

# FIRE AND RESCUE INTERNATIONAL

Integrated fire, rescue, EMS and incident command technology

Volume 7 No 3



## SANTAM'S DECADE OF BUILDING RESILIENT COMMUNITIES



## Portrait of a public servant

It is 03h00am on an icy cold winter morning.  
A piercing alarm shatters the silence at the station, and  
he is sped away on a flashing red vehicle, horns blaring,  
to respond to the emergency.

At the scene all three floors of the tenement are engulfed in flames which are  
spreading to adjoining buildings on either side.  
With selfless dedication and tremendous courage,  
he rushes into that awesome inferno.  
He is a professional firefighter in the city's Fire Department.  
But so many people never think of these virtues  
which carry him through his work.

### Dedication...

As a public servant hired by the city,  
he is needed by every man, woman, and child therein.  
This requires selfless dedication, for  
his purpose to save the lives and property  
involved in a fire emergency comes above all else.  
It may mean leaving Thanksgiving dinner at home with the family  
to respond to a three-alarm fire.  
It sometimes requires working on important holidays,  
so that the entire city  
is protected each minute of every day.  
It demands hours of study, drills, attending classes,  
constantly upgrading techniques and solving the new problems in firefighting.  
It involves endless paperwork and reports.  
It means being on call at all times to come to the aid of others in trouble.  
This is dedication.

### Courage...

A lighted match held close  
can often produce fear in the average individual.  
What a tremendous amount of courage it takes  
to run into a burning structure with  
flames licking at him from all directions...  
to enter the interior which is charged with dense smoke, where  
visibility is zero and requires him to crawl on his hands and knees,  
close to the floor where it is less thick, in order to see anything at all.  
But he forgets the risks.  
Most important is to rescue the trapped children,  
the elderly grandfather, or anyone possibly hiding under a bed,  
or squeezing behind a stove or refrigerator as they so often do in panic;  
or those screaming at a window,  
in which case he must scale the outside of the building on a ladder  
and attempt to bring them down to safety.  
This is courage.

I admire and respect him for these traits.  
They are part of him as a firefighter fulfilling those duties  
which are so often taken for granted.  
However, I do not take them for granted.  
His virtues never leave my mind.  
He is my husband.

Written by Sandra M Haight (2014)  
in honour of my husband, a firefighter for 27 years, who retired as assistant chief

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# Comment

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Fire and Rescue International (FRI) is proud to share its magazine's 62st edition. We remain dedicated to serve the emergency services and share technical and research articles, motivational leadership guidance as well as practical hands-on advice. Enjoy the read!

#### Cover profile

Santam is celebrating 10 years of building resilient communities through collaboration and partnership.

#### National Disaster Management Centre (NDMC)

Dr Bongani Elias Sithole shares the National disaster Management Centre's key initiatives by National Fire Services to improve fire services in the country.

#### Water supply systems

Industrial Fire and Hazard Control, in collaboration with Williams Fire and Hazard Control, has engineered and built the ultimate in high capacity firefighting water supply systems to cater for every eventuality.

#### Fire engineering and protection: deluge systems

Dosetech Fire discusses overcoming deluge system reliability challenges with the SA Fire Protection Double Chamber Deluge Valve model VDD.

#### Personal protective equipment (PPE)

Dräger introduces its HPS® SafeGuard fire and rescue helmet.

#### Incident command vehicle

Ramcom Trucks and Load Bodies introduces the new state-of-the-art, custom-designed mobile incident command bus for Cape Winelands District Municipality.

#### Firefighter safety

Vanguard shares health and air quality products and tips with Task Force Tips including the Decon/Pak, Crewprotect and Stationprotect.

#### Firefighting foams

AECI Specialty Chemicals held a demonstration day explaining the transition to Fluorine free foam. As part of ongoing efforts to evaluate the effectiveness of Fluorine free firefighting foams, the LASTFire group has carried out a comprehensive series of small and large scale tests.

#### Vehicle accidents and extrication

Colin Deiner's article in this edition is 'Using heavy-duty recovery vehicles in extrication'. Deiner looks at the lifting and winching capabilities, securement and stabilisation and rapid vehicle removal using heavy duty tow trucks.

Julius Fleischman shares the intricacies of a recent complex vehicle extrication when the driver miraculously survived after being impaled by a falling tree. Fleischman looks at navigating complexity in emergency rescue operations.

#### Wildfires

We review Working on Fire's 20th Anniversary Fire Symposium in Kruger National Park, Mpumalanga, which was held in partnership with the Nelson Mandela University George Campus and SANParks. Chief Tim Murphy's Command Corner focusses on the indicators of extreme fire behaviour.

#### JOIFF Guideline

We share the JOIFF Guideline on emergency response to incidents involving vehicles powered by alternative fuels, including hybrid vehicles.

#### Ethics

Jo Nieman shares some insight on social media ethics for first responders.

#### Fire engineering

The Stellenbosch University fire engineers explore risks for humans and dwellings.

#### K9 search and Rescue (SAR)

Morné Mommsen looks at K9 search and Rescue (SAR) as an essential function of fire services.

We thank all our local and international contributors, our advertisers and readers for their continued support! Fire and Rescue International is your magazine. Read it, use it and share it!

**Lee Raath-Brownie**  
Publisher

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## Congratulations

To Simon McDonnell for his photograph 'Aerial attack' taken with a Canon 1Dx Mark II, 28-300mm lens, f/3.5-5.6 IS USM, 1/80th sec; f/5.6; ISO220 (F/L 220mm).

## Well done!

### Simon McDonnell wins this months prize money of R2 000!

#### Photo description:

A Working on Fire Huey helicopter dropping 1 000 litres on the fire-line during the recent wildfires in Glencairn on Cape Town's Southern Peninsula.



**This month's FRI Images winner!**

## Best rescue, fire or EMS photo wins R2 000!

Fire and Rescue International's (FRI) bi monthly photographic competition is open to all its readers and offers you the opportunity of submitting your digital images of fires, fire fighters, disasters, incidents, emergencies and rescues.

#### Rules

- All photographs submitted must be high resolution (minimum 1meg) in jpeg format
- Allowed: cropping, curves, levels, colour saturation, contrast, brightness, sharpening but the faithful representation of a natural form, behaviour or phenomenon must be maintained
- Not allowed: cloning, merging/photo stitching, layering of two photos into one final frame, special effects digital filters
- Fire and Rescue International (FRI) reserves the right to publish (printed or digitally) submitted photographs with acknowledgement to the photographer
- Winners will be chosen on the merit of their photograph
- The judge's decision is final and no correspondence will be entered into afterwards

#### Entries must include:

Name of photographer  
Contact details (not for publishing)  
Email (not for publishing)  
Name of photograph  
Brief description of photograph including type of incident  
Camera, lens and settings used

All entries must be emailed to:

**lee@fireandrescue.co**

**>> ENTER NOW!**





# Santam is celebrating 10 years of building resilient communities through collaboration and partnership



Santam initiated the Partnership for Risk and Resilience (P4RR) Programme in 2012 in response to the South African government's call for the corporate community to support critical skills development and capacity building in municipalities within the framework of the Business Adopt a Municipality (BAAM).

P4RR is Santam's flagship programme that aims to help build societal resilience through collaboration and partnerships with all spheres of government, state owned entities, research and academic institutions, community-based organisations and private sector agencies. P4RR aims to co-create initiatives to enhance institutional capacity of mandated organisations to manage disaster risks focusing on three primary hazards such as drought, fires and floods.

The P4RR initiatives are largely funded by the Emthunzini Community Trust, corporate social investment (CSI) funds and also obtain resources from other parts of Santam's business. Climate change is impacting severity, frequency and intensity of hydro-meteorological hazards such as veldfires, drought and floods resulting in unprecedented scale of devastation of communities, livelihoods, infrastructure and insurance losses as witnessed during the 2022 April-May KwaZulu-Natal flood disaster.

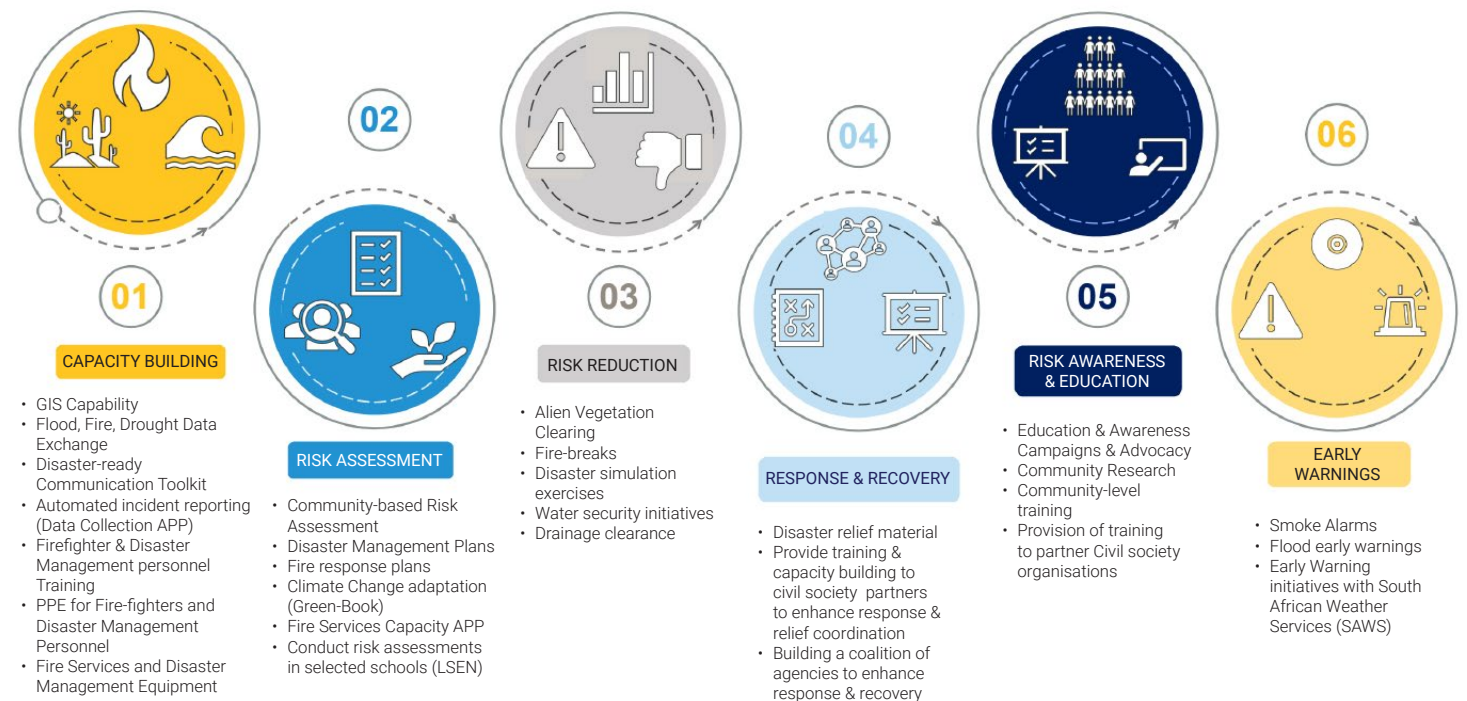
The P4RR programme contributes to the achievement of both the Sendai Priorities and Targets including through a. conducting community-based risk assessments, b. supporting resilience building efforts, c. strengthening municipal institutional capacity and d. community education and awareness programmes, etc.

*"The P4RR programme has made effective strides towards building resilient communities. It has over the past 10 years evolved into a holistic programme that addresses prevalent disaster risks such as fire, flood and drought. We have partnered with municipalities and other spheres of government and civil society to co-create solutions that are impactful. At Santam, we strive to help communities better manage their disaster risks. As a responsible corporate citizen of South Africa, we are proud of our programme, which fosters sustainable economic development and safer communities",* said Tavaziva Madzinga, Santam Group CEO.

The South African Disaster Management Act, 2002 (Act No 57 of 2002) calls for the active participation of all stakeholders, including the private sector, NGOs, technical experts, communities, traditional leaders and volunteers, in disaster risk management planning and operations. Against this background, Santam has integrated the initiatives implemented through P4RR in its corporate strategy under the strategic theme namely Help Build Resilient Societies and has aligned focus areas of the P4RR programme to the Key Performance Areas (KPA) of the National Disaster Management Framework to facilitate implementation and align reporting arrangements for partner municipalities.

Figure 1 below depicts the range of interventions that Santam implements with its partners based on the priorities of various agencies.

## SANTAM'S PARTNERSHIP FOR RISK AND RESILIENCE (P4RR) INTERVENTIONS



*"The Partnership for Risk and Resilience (P4RR) programme has made a significant impact over the past 10 years, helping vulnerable communities become more resilient amid pervasive disasters. Capacitating municipalities through collaboration has ensured the continuity and sustainability of service delivery beyond Santam's involvement. It exemplifies a strategic social impact programme, in that its outcome has a developmental and business imperative",* said Neptal Khoza, head of market development at Santam.



Santam’s work with its partners is underpinned by several fundamental principles. Figure 2 below summarises these values.

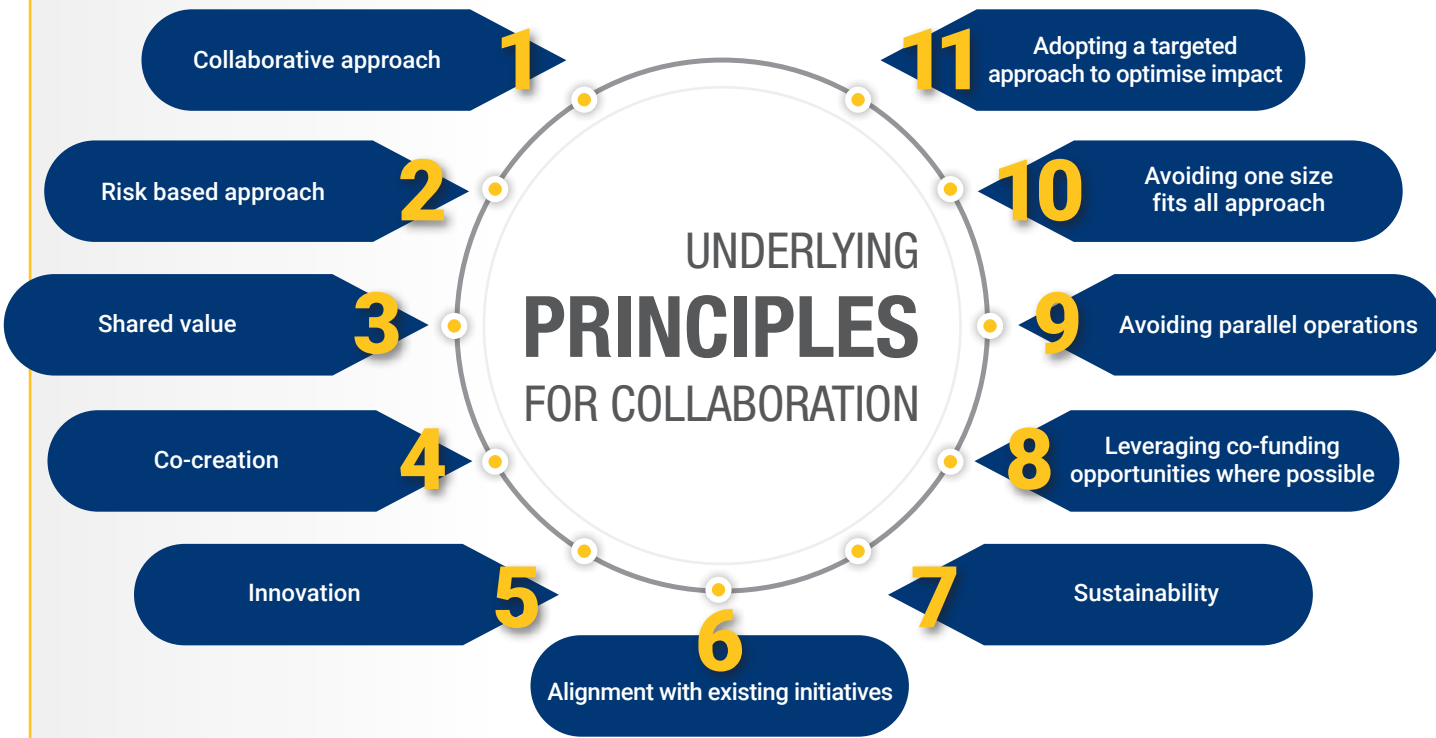


Figure 2: The P4RR underlying principles for collaboration and partnerships

**Key P4RR highlights**

As a leading short-term insurer, Santam continues to lead efforts to reduce risks and build resilience across the country through partnerships. To date, Santam and the Emthunzini Trust have:

 <b>Expended over R100m</b> towards supporting resilience building initiatives across the country	 <b>Supported 82 municipalities</b> impacted over 12.5m people	 <b>Installed over 16 000 smoke alarms</b> in selected high-risk areas	 <b>Trained over 400 people</b> in firefighting, disaster management and related training	 <b>Reached over 36 000 people</b> with community-level disaster risk awareness and education
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**Climate change adaptation support through the Greenbook**

Climate change and variability is impacting South Africa’s disaster risk profile resulting in unprecedented scale of devastation of communities, livelihoods, social infrastructure and insurance losses.

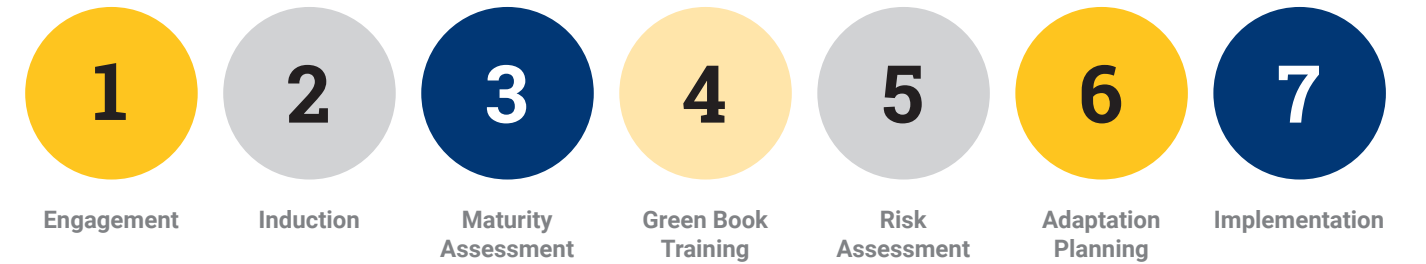
Against this background, Climate Change adaptation (CCA) is an integral component of Santam’s P4RR programme. With this in mind, Santam has partnered with the Council for Scientific and Industrial Research (CSIR), National Disaster Management Centre, Department of Forestry, Fisheries and Environment, Climate and Disaster Resilience Fund (CDRF) to assist selected municipalities to develop CCA plans using the Green Book.

The Green Book is a multi-disciplinary, open-access planning support system that provides evidence to municipalities to adapt their cities and towns to current and future climate change impacts based on their

risk assessment. The GreenBook also provides appropriate adaptation measures that can be implemented in cities and towns, so that South African settlements are able to minimise the impact of climate hazards on communities and infrastructure, while also contributing to developmental goals.

Santam and its partners have completed the development of climate change adaption plans for nine districts and one metro. Figure 3 below shows the process for the development of climate change adaptation plans:

Figure 3 Climate change adaptation through the Green Book



As part of supporting climate change adaptation efforts, Santam donated and planted 200 indigenous trees on 3 October 2023 in the Capricorn District; this district is one of the ten municipalities we supported to develop a climate change adaption plan. Vegetation indigenous to South Africa generally requires far less irrigation and forms an important part of the defence of cities against climate change. The 200 indigenous trees have been planted in selected special needs schools and fire stations.

**Emerging P4RR outcomes and high-level insights illustrate the positive impact of the programme**

A recent independent study revealed that the P4RR programme is making a positive contribution to disaster risk management in South Africa and most significantly, it is doing so in areas of systems failures, plugging important gaps. These contributions include institution strengthening and capacity building, the forging of new relationships and modalities for stakeholder cooperation and prompting innovation in the sector.

**Lessons learned**

Santam, together with its partners, have learned these important lessons from the implementation of the P4RR programme:

- Importance of linking initiatives to mandated organisations
- Alignment of programmes to existing initiatives and programme
- Adopting a targeted approach to optimise impact
- Collaborative approaches integral to public- private partnerships
- Importance of co-funding of initiatives in sustainability of initiatives
- Partnering/collaborating a district and metro level.

Mohlakoana Jones Mokoena, manager of Emergency Services for the Thabo Mofutsanyana District Municipality, said, “The district municipality was facing a significant challenge in fulfilling its constitutional mandate of providing service delivery for emergency services to the community due to a lack of funding. With the support we received from Santam, we can proudly say that we are in compliance with legislation. We conducted disaster risk assessment, which informs the municipal disaster management plans in accordance with legislative requirements. We were introduced to the Greenbook, which is currently assisting us to comply with the Climate Change Response requirements and we have an Incident Capturing Tool, which assists us with mapping incidents online. We have trained our emergency personnel in various courses such as fire prevention, incident command system and fire investigation, among others. We’ve also acquired equipment that assists us with managing disasters. In our experience, the P4RR programme has proven to be effective and is having a truly positive impact on our community.”

Dr Moses Khangale, manager for Stakeholder Programmes at Santam, said, “An independent study of Santam’s P4RR programme executed in 2022 revealed that over the last decade, Santam has made a





- positive contribution to disaster risk management and fire services in South Africa. These contributions include strengthening institutional capacity of governmental partners, capacity building, forging of new cross-sectoral partnerships and modalities for stakeholder cooperation as well as prompting innovation in the sector. While the study found out that there is ample evidence that the P4RR programme components are yielding developmental outcomes and making an important contribution to building resilient communities in the country, it also acknowledged that the programme has catalysed significant improvements and engendered collective ownership to proactively reduce risks and build resilience in the face of increasing losses associated with climate change and variability.”

Henry Prins, municipal manager at the Cape Winelands District Municipality, said, “The partnership between the Cape Winelands District Municipality (CWDM) and Santam’s P4RR programme commenced in 2019 and has enabled the creation of a risk-aware Cape Winelands. This partnership has benefitted not only our organisation and local municipalities, but more importantly, it has had a notable impact on the most vulnerable citizens of our district. Through our disaster management division, the partnership afforded our residents the opportunity to develop resilience against disasters with the installation of 4 000 smoke alarms in informal homes over a period of four years. We helped prepare children and their caregivers/educators for disasters by conducting disaster awareness exercises at schools during International Day of Disaster Risk Reduction (IDDR) and over 39 000 children received water safety training. The partnership benefitted and continues to benefit citizens through the Disaster Ready Toolkit, the development of which played an incalculable role during the pandemic.”

He added, “Our local municipalities were capacitated through the donation of firefighting equipment ensuring that resources were always on hand, thus reducing the impact of disasters on both the fire services and victims. A multi-sectoral disaster simulation ensured that all disaster response services in the CWDM are prepared for any incident. The mentorship that stemmed from the P4RR programme collaboration has equipped CWDM employees, particularly those involved in risk, communications, fire and disaster related divisions with the skills and knowledge that will continue to benefit our organisation, partners and citizens for years to come.”



Etienne du Toit, deputy director of Fire and Rescue Services, Western Cape Disaster Management Centre, Department of Local Government, said, “Most people will only experience emergency services once-in-a-lifetime. However, the only expectation citizens have, should they find themselves in the unfortunate position of needing emergency services, is that someone with adequate training, experience and equipment will arrive within an acceptable amount of time to alleviate the situation. Santam’s P4RR programme is a testament to how rigorous support from the private sector can strengthen the foundation for effective municipal fire and emergency service delivery. It is a brilliant example of how true partnerships between the private sector, government and municipalities can make a real difference and positively impact the lives of ordinary citizens, ensuring their expectations are met.”

#### **P4RR outcomes and unique value-add**

The review outcomes showed that P4RR is making a positive contribution to disaster and risk management in South Africa. Perhaps more significantly, it is doing so in areas of system failures, plugging important gaps. These contributions include institutional strengthening, capacity building and forging new relationships.

The P4RR programme has significantly enhanced disaster management and fire services capacity for its partner municipalities and agencies over the past 10 years.

While the P4RR programme continues to partner with new municipalities, its focus is evolving to explore measures to deepen the impact and sustainability of its interventions (depth as opposed to breadth).

Santam celebrated these achievements in two events, one being held in Johannesburg and the other in Cape Town. The events were well attended with the various municipalities providing feedback as well as panel discussions with the stakeholders. ▲

**See next page for photo gallery →**



Santam is an authorised financial services provider (FSP 3416),  
a licensed non-life insurer and controlling company for its group companies.





## CAPE TOWN

## JOHANNESBURG





# Key initiatives by National Fire Services to improve fire services in the country

By Dr Bongani Elias Sithole, Head of the National Disaster Management Centre (NDMC), South Africa



Dr Elias Sithole,  
head of the NDMC

Strategy outlines drastically needed impacts and outcomes that, once implemented will drive the transformation that responds to the needs of the Fire Services in the country.

