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GP 24-23

Active Fire Protection - Offshore

Group Practice

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This revision of Engineering Technical Practice (ETP) GP 24-23 includes updating the document format, reorganisation of some clauses, and minor content change. The changes were so extensive that revisions have not been identified in the margin as is normal practice.

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1. Scope

- a. This Group Practice (GP) provides requirements for the selection, design, and installation of active fire protection for offshore exploration and production facilities.
- b. This GP covers active systems, including firewater supply systems, fixed fire protection, portable equipment, extinguishers, and the arrangements for manual firefighting.
- c. This GP does not define the need for active fire protection or the standard for fire protection.
- d. This GP covers the protection of offshore fire hazards that may constitute a direct risk to life through their immediate effects or through escalation, including well, well service, riser, process hydrocarbon hazards, fuel, utilities, and accommodations.
- e. This GP covers drilling and blowout hazards and equipment on production installations or wellhead towers in which the drilling rig is an integral part of the facility. This GP does not apply to mobile offshore drilling units (MODU) or the fire protection of “knock down” drilling rigs that are owned by others and assembled as required on the facility.
- f. This GP does not cover use of active systems to reduce the overpressure of explosions, but it does cover the protection from fires that may occur following plant or structural damage caused by the explosion.

2. Normative references

None.

3. Terms and definitions

For the purposes of this GP, the following terms and definitions apply:

Active fire protection

A system for fire prevention or control requiring moving parts and mechanical system that may or may not require human intervention to initiate. These include water deluge and foam systems, gaseous suppression systems, water mist, monitors, and fire extinguishers.

Catastrophic hazards

Hazard of severity such that preservation of lives of personnel on facility cannot be demonstrated and design is such that effects cannot be mitigated to allow controlled evacuation.

Catastrophic escalation

Escalation that could lead to destruction of the facility before safe evacuation can be achieved.

Compartment fire

Fire originating in a modular compartment of an offshore installation.

Confined fire

Fire within an area such that the shape of the flames is severely disrupted by the presence of walls or ceilings, but the ventilation may not be restricted to the extent that it is ventilation controlled.

Control systems

(In the context of control measures for hazards rather than instrumented control systems). Measures, systems, procedures, or processes that limit the severity of hazards.



Controllable hazards

Hazard that has potential for local damage, harm to personnel, and escalation to a higher category if not effectively controlled and mitigated by inherently safer design (ISD) and safety critical design measures (SCDM).

Deluge header

Piping arrangement that distributes firewater from fire pumps and mains to the inlets to deluge systems.

Deluge system

System designed to distribute water spray onto specific targets either to suppress fires or to protect equipment and structures from the effects of fire or thermal radiation.

Escape route

Route whereby persons can remove themselves from a dangerous location to a place of safety.

Escape system

Secondary means for escape from an installation in which the individuals need to depend upon their own resources for survival (e.g., life rafts or descent devices).

Evacuation hazards

Hazard that has the potential, after a defined period of time under major accident conditions, to endanger lives of personnel on a facility through progressive escalation or through eventual impairment of muster locations, temporary refuge, and evacuation systems. ISD and SCDM combine to delay escalation long enough for controlled evacuation to take place.

Evacuation route

Path of minimum length from a workstation that is accessible at all times for employees to reach the evacuation system.

Evacuation system

A system consisting of boats, helicopters, or other means to evacuate the offshore installation.

Exposure protection

Fire protection offered from a suppression system for a specific type of fire event (e.g., jet fire or pool fire).

External flaming

Effect that occurs outside a roofed module if the fire size or ventilation conditions are such that a significant proportion of the flames extends beyond the module boundary to affect the areas to either side and above.

Fire and explosion hazard management (FEHM)

Active management of fire and explosion hazards from knowledge of the causes, likelihood, severity, and consequences of major accidents that could arise. FEHM delivers a hazard management strategy such that major accidents can be preferentially eliminated, prevented, and controlled such that evacuation is not necessary, or in extreme cases, that safe evacuation can be achieved.

