THE CATALYST

Q3 2021

JOIFF

THE INTERNATIONAL ORGANISATION FOR INDUSTRIAL EMERGENCY SERVICES MANAGEMENT

1. Decontamination OF PPE- Co2 Method
2. International PPE Standards EN & ISO Review
3. The Vital Link - The Emergency Control Room Operator Training

ALSO:

Responding To Hydrofluoric Acid Exposure

The Cube Fire

Industrial Disasters- Can They Be Prevented

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ABOUT JOIFF

JOIFF, the International Organisation for Industrial Emergency Services Management is a not-for-profit organisation dedicated to developing the knowledge, skills and understanding of personnel who work in and/or who are required to provide emergency response to incidents in Industry, primarily High Hazard Industry, with the aim of ensuring that risks in Industry are mitigated and managed safely.

The 4 pillars of JOIFF aiming to support its Membership in preventing and/or mitigating hazardous incidents in Industry are: Shared Learning – improving risk awareness amongst JOIFF Members; Accredited Training – enhancing operational preparedness in emergency response and crisis management; Technical Advisory Group – raising the quality of safety standards in the working environment of High Hazard Industry and Professional Affiliation - networking and access to professionals who have similar challenges in their work through Conferences and other events and the prestige of being a member of a globally recognised organisation of emergency response.

Full Members of JOIFF are organisations which are high hazard industries and/or have nominated personnel as emergency responders/hazard management team members who provide cover to such organisations. Commercial Members of JOIFF are organisations that provide goods and services to organisations in the High Hazard Industry.

JOIFF welcomes enquiries for Membership - please contact the JOIFF Secretariat for more information.

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JOIFF is the registered Business Name of JOIFF CLG

ABOUT THE CATALYST

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MESSAGE FROM THE CHAIRMAN

Dear JOIFF Members and Catalyst readers,

"Face reality as it is now; not as it was - or as you want it to be tomorrow! – Jack Welsh"

These words may sound harsh and unsympathetic in today's struggle with Covid 19, but for the emergency response fraternity in all its facets, today is the day you can make a difference in someone's life!

All over the world countries are changing levels of lock down and still the reality of today is that the delivery of effective and efficient emergency response cannot be jeopardised. It is my prayer that all the emergency responders will succeed in the call that the world is directing at you!

JOIFF has remained operational during the last quarter again and delivered on our promise to share learning events with all our members and interested others. For those that could not join these events, I would like to remind all members that the information is still available on the JOIFF website in the members area.

During April we had a very good presentation by MSA on firefighter safety and health, followed in May with yet another very good foam summit and thank you for the very positive feedback we received.

JOIFF AGM took place as a virtual event on 28 May 2021 and I am glad to report that the JOIFF company has met all its legal requirements and the appointment of two additional Directors (Mohanned Awad and Kevin Deveson) was also confirmed.

During June we were enlightened again by Dr Jeanne van Buren on the importance of Inspection, Testing and Maintenance of passive and active fire protection applications and Cost Benefit Analysis.

Please watch this space for the future events planned.

I am glad to announce that the Board approved the upgrade of the JOIFF website and work commenced already.

During the past quarter no less than nine serious petrochemical fire incidents were shared with members and this alone in proof enough that shared learning can never be underestimated. I plead with all members to take time out to visit the JOIFF website and study the very informative lessons captured on the website and also to use this to do a bit of introspection on how these lessons may impact your own situation.

If ever you need advice, information or want to share your wisdom with fellow members, please do not hesitate to get in touch with me.

I want to thank you all for just being you and wishing you all the best with the great work you are doing!

Semper Paratus!!

Regards,

Pine Pienaar FIFireE; FJOIFF; FSAESI
Director: JOIFF
Email: pine.pienaar2@outlook.com


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JOIFF NEWS

The Directors of JOIFF are pleased to announce the publication of the JOIFF Guideline on Emergency Services Management of Airports. This Guideline have been developed by a JOIFF Working Group of Subject Matter Experts and follows the consultation period of the final draft with the JOIFF Membership.

Many believe that emergency response in the Aviation industry is solely related to dealing with incidents involving aircraft. From an aviation licencing /regulatory perspective this may be correct, however aircraft cannot operate without airports. A fire in an airport that puts the Terminal, its facilities and/or Air Traffic Control, Fuel Farm/Depot and other structures out of operation could close the airport and have a resulting major impact on its community and operation, whereas a swift response by the airport services to a building/structure fire in its incipient stage could save lives, protect buildings, reduce operational downtime and enhance business continuity.

Due to the importance of airports to the Communities that they serve and the complexity of their operations, external agencies are often called to assist in the event of an emergency. However, waiting for a response from external agencies may not be an option in the event of some emergencies and this Guideline has been developed to advise airports on the importance of drawing up plans including effective and relevant policies, procedures and protocols for airport services to deal with incidents/accidents that may happen in airports before any external agencies arrive. The key elements of the plans should take account of at least pre-planning, rapid response by airport services and training all airport personnel in the actions to be taken in the event of an emergency.

The Guideline takes account that legal requirements and Good Industry Practice requires airports to identify all the hazards and assess all the risks in their organisation, to develop plans and procedures to deal with emergencies by their own services and in coordination with external agencies and the need to provide the resources and training to allow incidents/accidents to be effectively and decisively dealt with. This Guideline proposes that it is essential that equal emphasis is put on aircraft and non-aircraft incidents/accidents in airports and training and resources should be made available to cover both aircraft incidents and fire safety of the airport.

This is the newest JOIFF Guideline and it is available to the Members for free download in the Members Area of the JOIFF website. Other Guidelines available to members for free download include

Guideline on Emergency Response to incidents involving Alternative Fuel Vehicles (including hybrids vehicles)

- Guideline on Confined Space Entry
- Guideline on Foam Concentrate
- Guideline for the use and maintenance of fire extinguishers containing Foam
- Guideline on inerting vertical storage tanks plus
- Handbook on PPE to protect against heat and Flame (in English, French and Croation)

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NEW JOIFF MEMBERS

During April, May and June 2021, the JOIFF Board of Directors were pleased to welcome the following new Member.

Coats Performance Materials, United Kingdom represented by Jerome Heil, Performance Materials Sales Director EMEA, Brian Rowlandson, Country Manager UK and Milco Verongalli, Sales & Business Development Director EMEA. Coats Group plc is the world's leading industrial thread company, headquartered in the UK with a workforce of 17,000 in some 50 countries, across six continents around the world.

Coats develop high technology threads for conventional apparel across the range to highly demanding, safety-critical end uses, high-performance technical yarns that are used in a range of industries which include personal protection, transportation, household and recreation, telecoms and energy and other industrial end uses, a wide variety of zip fasteners for manufacturers of clothing, footwear, accessories, outdoor gear and many others sectors and a range of high quality interlinings, reflective tapes, hook and loop fasteners and mattress tapes developed in cooperation with leading suppliers and textile manufacturers.

JOIFF

ROLL OF HONOUR

During April, May and June 2021, the following persons were awarded JOIFF qualifications:

JOIFF DIPLOMA

ADNOC Onshore Main Oil Terminal
Abu Dhabi
United Arab Emirates

Mqondisi Moyo Dip.JOIFF
Fire Team Lead

Mqondisi Moyo is a Zimbabwean National and in 2010, he started his career as an emergency response professional as a firefighter in Bulawayo Industrial Fire Brigade. In 2014 he was transferred to the Fire Safety Department of the Brigade where he worked as a Fire Prevention Officer. A year later he was promoted to Fire Brigade Supervisor. He moved to ADNOC Onshore Abu Dhabi, U.A.E. in 2019 where he is now Fire Crew Leader with wide ranging responsibilities including supervising training, leading responses to fire and hazmat emergencies etc.

He holds several qualifications including the Graduate Diploma of the Institution of Fire Engineers, a Hazardous Materials/WMD Incident Commander and Diploma in Development and Disaster Management with merit from the National University of Science and Technology in Bulawayo. He recently received the award of registered professional with the Southern African Emergency Services Institute. Mqondisi continues to further his training and studies and recently successfully completed the JOIFF Diploma.

Greater Manchester Fire and Rescue Service (GMFRS)
Manchester
United Kingdom

Jon Nolan Dip.JOIFF
Station Manager
Contingency Planning Unit

Jon was recently awarded the JOIFF Diploma programme. On successfully completing the programme, Jon said "The JOIFF diploma course provided me with a good framework to work through. It enabled me to gain a greater understanding of industrial sites and their processes and with this understanding it has assisted me in providing training to Operational Fire crews, Petro-chemical officers and plan preparations. I am looking forward to developing further by joining the JOIFF Technician programme".

During the 2nd quarter of 2021, on successfully completing the programme, the JOIFF Diploma was also awarded to

Justin Benson Ryal Dip.JOIFF
Group Manager
Essex County Fire and Rescue Service
United Kingdom

Daron Driscoll Dip.JOIFF
Station Manager
Essex County Fire and Rescue Service
United Kingdom

Gary McArthur Dip.JOIFF
INEOS Chemicals Grangemouth Ltd.
Scotland

The Catalyst and the Directors of JOIFF extend congratulations to all those mentioned above.

NEWS FROM JOIFF

ACCREDITED TRAINING PROVIDERS

With the gradual lifting of COVID travel restrictions in the United Kingdom, it was possible for some overdue JOIFF accreditation audits to be carried out.

AIS SURVIVEX

JOIFF accredited Training Provider AIS Survivex, (formerly Petrofac Facilities Management Ltd.) Montrose, Scotland recently successfully completed an accreditation audit and received their certificate of JOIFF accreditation.

Left to right: Scott Birse, Major Emergency Management Fire Team Leader, West, Training Services, AIS Survivex; George Louden, Major Emergency Management Team Leader (Montrose), AIS Survivex; Gerry Johnson FJOIFF, JOIFF Director of Standards of Training and Competence.

FALCK FIRE SERVICES UK LTD.

JOIFF accredited Training Provider Falck Fire Services UK Ltd. Wilton International, United Kingdom, successfully completed a re-accreditation audit and received their current certificate of JOIFF accreditation.

Front left to right: Stephen Foreman, Principal Consultant, Falck Fire Services UK Ltd.; Gerry Johnson FJOIFF, JOIFF Director of Standards of Training and Competence.

Behind: Michael Taylor, Technical Fire Consultant (Fire Engineering), Falck Fire Services UK Ltd.

INTERNATONAL FIRE TRAINING CENTRE

JOIFF accredited Training Provider International Fire Training Centre, Darlington, United Kingdom recently successfully completed a re-accreditation audit and received their current certificate of JOIFF accreditation.

Front left to right: Gary Watson, Manging Director, International Fire Training Centre; Gerry Johnson FJOIFF, JOIFF Director of Standards of Training and Competence.
Behind: Daryl Bean MJOIFF, Curriculum Manager International Fire Training Centre.

When COVID travel restrictions will be lifted, the full programme of regular auditing of JOIFF Accredited Training Providers will be continued.

FIRE SERVICE COLLEGE UK.

JOIFF accredited Training Provider Fire Service College, Moreton-in March, United Kingdom recently successfully completed a re-accreditation audit and received their current certificate of JOIFF accreditation.

Left to right: Clair Mowbray, Director of Learning Delivery and Transformation, Fire Service College; Gerry Johnson FJOIFF JOIFF, Director of Standards of Training and Competence.

