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# Guidance on Practice for Above Ground Pipeline Facilities

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**GP 43-22**

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**BP GROUP**  
**ENGINEERING TECHNICAL PRACTICES**



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## 1. Scope

This guidance on practice addresses Above Ground Pipeline Facilities (AGPF) within the scope of pipeline systems as defined in GP 43-00 and normally designed and constructed in accordance with pipeline codes. Typical AGPF include:

- a. Pump and compressor stations
- b. Block valve stations
- c. Pigging facilities
- d. Pressure reduction facilities
- e. Metering stations and off-takes
- f. Storage Facilities

## 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.

### American Petroleum Industry (API)

- |              |                                                                                                                 |
|--------------|-----------------------------------------------------------------------------------------------------------------|
| API RP 520-1 | Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries; Part I - Sizing and Selection. |
| API RP 521   | Guide for Pressure-Relieving and Depressuring Systems.                                                          |

### American Society of Mechanical Engineers (ASME)

- |             |                                                                                |
|-------------|--------------------------------------------------------------------------------|
| ASME B16.5  | Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standard. |
| ASME B16.47 | Large Diameter Steel Flanges NPS 26 through NPS 60.                            |
| ASME B31.3  | Process Piping.                                                                |

### European Community (EC)

- |         |                                         |
|---------|-----------------------------------------|
| 94/9/EC | Atmospheres Explosive Directive (ATEX). |
|---------|-----------------------------------------|

### Institute of Petroleum (IP)

- |       |                                                                                                                 |
|-------|-----------------------------------------------------------------------------------------------------------------|
| IP 19 | Model Code of Safe Practice, Part 19 - Fire precautions at petroleum refineries and bulk storage installations. |
|-------|-----------------------------------------------------------------------------------------------------------------|



**International Electrotechnical Commission (IEC)**

|           |                                                                                                      |
|-----------|------------------------------------------------------------------------------------------------------|
| IEC 61508 | Functional safety of electrical/electronic/ programmable electronic (E/E/PE) safety-related systems. |
|-----------|------------------------------------------------------------------------------------------------------|

**International Organisation for Standardisation (ISO)**

|           |                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------|
| ISO 14313 | Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves (API Spec 6D). |
|-----------|---------------------------------------------------------------------------------------------------------|

**BP**

|            |                                                                                                                  |
|------------|------------------------------------------------------------------------------------------------------------------|
| GIS 34-201 | Guidance on Industry Standard for API 610 Centrifugal Pumps.                                                     |
| GP 06-25   | Guidance on Practice for Design for the Prevention of Corrosion under Insulation and Fireproofing (CUI and CUF). |
| GP 12-25   | Guidance on Practice for Earthing/Grounding.                                                                     |
| GP 32-30   | Site Inspection, Testing, and Precommissioning New Plant.                                                        |
| GP 43-00   | Guidance on Practice for Pipeline Systems.                                                                       |
| GP 43-01   | Guidance on Practice for Principles of Onshore Pipeline Design and Execution.                                    |
| GP 43-09   | Guidance on Practice for Hydraulic Design of Pipeline Systems.                                                   |
| GP 43-17   | Guidance on Practice for Risk Management for Pipelines.                                                          |
| GP 43-20   | Guidance on Practice for Onshore Pipeline Design.                                                                |
| GP 43-21   | Guidance on Practice for Offshore Pipeline Design Details.                                                       |
| GP 43-29   | Guidance on Practice for Land Acquisition for Pipelines.                                                         |
| GP 43-35   | Guidance on Practice for Valves for Pipelines.                                                                   |
| GP 43-42   | Guidance on Practice for Pipeline Construction HSSE Practices.                                                   |
| GP 43-46   | Guidance on Practice for Pipeline Pressure Testing and Pre-commissioning.                                        |
| GP 43-50   | Guidance on Practice for Pigging, Pig Launchers and Receivers.                                                   |
| GP 44-10   | Guidance on Practice for Plant Layout.                                                                           |
| GP 44-60   | Guidance on Practice for API RP 500 Area Classification.                                                         |
| GP 44-65   | Guidance on Practice for IP 15 Area Classification.                                                              |
| GP 64-01   | Guidance on Practice for Fluid Measurement Management.                                                           |

**3. Symbols and abbreviations**

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

|       |                                  |
|-------|----------------------------------|
| AGPF  | Above Ground Pipeline Facilities |
| CAPEX | Capital Expenditure              |
| CCTV  | Closed Circuit Television        |



|        |                                                |
|--------|------------------------------------------------|
| CP     | Cathodic Protection                            |
| CVP    | Capital Value Process                          |
| DRA    | Drag Reducing Agent                            |
| ESD    | Emergency Shutdown                             |
| HAZCON | Hazards of Construction                        |
| HIPPS  | High Integrity Pressure Protection System      |
| HP/LP  | High Pressure/Low Pressure                     |
| ICS    | Integrated Control System                      |
| OPEX   | Operational Expenditure                        |
| PHSER  | Project Health Safety and Environmental Review |
| PRS    | Pressure Reduction Station                     |
| SCADA  | System Control and Data Acquisition            |
| UPS    | Uninterruptible Power Supply                   |

