Gresham
(SMS) Ltd

Marine 3005
Test Report

Conducted at the Fire Service College
Moreton in Marsh
GL56 0RH
United Kingdom

25th & 26th August 2016

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Background

In 2015, a number of minor preliminary tests were undertaken on behalf of ProAqueous Global Solutions Ltd by a UK Fire & Rescue Service to ascertain if a product new to the UK (Marine 3005) fulfilled the claims by the manufacturer of its ability to extinguish fire more effectively than traditional products such as plain water, foam etc.

Following those original tests, it was agreed that more comprehensive and detailed tests should be undertaken through an independent source, designed to capture the full range of fire classes.

For this purpose, Gresham (SMS) Ltd, chaired by Sir Ken Knight, was commissioned to provide an independent overview and validation of Marine 3005 for firefighting purposes.

Independent Test Information

The tests were carried out at an independent location, The Fire Service College, Moreton-in-Marsh, Gloucestershire on the 25th and 26th August 2016.

The College, is a renowned and acknowledged centre of excellence for the UK and International Fire Service, providing world class incident ground training facilities supported by expert instructors. By using the Fire Service College, it enabled Marine 3005 to be tested through the full range of fire behaviour classes by trained fire professionals in a neutral test centre environment.

The tests were carried out under the direction of Gresham (SMS) Limited, supervised by former Chief Fire Officer Simon Routh-Jones QFSM. Neither Gresham (SMS) Limited nor Simon Routh-Jones are in any way associated with the Clients or the manufacturers of Marine 3005.

Test Criteria

The tests were designed to compare both a water attack and a conventional firefighting medium against Marine 3005, developed to reduce the time taken to extinguish a fire and in some instances, the levels of smoke and pollutants.

The method of application for the tests was a Dosatron Unit independently supplied and calibrated by FSE Group and as used in previous tests by a UK Fire & Rescue Service.

The Unit comprised of a 285 litre Water tank with top fill and a 20 litre Foam/Solution tank with top fill. The Pump was operated through a Honda Engine driving an impeller pump delivering approximately 7 Bar (100 psi) through a 20mm/1" hose reel.

The testing process was delivered via the pump, which was used to attack, suppress and extinguish each fire scenario. For each of the scenarios the testing process was delivered using the traditional method of firefighting with the same firefighting crew to ensure continuity of application.

In total, five test scenarios were undertaken to capture a wide range of fire classes.

These constituted:

- Pallet Fires within a building
- Straw Fires within a building which also tested the penetration effectiveness of Marine 3005
- Vehicle Fires
- Tyre Fires
- Oils/Fuel Fire

A further test on magnesium was undertaken as a comparison against hand-held Dry Powder extinguishers.

Thermal Imaging

In order to ensure continuity of test conditions for each of the scenarios, a thermal imaging camera with heat recording facility was operated. This ensured that the conditions of the fire behaviour for each of the individual scenarios were as similar as possible.

By using the thermal imaging camera with heat recording facility we were able to monitor the output temperature in a like for like environment. All tests were timed and recorded from the initial lighting, heat buildup and applications of the extinguishing media through to the final extinction of the fire.

Test Duplication

Each of the scenarios initially had two burns carried out using water or another medium to give a base line of measurement of conventional firefighting. Two further tests were then undertaken using Marine 3005 at the specified dilution ratio and all data was recorded.

The purpose of undertaking two tests per scenario was to ensure that any variation within the tests would be moderated and to verify how Marine 3005 consistently performed across the range of fire classes.

The scenarios were chosen to reflect the incidents that a firefighter would regularly encounter and where Marine 3005 could be adequately compared against other mediums as an alternative method of extinguishing a fire.

Scenarios

A **car fire** is a regular occurrence that provides for a number of different types of fire behaviour.

Burning Tyres were used to demonstrate the difficulties – physical and environmental – that can be encountered by fire crews.

An **Oil / fuel** scenario was chosen to evaluate how Marine 3005 would operate as a water based option as opposed to the conventional, environmentally unfriendly method of using foam.

Straw was tested to see how Marine 3005 would perform in a simulated thatched roof fire incident. This test was particularly looking to establish the penetration qualities of Marine 3005 – a quality lacking when water only is used in such incidents.

Wood is a standard frequent fire occurrence and would allow for a straight forward comparison test.

