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GP 24-10

Fire Protection - Onshore

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This issue of Engineering Technical Practice (ETP) GP 24-10 has been revised to remove references to GN 24-10 and GN 24-11.

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Introduction

Value of this Guidance on Practice

This is an approach for early analysis of fire hazards and mitigation of those hazards through appropriate levels of active and passive fire protection. Such an approach allows project teams to adequately design active and passive fire protection systems at an early stage of a project.

Application

Text in italics is Commentary. Commentary provides background information that supports the requirements of the GP, and may discuss alternative options. It also gives guidance on the implementation of any 'Specification' or 'Approval' actions.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Feedback and Further Information

Users are invited to feedback any comments and to detail experiences in the application of BP GPs, to assist in the process of their continuous improvement. Please use the ETP Library comment feature or the ETP Shared Learning System to provide feedback regarding issues with this document. You may access both systems through this link <http://etp.bpweb.bp.com/>.



1. Scope

This Guidance on Practice gives advice for development of an appropriate philosophy for the mitigation of fires in onshore plants and facilities. The GP discusses methods for identification, characterisation and quantification of hazards and also gives technical requirements for active and passive fire protection systems.

This GP shall be applied to the design of new onshore plants and facilities, and used for assessment and modification of existing plants and facilities.

- a. The GP specifies BP requirements for the design of active and passive fire protection systems for onshore facilities, utilising fire hazard assessments. The GP matches fire protection to the potential fire hazard based on BP's operating experience.
- b. The GP discusses the following installations: refinery facilities, petroleum terminals, pipeline tankage facilities, bulk plants, lube blending and packaging facilities, asphalt plants, and aviation service facilities. Excluded from this GP are: retail facilities, tanks and vessels less than 5 m³ (180 ft³) in storage capacity, and offshore facilities.
- c. The GP addresses hazard identification, minimisation, and assessment. It addresses the appropriate choice of active and passive fire protection measures to contain and, where practicable, extinguish potential fires.
- d. The GP further addresses additional considerations specific certain types of facilities and gives guidance on the choice of exposure protection, taking into account fire type and equipment or structure to be protected.
- e. Lastly, the GP addresses the technical requirements for selection of active and passive fire protection systems. This part of the document is intended for use with appropriate design guides and codes, e.g. BS, NFPA, and API.
- f. This GP does not cover explosion hazards. The design of buildings and structures to withstand blast loading shall be in accordance with GP 04-30.
The Steel Construction Institute interim guidance notes, while relating to offshore structures, provide useful information for onshore plant.
- g. Requirements for offshore facilities are given in GP 24-20, GP 24-23 and GP 24-24 which discuss Offshore Fire and Explosion Hazard Management, Active Fire Protection and Passive Fire Protection, respectively.
- h. The design philosophy for fire and gas detection and control systems is given in GP 30-85.
- i. The Plant Layout document GP 44-10 shall be used to minimise hazards in the Select stage or the Define Stage of a project, as required.
- j. To minimise hazards in the early stages or during the Appraise and Select Stages of a project, the Inherently Safer Design document GP 24-03 shall be used.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.



BP

GP 04-10	Guidance on Practice for Drainage Systems and Sewers.
GP 04-30	Guidance on Practice for Design of Buildings Subject to Blast Loading.
GP 06-60	Guidance on Practice for Painting of Metal Surfaces and Equipment.
GP 12-10	Guidance on Practice for Switchgear and Control Gear.
GIS 24-233	Guidance on Industry Standard for Fire Water Pumps and System Design
GIS 24-072	Guidance on Industry Standard for Carbon Dioxide Extinguishment Systems
GP 24-03	Guidance on Practice for Concept Selection for Inherently Safer Design
GP 24-07	Guidance on Practice for Fire Fighting Suppressants- Alternatives to Halon
GP 24-20	Guidance on Practice for Offshore Fire & Explosion Hazard Management
GP 24-23	Guidance on Practice for Active Fire Protection – Offshore
GP 24-24	Guidance on Practice for Passive Fire Protection - Offshore
GP 30-65	Guidance on Practice for Control Panels.
GP 30-85	Guidance on Practice for Fire and Gas Detection.
GP 42-10	Guidance on Practice for Metallic Piping Systems ASME B31.3.
GP 44-10	Guidance on Practice for Plant Layout.
GP 44-80	Guidance on Practice for Design Guidelines for Relief Disposal Systems.
GP 48-02	Guidance on Practice for Hazard and Operability Studies
GP 48-50	Guidance on Practice for Major Accident Risk Process
GP 52-10	Guidance on Practice for Thermal Insulation.
GP 62-01	Guidance on Practice for Valve Selection.
BP Group Fire booklet series;	Liquid hydrocarbon storage tanks: prevention and fire fighting (2003) Link to Booklet
BP Group Fire booklet series;	Passive fire protection: types and applications (Jan 2004) Link to Booklet