The Strategic Plan covers the period 2024-2030 and its implementation will be overseen by the NDMC, reporting its performance to the Fire Brigade Services Board and/or The Boards' Technical Structure envisioned in Section (5) (a) of the Fire Brigade Services Act and connected to Cooperative Governance and Traditional Affairs' (CoGTA's) annual departmental planning and reporting processes.

To help drive our continued focus on achieving the objectives of the Strategy, five strategic pillars have been developed that will inform how we strengthen the delivery of Fire Services in the coming years within South Africa.

Some of the goals associated with the pillars are already in progress with funding streams in place, while some areas require renewed attention and improved funding.

## Strategic Pillar 1

Developing a national capability for the delivery of the firefighting function

**Goal:** The provision of coordination and support of Fire Services

## Strategic Pillar 2

Ensuring all hazards preparedness for Fire Services

**Goal:** To be prepared to the highest standard for all extreme weather and flooding emergencies and rescue operations

## Strategic Pillar 3

Fire safety, prevention, and community preparedness

**Goal:** Reduce the likelihood and consequences from fires

## Strategic Pillar 4

Development and implementation of fire services' legislation through engagement and consultation

**Goal:** A well-regulated Fire Service

## Strategic Pillar 5

Capacity building and professionalisation of Fire Services

**Goal:** Fire Services professionalised

The National Fire Services Directorate continues to identify strategic projects and initiatives driven for implementation through the Strategy, noting that some initiatives may already be in progress.

PILLAR 1

1

Developing a national capability for the delivery of firefighting function

PILLAR 2

2

Ensuring all hazards preparedness for Fire Services

PILLAR 3

3

Fire safety, prevention and community preparedness

PILLAR 4

4

Implementation of fire services' legislation through engagement and consultation.

PILLAR 5

5

Capacity building and professionalization of Fire Services

Progress on some of the existing strategic projects are as follows:

## Re-alignment of the National Fire Services

The National Fire Services Directorate in the NDMC has been restored as stand-alone Directorate by the Minister of CoGTA, with plans in the making for expanding the existing structure into a different organisational structure. This will further strengthen the oversight function of the Head of the NDMC over the development, implementation and monitoring of fire services legislative frameworks, policies across the three spheres of government.

## Funding model for Fire Services

The National Fire Services is in continued discussions with the National Treasury for the finalization of a funding model suitable for the re-capitalization of Fire Services in the Country. The Fire Services Reference Group is instrumental in assisting the National Fire Services in putting together a business case in support of the funding model for Fire Services. The business case will include estimated costs for the recapitalisation of Fire Services in the country.

## NDMC Bursary Scheme: Fire Services Qualifications

For the first time in the history of the NDMC Bursary scheme, as

of the 2024/2025 financial year, bursaries will now be awarded for undergraduate and postgraduate studies, towards a qualification in Fire Services Technology (excluding Certificate courses and PhD qualifications). This is in support of the Fire Services Competency Framework gazetted as part of the Local Government Staff Regulations on 21 September 2021. The NDMC will continue to explore new initiatives to provide Fire Services support gaining access to the qualifications required for promotional consideration and to build the necessary fundamental knowledge required by members to effectively function within the Fire Services field.





**Progress on the Draft Bill on Fire Services**

The Draft Bill on Fire Services are currently being handled by the CoGTA Legal Services for preparation of the next phase in the legal process which involves the certification of the Fire Services Bill on Fire Services by the Office of the State Law Advisor, declaring it suitable for the next phase of tabling it before Cabinet's cluster committees to facilitate more detailed consideration of the specific policy areas and issues.

**Capacity assessments: National Fire Safety and Prevention Strategy**

During the 2016/17 financial year, the NDMC started a multi-year project aimed at supporting the implementation of the National Fire Safety and Prevention Strategy through capacity assessments and support in municipalities. During the assessment process, the National Fire Services identified key skills gaps that were adversely impacting on the ability of most assessed municipalities to deliver on the fire safety and prevention mandate outlined in the National Fire Safety and Prevention Strategy.

To date more than 93 municipalities have been assessed, with more than 500 fire safety practitioners trained in aspects of fire risk assessment and safety strategies, through partnership with the Fire Protection Association of South Africa (FPASA).

During the 24/25 financial year, the NDMC Fire Services, as part of its Annual Performance Plan, will continue to roll-out of its support programme for Fire Services and will assess 15 municipality on the capability to implement the National Fire Safety and Prevention Strategy.

**Capacity Assessments: Urban Search and Rescue (USAR)**

During the same period, we will also continue to perform Urban Search and Rescue (USAR) capacity assessments within four Provinces. This follows on the four Province's assessment during the previous financial year, aimed at providing support for strengthening the USAR function within the country.

In support of ensuring a national capability for the delivery of the firefighting function, the Strategy also includes outcomes and deliverables to drive the

implementation of the following support programmes for Fire Services over the next three years but not limited to:

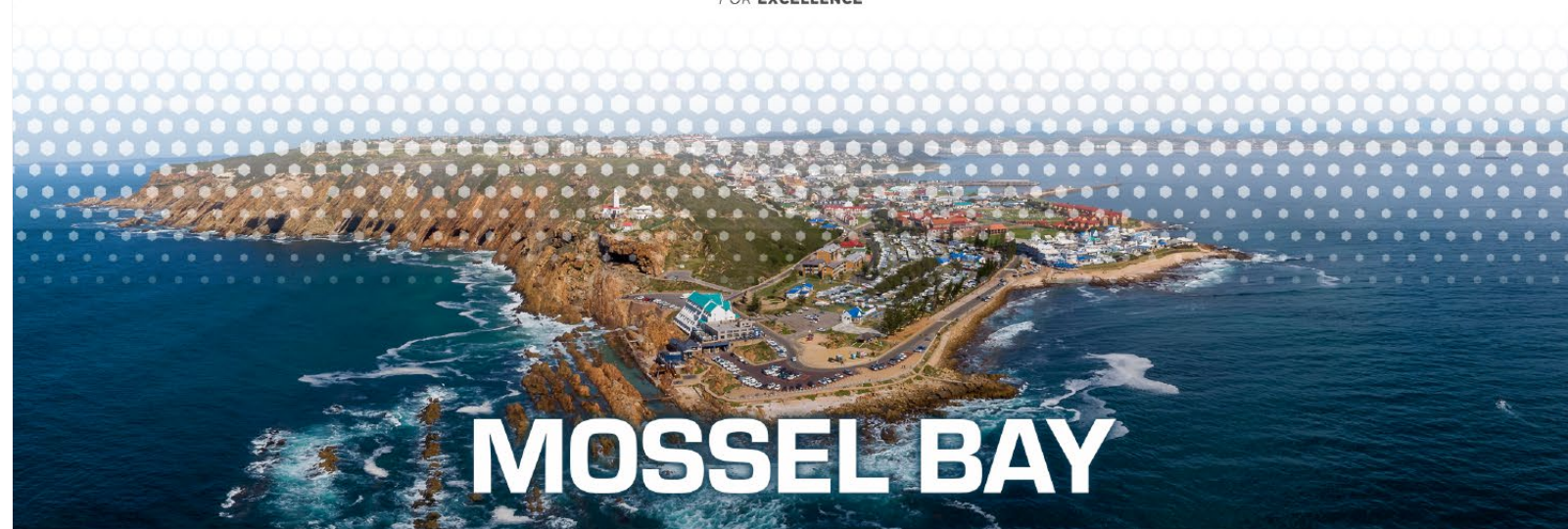
- Through our strategic approach, to implement the Fire Services Act within the next three years, as its implementation is a strategic imperative that gives further expression to the transformation of Fire Services in the country.
- Finalisation of a Fire Services Framework.
- Resurrection of the Fire Brigade Board and/or the Technical Structure established under S (5) (a) of the Fire Brigade Services Act.
- Implementation of a funding model for Fire Services.
- Implementation of a regulatory framework for the management of designated services.
- Gazetting of the USAR Governance Framework to ensure sustained Urban Search and Rescue (USAR) preparedness and response capability within the country.
- To continue the roll-out of the National Incident Command System (ICS) to improve response to incidents.
- Establishment of mechanisms to protect national key strategic facilities from fires and related risks.
- Development and implementation of a national strategy to professionalise the fire services; which included the feasibility study for the establishment of a National Fire Services Training Academy.
- Develop and implementation of a National Physical Fitness Framework for use in the fire service. ▲



# TOUGHEST FIREFIGHTER ALIVE SOUTH AFRICA

Open challenge

26-28 Sept 2024





# The Industrial Fire and Hazard Control Deluge system



Dependapower high volume booster pump



Surgemax high volume submersible pumps

Industrial Fire and Hazard Control, a proud member of the Advanced Group of Companies, in collaboration with Williams Fire and Hazard Control, has engineered and built the ultimate in high-capacity firefighting water supply systems to cater for every eventuality. Mitigating the most extreme and dangerous fire incidents by applying overwhelming fire suppression power is our business.

**Firefighting operations**  
Extreme fire risks in the petrochemical, oil and gas incidents requires robust emergency planning and an effective response which, by its very nature, requires specialised equipment, equipment that must exceed the sheer magnitude of these fire incidents. The biggest challenge in the response capability has always been the continuous and sufficient supply of water to feed the multitude

of delivery apparatus. This challenge is now something of the past with the introduction of the Deluge system.

The Deluge system comprises the following components:

- Surgemax high volume submersible pumps
- Dependapower high volume booster pump
- Megalift ultra load hook loading system
- Titanhook pro-lift crane system

- Annaconda high volume automated hose retrieval system
- Megaflow 304mm high volume hoses
- Maxstream high volume flow manifold system

The Deluge high volume water supply system offers the following unique operational characteristics:

- Surgemax high volume submersible pumps: 30 000l/min from a water source up to 61m away from the Dependapower and with a vertical lift of 10,6m. Total capable lift is 40m.
- Dependapower high volume booster pump: 30 000l/min from submersible pumps or 53 000l/min from draft and submersible pumps.
- Megalift ultra load hook loading system: hydraulic hook loader system for lifting and lowering the Dependapower system incorporating the Surgemax hydraulic submersible pumps.
- Titanhook pro-lift crane system with a lifting capacity of 1 950kg at 6m and 590kg at 16m.
- Annaconda high volume automated hose retrieval system, capable of housing 5km of Megaflow 304mm high volume hoses. The Annaconda is fitted with two Hosemules



Megalift ultra load hook loading system



Titanhook pro-lift crane system

that automatically retrieve the hoses. The Annaconda is fitted with a tail lift allowing the hoses to be "driven" out.

- Maxstream high volume flow manifold system allows for the connecting of 304mm

Megaflow supply lines and 184mm and 152mm discharge lines.

**Flood situations**  
The Deluge system is essential during flood situations and

*The Deluge system is a high-capacity firefighting water supply system catering for every eventuality*







# Introducing the **DELUGE** System

from



**INDUSTRIALFIRE**  
& HAZARD CONTROL



## The Industrial Fire & Hazard Control “DELUGE” System

Industrial Fire & Hazard Control, a proud member of the Advanced Group of Companies, in collaboration with Williams Fire & Hazard Control, has engineered and built the ultimate in high-capacity firefighting water supply systems to cater for every eventuality. Mitigating the most extreme and dangerous fire incidents by applying overwhelming fire suppression power is our business.

### Firefighting Operations:

Extreme fire risks in the petrochemical, oil and gas incidents requires robust emergency planning and an effective response which, by its very nature, requires specialised equipment, equipment that must exceed the sheer magnitude of these fire incidents.

The biggest challenge in the response capability has always been the continuous and sufficient supply of water to feed the multitude of delivery apparatus.

This challenge is now something of the past with the introduction of the “DELUGE” system.

**Zarto Williams:** Email: [zarto@industrialfire.co.za](mailto:zarto@industrialfire.co.za); Mobile: +27 (0) 61 158 6941  
**Abrie Dempers:** Email: [abrie@industrialfire.co.za](mailto:abrie@industrialfire.co.za); Mobile: +27 (0) 78 159 4845  
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**Trevor Fiford:** Email: [trevor@industrialfire.co.za](mailto:trevor@industrialfire.co.za); Mobile: +27 (0) 82 651 2580







Megaflow 304mm high volume hoses

is ideal for managing and controlling excess water thereby mitigating the impact of floods and protecting lives and property as well as the environment.

The Deluge system can rapidly reduce water levels with flows up to 53 000l/min (3 000 000 litres in 60 minutes) thus preventing structural damage to buildings and infrastructure ensuring public safety, facilitating emergency response and assisting in economic recovery.

**Wildland fires**

The Deluge system plays a key role in supplying water for firefighting operations in wildland fires. The system ensures that firefighters have water resources at the fire front to ensure rapid fire suppression; the system supplies water for cooling hotspots and for mopping up operations; the system is ideal for structural protection that requires increased volumes of water; the system easily provides a water source for modular airborne firefighting operations (MAFFS); the system is the backbone for hose lay operations and further ensures the safety of firefighters.

**Fire suppression system**

Water supply is a critical element for the effectiveness and reliability of fixed fire suppression systems. It is essential for these systems to fulfil their role in preventing and mitigating fire-related risks in a wide range of settings. In the event that an existing system is taken out of service for maintenance/repair/replacement, the Deluge system can operate as a “stand-in” system or can fulfil the role of the water supply system for a suppression system as a permanent supply in remote areas.

**Water supply in drought conditions**

The Deluge system is an imperative requirement for supplying high volumes of water over very long distances during times of drought. The Deluge system will ensure a water supply system for firefighting operations; the system can be used as a distribution system for water supply to residential, agricultural or industrial areas, including airports and other key points; the system is an ideal transfer system and can ensure the replenishing of reservoirs and dams. ▲



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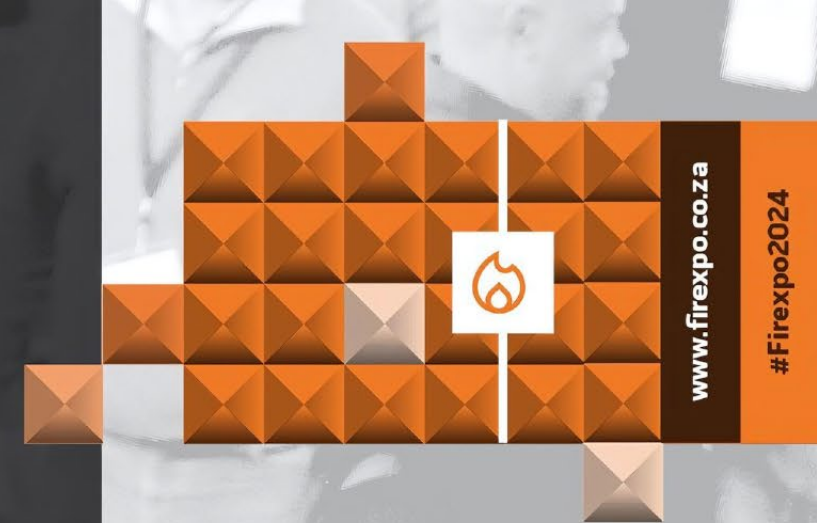
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# Overcoming deluge system reliability challenges with the SA Fire Protection Double Chamber Deluge Valve model VDD available from Dosetech Fire



The SA Fire Protection Double Chamber Deluge Valve model VDD

This review will concentrate on the role of the deluge valves, also known to reliability engineers as final elements. Those valves play a fundamental role in the success of the mitigation effect as their availability is key to deliver the water to the sprayers and therefore to protected targets. Some of the most advanced series of international

standards for addressing the subject of reliability in fire protection are the NORSOK S-0011 and the OLF 0702, which provides the guidelines for the qualification of safety functions in deluge systems.

Among the significant technical contributions that those standards have provided to fire protection engineers, it is worth

noticing that they finally have clarified a big misinterpretation that was obsessing the fire industry. It is in fact now clear to fire protection engineers that a deluge valve is a final element as the fire water is fully dependent by its availability to open on demand. This clarification has finally resolved the argument within the fire engineering community of Oil and Gas when it became

necessary to document the reliability of a deluge valve as requested by S-001 itself.

The wrong interpretation considers the solenoid valve as the final element when instead it is just a component of the deluge valve control trim. Moreover, some have compounded the theory by proposing the installation of parallel solenoid valves acting on a single deluge valve meets the aim of increasing the reliability of the deluge system. Clearly this is all wrong!

The right interpretation is in fact addressed by OLF 070, which clarifies that the deluge valve shall perform its reliability as a whole and hence as a common aggregate of the deluge valve, its control trim and its pilot solenoid valve.

The OLF 070 clarifies the definition of what final elements are, which is the actual valve that controls the opening/closing of water and not its pilot solenoid valves which is of course an important part of the deluge system but again is only a part of it.



The VDD has been designed to comply with the requirement of S001 granting continuous operability even during maintenance

Furthermore, "The fire water system shall be operable at all times including periods of maintenance and shall ensure adequate supply of water for fire fighting. The system shall be designed and calibrated such that deluge nozzles will receive water not later than 30 seconds after a confirmed fire signal has been given. For the fire water system, the fail-safe principles shall apply..."

The availability of deluge valves at all times can be achieved with redundancies of either the activation control trim and the flow control chamber. The SA Fire Protection Double Chamber

Deluge Valve model VDD, also simply known as the VDD, in fact has been designed to incorporate all these characteristics and comply exactly with the requirement of S001 granting continuous operability even during maintenance. The VDD and its control trim is also designed to respond to failures in no time and therefore grant water flowing to nozzle instantaneously.

In light of the above the double chamber deluge valves took the attention of the technical community for the design of fire protection systems for critical hazards. The VDD, is

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Release of firewater / Deluge; (fire water demand signal processed in Fire & Gas logic, start of fire pump, and opening of deluge-valve)

SIL 2

The SIL requirement applies to the sub-function needed for opening of one deluge valve, given confirmed fire or gas, i.e.:  
 - the fire water demand signal processed in the fire pump logic  
 - start of fire pumps  
 - Opening of one deluge-valve (given confirmed fire)

The function is considered successful when a certain amount of water (l/min) flows through the deluge valve.

**Table 7.1, section 7.6 of 070 – Norwegian Oil and Gas Application of IEC61508 and IEC 61511 in the Norwegian Petroleum Industry (2004).**

► a system on its own, which is comprised of two separate control trims (hydraulically bridged to form a unique actuation), which are capable to propagate the command to any of the two parallel membrane type chambers. The resulting deluge package is capable to perform with a very high level of reliability to the point that it has been validated by BV for integration in safety functions within Fire and Gas systems up to SIL 3. In addition to that the valve is equipped with an isolation system which allows for the impairment of a portion of the valve in order to allow for routine inspection, maintenance and/or repairs meanwhile the other portion of the valves remains operational and therefore grants continuous fire protection to

the process equipment. This in compliance with NORSOK S001 Par. 10.7 which requires to the deluge packages to be available at all times.

**What regulators state regarding deluge systems**

According to OLF 070, the aim of the deluge system is to deliver a certain amount of water where need. As such, operators are encouraged to consider the function of the entire deluge system not simply some of its components: (see table above)

In addition, NORSOK S-0014 highlights that “the fire water system shall be operable at all times including periods of maintenance and shall ensure adequate supply of water for firefighting”. The use of the term “at all times” emphasises

the importance of availability but also it could be argued that it is deliberately used as a reliability demand. In point 10.7.4 it is noted “Deluge valves shall be provided with manual bypass including flow restriction to match flow through the valve”. Furthermore, the bypass line shall be taken from another section of the ring main ensuring fire water supply at all times, including maintenance situations.

Thus, the Deluge is intended to automatically release a certain amount of water upon confirmed gas detection for explosion mitigation at all times, irrespective of maintenance activities. Despite this, the industry has focused on highly reliable detectors and logic solvers while overlooking the importance of the reliability of the final elements (such as deluge valves), being able to complete the loop in order to achieve explosion mitigation.

**Working practice**

Analysis demonstrates that the unavailability of the fire water system is highly reliant on the reliability of the deluge valves; in addition, “the deluge valves constitute 95,5 percent of the total unavailability”, therefore the deluge valve has a critical function in the system. It is also shown that “by designing fire



**The VDD was designed for fire protection systems according to NFPA15, UL 260 and IEC 61508/61511**

areas that depend on one deluge valve instead of two decreases the system unavailability to about 50 percent of the original unavailability”. It is important that the fire water system is available on demand at all times.

In respect of the data reached in the table on the right the overall system would only attain a quantitative SIL 1 level.

**Key features of the double chamber deluge valve**

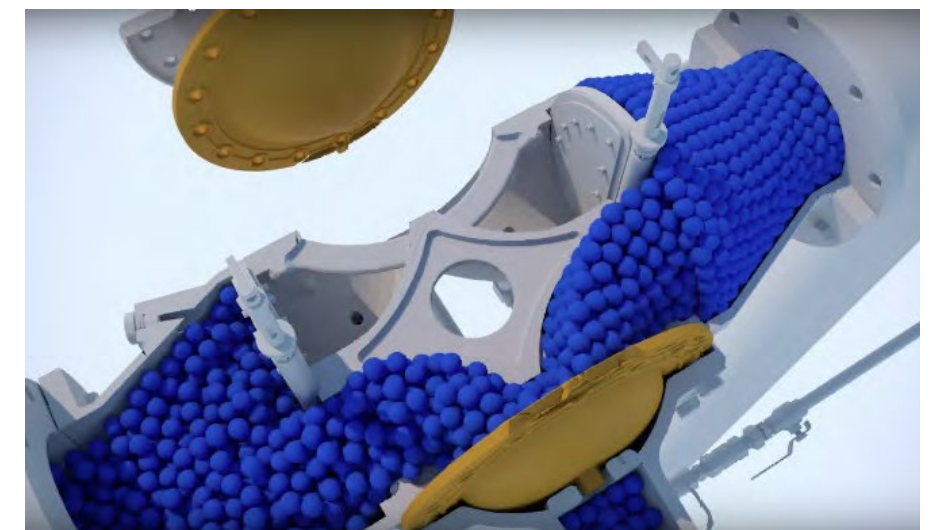
The Double Chamber Deluge Valve Model VDD was designed for fire protection systems according to NFPA15, UL 260 and IEC 61508/61511. Furthermore, the VDD was designed to accommodate installations requiring high safety function performance ensuring the requirements mentioned in the “Recommended guidelines for the application of IEC61508 and IEC61511 in petroleum activities on the Norwegian Shelf”, which called for a minimum SIL2 level for the “Deluge valve including actuator, solenoid and pilot valve”.

The VDD has a fully redundant architecture, has a built-in emergency bypass line, comes with a hydraulic bridge between the trims that allows each trim to control both diaphragms, can overcome double failure in the trim plus priming chamber, is very unlikely to fail on demand, responds to failure affecting the valve in zero time, provides continuous fire protection, according to IEC 61508/61511, is validated by Bureau Veritas up to SIL 3 and is UL listed.

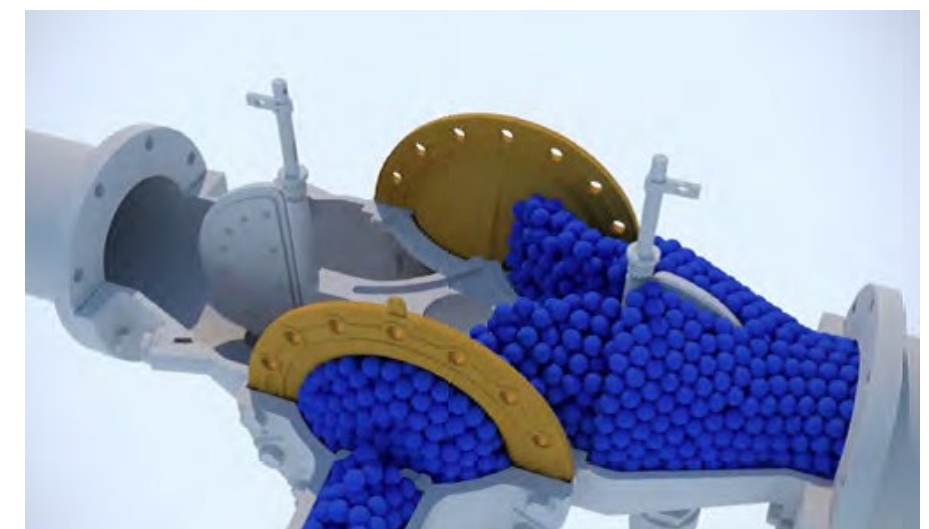
The SA Fire Protection Double Chamber Deluge Valve model VDD is available from Dosetech Fire. ⚠

Table A.16 PFD results for deluge Component	Voting	PFD per component	System PFD	System PSF
F&G logic + I/O	1oo1	4.4 x 10 <sup>-3</sup>	4.4 x 10 <sup>-3</sup>	5 10 <sup>-5</sup>
Fire water pump	1oo2	9.4 x 10 <sup>-4</sup>	5 x 10 <sup>-5</sup>	-
Fire water diesel engine	1oo2	1.9 x 10 <sup>-3</sup>	1 x 10 <sup>-4</sup>	-
Electric generator	1oo2	1.4 x 10 <sup>-3</sup>	7 x 10 <sup>-5</sup>	-
Electric motor	1oo2	1 x 10 <sup>-3</sup>	7 x 10 <sup>-5</sup>	-
Deluge valve	1oo1	1 x 10 <sup>-2</sup>	1 x 10 <sup>-2</sup>	-
<b>Total Function</b>	-	-	<b>0.015</b>	<b>5 x 10<sup>-5</sup></b>

**Table A.16, section 7.6 of 070 – Norwegian Oil and Gas Application of IEC61508 and IEC 61511 in the Norwegian Petroleum Industry (2004).**



**One chamber operational, one chamber under inspection NFPA 25**



**Both chambers operational**



# Dräger HPS® SafeGuard fire and rescue helmet



The Dräger HPS® SafeGuard is the extremely lightweight universal helmet for fire and rescue services. Its innovative design combines optimal protection with the highest levels of wearing comfort. Its sporty look, light weight and tailor-made accessories make the helmet a real all-rounder for any challenge.