Results of tests

In brief, the results from the scenario tests are as follows, however more detailed results are shown on the data sheets attached and the conclusions below.

Scenario	Best Time to extinguish	Best time to extinguish – Marine 3005	Comments
Car Fire	31 seconds Water	12 seconds	The smoke emitted from the fire during Marine 3005 test was considerably less than during the water test.
Burning Tyres	22 seconds Water	5 seconds	The black combustion cloud immediately changed to white vapour upon application of Marine 3005, thus reducing the effects of pollution.
Oil / Fuel	14 seconds Foam	13 seconds	Marine 3005 prevented re-ignition even with the application of an ignition source by Firefighters, whereas the foam test re-ignited.
Straw	19 seconds Water	9 seconds	The smoke emitted from the fire during Marine 3005 test was considerably less than during the water test. Marine 3005 prevented re-ignition, whereas the water test re-ignited.
Timber	32 seconds Water	24 seconds	The smoke emitted from the fire during Marine 3005 test was considerably less than during the water test.

Magnesium

Magnesium was selected as a hazardous material scenario to ascertain if Marine 3005 could cope with such types of fire.

In view of the limitations of the pump to apply Dry Powder, it was decided that a quantity of 40 litres would be ignited and extinguished using two 9kg hand-held extinguishers.

Similarly, 40 litres of magnesium would be ignited and extinguished using a 3% solution of Marine 3005 and water applied from the low pressure Dosatron pump.

Results

The two hand-held extinguishers failed to extinguish the fire.

Marine 3005 solution extinguished the fire in 65 seconds and formed a chemical reaction with the magnesium that allowed it to melt more effectively allowing for a higher level of containment for the clean-up crew.

The Magnesium test was only conducted once as an addendum test but the results were significantly impressive to warrant further investigation and testing.

Research has proven that cold aqueous solutions of various salts, including those used in Marine 3005, react at a higher speed allowing the magnesium to dissolve in the marine salt properties.

Summary and conclusion of Marine 3005 Testing

Marine 3005 demonstrated that it could be used effectively across a wide fire-fighting spectrum.

It is easy to use, environmentally friendly and minimises waste. It is understood from previous tests and discussion where the Environmental Agency were present, that they have concluded that Marine 3005 is not detrimental to the environment. Gresham have yet to have sight of their conclusions and therefore cannot confirm this fact.

The only difficulties encountered were with the third party supplied pump as it was not always easy to determine the exact induction rates and volumes of water. Marine 3005 was observed to mix well with water and was easy to use through a firefighting branch at a relatively low water pressure rate.

The scenarios undertaken demonstrated the effectiveness of how Marine 3005 compared against the various types of incident and showed how it would react with different types of materials etc.

It should be noted however that the tests were not designed or intended to evaluate Marine 3005 in large or in constructed building fires. Likewise, the test on straw is not of the scale of a thatched property incident. However, the tests demonstrated how Marine 3005 was able to penetrate the straw and most importantly, prevent re-ignition.

The opinion of all involved was that Marine 3005 tackled the fires more effectively than conventional water or foam. Although the Oil / Fuel test was marginal, Marine 3005 had the distinct advantages in reducing the toxins caused by smoke, restricted re-ignition and of course Marine 3005 is bio-degradable unlike the chemical foams most normally used for this type of fire. In the other tests the primary benefits were rapid extinguishing and less water needing to be applied.

Within the scenarios set to test Marine 3005, it was evident that there was a reasonable temperature drop on application. More significantly however, it was recognised that on the application of Marine 3005 that there was a notable increase in visibility around the fire, thus enabling a greater ability to attack the fire at source. This was particularly evident with the tyre fire which, on application of Marine 3005, almost instantly reduced the large amount of particulate matter pollution. This would therefore provide a safer environment for fire fighting and ultimately expedites the extinguishing of the fire whilst reducing risk to firefighting personnel.

It is our opinion that with the correct training and application, Marine 3005 would alleviate the dilemma faced by firefighters of which medium to use on a specific fire incident. It is apparent from the tests that Marine 3005 works effectively when being delivered at low pressures which would be a distinct advantage when looking at a smaller response vehicle configuration. The wider benefit would be that it could be introduced into a greater variety of firefighting vehicles reducing firefighting time, whilst also being environmentally friendly.