American Petroleum Institute (API)

API 2218	Fire Proofing Practices in Petroleum and Petrochemical Processing Plants.
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American Society of Mechanical Engineers (ASME)

ASME B31.3	Process Piping.
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American Society for Testing and Materials (ASTM)

ASTM C150	Specification for Portland Cement.
ASTM E119	Method for Fire Tests of Building Construction and Materials.
ASTM E1529	Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies.
ASTM G26	Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) with and without Water for Exposure of Nonmetallic Materials.

British Standards Institute (BSI)

BS 476	Fire tests on building materials and structures Part 5 - Method of test for ignitability Part 8 - Test methods and criteria for the fire resistance of elements of building construction.
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BS 5306	Fire extinguishing installations and equipment on premises Part 2 - Specification for sprinkler systems Part 4 - Specification for carbon dioxide systems.
BS 5950	Structural use of steelwork in building. Part 8 - Code of practice for fire resistant design.
BS 8110	Structural use of concrete Part 1 - Code of practice for design and construction.

UK Department of Energy (DEn)

DEn	Hydrocarbon fire resistance tests for elements of construction for Offshore Installations -Test specification - Test procedure.
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Institute of Petroleum (IP)

IP Part 9	Model code of safe practice in the petroleum industry. Part 9.
Montreal Protocol	Montreal Protocol Assessment II of the Halons Technical Options Committee.

National Fire Protection Association (NFPA)

NFPA 11	Foam extinguishing systems.
NFPA 12	Carbon dioxide extinguishing systems.
NFPA 13	Installation of sprinkler systems.
NFPA 15	Water spray fixed systems for fire protection.
NFPA 16	Deluge foam-water sprinkler and spray systems.
NFPA 17	Dry chemical extinguishing systems.
NFPA 20	Centrifugal fire pumps.
NFPA 24	Service mains and their appurtenances, private.
NFPA 86	Ovens and furnaces.
NFPA 101	Life Safety Code.

Steel Construction Institute (SCI)

Steel Construction Institute	Interim guidance notes for the design and protection of topside structures against explosion and fire.
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Fire and blast information group - updates.

Underwriters Laboratories (UL)

UL 1709	Standard for Safety Rapid Rise Fire Tests of Protection Materials for Structural Steel.
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3. Terms and definitions

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

Active Fire Protection

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



Boiling liquid expanding vapour explosion (BLEVE)

In some cases if hydrocarbon containing vessels become very hot in a fire situation and then fail with a resulting loss of containment, the expanding burning vapour results in a BLEVE.

Client

Organisation for which fire protection facilities are provided. Within BP this will normally be a Business Unit.

Fire Exposed Envelope

The space into which fire potential equipment can release combustible fluids that can cause substantial fire damage.

Fire Scenario Envelopes

Fire-scenario envelopes are three-dimensional spaces into which fire potential equipment can release flammable or combustible fluids that if ignited will burn for sufficient time and intensity to inflict escalation.

Fire Potential

Applicable to plant and equipment (but excluding pipe work) that contains combustible fluids (See API 2218).

Fire Proofing

Materials or application of materials to provide a degree of fire resistance to protect substrates.

Fire Resistance

Ability to resist fire for a given time when tested under defined conditions.

Fixed Systems

See section 20.3.1.

Flammable Liquid

Any liquid having a flash point below 37,8°C (100°F) and a vapour pressure not exceeding 2,76 bar abs at 37,8°C (40 psia at 100°F).

Flash fire

A flash fire occurs when the combustion of a flammable liquid and vapour results in a flame that passes through the mixture at less than sonic velocity such that damaging overpressures are negligible.

Integrated Safe Design or Inherently Safe Design

Incorporation of design safety features on an inter-disciplinary basis, encouraging a coordinated approach to safety in the overall design process.

Jet fire

A jet fire is a stable jet of flame produced when a high velocity discharge catches fire. The flame gives off little smoke as a considerable amount of air entrainment takes place during discharge.

Operator

Organisation responsible for safe operation of the Client's plant. Within BP this would be an Operating Unit.

Passive Fire Protection

Fire protection which does not require power sources or initiation in order to achieve its aim. This is generally applied to firewalls and systems which protect the plant and structures by preventing the



transfer of heat and temperature fires for a defined period. It may include systems which react to the fire; e.g. intumescent paints.