**Usability:**  
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Weighing just around 1,25 kg in its basic configuration, the Dräger HPS SafeGuard is one of the lightest helmets in its class. Its innovative design also ensures optimal weight

distribution of the fire and rescue helmet. These two factors combined offer you the best possible wearing comfort and the perfect fit for all types of movement, even when crawling.

The helmet is characterised by its advantageous weight distribution and the excellent climate characteristics: The excellent thermal insulation helps to protect you when fighting fires, ▶

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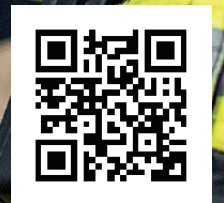
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**Lennart Wenzel**  
UX Design Manager



With its fully integrated, highest optical quality visors, your face and eyes are perfectly protected. Moreover, the additional multi-coating feature prevents it from fogging and scratching.

A gold coating not only provides the best possible protection against radiant heat but also gives the helmet a stylish look.

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Unhindered communication**

Thanks to the helmet shell's special design, your ears remain uncovered.

For you this translates to improved communication with your team that is being able to hear and speak to them clearly. Even the perception of background noises is flawless.

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for more information and/or assistance.

▶ while guaranteeing a balanced climate inside the helmet even during longer rescue missions without respiratory protection. Lots of benefits, all confirmed in external scientific studies.

**Safety+:  
A helmet for all situations**

Thanks to its universal design and multiple certifications, you can

make perfect use of the helmet for all key applications required in fire and rescue services.

The special endurance testing conducted by Dräger also means that you can rely on the multifunctional helmet to consistently deliver a high degree of safety, reliability and quality.

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# New incident command vehicle for Cape Winelands District Municipality



The Cape Winelands District Municipality's Fire Services took delivery of their new, state-of-the-art, custom-designed mobile incident command bus in July 2023.

"The Cape Winelands District Municipality has expressed the need for this vehicle for some time and it was finally manufactured after tender T2022/126 was awarded to Ramcom Trucks and Load Bodies in 2023", said Brandon Woolley, group director at Ramcom.

The need for a suitable, custom manufactured, mobile command

unit was increasing as the number of fires and incidents in the huge area covered by CWDM was increasing in numbers and intensity. The number one goal of CWDM has always been to protect lives, property and livelihood. They required the IC vehicle to accommodate all the role players involved in evaluating each incident. Role players then develop strategies to mitigate the impact of the incident on the environment and community from a comfortable, practical mobile bus.

"Ramcom Trucks and Load Bodies is extremely proud to

have been part of this amazing project. To be able to produce this vehicle and in partnership with the CWDM and the dedicated fire fighters and support teams, give back to service the community better", said Woolley.

The vehicle is built on an Isuzu chassis with the superstructure and the output profile is an integrated bus configuration.

The bus is equipped with the normal features such as air conditioning, mud flaps, lockable fuel cap, reverse buzzer and tinted windows.



## Manufacturers of Fire Fighting Vehicles

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[www.ramcomtrucks.co.za](http://www.ramcomtrucks.co.za)

Email: [brandon@ramcomtrucks.co.za](mailto:brandon@ramcomtrucks.co.za)





► The workstation and kitchen area boasts the following fitted and secured neatly to allow optimum productivity including individual seating on fixed swivel office chairs, worktop, plugs, radios, printer, microwave, fridge/freezer, LED lighting, inverter, LTE router, lockable cupboards and openable windows on either side of this space.

The ergonomically designed conference area has 10 seats to the left and the right of the bus facing a big 65 inch, fully interactive television. The 10 workstations have fixed, swivel chairs, electrical outlets,

HDMI ports, LED lighting, air conditioning, whiteboard and storage cupboards. There is a glass sliding door with sandblasted logos between the kitchen and the conference area.

The bus has a 30 metre heavy-duty extension cable (shoreline), solar system on the roof and a back-up generator to ensure that any situation at any time and any where can be handled efficiently and without the added concern of power restrictions.

There are lockers around the bottom (outside) of the bus for the generator, on board battery

bank and general storage purposes.

The bus is equipped with an electronic stability jack system providing optimum stability of the vehicle while stationary. A manual cranking awning system is fitted to the side of the bus providing shade for those operating outside the vehicle.

There is also a proper electrical DB box with all the networking and electrical requirements as well as two-way radios.

Chief Fire Officer Wayne Josias said, "The CWDM proudly



welcomed its state-of-the-art, custom-designed mobile incident command bus in July 2023. Employees were given the opportunity to name the vehicle and after much deliberation, she was officially christened 'Lady Sentinel' during the passing-out parade. The term sentinel is defined as guardian or protector, symbolising someone who watches over and stands guard. This perfectly encapsulates the function of the incident command bus. The Lady Sentinel will enable the CWDM, its partners and other stakeholders to assemble in an easily accessible vehicle to efficiently predict, plan and initiate mitigation actions in response to major incidents that threaten the community and property."

"May The Sentinel stand firm and keep watch for many more years to come!" added Woolley. ▲





# Health and air quality with Task Force Tips



The Decon/pak is a self-contained agent proportioning and rinse application system

We are focused on making your world safer, healthier and more productive. Firefighters are exposed to particulates, volatile organic compounds (VOCs) and moulds and have an increased risk of cancer and illness.

We believe that you and your crew deserve the best decontamination solutions on scene, in the apparatus and at the station. Our continuum of health approach integrates solutions for gross decontamination and air decon in both apparatus and public spaces.

With a three-phase approach, we aim to protect firefighters' health and protect those who protect us.

### Decon/Pak™

The Decon/pak is a self-contained agent proportioning and rinse application system developed specifically for gross decontamination of firefighting personnel donned with gear and their equipment.

The Decon/pak uses a simple three-step process:

- Add cleaning agent
- Connect to hoseline
- Wash/scrub/rinse.

Studies show that field decon using soap, water and brush can reduce cancer causing contamination on turnout gear by 85 percent.

The system includes a 2,5-gallon container for detergent, 12' hose with fan spray nozzle and a simple built-in eductor that allows water from the truck to be used in a mix or rinse application. ▶



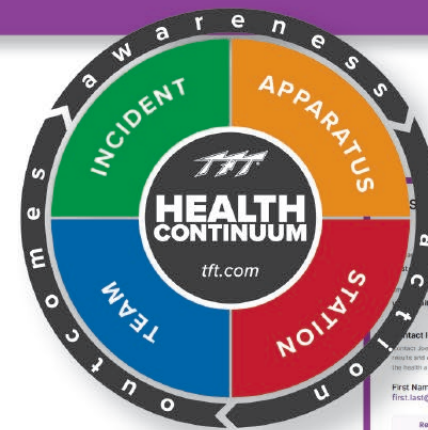
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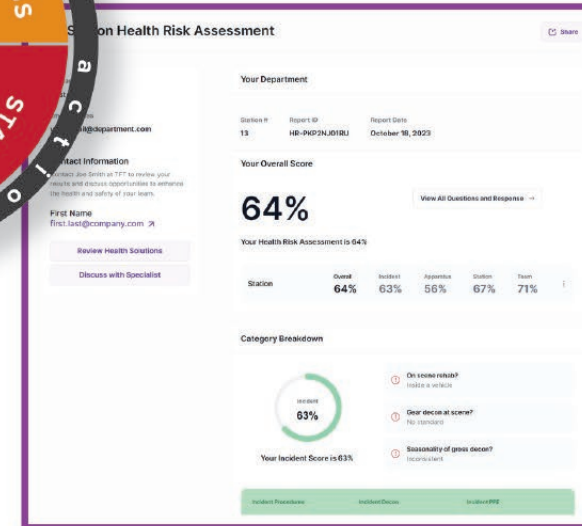
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The Health Continuum captures four points of exposure and potential health concerns for your department. These categories encompass the places a firefighter might experience a health risk on duty: station, apparatus, incident, team.

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**CrewProtect can be easily installed into new or existing apparatus**

► Our goals were to make it easy to deploy, simple to use and effective in getting contaminants off the firefighter.

**Crewprotect™**

CrewProtect is a unique, self-contained and comprehensive air decontamination system for enclosed apparatus cabs ambulance bodies and personal vehicles that protect first responders and their passengers from particulate soot and volatile organic compounds (VOCs).

CrewProtect can be easily installed into new or existing

apparatus and runs on standard 12VDC or 24VDC truck power. The system draws less than 2,5A in with 12VDC or under 1A with 24VDC and includes mounting brackets.

Most importantly, CrewProtect is safe. Competitive products don't tackle all major threats and may have the unintended consequence of adding more harmful contaminants into the air.

**Stationprotect™**

After returning from a fire, PPE and equipment can contain harmful particulates and

continue to off-gas for extended periods. StationProtect cleans the station air and protects crews from cancer causing soot, VOCs and improves air quality by reducing mould.

The unit cleans the air in gear rooms, sleeping quarters and living spaces up to 731 m2 with an airflow up to 655cfm.

StationProtect quickly and effectively removes particulates, VOCs, moulds and smoke through cutting edge decontamination technology with no hassle decontamination modules containing 18kg of patented decontamination media, replaced annually.

It offers true HEPA filtration for harmful sub-micron particulate matter. StationProtect is easy to operate, install and to use and is portable on casters for placement anywhere in the facility.

StationProtect is also low maintenance, easy to use with a single knob and works on standard electrical outlets and has a durable brushed aluminium exterior.

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# AECI Specialty Chemicals holds transition to Fluorine free foam demonstration



Marinus Scott

### The AECI Team

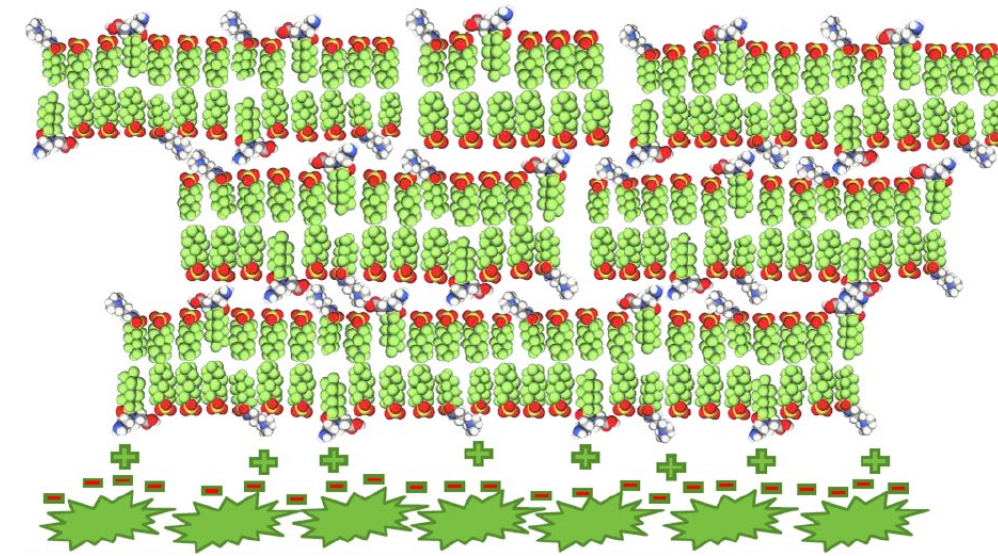
**A**ECI Specialty Chemicals recently hosted an information session explaining the new legislation possibly affecting firefighting foam in the near future. The event, which was held at the Modderfontein Training Centre in Ekurhuleni, included a live demonstration of the new fluorine free foam from Dr Sthamer, showing how effective fluorine free foam performs when compared to AFFF.

Attendees also had the opportunity to visit the AECI Chem Park facility at Chloorkop for a plant walk through to see first-hand where the foam is being manufactured.

Marinus Scott, technical sales representative at AECI Specialty Chemicals, shared a presentation on the practical issues when changing over to Fluorine free foams (F3).

Scott started his presentation saying that it is based on the practical implications of the directives. He added that the presentation includes information recently shared by their principle, Dr Thomas Leonhardt, who gave a presentation as section chairman of the

### Multi-layered structures form on surfaces



European Committee of the Manufacturers of Fire Protection Equipment and Fire Fighting Vehicles (EUROFEU) at the recent JOIFF seminar at the

National Maritime College of Ireland (NMCI). Scott also included information shared by Dr Ian Ross from

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SPECIALTY CHEMICALS

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**Marinus Scott**  
(011 922 1809)  
+27 82 330 6250  
marinus.scott@aeciworld.com

**Jason Gray (Cape Region)**  
+27 82 891 4264  
Jason.gray@aeciworld.com





Demonstrating the effect of fighting the fire with Fluorinated foam AFFF 3%

► the Manchester Metropolitan University in the UK, from the JOIFF online training session regarding PFAS and its implications.

**PFAS: Setting the stage**

“Legislators globally tighten the screws on Fluorochemicals. The UN Stockholm Convention of the parties has adopted PFOS, PFOA and recently PFHxS on their list of persistent organic pollutants (POP-List) and more are coming. The European Union is preparing to completely phase out any Fluorochemicals, not just in firefighting foams. China is preparing restrictions on PFAS and the USA has very tight restrictions in many States with more to come. Australia already has restrictions in place and is tightening them”, added Scott.

Scott also explained the complications of changing over from PFAS to Fluorine free foams with regards to the containers, proportioners, pumps, tanks and pipes. “Is it more cost effective to clean or to replace? Smaller tanks may be cheaper to replace than to clean. It is also important to consider the logistics of transporting “hazardous” chemical waste.” He added that all soft seals such as gaskets etc and any plastic parts need to be replaced. “We have produced a check list with the assistance from Dr Sthamer, which we can share.”

**Choosing your Fluorine free foam**

“As the world is changing and phasing out PFAS fluorinated compounds in firefighting foam, we at AECI Specialty Chemicals can offer the latest technology in Fluorine free foams, formulated by Dr Sthamer based in Hamburg, Germany,” said Scott.



Firefighting demonstration with Fluorine free Vaporex 3% extinguishing an hydrocarbon fire (Avgas)



**AFFF and AR-AFFF, as well as the latest Fluorine free foams**

With AECI’s manufacturing facility in Chloorkop, Johannesburg, the business can offer Fluorine containing foams including AFFF and AR-AFFF, as well as the latest Fluorine free foams. With certain market sectors phasing Fluorine foams out over the next 10 years, AECI

will continue to manufacture these foams to service customers until such a time where it is no longer possible to do so. This will allow for more adequate planning and budgeting time to do it right the first time.

**What AECI can do for you?**

AECI Specialty Chemicals is offering customers a complete

turnkey solution in changing over to the latest Fluorine free foams removing the uncertainty around a fairly new legislative requirement. With its local professionally equipped laboratories foams can be analysed and tested and feedback and recommendations provided to improve the life of the product.



Demonstration with AECI’s RLF 4 A class foam showing how the foam changes as you add or reduce air





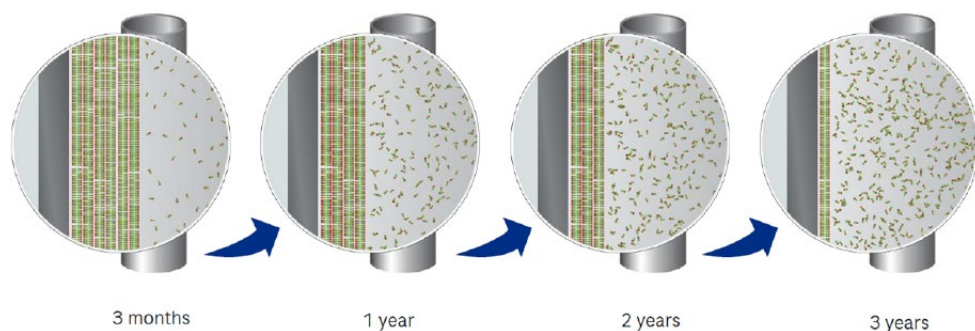
Demonstration extinguishing an alcohol fire using Fluorine Free alcohol resistant Vapurex AR 3X3 foam

► “Being audited by Dr Sthamer on a regular basis AECI is proud to say that it is the only company globally to have certification to manufacture these products”, said Scott.

Celebrating a 100-year anniversary this year, indicates the company’s commitment to the industry.

Staff are experienced to handle enquiries and challenges and facilities manufacture world class products consistently. ▲

**Projected Rebound of PFAS into F3 Foams**



**Poly-**  
(Precursors)

Biotransformation / Chemical Oxidation

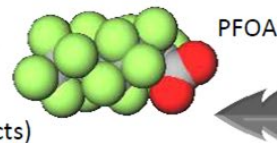
Persistent perfluorinated Non-fluorinated - Biologically/Chemically removed



Stone arrowhead, like perfluorinated section of molecule, persists forever

Wooden shaft, like non-fluorinated section of molecule, is degraded so rots away in ground / in vivo

**Per-**  
(Terminal products)



Perfluoroalkly acid formed from precursor persists indefinitely as “chemical rocks”, like stone arrowheads

Practical issues on change over to Fluorine free foams

# Toughest Firefighter Alive South Africa 2024 now open for registration

The 9th edition of South Africa’s ‘Toughest Firefighter Alive’ (TFA-SA) Open competition will be held at De Bakke beach in Mossel Bay on Thursday, 26 to Saturday, 28 September 2024. Registration will close on Thursday, 31 August 2024.

The TFA-SA is based on the international Toughest Firefighter Alive’ Challenge, the blue riband event of the World Firefighter Games (WFG). The WFG started in Auckland, New Zealand 1990 and is held in a different country every two years with the winner of the TFA Competition at the WFG being crowned the World’s Toughest Firefighter Alive, a very prestigious award.

The TFA-SA South Africa’s premier fire fighter event was held for the first in Cape Town at the Good Hope Centre on October 2011 with a total of approximately 80 competitors. The event has been primarily hosted in Cape Town, then in George in 2016 and with Mossel Bay hosting the event from 2022 until 2024. The 8th Edition of the event held in Mossel Bay 2023 attracted a South African record amount of 168 individual firefighter competitors’ participants, with 43 relay teams from 30 different municipalities and entities.

The Firefighters for Excellence Foundation – SA exists to promote and encourage elite fitness amongst firefighters, acknowledging the critical role fitness and wellness plays within the firefighting profession, in ensuring the safety and well-being of our communities.

Individuals, municipalities, volunteer organisations, private firefighting companies and industrial and military firefighters are encouraged to support and partake in TFA-SA. The event provides the opportunity to collaborate and benchmark the South Africa’s firefighters whilst enhancing service delivery through fitter, stronger fire fighters, build community relations, motivate fire fighters and restore local and national pride in the fire services.

**Registration**

The entry fee will be as follows:  
Individuals: R300  
Team: R950

## Categories

**Individual Age Categories (as on day of TFA competition)**

**Male**

- a. Men’s Individual 18~29 years
- b. Men’s Individual 30-34 years
- c. Men’s Individual 35~39 years
- d. Men’s Individual 40~44 years
- e. Men’s Individual 45~49 years
- f. Men’s Individual 50 – 54 years
- g. Men’s Individual 55 – 59 years
- h. Men’s Individual 60+

**Female**

- a. Women Individual 18~29 years
- b. Women Individual 30~34 years
- c. Women Individual 35~39 years
- d. Women Individual 40 – 44 years
- e. Women Individual 45 – 49 years
- f. Women Individual 50 + years

**Relay team categories (fastest time wins)**

**Male**

- a. Male Open
- b. Male over 40
- c. Male over 50

**Female**

- a. Female Open
  - b. Female over 40
- Relay event: individuals are required to be of the same region or functional sector to enter as a team

**For further enquiries contact Mark Smith**

Cell: 071 676 4272  
Email: [tfa@firerescue.co](mailto:tfa@firerescue.co)  
[www.frimedia.org/tfa](http://www.frimedia.org/tfa)

**Register here:**

[Registration form link](#) ▲



# Using heavy-duty recovery vehicles in extrication

By Colin Deiner, chief director, disaster management and fire brigade services, Western Cape Government



Heavy-duty tow trucks are specifically designed to handle large and heavy vehicles

The gradual movement from rail transport to road transport in South Africa in recent years has resulted in a significant increase in heavy motor vehicles on our roads. With this comes the possibility of more accidents and more complex victim entrapments.

Rescue services trying to survive in an increasingly difficult cut-back environment has forced them, in many cases, to revert to lighter, less specialised vehicles on which to base their rescue rigs. It is clear that these two tendencies are diametrically opposed, thereby increasing the challenge to the

rescuer and decreasing the survival chances of the victim. Something that no city or town is short of is the plethora of tow trucks that seem to arrive out of nowhere on every accident scene, sometimes even before the emergency services!

Tow trucks or recovery vehicles come in various configurations. The vast majority of tow trucks are light, two-seater, extremely fast vehicles designed to respond rapidly and to reach the scene of the accident before its competition. It is not these vehicles that will provide a rescue team with the assistance

they might need and, in many cases, create an extra risk to the rescue operation due to the high speeds at which they respond as well as overcrowding the accident scene by parking in areas which place responding units in danger.

The tow trucks that we wish to focus on here are the heavy-duty vehicles that are primarily designed for the recovery of large vehicles and loads. These powerful machines provide indispensable support to rescue services during vehicle accident extrication operations, ensuring the safety and efficiency of these critical missions.

## The heavy duty tow truck: a versatile asset

Heavy-duty tow trucks, also known as wrecker trucks or recovery vehicles, are designed for one primary purpose: to recover and transport large and heavy vehicles. They are equipped with an array of specialised tools and capabilities that make them indispensable in extrication operations:

- **Lifting and winching capabilities**

Heavy-duty tow trucks are equipped with powerful winches and hydraulics that can lift and move vehicles weighing several tons. This capability is vital when rescue services need to stabilise or reposition a vehicle to access victims or safely remove them from the wreckage.

- **Securement and stabilisation**

Tow trucks can secure vehicles in precarious positions to prevent further movement, reducing the risk of secondary accidents or structural collapses. Stabilisation is critical when rescue teams are working to free trapped individuals from a tangled mass of metal.

- **Rapid vehicle removal**

Quick removal of damaged vehicles from the accident scene is crucial to clear the roadway,



The tow truck's winching and lifting capabilities allow rescue teams to stabilise the damaged vehicle

allow medical personnel to access victims and ensure the safety of responders. Heavy-duty tow trucks can expedite this process, which is essential in high-pressure situations.

- **Standard operating procedures**

When it comes to large scale operators, they generally are very professional and proficient at their jobs and we have found that most tow companies are eager to aid in a rescue with just a quick discussion on arrival. The tow truck operator will generally be well trained in rigging and towing and have a deep understanding of his vehicle's capabilities and how to use them to achieve the desired outcome.

While we take it for granted that a tow-truck will almost always show up at an accident scene, we might not always be sure what type of truck will arrive. There might be delays in response if it is the operator's policy to first respond with a lighter tow truck and then call for a heavier unit if required.

It would therefore be good policy to meet with the operators offering a recovery service in your jurisdiction and set up an agreement for the deployment of the desired resource. This will allow for the rescue services call centre to immediately call for the correct rig when the information received indicates a heavy load involved in the incident. Although this might not always be possible due to the caller's lack of knowledge, there should almost always be a police or traffic law-enforcement officer first on scene who could clarify the need for a heavy-duty rig. It is essential that these vehicles are dispatched early. They do not have lights and sirens and might be delayed having to negotiate traffic or travel a long distance.

It is also important to make some time to train with the



Consider the type and size of the vehicles involved in the accident





Care should also be taken when lifting or stabilising a hazardous cargo load

- ▶ heavy-duty operators to ensure that (a) the operator understands the rescue service's methods and (b) that the rescuers understand the capabilities of the heavy-duty operator.

Before calling for a heavy-duty rig both groups must also be clear on why they need a particular unit. Are you stabilising? Are you lifting? This makes a difference in what vehicle you need to call for. You will need a rotator if you intend on moving a big rig tractor trailer or a similar type of vehicle at all. If you are only capturing and stabilising the weight, a straight boom rig may be sufficient.

**Command decisions**

Following the arrival and assumption of command by the fire/rescue service and the dispatch of the heavy-duty rig, based on the caller's description of the incident, the incident commander should evaluate the scene when making the decision to employ the heavy-duty rig. The following points must be considered when making this decision:

- **Scene safety**

Tow truck operators work in tandem with rescue personnel to

assess the situation. They help identify the safest approach for extrication, considering vehicle stability and the potential risks of movement. Also identify potential hazards such as leaking fluids, unstable structures or other dangerous conditions that could affect the deployment of a heavy-duty tow truck.