## 4. Corporate

### 4.1. Health and safety

- a. Above Ground Pipeline Facilities must be developed in accordance with BP Group 'Golden Rules of Safety', 'getting Health and Safety, Security and Environment right (gHSSer)' and the Construction HSSE practices (GP 43-42).
- b. The Project Health Safety and Environmental Review (PHSER) process shall be applied at the various stages in development and execution of a project

### 4.2. Environment

- a. Environmental issues shall be considered at all stages of development of AGPF in accordance with BP Environmental Impact Management Process (EIMP), Environmental and Social Impact Assessment (ESIA) and the PHSER processes.
- b. Risk management shall be as per GP 43-17.

### 4.3. Security

- a. Threats to security of AGPF shall be identified and mitigated in accordance with BP's Group 'Getting Security Right' guidance.



- b. BP Security should be consulted to get latest local security advice.

#### 4.4. Capital Value Process (CVP)

- a. Pipeline systems, which incorporate AGPF shall be developed in accordance with the requirements of the BP Capital Value Process (CVP) procedure for approval of capital expenditure during the various phases of project evolution.
- b. BP guidance must be followed with respect to the CVP.

*GP 43-03 provides guidance on the pipeline contract and procurement strategy. This GP generally identifies the works required in development of AGPF during the CVP phases, which are: Access; Appraise; Select; Define; Execute; Operate.*

### 5. National and local legislation

- a. Relevant national and local legislation and procedures shall be complied with in development of AGPF.

*The legislation may control or regulate options with respect to facility locations, specifications, construction methods, and environmental impact.*

- b. Any necessary permissions shall be gained before commencing works on AGPF.

*The following permissions are typically required:*

- *Landowner and tenant/occupiers.*
- *Statutory authorities.*
- *Local authority planning permission (granting of such permission is facilitated by early consultation with statutory and interested parties).*

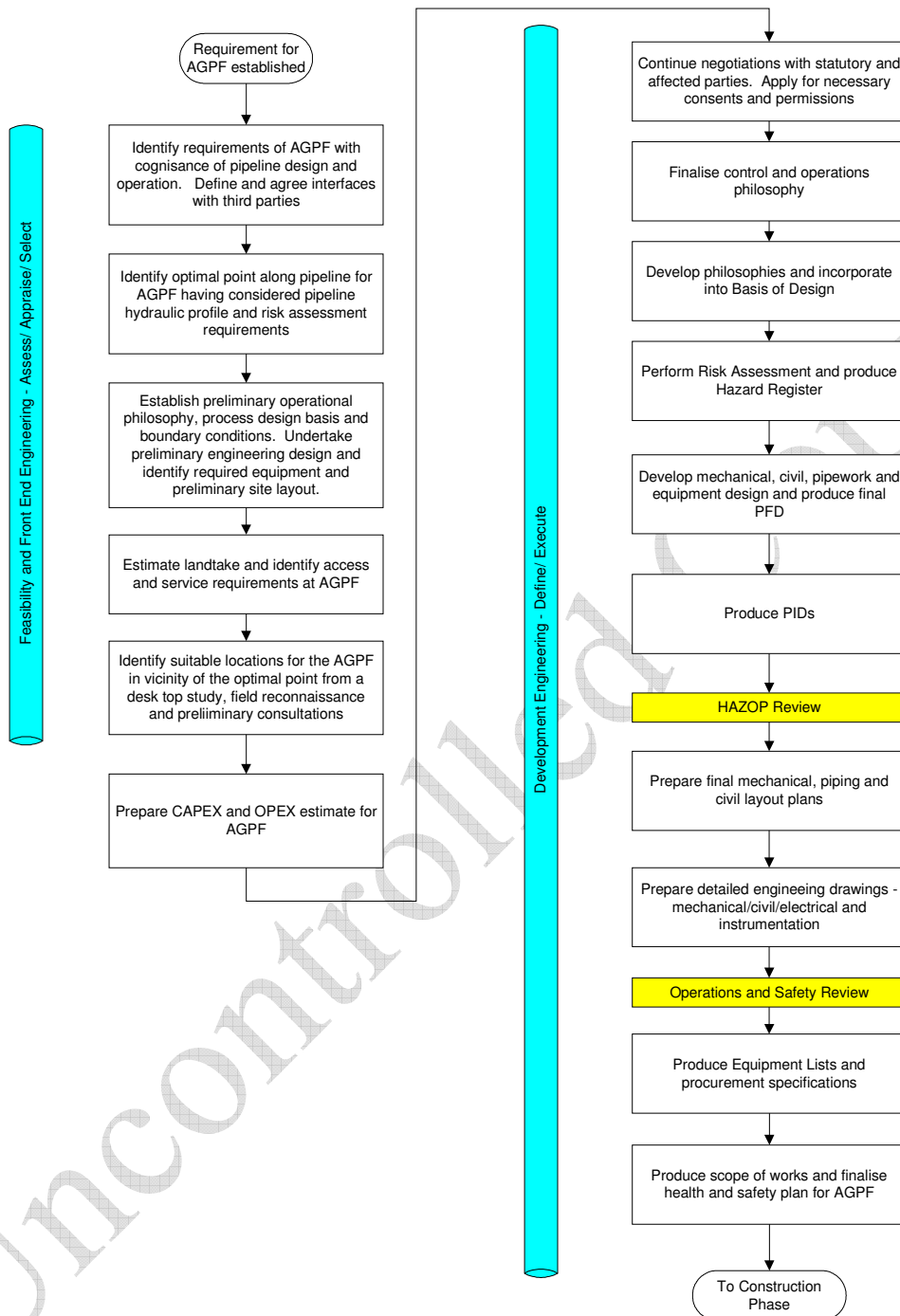
*It may be necessary to liaise with other government appointed bodies during the development of design and with whom there is a legal requirement to gain approval prior to system commissioning and operation.*