Petroleum Liquids

Class 0: Ethane, ethylene, propylene, LPG, and LNG. Class I: Liquids that have a flashpoint below 21°C. Class II: Liquids that have a flashpoint from 21°C to 55°C (70°F to 131°F) inclusive. Class III: Liquids that have a flashpoint above 55°C (131°F) up to and including 100°C (212°F). Class II or III liquids can be further subdivided. Class II(1) or III(1) liquids are those that are handled below their flashpoints. Class II(2) or III(2) liquids are those that are handled at or above their flashpoints.

Pool fire

A pool fire involves the combustion of hydrocarbons evaporating from a layer of liquid. A pool fire may occur within a clearly defined boundary, e.g. the bunding below a vessel. A pool fire may also be unconfined and the spread then depends on numerous factors such as the nature of the surface, the presence of drains, and the presence of water surfaces. The flames are often accompanied by large quantities of smoke with both flames and smoke orientated downwind.

Unclassified Liquids

Liquids that have a flashpoint above 100°C (212°F).

4. Symbols and abbreviations

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

AFFF	Aqueous film forming foam.
ALARP	As low as reasonably practical.
BLEVE	Boiling liquid expanding vapour explosion.
CBA	Cost benefit analysis.
CDP	Computer data processing.
CO2	Carbon dioxide.
DNV	Det Norske Veritas.
EAE	Extreme accidental event.
ESD	Emergency shutdown.
FEHMP	Fire and explosion hazard management plan.
FFFP	Film forming fluoroprotein.
FMEA	Fault free and failure modes and effects analysis
FP	Fluoroprotein.
FRA	Fire Risk Analysis.
GRP	Glass reinforced plastic.
HAZID	Hazard identification.



HAZOP	Hazard and operability
HVAC	Heating, ventilating and air conditioning
LNG	Liquefied natural gas.
LPG	Liquefied petroleum gas.
NPS	Nominal pipe size (inches)
NPSHA	Net positive suction head available
P&ID	Piping and instrument diagram.
PCM	Prevention, control and mitigation.
QRA	Quantitative risk assessment.

5. Fire hazard management philosophy

5.1. General

- a. BP sites and projects shall determine the risks to their plants, facilities, and personnel associated with fires, explosions, toxic inhalation, and environmental damage. Unwarranted releases leading to fire hazards shall be mitigated to minimise personnel exposure, preserve life, minimise injury, and limit business losses.
- b. This GP shall be used in conjunction with other BP Group HSSE and BP Group ETPs, assessments, guidelines, and standards to mitigate the risks associated with environmental releases from fire and explosion hazards.

Both environmental protection and fire protection share common goals. If the flammable or combustible material is kept contained the probability of either a fire or environmental incident is greatly reduced. Many of the comments in this document may also be applicable background for environmental releases.

5.2. Philosophy

- a. Each facility shall have a fire hazard management philosophy that is developed in the early design (Select, Define) stages of a project.
- b. The philosophy shall:
 1. Identify fire hazards at an early stage in design.
 2. Select a strategy to deal with the hazards.
 3. Optimise the design to minimise frequency, scale and consequence.
 4. Provide systems to control the hazards.
 5. Implement the strategy and maintain the systems.
 6. Update the strategy throughout the life of the installation.
- c. This should be developed as a Fire and Explosion Hazard Management Plan (FEHMP) that is agreed with the operator of the installation, fully documented, and included in the operating procedures.
- d. Since hydrocarbon releases are hazardous as potential fuels for both fires and explosions, it is sensible to embrace both aspects in the FEHMP. However, this GP does not advise on the specific design requirements for explosion hazards (see 1.f).



- e. The recommended fire hazard management process is shown in a simplified form in Figure 1 and in detail in Figure 2. It requires that all major fire hazards are identified and quantified, and that a strategy is chosen for each hazard.