- **Vehicle stabilisation**

The tow truck's winching and lifting capabilities allow rescue teams to stabilise the damaged vehicle. This is critical to prevent further shifting and collapse, creating a safer working environment for responders. Evaluate the stability of the damaged vehicles. If a vehicle is severely damaged and poses a risk of collapse or movement, deploying a heavy-duty tow truck may be necessary to stabilise the vehicle before rescue operations can proceed. Lifting or stabilising requires that you control the entire weight of the load you need to control. Balance points, the centre of gravity and the lift point are all critical to a controlled lift. Setting the chains in a stable, solid location on the vehicle is imperative; use the tow operator's expertise if you are unsure of how or where

to place the chains. You can't deploy any resources close to or under a weight that is not entirely controlled. An uncontrolled load could move unexpectedly if, for some reason, it was to over-balance in a particular direction.

- **Roadway clearance**

Determine whether the accident has resulted in road blockages or obstructions. Heavy-duty tow trucks can assist in the rapid removal of damaged vehicles, helping to clear the roadway and facilitate the movement of emergency vehicles. This is essential to provide responders with ample room to work efficiently and safely.

- **Extrication assistance**

In cases where a victim is trapped inside a severely damaged vehicle, tow trucks can help in carefully opening or removing the vehicle's structure. This requires a delicate and coordinated approach between rescue teams and tow truck. Assess whether there are victims entrapped inside vehicles. If heavy extrication is required, the tow truck's capabilities for lifting, winching and stabilising can be invaluable in creating a safer environment for extrication efforts. When lifting, you need to consider additionally the lift capacity since you will now be holding the full weight of the vehicle. Any movement with that load requires using a rotator instead of a straight boom truck, and having a place to set the vehicle down once it is lifted; more space is required. Some wreckers can simultaneously lift one vehicle and move another while some have additional winches that can pull a vehicle from underneath a load in the event of a vehicle under-ride incident.



It is important to make some time to train with the heavy-duty operators

- **Vehicle size and weight:** Consider the type and size of the vehicles involved in the accident. Heavy-duty tow trucks are specifically designed to handle large and heavy vehicles, so their deployment is most effective in incidents involving busses, trucks or other oversized vehicles.
- **Communication with rescue teams:** Establish effective communication with rescue services to understand their needs and requirements. Collaboration is key to coordinating the efforts of tow truck operators and rescue personnel for a seamless and safe operation.
- **Weather conditions:** Consider the impact of weather conditions on the rescue operation. Adverse weather, such as rain or snow, can affect the stability of the accident scene and the capabilities of the tow truck.
- **Hazardous cargoes:** Care should also be taken when lifting or stabilising a hazardous cargo load. Any pressure

vessel or gravity tank that is fully loaded and has sustained damage to its cargo hull could suffer further damage and catastrophically fail if undue pressure is placed on a particularly heavily compromised area.

- **Vehicle placement and resource allocation:** Evaluate the availability of other resources and personnel. Deploy the heavy-duty tow truck in a manner that optimises the use of available resources without compromising overall rescue operations. At the initial staging phase when you are expecting the heavy-duty rig to arrive make sure you leave enough space for them to set up. The rigs have outriggers like a ladder truck, reach could be as much as six metres, and they have to be close enough not to overreach the boom. Remember that you lose lifting capacity there further you have to extend the boom.

By carefully considering these factors, the incident commander can make informed decisions regarding the deployment of heavy-duty tow trucks,

ensuring a coordinated and safe response to vehicle accident extrication situations.

**Conclusion**

Heavy-duty tow trucks can be a vital piece of equipment in an extrication operation where heavy loads are involved and need to be lifted off victims or separated from areas where patients are trapped. They are not there to replace the rescue capacity but compliment it. You will still need the heavy hydraulic spreaders, rams and cutters to do the close-in moving and cutting and possible pneumatic lifting bags more precise work. The measure of how successful your team will be is in their ability to combine their resources and expertise with that of the heavy duty rig operator to safely extricate the victim.

Finally, remember that, like many tools we have brought into the rescue field in recent years such as core drills, concrete breakers, chainsaws etc, tow trucks were not specifically built for vehicle rescue. Understand its limits and its capabilities. It will then become an indispensable part of your rescue armoury. ▲



# Driver miraculously survives being impaled by a falling tree:

## *Beyond success: Navigating complexity in emergency rescue operations*

By Julius Fleischman, Free State Training College of Emergency Care, South Africa

During a recent storm in Bloemfontein in the Free State, South Africa, a tree fell on a light commercial vehicle close to the Bloemfontein Stadium and impaled the driver. His wife and child were uninjured during this ordeal.

It was important for me to convey a message that goes beyond the conventional understanding of success in emergency rescue operations and specific this scenario. While success is typically associated with achieving positive outcomes, this title suggests that success in this context involves more than just the result. It implies a journey through complexity, challenges and intricacies inherent in emergency rescue situations.

In this rescue scenario, the term 'beyond success' there was a deeper layer to be explored; a realm where the complexities of rescue emergency operations come to the forefront. 'Navigating complexity' did emphasise our skill, strategy and careful planning required as to navigate through intricate situations.

During our rescue operation there were some key aspects of navigating complexity in the emergency rescue operations: Our organisation and coordination did require clear roles and responsibilities, as well as well-defined procedures and communication channels; it did help us to avoid confusion and ensures that all parties involved are working towards a common goal.



The rescue team training and preparedness were well-trained and equipped to handle this situation. This includes not only the rescue team physical skills but also mental preparedness and resilience to withstand the stressors encountered during this rescue scenario.

One of our key successes was to collaboration with other agencies successful.

### Introduction

Henry Ford's famous quote, "If everyone is moving forward together, then success takes care of itself," encapsulates the essence of teamwork and unity.

However, in the realm of emergency rescue operations, especially within highly skilled teams like those at Free State EMS and Mangaung Fire and Rescue Department and private EMS operation, success demands more than mere forward momentum. It necessitates a profound level of professionalism, experience, commitment and precision teamwork.

### The challenge of unique rescue scenarios

In the intricate world of emergency response, every rescue scenario presents unique challenges. The success of operations depends on the preparedness, training and coordination of the EMS, fire and rescue teams involved. The recently faced highly complex extrication situation in Bloemfontein Free State underscores the critical importance of these factors.

### Risks and considerations in tree-related rescues

The danger of a tree falling on a



vehicle adds significant risks to occupants, rescue teams and bystanders. In the described scenario, potential dangers included occupant injuries, fire hazards, entrapment, secondary accidents, crushing damage and environmental impacts. Managing these risks required a meticulous approach, considering immediate dangers, extrication challenges and potential psychological toll on the rescue team.

### Complex extrication scenario

The entrapment and entanglement of a patient with a tree branch through the body presented formidable

challenges, especially affecting the pelvis and femoral artery. Additional considerations, such as critical medical situations, extrication plans, medical interventions, space creation, patient stabilisation and communication, were paramount in navigating the complexity of the scenario.

### The need to get back to the basics

What a wonderful idea and when the rescue team say such things in team performances or at debrief sessions, it sounds like such a moment of brilliance and knowledge.



BACK TO BASICS



of careful planning, clear communication and seamless teamwork. Despite facing unprecedented challenges, the team exhibited resilience and determination, ensuring the success of the operation. Through multiple operations, coupled with brilliant patient care, the patient emerged from the ordeal triumphantly, symbolising the culmination of dedicated efforts.

Key points

Meticulous planning: Success in emergency rescue operations hinges on comprehensive planning, considering various contingencies and challenges that may arise during the mission.

Effective communication: Clear and efficient communication among team members is paramount, ensuring seamless coordination and swift response to evolving circumstances.

Unwavering teamwork: Team cohesion and collaboration are indispensable, particularly in high-pressure situations, where every member's contribution is integral to achieving the mission's objectives.

Commitment to basics: Amidst the complexity of rescue operations, adherence to fundamental principles and protocols remains crucial, serving as the bedrock for successful outcomes.

Continuous improvement: Reflection and learning from past experiences are essential for enhancing performance and adapting to evolving challenges, reinforcing

Back to basics: essentials of rescue team success

Amidst the intricacies of rescue operations, a call to "get back to the basics" emerges as a beacon of wisdom. Communication, teamwork and planning stand as the fundamental pillars of success in any rescue team effort.

Evaluating the efficacy of these basics becomes essential for any department and partnering with organisations like The Ripple Effect can be instrumental in reinforcing these foundational elements.

Leadership skills in emergency response

Leadership in emergency response demands a multifaceted skill set. Effective communication, motivational prowess, keen observation and leading by example emerge as key attributes for an incident commander (IC) leader.

The ability to navigate conflicts, provide constructive feedback, maintain team morale during non-emergency periods and prioritise the well-being of the rescue team contributes to the success of operations.

Summary

The recent extrication scenario underscored the significance



the importance of ongoing training and development.

Conclusion

In the dynamic world of emergency rescue, success is not a mere by-product of forward movement. It is an outcome of meticulous planning, effective communication and unwavering teamwork, even in the face of unprecedented challenges.

The recent extrication scenario serves as a testament to the indispensable role of skilled professionals and the need for continuous reflection, improvement and a commitment to the basics to ensure success in every rescue operation.

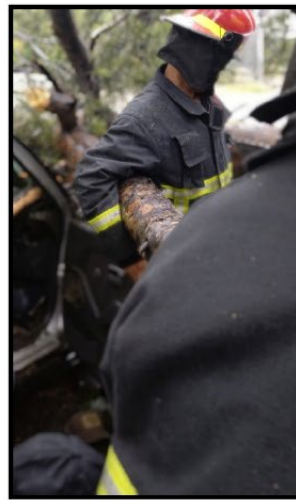
The successful extrication and recovery and numerous operations of the patient exemplify the culmination of meticulous planning, effective communication and unwavering teamwork. This experience underscores the invaluable role of skilled professionals in emergency rescue and emphasises the need for continuous improvement and a steadfast commitment to core principles.

As the patient steps out of the hospital, it serves as a poignant reminder of the positive impact of dedicated efforts in ensuring successful rescue operations.

I wish to acknowledge the following services who taught me the true meaning of the word 'teamwork' stands for 'together everyone achieves more': Mangaung Fire Department EMS Department of Health EMS private sector South African Police Mangaung Traffic Department.







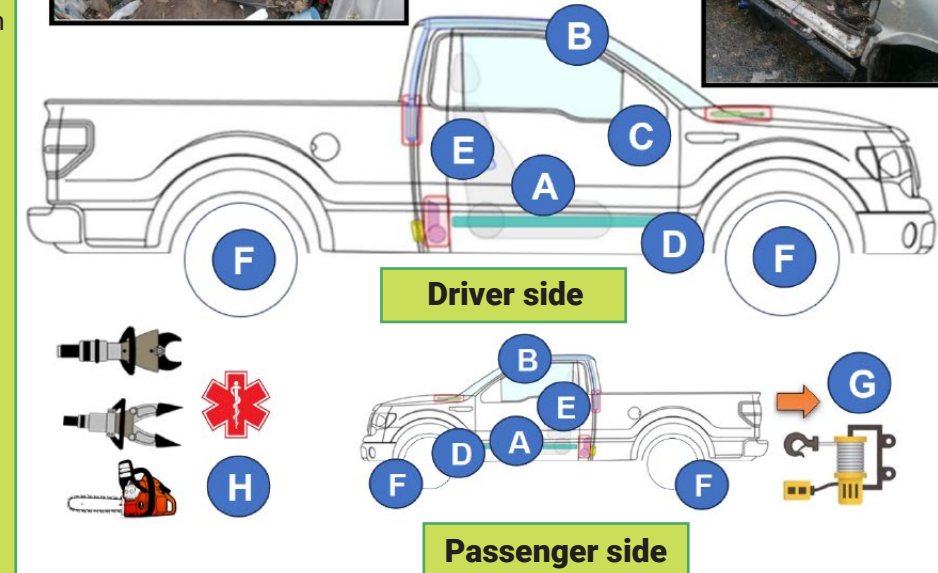
**Victim Entanglement**

A plan of rescue was made. "First, we had to stabilise the car because the tree were on top of the car and tree branch went through and penetrating the car and penetrating the patient and leaf the victim trap in the car with external femoral bleeding."



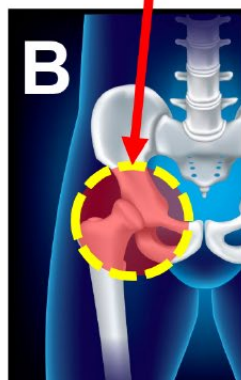
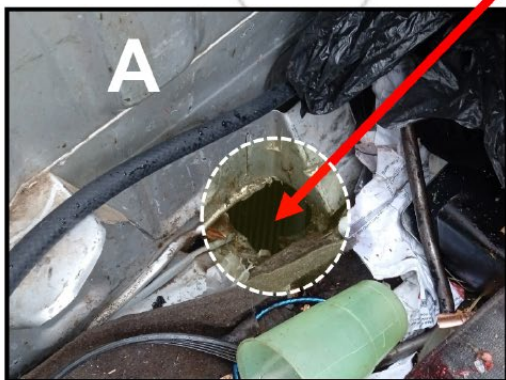
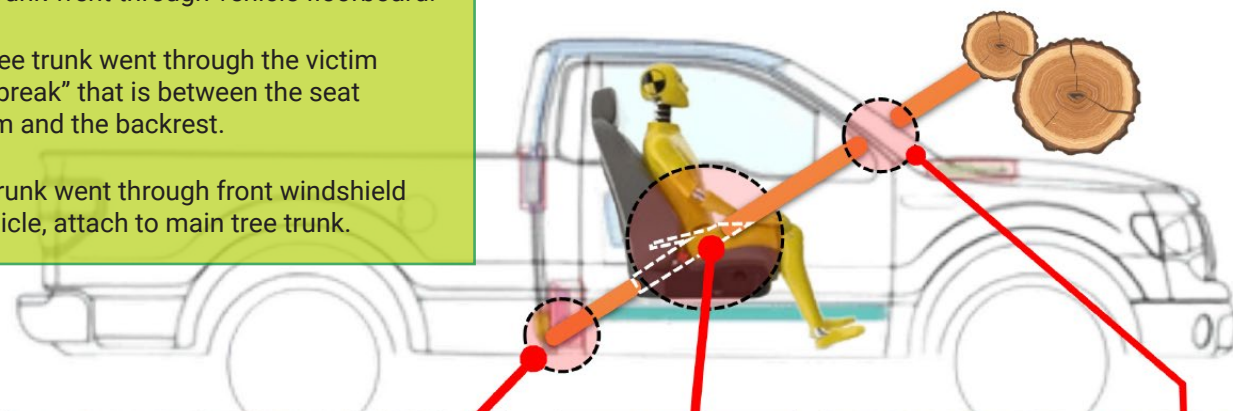
**Victim Entrapments**

- A** = Removed doors left and right
- B** = Removed roof and front laminated windshield.
- C** = Removed steering collum with airbag constrainer in place.
- D** = Dash displacements allow to free victims from secondary entrapment created by the dash area and make additional space for the path for CPR egress and victim removal plan B, plan A was victim removal on passenger side.
- E** = Removal of the backrest the tree trunk went through the seat "break" that is between the seat bottom and the backrest.
- F** = After removal of backrest second cut on tree trunk on the floorboard area, then then secondary vehicle stabilization flatten all four car tyres of the vehicle. The vehicle drop under the main tree trunk.
- G** = The vehicle free from the main tree we pull the vehicle back 2m for more working space, patient stabilisation, patient packaging and more work safe area.
- H** = Equipment used:
  - Chainsaw
  - Hydraulic spreader
  - Hydraulic cutter
  - Advance medical equipment



**Victim entrapments**

- A** = Tree trunk went through vehicle floorboard.
- B** = The tree trunk went through the victim seat "break" that is between the seat bottom and the backrest.
- C** = Tree trunk went through front windshield of vehicle, attach to main tree trunk.

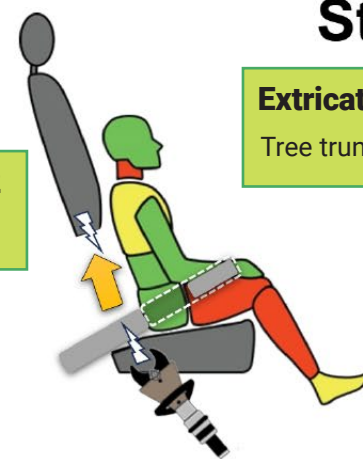


**Step 2**

**Extrication Step 2**  
Removal of backres

**Step 1**

**Extrication Step 1**  
Tree trunk first cut



**Step 3**

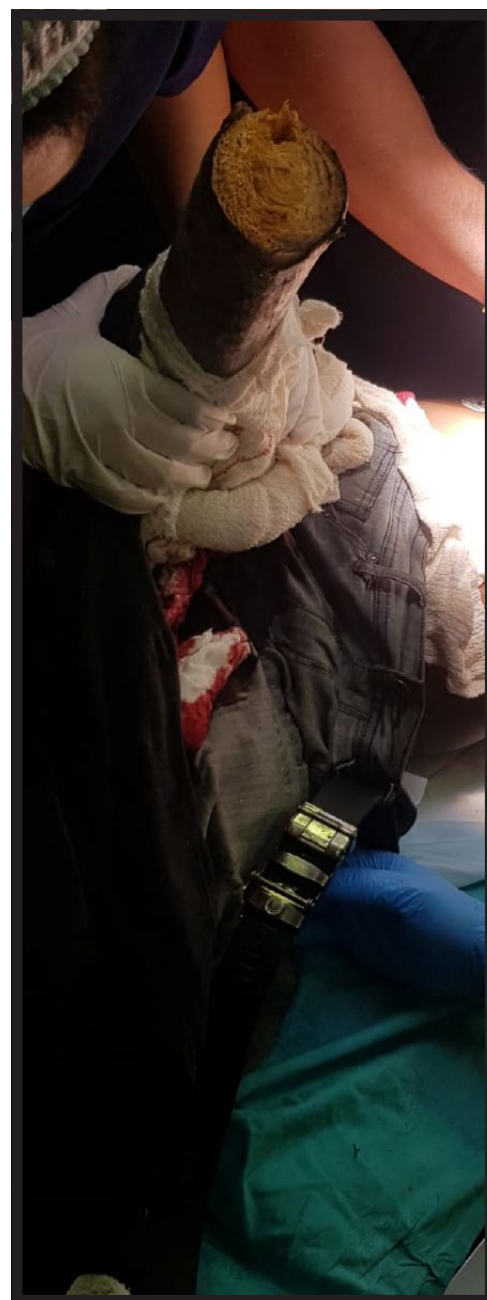
**Extrication Step 3**  
After removal of backrest second cut on tree trunk on the floorboard area





**Principles of patient packaging**

- Must be able to monitor injury or illness
- Assess CSMs, Vital Signs, Mental Status, access O2, IV and ECG
- Communication with patient must be maintained
- We did secure patient from movement along linear and horizontal and vertical axis
- We did protect patient from soft tissue injuries secondary to transport
- We did pad patient in all directions to avoid movement with transport
- Create a sleek, compact package for movement of patient to spine board, ambulance stretcher and ambulance



# Working on Fire holds 20th Anniversary Fire Symposium in Kruger National Park, South Africa



*At the start of the Symposium, guests were warmly welcomed with a Working on Fire marching parade*

**W**orking on Fire held its 20th Anniversary Fire Symposium in the Kruger National Park in Mpumalanga in partnership with the Nelson Mandela University George Campus and SANParks. The event was held at the Skukuza Conference Centre from 8 to 10 November 2023, with a field day with aerial and ground firefighting operations on 9 November 2023.

On the start of the Symposium, guests were warmly welcomed with a WoF marching parade, some chanting and singing of the National Anthem.

**Session 1: Working on Fire-Kishugu Joint Venture and its integrated fire management approach to fire management**  
Working on Fire stakeholder manager, Linton Rensburg, welcomed all dignitaries, delegates, speakers and exhibitors followed by a video from Working on Fire on climate change and wildfires in 2023. Senior general manager for conservation and area integrity for Kruger National Park, Danie Pienaar, provided an interesting presentation, overviewing the Kruger National Park's integrated fire management approach and welcomed all.

The keynote address and official opening was presented by Trevor Abrahams, managing director of Working on Fire (WoF), who discussed climate change and wildfires: the rapidly changing game, policy and operational responses. Abrahams also shared the current South African fire trends and the key challenges including mitigating the impact of climate change, resourcing wildland fire management and collaboration such as legislative jurisdictions and international collaboration. He outlined the policy and operational imperatives such as



► collaboration ie intra state, inter state, Africa and the incident command system (ICS) and training standards, the refocusing of wildland fire management, preventative and preparedness policies and actions, education, fuel load management, invasive alien eradication, integrating science and integrated fire management for example, using early detection.

Roland Hendriks, chief director at the National Disaster Management Centre (NDMC), discussed South Africa's preparedness for future wildfires on behalf of Dr Elias Sithole. The presentation included a legislative overview, the current review of the Disaster Management system in South Africa, improvement of fire services capacity, a policy shift from suppression to mitigation and adaptation, data collection and further research to inform risk reduction. In his conclusion, Hendriks stated the following: "1. Improvement of fire services capacity: The NDMC to support PDMCs to increase building capacity within fire services, with respect to training and equipping municipal firefighters to respond to wildfires, particularly on the WUI.

2. A policy shift from suppression to mitigation and adaptation: The White Paper on Fire Services underscores a policy shift from fire suppression to mitigation, prevention and preparation. The approach is both logical and pragmatic and more likely to reduce the negative socio-economic and ecological effects of fire than the current, largely one-dimensional, focus on fire suppression.

3. Integrated fire management strategies: The 'business as usual' approach to the wildfire

problem in South Africa will not solve the fire problem.

4. Governance and legislation: There should be alignment and harmonisation between respective legislation to ensure an integrated legal framework for managing wildfire risk in the country. All spheres of Government must ensure that there is a dedicated budget to ensure that their responsibilities towards the NVFFA are implemented.

5. Reduction of fire risk: The National Fire Safety and Prevention Strategy implores municipalities to incorporate fire-risk reduction into the planning of new developments, aims to prevent and combat veld, forest and mountain fires throughout the Republic. The NVFFA also provides for prevention and mitigation of veldfire risk through the establishment of variety of institutions, methods and practices, in line with the provision of Section 20 of Disaster Management Act 57, of 2002.

6. Data collection and further research to inform risk reduction: Post-disaster assessment findings should be integrated into risk assessments as a measure of actual impacts. Standard impact reporting procedures for municipalities and government departments should be developed and implemented.

7. Adopt a learning approach: Residents can reduce the risk to their homes by addressing the risks surrounding their properties, creating defensible spaces around structures and managing or modifying vegetation to reduce fire intensity and spotting. It is critical to inform a learning and adaptive approach in this

regard to support more effective veldfire risk management.

### Session 2: Climate change and the new "normal" in integrated fire, chaired by Prof Edith Vries

Kevin Rae, chief forecaster: Disaster Risk Reduction (DRR) at the South African Weather Service (SAWS) discussed comparative performance and daily behavioural characteristics of the Canadian Fire Weather Index (FWI) and the Lowveld Fire Danger Index (FDI) models in a South African domain. Rae provided an update on the collaboration between SAWS and the CSIR on the calibration and evaluation of an improved National Fire Danger Rating System (NFDRS), which builds on research previously conducted by the CSIR, improving from daily and municipality level forecasts to high resolution, hourly outlooks and include fire weather observations, fire moisture codes and fire behaviour indices. He also shared the latest research project ie the Government of Flanders

Kim Connors, executive director of the Canadian Interagency Forest Fire Centre (CIFFC) Canada, shared the lessons learnt from Canada's unprecedented fire season in his topic 'strengthening global collaborations in wildland fire management'. Connors said that the CIFFC was created in 1982 and facilitates cooperation between federal, provincial and territorial wildland fire management agencies. It also support member agencies through coordination of firefighting resources within Canada and internationally. He said that the cumulative area burned in Canada in 2023, estimated from satellite

hotspots, is 18 466 108 hectares, adding that they received international support from 12 countries. Connors also shared the reasoning behind its collaboration and coordination, adding that no single agency can do it alone, that Canada has a long history of wildfire as it has nine percent of world's forest and that the global wildfire issue worsening. He also shared what makes International cooperation a success such as commitment, saying it is more than the sharing of ideas and best practices, commitment to negotiating terms ie give and take, exchange standards and commitment to cultural learning and acceptance.

