

# STADIO

## HIGHER EDUCATION

**This document outlines the purpose, outcomes, and key concepts addressed within the fire-related modules encompassed in the fire-related qualifications.**

### **Purpose and key elements of the fire services modules.**

#### **Fire Science Management and Application (NQF6).**

##### **Purpose:**

This module equips firefighters and officers with the essential skills needed to effectively manage hydraulic systems, pump performance, and flow rate dynamics during firefighting operations. Participants will cultivate expertise in critical decision-making areas, including water pressure requirements, nozzle selection, and pressure loss mitigation, as well as applied physics and chemistry for managing heat, load distribution, and hazardous materials. With a strong emphasis on a strategic approach, the module prepares fire service personnel to apply scientific principles to ensure safe and efficient firefighting, ultimately optimising team performance and operational effectiveness in emergency scenarios.

##### **Outcomes:**

Upon successful completion of this module, the student will be able to:

1. Develop and implement effective strategies to reduce electrical hazards during fire emergencies, ensuring the safety of personnel and equipment.
2. Formulate and execute strategies to manage fire dynamics, including understanding the behaviour of water and other extinguishing agents, to enhance firefighting operations.
3. Create and deploy strategies for the optimal allocation of water and other firefighting resources, informed by hydraulic calculations and operational requirements.
4. Develop and apply strategies that incorporate principles of physics to make well-informed decisions in complex firefighting situations, maximising resource utilisation and minimising risks.
5. Utilise fire science principles, hydraulic calculations, and safe firefighting practices to maintain a high level of operational readiness.
6. Apply principles related to chemical behaviour and hazardous materials effectively.

##### **Key Elements:**

###### Fire service hydraulics and water supplies

- Calculation of water flow rates, nozzle discharge, and hose lengths in firefighting operations.
- Applying Pascal's Law

Office 101, The Village Square, c/o Oxford and Queen Streets, Durbanville, Western Cape, 7550

CPD Vorster – Director | S Totaram – Director | D Singh – Director | JJ Human – Director

Company registration number: 2004/031722/07

- Transmission of pressure in hydraulic systems, ensuring the effective operation of firefighting equipment.
- “Firefighters” formula for pressure
- Water pressure requirements and nozzle selection in various firefighting scenarios
- Hydraulic calculations to determine the appropriate water pressure, flow rate, and nozzle selection for different firefighting scenarios.

## Pump performance and water flow

- Evaluations of pump performance metrics
- Strategies to minimise pressure loss due to friction in firefighting systems
- Pressure and flow dynamics
- Balance of kinetic energy and static energy in firefighting operations
- Strategies to prevent and mitigate water hammer effects in firefighting systems.

## Flow rate

- Discharge, velocity, and flow rate in firefighting operations
- Derivation of the “firefighters” formula
- Making informed decisions about nozzle selection and water pressure requirements in various firefighting scenarios.
- Bernoulli’s equation to manage the pressure and velocity of water in firefighting operations.

## Applied Physics

- Fire loads and water loads on building structures in firefighting strategies
- Moments and levers
- Effects of power, energy, and Newton’s Laws of Motion in fire scenarios
- Heat transfer processes
- Electricity and electrical applications

## Chemistry

- Properties and states of matter
- Flammability and heat on materials
- Radioactivity and radioactive materials
- Compounds, mixtures, and chemical materials in emergencies
- Chemical reactions
- Elements, compounds, chemical reactions, chemical equations and balancing
- Properties of elements and molecular formulae
- Combustion
- Organic chemistry

## **Fire Technology Management I (NQF 5)**

### **Purpose:**

The module focuses on the responsibilities of fire service managers in overseeing personnel assigned to operate firefighting vehicles, pumps, and other specialised equipment. Students will be introduced to the structure of the fireground organisation and its associated functions.

This module addresses the challenges involved in developing an effective fireground organisation and its related operations. By engaging with the information and principles presented, students will enhance their competency as managers.

Additionally, students will receive support in improving their skills in firefighting tactics and strategies for effective incident management.

The incident command system will be introduced to enable the fire service managers to effectively manage incidents by integrating facilities, equipment, personnel, procedures, and communications.

In addition, this module aims to address the progressive challenges, hazards and risks in veld and forest fires.

### **Outcomes:**

**Upon successful completion of this module, the student will be able to:**

1. Apply effective incident management and emergency procedures.
2. Manage the operational procedures to control and extinguish fires.
3. Use the incident command system to manage operational incidents in the operational work environment.
4. Apply or delegate functional responsibilities to manage subordinates assigned with specialised firefighting equipment.
5. Demonstrate an understanding of control and extinguishment of wildland fires and the challenges associated with the risks and hazards of these fires.

