



Document No.	GP 43-46
Applicability	Group
Date	31 May 2006

Guidance on Practice for Pipeline Hydro-test and Pre-commissioning

GP 43-46

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 43-46. This Guidance on Practice (GP) is not derived from any heritage documents.

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1. Scope

This GP provides guidance on the hydro-test and pre-commissioning of pipeline systems including the requirements for dewatering, cleaning, drying, and conditioning of pipelines in preparation for commissioning. The document is intended for use by the Pipeline Technical Authority (TA) and project team during CVP Define and Execute stages albeit some of the requirements are pertinent to extension and modification work undertaken during Operate stage. The document can also be referenced during Appraise and Select phases to ensure that the pre-commissioning scope is adequately understood before entering Define.

Pre-commissioning scope covers steps necessary, following completion of construction, to prepare the pipeline to accept process fluid and to prevent internal corrosion or fluid contamination during commissioning and operation of the pipeline.

This GP is applicable to onshore and offshore pipelines and covers the activities to be completed before commencing the commissioning activities described in GP 43-47 Guidance on Practice for Pipeline Commissioning and Handover to Operations. It does not cover pre-commissioning of above ground installations such as pump and compressor stations or receipt 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 shall apply.

BP

GP 43-08	Guidance on Practice for Selection and Use of Pipeline Codes and Standards.
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American Society of Mechanical Engineers (ASME)

ASME B31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
ASME B31.8	Gas Transmission and Distribution Piping Systems.

3. Terms and definitions

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

GRP/GRE

Glass-fibre Reinforced Plastics/ Glass-fibre Reinforced Epoxy



ID

Inside diameter

MAOP

Maximum Allowable Operating Pressure

SMYS

Specified minimum yield strength

GA

General arrangement drawing

4. National regulations and regulatory authorities

- a. The Pipeline TA shall review national and/or local regulations, and national codes and standards that are referred to in the regulations, to determine if there are any requirements for hydro-test and pre-commissioning that are more stringent than those defined in this GP.
- b. If compliance with the national codes and standards is required by law, the national codes and standards shall be reviewed to determine areas where they exceed the requirements of this GP, and these shall be implemented. If the national code or standard is not as stringent as this GP, this GP shall be followed.
- c. If compliance with the national codes and standards is not required by law, the Pipeline TA shall initiate discussion with the regulatory bodies with the objective of obtaining agreement to follow the requirements of this GP.

5. Health, safety, security, and environment

General HSSE requirements for the project should normally be addressed in the project HSSE plan. Activities and hazards specific to pre-commissioning works shall be addressed in a specific method statement for the pre-commissioning works.

- a. A risk assessment specific to pre-commissioning activities shall be performed which considers each pre-commissioning activity.

The objective of the risk assessment is to identify all potential health, safety, security, and environmental hazards, evaluate the risks associated with the hazards, and define the control measures that will be put in place to mitigate the risks.

- b. The risk assessment shall be appended to the method statement, and the measures required to control the identified risks shall be clearly cross referenced within the method statement procedures.
- c. An emergency response plan and associated contingency procedures specific to pre-commissioning shall be included within the method statement to deal with foreseeable incidents, such as injuries to personnel, loss of containment, pollution incidents, fire, and



damage to the pipeline or third party property. This should be based on the emergency response plan which applies during the operations phase.

- d. Emergency response procedures for pre-commissioning shall recognise that the non-routine pre-commissioning activities may introduce both gas and liquid into the pipeline which, in the event of a leak or loss of containment, gas emission may be followed by liquid or vice versa.

A liquid leak sustained by propellant gas would persist longer than would be expected in normal liquid only operation.

- e. Equipment to be used for pre-commissioning of the pipeline shall be installed at locations remote from uncontrolled public access, roads, or accommodation if possible. Access to and activities at these locations shall be appropriately controlled by means of security fences, security guards, protection of the public, and permits to work.
- f. Entry into controlled areas during hydro-test duration shall be limited to key trained personnel. Procedures shall be developed for entry into the controlled area in the event of the need to inspect potential leaks. The pipeline shall be de-pressurised or the leak area shall be completely isolated for the remaining test segment before applying remedial action to leaking fittings or flanges (See 10.3.6).
- g. The pre-commissioning method statement shall define the methods of communication between sites to ensure that the hazards associated with the work and the safety precautions to protect personnel are known, understood, and applied by personnel carrying out the work.
- h. The method statement shall identify specific worksite safety training pertinent to pre-commissioning activities for personnel, including site induction training and job safety assessments.
- i. Personnel at the work sites shall be informed of hazards through material safety data sheets and those handling chemicals shall be provided with appropriate training and protective clothing.