Fixed monitor

Part of the active fire protection system. This device is fixed in a permanent location, connected to the firewater supply, and capable of directing a straight or diffuse jet of water through a variable horizontal trajectory and elevation towards a potential fire location. Typical monitors have a capacity from 1 800 l/min to 3 600 l/min (475 gpm to 950 gpm).



Fixed system

Permanently installed system that either extinguishes or controls a fire at the location of the system.

Hazard

Condition or practice with the potential to cause harm to people, the environment, property, or BP's reputation.

Helideck reference area

Landing area as defined by local regulations for the largest helicopter for which the helideck is certified.

Integrated platform

Having all the facilities upon one supporting structure or floating hull. This may include processing, wells, drilling facilities, riser utilities, and accommodations.

Jet fire

Fire caused by the release and ignition of a pressurised gas.

Manual firefighting

Involving personnel using portable or fixed firefighting equipment to extinguish a fire.

Muster location

Designated place where personnel can muster and survive the effect of a major hazard accident while awaiting evacuation.

Natural gas liquids (NGLs)

Portions of reservoir gas that are liquefied at the surface in lease separators, field facilities, or gas processing plants. NGLs include ethane, propane, butanes, pentanes, natural gasoline, and condensate.

Passive fire protection

Fire protection that does not require power sources or initiation to achieve its aim. This is generally applied to firewalls and systems that protect the plant and structures by preventing the transfer of heat and temperature fires for a defined period. It may include systems that react to the fire (e.g., intumescent paints).

Performance standard

Describes the functionality (response time, duration, flow, or application rate), reliability (probability of components, parts, and systems to perform their required functions for a desired period of time without failure in specified environments with a desired confidence), and survivability (equipment remaining operational after a fire or other event) of a protection system.

Pool fire

Turbulent diffusion fire that burns above a horizontal pool of vaporising hydrocarbon fuel in which the fuel has zero or low initial momentum.

Pool/spray transition pressure

Pressure below which an ignited pressurised liquid release burns as a pool and above which a significant portion burns as a spray.

Portable firefighting equipment

Firefighting equipment that is not fixed and is intended to be moved to location in the event of a fire.



Probability of failure on demand

Probability that a system will fail to perform a specified function on demand.

Radiant heat flux

Amount of radiant heat from a heat source, such as a fire, that flows through a unit area of a piece of equipment or structure per unit time.

Ring main

Method of distributing firewater around a platform such that any point can be supplied from at least two different directions. In this GP, a ring main is only used for hydrants in process and well bay areas and for supplies to nonhazardous areas. Deluge systems should be supplied through a deluge header.

Risk

A measure of loss/harm to people, the environment, compliance status, Group reputation, assets, or business performance in terms of the product of the probability of an event occurring and the magnitude of its impact. Throughout this Practice, the term “risk” is used to describe health, safety, security, environmental, and operational (HSSE&O) undesired events.

Safety critical design measure (SCDM)

Those safety systems, devices, and controls that are designed to prevent, detect, control, or mitigate a major accident or facilitate the escape and survival of people. These are also referred to as “safety critical elements” in some regions and “protective systems”.

Prevention

Design measures to prevent a major accident through effective monitoring and process safety systems, with automatic executive action to remedy abnormal plant behaviour where appropriate.

Control

These are the active and passive measures to prevent escalation of a major accident and to bring the plant to a stable condition over a defined time period without operator intervention. Operator intervention should be possible, but not relied upon to carry out essential incident control.

Mitigation

These are measures that provide reliable protection for personnel and critical equipment or structure from the effects of a major accident. It is often through barriers, structural strength and active fire protection.

Spray fire

Fire characteristics resulting from the release of pressurised liquid such that the droplet generation and heat feedback cause the liquid to burn as a spray rather than dropping out to form a pool fire. A spray fire is normally defined by the pool/spray transition pressure.