Final Comment

The fire-fighting team was particularly impressed with the speed that Marine 3005 tackled the tyre fire scenario as they can be hazardous and difficult to deal with. Marine 3005 appears to have a unique characteristic of being able to extract the toxic chemicals produced from the breakdown of synthetic rubber compound within the smoke.

The chemicals from a tyre fire usually remain within the fire area but when extinguished with Marine 3005, it would appear that only the vapour from the fire is released into the atmosphere.

As a downside, because of the issues encountered with the pump, it was difficult to be completely accurate of both the concentration and percentage ratio of Marine 3005 to water together with the volume of water used. As a consequence, based on a common format, certain measurements were made through professional judgement.

Although every effort was made to ensure the accuracy and reliability of every test, there is a possibility that some of the data recorded may be slightly inaccurate due to the measurement restrictions of the pump. However, the opinion of Gresham SMS Ltd is that Marine 3005 is a safe, efficient and effective product and would benefit the Fire and Rescue Services through application as a 'one stop shop' or a 'stop the clock' product.

Finally, we would strongly recommend that if further evaluations and tests are to be undertaken, a more accurate and suitable pump is sourced or designed.

Tests observed and witnessed by:
Simon Routh-Jones QFSM
Associate Director, Gresham (SMS) Ltd

Signed 

Report prepared by:
Stephen C. Neville OBE
Managing Director, Gresham (SMS) Ltd

Signed 

Report validated by:
Sir Ken Knight CBE QFSM FIFireE
Chairman, Gresham (SMS) Ltd

Signed 

APPENDIX

Marine 3005 Testing Project

Straw

Materials Used	Water	Water	Marine 3005	Marine 3005	Foam	Dry Powder
Testing Criterial						
Induction Percentage of Product	N/A	N/A	2%	2%		
Flow Rate Applied	7 Bars (100 psi)	7 Bar (100 psi)	7 Bars (100 psi)	7 Bar (100 psi)		
Litres of Product Made	285 ltrs	285 ltrs				
Litres of Product left in container	227	215				
Test & Results STRAW						
Depth of Straw	2 split bales	2 split bales	2 split bales	2 split bales		
Temperature within burn product	18/500	20/680	22/870	24/790		
Time taken to involve Straw min/sec	5.42	2.42	2.27	3.57		
Time Product applied	5.45	2.45	2.30	4.00		
Time when extinguished	6.04	3.06	2.44	4.09		
Time to extinguish (secs)	19	21	14	9		
Litres of Product used to fully extinguish fire	58	70	5 ltrs - 40 ltrs	6 ltrs - 28 ltrs		
Moderated time of tests-secs	20		11.5			

NOTES

1. Figures within 'litres of Product used' refers to litres of product & water.
2. Following extinguishing the fire, water and Marine 3005 were applied for a further 10 seconds to soak into straw to test penetration qualities - on both water tests, reignition took place whilst neither of the two scenarios for Marine 3005 developed reignition over the time monitored.
3. To undertake all four tests the bales of straw needed to be broken in order to carry out the tests in a suitable time - thatch would be denser.
4. The smoke emitted during Marine 3005 test was far less than during the water only test, thus significantly improving visibility.

APPENDIX

Marine 3005 Testing Project

Pallets

Materials Used	Water	Water	Marine 3005	Marine 3005	Foam	Dry Powder
Testing Criterial						
Induction Percentage of Product	N/A	N/A	2%	2%		
Flow Rate Applied	7 Bars (100 psi)	7 Bars (100 psi)	7 Bars (100 psi)	7 Bars (100 psi)		
Litres of Product Made	285 ltrs	285 ltrs				
Litres of Product left in container	240 ltrs	240 ltrs				
Test & Results PALLETS						
Number of Pallet	4	4	4	4		
Temperature within Attack Container	25/930	24/950	24/890	24/910		
Time taken to involve Pallets	4.55	4.05	3.55	4.29		
Time Product applied	5.00	4.08	4.00	4.32		
Time when extinguished	5.32	4.41	4.27	4.56		
Time to extinguish (secs)	32	33	27	24		
Litres of Product used to fully extinguish fire	45 ltrs	45 lts	5 lts - 28 ltrs	5 lts - 48 ltrs		
Moderated time of tests	32.5		25.5			

NOTES

1. Figures within 'litres of Product used' refers to litres of product & water.
2. The smoke emitted during Marine 3005 test was far less than during the water only test, thus significantly improving visibility.

