SUBMISSION TO THE SENATE EDUCATION, EMPLOYMENT AND WORKPLACE RELATIONS COMMITTEE

ON THE SAFETY, REHABILITATION AND COMPENSATION AMENDMENT (FAIR PROTECTION FOR FIREFIGHTERS) BILL 2011

1. My name is Brian Kenneth WHITTAKER and I have been employed by the Metropolitan Fire Brigade (MFB) since 1985 and currently hold the position of Commander, HAZMAT/Scientific Unit, Emergency Management department.

2. I have had extensive involvement in the field of Hazardous Materials (HAZMAT) response, including the development and implementation of the HAZMAT Technician programme. This programme saw significant improvements in the education of firefighters and equipment used in the response to incidents involving hazardous materials.

3. My qualifications include an advanced diploma of public safety and firefighting management, diploma of fire technology and HAZMAT technician.

4. For the past 8 years I have worked in the HAZMAT Unit, my duties including representation on the Australasian Fire Authorities Council – HAZMAT Working Group, development of HAZMAT training materials based on Public Safety standards and National Fire Protection Association (NFPA) standards, research and implementation of technical equipment required for HAZMAT response.

Fireground Hazards

5. Firefighters are exposed to many hazards on a fireground. Their workplace is an uncontrolled environment where safety controls cannot eliminate all hazardous products encountered. Risk of exposure to various toxic gases, vapours and particulate matter found in fire smoke does exist. These products can be carcinogenic and cause irritation, incapacitation, systemic toxicity and asphyxiation. The effects from exposure to the above products can be both acute and chronic.

6. Many studies have concluded that the combustion or pyrolysis (heating) of general household materials can generate many carcinogenic products. The prediction of combustion products is a complex area and there is potential for generation of a huge range of products depending on the nature of the fire and the conditions of burning. Although each fire will have individual characteristics there are commonalities.

7. Some of the common toxic chemicals which may be present in fire effluent include;

   - Polycyclic Aromatic Hydrocarbons (PAHs) - naphthalene, benzo[a]pyrene
   - Irritant gases - formaldehyde, acrolein, oxides of nitrogen
   - Asphyxiant gases - carbon monoxide, hydrogen cyanide

   Note : Refer to Appendix 1 – Hazardous combustion products generated with respect to material involved in fire.

Gas Detection Equipment

8. Fire services operate a range of gas detection equipment that monitor for flammability, oxygen levels and many toxic compounds. Detection is performed primarily at HAZMAT type incidents or investigation of an emergency call that does not involve a fire.

9. When responding to a fire, or detection has identified a flammable environment, firefighters will react accordingly and perform fire fighting tasks in the protection of life and property, this will include the wearing of structural firefighting uniform and breathing apparatus.

10. Gas detection at a fire scene is not routinely performed as firefighters are educated in the hazards of fire smoke and the possible by-products produced from general household materials.

11. The purpose of detection at a fire scene is to establish safe evacuation distances and areas for the public. It is not a research function.

Hazard Control

12. Firefighters attempt to eliminate all hazards to mitigate and control an emergency situation. In regards to the 'Hierarchy of Controls' the core activity of firefighters is to eliminate, substitute and isolate hazards. This is routinely achieved by the use of engineering controls (equipment), administrative controls (skills and operational protocols) and PPC/E. However with the inherent nature of fire fighting it is impossible to eliminate all hazards.

Personal Protective Clothing/Equipment for hazardous material incidents and structure fires

13. Today's personal protective clothing (PPC) and equipment (E) provides protection from most hazards encountered. As per NFPA standards PPC/E is provided in several levels;

    Level A Fully encapsulating gas tight suit with breathing apparatus (BA)

    Level B Chemical splash suit (protection from liquids and solids) with BA

    Level C Chemical splash suit (protection from liquids and solids) with respirator

    Level D Structural firefighting ensemble with breathing apparatus

14. Level A, B and C are for incidents involving hazardous materials which do not involve fire or risk of fire as the protective equipment is not suitable for incidents that involve fire.

15. Level D protective equipment is designed to protect firefighters when working in a fire environment or threatened fire environment, however does not provide the fully encapsulated protection as specified in Level A.

16. The issue with PPC is selectivity, specifically regarding fit for purpose due to specific hazards encountered and task requirements. For example, the use of fully encapsulating gas tight suits at an incident involving the spill of benzene, with no threat of fire is the appropriate level of protection and is fit for purpose. This scenario would change dramatically if the benzene was on fire, or if readings from detection equipment indicated the spill had created a flammable environment. PPC would change from gas tight suits to structural firefighting ensemble to protect the firefighters from the immediate hazard of fire/explosion.

17. AS/NZS ISO 6529:2006 and AS/NZS 6530:2006 specifies the requirements for fully encapsulating gas tight suits and chemical splash suits respectively. The requirements for these standards are in terms of chemical resistance, mechanical strength, indices of penetration and repellence.

18. The above standards do not specify a requirement for the suits to be **fire resistant/proof**, therefore these suits cannot be used for firefighting purposes. The reason that the standards do not specify that requirement is because the material is not suitable for fire fighting.

