Vehicle Accidents (MVAs) During Construction. Presentation to: *One-Day ACHASM Gauteng 2018 Construction Health and Safety (H&S) Symposium*, Midrand, 12 March.

General Introduction (1)

Year	Fatal Crashes (No.)	Fatalities (No.)	Severity
2010	10 837	13 967	1.3
2011	11 228	13 954	1.2
2012	10 977	13 528	1.2
2013	10 170	11 844	1.2
2014	10 367	12 702	1.2
2015	10 613	12 944	1.2

Table 1: Fatal road accidents reported in 2010 to 2015
(South African Department of Transport in Verster & Fourie, 2018)

General Introduction (2)

- The total cost of South African road traffic accidents in 2015 was estimated to be R142.95 billion (Verster & Fourie, 2018):
  - Equates to 3.4% of South Africa's gross domestic product (GDP)
  - The average cost of accidents in similar countries is reported at only 2.2% of their GDP
- The number of crashes per 10 000 motorised vehicles for South Africa is 12 and the number of fatalities is 11
- In 2015 of the 12 944 fatalities:
  - 27.0% were drivers of which 66.7% were younger than 30
  - 32.8% of the fatalities were passengers and 37.7% were pedestrians
  - 78.0% were male and 22.0% were female
  - 24.6% were 20–29 years of age and 24.9% were 30–39 years of age
  - 48.5% of the vehicles involved were motor cars (and station wagons), and LDVs 18.4% (64.6% and 22.5% of registered vehicles respectively) - minibuses third (9.0%)

General Introduction (3)

- 60.3% occurred on weekends (Fridays, Saturdays, and Sundays) and slightly over 40% of the accidents occurred late afternoon and at night (16:00 - 22:00)

Construction Introduction (1)

Year	Accidents		Consequence (No.)	
	%	No.	Fatality	Permanent Disability
2011	12.47	892	23	25
2010	10.85	984	63	57
2009	9.18	949	31	51
2008	8.35	910	31	30
2007	8.30	871	30	37
2006	6.95	629	34	29
2005	7.54	674	26	24
2004	7.66	624	28	26
2003	7.55	557	36	30
2002	8.15	561	33	29
2001	4.26	278	26	11
2000	3.59	264	15	11

Table 2: MVAs in South African construction from 2000 to 2011 (FEM in Emuze and Smallwood , 2012).

Construction Introduction (2)

Cause	Accidents (No.)	Accidents (%)	Fatal accidents (No.)	Fatal accidents (%)	PDs not resulting in pensions (No.)	PDs resulting in pensions (No.)	Lost Days (No.)	Lost Days (%)	Average cost per accident (Rand)
Accident type NEC	97	1.28	3	4.35	2	1	92	0.30	31 863
Awaiting information	1	0.01	0	0.00	0	0	0	0.00	7 500
Caught in. on. between	500	6.61	2	2.90	88	0	2 013	6.51	29 527
Contact with electric current	39	0.52	1	1.45	9	0	234	0.76	93 070
Contact with temp extremes	137	1.81	2	2.90	53	0	497	1.61	59 576
Fall on to different levels	833	11.02	12	17.39	125	1	5 899	19.08	51 061
Fall on to same level	292	3.86	0	0.00	28	0	1 137	3.68	21 113
Inhalation / Absorption / Ingestion	174	2.30	0	0.00	4	2	216	0.70	31 411
Motor vehicle accident (MVA)	915	12.10	43	62.32	116	5	6 172	19.96	83 948
Slip or over-exertion	987	13.06	0	0.00	54	0	3 250	10.51	16 631
Striking against	1 202	15.90	0	0.00	208	0	3 422	11.07	15 581
Struck by	2 374	31.40	6	8.70	323	0	7 966	25.76	21 814
Unclassified (Insufficient data)	9	0.12	0	0.00	0	0	25	0.08	40 904
Total	7 560	100.0	69	100.0	1 010	9	30 923	100.0	32 794

Table 3: Causes of accidents for FEM insured clients for the year 2017 for all regions of South Africa (FEM, 2018)

Construction Introduction (3)