RESPONDING TO HYDROFLUORIC ACID EXPOSURE

Hydrofluoric acid forms when hydrogen fluoride, a colourless gas, is dissolved in water. Hydrofluoric acid and hydrogen fluoride have a reputation of being among the most feared chemicals that responders can encounter during incidents involving hazardous materials. While exposure can have serious consequences, responders can protect themselves and help casualties survive serious exposures as long as they understand the properties of the chemicals.

HYDROFLUORIC ACID

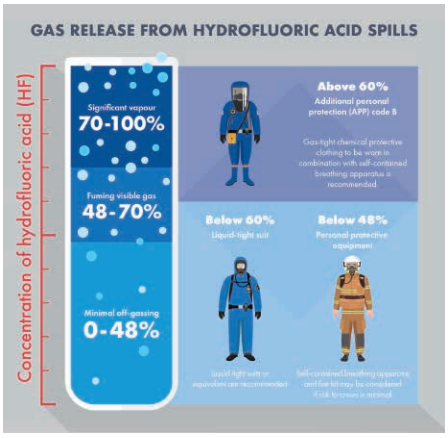
Hydrofluoric acid is toxic, corrosive and burns to the skin caused by exposure can be life-threatening. Fortunately, hydrofluoric acid's dangers are very well understood. Specialist decontamination and antidote kits are available, and responders can take simple measures that will drastically improve a casualty's chance of survival.

The most important factor in surviving serious exposures is acting quickly. Casualties must be decontaminated as quickly as possible to prevent the hydrofluoric acid from penetrating their skin and an antidote should be applied if this is available. Transferring casualties to a medical facility, where they can receive the necessary support, must be a high priority. With rapid action, casualties can make a full recovery from very severe exposures.

HYDROGEN FLUORIDE

Incidents involving hydrogen fluoride are generally on a small scale, but large-scale incidents have occurred. In 2012, between 8 and 12 tonnes of hydrogen fluoride was accidentally released from a portable tank at the Hube Global plant in South Korea. Over 12,000 people were affected, many of them were treated in temporary field hospitals. Portable tanks of hydrogen fluoride, similar to the one at Hube Global, are encountered in many places so, responders need to understand hydrogen fluoride's properties and be prepared to deal with potentially high-consequence incidents.

When dealing with an incident involving hydrofluoric acid, it is vital to know the concentration of



the spill. For concentrations below 48%, breathing apparatus and appropriate personal protective equipment would be suggested although these recommendations do depend on the situation and amount involved. For concentrations above 48%, it is suggested that gas-tight or liquid-tight suits be worn to protect emergency response teams. As the symptoms of exposure to hydrofluoric acid can be delayed up to 24 hours (depending on concentration), selecting and wearing the correct type of personal protective equipment is vital to ensure that the risk of exposure is minimised. Furthermore, exposure to hydrofluoric acid may result in nerve damage so those affected may not feel any pain.

BE PREPARED

NCEC recognises the importance of chemical safety training, which is why our training platform, Hazmat Academy, has been established. It provides training for public and private-sector organisations in safe, effective and proportionate response for incidents involving hazardous materials. NCEC runs many courses on chemical use and safety, and has designed a module specifically on hydrogen fluoride safety that covers:

- Physical and chemical properties.
- Hazardous nature and effects.
- Routes of exposure.
- First aid response and treatment methods.
- Exposure prevention.
- Waste disposal.

Visit the-ncec.com/ncec-training to learn more about the course.

Author

Dr Nigel Blumire
Training Product Manager, NCEC
Hazardous Materials Commission Secretary, International Association of Fire and Rescue Services (CTIF)

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DECONTAMINATION OF PPE: FOCUS ON LIQUID CO2 METHOD

Amongst firefighting professionals globally there is an increasing awareness of the health and safety issues surrounding the contamination of PPE and the long-term effects on the individual and the consequences to the overall organisation. Many studies have been commissioned and are continuing to be studied in the area of particulate contamination from the smoke generated by all types of fires. The concern is primarily with the multitude of carcinogenic compounds that evolve from combustion and their subsequent penetration of firefighting PPE onto the individual's skin.

One of the key issues faced by firefighting professionals is "How can I clean my PPE effectively?".

Are the manufacturer's instructions enough to decontaminate my PPE?

Before we can answer the question of decontamination, we must understand what contamination is. In particular we will look at the contaminants of concern. The key contaminants that are a threat to an individual firefighter can be divided into three main categories:

- Chemical contamination, either from direct liquid or gas exposure as well as the by-products of combustion forming particulates that comprise the bulk of the smoke generated in a fire. In general, these can be Cyanides, Dioxins, Polycyclic Aromatic Hydrocarbons (PAH) and Volatile Organic Compounds (VOC).
- Biological contamination such as bacteria and viruses
- Physical contamination such as asbestos and heavy metals

The problem is that these contaminants may remain on or in the PPE after an event and contribute to long term exposure of known carcinogens or other serious health conditions.
The construction of most PPE is either of 4-layers of materials: Outer-shell, thermal barrier, membrane and a liner system or condensed into a 3-layer system: Outer-shell, thermal barrier and a membrane liner. Many studies have shown that the penetration of PAH and VOC contaminants tend to go through most of the layers except the membrane. In the studies done, a good ePTFE membrane stopped most levels of contamination to the skin. However, the membrane was permeated with contaminants as were the outer layers. Cross contamination occurs with donning and doffing, and possibly in the washing process, potentially transferring contamination to the skin layer. It should also be noted that the build up of contamination occurs to higher levels if the PPE is not properly decontaminated, increasing the levels of VOCs and PAHs in the garment [1]
The question is how effective is ordinary washing of PPE in decontamination?
A study done by the Finnish Institute of Occupational Health on firefighting garments showed that the washing efficiency of garments decreased dramatically as the number of garments increased in the washing machine [2]. Cross contamination occurring in the washing machine increased with more garments in the batch. Decontamination was not effective and, in some cases, increasing the contaminant levels on the inner layers which are next to skin [3].

So, if conventional washing of firefighter PPE is not completely effective to remove contaminants of concern what other methods are effective?

LIQUID CO2 DRY CLEANING

Decontamination using liquid CO2 is highly effective. It penetrates into the deepest textile fibres, loosening and removing even the most harmful toxic particles. Unlike perchloroethylene (PERC) which is in itself a toxic hazard. At the right temperature for the process the CO2 liquifies and combines the benefits of wet and dry cleaning. The CO2 is a highly effective solvent and can remove all types of contaminants with high efficacy. Liquid CO2 is a safe non-toxic form of dry cleaning. The process is fully contained and recirculated.
The decontamination technology is based on designs used by NASA to clean spacesuits in the 1980s.
In its gaseous form, carbon dioxide has a low surface tension, allowing it

to function as a highly efficient cleaning tool when fused with specialised washing detergents. The CO2 saturates the textile fibres as the pressure is ramped up to fifty bar (725 psi). After the dry-cleaning process the CO2 is safely stored in a storage tank for reuse. There are no regulatory or disposal procedures as would be required if using PERC.
There is practically no agitation as the laundry drum in the machine rotates at 1 round minute. Textiles can be cleaned countless times without mechanical damage thereby increasing durability.

Fabric membranes that are designed to be difficult to penetrate with liquid are deposited into a large storage tank filled with liquid CO2, which has a density approximately 100 times lower than water. This meticulous process is repeated nine to twelve times to ensure that dirt is thoroughly cleaned out. To round off the process, the liquid CO2 is deposited into a distillation tank for dirty CO2 which is almost recycled 100% in the following cleaning cycle, whilst the dirt is stored in a waste tank and sent to a certified company to treat the toxic by-product.
The process removes bacteria in 15C because temperature is not a parameter. The process is also able to remove asbestos fibres.

VERIFICATION OF DECONTAMINATION

Given the wide variety of possible contaminants and the different associated risks to individual health there should be a level of quality assurance that is verifiable from a third-party source. Currently, there exists two key standards for the cleaning of firefighter PPE:

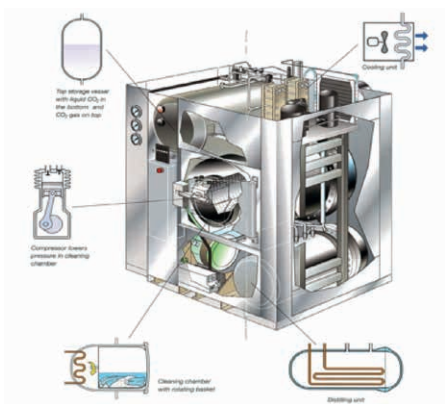
NFPA 1851
Standard on selection, care, and maintenance of protective ensembles for structural firefighting and proximity firefighting

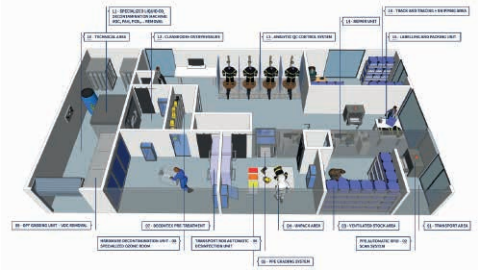
BS 8617:2019
Personal protective equipment for firefighters. Cleaning, maintenance, and repair. Code of practice.

While these two standards outline a general practice of cleaning and advanced cleaning of PPE, neither has set limits or values for the maximum level of key marker contaminants that are of concern. To do this would require independent testing and certification of the cleaning or decontamination process. Verifying that the cleaning decontaminates and reduces the level of carcinogens below the acceptable levels as specified by the W.H.O. within the entire garment should be essential for any cleaning method. Liquid CO2 cleaning has been tested according to Oeko-tex 100 and REACH standards and verified at Centexbel (Belgium) and Hohenstein (Germany). In these tests key carcinogenic contaminants were reduced to below 1ppm in all layers of the garment; outer shell, membrane, and lining. Standard washing did not reduce all key contaminants below the levels as specified, in fact, the levels within the membrane remained high and in some cases the lining showed increases in some carcinogenic molecules [4].

ENVIRONMENTAL IMPACT

Using liquid CO2 as a primary cleaning solvent instead of water means that the impact of water use, and waste treatment is negated. This method of cleaning is extremely environmentally friendly and can operate in almost any location without need for complex waste treatment. It also negates the use of a drying process thus reducing time to clean and return garments to the user. A clean room approach is used in the CO2 cleaning method which protects the workers in the operation and the surrounding environment. This process is easily certified to ISO 14001. An example of the CO2 cleaning "module" is shown below [5].





CONCLUSION

Liquid CO2 decontamination is a new environmentally friendly technology that is now available to firefighters and wider industry. It is a clean and sustainable way of decontaminating firefighting PPE in a certified and verifiable way. Compared to other current methods of cleaning it is proven to give a superior result in removing contaminants of concern and in reducing turnaround time. The cost of cutting-edge technologies is reducing as applications are commercialised and adopted across the globe, driving high returns on investment. This process has an extremely low impact on garments which reduces the wear and tear considerable and extends the life of garments, adding further cost efficiencies. As our understanding increases of the impact of occupational exposure to carcinogens and the impact to health, the need to ensure garments are decontaminated effectively will be a critical part of any risk assessment. Understanding the difference between cleaning and decontamination is critical to protecting the health of our firefighters.

BIOGRAPHY TIM WIGHT

Tim Wight has worked in the fire industry for over 25 years in fire chemistry related businesses and, with textile/PPE producers for firefighters. Tim specialises in structural, wildland and industrial firefighting as well as foams and retardants.