APPENDIX

Marine 3005 Testing Project

Tyres

Materials Used	Water	Water	Marine 3005	Marine 3005	Foam	Dry Powder
Testing Criterial						
Induction Percentage of Product	N/A	N/A	2%	2%		
Flow Rate Applied	7 bar (100 psi)	7 bar (100 psi)	7 bar (100 psi)	7 bar (100 psi)		
Litres of Product Made	285 ltrs	285 ltrs				
Litres of Product left in container	145 litres	165 litres	19 litres	19 litres		
Test & Results TYRES						
Number of Tyres	10	10	10	10		
Temperature within tyre pile (before/after)	24/940	24/980	19/1000	21/980		
Time taken to involve Tyres (mins/seconds)	3.24	3.48	4.15	4.03		
Time Product applied	3.27	4.01	4.19	4.06		
Time when extinguished	3.52	4.23	4.24	4.13		
Time to extinguish (secs)	25	22	5	6		
Litres of Product used to fully extinguish fire	140	120	1 ltr - 40ltr	1 ltr - 40ltr		
Moderated time of tests	23.5 seconds		6 seconds			

NOTES

1. Figures within 'litres of Product used' refers to litres of product & water.
2. Black combustion cloud immediately changed to white vapour on application of Marine 3005 with deposits of black carbonated material dropping to the ground.
3. Instant reaction to extinguish when Marine 3005 applied.

APPENDIX

Marine 3005 Testing Project

Vehicles

Materials Used	Water	Water	Marine 3005	Marine 3005	Foam	Dry Powder
Testing Criterial						
Induction Percentage of Product	N/A	N/A	1%	2%		
Flow Rate Applied	7 Bar (100 psi)	7 Bar (100 psi)	7 Bar (100 psi)	7 Bar (100 psi)		
Litres of Product Made	285 ltrs	285 ltrs				
Litres of Product left in container	5	5	18.6	18.5		
Test & Results VEHICLES						
Number of Vehicles	1	1	1	1		
Temperature within car fire	24/700	22/660	20/710	23/840		
Time taken to involve Vehicles Min/secs	2.40	2.12	1.47	2.20		
Time Product applied	2.45	2.16	1.56	2.27		
Time when extinguished	3.18	2.47	2.11	2.39		
Time to extinguish (secs)	33	31	15	12		
Litres of Product used to fully extinguish fire	280	280	1.4ltrs - 140 ltrs	1.5 ltrs - 110 ltrs		
Moderated time of tests	32		13.5			

NOTES

1. Figures within 'litres of Product used' refers to litres of product & water.
2. The smoke emitted during Marine 3005 test was far less than during the water only test, thus significantly improving visibility.
3. Induction percentage of Marine 3005 changed from Test 1 and Test 2 from 1% to 2% - more effective and better penetration.

APPENDIX

Marine 3005 Testing Project

Oil

Materials Used	Water	Water	Marine 3005	Marine 3005	Foam	Foam
			Smaller Tank- 40 lt	Larger Tank- 40 lt	Smaller Tank- 40 lt	Larger Tank- 40 lt
Testing Criterial						
Induction Percentage of Product	N/A	N/A	2%	2&	3%	3%
Flow Rate Applied			7 Bars (100 psi)	7 Bars (100 psi)	7 Bars (100 psi)	7 Bars (100 psi)
Litres of Product Made	285 ltrs	285 ltrs				
Litres of Product left in container						
Test & Results OIL FIRE						
Quantity of Oil			30 litres	30 litres	30 litres	30 litres
Temperature within oil Container (*C)			25/900	27/980	26/920	23/980
Time taken to involve Oil Fire mins/secs			1.25	0.57	1.12	1.03
Time Product applied			1.00	1.28	1.15	1.06
Time when extinguished			1.13	1.43	1.32	1.20
Time to extinguish (secs)			13	15	14	14
Litres of Product used to fully extinguish fire			0.7 lts - 28 ltrs	1 ltr - 40 ltrs	1.5 ltrs - 40 ltrs	1.5 ltrs - 37 ltrs
Moderated time of tests			14		14	

NOTES

1. Figures within 'litres of Product used' refers to litres of product & water.
2. Application of Marine 3005 for the first test was undertaken with a small cone setting on the branch with a 'direct hit' approach whilst the 2nd test was carried out with a larger cone spread and hence sprayed on.
3. Marine 3005 prevented re-ignition even when introducing fuel/ignition source - Foam re-ignited under similar conditions.
4. The dilution rates for Marine 3005 were provided at 2% whilst Foam was delivered at 3% - no cost comparisons have been considered on this test.