Figure 1 - Hazard management process outline

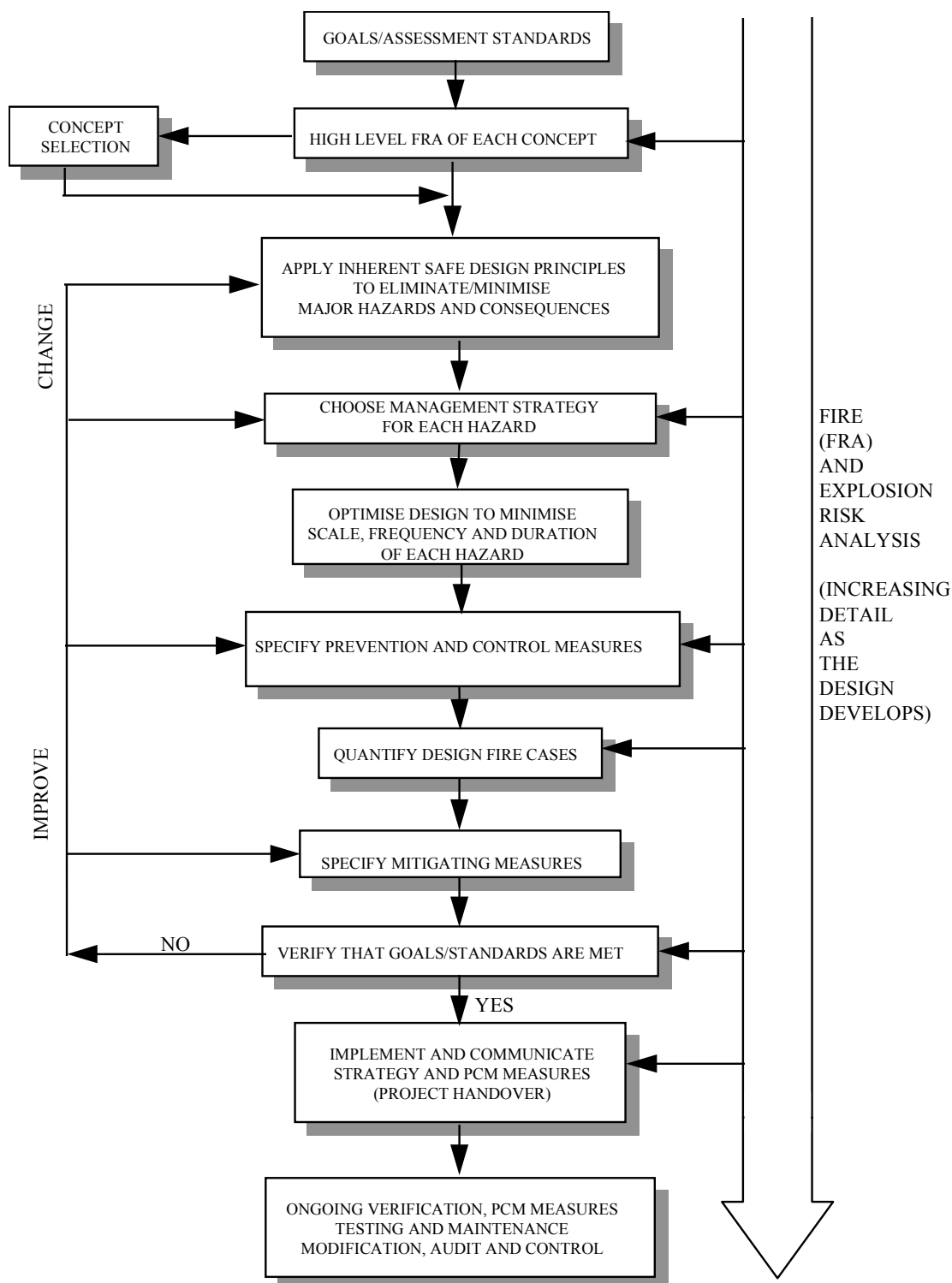


Figure 2 (Sheet 1) - Hazard