From 1989 -2001 he worked with Monsanto/ Solutia and managed international sales for phosphate chemicals and retardants with a focus on wildland firefighting. From 2002-2016 he worked with W.L. Gore and Associates specialising in firefighting PPE (EN469). Since 2017 he has worked with the PPE manufacturer Texport based in Austria.
He is currently a member of the FIRESA group of the FIA and sits on the BSI committee of standards for firefighter PPE PH/14. He has degree in Materials technology from Deakin University and has many broad academic interests.

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STANDARDIZATION OF PPE FOR FIREFIGHTERS

As reported in the last issue of The Catalyst, there are many standards for firefighter`s PPE, too many. Although not intended as PPE against chemicals, most of these standards require some protection against liquid chemicals, e.g. EN 469:2020

Chemical	*Concentration (%)*	*Temperature of chemical ±2 °C*
H_2SO_4	30	20
C_8H_{10} (o-xylene)	100	20

For each specimen, there shall be no penetration to the innermost surface and the index of repellency shall be ≥ 80 % classified according to the average result. This test shall be carried out, even if the garment has a moisture barrier.

Other standards contain even more test chemicals, and also EN 469:2005 contained additionally NaOH and HCl.
In order to fulfil these requirements, the outer layer of firefighter's PPE has to be fluorcarbonated. The fluorocarbon finish provides not only protection against liquid chemicals, but also water-, oil- and dirt-repellency. But sufficient protection against chemicals can only be reached by using PFOA with a chain length of C8 (*). Unfortunately this type of PFOA is carcinogenic and therefore on the Reach list Annex VII. However, there is a transitional arrangement for PSA until 23. July 2023.
While creating EN 469:2020 these circumstances have been already considered.

Based on round robin tests two things have emerged:

1. There is no impregnation necessary to fulfil the requirements on NaOH and HCl; consequently, these were removed from the requirements and
2. PFOA of chains other than C8 cannot meet the requirements on the remaining test chemicals.

What is to do after the transitional date of 23. July 2023?

Following this, it would be the best solution to abandon PFOA totally.

That means either
- to skip the requirement on protection against liquid chemicals since it could be seen as a minor risk or
- to skip just the requirement on the run off ≥ 80 %

PPE shall protect firefighters. In the case of liquid chemicals, it is therefore important that they do not reach the firefighter's skin, and this is guaranteed by the requirement of no penetration to the innermost surface. This requirement is not at first performed by the PFOA impregnation but mainly by the water vapour permeable membrane which includes the protection against water and oil, too.
The lack of dirt repellency could even be an advantage if the soiling / contamination of the PPE is recognized sooner and thus washed earlier and more frequently.
However that might be a problem in countries, where the use of a membrane is contraproductive due to the climate with high ambient heat and humidity.
As you can see, the worldwide application of standards is not so easy, and we can only hope that the industry will develop a workable solution by 23 July 2023.

(*) ECHA 1(340) ANNEX XV RESTRICTION REPORT

Author Siegfried Assmann
ALWIT GmbH

YOUR EMERGENCY RESPONSE IN SAFE HANDS...

Reducing the risk of emergency situations by always being prepared, ready and able to respond instantly to any incident is the primary objection of G3 Systems Fire and Rescue Service.

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EUROPEAN AND INTERNATIONAL STANDARDS

A REVIEW AND CRITIQUE OF SOME EN AND ISO EXAMPLES

This article looks at some current product performance standards and comments on the very interesting suggestions for simplifying the range of these standards as proposed in the last edition of the Catalyst – Q2 2021.

EN 469:2020 and BS EN 469:2020

CLOTHING FOR FIGHTING FIRES; TWO LEVELS OF PERFORMANCE, ONE FOR FIGHTING FIRES IN STRUCTURES, ONE FOR USE IN LESS SEVERE ENVIRONMENTS

During the development of the revision of EN 469:2005, the UK delegation proposed that there was a justification for increasing the performance requirements, in particular for heat penetration resistance (expressed as HTI and RHTI) and water vapour transmission (that is the ease of removal of perspiration expressed as Water Vapour Resistance). There were two linked arguments for this proposal – that clothing equalling or exceeding these increased requirements was in use in several European fire and rescue services – that risk assessments by some individual fire and rescue services justified the need for these increases. There was also the argument that surely since 2005 a revised standard to protect firefighters should reflect the technical advances achieved in the materials used to construct the typical tunic and trousers used to fight fires in structures, the intended use of EN 469 Level 2 compliant clothing. It should be noted that the development of what became these UK proposals was initiated by the UK National Fire Chiefs Council (NFCC) representative on the British Standards Institution committee, not manufacturers or testing laboratories. However, the UK proposals received no support from the other nations represented on the European CEN standardisation committee. In retrospect, proposing adding a third and higher level of performance from which end-users would have to make a choice, two of which are supposedly suitable for fighting fires in structures, was unwise. This proposal only added to the long held view by some end-users that there should only be one minimum level of performance for one type of hazard, that is fighting fires in structures, not close approach to high radiant heat events or fighting fires in bushland, forests etc. Other standards are available for these specific activities.

The rejection of these UK proposals resulted in the UK casting a negative vote on the final draft of what has become EN 469:2020 with its continuation of the two levels of performance (as L1 and L2) as in the 2005 edition and no increases in heat penetration resistance requirements. This outcome led to BSI publishing BS EN 469:2020 with reference to the rejected UK proposals. Therefore BS EN 469:2020 has a quite lengthy and detailed National Forward. This does not set out the specific proposals made by the UK – to do so would mean that BS EN 469:2020 conflicts with EN 469:2020 so could not be published as 469 compliant. The compromise is that the National Forward recommends increases in the minimum levels of performance for heat penetration resistance, water vapour transmission and some textile

FOR CLOTHING FOR FIREFIGHTERS

By Neil Sorensen

mechanical properties that may be necessary to meet individual fire and rescue service risk assessments.

ISO 11999-3:2015

CLOTHING FOR FIGHTING FIRES IN STRUCTURES; CHOICE OF TWO LEVELS OF PERFORMANCE BASED ON RISK ASSESSMENT

This standard recognises that risk assessments by some fire and rescue services worldwide may not conclude that the same levels of performance, particularly for heat penetration resistance, are appropriate and therefore sets out two levels of performance as A1 and A2. Some nations that are represented in the European (CEN) standardisation committee responsible for EN 469 are also represented on the equivalent International (ISO) standardisation committee, often by the same delegates so there is inevitably and currently generally agreed understanding of what test methods are necessary for clothing for fighting fires in structures but with some differing views of the minimum performance requirements expected from some key tests such as for heat penetration resistance. As shown by the detailed table of performance requirements set out in the Q2 2021 edition of the Catalyst, the heat penetration resistance requirements (HTI and RHTI) for the lower (A1) level of performance in ISO 11999-3:2015 are the same as for the higher (L2) level in EN 469:2020 (and retained in BS EN 469:2020). The higher of the two heat penetration resistance levels in ISO 11999:2015 are very similar to what the UK wanted to see included in EN 469:2020 so what the UK was seeking was hardly "off the scale" when proposed some years after the publication of this ISO standard!

ISO 11613:2017

CLOTHING FOR SUPPORT ACTIVITIES ASSOCIATED WITH FIGHTING FIRES IN STRUCTURES

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PPE for Firefighters
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This standard, produced by the same ISO committee as ISO 11999-3, exists as the outcome of years of discussion initiated and pursued by the Japanese delegation. They wanted an ISO standard written around some of the clothing they use for activities associated with fighting fires in structures. Eventually, a good compromise, in this writer's opinion, was reached so to ensure a clear distinction between the heat protection provided by compliance with this standard and that of ISO 11999-3. The heat penetration resistance requirements (HTI and RHTI) are much lower than for ISO 11999-3 A1 being, logically, the same as Level 1 in EN 469:2020. The scope of this ISO 11613 is particularly thorough in that it sets out, as a list, the tasks that can be undertaken when wearing this clothing and makes a clear distinction with the tasks that can be undertaken when wearing ISO 11999-3 clothing. Unlike ISO 11999-3, ISO 11613 only has one level of performance.

MANIKIN FIRE TESTING OF CLOTHING FOR FIREFIGHTERS

EN 469:2020 edition includes optional testing to EN ISO 13506-1:2017 which introduced the new concept of measuring Transferred Energy. ISO 13506-2:2017 continues to measure Burn Injury Prediction (BIP), a 1980s concept, and is noted in this EN as being additional data that can be requested because it is more familiar to users of this test. ISO 11999-3:2015 only says that additional requirements are under review with respect to this manikin fire test. This two-part standard succeeded the 2008 first edition which only measured BIP.

The reason for this test remaining optional in EN 469 and having no more than a brief mention on ISO 11999-3 (see clause 4.21.8) is that the consistency of test data from the steadily increasing number of laboratories offering this test needs to be radically improved. A massive work programme involving about ten testing laboratories worldwide has been under way for several years and has had more than 50 meetings. The work includes an in-depth investigation of the testing apparatus setup in each laboratory to ensure that they are subjecting the firefighter tunic/trouser ensembles to the same heat energy from their gas burner systems. The results to date from the almost completed and extensive interlaboratory trials indicate that improvements in consistency of results from the participating laboratories are being achieved. The aim ultimately is to achieve consistency good enough to consider adding performance requirements to product standards such as EN 469 and ISO 11999-3.

BTTG has been undertaking manikin fire testing on clothing for firefighters and for industrial end-users for almost thirty years and has been participating in this work programme since its commencement. BTTG also pioneered the introduction of a female body form manikin test to complement the male body form test specified in both the 2008 and current 2017 ISO standards.

Because this test is so widely recognised as an important tool for comparing different firefighter clothing ensembles, it is essential that it be improved and that the new measure of Transferred Energy becomes understood by its users. This will require that they be provided with information to understand its relationship to the long familiar Burn Injury Predictions.

The next step following the outcome of the work of this group of test laboratories will be new editions of both EN ISO 13506-1 and ISO 13506-2 – expected in 2022 and intended to also include a specification for a female body form manikin – a vindication of BTTG's decision of more than ten years ago and the increasing numbers of female firefighters.

THE PROPOSALS MADE IN AN ARTICLE IN THE JOIFF CATALYST – EDITION Q2 OF 2021

The writer, who has been involved in the creation and updating of EN, EN ISO and ISO product standards for more than thirty years, was both surprised and pleased to see that someone similarly involved over many years wants this standardisation community to consider a radical shake-up of several standards. The idea to delete Level 1 requirements from EN 469 and revise ISO 11613 into and EN ISO 11613 under the Vienna Agreement for collaboration between CEN and ISO is one such proposal. Another is that for fighting fires in structures, EN 469 Level 2 or the higher performance in ISO 11999-3 Level A2 could be used, the latter being amended to delete its Level A1. This avoids duplication of performance requirements, EN 469 and ISO 11999-3 each then having a different single level.

These and the other proposals in this Catalyst article - concerning standards for clothing for fighting wildland fires, plus also for use as station uniforms - are surely worth being considered by the National Standardisation Bodies (NSBs) of the nations represented on the relevant CEN and ISO committees. There has been good cooperation between CEN and ISO committees in the industrial fire protective clothing sector in the past, EN ISO 11612:2015 being a leading example. Future cooperation will require a renewed spirit to succeed in view of some recent difficulties concerning the EN ISO 15384 standard for clothing for wildland firefighting.