Temporary refuge (TR)

Location (typically in an enclosure or building) that enables occupants to survive defined major accidents, including fire or blast events. Other commonly used names are “protected muster location” or “safe muster location” or, less commonly used, “safe refuge”. TR should be safely accessible by personnel not in immediate vicinity of event, provide protection from event, and provide life support systems for designated period. Direct access to primary evacuation facilities (e.g., lifeboats) should be available. A temporary refuge could be the living quarters and is generally where the majority of personnel reside.



4. Symbols and abbreviations

For the purpose of this GP, the following symbols and abbreviations apply:

AFFF	Aqueous film forming foam.
BC	Bicarbonate.
EA	Engineering authority.
EHA	Explosion hazard analysis.
ESD	Emergency shutdown.
FEHM	Fire and explosion hazard management program or process.
FHA	Fire hazard analysis.
FPSO	Floating production, storage, and offloading facility.
GRP	Glass reinforced plastic.
HP	High pressure.
HSSE&O	Health, safety, security, environmental, and operational.
ISD	Inherently safer design.
LP	Liquid petroleum.
NGL	Natural gas liquid.
NPSHA	Net positive suction head available.
SCDM	Safety critical design measures.
SOLAS	Safety of life at sea.
SPU	Strategic performance unit.
TR	Temporary refuge.

5. Requirements for active fire protection

5.1. Roles in fire hazard management

- a. Active fire protection systems are considered SCDMs. SCDMs have clearly defined roles as designated by FEHM and the categorisation of hazards. The overall aim for the fire protection in each hazard category is:
 1. Controllable hazards: To suppress the hazard effects, protect personnel in the muster area, and prevent the controllable event from escalating to an evacuation or catastrophic event.
 2. Evacuation hazards: To protect muster and evacuation areas and prevent catastrophic escalation until controlled evacuation has been completed.



3. Catastrophic hazards: To prevent the occurrence of catastrophic events through fire exposure.
- b. The roles in a. are in relation to specific hazards and their quantified effects. Systems are intended to:
 1. Extinguish fire.
 2. Suppress fire.
 3. Prevent ignition.
 4. Prevent or delay structural failure, escalation, or the loss of safety systems.
 5. Shield muster points, escape, and evacuation routes.

5.2. System performance specifications

5.2.1. General

Performance specifications shall be stated in terms of functionality, reliability, and survivability in accordance with 5.2.2 through 5.2.4.

5.2.2. Functionality

- a. Active fire suppression systems shall function to counteract hazards characterised in the FEHM.
- b. Active fire protection system coverage should be sufficient for the size of the event. The extent of active fire protection coverage accounts for variations of coverage due to wind strength and direction.
- c. External flaming from confined modules and radiation and smoke effects from large fires should be considered.
- d. The functional performance standard should be achievable throughout the life of the facility. This may require design contingencies to address performance deterioration of the system over time or to minimise the impact of equipment downtime.

5.2.3. Reliability

- a. The FEHM process determines the minimum required probability that a system, including its supporting infrastructure (e.g., power supplies or control systems), will fulfil its role as defined by the functional performance standard.
- b. Reliability should consider system availability, given delivery system (e.g., pump and mains), and potential effects from environmental conditions, including the effects of temperature, wind, and the saline atmosphere.
- c. Reliability should be verified by regular testing of components or the complete system.
- d. Reliability targets should ideally be achieved by design allowances and the quality of equipment selected rather than use of redundant systems. While this may not be applicable to pumps and delivery systems, it should be applied to active systems (e.g., deluge piping and nozzles and sprinkler systems).

5.2.4. Survivability

- a. Fire protection systems shall be designed to remain operable during identified fire conditions as described in the FEHM. Methods to achieve this include location, shielding, protection, and rapid operation of the system itself.
- b. Systems shall be designed to remain operable following explosions as described in the FEHM plan. Methods to achieve this include location, shielding, and strengthening of equipment.