management process detail

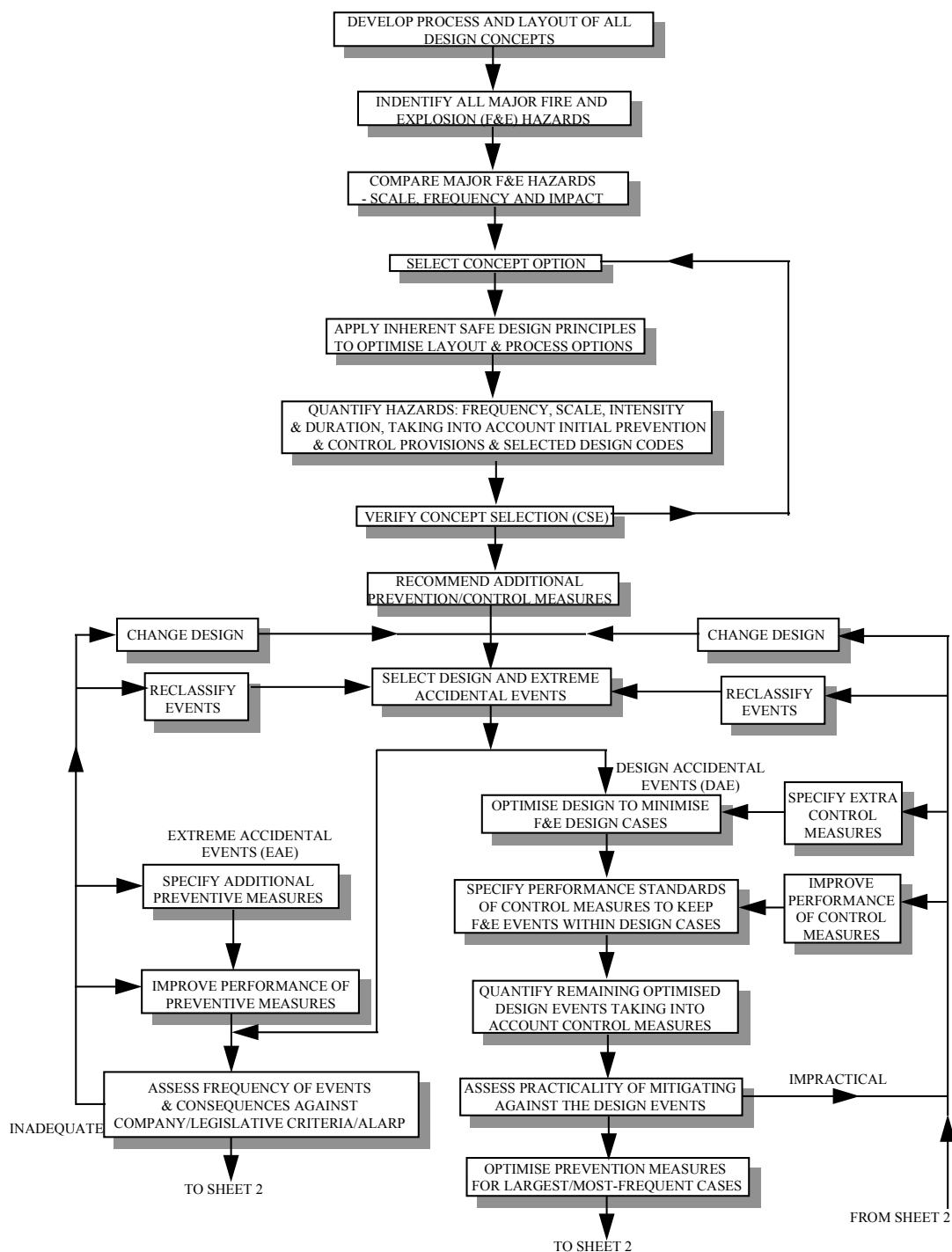
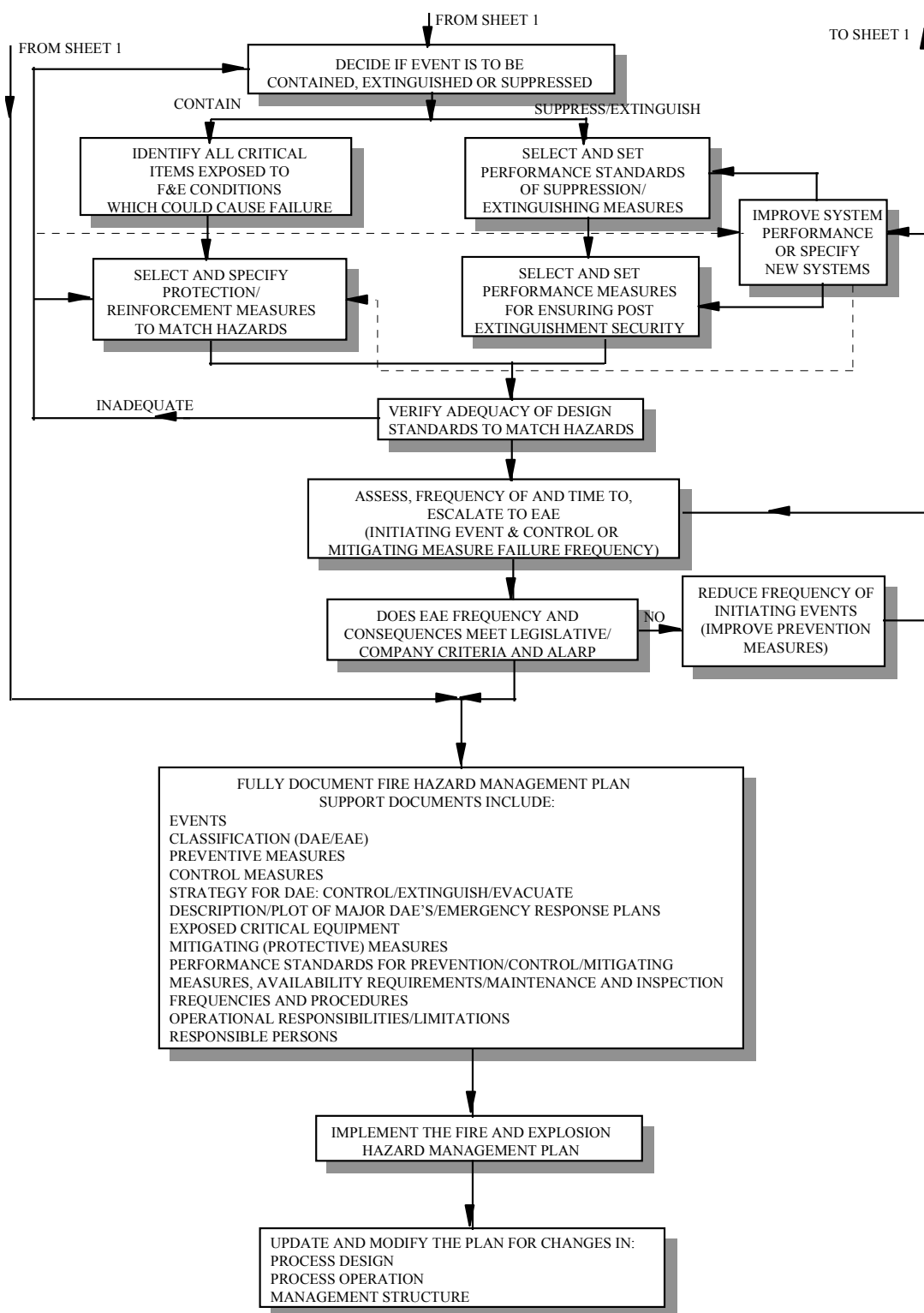