- MVAs are reported to be the dominating cause of fatalities in South African construction – 47% (cidb, 2009)
- 43 / 69 (62.3%) of fatalities in 2017 were attributable to MVAs during construction (FEM, 2018)
- MVAs contribute greatly to fatalities and injuries in construction because of common unsafe transport / traffic practices (Smallwood, 2002) - such practices are not limited to:
  - Workers sitting on the sides and beds of vehicles
  - Workers mounting or dismounting from moving vehicles
  - Overloading of vehicles
  - Non-wearing of seat belts
  - Non-roadworthiness of vehicles

Construction Introduction (3)

- Between 2000 and 2011, the number of accidents increased from 264 to 892 per annum:
  - Percentage contribution has increased from 3.6% to 12.5%
  - Invariably, the MVA incidence rate has increased

Legislation

- Regulation 23 (2) (i) of the Construction Regulations states that vehicles used to transport workers must have seats firmly secured and adequate for the number of employees to be carried (Republic of South Africa, 2014)
- National Road Traffic Regulations 2000, Regulation 247 states that no person shall operate on a public road a goods vehicle conveying persons unless that portion of the vehicle in which such persons are being conveyed is enclosed to a height of at least 350mm above the surface upon which such person is seated or at least 900mm above the surface on which such person is standing, in a manner and with a material of sufficient strength to prevent such person from falling from such vehicle when it is in motion (Republic of South Africa, 2000)

Legislation (2)

- Neither the Construction Regulations 2014, or the National Road Traffic Regulations 2000 refer to / require:
  - Any form of roll over protection!
  - Seat belts!

Factors that influence MVAs

A vehicle crash is considered to be an interacting system of five factors (Bayam et al. in Verster & Fourie, 2018):

- **Driver:**
  - **Age and gender**
- **Vehicle:**
  - **Vehicle type and age (year)**
- **Environmental and geographical conditions:**
  - **Weather conditions**
  - **Lighting conditions**
  - **Day and time of the day**
  - **Area type**
- **Roadway:**
  - **Road condition**
  - **Road surface**
- **Occupants and other road users:**
  - **Age and gender**

Factors contributing to fatal road accidents

- Human (79.6%) of which 52.5% due to jaywalking
- Road and environmental (12.7%) of which 22.0% due to sharp bends
- Vehicle (7.8%) of which 71.1% are due to tyre bursts

(South African Department of Transport in Verster & Fourie, 2018)

Reasons for fatal accidents (Road and environmental conditions)

In descending order:

- Sharp bends
- Poor visibility
- Wet and slippery road surfaces
- Stray or wild animals
- Poor road surfaces
- Poor lighting
- Road works
- Poor and inadequate road markings
- Blind corners

(South African Department of Transport in Verster & Fourie, 2018)

MBSA H&S programme - Road traffic safety?

Transport and material handling (20 / 924)

17. TRANSPORT AND MATERIAL HANDLING EQUIPMENT					COM-MENT
SUBJECT	REQUIREMENT	P	S	N	
SITE VEHICLES	Passengers seating provided (1) sufficient (1) and suitable (1)	3			
	Site speed limit displayed (1) and adhered to (1)	2			
	Windscreen in good condition (1)	1			
	Lights operational condition (1), indicators fitted and operational (1)	2			
	Hooter working (1), equipped with an automatic acoustic reversing alarm (1)	2			
	No oil leaks (1)	1			
CONVEYOR BELT	Conveyor belt guarding of nip-points (1), drive (1) and tail pulley (1)	3			
	Emergency stop accessible (1), head protruding (1) trip wire operational (1)	3			
	Conveyor frame supported (1), structure protected (1), adequately secured (1)	3			
	TOTALS: SECTION 17 - TRANSPORT AND MATERIAL HANDLING EQUIPMENT [20]				

ISO 39001: Road traffic safety (RTS) management systems (1)

Introduction

1. Scope
2. Normative references
3. Terms and definitions
4. Context of the organisation – needs, requirements, and scope
5. Leadership – top management's role, and policy
6. Planning – strategic objectives, and guiding principles
7. Support – establishing competence, and communicating, while documenting, controlling, maintaining and retaining the required documentation
8. Operation – the requirements, how to address them and develop the procedures to manage and respond to an emergency

ISO 39001: Road traffic safety (RTS) management systems (2)