### **Key Elements:**

Understanding fire behaviour

- Fire Behaviour terminology
- The combustion process
- Classes and characteristics of fires
- Managing dangerous fire events
- Control and manage the confinement and extinguishment

The basics of effective incident command management

- Leadership on the ground
- Development of command presence
- Fire officer responsibilities
- Incident Command

- Incident communication systems
- Transfer of Command

## Fireground command

- The management functions of fireground command
- Role and responsibilities of the fireground commander
- Decision-making of the fireground manager
- Command and control
- Command functions
- Fireground etiquette
- Size-up and situation evaluation

## Breathing apparatus operation

- Fire officer's responsibility regarding breathing apparatus procedures
- breathing apparatus crews
- Breathing apparatus control boards
- Communications and safe working procedures

## Wildland /vegetation firefighting

- Manage fire line safety
- Fire weather
- Topography and fuel
- Fireline construction
- Use of water and fire
- Use of firefighting resources
- Initial attack: strategies and tactics
- Use of hand tools
- Danger of vegetation fires

## Driver and pump operator

- Skills and Physical abilities needed by the driver/pump operator
- Types of fire apparatus
- Inspection and maintenance
- Operating emergency vehicles
- Positioning firefighting vehicles
- Water as a fire-extinguishing agent
- Fire hose nozzles
- Theoretical aspects of fire streams

- Operating fire pumps
- Water resources
- The responsibility of the pump operator to provide sufficient volume of water and at the pressure needed
- Loss of pressure due to friction
- Pressure loss for varying types of hose
- Kinetic and Static energy
- Path of water from source to jet
- Water Hammer
- Relay pumping
- Use of foam equipment
- Apparatus testing

## **Fire Technology Management II (NQF6)**

### **Purpose**

This module addresses the evolving challenges of fire-ground control and coordination. It aims to cultivate fire service officers into proficient managers by exposing them to effective firefighting strategies and equipping them with the knowledge and systematic approaches needed to tackle fire hazards and manage the spread of fire.

The content will cover the guidelines, procedures, and actions that fire managers should follow when responding to or attending hazardous chemical incidents.

Furthermore, the module emphasizes the importance of training and physical fitness for firefighting personnel, along with the effective management of fire grounds and the deployment of firefighting vehicles. In addition, it highlights the pivotal role of the fire service manager in executing both defensive and offensive fire attack operations.

### **Outcomes**

Upon successful completion of this module, the student will be able to:

1. Tactical deployment of firefighting vehicles and apparatus to all incidents or fires.
2. Identify and apply different firefighting strategies and tactics to emergency incidents.
3. Apply the functions and responsibilities of the fire service officer to ensure command and control when dealing with hazardous materials or chemical incidents.
4. Apply and coordinate the implementation of strategic, tactical and action plans applicable to fire and other emergencies.
5. Fire service personnel's wellness, training, and fitness programs.

### **Key Elements:**

Tactical deployment of firefighting and support services.

- Functions of firefighting crews (engine companies)

- Functions of support crews (truck companies)
- Predesignated assignments for support crews

## Standards of offensive operations at all risk incidents

- Offensive fire attack strategy.
- Operational personnel during search operations
- Ventilation as an offensive operation.
- Coordinate and control the salvage of property

## Standards of defensive operations

- Defensive fire attack strategy
- Transition of strategy
- Managing a retreat
- Coordination of division/group/sector leaders

## Firefighting principles and practices

- General strategic plans at the operational level
- Tactical plans at the operational level
- Action plans at the operational level
- Fireground control and coordination

## Hazardous material incidents

- Identification of hazardous materials
- Training and development of hazardous materials response teams
- Setting up and managing a hazardous materials response team
- Decontamination function at a hazardous material incident

## Physical fitness and wellness in the firefighting profession

- The need and beneficial outcomes of physical fitness in the fire service
- Evaluation of physical fitness
- Physical fitness program
- Wellness education
- Critical incident stress management
- Employee assistance

## **Fire Technology Management III (NQF6)**

### **Purpose:**

This module equips fire service officers of all ranks with the essential information, skills, and knowledge necessary for excellence in their roles. The development of leadership, supervision, and management is crucial for enhancing performance, and this module focuses explicitly on cultivating the leadership capabilities of fire officers.

Additionally, the module will address the vital function of fire ground, emphasising the evaluation of situations and preparedness planning for incidents. It will also cover the organisation, coordination, and command required during emergency situations.