NEIL SORENSEN has spent his entire career at BTTG and its predecessor, the Shirley Institute. Starting around 1982 he has become deeply involved with BSI, CEN and ISO standardisation committees. He has concentrated on working in the fire protective clothing sector of standardisation and is associated particularly with the development and introduction of BTTG's manikin fire test facility in the early 1990s. Since the introduction of ISO 13506:2008, BTTG has offered both its RALPH (male) and SOPHIE (female) manikin fire test capability. Neil is currently a director of Shirley Technologies Ltd/BTTG and chair of the BSI committee for fire protective clothing.

PROUD TO PROTECT OUR FIREFIGHTERS

They risk their lives to protect ours – so it's only right that we at Coats should do everything we can to help provide our firefighters with the very best PPE available.

At Coats, we have been protecting firefighters for years – but the history of this amazing profession can be traced back to Roman times under the rule of Augustus. Protection was, as you'd expect, minimal, which meant that firefighters could only fight fires from the outside, armed only with refillable containers of water.

Over the years, firefighting has evolved – togas and everyday clothing gave way to long leather coats and rubber outerwear. These days, innovations in flame and heat resistance mean that firefighters are much better protected, and are able to fight their way into the very heart of a blaze. Coats is with them every step of the way – and we are constantly striving to reinvent PPE threads and yarns to offer even more protection.

FIRED UP BY THE URGE TO INNOVATE

With homes in 50 countries across six continents, and a 17,000-strong workforce, Coats is a world-leader in developing innovative yarn for firefighter turnout gear. Wherever you are in the world, we are on hand to work side by side with you, so that we can continue to protect those people who do so much to look after us, every day.

Our American Innovation Hub is based at the Sevier manufacturing site in North Carolina, US and is dedicated to advances in PPE materials. It features a Materials Lab, where customers can collaborate directly with R&D technologists in the idea generation and creation processes.

There is a Prototyping Area, too, where thread, yarn and fabric prototypes prototypes can be created; along with a pilot factory with a full range of manufacturing

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PROTECTING FIREFIGHTERS IN THE HEAT OF THE MOMENT...

Whether it's battling forest fires or fighting to extinguish burning buildings, firefighters need PPE that protects them from huge heat and flame. Fire will always seek out the weakest points in a garment, so it is essential that every stitch, seam and scrap of material is protected.

Coats Firefly thread is made from 100% spun meta-aramid fibre using a vertically integrated aramid manufacturing system. It is uniquely engineered to provide exceptional flame, heat and electric arc resistance, and can resist flame temperatures up to 371°C without melting – perfect for fire retardant protective garments that need a high level of durability like fire fighter uniforms and safety jackets.

Meanwhile, Coats FlamePro is an innovative family of flame resistant and electric arc woven or knitting yarns for extreme personal protection. Our latest innovation, FlamePro Splash is a molten metal splash protective fabric that is specially engineered to be lightweight, soft and flexible while maintaining durability.

...AND KEEPING THEM SAFE AND SEEN...

Our EMEA Innovation Hub in Turkey is exploring the potential for high visibility yarns and fabrics – like Signal Lucence.

Visibility for firefighters is vital – whatever the conditions. Working in the dark, being seen can save lives – which is why we have developed this range of sew-on tapes, heat transfers and self-adhesive material utilises a patent pending, revolutionary safety innovation based on phosphorescent technology (VizLite DT).

The photoluminescent material works when there is no primary light source or reduced light, absorbing both natural and artificial UV light, which it then emits as an afterglow in low or zero light – for up to 20 hours.

YARNS AND BLENDS ARE ALWAYS READY FOR ACTION

While firefighters need to be prepared for anything, Coats works with PPE manufacturers to help create specific clothing and equipment that are right for the job. Rescuers attending traffic accidents or looking for survivors in collapsed buildings need durable, more lightweight clothing, but still with heat resistant properties.

Firefighters facing forest fires and mountainous terrain need a uniform offering high protection with lightweight comfort. Of course, good flame spread resistance and radiant heat protection are mandatory.

Even when they're at the station waiting for a call, firefighters need the right sort of uniform – both comfortable and hard-wearing. Our high-quality threads and yarns are specifically engineered for fire service station wear, with very high heat and flame protection and low elongation.

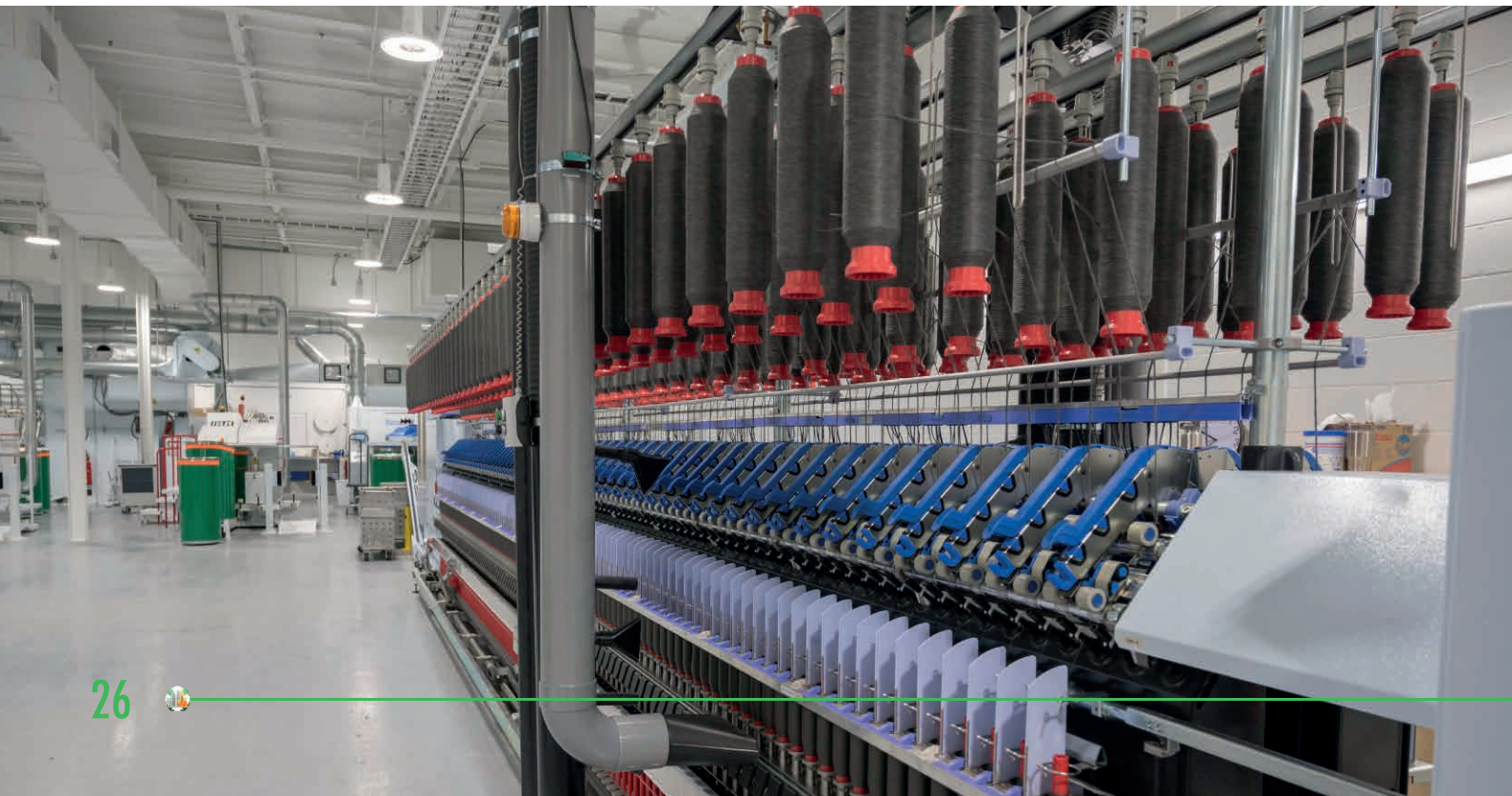
WORKING TOGETHER FOR MAXIMUM PROTECTION

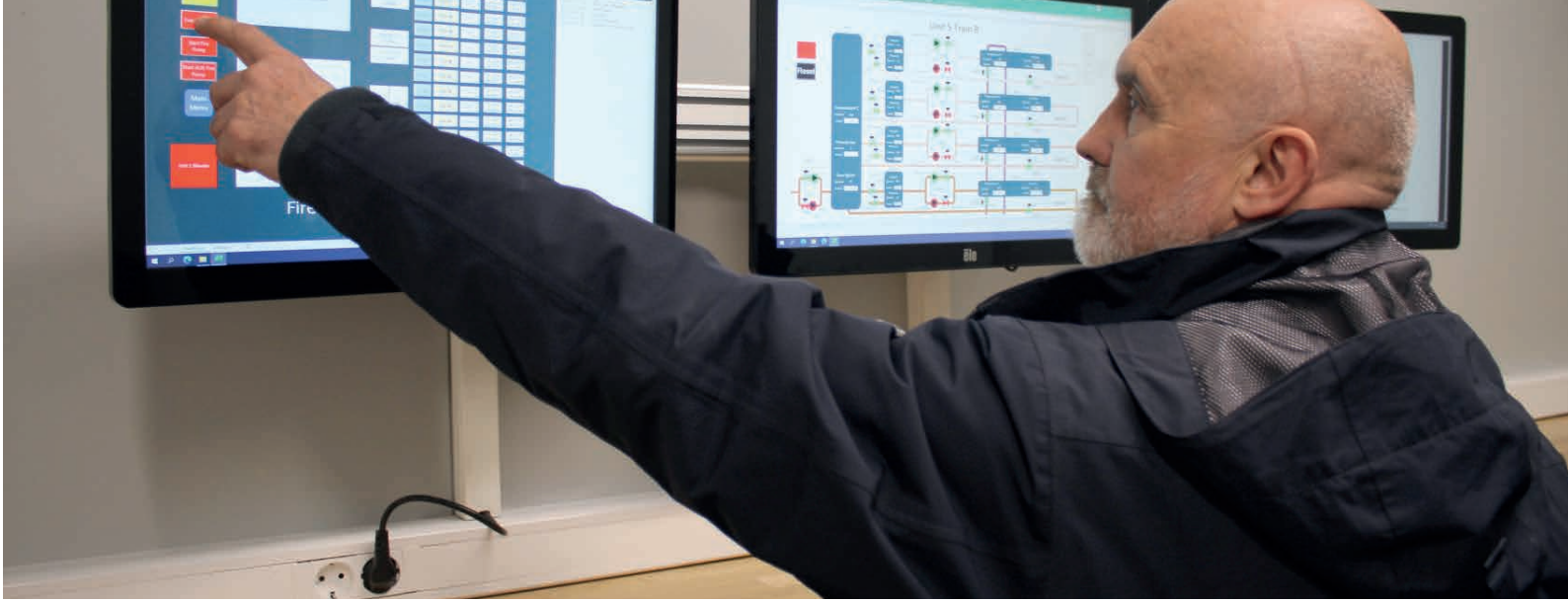
If you're a PPE manufacturer, you can be confident that Coats will collaborate with you to provide the highest standards of safety and durability. We may even develop a solution you may never have thought possible.

GET IN TOUCH

For more information,please visit our website: www.coats.com

COATS





THE VITAL LINK

THE EMERGENCY CONTROL ROOM OPERATOR TRAINING

Information gathering and communication during an incident are crucial to the outcome of that incident. In the heat of the moment control room staff is receiving and passing the information from different sources and react to alarm panels at the same time. Interpreting behaviour of their process control systems can make a huge difference as to how the incident is managed. But how often is this really trained in a realistic environment and is the staff competent in a stressful situation.