9. Performance evaluation – summarises the requirements necessary to measure RTS performance
10. Improvement - identify and act on RTSMS non-conformance through corrective action

(International Organisation for Standards (ISO), 2012)

Visuals of MVAs during construction (1)

Photo 1: Overturned RMC Truck, Garsfontein Road, 14 November 2012 (Eye Witness News)

Visuals of MVAs during construction (2)

Photo 2: Overturned RMC Truck, Garsfontein Road, 14 November 2012 (Eye Witness News)

Visuals of MVAs during construction (3)

Photo 3: Overturned RMC Truck, Garsfontein Road, 14 November 2012 (Eye Witness News)

Visuals of MVAs during construction (4)

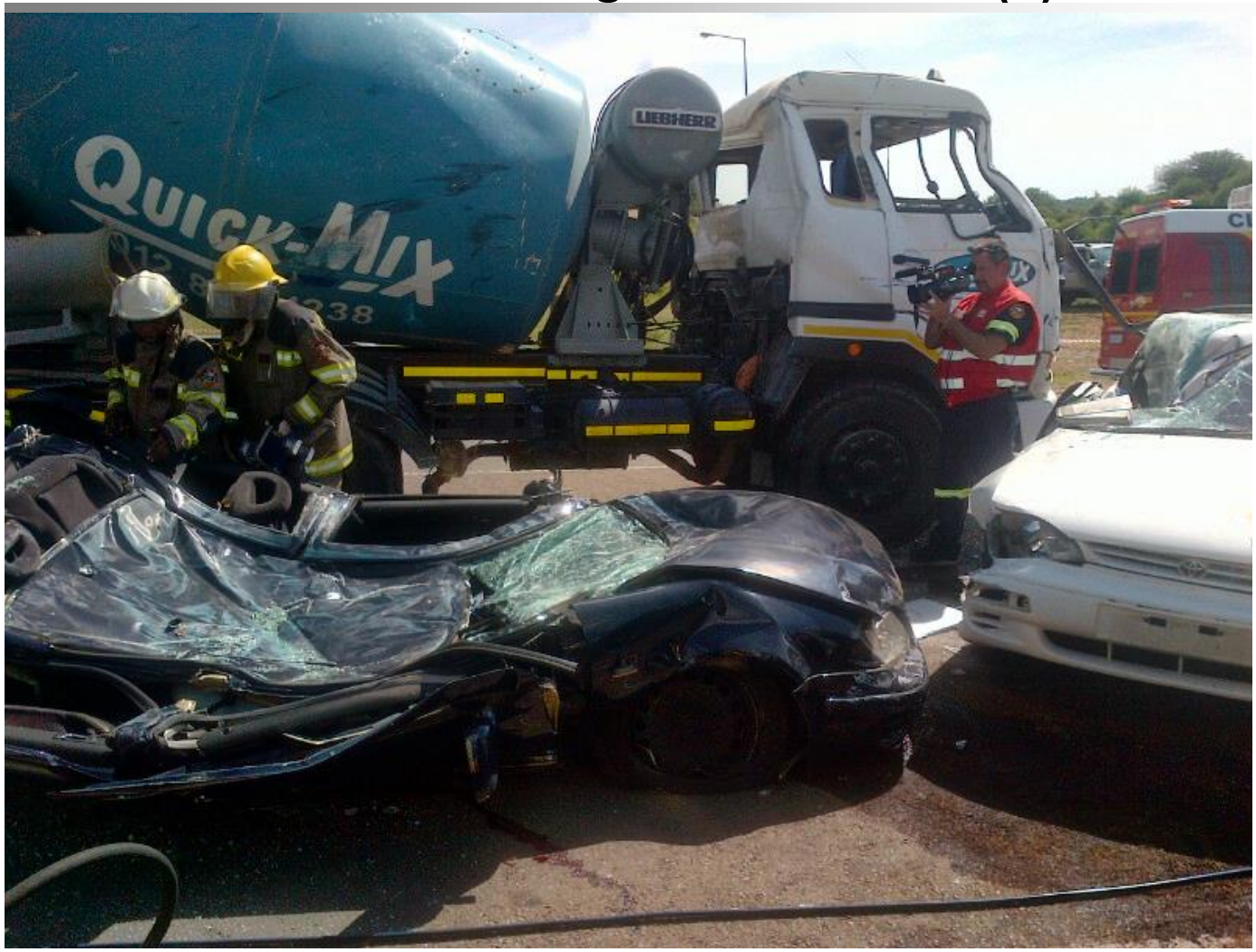

Photo 4: Overturned RMC Truck, Garsfontein Road, 14 November 2012 (Eye Witness News)

