



Australian Government

PUAFIR606 Apply principles of combustion and fire dynamics to fire scene investigation

Release: 1

PUAFIR606 Apply principles of combustion and fire dynamics to fire scene investigation

Modification History

Release 1. This is the first release of this unit of competency in the PUA Public Safety Training Package.

Application

This unit of competency involves the skills and knowledge required to apply the principles of fire science and fire dynamics to a fire scene investigation. It includes applying principles of fire chemistry, chemistry of combustion and fire behaviour.

The unit is applicable to the work of a specialist fire investigator.

The fire sector is those sections of government departments, statutory authorities or organisations that have responsibility under jurisdictional arrangements for the delivery of firefighting and fire management services.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Not applicable.

Competency Field

Fire

Unit Sector

Fire

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Apply principles of fire chemistry in fire

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

1.1 States of matter, changes and impact on combustion are explained in relationship to fire scene investigation

behaviour		when reporting on fire behaviour
	1.2	Chemical reactions, basic chemical structures, bonds and energy are defined in relationship to fire scene investigation when reporting on fire behaviour
	1.3	Process of chemical reaction and oxidisation is explained in relationship to fire scene investigation when reporting on fire behaviour
	1.4	Organic and inorganic compounds are distinguished in relationship to fire scene investigation when reporting on fire behaviour
	1.5	Hydrocarbons and how they are constructed are explained in relationship to fire scene investigation when reporting on fire behaviour
	1.6	Pyrolysis is defined in relationship to fire scene investigation when reporting on fire behaviour
	1.7	Chemistry of combustion in solids, liquids and gases is explained in relationship to fire scene investigation when reporting on fire behaviour
	1.8	Vapour density and its impact on fire spread is assessed in relationship to fire scene investigation when reporting on fire behaviour
	1.9	Different fuel types are identified, and fuel loads are assessed in relationship to fire scene investigation when reporting on fire behaviour
	1.10	Difference between exothermic and endothermic reactions is explained in relationship to fire scene investigation when reporting on fire behaviour
2 Apply knowledge of fire physics and impact on fire behaviour	2.1	Evidence of presence of heat is identified and explained by applying theory of heat release and methods of heat transfer
	2.2	Stages of fire development in structures are identified and outlined in relationship to fire scene investigation when reporting on fire behaviour
	2.3	Stages of fire development in a compartment are identified and detailed in relationship to fire scene investigation when reporting on fire behaviour

- 2.4 Concepts of flashover and backdraught, and their signs and symptoms are outlined in relationship to fire scene investigation when reporting on fire behaviour
- 2.5 Effect of fuel load on fire behaviour is explained in relationship to fire scene investigation when reporting on fire behaviour
- 2.6 Deflagration and detonation are outlined in relationship to fire scene investigation when reporting on fire behaviour
- 2.7 Types of ignition are outlined in relationship to fire scene investigation when reporting on fire behaviour

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to PUAFIR606A Apply principles of combustion and fire dynamics to fire scene investigation.

Links

PUA Training Package Companion Volume Implementation Guide is found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=3eca5672-6d5a-410b-8942-810d0ba05bbf>

Assessment Requirements for PUAFIR606 Apply principles of combustion and fire dynamics to fire scene investigation

Modification History

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and includes

- applying Work Health and Safety (WHS)/Occupational Health and Safety (OHS) organisational requirements including risk mitigation
- assessing fuel type and load at investigation scene
- demonstrating knowledge of fire physics and impact on fire behaviour
- evaluating impact of vapour density on fire spread
- identifying and assessing ignition sources
- identifying unrelated fire science evidence including finger prints, forced entry, signs of burglary and tool marks
- implementing legislation, codes of practice and industry standards to fire investigation
- undertaking risk analysis of fire scenes including consideration of electrical hazards, hazardous materials, physical hazards and environmental hazards
- using physical principles to fire investigation including compartment fire behaviour and wildfire behaviour and fire spread at an investigation scene
- validating fire investigation conclusions using scientific principles
- working with principles of fire chemistry when investigating fire behaviour including methodology to determine fire cause and theory related to principles of fire chemistry and physics to develop hypothesis based on fire scene evidence

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria and includes knowledge of

- chemistry and properties of flammable and combustible liquids, solids and gases
- chemistry of combustion including combustion products of common fuels
- chemistry of pyrolysis
- Classes of fire and fuel types including Class A solid carbonaceous materials, Class B flammable liquids, Class C flammable gases, Class D combustible metals such as sodium, potassium, calcium, magnesium, aluminium dust, zinc dust, titanium dust, Class E fires involving energised electrical equipment and Class F fires involving cooking oil and fat
- combustion and fire dynamics at fire scene investigations including deflagration and

detonation including dust and vapour explosion, mechanical explosion and solid explosion, effect of oxygen concentration, combustion products of different fuels and fire extinguishment theory and methods

- compartment fire development and spread including ignition, growth, flashover, fully developed, backdraught and decay
- fire extinguishment theory
- flammable vapours
- ignition temperatures including flashpoint, fire point, auto-ignition temperature or flame point and explosive limits
- interrelationship between fuel size, quantity, arrangements, moisture content, weather and topography on wildfire development and behaviour
- mathematical formulae to assist with the determination of cause and origin
- methods of heat transfer including radiant, convection, conduction and direct flame contact
- non-piloted autoignition
- products of different fuels
- spontaneous combustion including drying oils, chemicals, vegetable matter and friction
- states of matter including solids, liquids and gases
- theory of heat release including heat flux, heat release rate and temperature
- toxicity of combustion gases
- types of combustion including incipient, smouldering and flaming
- types of ignition including chemical or reaction, friction or mechanical, flame or heat, self-ignition and spark, arc or electrical
- vapour density
- Work, Health and Safety (WHS)/Occupational Health and Safety (OHS) organisational requirements including safe work practices

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations current at the time of assessment.

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Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations. Where this is not appropriate, assessment must occur in industry approved simulated workplace operational situations that reflect workplace conditions.

Resources for assessment must include access to

- a range of relevant exercises, case studies and/or simulations including:
 - workplace scenarios to capture the range of causes likely to occur for which evidence

needs to be gathered and managed

- relevant and appropriate materials, equipment, tools and personal protective clothing and equipment currently used in industry
- applicable documentation including organisational procedures, industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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