RelyOn Nutec thinks the control room staff is a very important link in the emergency organisation and needs to be trained. More and more companies are sending extra personnel (besides the fire teams) during a normal fire training to compliment the firefighting response being carried out on our fire simulators. At our training centre we have 6 fire training simulators and each have a purpose, a process flow and pipe work between vessels and pumps with valves to isolate (remotely or otherwise).
To compliment the fire training simulators we have now created a virtual control room which reflects the process layout. A scenario can be simulated with real flammable liquids and gases where in the control room you can see the initial report (gas or fire alarm) and can see the effects of the fire on the vessels such as pressure, temperature and flow changes. The control room staff now are able to interact with the incident commander or fire ground commanders.
With our new control room we can train the following objectives:

- Interoperability between panel operators and emergency response personnel.
- Interpersonal skills required for efficient control room operator (CRO) competencies.
- Test and develop your own company procedures at all levels, from single resource up to multiagency responses. The system can be modified to compliment the client's own emergency response plan.
- Switching to non-digital means with a crash pack system, should there be IT or power failures.

The command suite is designed for incident command information logging facilities (ICS) and process panels where alarms or process "excursions" (something happening outside the norm) can be generated by the instructor in order to stimulate a reaction. The control room is fully equipped with various communication means and white boards. For higher level command training a separate crisis room is equipped with the necessary facilities to develop team work among the crisis team.
The control room can be used in conjunction with our live fire simulators or virtual scenarios. It can be used not only for the oil and gas sector, but also for other disciplines such as command of protracted civil defence scenarios. The software used in the control room can be modified to reflect the needs of the client such as utilising their own emergency response procedures and even can be used at a client's location.
Talk to our consultants at RelyOn Nutec Fire Academy for further advice on specific CRO or other command training.

INDUSTRIAL DISASTERS, CAN THEY BE PREVENTED ?

The West Fertiliser Plant after the fire

Disasters that took place in the 2nd quarter in years past.

WEST, TEXAS FERTILISER PLANT FIRE

On 17th April 2013, the volunteer fire department of the city of West in the State of Texas, USA, responded to a fire at the city's fertiliser plant. The fire involved the building where pallets of seed and fertiliser were stored ready for sale. Around this building were other storage areas where ammonium nitrate pellets and other chemicals in bulk were stored and mixed according to customers' specifications.

As the building became involved in the fire the roof collapsed and an explosion occurred, killing ten firefighters and five civilians who were assisting them. Several more responding firefighters suffered debilitating or near-fatal injuries. The blast created a 90 foot wide and 10 foot deep crater, and damaged or destroyed 500 structures in a 37 block area including three schools, a nursing home, an apartment complex, and many single-family homes. The explosion registered 2.1 on the Richter scale for earthquakes. Pieces of debris from the plant were photographed as far away as 2.5 miles. Civilian injuries totalled more than 200. Initial loss estimates reached $100 million US dollars.

Could this disaster have been prevented ?

- There was no requirement for strategic incident plans for a co-ordinated approach to emergency operations.
- The local jurisdiction had no hazardous materials programme.
- The City of West had no fire prevention code and no personnel to carry out fire inspections.
- The storage of the ammonium nitrate and other hazardous chemicals was not in compliance with standards of Good Industry Practice.

The investigation into the firefighter fatalities ascertained:

- The State of Texas had not adopted minimum training standards for volunteer fire departments.
- There was no pre-fire or pre-incident plan of the facility.
- The absence of command and control and the failure to create and communicate an incident action plan resulted in an uncoordinated and unmanaged fire ground operation.
- The fire department did not approach this fire as a commercial structure with hazardous materials, but rather initiated residential structural firefighting practices, with which they were familiar.
- Firefighting operations were not conducted in a manner that incorporated national and industry recognized safety standards and practices. Nationally recognized firefighter risk management principles were not applied.

Investigation report available from http://www.tdi.texas.gov/reports/fire/documents/fmloddwest.pdf

COMMENT:

In the USA since 1996, chemical

plants that use certain toxic or flammable substances have been required to file risk-management plans that disclose inventories of dangerous chemicals, worst-case scenarios and proper emergency response procedures. After the 9/11 tragedy, fearing terrorists might use this information to target the plants, the US Congress made the risk-management plans almost impossible to access. But that meant that first responders, often didn't know what they were facing when they arrived at a chemical plant accident.

The deadly 2013 blast at the West Fertilizer Company plant in West, Texas prompted the Obama-era US Environmental Protection Agency to issue a series of tough new regulations collectively known as the "Chemical Disaster Rule". The Chemical Disaster Rule addressed that problem by forcing plants to notify their local communities of any dangerous chemicals they were storing and to collaborate on disaster response plans. It also mandated third-party audits, root-cause analyses after accidents and the adoption of safer technologies and processes. It also required companies to provide increased emergency planning information to local officials and to hold more frequent meetings and training.

The rule was scheduled to go into effect in March 2017, but, like so much else in America, everything changed with the election of Donald Trump. On the day he took office, Trump ordered a freeze on all new federal regulations.

Those regulations never went into effect because the Trump administration first delayed, then rescinded them, claiming they were too costly and ironically enough, would make chemical plants vulnerable to terrorist attacks.

In August 2018, the US Court of Appeals for Washington DC ruled that the indefinite suspension of the rule "made a mockery of the statute" and ordered the EPA to implement it. Rather than appeal that ruling, the Trump administration opted to gut the rule entirely and in November 2019, it announced it was rolling back the most significant new protections.

In June 2019, an explosion at a Philadelphia petrochemical refinery (reported below) released over 5,000 pounds of hydrofluoric acid and sent truck-size pieces of metal shrapnel flying through the air. The Chemical Disaster Rule encouraged the approximately 50 petrochemical plants across the USA that used hydrofluoric acid to switch to sulfuric acid, a safer alternative. But chemical companies have resisted the move because reconfiguring the plants would require temporarily shutting them down.

Other disasters that took place during the second quarter of years past, that could have been prevented with early effective remedial action include:

MAY 2001 SHELL PLANT EXPLOSION IN DIAMOND, LOUISIANA

An early morning explosion on 5th May 2001 from the Norco Oil Refinery in Louisiana killed seven workers, destroyed homes in the Diamond community, and released 159 million pounds (72kt) of chemical waste into the atmosphere. 2,800 residents from nearby neighbourhoods were evacuated. Seven workers were killed and 42 injured. The total cost arising from the Norco blast is estimated at US$706 million. Residents still suffer from early illnesses and deaths as a result of the toxic fumes.
The explosion was apparently the result of corrosion of a vapor line from which hydrocarbon gas was escaping and a possible ignition source could have been the unit's superheater furnace.

JUNE 2019 PHILADELPHIA ENERGY SOLUTIONS (PES) FIRE

On 21st June 2019 a fire and explosion occurred at Philadelphia Energy Solutions (PES), a refining complex near the Schuylkill River between the city's international airport and downtown. Flammable process fluid containing mostly propane with a small concentration of highly toxic hydrofluoric acid (HF) escaped from the Refinery's HF alkylation unit. The leaking process caused a growing vapour cloud which ignited and caused a massive fire.

A series of explosions in the alkylation unit rained huge pieces of shrapnel across the refinery and released 5,239 pounds of hydrofluoric acid (HF), a chemical so toxic that worker-safety advocates have called for its banishment from use in refining. Five workers experienced minor injuries during the incident and response, requiring first aid treatment.

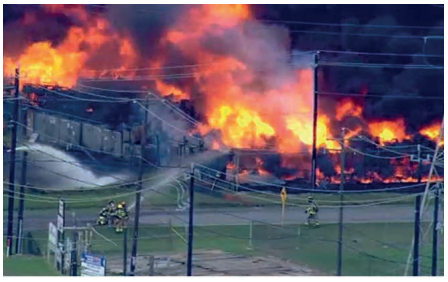
The U.S. Chemical Safety Board (CSB) reported that the PES refinery is one of nearly 30 in the United States that are more than a century old, Refineries frequently update their systems and replace old parts, but the PES fire stemmed from equipment installed in the 1970s that had been allowed to run to failure. The ruptured PES pipe contained levels of nickel and copper that were permitted when installed, but not under recommendations made in later years by ASTM International. That pipe elbow corroded at a faster rate than other pieces of the system.

Philadelphia Energy Solutions (PES) Fire

JOIFF

AND SHARED LEARNING





One of the benefits of JOIFF membership is that JOIFF regularly circulates information on incidents that occur in high hazard industry to its membership. This is part of JOIFF's Shared Learning and it is aimed at raising awareness so that members can consider errors that caused the misfortunes of some, to educate against the same mistakes being repeated in their own location.

These are just a few of the incidents that JOIFF reported on during the first 6 months 2021.

- USA - Fire at Oil Storage Tank Injures Seven
- Singapore - Dust Explosion Kills 3, Critically Injures 5
- Equatorial Guinea - Military base explosion kills 98, injures 615
- Tunisia - 6 Killed following tanker explosion
- Indonesia - Massive Blaze at Pertamina Balongan refinery
- Mexico - Explosion & Fire Rock PEMEX Refinery- 7 Injured
- China - Three Missing after blowout and fire on platform at China's largest offshore oilfield
- USA - Texas - Large chemical fire report
- Syria - Major fire hits Homs oil refinery
- USA -Train carrying chemicals derails and explodes
- India - Fire at HPCL Visakhapatnam refinery
- Iran - Iranian oil refinery and Nation's largest warship catch fire in separate incidents
- Indonesia – Second large scale fire at a Pertamina refinery in less than a month in less than a month
- USA - Lubrizol chemical plant fire

JOIFF would like to include in its mailings on such incidents the causes of any incidents and actions taken as a result, but this information is not readily available at the time of the incident being reported. When the reports of incidents are eventually completed, they tend to have restricted or abridged circulation rather than being made available to those in similar organisations with similar risks. Is this why we are we still seeing indents causing a major loss of life and property and damage to the environment when the hazards and risks are known?

Quite apart from the human tragedies of injuries, deaths, homelessness and environmental destruction caused by these events, in many cases, these are an unnecessary cost of loss due to the experience and information that is available to prevent these incidents.

There is no such thing as "no risk" and a great deal of Emergency Services Management is built around reducing residual risk. For effective reduction of residual risk, the prime requirement is information – and what better information can there be than that from an organisation that has suffered from an incident in the type of risk that others need to reduce?

Can disasters caused by Industry be prevented? Of course they can, if information is made more freely available to allow management to learn from and act on the mistakes of others who have had the experience of similar previous disasters. Industry, Insurance and Risk Management Companies all need to ask themselves if they are doing enough to educate Industry on lessons learnt. Action from lessons learnt can unquestionably reduce the number of repeat incidents and when they do occur, with knowledge gained, those attending can more effectively and competently deal with them to reduce potential loss.

Those who fail to learn from history are condemned to repeat it.

US Navy Info 2019

"We need to come up with fluorine-free foam. But what's available now can't meet (MIL-) specification."

– John Farley, Director of Fire Test Operations
US Naval Research Laboratory (NRL)

C&EN "The price of fire safety" January 14, 2019

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RESEARCH FOR THE NFPA MISSION

Evaluation of the fire protection effectiveness of fluorine free firefighting foams

FINAL REPORT BY:

Gerard G. Back
JENSEN HUGHES
Baltimore Maryland, USA

John P. Farley
NAVAL RESEARCH LABORATORY
Washington, DC, USA

January 2020

NFPA RF Report 2020

165 UL FIRE TESTS compare H-FFF and AR-FFF with C6 AR-AFFF (control)

Variables:

- **Hydrocarbon and polar fuels**
- **Fresh and salt water**
- **High and low foam expansion**
- **Gentle and forceful application**

Scan code for full NFPA RF Final Report

NFPA RF Report 2020 Executive Summary:

"The FFFs [F3 Agents] required between 2 – 4 times both the rates and the densities of the AR-AFFF to produce similar results against the IPA fires conducted with the Type II [Gentle application] test configuration.