Furthermore, the module will delve into the aspects of fire and arson investigation, outlining the procedures to follow and the responsibilities that fall on the fire service manager.

### **Outcomes:**

#### **Upon successful completion of this module, the student will be able to:**

1. Manage fire services personnel in the work environment.
2. Apply situation evaluation of fire or emergency incidents on a fire-ground.
3. Administration and strategic planning in the fire services work .
4. Develop pre-fire and preparedness plans for fires and incidents.
5. Control and maintain communication at the fire ground or other operational incidents.
6. Coordinate and manage offensive and defensive operations and make quick, effective decisions.
7. Fire and arson investigation process and ensure compliance with prescribed procedures.

### **Key Elements**

#### Fire service personnel management and administration

- Overview of fire service personnel management
- Fire personnel job analysis
- Training and development of fire service personnel
- Discipline in the fire service environment
- Ethics in the fire service

#### Operational management in the fire service

- Introduction to Administration
- Strategic planning
- Developing fire apparatus specifications
- Coordination of public education

## Organising, coordinating, and commanding emergency incidents

- Initial command and control
- Developing standard operating procedures
- Evaluating life safety decisions and Coordinating evacuation procedures
- Organize and coordinate offensive operations.
- Organize and coordinate defensive operations.
- Property conservation as an offensive attack.
- Tactics and strategic objectives used in high-rise firefighting

## Preplanning

- Pre-fire planning
- Management of the pre-fire plan
- Coordinating pre-fire inspections
- Preplanning computer programs
- Effective utilization of fire preplanning
- The evaluation system

## Communications

- Communication problems
- Initiating operational communications
- Maintain effective operational communication.
- Control communication in the work environment

## Fire and arson investigating

- Fire investigation
- Drafting of an official fire report
- Determining the cause of the fire
- The cause analysis.
- Recognizing and preserving evidence of arson
- The framework of the investigation report
- Reasons, motives, and methods of arson

## **Fire Safety Legislation (NQF5)**

### **Purpose:**

This module focuses on legislation and fire protection codes of practice to enhance the knowledge and skills of managers in their roles as fire officers. Students will become familiar with fire safety by-laws aimed at fostering a fire-safe environment within a municipality's jurisdiction.

The module will cover relevant procedures, methods, and practices that regulate fire safety. It will also emphasize the powers, functions, duties, and responsibilities of the chief fire officer and fire service personnel. Additionally, the purpose and application of SANS codes of practice will be introduced.



## **Outcomes:**

Upon successful completion of this module, the student will be able to:

1. Inspection of buildings and enforcement of fire safety legislation in the work environment.
2. Demonstrate an understanding of fire safety By-Laws to ensure a fire-safe environment within the area of jurisdiction.
3. Identify fire service members' powers, functions and responsibilities as prescribed in the Fire Brigade Services Act, 99 of 1987.
4. Apply relevant legislative requirements and approved by-laws for hazardous and managed transportation.
5. Apply the requirements of the SANS codes of practice and By-Laws related to flammable liquids and liquid petroleum gas in the work environment of the fire services.
6. Manage the prohibitions of flammable substances' use, handling, and storage.

## **Key Elements**

### Fire Safety By-Law

- Definitions and interpretation
- Purpose and application of By-Law
- Establishment of Fire Service
- Regulation of fireworks
- Declaration of Fire Control Zones
- Spray painting and spraying rooms.

### Community Fire Protection

- Fire protection of buildings and premises
- Emergency evacuation plans
- Public gatherings and events
- Water supply for firefighting purposes
- Prevention of fire hazards

### Flammable substances

- The certification for usage, handling, and storage of flammable substances on premises
- Principles of sound record keeping
- Execution of by-laws dealing with the storage of flammable substances

### Hazardous substances

- Legislative requirements for hazardous substances
- Development of by-laws relating to hazardous substances
- Identification of the different groups of hazardous substances
- Coordinate the inspection of transport, supply, and delivery of dangerous goods.
- Manage and control the issuing of transport permits in terms of legal requirements.

## Fire Brigade Services Act

- Legal functions of the Fire Services concerning the Fire Brigade Services Act, 99 of 1987
- Procedures to appoint Fire Brigade reserve force.
- Regulation Designated services

## SANS codes of practice on Petroleum products and liquid petroleum gas

- Enforcement of the legal stipulations and prescriptions regarding the handling, storage, and distribution of liquified petroleum gas products
- Coordinate fire prevention and safety inspections at liquified petroleum gas installations.
- Fire risk precautions and control of fires
- Enforcement of legal requirements relating to the handling and storage of LPG containers.