Pre-commissioning activities may require use of chemicals and additives for cleaning which may introduce hazards that may not be encountered during normal operation.

- j. The use of chemicals shall be clearly identified in risk assessments and in method statements, particularly the use of chemicals in confined or enclosed spaces.

E.g. chemicals such as anti freeze may be used and therefore preparations for safe handling, containment, and correct disposal would form part of the risk assessment and method statement.

- k. If nitrogen gas or other asphyxiant gases are used during pre-commissioning, precautions shall be addressed in the pre-commissioning risk assessment.
- l. Venting of hydrocarbon, toxic, or explosive gas mixtures shall be minimised as far as practicable and appropriate shall be facilities identified in the pre-commissioning method statement.
- m. The location of any vents shall consider wind direction, local population, and site workers.



- n. Maximum permissible levels for noise emissions shall be kept as low as is practicable and shall be below the levels of noise required by the permanent facility design basis, local regulatory requirements, and ESIA commitments.

Abnormal noise levels may be generated from pre-commissioning activities such as gas venting or drying/purging activities.

- o. The effects of noise on the local population, particularly those in remote or rural areas, shall also be considered and the local authorities and affected parties shall be advised of any high or intermittent noise levels, particularly if working at night in areas of high population.

The selection of appropriate equipment and provision of noise absorbing barriers and silencers where appropriate during venting operations can keep noise levels to a minimum.

- p. Acquisition and disposal of hydro-test and cleaning water shall be addressed in the pre-commissioning method statement to ensure it is disposed of with minimal impact on the surrounding environment and in full accordance with relevant regulatory requirements and permits.

Pre-commissioning activities especially pipeline pigging to clean the pipeline can sometimes generate quantities of debris that could create disposal difficulties.

- q. Internal coating of the pipeline should be considered in CVP Select phase to help avoid potential future debris problems.

6. Planning of pre-commissioning activities

Before commencing the pre-commissioning, the Pipeline TA shall ensure that detailed plans and method statements for the works are in place. The detailed plans and method statements shall include as a minimum:

- a. Precise definition of the pipelines or flowlines to be pre-commissioned, including marked up P&IDs and mechanical layout drawings, (GAs, isometrics, route sheets, etc).
- b. A detailed activity programme with critical path activities identified.
- c. A P&ID summary and general arrangement of any temporary pipework, equipment, and facilities for each section to be pre-commissioned. A list of required spares should also be included.
- d. A risk assessment to identify of potential health, safety, and environmental hazards with a description of the contingency procedures and an emergency plan.

Note: this complements the project HSE plan, and may refer to it as necessary. Refer to clause 5 above for more information.

- e. Details, naming and describing with addresses and contact information, of the principal contractors and any subcontractors and suppliers. This should also describe the scopes of work of the subcontractors and suppliers, and how these will be co-ordinated by the principal contractor.



- f. The principal contractor's organisation chart for the work, brief job descriptions, and relevant qualifications for the key personnel. A manpower histogram for the works detailing the number of personnel and trades should also be included.
- g. A summary of the quantities of material and consumables to be used for the pre-commissioning work including the material datasheets (MSDS), methods of storage, transportation, safe handling, and disposal.

Note that dewatering operations may require several pigging runs to achieve the required dryness, so an adequate number of pigs with spares is required.
- h. Temporary space requirements for compressors, nitrogen generating plant, dewatering and drying equipment.
- i. Temporary utilities in addition to permanent facilities.
- j. Test/calibration procedures or certificates for main equipment and instrumentation.
- k. A torquing plan for bolted connections.
- l. A detailed procedure for each activity including:
 - 1. A step by step description of the activity.
 - 2. Description of the required personnel, equipment, utilities, and consumables.
 - 3. Permitting requirements.
 - 4. Certification, records, and verification of same.
 - 5. Location and layouts with hazardous area classifications for equipment and supplies.
 - 6. Calculations, drawings, and any other engineering work necessary to demonstrate that the work will be executed in a manner that is safe and does not impact the environment.
- m. A description of the method to preserve the dryness and cleanliness of the line once pre-commissioning is complete.
- n. Any tie-in work to be carried out after pre-commissioning.
- o. The plan/method statement for pre-commissioning of valves, instrumentation, branch off takes, etc.
- p. Pre-commissioning method statement for any mechanical equipment.

Major equipment, such as compressors, would normally be the subject of a separate method statement.

- q. Actual details of the test operation stating what the test is to achieve to verify the success of the operation.
- r. Contingency procedure(s) for the removal of stuck pigs, containing spills, etc.
- s. A description of the format of the pre-commissioning handover documentation, with sample copies of the contractor's standard forms and sheets.