During the Type III tests [Forceful application], the FFFs required between 3 – 4 times the extinguishment density [gpm/ft^2] of the AR-AFFF for the tests conducted with MIL SPEC gasoline and between 6 – 7 times the density of the AR-AFFF for the tests conducted with E10 gasoline."

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THE CUBE FIRE:

BOLTON, GREATER MANCHESTER

by Ben Levy

INTRODUCTION

On 15 November 2019 a fire broke out at The Cube, student accommodation in Bolton, Greater Manchester. The speed with which the fire took hold and the devastating impact it had on the building was truly shocking, serving to further highlight the risks within the built environment and the national pattern of buildings failing in fires. Such incidents continue to present challenges to members of the public, Fire and Rescue Services (FRSs) and other key responding and responsible agencies.

Alongside Greater Manchester Fire and Rescue Service (GMFRS) firefighters, residents of The Cube displayed courage, integrity and community spirit as they found themselves involved in a major incident.

Partners from North West Fire Control (NWFC), Greater Manchester Police, North West Ambulance Service, Bolton Council, and the University of Bolton also responded with courage and commitment to support operational firefighting, strategic decision making, and the evacuation and relocation of residents.

Thanks to the quick and effective decision-making of firefighters and officers on the night and the actions of many of the students themselves, there was thankfully no loss of life.

GMFRS offer learning and areas of refection within a detailed report into the fire at The Cube and whilst we are very proud that the overall response was a clear example of the high standards and professionalism that exists within the UK Fire and Rescue Service, we also recognise the learning opportunities that were identified and are keen to share these widely in order to further support improvements to the safety of our communities and our firefighters.

ACTIONS PRIOR TO THE CUBE

In direct and immediate response to the fire at Grenfell Tower, and prior to the fire at The Cube, GMFRS had commenced local actions to assure itself of preparedness and operational resilience with regard to fire in high rise residential buildings (HRRBs), and had undertaken a significant amount of work in direct response to Grenfell and subsequent recommendations arising from the public inquiry into that fire and had achieved a number of key milestones:

✓Inspection of all high rise buildings in Greater Manchester.

✓Ongoing engagement with housing providers and managing agents.

✓Review of site-specific operational plans for high rise residential buildings (HRRBs).

✓Support to, and coordination of the Greater Manchester High Rise Task Force.

✓Provided smoke hoods to all fire engines in GMFRS to support the evacuation / rescue of residents through areas of a building affected by smoke.

✓Provided smoke curtains to all fire engines in GMFRS to support the protection of means of escape within multi-occupied residential buildings and control of air flow into a fire compartment.

✓Developed, trained and tested firefighters in newly developed High Rise Immediate Resident Evacuation (HIRE) procedures.

✓Amended high rise firefighting procedures to include the implementation of Stairwell Protection Teams, and the safe working systems for extended working above a floor involved in fire.

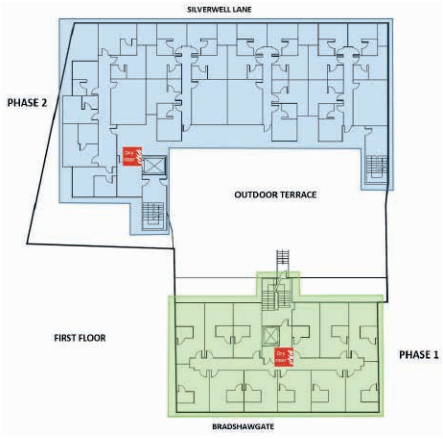
✓Contributed to the development and delivery of local resilience arrangements and workshops, focussed on evacuation, in each of the ten Greater Manchester boroughs.

✓Delivered training to firefighters in recognising the risk of abnormal fire spread in buildings.

✓Developed and delivered multiple large scale multi-agency high rise exercises at GMFRS's dedicated operational training centre in Bury.

✓Supported detailed, evidence based responses to Government consultations.

✓Influenced the National Fire Chiefs Council (NFCC) as a lead contributor to the Building Safety Team.



THE CUBE

The Cube building is located on a main thoroughfare into, and within close walking distance of Bolton's town centre.

The Cube building is a multi-occupied residential building consisting of 221 units which offered private residential accommodation primarily marketed to students at the University of Bolton.

The Cube is separated into two parts, Phase 1 and Phase 2. The area of the building through which the fire spread, Phase 2, is a purpose built seven storey block and stands behind Phase 1, separated by an open courtyard area. The inside aspect provides decked walkway access which overlooks the courtyard. Decks at each level provide access routes to individual flats.

Both phases were clad with a High Pressure Laminate (HPL) external wall system.

THE FIRE

At just before 20:30 hrs of Friday 15th November 2019 a fire was reported at The Cube. The first fire engine was in attendance within 3 minutes and 17 seconds of being mobilised, as part of a pre-determined attendance of 5 fire engines and a high reach aerial appliance.

With clear evidence that the building was failing to contain the fire in accordance with standard expectations, a full and immediate evacuation was instigated by the Incident Commander, testing for the first time under real conditions, GMFRS's recently developed arrangements for such a scenario, namely the 'HIRE' procedure.

The incident was subsequently declared a Major Incident and at its peak had an attendance of 27 fire engines and special appliances.

Two residents who had not evacuated and became trapped in their flats were rescued by firefighters from the exterior of the building, one from the sixth floor window by a high reach aerial appliance, a 32 metre Turntable Ladder. Almost immediately following her rescue, the flat she had been trapped in became engulfed in smoke and fire and was rapidly destroyed.

The second rescue took place from a second floor window by ladder.

At the peak of operational activity 45 of 50 available GMFRS fire engines and all on duty supervisory officers who were available to form an incident command team, were attending this or other concurrent operational incidents. At midnight, a total of 19 supervisory officers were committed to incidents across Greater Manchester.

Resources from Cheshire and Lancashire FRS were utilised under existing mutual aid agreements and from Merseyside and West Yorkshire FRS via National Resilience arrangements, resulting in 18 fire engines from other FRSs brought into Greater Manchester to support GMFRS. In addition to FRS resources, the incident attracted a multi-agency response from both Category One and Category Two responders.

The incident was open for a total of 15 days to support a full and comprehensive fire investigation, with GMFRS resources finally leaving the scene on 30th November 2019. The investigation determined a discarded cigarette as the most probable cause of fire.

LEARNING

GMFRS have offered constructive learning outcomes identified from an analysis of its own operational response to the incident and the wider organisational support mechanisms.

The detailed report also serves as an opportunity specifically for FRSs and other responders to reflect on operational preparedness and where identified as necessary to implement or adapt GMFRS's own reflection and analysis into any local arrangements.

GMFRS offer 23 Key Observations and 38 associated Actions which are detailed within the report but can be broadly considered under the following themes;

✓fundamental review of fire safety prevention messaging for residents of flats;

✓emergency response planning assumptions to support an effective response to a foreseeable large scale multi-agency incident, both at the scene and at remote locations;

✓personnel understand the principles of modern building construction in order to appreciate and recognise the risks of rapid and unexpected fire spread;

✓timely and effective gathering and use of operational risk information;

✓realistic practical training for fighting fires in high rise buildings;

✓effectiveness of collecting information at the point of an emergency call in order to develop and share situational awareness within the control room and with attending firefighters both en-route and in attendance;

✓maintaining clear lines of communication between the control room and the incident ground, including two-

way sharing of situational awareness;
✓means of communication between FRS and other emergency service control rooms, including the direct and real-time sharing of incident specific information;
✓interagency protocols for the use of interoperable radio communications;
✓multiagency training, focussing on the application of JESIP (Joint Emergency Services Interoperability Principles), interagency communications and the management of large scale resident evacuations;
✓means for large scale evacuation from multi-occupied buildings, including solutions for accounting for all residents present within a premises;
✓training for incident commanders in the use of drone technology;
✓methods and application of recording decisions at incidents; and,
✓management of post-incident welfare checks for atten

EVACUATION

Within the report, reference is made to the HIRE procedures. Prior to the fire at The Cube, and in direct response to the Grenfell Tower fire, GMFRS had developed, tested and implemented the HIRE procedure for the management of emergency evacuation of a high rise building where the decision to move from 'stay put' to evacuate was required.

The recognition early into the incident that the building was failing to contain the fire, multiple fire spread patterns and the loss of integrity of the protected stairwells resulted in the Incident Commander (IC) realising the need for an immediate and full evacuation of The Cube.
NWFC's subsequent and clear change of advice to callers from 'stay put' to 'evacuate' contributed to the reduction of injury and allowed persons to safely leave the building.

The Evacuation Officer coordinated the evacuation plan supported by a dedicated team on the Evacuation Command Unit, which became the intended focal point for management of information for evacuated persons.

With the fire occurring on a Friday evening, so close to a town centre, tracking occupants was not easy. For a number of hours, it was unsure if those unaccounted for from severely damaged areas of the building and hence unable to be searched, remained in situ.

The Evacuation Command Unit provided the method and mechanics for tracking where residents had been located, and to where they had been relocated, to a point early into the following day where all persons were accounted for. It is key to note that this activity went far beyond the initial emergency stages of firefighting.

Following the fire at The Cube and the implementation of HIRE outside the training environment and based on further feedback, GMFRS has since adapted this procedure to allow it to be extended to any multi-occupied residential building, amending the procedure to 'Immediate Building Evacuation' (IBE).

If it is determined by an IC that a building which would be expected to have a stay put strategy in place, requires immediate evacuation due to the building not behaving as would be expected, the IC can send an IBE message to Fire Control. On receipt of an IBE message, Fire Control will:
✓Change Fire Survival Guidance to 'Evacuate'
✓Mobilise additional resources including an Evacuation Officer and Evacuation Command Unit with support fire engine
✓Create a second incident and airwave talk group for the Evacuation Command Unit
✓Automatically declare a Major Incident and inform other agencies.

Once IBE has been initiated, all occupants of the building are assumed as at risk and evacuation is commenced. A dedicated Evacuation Officer supported by a Command Unit mobilised specifically for the coordination of the evacuation will develop and implement the evacuation process which is implemented in each area of the incident by the Sector Commanders.

GMFRS'S BUILT ENVIRONMENT PROJECT

It is clear that there are current shortcomings in the built environment which represent a significant risk to GMFRS, our firefighters and the communities we serve.

There are over 500 high rise residential buildings in Greater Manchester, of which at the time of writing this summary into the fire at The Cube, 95 are subject to interim measures as a result of an identified risk that means that the building can no longer support a 'stay put' strategy.

GMFRS has implemented a structure and supporting mechanisms to lead on the coordination of its response to identified risks and learning in respect of the built environment. This 'Built Environment Project' seeks to build on the existing coordinated and collaborative approach by GMFRS, to implement further measures to support the coordination, analysis and routes for mitigation of significant learning identified.

The project encompasses all aspects of work related to the built environment including learning from The Cube and significantly, implementing recommendations of the Grenfell Tower Public Inquiry, to coordinate and support these improvements within Greater Manchester.