## Fire Risk Management (NQF5)

### Purpose:

This module addresses the evolving risk challenges encountered on the fire ground and within the community. The material presented here aims to develop fire service officers into effective managers by establishing risk management objectives essential for evaluating current services and planning for future needs.

By assessing the current level of risk alongside the acceptable risk threshold for the community, managers can set clear objectives aimed at minimising or mitigating these risks. This strategic planning process encompasses a comprehensive community risk assessment and considerations for related hazards.

Furthermore, this module will introduce fire-ground risk analysis to enhance safety measures and control the risks associated with firefighting operations.

### Outcomes:

Upon successful completion of this module, the student will be able to:

1. Demonstrate an understanding of fire risk management and the reduction of risk in the work environment
2. Apply the fire risk accountability system to manage the rapid intervention teams on the fire ground.
3. Execute strategic planning to include a community fire risk assessment and set objectives for minimising or reducing risk.
4. Implement risk management practices to be prepared for all types of risks and to determine what risks exist and how to manage those risks.
5. Manage the safety of personnel in the work environment

## Key Elements:

### Introduction to fire-ground Risk Management

- Factors contributing to firefighter injury and death.
- Utilizing accountability systems
- Manage rapid intervention teams.
- Reducing risks
- Classic risk management

### Community Fire Risk

- Evaluating local risk
- Planning for necessary resources
- Community fire risk assessment
- Risk identification
- Risk analysis
- Community risk management
- Risk control measures

### Risk Management for the Fire services

- Contemporary Risk management
- Risk management process
- Risk management planning
- Risk management evaluation
- Risk analysis of operational dangers

### Fire Service safety manager

- Standard safety procedures
- Departmental safety rules
- The development of the fire department safety officer
- The fire or safety officer as a risk manager
- The health and safety officer's responsibilities in the training process
- Managing a safe working environment
- Managing equipment safety and personal protective equipment policies
- Managing response and apparatus/vehicle safety
- Managing incident scene safety

### Dangerous firefighting tactics

- Causes of firefighter injuries
- Coordination of safety procedures during rescue operations
- Dangers at the fire location
- Manage and control safety procedures when using specialised firefighting equipment.
- Evaluating risk-taking decisions

## **Incident Command Management Systems (NQF6)**

### **Purpose**

This module introduces the incident command system designed to enable fire service officers and managers to effectively manage incidents by integrating a combination of facilities, equipment, personnel, procedures, and communications. It will cover responses to emergencies and the implementation of the incident command system, providing detailed information about both the incident command and unified command systems, as well as the five key management activities: Command, Operations, Planning, Logistics, and Finance/Administration. Additionally, the module emphasises the importance of ensuring the safety of personnel and the public during an incident.

### **Outcomes:**

Upon successful completion of this module, the student will be able to:

1. Identify the role players in the different functional areas of the incident command, namely the incident commander, operations, planning, logistics, admin, and finance section chiefs.
2. Outline the functions, responsibilities, and accountability of all the critical role players in each function, including the incident commander, operational-, planning-, logistics-, and admin/finance section chiefs.
3. Apply the functions of the incident commander to coordinate and evaluate the functions of the command staff and all role players to implement the incident action plan at the scene of a major incident.

### **Key Elements:**

#### Command staff- roles and responsibilities

- Leadership responsibilities
- Elements of incident command
- The incident commander
- Incident command responsibilities
- Public information officer
- Safety officer
- Liaison officer
- Agency representative
- Area Command

#### General staff: Operations roles and responsibilities

- Operations section chief
- Staging area manager
- Branch director
- Division supervisor
- Strike team
- Single resource leader
- Air operations branch director
- Air tactical group supervisor
- Air support group supervisor

## General staff: Planning- roles and responsibilities

- Planning section chief
- Situation unit leader
- Resource unit leader
- Documentation unit leader
- Demobilisation unit leader
- Technical specialist

## General staff: Logistics- roles and responsibilities

- Logistics section chief
- Service branch director
- Communications unit leader
- Medical unit leader
- Food unit leader
- Support branch director
- Supply unit leader
- Facilities unit leader
- Ground support unit leader

## General staff: Finance roles and responsibilities

- Finance section chief
- Situation unit leader
- Compensation claims/ unit leader
- Cost unit leader
- Procurement unit leader
- Time unit leader

Regards



Andre Roets

Discipline Leader: Public Safety Management

School of Administration and Management