Visuals of MVAs during construction (5)

Photo 5: Non-secured load fatality, Oudshoorn, 25 April 2012 (buildsafe, 2012)

Visuals of MVAs during construction (6)

Photo 6: Rescue workers start to free a car trapped under a RMC truck (La Grange, 2009)

Examples of behaviour (1)

Photo 7: Worker tied down to back of LDV (Mtola in cidb, 2009)

Examples of behaviour (2)

Photo 8: 'Riding' a RMC truck, Cape Town, 14 July 2016 (Anonymous, 2016)

Research – Study 1 (Introduction)

- The statistics underscore the need for an empirical study
- The objectives of the study are to:
  - Determine why MVA related fatalities occur
  - Determine why MVA related fatalities have increased
  - Evolve strategies that could address the problem

Research – Study 1 (Method)

- Exploratory study
- Convenience sample
- 15 General contractor (GC) members of the East Cape Master Builders Association (ECMBA) responded to the survey

Research – Study 1 (Findings) (1)

Category	Response (%)						MS	Rank
	Unsure	Minor……Major						
		1	2	3	4	5		
Drivers / Operators	6.7	6.7	13.3	26.7	26.7	20.0	3.43	1
General workers	0.0	26.7	6.7	20.0	20.0	26.7	3.13	2
Semi-skilled workers	0.0	20.0	13.3	33.3	20.0	13.3	2.93	3
Skilled workers	0.0	20.0	40.0	13.3	13.3	13.3	2.60	4
Site management (supervisors, foremen)	0.0	42.9	14.3	28.6	7.1	7.1	2.21	5

Table 4: Extent of the exposure or vulnerability of categories of personnel to MVAs (MS = 1.00 to 5.00) (Emuze & Smallwood, 2013)

Research – Study 1 (Findings) (2)

Practice	Response (%)						MS	Rank
	Un-sure	Minor……Major						
		1	2	3	4	5		
Overloading of vehicles	7.1	7.1	0.0	14.3	7.1	64.3	4.31	1
Non-roadworthiness of vehicles / unsafe vehicles	14.3	7.1	7.1	7.1	14.3	50.0	4.08	2
Workers sitting on sides / or beds of vehicles	6.7	6.7	0.0	20.0	20.0	46.7	4.07	3
Worn tyres	6.7	13.3	6.7	13.3	26.7	33.3	3.64	4
Misjudgement / disregarding traffic control	21.4	0.0	21.4	7.1	28.6	21.4	3.64	5
Workers mounting / dismounting vehicles in motion	7.1	7.1	14.3	21.4	14.3	35.7	3.62	6
Inattentive driving of vehicles	21.4	7.1	7.1	21.4	21.4	21.4	3.55	7
Loss of vehicle control due to driver tiredness	28.6	7.1	28.6	7.1	14.3	14.3	3.00	8
Loss of vehicle control due to unsecured loads	7.1	28.6	0.0	28.6	28.6	7.1	2.85	9
Loss of vehicle control due to alcohol abuse	35.7	14.3	7.1	28.6	7.1	7.1	2.78	10
Loss of vehicle control due to adverse weather	20.0	13.3	26.7	13.3	20.0	6.7	2.75	11
Loss of vehicle control due to brake failure	21.4	21.4	21.4	14.3	7.1	14.3	2.64	12
Lack of adequate construction site signage	28.6	14.3	35.7	14.3	7.1	0.0	2.20	13
Loss of vehicle control due to drug abuse	42.9	28.6	7.1	14.3	0.0	7.1	2.13	14

Table 5: Extent to which unsafe transport / traffic practices contribute to the occurrence of accidents in South African construction (MS = 1.00 to 5.00) (Emuze & Smallwood, 2013)

Research – Study 1 (Findings) (3)