Figure 2 (Sheet 2) - Hazard management process detail**5.3. Strategy choices**

- a. The choice of a particular strategy should be made at an early stage when it is still possible to optimise the design, to minimise the hazards, and take credit for these features before



committing expenditure on extensive protection. This approach achieves full integration of prevention, protection, and mitigation of fire hazards.

- b. The possible strategies are:
 - 1. Fire prevention.
 - 2. Fire containment and prevention of escalation (i.e. minimisation).
 - 3. Acceptance of consequential damage.
- c. Each of these strategies requires the provision of measures to manage the hazard and at each stage cost effectiveness shall be considered.

These measures are a combination of prevention and control to minimise the frequency, scale, intensity, and duration of the hazard and mitigation to protect personnel and critical equipment.

- d. These measures shall be identified and designed to suit the type, scale and frequency of the perceived hazard. They shall be included in the FEHMP as it develops during the project and ultimately handed over to the Operator as part of the operating procedures.

5.4. Strategy goals

- a. The chosen mitigation strategies shall:
 - 1. aim to reduce the risks to personnel both at the facility and offsite locations
 - 2. address business losses and the need to prevent escalation to a major environmental incident.
 - 3. meet targets for individual risk and major accident frequency specified by Client/Operator and/or national legislation (See GP 48-02 on HAZOP which provides a corporate risk matrix and GP 48-50 GP Major Accident Risk Process).
- b. Further specific asset protection should only be provided following a request from the Client/Operator and may be subjected to a cost benefit analysis.
- c. A formal review of the strategy should be undertaken to ensure that all hazards have been identified and that the quality of the FEHMP is acceptable.
- d. The FEHMP should be handed over to and subject to acceptance by the Client/Operator.
- e. A fire risk analysis shall examine the chosen strategies to independently verify that the measures are adequate.

5.5. Benefits of the FEHMP process

- *The process and approach provides protection that is matched to the fire hazards and consequences and identifies the 'design case'. This places obligations on the Operator to ensure that the chosen strategy and associated facilities are maintained in an operative condition.*
- *Implications for capital investment- The FEHMP process ensures that the optimum combinations of prevention control and mitigation measures are chosen, eliminating unnecessary systems and selecting the most cost effective way of managing each hazard.*
- *Implications for active fire protection- The FEHMP process described in this GP has the benefit of determining more accurately the information upon which firewater requirements are based. This occurs at an early design stage and requires assessment of potential fires that are chosen as the design case in individual risk areas, and matching the protection to them. It is more realistic than the traditional Reference Area method and does not require arbitrary correction factors.*



- *Implications for passive fire protection- Areas requiring passive protection are more easily identified and unnecessary protection can be avoided.*
- *Implications for operators- A clear strategy is put in place for each hazard and all the thinking behind it, the systems required to implement it and performance standards for each prevention control and mitigation measure, are documented and handed over from a project. This allows effective hazard management to be documented. The requirements for procedural controls, maintenance, inspection, and test as developed during design and construction would therefore be transmitted to the Operator.*

5.6. Caution on the use of this procedure

Since the FEHMP process is based on different assumptions from the Reference Area method, the two techniques should not be used in combination.