### 6. Feasibility and front end engineering (Access, Appraise, and Select)

#### 6.1. General philosophy

- a. The following shows the general process that should be followed in AGPF development:





*The order of execution shown above is for illustration only and it is expected that many of the above steps occur concurrently or in a slightly different process, depending upon the contract strategy and the nature of the site that is being developed. Progress on AGPF development is strongly influenced by the pipeline routing, design, and application process.*

- b. The preliminary requirements of AGPF should be defined through consideration of the expected future operational requirements of the pipeline, the availability, utilisation, and criticality of service.

- c. An operation and maintenance philosophy shall be developed for the pipeline and the associated AGPF at an early stage of the project, details of which should be incorporated into the design basis.
- d. Experienced operations personnel shall provide input to the development and review of this philosophy and provide Operations and Maintenance (O&M) input into key stages of the development of the pipeline system and associated AGPF.
- e. The AGPF requirements and operations philosophy may be fully defined within the Pipeline Basis of Design document.

## 6.2. Identifying

*The requirement for AGPF in the first instance is generally defined by pipeline hydraulic design considerations (as per GP 43-09), by pipeline design code requirements, and through risk assessment as part of the onshore pipeline design guidance (GP 43-21).*

*Block/check valves – Selected to provide section isolations and to minimise impact of leakage as identified through risk assessment (as per GP 43-20).*

*Pigging facilities – Defined by consideration of operational requirements of pipeline design (as per GP 43-20).*

*Pumping/compressor stations – Requirement identified through hydraulic design (as per GP 43-09). Typically required at the start of a pipeline, the size and number of pumps/compressors required along the line should be established through an iterative process as part of the pipeline feasibility and preliminary design phases.*

*Pressure reduction/regulation facilities – Often required at design/class interfaces and at receipt facilities (subject to hydraulic design requirements as per GP 43-09).*

## 6.3. Redundancy/sparing

*Whether the systems being installed at the AGPF are provided with redundancy is decided by the commercial environment and the required availability and reliability of the new pipeline.*

- a. The design process shall consider the need to incorporate duplicate streams or plant bypasses that enable the site to operate safely when the plant item is out of operation for routine or emergency maintenance.
- b. It should also account for the business operating availability demands.
- c. The estimated level of downtime for maintenance and normal operation shall be refined during the design development phase with estimation of the risks of unforeseen down time using risk based infrastructure audit techniques.

*This helps inform the decision on levels of plant redundancy.*

*Key plant items for which redundancy is typically required are pump/compressor units, meter streams, and filtration units. Maintenance valves or access tees for isolation may also be required to facilitate maintenance of key process or ESD valves without pipeline drain down.*



## 6.4. Site selection

### 6.4.1. General

- a. Following early hydraulic analysis and preliminary development of the operational philosophy for the pipeline system, potential locations for AGPF should be identified through desktop studies, preliminary consultations, and field reconnaissance as required.
- b. Sites for AGPF shall be selected and located with consideration of:
  1. Land availability and take.
  2. Physical aspect (topography/geology/hydrology).
  3. Access (links to public roads/winter and wet season access).
  4. Planning constraints (protected land/green belt/designated use).
  5. Service/utility availability (electricity/telecommunications/water/drainage).
  6. Environmental sensitivity.
  7. Safety and security (proximity to populations).
  8. Construction (access for equipment, local requirements).
  9. Economics (OPEX and CAPEX estimates).
- c. The following sections provide further details associated with the above considerations.