Contributor	Response (%)						MS	Rank
	Un-sure	Minor……Major						
		1	2	3	4	5		
Lack of secured seats	20.0	0.0	6.7	6.7	26.7	40.0	4.25	1
Lack of seat belts	21.4	0.0	7.1	7.1	35.7	28.6	4.09	2
Non-wearing of seat belts	13.3	0.0	6.7	20.0	20.0	40.0	4.08	3
Lack of roll over protection	20.0	6.7	13.3	13.3	26.7	20.0	3.50	4
Lack of pre-start up inspections	21.4	21.4	7.1	28.6	21.4	0.0	2.64	5

Table 6: Extent to which contributors exacerbate the injuries incidental to accidents in South African construction (MS = 1.00 to 5.00) (Emuze & Smallwood, 2013)

Research – Study 1 (Findings) (4)

Incident	Response (%)						MS	Rank
	Un-sure	Limited……Always						
		1	2	3	4	5		
Fall from vehicle in motion while getting on / off	13.3	6.7	6.7	26.7	33.3	13.3	3.46	1
Fall from vehicle in motion	26.7	0.0	13.3	20.0	33.3	6.7	3.45	2
Collision with other vehicles	14.3	14.3	14.3	14.3	35.7	7.1	3.08	3
Collisions between vehicle and other equipment	21.4	0.0	35.7	14.3	28.6	0.0	2.91	4
Crunched / run-over by highway vehicle	42.9	7.1	28.6	14.3	0.0	7.1	2.50	5
Crunched / run-over by manoeuvring vehicle	28.6	28.6	28.6	14.3	0.0	0.0	1.80	6
Worker struck by vehicle exiting work area	21.4	57.1	7.1	0.0	14.3	0.0	1.64	7
Worker struck by vehicle entering work area	21.4	57.1	14.3	0.0	7.1	0.0	1.45	8
Worker struck by vehicle inside work area	14.3	64.3	14.3	0.0	7.1	0.0	1.42	9
Crunched / run-over by vehicle entering the site	21.4	50.0	28.6	0.0	0.0	0.0	1.36	10

Table 7: Extent to which incidents eventuate due to MVAs in South African construction (MS = 1.00 to 5.00) (Emuze & Smallwood, 2013)

Research – Study 2 (Introduction) (1)

- MSc (Built Environment) study – Treatise (Norris, 2016):
  - *The Adequacy of Traffic Control Measures During Road Works*
- Two of the three primary study sites were situated on the Sipetu Road project near Mount Frere, and the third site where the road users' opinion study was conducted, was situated on the R61, 20 kilometres outside Mthatha on route to Queenstown
- Measuring of motorist speed through a work zone – N2 road works adjacent to the new Bay West Mall, part of the 'traffic accommodation' included the use of a speed measuring device which alerted motorists to the speed at which they were traveling through the work zone. Thus, this site became an additional site of data collection in terms of the efficacy of speed measuring devices

Research – Study 2 (Introduction) (2)

- Thirdly, road users' opinions regarding the lay-out of work-zones were required. This required a stop-and-go facility where road users had sufficient time to answer a few questions while waiting. The statistics underscored the need for an empirical study

Research – Study 2 (Findings) (1)

Mean	74.3
Minimum	54
Maximum	123
Count	616

Table 8: Summary of speed measurement (Norris, 2016).

Speed	%	No.
> 50 ≤ 60 km/h	11.4	70
> 60 ≤ 70 km/h	35.2	217
> 70 ≤ 80 km/h	22.7	140
> 80 ≤ 90 km/h	15.9	98
> 90 ≤ 100 km/h	10.2	63
> 100 ≤ 110 km/h	3.1	19
> 110 ≤ 120 km/h	1.3	8
> 120 ≤ 130 km/h	0.2	1
Total		616

Table 9: Analysis of speed measurement (Norris, 2016).