The Reference Area method of determining active protection for hydrocarbon areas uses prescriptive water application rates that are pre-defined regardless of the hazard addressed. One result of this type of approach may be the over or under design of water systems. The Hazard Management approach, which matches fire protection closely to the fire risk, leads to more effective protection and a more effective design.

6. Hazard identification and listing

6.1. Identification of Hazards

- Identification of hazards shall be approached on a formalised basis.
- The facility shall be divided into areas and if necessary sub areas. For each area a Fire Risk Analysis (FRA) report shall be prepared.
- The FRA shall establish hydrocarbon inventories and the valving arrangements in order to identify the major isolatable inventories, source, fire type, combustible material, pressure, etc. This information shall be presented in tabular form as shown in Table 1.
- If an identified hazard can impact upon other equipment or areas then it shall also be listed as shown in the example entry for Table 2.
- Special note shall be made of instances where fires may be preceded by a gas release that may be followed by a confined explosion, an explosion (the initiating event) that may cause larger/multiple releases and fires or structural damage.
- Releases, fires and explosions in other fire areas that can affect the area in question shall also be considered.

6.2. Information requirements

When determining the requirements for fire protection facilities, the following factors shall be considered:

1. The statutory requirements of the country in which the facility will be or is operating.
2. The type and size of the facility.
3. The number of employees on site or planned to be on site.
4. The products stored, processed, or handled.
5. The availability and response time of trained fire crews.
6. The availability and quality of mutual aid schemes.
7. The proximity of adjacent vessels/process plant.



8. The proximity of third party and public property.
9. The proximity to water courses.
10. Relief and Blow down.
11. Topography including elevation, slope, and drainage.
12. Existence of threatened, endangered species.
13. The proximity of local population/community.
14. The economic importance of the installation.
15. Capital cost of replacement plant.
16. Potential environmental pollution.
17. Business loss.

6.3. Information sources

Installation design information may be available from (some of which may be preliminary):

1. Planning application information.
2. Hazardous area drawings.
3. Plot plans, including equipment lists.
4. P&IDs, e.g. main process area, storage area, etc.
5. Process data sheets.
6. Plot plans of escape routes.
7. Process flow diagrams.
8. Key operating procedure details.
9. HVAC philosophy.
10. Fire and Gas detection/cause and Effect diagrams.
11. Area Drainage/containment.
12. Failure rate estimates.

6.4. Fire scenario development

A fire scenario shall be development for the plant or facility which identifies the progress of events that could contribute to the fire, what elements affect the nature of the fire, and the situation if the fire is left unabated. For each scenario the following data should be considered:

1. What could cause the release of fuel?
2. Where is the fuel release scenario located?
3. Realistic quantity of release?
 - a) hydrocarbon hold-up, and
 - b) releasable inventory.
4. Flow rate of release?
 - a) Temperature and pressure of source.
 - b) Size of "hole".
 - c) Nature of release.
5. Will the release be contained?



- a) Capacity of drainage system to remove the spill.
- 6. If ignited, what would be the character and extent of the fire?
 - a) Volatility.
 - b) Burn rate.
 - c) Heat of combustion.
 - d) Physical properties of released material.
- 7. Heat release if ignites?
- 8. Burn-out time if left alone?

6.5. Fire-scenario envelope

- a. A fire-scenario envelope shall be used when determining fire damage and assigning protection.
- b. Preliminary dimensions for fire scenario envelopes that should be used are:
 - 1. Pool fires, 6 to 12 m (20 to 40 ft) horizontal, and 6 to 12 m (20 to 40 ft) vertical from the periphery or spill quantity.
 - 2. LPG vessels, within 15 m (50 ft) horizontally and vertically of the vessel or within the spill containment area.
- c. These estimates are sufficient for preliminary analysis, but further consequence modelling should be completed to verify the fire-scenario envelope.

6.6. Needs analysis

A needs analysis shall be under taken to determine the level of protection (if any) that is required to protect the plant and facility equipment. The needs analysis should be a qualitative 'What If' exercise. It should include factors relating to duration and severity of the fire scenario. It shall consider which specific equipment might be exposed, the vulnerability, and the resulting impact. These should include social, environmental, and human aspects as well as the business costs. The analysis should consider the effectiveness of intervention and suppression resources together with the probability of the event together with escalation. The needs analysis should be conducted as phased exercises.