Exposure

19. Firefighters are at risk of exposure at several levels. Chemical exposure can be from inhalation or absorption (through skin, eyes, wounds, etc). These routes of entry are well protected when wearing Level A PPE (fully encapsulated gas tight suit with breathing apparatus) at a HAZMAT incident.

20. However, as discussed previously Level A is inappropriate at a fire, therefore structural firefighting ensemble must be worn. It is not possible for a firefighter to wear Level A and Level D protective equipment at the same time as the firefighter would quickly perish from metabolic heat build-up which could damage firefighter's internal organs. Additionally the two different types of protective equipment are incompatible by the very nature of their design and purpose.

21. In emphasising the above, Level A provides a situation that protects firefighters from the risk of exposure from gases, vapours and particulate matters.

22. Structural fire fighting ensemble has limited protection from gases, vapours and particulate matter due to the requirement and necessity to have a compromise between protection from radiated heat exposure and the release of metabolic heat build up. In short the breathability is in effect a hazard to firefighters that cannot be eliminated.

23. As explained above, the products of combustion will penetrate/permeate structural firefighting uniforms (Level D), including the vapour barrier. This will result in exposure of toxins to the firefighter by absorption through the skin.

24. The areas where the uniform is separated (between sleeves and gloves, trousers and coat, legs and boots, collar and hood) also provide a potential inlet for gases, vapours and particulate matter. The inherent nature of fire fighting provides an environment which prevents the design of protective equipment that will negate these inlets and possible exposures.

25. It should be noted that exposure, and the extent of exposures may also come at different stages of fire fighting:

    Primary exposure

    Firefighters in direct contact with smoke. Uniform exposed to gas, vapour and particulates can not be eliminated due to the primary requirement of fire-fighters to perform rescue and fire fighting suppression activities as part of their core activities.

    Secondary exposure

    The contaminant is transferred when contact is made by fire-fighters when touching exposed materials (uniform or equipment), commonly known as 'cross contamination' and occurs during post fire operations. Procedures are in place to eliminate secondary exposure as much as practicable however; secondary exposure is a risk that cannot be totally eliminated.

Respiratory protection

26. Exposure or contamination by inhalation to the fire-fighters respiratory system is eliminated by the wearing of a breathing apparatus which offers the highest level of respiratory protection.

27. The protection of fire fighter respiratory systems and the equipment that provide such protection has significantly evolved over the years. We have state of the art protection for the respiratory system. However, there is no equipment that provides this same level of protection, in fire fighting operations, from absorption of toxins through the skin. This means the risk of absorption of toxins through the skin cannot be eliminated.

Summary

Fire effluent (smoke, by-products of combustion) presents significant, compounding chemical hazards to fire-fighters.

Global research has concluded that components of fire smoke are carcinogenic.

Attachment one specifies materials that are utilised globally in manufacturing. These items include household furnishings and materials that are commonly found in structure fires irrespective of location or country.

The protection of firefighters has evolved over the last decade and contemporary firefighters adhere to strict hazard control measures inclusive of the wearing of Personal Protective Clothing and Equipment.

It is currently not possible to fully protect a firefighter from fire/heat and the chemical hazards associated with the smoke and by-products of combustion. The risk of exposure to these carcinogenic products has been identified however technology has not been able to eliminate all risk that remains unavoidable in the duties of a firefighter.

Dated this 28th day of July 2011

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References

A Toxicological Review of the Products of Combustion, 2010, J.C. Wakefield Health Protection Agency UK, Chemical Hazards and Poisons Division

Smoke, 2009, Jean Marie McMahon MD Cyanide Poisoning Treatment Coalition US

Cancer Among Firefighters : A review and Meta-analysis of 32 Studies, 2006 G.K Masters PhD, American College of Occupational and Environmental Medicine

Appendix 1 – Hazardous combustion products generated with respect to material involved

	Complex Molecules		Irritant Gases					Asphyxiant gases	
	Polycyclic Aromatic Hydrocarbons (PAHs)	Particulate Matter (PM)	Formaldehyde / Acrolein	Ammonia / Chlorine	Hydrogen Chloride	Sulphur Dioxide	Oxides of Nitrogen	Carbon Monoxide	Hydrogen Cyanide
Polymeric Materials. (plastics, resins, fibres, foams)	H	VH	H	P	VH	P	H	VH	VH
Wood. (timber constructions, furnishings, vegetation)	P	VH	H	–	–	–	P	H	–
Rubber / Tyres	H	VH	H	P	P	VH	P	VH	P
Fossil Fuels (Petrol, Oil)	H	VH	H	–	–	P	–	H	–
Detection Capability	No	No	Monitor concentrations only, does not identify.	Yes	No	Yes	Yes	Yes	Yes

Key

VH	Likely to be present in Very High concentrations
H	Likely to be present in High concentrations
P	Likely to be present
–	Unlikely to be present

Sourced from Health Protection Agency UK, Chemical Hazards Division, A Toxicological Review of the Products of Combustion 2010