APPENDIX

Marine 3005 Testing Project

Magnesium

Materials Used	Marine 3005	Marine 3005	Foam	Foam	Dry Powder	Dry Powder
					2 Extinguishers	2 Extinguishers
Testing Criterial						
Induction Percentage of Product	7 Bar (100 psi)	& Bar (100 psi)				
Flow Rate Applied						
Litres of Product Made	285				18 Kg	18 Kg
Litres of Product left in container	85				0 Kg	0 Kg
Test & Results MAGNESIUM						
Quantity of Magnesium	40 ltrs	40 ltrs			40 ltrs	40 ltrs
Temperature within oil Container	980					
Time taken to involve Magnesium	16.35					
Time Product applied	16.38					
Time when extinguished	17.43					
Time to extinguish (secs)	65					
Litres of Product used to fully extinguish fire	8 ltrs - 200 ltrs				Did not Extinguish	
Moderated time of tests	65 secs				Did not Extinguish	

NOTES

1. This was an inconclusive test due to the fact we were only able to run one test for Marine 3005 against Dry Powder as previously during the day the original tests failed to ignite, possibly due to defective magnesium.
2. The Magnesium failed to be extinguished by the application of Dry Powder. Two 9 kg extinguishers were used but ran out before the fire was extinguished.
3. Marine 3005 extinguished the fire after a period of time but also developed a sludge which covered the Magnesium.

APPENDIX

Sir Ken Knight CBE QFSM FIFireE

Sir Ken Knight is the Chairman of Gresham (SMS) Ltd

Since leaving his position as the Chief Fire and Rescue Adviser to the UK Government in 2013, Sir Ken Knight has been providing independent consultancy advice to both public and private sector organisations and is the founding Chairman of Gresham (SMS) Ltd.

In May 2013 Sir Ken published an efficiencies review of the 46 UK fire and rescue services entitled 'Facing the Future' which was commissioned by the Government.

From 2007 until January 2013, Sir Ken was the Government's Chief Fire and Rescue Adviser for England, advising Ministers and senior officials on fire policy matters and, providing advice during major and catastrophic emergencies together with operational advice on preparedness and response during the 2012 Olympics.

He produced an independent report for the UK Government on the fire and rescue services response to the widespread flooding in 2007 entitled 'Facing the Challenge'. He was also tasked to undertake a review in the immediate aftermath of a fire in a high rise social housing block in Camberwell, South London in 2009 in which 6 people tragically died.

Sir Ken has also completed reviews of the fire and rescue services in Southern Ireland, Bermuda and Gibraltar and undertook a review of the national fire safety and civil defence arrangements in the Kurdish region of Iraq at the request of the Kurdish Regional Government.

Sir Ken commenced his fire service career as a firefighter in 1966 and subsequently served in a number of UK fire services. At a Chief Fire Officer level he served as the Chief Fire Officer of Dorset and West Midlands Fire Services before becoming London's Fire Commissioner from 2003 until 2007.

Sir Ken is a Companion of the Chartered Management Institute and a Fellow of the Institution of Fire Engineers. He is also a Trustee of the Building Research Establishment and the independent member of the Palace of Westminster fire safety committee.

Her Majesty the Queen awarded Sir Ken the Queens' Fire Service Medal in 1991, the CBE in 2001 and Sir Ken was Knighted in the Queen's Birthday Honours in 2006 in recognition of his outstanding contribution to the fire and rescue service. He was appointed as Her Majesty's Representative Deputy Lieutenant for Richmond upon Thames in 2007.

APPENDIX

Steve Neville OBE ABIFM

Steve Neville is a Fire & Security Professional. With 50 years of hands-on experience of business development, he has recognised and been involved in the vanguard of an industry, adapting to some remarkable changes in regulation, legislation, terrorism and organised crime.

Steve initially trained as an Insurance Fire and Security Surveyor in the City of London for 12 years. Recognising the impact of microchips and emerging new technologies on the fire and security industry in the late 1970's he joined a national security group responsible for insurance and Police liaison.