Better practice (1)

Photo 9: OJ Construction bus, Namibia (OJ Construction, 2014)

Better practice (2)

Photo 10: OJ Construction bus, Namibia (OJ Construction, 2014)

Better practice (3)

Photo 11: Rand Civils bus, Port Elizabeth (Anonymous, 2011)

Better practice (4)

Photo 12: Rand Civils bus, Port Elizabeth (Anonymous, 2011)

Better practice (5)

Photo 13: CSV Construction bus, Port Elizabeth (Smallwood, June 2018)

Better practice (6)

Photo 14: Secured load, London (Smallwood, April 2018)

Better practice (7)

Photo 15: Secured load, Los Angeles (Smallwood, July 2017)

Better practice (8)

Photo 16: Close up of secured load truck, Los Angeles (Smallwood, July 2017)

Better practice (9)

Photo 17: Tip truck – a symbol? Los Angeles (Smallwood, July 2017)

Conclusions

- The South African construction industry is presently (still) grappling with MVA related issues
- There has being a steady rise in MVAs in South African construction since 2001
- A range of MVAs occur e.g. conveyance of materials
- Different types of MVAs occur e.g. overturning, and collisions
- A range of losses occur e.g. people, materials, and plant
- It can be deduced that there is a lack of HIRA relative to the transporting of people
- Context - The issue is a national problem!
  - The industry problem is a sub-set of ditto

Recommendations (1)

- Awareness! Realise / Raise the level?
- Acknowledgement, then action!
- A comprehensive traffic safety programme must be implemented in the construction industry, in all construction organisations, and on all projects
- The implementation of a documented Road traffic safety (RTS) management system standard such as ISO 39001 would be the ideal
- Workers must be conveyed in appropriate vehicles
- Mixed (materials, plant and equipment, and workers) transportation must be ‘banned’ in the industry
- Industry H&S programmes must focus on transport and traffic safety

Recommendations (2)

- Contractors should evolve transport programmes, which include a transport policy
- Client BRAs, H&S Specifications, and H&S Plans should address transport and traffic

References (1)

- buildsafe South Africa (2012) *SAFETY ALERT 045 Non-Secured Load Fatality*. Johannesburg: buildsafe.
- Construction Industry Development Board (cidb) (2009) *Construction Health & Safety in South Africa Status & Recommendations*. Pretoria: cidb.
- Emuze, F.A. and Smallwood, J.J. (2012) Construction Motor Vehicle Accidents in South Africa: Preliminary Findings. In: *Proceedings of CIB W099 International Conference 2012: Modelling and Building Health and Safety*, 10-11 September 2012, Singapore, 203-208.
- Emuze, F.A. and Smallwood, J.J. (2013) Construction Motor Vehicle Accidents in South Africa: Causes and Impact. In: *Proceedings of the 29th Annual Association of Researchers in Construction Management (ARCOM) Conference*, 2-4 September, Reading, UK, 311-321.

References (2)

- Federated Employers Assurance (FEM) (2018) Injuries per Injury Type for all MBA Regions from 2017 to 2018 http://www.fem.co.za/Layer_SL/FEM_Home/FEM_Accident_Stats/FEM_Accident_Stats.htm [accessed 11 March 2018]
- International Organisation for Standards (ISO). 2012. ISO 39001 Road traffic safety (RTS) management systems — Requirements with guidance. Geneva: ISO.
- La Grange, B. (2009) I just closed my eyes and waited for it to happen [online]. Available from: *http://www.timeslive.co.za/sundaytimes/2009/09/01/* [Accessed 6 March 2012]
- Norris, S. 2016. *The Adequacy of Traffic Control Measures During Road Works*. Unpublished MSc (Built Environment) Construction Health and Safety specialisation Treatise. Port Elizabeth: Nelson Mandela Metropolitan University.

References (3)

- OJ Construction (2014) Branding soon to be applied to our new bus….what do you think? https://www.facebook.com/ojcnam/photos/a.1725 [accessed 4 June 2014]
- Republic of South Africa (2000) National Road Traffic Regulations 2000. Government Notice No. R. 225. Pretoria.
- Republic of South Africa (2014) *No. R. 84 Occupational Health and Safety Act, 1993 Construction Regulations 2014. Government Gazette No. 37305*. Pretoria.
- Smallwood, J.J. (2002) Traffic accidents contribute substantially to fatalities in construction. *SA Builder*, September, p. 9.
- Verster, T. & Fourie, E. 2018. The good, the bad and the ugly of South African fatal road accidents. South African Journal of Science, 114(7/8), July/August, 1-7.