- a. The first phase should include:
 - 1. The location and potential heat release.
 - a) Equipment that can be exposed, and
 - b) The nature and proximity of the exposure.
 - 2. The severity of operating conditions in exposed equipment.
 - a) Process temperature and pressure.
 - b) Process materials above auto ignition points.
 - c) Equipment contains liquids that act as a heat sink.
 - 3. Fire Grade area potential of equipment.
 - 4. Equipment spacing, layout and potential fire exposure to adjacent fire.
 - 5. Estimated duration of unabated fire.
- b. The second phase should consider intervention capabilities:
 - 1. Effectiveness of drainage system to remove hydrocarbon spillages.



2. Capability of isolation and blow down systems.
3. Active fire protection provided by fixed water spray systems or fixed monitors.
4. Unit spacing, equipment layout, and access for emergency response.
- c. The third phase should consider Effective Response Times:
 1. Automatic fire and gas detection.
 2. Investigation/ confirmation of fire.
 3. Manual initiation of control actions.
 4. Blow-down time of fuel source.
 5. Fire team assembly and control time.
 6. Additional fire inventory control.
- d. The final phase considers the risk:
 1. The potential impact on employees, the public or the environment.
 2. Scenario event probability (qualitative assessment).
 3. The fire grade hazard rating of equipment.
 4. The intrinsic value of potentially exposed plant or equipment.
 5. The importance of unit equipment to continued plant operations.

6.7. Fire types

6.7.1. General

Different types of fire should be considered:

1. Flash from gaseous hydrocarbons.
2. Jet from gaseous or high pressure liquid hydrocarbons.
3. Three dimensional running liquid fires.
4. Pool from low pressure liquid hydrocarbons.
5. Boiling liquid expanding vapour explosion (BLEVE).
6. Electrical.
7. Cellulose.
8. Fire resulting from an explosion.

7. Selection of fire hazard management strategy - design fire cases

7.1. General

- a. A hazard management strategy shall be required for every major fire hazard identified for a new plant or facility installation.
- b. The Client shall decide at the beginning of a project if the strategy should only address the preservation of life and the environment or include investment protection.
- c. The selection of the hazard management strategy depends on two considerations: the practicality of implementing the strategy and the scale of the incident.
- d. The selected hazard management strategy will need to be reviewed at various points in the design to verify that it remains viable.



It is preferable and more cost effective to specify prevention measures rather than mitigating measures.

7.2. Fire prevention

Decisions on prevention and mitigation shall be based on risk and considerations should be given for cost benefit analysis (CBA). The aim should be to reduce the frequency and consequences of these events to within acceptable risk tolerability as defined by the business unit and in GP 48-02 and 48-50.

7.3. Fire containment and prevention of escalation

- a. Fire containment and prevention of escalation should be the most common strategy for all process, fuel, and non hydrocarbon fires.
- b. Critical equipment should be protected by location or protective systems that match the type and duration of the initial hazard.

The protective systems depend on the operation of control equipment such as drains and ESD. The Operator will be responsible for maintenance and testing to ensure that these systems work when needed.

- c. If the size, location and character of a fire are predictable, proven extinguishing methods shall be employed to put it out or control it before there is critical escalation or loss of life.
- d. Extinguishment may be an alternative to passive protection for stored fuel or very low pressure oil processing. Post extinguishment re-ignition hazards, such as residual pockets of flammable gas or pools of liquid, should be considered in selecting an extinguishment measure.
- e. Extinguishment of gas releases and flashing liquids should not be considered if there may be a subsequent explosion or gas ingress hazard.

Emergency shutdown provisions and isolation of process units help to determine the type and duration of the fire protection appropriate for a facility. If the fire cannot be isolated and de-inventoried quickly, the duration of a fire can exceed 1 to 4 hours. This time period is that which passive fire proofing can reasonably provide. After this time it is feasible that escalation of the fire can become a major consideration.

7.4. Fire and mitigation planning

- a. Comprehensive fire and explosion mitigation plans should be developed for each major incident scenario developed in the fire and explosion assessment.
- b. Regardless of the type of mitigation strategy selected for each exposure, appropriate resources shall be made available. In addition, as locations new and established grow in size, possibility of simultaneous incidents occurring increases and this aspect should be taken into account.
- c. The possible impact on the community and environment may justify the installation of additional detection and protective systems where they may not otherwise appear necessary.

In some situations, a potential fire location is close to residential or environmentally sensitive sites and additional detection and protective systems are necessary.

7.5. Acceptance of consequential damage

- a. Fixed protection shall not be needed if the strategy of acceptance of consequential damage is chosen.