Throughout the 1980's he became a regular and popular speaker on new technologies and crime trends at police academies, Insurance seminars and Lloyds of London, becoming a major influencer in the introduction of multi discipline integrated technology techniques.

In the early 90's Steve was appointed MD of a specialist bank security company.

Through the use of newly developed computer techniques he worked with senior crime squad officers in police forces throughout the country in identifying serial bank robbers.

With a reputation for company recovery and progression, Steve was invited to join the UK Board of Directors of an American corporation. He was personally involved in security planning with many major national customers including Tesco, Asda, Boots and Next Retail. Here he developed systems to combat racial abuse and physical assault in the workplace.

During the 2012 London Olympic Games, Steve was engaged by LOCOG to review the personal security requirements of senior members of the executive and played an important and discreet role in ensuring their safety.

He has been involved with Livery and the City of London for over 30 years, being a Liveryman of the Worshipful Company of Firefighters; a Freeman of the Company of Watermen and a co-Founder of The Worshipful Company of Security Professionals.

More recently he was elected Chair of the newly established Hi-Rig High Rise Interactive Group, working with senior Managers and Directors responsible for the management of tall towers, in forming common policies and procedures in conjunction with the City of London Police and London Fire Brigade.

Her Majesty the Queen awarded Steve the OBE in 2011 in recognition of his work for Fire & Security charities over the lifetime of his career.

APPENDIX

Simon Routh-Jones QFSM, GIFireE, FCMI, FInstLM

Simon Routh-Jones has over 37 years' experience within the Fire & Rescue Service. Simon started his career as a firefighter and rose through the ranks to become Chief Fire officer and Chief Executive for Wiltshire Fire and Rescue Service.

Simon has extensive and detailed knowledge of how the Fire Service operates both at a local level and at the national political level. He has considerable operational experience having commanded many incidents of all sizes and complexity and is familiar with the political environment in which the Fire Service has to operate in.

From December 2013, Simon worked extensively with Members of Parliament and Officials in the development of a business case for a merger between Dorset Fire & Rescue Service and Wiltshire Fire & Rescue Service. The Secretary of State approved the Combination Order and the new Organisation 'Dorset & Wiltshire Fire and Rescue Service' commenced on 1st April 2016.

Following the announcement of Grant Funding for Transformation within the Fire Service Simon oversaw a successful bid of £5.54m for the development of a new Safety Centre, Organisational HQ Hub, ICT Infrastructure and associated funds in respect to the proposed merger between Wiltshire and Dorset Fire and Rescue Services. This was one of the largest Fire/Fire bids granted by the UK Government to date.

Simon provided strategic leadership and effective management for the service and for establishing a framework for management direction, style & standards and for monitoring the performance of the organisation. This included Risk Management and Business Continuity thus ensuring that suitable measures were in place to meet the Service's legal and strategic requirements.

In conjunction with a restructure within the Service, Simon introduced a significant cultural change, giving ownership to decision-making and developing a culture of freedom and ownership through seven key areas of behaviour which are driven through a RESPECT agenda (Responsibility, Equality, Supportive, Professionalism, Excellence, Communication, Transformation).

Simon developed and implemented a highly successful Juvenile Firesetters Programme to intervene and educate young adults in their obsessions and actions in fire and deterring youths from firesetting. This programme has subsequently been introduced and adopted throughout the South West region and has been developed further to become part of the National approach to youth education in the prevention of fire and firesetting within Fire Safety Education. In addition, Simon oversaw the introduction of Anti-social behaviour intervention scheme, which addressed behavioural problems within the community and teaches behavioural changes and integration back into Society.

Simon was responsible for the drive behind and introduction of Domestic Sprinkler Systems within the UK. Wiltshire led on the first residential area installations, which remains the biggest single social housing installation in Europe.

Simon had the responsibility for Research & Development, new technology introduction and for product testing of new equipment with Wiltshire Fire & Rescue Service.

Simon is a Fellow of Institute of Leadership and Management, a Fellow of Chartered Management Institute, a member of Institute of Fire Engineers and a Member of Solace.

Simon has recently been appointed as an Inspector within the HM Inspectorate of Fire for Scotland.

Her Majesty the Queen Awarded Simon the Queens' Fire Service Medal which he received in the New Years' Honours of 2015.