The full report into the fire at The Cube can be accessed at www.manchesterfire.gov.uk/cube

For further details, please contact BuiltEnvironmentProject@manchesterfire.gov.uk

EDITOR'S NOTE:

Ben Levy BEd (Hons), BEng (Hons), MIFireE is an Area Manager at JOIFF member organisation Greater Manchester Fire and Rescue Service. As Head of Built Environment, Ben is coordinating GMFRS's response to the Grenfell Tower Public Inquiry Phase 1 recommendations and the wider issues relating the built environment including the prevalence of buildings that fail in fires. On the evening of the fire at The Cube, Ben supported GMFRS's strategic response to the incident.

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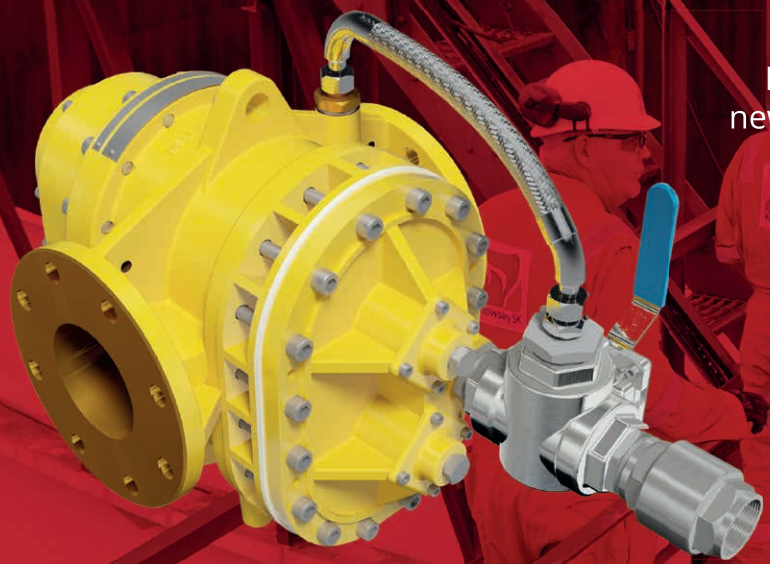

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PRODUCT FEATURES

BRISTOL

Bristol is part of the Concorde – Corodex Group (CCG), was established in 1974 as a leading manufacturer of high quality Fire Fighting Systems, Equipment & Vehicles. BRISTOL was one of the first firefighting companies to receive an ISO 9001 certification in the Middle East, placing a great emphasis on achieving international and third party approvals in all our product range such as Kite Mark, LPBC, UL listing and FM. Bristol - Vehicles Manufacturing Division focused in engineering and manufacturing of bodies for all types of commercial vehicles such as ambulances, mobile clinics, rescue, firefighting and specialized vehicles. We have introduced following specialized products in the region for industrial, oil & gas, health sector; some of them are below:

HIGH FLOW INDUSTRIAL FIREFIGHTING TRUCK – AL SHALLAL:

Al Shallal Fire Truck designed and built to fight massive fire breakout mainly in Oil & Gas Fields and Industrial Areas. The vehicle is designed and certified to NFPA codes and built on Mercedes Benz commercial chassis and it can carry up to 6 firefighters onboard. Al Shallal Fire Truck has 360 degrees vision for the pump operator. The fire truck is enquired with up to date aggregates such as Williams, remotely controlled monitor "Ambassador" on the top with 6000gpm, and two TFT monitors at the back side with 2000gpm each with more than 150m reach and has the capacity to throw high volume of water and foam up to 10,000 Gallon per Minute (GPM) and also equipped with cross – lay hoses which is easy to deploy.

SIX-WAY MANIFOLD HYDRANT:

We introduced the six manifold fire hydrants where the large fires require large volumes of water, which sometimes require multiple large diameter water supply hoses. These hydrant manifolds are then used in conjunction with large diameter water supply hose to supply the necessary water to pumps, nozzles, and foam proportioning equipment.

CONTAINERIZED FIREFIGHTING PUMP:

Containerized firefighting pump's controllers and all accessories are engineered inside the container. All pipings based on the customer's specification & requirements. Most of the heavy equipment are accessible by door area around the container so that material handling arrangements could be provided for easiness for unit movement.

Bristol Fire Pumps are standardized and manufactured accurately for its excellent performance, increasing overall durability & reliable operation. Precision balancing of impellers provides mechanical stability, smooth operation and minimal maintenance. Rotating parts & Impellers are constructed with corrosion resistant material. Special metallurgies are also available on request. Our pumps are available with electric, diesel, or Electric-Diesel powered sets.

EN 1789 CERTIFIED AMBULANCE:

Ambulance conversion can be carried on all type of vans, minibuses or four wheel drive vehicles. Our EN 1789 certified Ambulances comes with Glass fiber reinforced (GRP) roof, ABS wall with integrated sliding window between the driver and patient compartment, Welded fixation points for stretcher and seating, Integrated room emergency external lights, One piece floor, anti-slip and easy to clean, Ceiling supply center, One door seat, One/two rotating front facing seats, Partition wall medical cabinets, Medical equipment based on Client's requirement, 12V/220V electrical system. Each ambulance is designed specifically for the client's particular application and in relation to the chassis and specifications.

www.bristol-fire.com

BRONTO SKYLIFT

AERIAL PLATFORMS FOR INDUSTRIAL FIRE PROTECTION

Industrial fire brigades at oil refineries, chemical plants or other industrial environments work in dangerous conditions, and they must be prepared for situations where high foam and water capacity is needed. Bronto Skylift's industrial line of aerials feature spacious rescue cages with various additional equipment, a large water capacity, efficient foam systems and a reach to meet even the most demanding challenges.

The Bronto Water and Foam Towers (WFT) and Super Extinguishers (SE) are ideal for targets that are difficult to access, extinguish or cool down safely. Whether you need to access difficult

to reach places to inspect and repair the fixed firefighting systems, need to cool down high or complex structures or need to fight fires using water, foam or powder, Bronto aerial platforms can help you do that efficiently – and safely.
Customizable configuration
In addition to safety, our industrial fire solutions are strongly based on a multifunctional usability principle. Through flexible modifications and customization options you can be sure that the aerial platforms can adapt smoothly to your own procedures, systems and standards.
The aerials are designed to fit multiple standards, they can be mounted on different chassis and equipped with fire pumps and foam systems that meet your purposes. The optional features also include radio remote controls for boom movements and water monitors to enable firefighting from afar. The remote-controlled video and thermal cameras with transmission to control centre displays enable surveillance and increase situational awareness.

VERSATILE SUPER EXTINGUISHERS

The multipurpose SE range includes the biggest rescue cage available, with maximum safe load up to 500 kg. The ideal height-to-weight ratio enables safe operations with increased horizontal outreach, extensive reach over an obstacle and an efficient water capacity.
SE-range key features
- Unmatched extinguishing capability
- Water capacity of 6,000 l/min (up to 12,000 l/min as an option)

- Spacious rescue cage with 500kg capacity, e.g. stretcher carriers as an option
- Wide-ranging water and foam throw
- Can be equipped with any suitable, high capacity fire pump
- Can be equipped with advanced foam mixing systems and dry powder lines
- User friendly Bronto+ control system

EFFICIENT WATER AND FOAM TOWERS

The WFT-products are unique in Bronto Skylift's product portfolio, as they are not equipped with a rescue cage at the end of the boom, but a high-capacity water monitor(s) instead. They are especially designed for industrial firefighting where water and foam capacity are the key. Water way capacity is 6 000 litres / minute as a standard.
WFT-range key features
- Very short transport length
- Water capacity of 6,000 l/min
- Ideal for cooling tanks under fire hazard and fighting intensive fires
- Can be equipped with advanced foam mixing systems and dry powder lines
- Can be adapted for various specifications
- Optional remote control allows operation from a safe distance
- User friendly Bronto+ control system

www.brontoskylift.com

Dr. STHAMER HAMBURG

THIS TECHNOLOGY MAKES OUR FOAM BETTER

In the transition from AFFF (-AR) to F3 (-AR) foam concepts Fire & Rescue Services (FRS) like to use the tactics and equipment they have been trained on. The main task in the transition to the new F3 foams is not only to update their application skills like direct foam application on non-polar fuels and achieve a good vapour suppressing foam blanket, as well as reducing fuel pick-up, to a more gentle application approach allowing the F3 foams to create a good foam layer, but also to use the existing delivery equipment in a more efficient way.
The NEW F3 foam product line vaPUREx® by Dr. Sthamer has a family of new formulations, our Research and Development team has also been investigating which technologies and application methods improve the foam's extinguishing properties.
One solution to improve the foam quality is CAFs (compressed air foam). We have tested CAFS (compressed air foam system) supplied by various manufacturers successfully for specific projects. Our experience with municipal fire brigades helped us to optimise and reduce the foam application rates for class A fires and smaller class B fuel fires. We now have a strong focus on the industrial use of CAFs especially in combination with vaPUREx® LV 0,5% and the alcohol resistant F3 vaPUREx® AR 3/3 F-5.
The improved and homogenous foam quality allows a fast flame control/ knockdown. CAFs can be used to establish a stable foam blanket on both non-polar and polar solvents, CAFs allow for a longer throwing distance of low expansion foam and thereby reducing the foam loss
NFPA 11 (Standard for Low-, Medium-, and High-Expansion Foam) states a reduced application rate for CAFs application compared to normal aspirated or semi-aspirated foam applications.

Due to the fact that different fuels have different impacts on the application density for a fast flame knock down it needs to be discussed and verified by fire tests for which fuel or groups of fuels suitable application rates will be required. The CAFs application rate can be tested on small scale fire tests in the

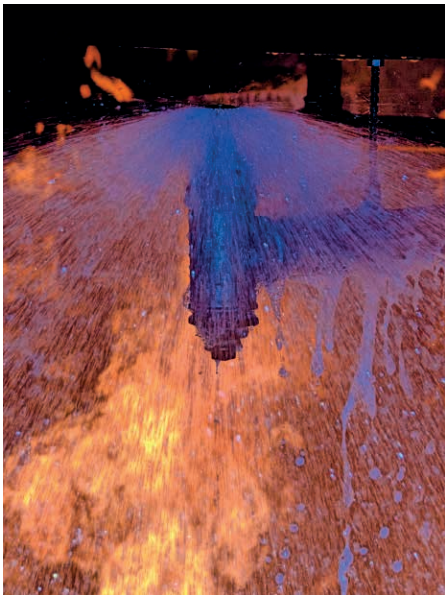
Dr. Sthamer laboratory. Therefore Dr. Sthamer can demonstrate low, medium and high expansion foam tests on your specific fuels , low expansion foam also with CAFs.
Our customers trust on our experience and comprehensive analysis when developing their F3 transition plan with the most powerful and environmentally benign foams in our portfolio.
We will be happy to assist you in your transition journey.
For more information please contact us.
info@sthamer.com
export@sthamer.com

fomtec
Fire Fighting Foams & Equipment

PERFORMANCE – TRUST - SUSTAINABILITY

In May this year Fomtec announced the FM approvals on two SFFF (Synthetic Fluorine Free Foam) concentrates for the fixed nozzle systems markets. Enviro USP is a hydrocarbon fuel fire foam concentrate and an alternative to current PFAS based products such as AFFF, FFFP and FP, whereas Enviro ARK is for hydrocarbon fuel and polar solvent fuel fire foam concentrate and an alternative to AFFF-AR and FFFP-AR. At the same time Enviro ARK achieved its UL listing and the existing UL listing for Enviro USP was updated and expanded. In collaboration with Messrs. Viking Corporation and their subsidiary KCA the approvals also cover a range of storage, proportioning and discharge options such that end-to-end UL listed, or FM approved "systems" can be specified and supplied.