Dr Danie Boshoff, senior lecturer of Geography at the North-West University discussed the role of climate on large fire events in the Western Cape. Dr Boshoff said that teleconnections like El Niño Southern Oscillation (ENSO) and the Southern Annular Mode (SAM) exert significant influence on fire seasons, which can lead to an uptick in large fires during

dry and warm periods. He added that future predictions include rising temperatures and less precipitation in the southwestern regions of Africa, increase in heatwave frequency and high-fire danger days. The research methods included CapeNature that generated a map displaying the geographical distribution of the 15 largest fire incidents in the Western Cape spanning from 1927 to 2021, precipitation anomalies were visualised using the IRI Climate Lab interactive tools adding that the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA5 climate reanalysis datasets were used to plot and display ENSO (SOI) and SAM phases via the KMNI Climate Explorer. Sharing the results he said that in the Western Cape, more than half of the largest fire events occurred in the years following the El Niño phase of ENSO, positive phase of SAM (66 percent) and below normal seasonal precipitation anomalies (66 percent) and that only 27 percent of the large fire events

occurred after La Niña phases of ENSO, negative phases of SAM and below normal seasonal precipitation anomalies.

Dr Christo Marais shared a presentation on climate change and the "new normal" for integrated fire management, looking at the potential contribution of integrated wildland fire management to ecosystem-based adaptation to climate change. Dr Marais discussed the key driver of climate change ie the increased CO2 levels in the air and its implications on the environment and biomes. He also discussed the implications of changing vegetation cover during wildland fires and the effect of vegetation cover on the water retention abilities of soils. Dr Marais shared the impact of bush encroachment on livelihoods and soil carbon, the considerations for managing the developed zone wildland interface and the need for land-use based risk assessments. He discussed the fuel reduction



*The Symposium saw numerous international and local speakers sharing their research and knowledge*





Most of South Africa's fire protection associations were represented

► measures undertaken by fire protection associations and prescribed burning. "There is a need to create a pool of well-trained practitioners through a knowledge co-creation process", concluded Dr Marais.

**Session 3: Empowering Africa to become IFM compliant chaired by Dr Christo Marais**

Haritiana Zacharie, head researcher, Land, Landscape and Development Research Lab (LLandDev) in Madagascar, discussed using remote sensing data in supporting wildfire early warning in East-Africa and shared experiences from the Regional Eastern Africa Fire Monitoring Resource Centre (REA-FMRC). Zacharie discussed designing of early warning systems for East Africa, the calibration of the Fire Weather Index, the calibration of the Fine Fuel Moisture Code (FFMC) and said that early warning

has been done operationally for three years in Madagascar; communication to stakeholders and the public via social media, WhatsApp and the geoportal and to the local community via radio. Identification of high prone fires areas and implementation of 65km agricultural fuelbreaks, mainly around Ankarafantsika National Park in northern Madagascar between 2021 and 2022; established in generally open landscapes dominated by grassy savanna to limit the spread of fires and create an additional 615ha of farmland for crop production to limit further slash-and-burn activities in the national park and so further reduce the potential for future fire ignitions. Data for all Eastern African countries are available from January 2019 to today.

Dr Paolo Fiorucci of the Centro Internazionale di Monitoraggio Ambientale (CIMA) Research

Foundation in Italy discussed enabling integrated fire management strategies through integrating a comprehensive smart modelling chain into a wildfire early warning system. He said that the CIMA Foundation is supporting the establishment of a Network of Centres of Excellence in Africa and that the project was initiated and supported by the UNDRR Africa Office and the Government of Italy. Its aim is to promote and facilitate enhanced engagement and collaboration between various stakeholders NGOs, academia, practitioners and scientists. Dr Fiorucci also described the Rischio Incendi e Coordinamento (RISICO), which is a Forest Fire Danger Rating System, which started in 2000 for the Liguria region in Italy and expanded nationwide in 2003 and adopted by the Italian Civil Protection Department and is operational in several countries

including Bolivia, Ethiopia, Ukraine, Moldova, Georgia, Armenia, etc and recently implemented in Ethiopia. He said that RISICO, together with Propagator, a fire propagation model for operational use during emergencies forms a unified tool to support Integrated Fire Management strategies.

Dr Ida Herdieckerho of the University of Eastern Finland, looked at taming the flames using participatory GIS as a tool to support community-based fire management in land use planning in the Southern Highlands of Tanzania. Dr Herdieckerho said that uncontrolled fires wreak havoc on societies, economies and the natural environment with most fires caused by agricultural activities. The community-based fire management (CBFIM)

programme actively engages local communities in the development and implementation of strategies designed to prevent, control or utilise fires in ways that will improve their livelihood, health and security. They used participatory GIS (PGIS), a process in which community members contribute their own experiences, relationships, information and ideas about a place to the creation of a map to use as Village Fire Management Plans (VFMP) looking at problem- tree analysis, mapping fire incidences of the past five years, fire risk maps and fire break maps.

Prof John Kessy of the College of Forestry, Wildlife and Tourism at Sokoine University of Agriculture in Tanzania, shared the development of community level action plans for the enforcement of the national

integrated fire management (IFM) policies, including processes and lessons from Tanzania. Although IFM supportive policies and legal frameworks are in place, they are not translated to actions at community level. "Village level action plans and by laws are in place and implemented by each village to varying degrees of success and fire incidences have been reduced and fire suppression is effectively done. However, monitoring and evaluation needs to be developed and the Southern Tanzania model needs to be scaled to other parts of the country. The Government, through the Private Forestry Programme (PFP2), has developed standardised action plans and by-law templates to facilitate the scaling up of the model to other parts of the country", said Prof Kessy.

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Kim Connors of CIFFC in Canada and Working on Fire's Trevor Abrahams handed paintings over to each other's organisations in thanks



► Tiaan Pool, head of department at Nelson Mandela University, George Campus, discussed the implementation of integrated fire management practices on the Southern Highlands of Tanzania. Pool shared the statistics including the plantation ownership, number of fires detected, the hectares of commercial forests lost and the total value of timber lost. "The methodology used included understanding the land use and broader leadership culture in regions, analysing of existing use of fire such as crop preparation, honey hunting, grazing, hunting, brick making and charcoal making,

knowledge of fires and use of fires (design short courses), understand the legal system/ authority, train instructors and extension officers, establish village fire committees and proto-teams. We also looked at the bylaws (including the issue of burning permits, use of the FDI, fire investigation, creation of a Fire Fund, planned burning). We ensured an understanding of the weather (FDI), initiated distribution of the FDI warnings, tools and equipment, risk analyses and fire management plans including training to all villages but established a pilot village that could serve as blue print for others", said Pool.

Navashni Govender, senior manager: Conservation Management for the Kruger National Park, shared the integrated fire management plan for the Kruger National Park. She included the lessons learnt from seven decades of fire management, the fire policies from 1926 onwards, the Park's rainfall, geology and fire frequency, its long-term fire experiments and the influence of fire regimes. Govender said that semi-arid savanna systems are robust ecosystems that have developed with and exist due to variable fire regimes with the greatest difference being: no fire versus annual fires (50 years). "The Kruger National Park as a complex ecosystem in which we need to balance human values and needs with ecosystem processes with limited resources. This can be achieved through strategic adaptive management, cooperation and partnerships ie WoF and through education, awareness and training", said Govender.

#### Day two

Day two of the event started off with several presentations in the morning followed by a game drive and field day, which showcased both aerial and ground firefighting resources using integrated fire management as a key tool in managing biodiversity and wildfire risks. This followed by a boma braai, South African style.

The morning presentations started with Nicolene Oliver of AON, discussing business continuity plans and processes followed by a presentation from Wimpie van Onselen and Quinton Taylor of Dräger South Africa, who shared Dräger's solutions for wildland firefighting.

Fred Ludick, operations manager at Risk Management Resources, provided an overview of their operational areas and resources including fire detection, aerial operations and integration, which was followed by a presentation by Tony Marcos, CEO of the Kishugu Training Academy, discussing wildfire training for both management and firefighters and what the future holds in context of climate change and global warming.

Coenie Lamprecht, CEO of Kishugu Fleet, provided an overview of fleet management as a key component of integrated fire management and the application of advanced technology in vehicles and drivers, which was followed by a presentation by Emile Grobbelaar, CEO of Kishugu Aviation, looking at aerial firefighting as a critical component in early initial attack and global best practices.

#### Session 4: Prevention the key to mitigating the increased incidence of wildland fires, chaired by Tiaan Pool

Nokuphila Buthelezi of the eThekweni Metropolitan Municipality in KwaZulu-Natal discussed using fire to manage grasslands in eThekweni Metropolitan Municipality. She provided background on Durban's eco system, which is situated in the Maputaland-Pondoland-Albany Biodiversity Hotspot. Buthelezi shared the threats to open spaces (grasslands). She said that large-scale restoration programmes were established to manage the grasslands and she detailed the Fire and Invasive Species Control (FISC) Programme. The management interventions include invasive alien plants

(IAP) control and the application of prescribed burns, providing sustainable green jobs and skills to previously marginalised communities, protect critical biodiversity areas within the municipality (KZN SS), promote supply of ecosystem services to the municipality and its citizens and develop and mentor small medium and micro enterprises (SMMEs). The methods used included a combination of manual, chemical and mechanical control and the use of fire through prescribed burns.

Dave Dobson of Umziki Forestry Consulting discussed how changes in the ecology of fires as a result of climate change will affect management decision making. Dobson detailed the changes in the southern African fire regime, adding that it will become generally drier. He shared a causal loop diagram that provided a visual picture of how the different elements in our fire ecology system fit together, interact and change over time. The causal loop diagram included temperature, wind, rainfall and CO<sub>2</sub> seeding. Projections and actual data show that in the summer rainfall region, the climate will be warmer and more erratic. Overall the amount of rain remains the same but with heavier rainfall events, there will be more lightning and more hail. In the winter rainfall region the climate is expected to become drier. He also discussed the option of plantation slash ie to mulch or burn. "Are we prepared for future wild fires?" asked Dobson.

Dr Pieter Olivier, director at MAP Scientific Services (MAPSS) looked at harnessing the power of wildfire data to enable integrated fire management for safer landscapes. Dr Olivier said that a data-driven approach

to wildfire management can mitigate the impact of wildfires on people, the economy and the environment. He provided an overview of the Moses Kotane Local Municipality in the North-West Province of South Africa, which is 571 900 hectares with a population of 242 554 people. In the 2023 fire season they had 2 753 fires, which burnt 198 610 hectares; 35 percent of the total area. The solution was to determine the number of fires and where they are happening by using a model combining AI and remote sensing detect and map every fire that takes place in South Africa every day. Then provide the tools to utilise this data easily to report, plan and respond to wildfire risk.

Gaston Hedwigino Tahintsoa, researcher at REAFMRC in Madagascar, discussed analysing interactions between landscape structure and fire-resilience at watershed level, sharing their experiences from Ankarafantsika National Park in Madagascar. Tahintsoa said that five percent of the planet's plant and animal species are found in Madagascar, with an endemism rate approaching 80 percent. There are several biodiversity hotspots due to the recurrence of wildfires. "Limits of fire suppression-centred strategies have become evident, especially in underdeveloped and technologically less equipped countries such as Madagascar due to limited budget allocation, resulting in the concept of fire resilience becoming increasingly relevant", said Tahintsoa. He shared statistics and said that large wildfires often occur in homogeneous open (grassland) and closed (forest) landscapes, with cropland less impacted by fires. A mosaic landscape reduces ►





► the fuel load and helps to control and fight fires. He also discussed the effect of the weather and topography to fire behaviour, saying that these results offer new options for fire and land managers in designing and implementing more fire resilient landscapes.

Louise Wessels, manager at the Greater Overberg Fire Protection Association (GoFPA) provided delegates with an overview of the Seventh International Wildland Fire Conference, which was held in Porto in May 2023, sharing the benchmark exercise with some new perspectives and take-home messages. She shared some of the take home messages from the presentations and added that fire protection associations are a key component to integrated fire management as they encapsulate landscape management. “The proposed governance model calls for fire-risk assessment and determining how communities and cultures perceive risk and accept fire impacts. That perception drives risk management and promotes clear communication. Stakeholder engagement is crucial for governance and

having stakeholders involved in decision-making helps with monitoring and aiming at continuous improvement, measuring progress and planning for shorter periods under context of uncertainty”, said Wessels. The take home messages included building relationships, focussing on local communities –risk identification, their competencies, communication and ownership of their risks, perceived risk and education, pre-fire knowledge, post fire interventions have to be identified and planned for, informed budgeting and investing in fire protection associations.

Nothando Ngobeni, fire researcher at Working on Fire, discussed the effect of the time of day on factors that affect fire intensity in Southern African savanna. Ngobeni described savanna characteristics and manipulating fire intensity as a management tool. She said that the aim was to see the effect of burning at different times of the day on fire intensity, to investigate whether fuel characteristics or weather conditions affected fire intensity among fires that were set at different times of day and to

see whether fire occurring in the day is more intense than fire occurring early morning and late afternoon. “Substantial variation in fire intensity was obtained by just changing the time of day that we burned, however, we can still use time of day as a management tool”, said Ngobeni. She detailed the methodology and shared the results, adding that the results suggest that specific weather conditions, fire behaviour and fuel characteristics are directly affected by the time of day at which fires are applied. “The results of our study are consistent with findings of Ndri et al (2018) where we found that relative humidity was the only variable that varied between all three days.”

Angel Goldsmith from Kings College London’s Geography Department and Faculty of Social Science and Public Policy in the UK presented on the prophylactic land-use for wildfire risk reduction at South Africa’s wildland-urban interface, a Knysna case study. He discussed the various settlement forms ie informal settlements, township settlements and formal settlements in the WUI and detailed the risk perception, practicalities and challenges of each. “There is no evidence of coordination between the land management department and fire service department/agencies with respect to projected land developments. There is an urgent need to educate the public about the importance of prophylactic land-use and vegetation management in the WUI. Land desperation combined with housing pressure and uncontrolled development strains practicalities of prophylactic land-use in South Africa’s WUI areas”, said Goldsmith.



### Session 5: Better collaboration of global, continental and local level, chaired by Trevor Abrahams

Johann Savage Breytenbach of the Free State Umbrella Fire Protection Association discussed implementing the Incident Command Systems (ICS) as a critical component of response and management of wildfire emergencies in the Free State. Breytenbach said that the Free State Province surface area is 129 464km<sup>2</sup>, population density: 22,8/km<sup>2</sup> ( second lowest in the country), the biomes are 86,7 percent grassland, 6,47 percent Nama Karoo and 6,49 percent savanna. The land use is 91,9 percent agricultural, cultivated land is 32 000km<sup>2</sup> (24,7 percent total surface area) and grazing/natural veld 87 000km<sup>2</sup> (67,2 percent total surface area). In the 2019 to 2023 fire seasons they had 53 378 fire incidents, 2 308 694 hectares burnt of which 19 were large fire incidents, which burnt 401 429,64 hectares. He shared the challenges faced by the fire services and disaster

management. He detailed the Free State Provincial Wildfire Management Framework (FSPWMF) and its practical implementation of integrated wildfire management using ICS principles and structure and the incident specific virtual EOC/JOC, the incident management teams and firefighting resources. “ICS is the critical component enabling effective wildfire incident response”, said Breytenbach.

Dr Abigail Croker of the Centre for Environmental Policy, Imperial College London in the UK discussed community-based fire management (CBFiM) in East and Southern African savanna-protected areas and shared a review of the published evidence. Dr Croker said, “There is a pyric transition: decline in community fire use and total area burnt X increase in agrarian political resistance fires and large wildfire events resulting in a wildfire paradox in need of a bottom up CBFiM. She detailed the savanna burning

emissions abatement schemes and discussed the climate, biology and fire; topographic environment and fire and society, culture and fire assumptions. “Traditional fire management versus market-based approach? The SBEA projects under the Clean Development Mechanism present a market opportunity with ‘real, measurable and long-term benefits related to the mitigation of climate change’”, said Dr Croker.

Each session was followed by a panel discussion allowing the audience a chance for questions and comments.

Working on Fire’s Trevor Abrahams thanked everyone for their presentations, attendance and sharing of information during the event’s closure, where after Kim Connors of CIFFC in Canada and Trevor handed paintings over to each other’s organisations in thanks.

[See next page for photo gallery →](#)







# Command Corner: Indicators of extreme fire behaviour

By Chief Tim Murphy, US Forest Service Africa  
Disaster Management Technical Advisor



Chief Tim Murphy

It is critical for firefighters to maintain situational awareness of live and dead fuel moisture conditions as well as predicted and current weather conditions. As fire behaviour changes, it is critical to act decisively to the changing situation. Discuss the following indicators of extreme fire behaviour:

- Relative humidity less than 15 percent
- Fine fuel moisture less than five percent
- Transition from surface to crown fire.
- Smouldering fires that exist in the early part of the day are beginning to burn very actively as the day progresses.
- Approaching thunderheads with dark clouds beneath.
- Presence of dust devils indicating an unstable atmosphere.
- Increased spotting
- Sudden calm high clouds moving fast in direction different from surface wind

**Fire whirls video:**

[Video link](#) 🔥

# 14<sup>th</sup> Fire Management Symposium South Africa



NELSON MANDELA  
UNIVERSITY



The Forestry Department of the Nelson Mandela University (NMU) will be hosting its 14th Fire Management Symposium on 6 to 8 November 2024 at the Halliwell Country Inn, Karkloof region, KwaZulu-Natal Province, South Africa. The theme will be 'Educating and training for effective wildfire management'.

## Background and purpose

Globally, effective wildfire management is impeded by a lack of integration between research results, technological development and efforts by fire managers. In the end, all role-players on the wildfire stage strive to prevent, suppress and protect the environment, human wellbeing and assets against wildfire.

This event aims to integrate the efforts of natural resource managers, engineers, fire managers, educators/trainers and scientists. Through an integrated approach, different role-players will be sensitised about each other's realities, successes and failures.

Understanding the needs and gaps within organisations involved in wildfire management will open up new avenues that will support the fire management effort.

You are therefore invited to join fire managers and authorities

from different disciplines and land uses ie nature conservation, agriculture, disaster management, forestry, local authorities, etc, for a range of informative presentations, and exciting networking opportunities.

## Focus

In addition to technical developments, new inventions and improved fire management methods, education and training to implement these cannot stay behind. This raises the following questions: "What training/education do we need, who will provide this, who need to be educated and trained and how do we pay for it?"

## Programme

The 2024 Fire Management Symposium promises to be a special event. Not only because of the unique setting of the venue in the heart of the scenic Karkloof region but because of the conglomeration of top-rated international and local fire management specialists and service providers who will share their expertise in a very practical and applied manner.

On the first day of this event the focus will be on the education and training needs that exist in our industries. Organisations will express their needs and providers will explain how these needs can be addressed.

The second day of the event, hosted by The KwaZulu-Natal Fire Protection Association (KZNFPFA), will provide opportunities to visit fire management activities, scenery and cultural attractions and view some of the latest technology, tools and equipment.

A gala dinner on the evening of the second day will allow networking opportunities for guests. On the final day of the event Fire management topics dealing with protection, prevention and suppression will make up the programme.

## In general

This event presents opportunities to people from different entities, management levels and parts of South Africa. Due to the capacity of the venue only 200 delegates can be accommodated for the event. Cost to attend the whole event (including lunches, field day and gala dinner), amounts to ± R3 500-00pp. The venue host will spoil us with local cuisine with live music.

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# JOIFF Guideline on emergency response to incidents involving vehicles powered by alternative fuels, including hybrid vehicles



The International Organisation for  
Industrial Emergency Services Management

JOIFF Guideline on  
Emergency Response to incidents involving  
vehicles powered by  
Alternative Fuels  
(including Hybrid vehicles)

November 2020

**J**OIFF, the International Organisation for Industrial Emergency Services Management, through their shared learning committee, compiled this Guideline to assist emergency services in responding to incidents involving vehicles powered by alternative fuels including hybrid vehicles. JOIFF gave special permission to Fire and Rescue International to publish the Guideline in order to assist our emergency services in dealing with the challenges they face during these incidents.

Due to the length of the Guideline, it will be published in three sections, this being the second section of the guideline.

## Section 5: Operational response for fires/incidents involving electrically powered vehicles

Responders to a fire/incident involving a hybrid or an electrically powered vehicle should be wearing full appropriate personal protective equipment (PPE) including fully charged breathing apparatus.

The following steps are recommended:

### 5.1 Identify the vehicle

On arrival at the scene, the type or make of vehicle may not be immediately obvious due to the many new types and makes of vehicle now being used. This may increase the time before responders can begin the actions required to mitigate the incident.

To assist in vehicle identification, a comprehensive list of vehicles is available from the European New Car Assessment Programme (NCAP) who, in association with International Association of Fire and Rescue Services (CTIF), have produced a free app called "Euro Rescue". This app, which can be downloaded from Google play and the Apple App Store, contains 'Rescue Sheets and Emergency Response Guides', which can be installed on a mobile device.

### 5.2 Immobilise the vehicle

Vehicles with electric motors as

part of their propulsion, provide no audible indicators and when stationary, it may not be obvious that the engine is still running and it will move as soon as the accelerator is depressed. Electric vehicles should be chocked as soon as possible to prevent any inadvertent movement of the vehicle. Although a good preventative measure, chocking alone may not prevent movement if the drive system is engaged. If possible, setting the emergency brake and placing the vehicle in park can add additional protection against inadvertent movement.

### 5.3 Disable the vehicle

The status of the vehicle can be determined by viewing the dash display, the position of the key in the ignition and/or the power button to see if the indicator light is lit. If the vehicle is "on", turn the key to the "off" position.

Some electric vehicles operate by a proximity key. If the proximity key is within range of the vehicle - usually less than five metres (16 feet) - the vehicle is powered "on" by a button on the dash. Turn the vehicle "off" by pressing this button. Then, place the proximity key beyond the range of the vehicle, typically greater than five metres (16 feet), in a safe location in the event that it may be required to restart the vehicle if the fire is quickly extinguished.



### 5.4 Extrication considerations

When the vehicle is immobilised and disabled, vehicle extrication can commence. Always stabilise the vehicle before beginning extrication.

A damaged high voltage battery may emit corrosive, toxic and flammable fumes so responders should use ventilation techniques to protect the occupants of the vehicle and prevent the build-up of toxic and flammable vapours in the passenger compartment. If toxic and/or flammable vapours are present in the vicinity of persons trapped, it may be considered necessary to supply them with a means of breathing protection, preferably a self-contained breathing apparatus or an external supply of air with a full face mask with a suitable filter. In this condition, responders with charged attack lines should be in close proximity to take whatever steps may be necessary to protect personnel.

Caution must be taken when using conventional extrication techniques as they may cause damage to the vehicle's battery fuel cells. Manufacturers usually route fuel pipes and high voltage cabling in electric vehicles in protected areas under the vehicle or within the vehicle panels.

Responders should constantly monitor for indications that a damaged battery may be overheating, eg sparking, emitting smoke, or making bubbling sounds, and deal with any fires due to these conditions.

### 5.5 Extinguishment considerations

#### 5.5.1 Li-ion batteries

When a li-ion battery ignites, it can produce large emissions of what appears to be white smoke, which will be the first sign of a thermal runaway event. The smoke is likely to be flammable and toxic and it may ignite at any time. If a fire develops and visible flames appear, a decision should be

made as to whether to attempt to suppress the fire or to concentrate on protecting exposures and surrounding materials and allow the battery to burn until it self-extinguishes. If the fire is allowed to burn itself out the chemicals released will be consumed by the fire and the remains of the battery may contain considerable amounts of Lithium hydroxide, a corrosive liquid.

As a fire progresses, gasses venting from cells can exceed 600°C (1 110°F) and can include violent eruptions as some types of cells will hold the pressure in the casing for some time and when the outer casing fails it will vent the gasses. If the gasses collect in an inside space, eg vehicle passenger compartment, luggage hold, boat/ship, warehouse, garage, energy storage system etc a powerful gas explosion may occur with battery debris. If there is high risk of explosion, evacuation to a safe distance may need to be necessary. ►



*“To assist in vehicle identification, a comprehensive list of vehicles is available from the European New Car Assessment Programme (NCAP) who, in association with International Association of Fire and Rescue Services (CTIF), have produced a free app called “Euro Rescue”.”*

- ▶ Vented electrolyte is flammable and may ignite on contact with an ignition source such as an open flame, spark, a sufficiently heated surface or contact with cells undergoing a thermal runaway reaction.

Always take into account that ignition of vented electrolyte in an enclosed space may lead to an explosion.

In an explosive atmosphere, if the jet fumes are already ignited, they should be allowed to burn if it is safely possible to do so, whilst ventilating and cooling continually until the temperature of the battery cools down.

The process of failure of a li-ion battery results in some very toxic chemicals and they can mix with fire water to penetrate the ground and go into the ground water which can lead to environmental damage.

#### 5.5.2 Extinguishment

Extinguishing a fire in a li-ion battery can take a prolonged period. If water is the chosen medium to deal with the incident, it is likely that it will be necessary to establish a sustained water supply through a hydrant or

static water source. A high voltage battery fire could require 12 000 litres (2 600 gallons) of water or more, depending on the size and location of the battery.

Because high voltage batteries are in protective cases, it is difficult to get any extinguishing agent directly onto the burning cells. Cells have limited ability to transfer heat to their nearest neighbours so if possible, the aim should be to remove heat from between the cells. The application of large volumes of water may cool the high voltage battery sufficiently to prevent the propagation of fire to adjacent cells and continuous application of water on a localised area of the battery for a prolonged period of time before moving to another section of the battery, may provide for quicker extinguishment.