*At Access, Appraise, and Select stages, full definition of the above may not be practical. Preliminary selection should therefore be based on the information that can reasonably be established given the financial and scheduling constraints of this phase of works. If possible, however, the likelihood of consents for AGPF development being forthcoming should be established.*

### 6.4.2. Land availability and take

- a. An early and conservative estimate of land take requirements for AGPF should be made during the Access and Select phase through the development of a preliminary site layout based on the equipment required at the facility, equipment sizing estimates and a preliminary layout plan.
- b. Once the land take requirement has been established, suitable areas of land for the AGPF in proximity to the required location should be identified with cognisance of the general site selection and location criteria (described in clause 6.4.1)
- c. If possible several potential sites should be identified for initial approach to the landowners/tenants and the planning authority to establish the likelihood of the land being available for development of AGPF.
- d. Land acquisition should be undertaken in accordance with GP 43-29.



**6.4.3. Physical aspect**

- a. The topography, hydrology, and geology of land should be considered in the identification of prospective sites for AGPF.

*Sites constructed on firm, level, uncontaminated ground that can be easily excavated and is not at risk of flooding are generally preferred.*

- b. For larger AGPF the requirement for and location of outfalls should be considered.

**6.4.4. Access**

- a. Means of gaining access to AGPF for construction, operational, and maintenance purposes shall be identified during the Access phase.
- b. Vehicular access should extend from the AGPF to the nearest public or other established roads.
- c. Where vehicular access may not be possible during certain seasons, this should be considered in the design of the facility.
- d. The access road design shall consider the frequency and type of vehicles that requires access to the facility. This should account for axle loads, widths, and turning circles.

**6.4.5. Planning constraints**

- a. The owner and tenant of potential AGPF sites shall be approached early on in the design process to allow understanding of their objections and the likelihood of the land being made available for development.
- b. Restrictions on development in vicinity of proposed AGPF should be identified during the Access and Select phases.

*Restrictions may be due to the land being:*

- *A protected area (such as a National Park, greenbelt, etc.).*
- *A site of special scientific interest.*
- *An archeologically protected area.*
- *Set aside for a particular type of development.*
- *Future land use and local plans.*

- c. The consultation process that needs to be undertaken to gain permission for development of AGPF should be determined early on in the design process.
- d. Any constraints on development of the possible AGPF sites should be defined early on and preliminary discussions held to determine the viability of consent being forthcoming for the proposed sites.

*Restrictions on and objections to development are established as part of the pipeline design process (see GP 43-01). This information may be used in identifying locations for AGPF that are likely to be acceptable.*

- e. Land acquisition shall be undertaken in accordance with GP 43-29.



**6.4.6. Service/utility availability**

- a. Early consideration shall be given to the requirements and availability of energy and telecommunications infrastructure in vicinity of AGPF.
- b. If appropriate energy and telecommunications (i.e. of adequate capacity/power with required reliability) are not locally available, the means of providing these should be determined, whether this is through extension of an existing electricity/communications network, wireless communications, or on-site electrical generation.
- c. Backup power and communications shall be required at facilities which are considered critical to pipeline operation.
- d. The requirement for water and sewerage at an AGPF should be established and suitable means of providing this provisionally identified.

**6.4.7. Environmental sensitivity**

- a. Environmental sensitivity should be considered during the selection of appropriate sites for AGPF.
- b. Preliminary investigations and inquiries should be undertaken during the Access phase to identify any ecological or archaeological features that may prohibit or discourage development.

*During subsequent development phases a full archaeological and ecological evaluation is required as part of the environmental management process.*

- c. The short term construction and longer term permanent effects of AGPF development with respect to visual impact, emissions, and noise should be considered during the Access phase.

*Those sites which are away from occupied properties and have minimal visual impact, emissions or noise output are more likely to be acceptable for development.*

*GP 43-30 provides detailed guidance on the key aspects relating to development, execution, and operation of pipeline system projects.*

**6.4.8. Safety and security**

A hazard register shall be developed for the prospective AGPF in accordance with GP 43-17.

- a. This should consider the influences from outside the facility with potential for hazard/risk such as natural occurrences, vehicle impacts, fire, explosions, etc.
- b. Means of ensuring AGPF security shall be considered in the identification of suitable locations and land take requirements.

**6.4.9. Economic considerations**

- a. The affect of AGPF design on the construction and life cycle operational costs shall be considered throughout site selection, development, and engineering.
- b. In defining the sparing/backup requirements, the financial consequences of system shut down due to AGPF failure or maintenance shall be accounted for.