Fomtec Enviro ARK is the first SFFF to be tested and approved by FM for use with standard non-aspirating foam water sprinklers on polar solvent fuels. Fomtec Enviro USP added the FM approval to the existing UL listing for use with foam water sprinklers on hydrocarbon fuel fires. Allied to the approvals with foam makers, pourers and monitors these recently announced approvals mean that whether you are an end user, a consultant, or a system integrator you



can now progress your PFAS foam system transition based on data rather than opinion.
Fomtec fully believes that the foam concentrate is only part of the solution, and this statement was never truer than when using SFFF concentrates. The variance between different manufacturers SFFF formulations mean that testing and approvals are necessary to verify the proportioning equipment used, and the ability of the different discharge devices to generate expanded foam with foam qualities that will allow successful extinguishment and burn-back protection. The UL listings and FM approvals for Enviro ARK and Enviro USP now allow confident specification, design, and use in fixed nozzles systems in accordance with the current NFPA standards.
At Fomtec we often talk about "Data not Opinion", and when asked to provide a recommendation on, for example, "type of foam, application density and application duration" as stated for some non-aspirated discharge devices in the current edition of EN 13565-2, this is done based on data from independent testing and approvals. Trying to correlate the performance of a SFFF agent with various discharge devices based on a top side EN 1568 fire test rating is insufficient data, and therefore only an opinion ! The UL and FM data that Fomtec have accumulated allows us to confirm that a specific discharge device when used with an Enviro foam will provide foam qualities that have been tested and proven to extinguish the fire.

Enviro ARK and Enviro USP are available NOW backed by the UL and FM systems approvals enabling transition from PFAS based solutions and future proofing your new foam installations.

enviro by fomtec

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IAP | G3

G3 SYSTEMS FIRE & RESCUE SERVICES - A fully managed, professional Fire and Rescue Service

Responding professionally and swiftly to an emergency is the primary responsibility of the Fire and Rescue Service. Firefighters meet the emergency challenges they face through a combination of continuous technical training and personal skills development, innovation and investment in tools, vehicles and Personal Protective Equipment (PPE), compliance with recognised standards, collaboration and interoperability with other emergency responders and a strong, committed leadership from their senior management.
G3 Systems Ltd (G3 Systems) provide fully managed emergency Fire and Rescue Services to protect critical high-risk infrastructure, transportation, and industrial assets around the world. Our service offer includes emergency dispatch and first response, fire safety, fire audits, inspection and investigation, equipment, and vehicle maintenance, testing and compliance, firefighter training and CPD and Medical Ambulance Services.
In addition, G3 Systems, a group subsidiary of IAP Worldwide Services Inc, can provide emergency medical services and client training in emergency response procedures as well as through-life logistics support delivered by our Field Service Engineers.

SKILLED, PROFESSIONAL AND READY

Our professional FRS crews provide a disciplined, self-contained, and adaptable workforce to meet your organisations Emergency Preparedness needs. Staffed, equipped, trained, and qualified to meet a variety of hazardous assignments, our crews may be pre-positioned for initial response or perform ready duties at stations as required by planning needs. When not committed to fire response, crews provide a skilled workforce to accomplish a variety of

asset management objectives while maintaining instant availability for incident mobilization.

EMERGENCY DISPATCH AND FIRST RESPONSE

Centralised Emergency Dispatch with 24/7 cover is a critical element of any emergency response effort. An established and reliable communications infrastructure is also essential to ensure incidents are dealt with swiftly and effectively.

The G3 Systems Emergency Dispatch function ensures a professional response to all emergency incidents. They handle all communications, dispatching the appropriate resources, vehicles, and equipment in accordance with standard operating procedures and maintain an accurate log of all incidents from commencement to completion. The records kept within the dispatch function provide auditable, legal documents in the event of an emergency and any subsequent investigation.

SPECIALIST EQUIPMENT AND EMERGENCY VEHICLE MAINTENANCE

The inspection and testing of fire fighting vehicles and the preventive maintenance and repair of firefighting systems, breathing air equipment, PPE, and appliances forms an integral part of the day to day operational activities of the G3 Systems FRS team. Our team members undertake day to day maintenance and husbandry of vehicles, PPE, and essential emergency equipment.

Operating and tracking assets, monitoring their status, reporting maintenance requirements, and developing recurring and corrective maintenance requirements, in the form of a Planned Preventative Maintenance Programme adds further value to our client's operations.

MAINTENANCE OF SKILLS AND CONTINUING PROFESSIONAL DEVELOPMENT

Every professional FRS Service must have a robust training system in place to meet the operational requirements of each client's specific site location. G3 Systems Training Plan ensures that our staff maintain and further develop their specialist skillset, ensuring that there is no dependency upon any single individual for operation of and training on essential equipment.

Our highly qualified FRS Training Instructors maximise every opportunity to train their Firefighters to develop the personal and professional skills of all staff. As new risks are identified or equipment procured, the training needs of the team are constantly reassessed to ensure that the G3 Systems FRS crews are fully capable of responding efficiently and effectively in accordance with the operational environment.

Managing Risk, Loss and Resilience

Risk minimisation, loss prevention and increased operational resilience are always primary objectives in critical high-risk infrastructure operations. G3 Systems Fire and Rescue Services mitigate the risk of emergency incidents, being prepared, ready and capable to respond instantly to any emergency or hazardous situation as well as recognising new risk challenges as they arise and adapting their operations to meet them. We would be very pleased to discuss your operational FRS needs.

www.g3-systems.co.uk

HFS Hytrans Fire System
mobile water supply

LEANING ON 33 YEARS' EXPERIENCE IN COMPLETE MOBILE WATER TRANSPORT SOLUTIONS...

Hytrans® has developed, manufactured and supplied mobile water transport units with hydraulically driven submersible pumps (HydroSub®) since 1988. During these 33 years Hytrans Systems has supplied over 1200 HydroSub® units across the globe.

Quality, proven performance and innovation are the keywords that contributed to the success of the mobile water transport equipment of Hytrans®.

The HydroSub® pump units are an important part of the system, but it is not the only item that needs attention when considering a mobile water transport solution. The Hytrans® Hose Layer Containers including Hose Recovery Units are designed to deploy and recover hoses including the coupling up to 12"-diameter. Making the system easy to deploy and recover will encourage people to use it and train with it, so they are prepared when it really matters.

Working in emergency situations a fast deployment is key, for the fast deployment of large diameter hoses, it is important that couplings can withstand ground impact at speed. A low weight on the coupling reduces the force of the impact but it also increases the length of hose that can be stored inside the Hose Layer Container, as a result of the decrease in size of the coupling.

Hardware aside, one of the most important elements for a high-volume water transport system remains the choice of material for large diameter hoses, with the basic options being rubber or polyurethane. The main difference between these two materials is their heat resistance. PU is not recommended for firefighting because it is unable to withstand the effect of a burning object, as per BS 6391 (Hot Cube Test). A number of additional factors should be taken into consideration when equipping your water transport system with the right hoses. These include working pressure, burst pressure, wear resistance, weight, elongation/expansion ratio, and hose recovery.

Especially when having to use the large diameter hoses, one needs to take sure that the hoses are flexible, heat resistant and have limited elongation. Tests have proven that hoses with more than 1,5% elongation will move a lot or even "jump" every time they will be pressurised.

As the benefits of a mobile water transport solution become more recognized the systems are now even used for direct firefighting, it was necessary to develop a foam injection unit that is very accurate and can deal with high flows that are needed to extinguish the largest (Petrochemicals) fires. This resulted in the Hytrans® PowerFoam which can either be integrated in the larger HydroSub® units or supplied as a standalone unit.

To complement the mobile water transport systems, Hytrans® has a wide range of trailer mounted monitors up to a capacity of 60.000 lpm. The nozzle allows you to change the flow setting at work pressure and without interruption of operation. The trailers are designed in such a way that there is no need for a water ballast tank. For every specific need Hytrans® can supply the right type of nozzle, such as jet, jet/spray and nozzles with foam attachments.

The mobile systems made by Hytrans Systems are a complete solution and designed to be used in extreme circumstances. We are using our 33-years of experience to make the best system worldwide available. Get in touch with our skilled team to get more detailed information about what Hytrans® can do for you.

Contact us via: sales.hfs@hytrans.com

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LNG Awareness and Fire Fighting - 5 Days

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RelyOn Nutec
360° Safety

RELYON NUTEC FIRE ACADEMY
MAASVLAKTE - ROTTERDAM, NETHERLANDS
Tel. +31 (0)181 376 666
Email: fireacademy@nl.relyonnutec.com

Industrial Fire Brigade Incident Commander Course (IFBIC) 5 days
Industrial Fire Team Leader (IFTL) 10 days
Industrial Fire Team Leader Remain Qualified (IFTL RQ) 3 days

YASSINE MARINE SERVICES
YMS TRAINING CENTRE - SFAX, TUNISIA.
Tel : +216 36 408 290
Email: yms.training@y.marineservices.com

Foundation Course 4 days
Fire Team Member 3 days
Fire Team Leader 3days
Helicopter Firefighting and Rescue 1 day
H2S awareness 1 day

Courses throughout the year on request.

FIRE SERVICE COLLEGE
GLOUCESTERSHIRE
UNITED KINGDOM
Contact: Claire Spender
Tel: + 44 1608 812 150
Email: claire.spender@capita.co.uk
Website: www.fireservicecollege.ac.uk

Courses on Request

SASOL EMERGENCY MANAGEMENT
TRAINING ACADEMY
SECUNDA, SOUTH AFRICA
Tel: + 27 17 610 6016
Email: isabel.dejongh@sasol.com

Full range of JOIFF Accredited courses on Emergency Response.

NCEC
Part of Ricardo

NATIONAL CHEMICAL EMERGENCY CENTRE
OXFORDSHIRE,
UNITED KINGDOM
Email: support@thehazmatacademy.co.uk
Website: www.thehazmatacademy.co.uk

Hazardous Materials Adviser Initial
Phase 1 online training – 6th September
Phase 2 online training – 20th September
In person scenario week – 11th to 15th October
Hazardous Materials Adviser Revalidation
Online training – 13th September
In person training – 22nd and 23rd September
Online training – 29th November
In person training – 15th and 16th December
Hazardous Materials First Responder
In person training – 1st to 5th November
Hazardous Materials Instructor
Online training – 4th October
In person training – 25th October

International Fire Training Centre

SERCO INTERNATIONAL FIRE TRAINING CENTRE
DARLINGTON, UNITED KINGDOM
Tel: +44 (0)1325 333317
Email: bookings@iftc.co.uk
Website: www.iftcentre.com

3 day JOIFF Occupational Fire Fighter
2 Day JOIFF Fire Fighter Refresher
5 day JOIFF Team Leader

Your partner for industrial fire training

Our international courses:

- **5-day annual Foam School with Dr. Sthamer** (JOIFF-accredited)
- **3-day Tank and Bund Fires** (JOIFF-accredited)
- **3-day Integrated fire safety of IBC tanks and tank containers** (JOIFF-accredited)
- **5-day Industrial Firefighting** (JOIFF-accredited)
- **Modular training program industrial firefighting**
- **Anhydrous ammonia incident and safety training**
- **Chemical and gas tight suit training**

H2K
education • training • consultancy

Discover more at **www.h2k.nl**