To properly cool a high voltage battery pack and prevent/reduce the risk of re-ignition, continue to apply water even after visible flame is no longer present.

Lack of barriers between cells in some batteries can result in a deep seated and inaccessible fire, which in practice, would require the use of more water to cool and contain the fire. The use of copious amounts of water potentially introduces the unwanted effect of shorting out other cells, thereby perpetuating the fire.

Periodically check for signs of heat using a thermal imaging camera.

#### 5.5.3 Extinguishing media

Water or other standard agents such as dry powder, CO<sub>2</sub> and Foam can be used to fight fires

in electric vehicles when the batteries are not involved. When the batteries are involved, dry powder, CO<sub>2</sub> and foam may extinguish the flames but they will not stop thermal runaway so water by itself or with salt and/or certain additives may be the most suitable medium for dealing with fires involving li-ion batteries.

Under certain conditions, isolating the damaged vehicle by immersing it in a container filled with water at the incident location or a spot nearby where it causes no blockage or risk may have to be considered.

Immersing a battery in water only cools it down and so may stop a thermal runaway but because the water does nothing to reduce the amount of energy in the battery, this energy may restart a thermal runaway in an unstable pack.

Salt water drains the battery of its energy, as the energy is used for electrolysis of the salt (NaCl), so using salt water is the easiest way to take the energy out of a pack so that reignition can no longer take place. Salt water does not have to be sea water, it can be water mixed with road or kitchen salt.

#### Note

At the time of writing this Guideline, reports were received of ongoing testing by vehicle manufacturers on whether the use of a water/additive cutting lance will be of use in firefighting operations to permit quick access to the cell/module via the floor pan of the vehicle from the passenger compartment, in order to extinguish and prevent thermal runaway. It has been reported that during testing there has not been any electrical

conductivity recorded to the user of the lance.

#### 5.5.4 High voltage hazards

During all phases of any response to incidents including during the overhaul phase, responders should avoid contact with any high voltage component until they are neutralised. Until the battery has been deenergised, responders should not attempt to cut, breach or remove the high voltage battery or any high voltage component nor drive prying tools into any area that may house or cover high voltage components as this could pose risk from severe shock/injury/electrocution.

Under normal conditions of use, high voltage batteries, cables and the electric motor do not pose an electrical hazard as reputable manufacturers incorporate safeguards to help ensure that a high voltage battery and cables are kept safe and secure during expected conditions of use. However, if the outer enclosure, pod/module enclosures and/or safety circuits of a high voltage battery and cables have been damaged, a significant risk of high voltage that can cause injury or death is likely to exist and appropriate precautions should be taken against exposure to the risk.

Responders should avoid contact with any electrical cables and components that have high voltage warning labels.

Warning labels may have been burnt by the fire or been rendered illegible in other ways, so standard operating procedures (SOPs)/standard operating guidelines (SOGs) should be that responders should not touch

any electric drive or drive system component nor should they attempt to breach (open up) a high voltage battery or its casing for any reason.

Batteries in some electric vehicles are located relatively inaccessibly between the vehicle's under carriage and passenger compartment where it can be difficult, if not impossible, to access to apply water.

Cutting holes in the vehicle floor to expose the battery can be dangerous as the fire may spread quicker, causing damage and beginning the thermal runaway process in more of the cells. Also, there is the extreme hazard of cutting into areas of the vehicle where high voltage still remains.

Many high voltage components are directly accessible from the engine compartment. Responders should not attempt to force entry into the engine compartment nor should they attempt to spike or cut the bonnet (hood) or wheel guards (fenders) with a piercing nozzle, cutting tool or prying tool due to the risk of severe shock or electrocution. If responders are unable to gain access to the engine compartment/electric motor, fire suppression tactics should be employed until the fire is completely extinguished.

#### 5.5.5 Using portable fire extinguishers on fires involving Lithium batteries

Lithium batteries can be primary or secondary (see Clause 3.2). Fires involving primary Lithium batteries are classified as Class D Metal Fires. Portable fire extinguishers designed to deal with incipient Class D fires in primary cells contain specialist

dry powders that fuse the powder to form a crust, which excludes the oxygen from the surface of the molten metal. A specific agent is added to the powder to prevent it sinking into the surface of the molten metal.

Using a portable fire extinguisher on a fire involving li-ion batteries can be extremely hazardous. Li-ion batteries do not contain any metallic Lithium therefore a Class D extinguishing medium will not be successful in extinguishing a fire in these batteries. Standard dry powders are not effective on fires involving li-ion batteries and foam or CO<sub>2</sub> will have limited cooling effect, will not stop thermal runaway and may cause a chemical reaction. Some manufacturers of portable fire extinguishers recommend extinguishment by using a portable fire extinguisher with water mist mixed with certain chemical additives but applying small amounts of water on such fires can result in release of toxic and flammable gasses.

If the fire is a small fire, it may be advisable to let the fire burn out by itself. The recommended method of dealing with a fire involving a small battery, is to submerge the battery in water.

Portable fire extinguishers are designed to be used primarily on incipient fires and they have limited capacity. Anyone expected to use a portable fire extinguisher on a fire involving batteries should be given suitable training as such fires can escalate very quickly and can burn at high temperatures.

If attempts to extinguish a fire involving a battery with a portable fire extinguisher



- ▶ have not been successful, personnel should rapidly distance themselves from the scene.

### 5.6 Overhaul (post fire/incident) operations

Responders dealing with overhaul should wear full appropriate personal protective equipment (PPE) including fully charged breathing apparatus due to the dangers of re-ignition and/or release of gasses and particles that contain toxins and carcinogens during the overhaul process.

Following firefighting operations, responders should verify that the vehicle has been properly immobilised and disabled and if these tasks have not already been completed, the appropriate steps should be taken to do so.

Li-ion batteries involved in a fire could reignite after extinguishment anywhere from several hours to a day or more following extinguishment. Re-ignition of fire in a high voltage battery pack is typically accompanied by "whooshing" or "popping" sounds, followed by off-gassing of white smoke and/or electrical arcs/sparks which causes the re-ignition and responders should carefully observe the high voltage battery compartment to ensure it is not emitting smoke, sparking or making bubbling sounds.

Be aware that if the battery pack contains cylindrical cells and it has been opened due to the incident, cells that will catch fire may be ejected for some distance, causing personal injury to responders and secondary fires.

Using a thermal imaging camera to assess the temperature of the

battery will assist in determining if it is producing heat.

After a fire, a battery module or system may contain intact cells that still have DC voltage, meaning there is a persisting electrical hazard due to stranded energy. Responders should not try to discharge batteries; this is a specialised task and under appropriate conditions, specialists can test, handle and remove the battery's energised li-ion cells and/or drain the amount of energy trapped in the unstable battery. Contact the manufacturer's representative for assistance in de-energising a high voltage battery and to determine the final disposition and storage of the vehicle.

### 5.7 Removal of a vehicle with an unstable battery pack

When it is considered that the overhaul is completed and the vehicle is in a condition to be removed from the incident site, the vehicle should be recovered and transported to a safe location where it can be monitored until it is verified that the battery has been de-energised. Some manufacturers recommend de-energising damaged batteries by submerging them for several days in a saltwater bath until the bubbles stop, indicating that the chemical reaction inside the battery has ceased. Transporting a damaged electrically powered vehicle with an unstable battery pack immersed in water will result in an unstable recovery vehicle so it may have to remain at the scene of the incident for several days.

Removal should be on a flatbed truck and if this is not possible, it should be towed with its drive

wheels off the ground; for some vehicles, towing with drive wheels on the ground poses a risk of fire in the high voltage electrical system.

If at the scene of the incident, the battery pack does not actually burn and if it is safe to do so, it may be possible to transport the container in a dry state under a fire blanket to a suitable location where the container can be filled with water and the battery pack submerged as soon as it has been unloaded.

The National Fire Protection Association (USA) recommends that vehicles containing a damaged or burned li-ion battery should not be stored in or within 15 metres (50 feet) of a structure or other vehicle until the battery can be discharged.

### Next edition

The next edition will feature Section 6, which deals with Hydrogen powered vehicles, Section 7, which features gaseous fuel vehicles, Section 8, which focusses on training, insurance and media; Section 9 (Appendix 1), which shares useful sources of information and Section 10 (Appendix 2), which focusses on ISO 17840.

### Visit the JOIFF web site for information on membership:

[www.joiff.com](http://www.joiff.com) or watch their introductory video: <https://www.youtube.com/watch?v=lkzpYzrSHf4>.

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# LASTFire: Phase 1 - tank testing

By Dr Niall Ramsden



The LASTFire Project, a group of international storage tank operators working together to develop best practice guidance in storage tank Fire Hazard Management is committed to minimising environmental consequences of their activities.

As part of ongoing efforts to evaluate the effectiveness of Fluorine free firefighting foams, the LASTFire group has carried out a comprehensive series of small and large scale tests, starting in 2016. It is important to review all results, from all phases of this work, holistically to get a full understanding of the results and achievements.

The test programme is undoubtedly the most comprehensive large scale, end user driven and managed practical work related to storage tanks undertaken for more than 30 years.

In addition, LASTFire is working with other industry groups to form a true understanding of the environmental effects of the new generation foams.

As the first of a series of articles, this article describes the procedures and results of the first phase of the test programme, which began in 2017 and involved more than 100 fires up to tank fires with 11m diameter.

It is important to recognise that whilst fire performance is obviously a major factor in selecting and using firefighting foam, other issues including physical properties, guaranteed shelf life, compatibility with other firefighting agents and suitability for use with materials of construction of systems must also be taken into account.

Overall the intention of this phase was also to address the following areas:

- Developing a snapshot of current capability of a representative selection of the new generation foams, particularly to assess if they can be considered absolute 'drop in' replacements with

equivalent performance capability and without the need for system or application equipment modifications.

- Forming an overall view on whether or not modifications to current practices of foam application are required with new foam formulations to achieve acceptable performance or if more efficient usage of resources can be gained with different application techniques.
- Revalidation of the LASTFire test protocol
- Validating the accepted strategy for large bund fires using a 'section by section' approach.
- Investigation into application rate versus extinguishing time.

The first series of tests was carried out in Hungary at the facilities of FER, a LASTFire member that operates the emergency response capability at the MOL Szazhalombatta Refinery. These tests consisted of standard LASTFire tests and small (~4.5m) and large (~18m) simulated bund spill fires. Application rates consistent with LASTFire testing were generally used so typically represented approximately 50 to 60 percent of typical NFPA 11 design application rates. The lower test rate being used to provide a 'safety factor' in real situations.

Different devices using small scale non-aspirating, aspirating, medium expansion and CAF application were used. The three main



- ▶ LASTFire nozzles were designed to provide similar foam quality as would be achieved with typical proprietary equipment but on the small scale so as to represent real situations as closely as possible.



Test site used in Phase 1



Tank used for Phase 1 of the LASTFIRE Fluorine Free Foam Testing

The second series of tests was carried out at the facilities of GESIP, Vernon, France. These tests involved application of foam using standard rates as per NFPA 11 guidance with proprietary

equipment including aspirated and non-aspirated monitors, a fixed system pourer and a compressor driven CAF unit onto a 100m (~11m diameter) 10m high tank fire. Sufficient fuel depth was used to ensure that foam applied forcefully from ground level equipment did not penetrate through to the water substrate.

**Small bund testing**

The small bund test pan was of metal construction with dimensions 2,15m x 2,15m. This size of bund allowed the current LASTFire nozzles to be used for foam application at the same application rate as the LASTFire test itself. This also allowed for comparison between the LASTFire tests and the small bund tests. The depth of the test pan was designed such that a freeboard of approximately 200mm of hot metal remained above the fuel level. The fuel layer depth was defined to ensure that foam application did not penetrate through it. Obstacles were installed in the test pan to evaluate the capability of foam to travel round objects of different configurations that would generally be found in real large-scale bunds such as pipes and their supports etc. Two obstacles were used in the small bund tests, one with the opening facing towards foam application and the other obstacle with the opening facing away.



**Large bund testing**

The large bund test pan was of metal construction with dimensions 4.3 m x 4.3 m (four times the area of the small bund test pan). The obstacles used in the small bund testing were also used in the large bund testing. However, for the large bund test, four obstacles were used, all with opening facing in different directions, see Figure 4.4 below.

It is recognised that most bund walls are not of metal construction, so these tests probably represented worst case situations but nevertheless there will always be pipework and other metal structures within the bund that the foam will have to seal against



**Tank testing**

The test tank used had a surface area of 100 m<sup>2</sup> and was approximately 10m in height. Only one application rate for each nozzle was used during these tests as follows:

- Application rate of 1 000lpm (10lpm/m) for aspirated and non-aspirated nozzle (referencing NFPA 11 rates, including a factor to allow for drop out from monitor application)
- Application rate of 400lpm (4lpm/m) for system nozzle (referencing NFPA 11 rates)
- Application rate of 325lpm (3,25lpm/m) for CAF

Some of the key conclusions from this work are highlighted below:

- The LASTFire test still continues to be relevant to all foam types for assessing the performance of foams using different application devices. However, the scoring system will be reviewed to give even greater emphasis on extinguishment and additional nozzle types will be developed.
- Although there is a tendency to be generic in comments regarding foam types, realistically this is a too simplistic approach because there are good and bad example for every foam type. What is critical is to assess actual performance related to specific applications, whatever the generic type of foam.

- None of the new generation foams should be considered as a straightforward drop in replacement for any current foam concentrate being used. Even if appropriate fire performance can be shown for the specific hazard it is still necessary to check that the concentrate is compatible with the proportioning systems and other system components.
- The tank fire tests showed that new generation foams can be used at NFPA 11 application rates for these limited sized tanks but additional work is required to validate for larger incidents, including work on optimising foam properties and application techniques.
- An optimum combination of the application system and the foam is key to efficient foam application as some foams clearly work better with certain nozzle types. It is not necessarily the case that a foam that works better with one nozzle will work better than another foam with a different nozzle. It was also apparent, from visual observation of the foam stream that given the same atmospheric conditions and equipment, the dropout rate for monitor application also varied with foam concentrate. This was considered to be due partly to different expansion and stability achieved with the different foams through the same equipment but highlights the need to optimise equipment and foam concentrate combination.
- Standards should take into account the combined effect of foam concentrate, finished foam properties, application rate and application.

LASTFire continue to carry out further research in various events, which run annually; in February 2024 we are running a Firefighting Foam Workshop which will be held in Centro Jovellanos, Spain. This workshop is directed and wholly presented by independent specialists with extensive international knowledge and experience without any bias towards certain policies or products.

In April 2024, LASTFire are also hosting a Foam Summit in Vernon, France. This event will bring together specialists from all aspects of the transition process and is relevant to those with overall responsibility for the process.

For more information or to book please contact [info@lastfire.org](mailto:info@lastfire.org) or visit [Lastfire - News](#). ▲



# First responders and social media ethics

by Jo Nieman



Recent dramatic and traumatising events have once again highlighted the questionable practice of sharing images of victims or gruesome injuries or fatalities and accident scenes on social media by emergency responders in South Africa and has become a serious ethical concern and these actions raise important issues such as violations of privacy and dignity, emotional distress, desensitisation and sensationalism by private emergency services or volunteer groups to promote their organisations.

A major concern is the violation of victims' privacy and dignity.

These individuals and their families may not wish for images of their loved ones in such a vulnerable state to be made public. Additionally, the posting of these images can cause emotional distress to both victims' families and the public who may see them and there is also the question of children's images being posted without a responsible adult's consent.

Psychologically these images can desensitize individuals to the reality of these situations, leading to a lack of empathy and understanding of their impact on individuals and communities. These images can also be used for sensationalism and can be used to gain likes, views, or

followers on social media, which can lead to a distorted view of the incident.

The posting of images on social media can also have a negative impact on the next of kin of the victims. In some cases, family members may see these images on social media before they have been officially notified by authorities, causing them emotional distress and trauma.

It is crucial for emergency responders to be mindful of these potential negative impacts when posting images on social media. They should be sensitive to the needs of the next of kin and avoid posting images that may be disturbing

or traumatising to them. They should also be aware of official protocols and should not share any information with the public before notifying the next of kin and authorities.

A suggested solution to addressing these ethical concerns is to have a dedicated media liaison officer handle such social media. This officer would be responsible for managing the agency's social media accounts and would be the point of contact for the media and the public. They should have a thorough understanding of their organisation's policies and procedures regarding sharing information on social media, as well as any relevant laws or regulations. They should also be trained in public crisis communication and should be able to handle sensitive and potentially traumatic information in a professional and compassionate manner.

The Health Professions Council of South Africa (HPCSA) is a regulatory body that oversees the conduct of medical practitioners in South Africa. If a medical practitioner is found to have posted sensitive images on social media, the HPCSA has the authority to take disciplinary action against them. The severity of the penalty will depend on the nature and circumstances of the incident.

The HPCSA's Code of Conduct for medical practitioners states that they must respect the privacy of their patients and must not disclose any confidential information about them without their consent. Posting sensitive images of patients on social

media would be in violation of this code and could result in disciplinary action.

This could include a formal warning, conditions of practice, suspension or striking off of the practitioner's registration and criminal investigation if the practitioner has broken the law.

It is imperative that regulatory bodies hold private emergency services, such as ambulance and security companies, accountable for the actions of their staff and implement strict financial penalties for any violations of patient privacy on social media.

These penalties could include substantial fines for both individual staff members and the company, as well as covering any legal fees incurred. It is also necessary for these companies to consider the detrimental impact on their reputation that such violations may cause.

Furthermore, both public and private emergency services must establish rigorous policies regarding the sharing of sensitive information on social media and provide regular training to all staff members on these policies. This will help to ensure that staff members are fully aware of the importance of protecting patient privacy and the potential consequences of any violations.

It is the duty of all citizens to actively report and speak out against the unethical practice of posting sensitive images on social media.

By implementing clear policies, providing regular awareness training and fostering a culture of accountability, we can work towards ensuring that emergency service members understand the importance of respecting the privacy and dignity of vulnerable patients. ▲





# Stellenbosch University fire engineers explore risks for humans and dwellings

By Jorisna Bonthuys



*Following the ignition of a shack, the engulfing of the entire dwelling in flames or "flashover", happens extremely fast. Flashover occurs when it goes from a localised fire to everything burning in the room and normally happens when the smoke reaches around 600 degrees Celsius.*

According to statistics, up to 115 people die annually due to fires in Cape Town's informal settlements. The city is known as the "fire capital" of South Africa due to its high number of fire-related incidents, recorded with its effective data collection systems. Other cities could potentially have higher death rates but often have incomplete fire incident data.

Fires leave countless people homeless in the metropolitan area. Annually, 4 500 dwellings are damaged or destroyed, shattering many communities.

And this destruction is not limited to Cape Town.

The recent fire incident in Johannesburg, in which at least 77 people died and hundreds were left homeless, clearly illustrates the sweeping extent of fire risk across the country.

Apart from the lives lost, the more than 40 000 fires reported in South Africa annually translate to roughly R4 billion in financial losses. Last year, the South African Government reportedly added another R2 billion to this fire tag after the South African parliament building in Cape Town was gutted in January.

"As a society, we need to understand how fires spread if we are to prevent them from becoming total disasters," says Prof Richard Walls, who heads up the fire engineering team, FireSUN, at Stellenbosch University. "Urban fires can be incredibly dangerous, particularly in informal settlements."

Established in Stellenbosch University's Department of Civil Engineering, FireSUN is training the next generation of fire safety experts. In 2019, the university launched its master's and PhD degree programmes in fire safety engineering, the first academic

offerings of their kind on the African continent. In 2024, an online Master's degree is being launched to train engineers across South Africa and the developing world.

## A place to dwell

In 2022, South Africa had more than 2 700 informal settlements, most of them located on land that is unsuitable for property development and prone to housing emergencies. Across the country, an estimated 7,6 million people live in primary dwellings and the so-called "backyard dwellings" behind them in informal settlements.

These settlements are dense, unplanned and ramshackle, typically housing low-income communities. Most of the homes are make-shift enclosures ("shacks") cobbled together from corrugated-iron and plastic sheets, as well as wooden materials. And their numbers are growing.

"Whether we like it or not, we live in flammable cities with high densities and many flammable buildings," Walls says. "The consequences of urban fires are often devastating but preventable."

All sorts of things can start fires in informal settlements, from open flames and dodgy electrical setups to a variety of other causes. Climate change has also made fire-prone weather conditions twice as likely in Cape Town today than in the late 1970s. A recent attribution study showed that the extreme, destructive wildfire of April 2021 on the slopes of Devil's Peak has become around 90% more likely in a warmer world.



*Access to communal water supply is essential for fighting fires in informal settlements. Picture taken in Imizamo Yetho in Hout Bay in 2017, when more than 3 000 homes were gutted.*



*Fires move very quickly through areas where homes are situated close together.*

In holistic fire management, Walls says, both understanding fire behaviour (the physics of why things burn) and fire safety engineering (design approaches that improve fire safety) are crucial.

## Engineering for change

Before joining Stellenbosch University as a lecturer and researcher, Walls worked as a structural engineer designing industrial, petrochemical and commercial buildings. "I became involved with fire safety engineering by accident during my PhD studies at

Stellenbosch University," he says. "At the time, my study leader [in civil engineering] suggested I focus on fire safety and steel structures. I soon realised there is a massive gap in this field and became interested in the teaching aspects of it."

But Walls' connection with communities affected by fire started much earlier. As an 18-year-old student, he volunteered at a soup kitchen in Braamfontein, Johannesburg, called Paballo Ya Batho and at Children of Fire, a charity working with young fire survivors.





Illustration showing how informal dwellings catch fire from flame impingement (left), branding/spotting (middle) and radiation (right).

► These experiences made him aware of the hardship caused by the legacy of fires for both individuals and households. Today, he wants to bring fire-related risks and safety issues to the fore to help make our cities and informal settlements more fire resistant.

In 2020, Walls was awarded the NSTF-South32 national prize for emerging researcher of the year and in 2021, the IStructE Excellence in Structural Engineering Education Award. This international award

celebrates innovative and effective teaching techniques to improve student learning at a tertiary level.

Walls serves on the research advisory board for the National Fire Protection Association, a US-based non-profit organisation and is a member of the South African Bureau of Standards (SABS) working group for fire engineering codes.

He works closely with fire services to develop solutions for

local fire challenges, embraces innovative approaches to engineering education and engages on the global stage to help find practical solutions for complex fire problems.

Moreover, Walls was instrumental in developing the Fire safety engineering guideline for informal settlements, a project co-funded by Lloyd's Register Foundation, for the Western Cape Department of Human Settlements. These guidelines were formulated in a collaborative effort between FireSUN, the Research Alliance for Disaster and Risk Reduction (RADAR), the Milneron Fire Brigade, and Kindling (a US-based non-profit fire safety organisation). This is the world's first set of technical guidelines on fire safety in informal settlements, supported by a series of online training videos.

**The science of fire**

South Africa has one of the highest incidences of fire-related casualties in the world. Daily, at least 30 fires are recorded in informal settlements across the country, accounting for at least



There is no one-size-fits-all method, material or gadget to make informal settlements and backyard dwellings fire safe. However, understanding how fire behaves, how homes ignite, what makes an area a high risk one and what happens during a fire incident will help make communities safer.

Photo by Justin Sullivan

one person's death per day. Yet, little is known about such fires' triggers, incidence and impacts. With this in mind, FireSUN has done experiments to determine how fires spread and how fast this happens in informal settlements. Over the years, Walls and his students have burned down more than 70 life-sized dwellings.

Some of this research was done in 2018 as part of the world's largest informal settlement fire experiment to date. Twenty full-scale homes were set up, fitted with instruments and burnt down to try to understand the spread of fires between dwellings in informal settlements. The results of this research, conducted with collaborators from the University of Edinburgh (Scotland) and the Breede Valley Fire Department, were published in Fire Technology.

Even with a relatively mild wind speed of 15 to 25km/h, common in Cape Town's metropolitan area and adjacent regions, the fire spread through the mock settlement within five minutes.

The research team knew that the burning dwellings would act as tinderboxes, igniting nearby structures. Following the ignition of a shack, the engulfing of the entire dwelling in flames, or "flashover", happens extremely fast. The experiment revealed the sheer speed at which this happens: Temperatures reached more than 1 000 degrees Celsius within a minute and downwind neighbouring structures ignited less than a minute after that.

According to Walls, fire behaviour in informal settlements differs significantly from that in formal-building fires. When a fire rips



A variety of unregulated construction methods and materials are used to build informal dwellings

Photo by Justin Sullivan

through an informal settlement, this is analogous to a wildfire with a continuous firefront moving through a natural area. While the individual dwellings still follow the distinct phases of enclosure fires, they collapse faster than formal structures.

Many factors influence the spread of fire, including the building materials used.

At FireSUN, researchers consider how different construction materials behave when burning. For instance, Dr Antonio Cicione and others have investigated the effect of fire on cladding materials (specifically timber versus steel cladding, often used in informal settlements). An important finding of this study was that separation is critical: A gap of roughly three to five metres between dwellings is necessary to prevent the spread of fire between them. Cicione, an adjunct senior lecturer in structural fire engineering at Stellenbosch University, is also the founder of CFS Engineering Consultants and the fire safety engineering lead at Kindling Wildfires and the urban edge.

Fire is an important ecological driver in many ecosystems, including the Greater Cape Floristic Region. Natural vegetation in this biodiversity hotspot must burn at certain intervals in order to rejuvenate. But uncontrolled wildfires aka veld fires pose a risk to lives, livelihoods, property and the natural environment.

This fact was underlined by the recent devastating wildfire that incinerated many of the coastal settlements on Maui, Hawaii, in August 2023. It was declared the deadliest US wildfire in more than a century and destroyed much of the historic town of Lāhainā. At least 114 people died and hundreds more are unaccounted for. Hawaii is increasingly under siege from natural disasters and what is escalating most is wildfire.

Locally, the 2017 Knysna fire disaster also provided urban planners, researchers and decision-makers alike with much food for thought. Several points of ignition and severe climatic and meteorological conditions, including storm winds of more than 90km/h, led to this event,



► considered South Africa's largest ever wildfire disaster in terms of structural and economic losses. "With close to 1 000 homes destroyed and billions of Rands worth of damage, it is important that we understand this and similar incidents," Walls says. "Firebrands (small flaming particles) jumped distances of up to 2,8 km."

Under the leadership of postdoctoral researcher Dr Natalia Flores Quiroz, Stellenbosch University researchers investigated the Knysna event in detail, including how the fire spread and the influence of vegetation and weather. Their findings were published in the journal, *International Journal of Disaster Risk Reduction*.

According to the researchers, regional drought and other weather conditions impacted fire suppression, with high wind speeds and critically low humidity contributing to the ignition of several secondary fires. Flames jumped distances of up to 2,8km under these conditions. The fire was also fuelled by old stands of invasive alien species, as well as combustible materials like thatch and timber, which made some homes more susceptible to fire damage than others.

### Understanding large-scale disasters

Global estimates indicate that up to 300 000 people die annually because of fires. This means that fire kills up to five times more people than natural disasters do.

Over 95 percent of reported fire deaths and burn injuries occur in low- and middle-income

countries in the Middle East, Asia and Africa, said Dr Danielle Antonellis, an extraordinary staff member of FireSUN, in a recent webinar. Antonellis, also the founder and executive director of Kindling, received the International Fire Safety Woman of the Year Award in 2022 from Women in Fire Safety.

Urban fires disproportionately impact people, property and livelihoods in vulnerable communities, she said. In informal settlements, fire investigations are often not conducted and close to 40% of all fire causes are labelled as "undetermined".

Often, a lack of evidence at the scene hinders fire investigations. With this fact in mind, Flores Quiroz developed a framework for fire investigations in informal settlements, which was published in the *Fire Safety Journal*. Although the data for this study was collected in Cape Town, South Africa, the lessons learnt can be applied elsewhere across the globe.

Fire risks are also acute in high-density refugee camps, including the Cox's Bazar camp in Bangladesh. In March 2023, an estimated 15 000 Rohingya refugees from Myanmar were left without shelter after a fire tore through Camp 11 of the larger camp, destroying 2 800 shelters, as well as several mosques and learning centres. The Cox's Bazar camp houses almost one million people overall, making it the world's largest and most populated refugee camp.

Flores Quiroz and Walls have been involved in international collaborations to understand fire risks in Camp 11 to better inform

humanitarian efforts. After working closely with the Migrant Offshore Aid Station and fire engineers from the University of Maryland, they provided guidance to disaster agencies working in the camp, including the UN Refugee Agency.

Together, the researchers reconstructed the most recent disaster incident, from the fire, all the way through to the response and evacuation, based on firefighters' statements, media reports and satellite imagery. Their findings were published in the journal, *Fire Technology Journal*.

This is the first detailed documentation of such a large-scale refugee camp incident in the academic literature and is especially relevant at a time when global displacement is on the rise.

### Forensic investigations

It is necessary to understand large-scale fire incidents and have data on grounds of which evidence-based interventions can be developed. "We cannot prevent these fires from happening altogether but we can prepare for them and reduce potential impacts," Walls emphasises.

Fire investigations are often complex due to factors like material type, weather and fuel loads, which should all be considered. In recent years, FireSUN's team has participated in several high-profile studies.

Cicione and Antonellis were involved in investigations of the devastating 2020 Beirut explosion, which ripped through the city, destroying 70 000 homes and leaving 200 people dead and over 300 000 homeless. Forensic investigations of the

event have cast doubt on the widespread claims that Syrian welders' shoddy work is to blame for the fire that triggered the blast. In 2023, Forensic Architecture released an analysis of the port explosion based on leaked documents and Kindling fire dynamics simulations. The report showed that the detonation was likely caused by vast quantities of ammonium nitrate that were improperly stored in a warehouse in the port and that the work of the Syrian welders was unlikely the cause of ignition. The modelling for this research, analysed by Forensic Architecture, was done on Stellenbosch University's computers.

In recent years, fires such as that at the South African parliament in 2022 and at the Charlotte Maxeke Hospital in Johannesburg in 2021 have reportedly caused the South African government and parastatals direct losses of between R5 billion and R10 billion. Sections of the hospital, one of the biggest in the country, were closed for months, causing a disruption to the provision of healthcare services in Gauteng. FireSUN researchers subsequently examined the effect of these fires on critical infrastructure and have been involved in reconstructing the hospital.

### What is more flammable, peanuts or wood?

FireSUN's researchers are exploring several fire-related topics, such as the effect of fire on 3D-printed concrete and fire safety challenges related to "green" buildings. "In our unit, we've burned all sorts of weird and wonderful things," Walls says. These investigations range

from testing how flammable train seats are to determining the fire risks involved in using eco-bricks and storing peanuts in warehouses.

Anene Oguaka focused his recent PhD dissertation on the fire behaviour of bulk African foodstuffs, with the purpose of advancing food safety. In 2023, based on this experimental research, he published an article, co-authored by Walls and Flores Quiroz, in the journal *Process Safety and Environmental Protection*.

The researchers considered the fire hazard of food grains being stored in warehouses. Oven-dried cowpeas, lentils, millet, soybeans, flax seed (linseed), peanuts and sunflower and sesame seeds were subjected to different heat fluxes.

Their findings show some grains, including peanuts, to have a higher fire hazard than even wood pellets. "This means there are fire risks in large storage units which, in turn,

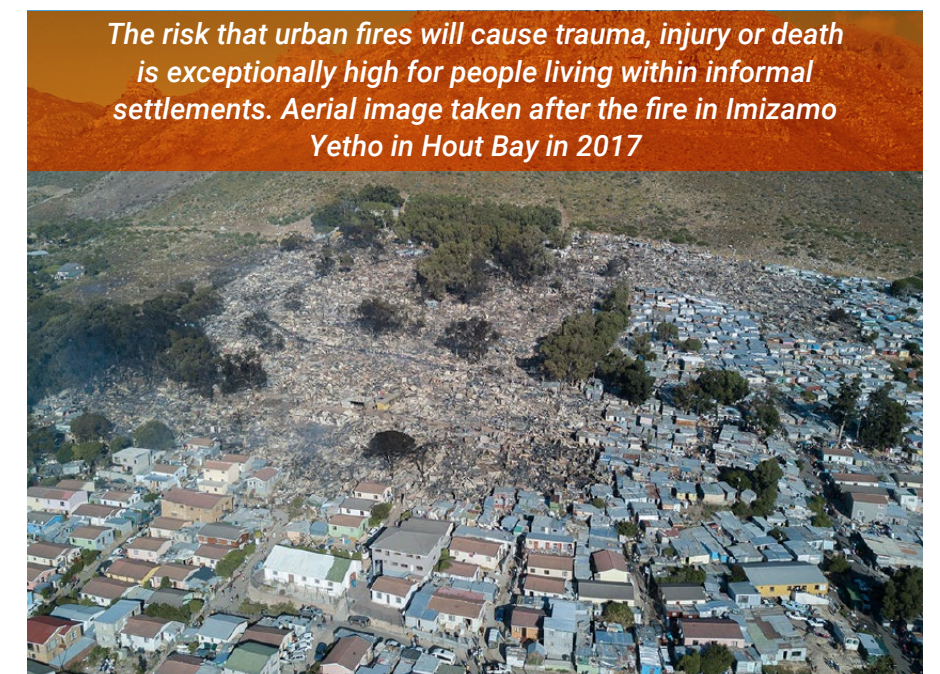
pose a risk to food security in our region," Walls explains.

### Greening the future

Materials used in the construction of buildings account for around 9% of overall energy-related carbon emissions, according to UNEP. Moreover, of the projected African building stock in 2040, an estimated 70 percent is yet to be built. With this in mind, the sector is looking at alternative materials and at decarbonising conventional materials such as cement.

However, one of the biggest barriers to sustainable construction is fire safety, Walls points out. Green intentions and fire safety do not necessarily align, rigorous testing of products and materials is necessary.

"Green buildings pose their own fire risk challenge," Walls says. "This is because many of the ecologically sustainable products on the market used to, for instance, insulate these buildings are made of biomass or waste, which is normally oil-based." ►



*The risk that urban fires will cause trauma, injury or death is exceptionally high for people living within informal settlements. Aerial image taken after the fire in Imizamo Yetho in Hout Bay in 2017*

Photo by Justin Sullivan





Aerial image of Imizamo Yetho in 2017, showing the devastation caused by the fire

Photo by Justin Sullivan

► “In many of the novel sustainable [building] products, one of the main barriers to commercialisation is fire. Overseas, 18-storey timber structures are being built in a move away from using traditional building materials with a large carbon footprint. But are these buildings posing fire risks? If so, how can we design and build them in a way that reduces that risk?”

As the demand for exposed structural timber continues to grow, it's becoming increasingly important to understand how these structures will behave in the event of a fire. This means paying close attention to the structural connections and ensuring they are designed to withstand heat and flames. FireSUN is involved in developing biomass-based fire protection systems, including coatings on timber for fire protection.

Going forward, FireSUN's researchers will consider the fire-resistance rating of

different materials, including local plywood. The unit is also investigating the use of fire-resistant timber as a construction material in high-rise buildings in high-rise buildings.

#### Solutions, not gadgets needed

Engineering solutions can help sort out many fire-related issues in the urban landscape, Walls says. “From alarms to fire trucks, a lot can be done to improve our responses to fires in informal settlements. Many issues related to fire risk and safety come back to [applying] common sense. Often, fire safety is not the focus of decision-makers who must provide people with homes, roads, electricity and water. But by providing these things, we can also improve fire safety in informal settlements.”

He added, “So, while we upgrade settlements, we can reduce risk by not using highly combustible building materials. Putting in new roads and water infrastructure can help when we need a firebreak.”

It is crucial to consider the practicalities and challenges associated with a large-scale rollout of the solutions offered. “Too often, one-size-fits-all ‘solutions’ are offered to mayors and city officials. Some of these solutions are inappropriate and not as effective as promised. Our job [at the unit] entails testing new technologies and providing decision-makers with scientifically proven facts to inform their decisions about implementing solutions. Also, sometimes the best solutions for a specific community are not highly scientific. People might, for instance, simply need buckets with sand or water sources in the right place, which can make all the difference during a fire event. We need solutions, not gadgets,” he emphasises.

“The ideal situation would be to provide people with safer, code-compliant homes but resources are limited. However, there is still a lot that authorities can do to reduce fire risks.”

Walls believes fire and structural engineers can help make towns and cities more fire resistant and ultimately help provide a roadmap for making living spaces safer for local communities.

“Understanding fire behaviour is vital,” he says. “Before you try out interventions [to improve fire safety], ask yourself if it has been tested in local communities and in a technical environment.”

In this regard, he believes FireSUN's work could pave the way to more fire-resilient infrastructure choices and investments. “We need to learn how to make buildings safer by seeing what can go wrong.” ▲

# Search and rescue: K9 an essential function of fire services

By Morné Mommsen

**T**here is a great deal of debates on the table of who oversees an emergency scene and where do dogs fit in. The opinion of the author is to go and read each available act in detail and the truth will be revealed. Because many claim they do search and rescue but actually their function is search and recovery and search and rescue is a municipal (fire department) mandate.

#### Areas where dogs can be of great assistance

Dogs are invaluable assets in search and rescue (SAR) operations due to their exceptional olfactory capabilities, agility and trainability. Here are some areas where dogs play a crucial role in search and rescue environments:

- Urban search and rescue
- Wilderness search and rescue
- Water rescue (urban flooding, river flooding)
- Narcotic or explosive detection (hazardous material)
- Special K9 services (medical detection, humanitarian missions)

Dogs within the emergency services such as disaster risk reduction/management can benefit us ie how can dogs assist us, thus, K9 support is an integral component of emergency services regarding disaster risk reduction and management.



#### Rapid response

K9 teams can quickly deploy to disaster-stricken areas, providing a rapid response that is essential for locating and rescuing survivors.

The speed of K9 teams can significantly reduce response time, increasing the chances of finding people alive in the critical initial hours following a disaster.

A trained dog can replace 30 rescuers on a single search and can search a 300 wide x 800-metre-long area in under 10 minutes if the area and condition allow for it.

Dogs just have amazing abilities and can be used in many different ways to benefit us.

#### Search efficiency

Dogs have a highly developed sense of smell, allowing them to detect scents even in challenging environments.

K9s can cover large areas quickly and efficiently, locating survivors buried under debris or trapped in hard-to-reach places that may be inaccessible to human responders.

Fire safety can also benefit by making use of a professional trained accelerant detection dog, which can pinpoint traces of unburned fuel, by making use of 300 million olfactory receptors in their noses compared to our six million. Smell is a dog's primary sense and it is 10 000 to 100 000 times more acute than ours. If we can see what a dog can smell, we will be able see the past.

#### Talking about arson detection

When fire investigators such as the fire department or the police and forensic engineers are called to the scene after an incident, it is their job to determine the origin and cause of the fire. Sometimes things just do not add up. Suspicious circumstances surrounding the physical evidence ►





Morné Mommsen and Missile

- ▶ on site can lead investigators to suspect arson and foul play.

Fire investigators take a systematic approach to understanding the science behind an incident and one of the most powerful tools available to forensic experts analysing the scene of a fire is a professionally-trained accelerant detection dog.

#### Accuracy and efficient are the name of the game

Accelerant detection dogs are trained to locate the residual scents of flammable substances such as petrol, diesel fuel, lamp oil, paint thinner and kerosene that are often used as accelerants in cases of arson. The dog will sniff out and lead fire investigators to traces of unburned fuel so that samples can be taken from precise locations and then sent to a lab for analysis. Dogs can detect extremely low volumes of fire accelerants. They can find fragments of accelerants at

fire scenes far more quickly and accurately than humans, at levels that are at and sometimes beyond the sensitivity of lab testing techniques and equipment.

A canine unit's involvement in a fire investigation brings incredible value to the file when it comes to cost and time efficiency. As experienced investigators and forensic engineers, we are certainly capable of analysing burn patterns: deep charring, low burning areas of consumption, shapes and sizes of burn areas and other factors for evaluating potential samples. We suspect there are accelerants in particular areas and then take samples for the lab to test. But a dog trained in accelerant detection brings a whole new level of accuracy and efficiency to a fire scene investigation.

#### Precise sampling plus lower lab testing cost

Using an accelerant detection dog during a fire investigation is always the most efficient and cost-effective method of identifying potential samples for lab testing. Fire accelerant lab tests cost approximately R6 000 per sample and using an accelerant detection dog can help insurance companies improve accuracy and save money on the cost of a fire investigation.

Fewer samples mean reduced cost. Physical evidence can raise a 'red flag' for forensic experts but without a dog to zero in on precise locations, investigators must rely on burn patterns alone to identify areas for sampling. That can mean more samples are required for lab testing and more testing-related costs for the insurance company. An accelerant detection dog can identify precise locations for sampling,

which means fewer samples and a reduced overall cost.

Using an accelerant detection dog is like bringing the lab right into the fire investigation scene. A dog can sweep an entire building relatively quickly, and pinpoint exact locations that need to be sampled. There is very little room for error; the dog is never wrong. In fact, standard lab tests can sometimes come back negative but because the dog sensed something, deeper tests are conducted and accelerants can be revealed.

#### Humanitarian aid

K9 teams contribute to the humanitarian aspect of disaster response by locating survivors and providing the necessary information for timely medical assistance and evacuation.

#### Special skills of dogs

Some search and rescue dogs are trained for specific tasks, such as detecting live humans, locating cadavers or identifying specific scents related to disaster response eg gas leaks or hazardous materials.

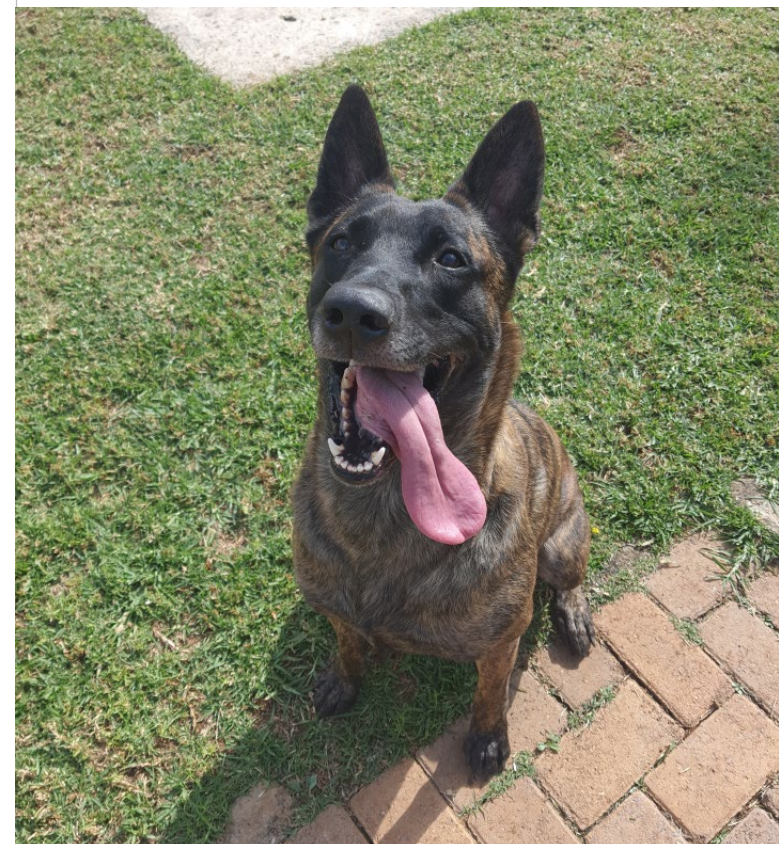
#### Training and preparedness

The presence of well-trained K9 teams enhances overall disaster preparedness and response capabilities.

Regular training exercises and drills involving K9 teams help maintain their skills and ensure effective coordination with other response units. Advance training is a strategic investment in preparedness.

#### Enhance safety for responders

"My Dog gave me the signal – get back." K9 teams can help identify safe pathways for human responders by detecting potential hazards or unstable structures.



Their ability to locate victims can prevent unnecessary risks for human responders, allowing them to focus efforts where they are most needed.

#### Community awareness

The presence of K9 search and rescue teams can raise awareness about disaster preparedness within communities, encouraging proactive measures and education on safety protocols.

#### Multi-agency collaboration

K9 search and rescue teams often work in collaboration with other response agencies, fostering a coordinated and integrated approach to disaster management.

#### Public confidence

The use of K9 teams instills confidence in the public, as these animals are often seen as heroes in disaster situations. This confidence can be vital

for maintaining calm and order during and after a disaster.

#### Post disaster recovery

K9 teams continue to be valuable during the recovery phase by helping locate missing persons, identify hazards and ensure that affected areas are safe for rebuilding.

#### Many claim they have a qualified search and rescue dog

- If your dog is not certified by an accredited IRO or FEMA entity, you merely have a mantrailing (air scent) or tracking (ground disturbance) dog.
- To have a SAR-certified dog and to be able to utilize it for SAR the dog must be a minimum of 18 months old, either be certified for live or deceased but not both and be certified on an approved rubble pile; six victims under 20 minutes without any false indication (food or toys).
- Handler must be trained in DH1-5, tracking with a HPCSA

registration and NFPA 1006 rescue qualifications.

- Additionally, handlers need a Performing Animal Protection Act (PAPA Licence).

#### In summary

K9 search and rescue is an integral component of disaster risk reduction and management, providing rapid, efficient and specialised support to enhance overall response efforts.

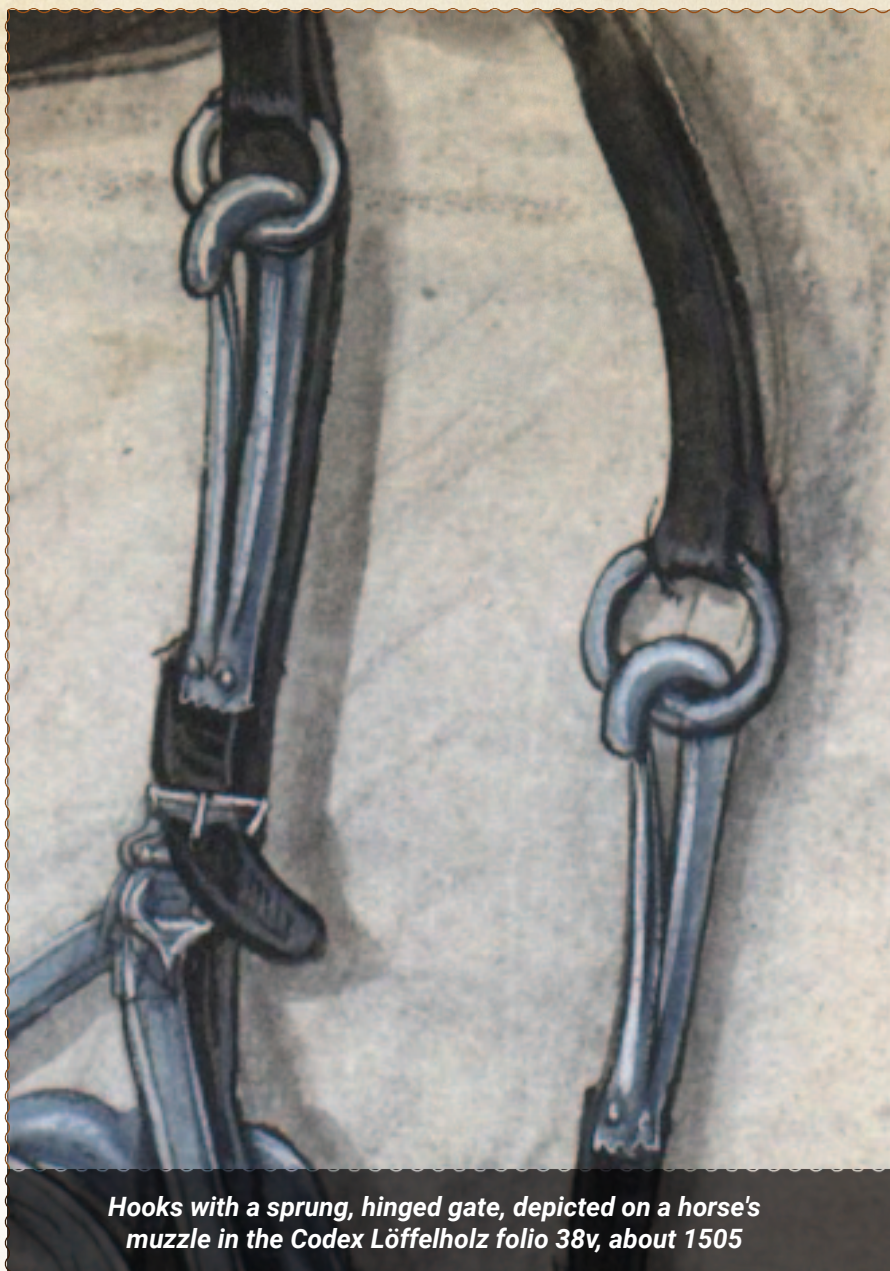
The purpose of incorporating K9 units in the emergency services, which include disaster risk reduction activities, is to boost and optimise the overall effectiveness of emergency response efforts. K9 units, consisting of specially trained dogs and handlers, are vital assets in various phases of disaster management, including preparedness, response and recovery.

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# The carabiner



Hooks with a sprung, hinged gate, depicted on a horse's muzzle in the Codex Löffelholz folio 38v, about 1505

Löffelholz von Kolberg in about 1505 in the Codex Löffelholz, in the Holy Roman Empire. These then became the clip used to hold a cavalry carbine or arquebus, with the earliest known mention of them being in 1616 by Johann Jacob von Wallhausen, in the Holy Roman Empire.

They were widely used in many European countries during the 17th Century and typically had a belt attachment and swivel joint, much like a modern luggage strap or handbag strap.

The load bearing latch was added in the 1790s, for the British cavalry design. They were used for many other purposes during the 19th Century, such as for luggage straps, mining and connecting ropes.

Some common designs first appeared during that time, including S-carabiners. Oval links, which had also appeared in 1485, also reappeared as carabiners. Screw gates and internal springs were developed.

Prussian fire brigades began to use carabiners for connecting themselves to ladders in 1847 and this became the modern gourd-shaped design by 1868.

German and Austrian mountaineers started using them during the late 19th Century, with a mention of their use from 1879 and their continued use for climbing by climbers in Saxon Switzerland. The majority used gourd shaped carabiners, which

A carabiner or karabiner often shortened to biner or to crab, colloquially known as a (climbing) clip, is a specialised type of shackle, a metal loop with a spring-loaded gate used to quickly and reversibly connect components, most notably in safety-critical systems. The word comes from the German Karabiner, short for

Karabinerhaken, German for 'carbine hook', used by a carbine rifleman or carabinier, to attach his carbine to a belt or bandolier.

The first known hooks that had a sprung, hinged gate where the spring kept it closed, characteristics expected of a carabiner, were depicted by Nuremberg patrician Martin

were created for mining or other utility purposes.

The common myth suggesting that they were invented, created, designed, made or developed by German climber Otto "Rambo" Herzog has no basis in fact. However, like many climbers before him, he did use them for some challenging climbs and some new techniques. However, it is worth noting that he did not invent them or develop any designs and he was born long after other climbers were already using them.

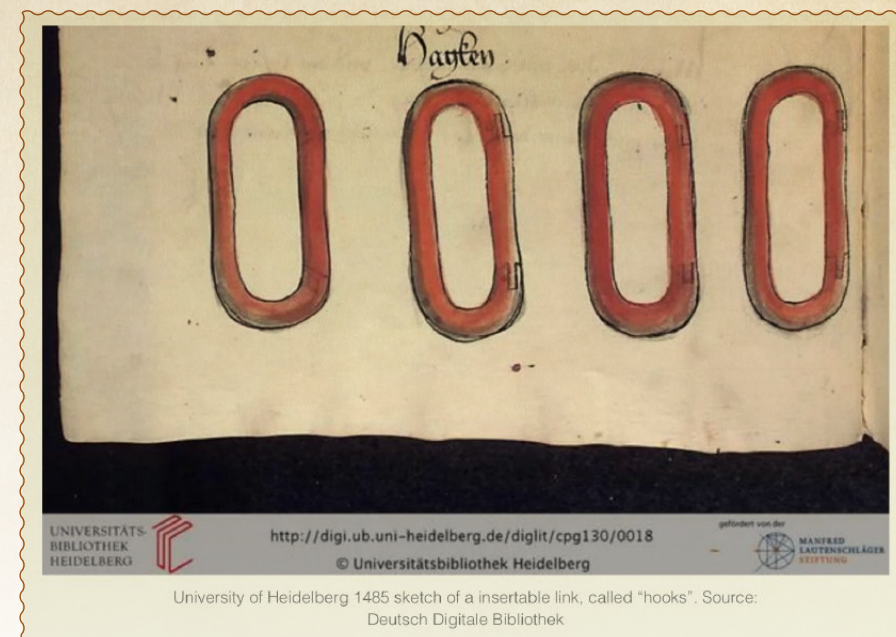
More designs were used by climbers during the 1920s, such as narrow pear shapes, mostly sold for general hardware. During the late 1920s and early 1930s, carabiners were being sold for climbing, with oval designs being popular during the 1930s.

Hardened steel carabiners appeared in the 1930s.

Prototype aluminium carabiners, the first dedicated climbing carabiners, were made first by Pierre Allain during the 1930s, which were also the first offset D-shaped carabiner. Aluminium carabiners were first sold to the military in 1941, which were the first commercial carabiners designed specifically for climbing.

Slightly-offset D-shaped carabiners were sold in the late 1940s, which became the standard offset D-shape which is now the most common in the 1950s.

Chouinard Equipment introduced the 22kN aluminium carabiner in



1968, though this strength had already been far surpassed by steel carabiners.

Wiregate carabiners were first patented in 1969 and were sold for maritime use. They were first sold for climbing in 1996.

The popular keylock, which avoids snagging, was developed around 1984-1987.

## Shape

Carabiners come in four characteristic shapes:

Oval: Symmetric, most basic and utilitarian. Smooth regular curves are gentle on equipment and allow easy repositioning of loads. Their greatest disadvantage is that a load is shared equally on both the strong solid spine and the weaker gated axis. Often preferred type for racking biners due to their symmetric shape.

D: Asymmetric shape transfers the majority of the load on to the spine, the carabiner's strongest axis.

Offset-D: Variant of a D with a greater asymmetry, allowing for a wider gate opening.

Pear/HMS: Wider and rounder shape at the top than offset-Ds and typically larger. Used for belaying with a munter hitch and with some types of belay device. ▶



Cassin steel carabiner, dated c.1950. Maker's mark "CASSIN ITALY" stamped on one side, reverse side stamped "CARICO. MINIMO ROTTURA KG.1800." Richard K. Irvin Collection



Mitteilungen des Deutschen und Osterreichischen Alpenvereins.

**Gute Abseilmethode.** Man schreibt uns: «Es ist schon so oft von Abseilmethoden geschrieben worden, daß es mich wundert, daß hierbei nicht auf ein gutes, altes und erprobtes Hilfsmittel aufmerksam gemacht wurde, das an Sicherheit und Verlässlichkeit den bisher geschilderten Methoden sicher nicht nachsteht. Es ist dies die Benutzung eines einfachen, geschmiedeten Eisenrings von etwa 8 mm Stärke und 70 mm Durchmesser, wie man solche in jeder Eisenhandlung erhalten kann. Durch diesen Ring wird das Seil zwei- bis dreimal durchgeschlungen, je nach dem Gewicht des sich Abseilenden, und es entsteht beim Abseilen durch das Durchwinden des Seiles durch und um den Ring eine vorzügliche Bremse. Man befestigt an dem Ring eine Seilschlinge oder Gurt, in den man sich bequem hineinsetzen kann. Mit der linken Hand hält man sich an dem von oben kommenden Seil,

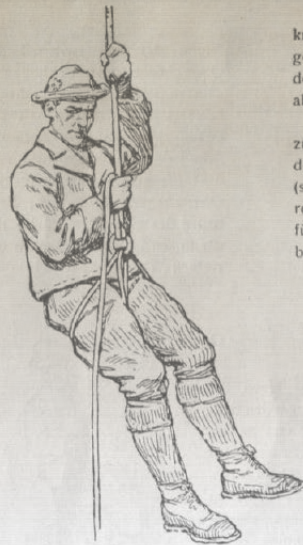
während man das freie Ende mit der rechten Hand leicht nach oben geneigt hebt. Die Bremswirkung ist absolut sicher, leicht für rasche und langsame Fahrt zu regulieren und hat den großen Vorteil, daß die ganze Seillänge ohne Verlust für Schlingen oder Befestigungen ausgenutzt werden kann, wenn das Seil, wie in Nr. 1 der „Mitteilungen“ von 1907 beschrieben, mit einem Eisenring versehen ist und durch den kleinen Ring der Seilschlinge gezogen wird. Dabei ist noch besonders hervorzuheben, daß bei dieser Abseilung das Seil geschont bleibt, da es sich an der glatten Fläche des Rings nicht abscheuert. Um nun auch die Seilschlinge wieder zu erlangen, empfehle ich, sie nicht in gewöhnlicher Weise aufzuhängen, sondern so um den Fels zu legen, daß zwei Schleifen nach unten hängen, von denen eine mit einer Rebschnur versehen ist, an welcher nach dem Einholen des Seils mit Leichtigkeit die Schlinge ebenfalls herunterzuziehen ist. Als besonders vorteilhaft würde ich sogar empfehlen, statt der Seilschlinge nur ein einfaches Seil von etwa 2 m Länge zu verwenden und beide Enden mit kleinen Eisenringen zu versehen, durch welche das Seil gezogen wird. Ein Verfangen beim Einholen dieses kleinen Seils ist nach meiner Erfahrung gänzlich ausgeschlossen.

Wilh. Schmidt-S. Offenbach a. M.»

Left: 1910 description of abseil method with strong forged "iron" rings that were readily available (these are most certainly forged steel rings). Right: Anwendung des Seiles, 1913

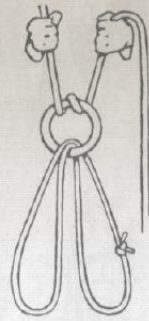
C. Mit größter Ausnützung der Seillänge.

Soll nur ausnahmsweise angewandt werden, da die Abnutzung des Seiles durch die gegenseitige Reibung und die starke Knickung an der Ringumwindung eine sehr große ist.



Aus ca. 2 m Reepschnur knüpfe einen Ring, der doppelt genommen durch einen geschmiedeten Strangring gezogen und als Sitzschlinge benützt wird.

Durch denselben Strangring ziehe zweimal das untere Ende des einfach eingehängten Seiles (s. S. 14) und halte mit der rechten Hand das nach unten führende Stück. Aufwärtsziehen bremst.



Als Selbstsicherung beim Abseilen kann eine von Sixt-Kröner konstruierte, 250 g schwere Klemmvorrichtung (in München bei Karl Biber) empfohlen werden.

► The largest HMS carabiners can also be used for rappelling with a munter hitch (the size is needed to accommodate the hitch with two strands of rope). These are usually the heaviest carabiners.

**Locking mechanisms**

Carabiners fall into three broad locking categories: non-locking, manual locking and auto locking.

**Non-locking**

Non-locking carabiners (or snap-links) have a sprung swinging gate that accepts a rope, webbing sling or other hardware. Rock climbers frequently connect two non-locking

carabiners with a short length of webbing to create a quickdraw (an extender).

**Two gate types are common**

**Solid gate:** The more traditional carabiner design, incorporating a solid metal gate with separate pin and spring mechanisms. Most modern carabiners feature a 'key-lock nose shape and gate opening, which is less prone to snagging than traditional notch and pin design. Most locking carabiners are based on the solid gate design.

**Wire gate:** A single piece of bent spring-steel wire forms

the gate. Wire gate carabiners are significantly lighter than solid gates, with roughly the same strength. Wire gates are less prone to icing up than solid gates, an advantage in Alpine mountaineering and ice climbing. The reduced gate mass makes their wire bales less prone to "gate flutter", a dangerous condition created when the carabiner suddenly impacts rock or other hard surfaces during a fall and the gate opens momentarily due to momentum and both lowers the breaking strength of the carabiner when open and potentially allows the rope

to escape. Simple wiregate designs feature a notch that can snag objects (similar to original solid gate designs) but newer designs feature a shroud or guide wires around the "hooked" part of the carabiner nose to prevent snagging.

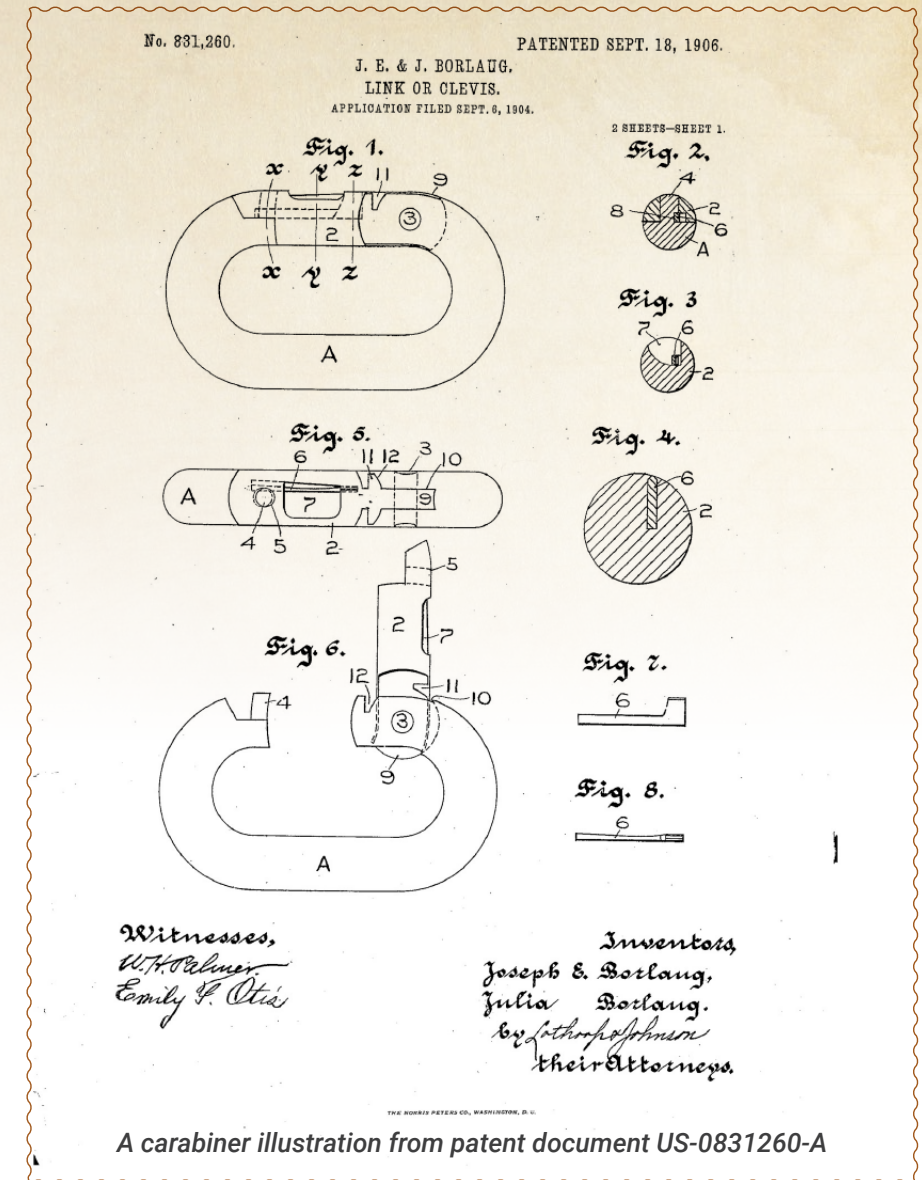
Both solid and wire gate carabiners can be either "straight gate" or "bent gate". Bent-gate carabiners are easier to clip a rope into using only one hand, and so are often used for the rope-end carabiner of quickdraws and alpine draws used for lead climbing.

**Locking**

Locking carabiners have the same general shape as non-locking carabiners but have an additional mechanism securing the gate to prevent unintentional opening during use. These mechanisms may be either threaded sleeves (screw-lock), spring-loaded sleeves (twist-lock), magnetic levers (Magnetron), other spring loaded unlocking levers or opposing double spring loaded gates (twin-gate).

**Manual**

**Screw-lock (or screw gate):** Have a threaded sleeve over the gate which must be engaged and disengaged manually. They have fewer moving parts than spring-loaded mechanisms, are less prone to malfunctioning due to contamination or component fatigue and are easier to employ one-handed. They, however, require more total effort and are more time-consuming than pull-lock, twist-lock or lever-lock.



**Auto-locking**

**Twist-lock, push-lock, twist-and-push-lock:** Have a security sleeve over the gate which must be manually rotated and/or pulled to disengage but which springs automatically to locked position upon release. They offer the advantage of re-engaging without additional user input but being spring-loaded are prone to both spring fatigue and their more complex mechanisms becoming balky from dirt, ice, or other contamination. They are also difficult to open one-

handed and with gloves on and sometimes jam, getting stuck after being tightened under load and being very hard to undo once the load is removed.

**Multiple-levers:** Having at least two spring loaded levers that are each operated with one hand.

**Magnetic:** Have two small levers with embedded magnets on either side of the locking gate, which must be pushed towards each other or pinched simultaneously to unlock. Upon release the levers pull shut



verfertigtes Musterstück habe ich nun seit drei Jahren im Gebrauch und es hat sich als vorzüglich bewährt. Die Abmessungen sind so gehalten, daß der Hammer leicht in einer Tasche untergebracht werden kann. Zug und Griff sind vorzüglich, die pyramidenförmige Spitze des Vordertheiles leistet bei Vereisung oder auf hartem Schnee gute Dienste.

Ist nun der Mauerhaken eingetrieben, so wird das Seil nicht unmittelbar durch den Ring gezogen, was ein Losfeilen beider Teilnehmer erfordern würde, sondern es wird durch einen starken Karabiner aus Stahl mit dem Ringe verbunden: Sehr geeignet hierzu sind sogenannte Feuerwehrkarabiner (Fig. 3); noch vorteilhafter wäre eine ovale

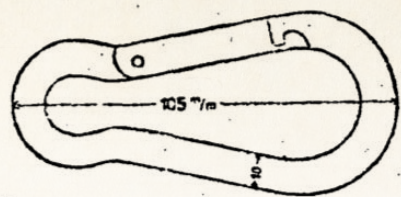


Fig. 3.

1920

► and into the locked position against a small steel insert in the carabiner nose. With the gate open the magnets in the two levers repel each other so they do not lock or stick together, which might prevent the gate from closing properly. Advantages are very easy one-handed operation, re-engaging without additional user input and few mechanical parts that can fail.

Double-gate: Have two opposed overlapping gates at the opening which prevent a rope or anchor from inadvertently passing through the gate in either direction. Gates may only be opened by pushing outwards from in between towards either direction. The carabiner can therefore be opened by splitting the gates with a fingertip, allowing easy one hand operation. The likelihood of a rope under tension to split the gates is therefore practically none. The lack of a rotating lock prevents a rolling knot, such as the

Munter hitch, from unlocking the gate and passing through, giving a measure of inherent safety in use and reducing mechanical complexity.

#### Certification: Europe

Recreation: Carabiners sold for use in climbing in Europe must conform to standard EN 12275:1998 "Mountaineering equipment – connectors – safety requirements and test methods", which governs testing protocols, rated strengths and markings. A breaking strength of at least 20kN (20 000 Newtons = approximately 2 040 kilograms of force, which is significantly more than the weight of a small car) with the gate closed and 7kN with the gate open is the standard for most climbing applications, although requirements vary depending on the activity. Carabiners are marked on the side with single letters showing their intended area of use, for example, K (via ferrata), B (base) and H (for belaying with an Italian or Munter hitch).

Industry: Carabiners used for access in commercial and industrial environments within Europe must comply with EN 362:2004 "Personal protective equipment against falls from a height. Connectors." The minimum gate closed breaking strength of a carabiner conforming with EN 362:2004 is nominally the same as that of EN 12275:1998 at around 20kN. Carabiners complying with both EN 12275:1998 and EN 362:2004 are available.

#### Certification: United States

Climbing and mountaineering: Minimum breaking strength (MBS) requirements and calculations for climbing and mountaineering carabiners in the USA are set out in ASTM Standard F1774. This standard calls for a MBS of 20kN on the long axis and 7kN on the short axis (cross load).

Rescue: Carabiners used for rescue are addressed in ASTM F1956. This document addresses two classifications of carabiners, light use and heavy-duty. Light use carabiners are the most widely used and are commonly found in applications including technical rope rescue, mountain rescue, cave rescue, cliff rescue, military, SWAT and even by some non-NFPA fire departments. ASTM requirements for light use carabiners are 27kN MBS on the long axis, 7kN on the short axis. Requirements for the lesser-used heavy duty rescue carabiners are 40kN MBS long axis, 10.68kN short axis.

Fire rescue: Minimum breaking strength requirements and

calculations for rescue carabiners used by NFPA compliant agencies are set out in National Fire Protection Association standard 1983-2012 edition Fire Service Life Safety Rope and Equipment. The standard defines two classes of rescue carabiners. Technical use rescue carabiners are required to have minimum breaking strengths of 27kN gate closed, 7kN gate open and 7kN minor axis. General use rescue carabiners are required to have minimum breaking strengths of 40kN gate closed, 11kN gate open and 11kN minor axis. Testing procedures for rescue carabiners are set out in ASTM International standard F 1956 Standard Specification of Rescue Carabiners.

Fall protection: Carabiners used for fall protection in US industry are classified as "connectors" and are required to meet Occupational Safety and Health Administration standard 1910.66 App C Personal Fall Arrest System which specifies "drop forged, pressed or formed steel or made of equivalent materials" and a minimum breaking strength of 22kN.

American National Standards Institute/American Society of Safety Engineers standard ANSI Z359.1-2007 Safety Requirement for Personal Fall Arrest Systems, Subsystems and Components, section 3.2.1.4 (for snap hooks and carabiners) is a voluntary consensus standard. This standard requires that all connectors/carabiners support a minimum breaking strength (MBS) of (22kN) and

feature an auto-locking gate mechanism which supports a minimum breaking strength (MBS) of 16kN.

#### Understand the standards

A kiloNewton is the unit used to measure carabiner strength and it can be tricky to understand in climbing scenarios as it is not a static force. Instead, it means mass times acceleration or how much weight is moving times the accelerating force of gravity. For a better real-world understanding of this measurement, you can think of 1kN as approximately 225 pounds.

The major axis is the long side of the carabiner, which runs parallel to the spine, while the minor axis is perpendicular to that. The strongest orientation is always along the major axis with the gate closed. Applying force on the minor axis is called cross-loading, a dangerous situation since this axis is much weaker.

Modern climbing biners are rated to at least 20kN along the major axis with the gate closed and 7kN along the minor axis and with the gate open. But how did companies arrive at these numbers for industry standards?

The German military found that parachuters jumping out of planes could withstand up to 12kN in a full-body harness, so this became a standard for harnesses and ropes.

When determining how strong a biner needed to be, engineers took into account the force from the rope on the biner and found that the belay side had to hold 8kN. This breaks down to 12kN on the climber's side and 8kN on the belay side, so 20kN total. The 7kN rating was determined after a series of field accidents where carabiners were failing at a rating of 6kN, so the regulation was upped to 7kN.

Sources: Climbing, Wikipedia, High Snobity ▲



Pierre Allain aluminium carabiner, unknown exact date but likely between 1950s–1960s. Maker's mark "P. ALLAIN 1600KG" stamped on one side, reverse side stamped "BREVETE S.G.D.G." (sans garantie du gouvernement), which translates from French to "Patent without government guarantee." Richard K Irvin Collection



# What's On?

## 2024

### April

#### 15 April to 19 April 2024

##### Fire Behaviour and Fuels Conference

USA, Ireland, Australia

<https://firebehaviorandfuelsconference.com/>

#### 15 to 20 April 2024

##### FDIC International

Indianapolis, US

[www.fdic.com](http://www.fdic.com)

#### 24 to 25 April 2024

##### Fire Sprinkler International 2024

Dublin, Ireland

[firesprinklerinternational.com/](http://firesprinklerinternational.com/)

### May

#### 3 to 4 May 2024

##### Second Annual Wildfire Expo for Central South Africa

This year, the Free State Umbrella Fire Protection Association (FSUFPA), in collaboration with the Northern Cape Umbrella Fire Protection Association (NCUFPA) and in partnership with the Working on Fire - Kishugu Joint Venture, is proud to announce the Central South African Wildfire Expo. The Central South African Wildfire Expo is a public participation event that allows industry professionals, service and equipment providers, to interact with landowners and the broader public over two days packed with opportunities to display, demonstrate, explain, discuss and learn. Proceeds of the Wildfire Expo will go towards the Free State and Northern Cape Wildfire Respond Funds.

**Live streaming:** The entire event will be livestreamed on FSUFPA, NCUFPA and WoF social media platforms.

**Dates and times:** 3 May 2024: 09h00 – 16h00 and 4 May 2024: 09h00 – 13h00

**Venue:** Be-Human @ Middelwater Farm, Bloemfontein, Free State, South Africa

**Enquires:** [expo@fsufpa.co.za](mailto:expo@fsufpa.co.za)

Proceeds of the Wildfire Expo will go towards the Free State and Northern Cape Wildfire Respond Funds

#### 4 May 2024

##### International Fire Fighters Day

#### 6 to 8 May 2024

##### World Fire Congress

Washington, DC, US

#### 25 May 2024

##### Midvaal Fit to Fight Fire Challenge

**Venue:** Midvaal Sports Club, Meyerton, Gauteng, South Africa

**Contact:** Tertius Engelbrecht

**Cell:** 072 197 2700

**Email:** [Midfiresubs@midvaal.gov.za](mailto:Midfiresubs@midvaal.gov.za)

### June

#### 5 to 9 June 2024

##### International Hazardous Materials Response

**Teams Conference 2024**

Baltimore, Maryland, US

[www.eventscribe.net/2023/HazmatConf/](http://www.eventscribe.net/2023/HazmatConf/)

#### 8, 9 June 2024

##### Toughest Firefighter Alive Germany 2024

Mönchengladbach

[www.tfa-germany.de](http://www.tfa-germany.de)

#### 11 to 13 June 2024

##### A-OSH 2024

A-OSH Expo, Africa's largest, and most all-encompassing occupational safety & health exhibition has been the undisputed premier platform for showcasing OSH products and services to the industry for 14 years.

**Venue:** Gallagher Convention Centre, Midrand, Gauteng, South Africa

[www.aosh.co.za](http://www.aosh.co.za)

#### 11 to 13 June 2024

##### Fireexpo South Africa 2024

Now in its third year of bringing the latest fire safety products and services to a wide market sector, Fireexpo has defined itself as the reliable and trusted source of fire detection and management solutions.

**Venue:** Gallagher Convention Centre, Midrand, Gauteng, South Africa

[www.fireexpo.co.za](http://www.fireexpo.co.za)