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Guidance on Practice for Pipeline Assessment, Rehabilitation, and Change of Use

GP 43-56

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 43-56. This Guidance on Practice (GP) is newly created and is not based on heritage documents from the merged BP companies.

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Introduction

This document gives guidance to those undertaking the rehabilitation of all or part of a pipeline or intending to change the process performance parameters of a pipeline. The key objective is to ensure appropriate guidance is available to ensure adequate management of change processes are applied to pipeline rehabilitation and change of use and the resulting facility can be operated in accordance with gHSSer and BP Integrity Management standard. The document also provides a framework for a due diligence assessment of pipeline integrity before acquisition or assumption of the operator role.

In recognition of the global and trans-national nature of BP's business and asset holdings, this document tries to avoid a wholly prescriptive approach that might introduce unnecessary constraints that are location specific or may conflict with local regulatory requirements.

The regulatory requirements in the country in which the pipeline is situated may define the standards that apply to that pipeline. In order to provide guidance that conforms to good practice, this document is based upon the principles of ASME B31.4, ASME B31.8 and ASME B31G.



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1. Scope

The primary focus of this document is for onshore and offshore hydrocarbon or water injection pipelines constructed from weldable carbon steels. Notwithstanding the previous statement, much of this document is equally applicable to other pipelines or other materials as many of the principles and considerations highlighted herein are similar.

For cases of both pipeline rehabilitation and change of use the document defines the baseline audit process to be followed to determine the pipeline current status and allow definition of the measures required to achieve the objectives of the rehabilitation or change of use.

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 43-00	Guidance on Practice for Pipeline Systems Overview.
GP 43-17	Guidance on Practice for Risk Management for Pipelines.
GP 43-28	Guidance on Practice for Pipeline Crossings.
GP 43-46	Guidance on Practice for Pipeline Hydro-test and Pre-commissioning.
GP 43-49	Guidance on Practice for Pipeline Integrity Management Systems.
GP 43-52	Guidance on Practice for Pipeline Wall Inspection and Defect Assessment.
GP 43-53	Guidance on Practice for Pipeline Repair.

American Society of Mechanical Engineers (ASME)

ASME B31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
ASME B31.8	Gas Transmission and Piping Systems.
ASME B31G	Manual for Determining the Remaining Strength in Pipelines.

3. Terms and definitions

Pipeline

Refers primarily to an enclosed pipe system that extends between two or more process facilities (e.g. platform wells, pumping station, tank farm/ storage facility, refinery, etc.) with the objective of conveying bulk volumes of fluid or fluids between those process facilities. The scope of the pipeline is



as defined in GP 43-00 and generally aligns with all or part of the scope covered by in ASME B31.4 or ASME B31.8.

Rehabilitation

Refers to the objective to restore a pipeline and associated above ground facilities to achieve all or part of the original design performance specification or the most recently implemented design performance specification. Rehabilitation may be undertaken due to the deterioration of the pipeline system preventing the design performance specification from being achieved or due to changes in regulatory requirements which have rendered the current status or technology of the pipeline system obsolete in achieving the performance design specification.

Change of use

Refers to a modification to the process performance specification that is outside of the original or current design process specification of the pipeline facility. Change of use may or may not require any physical changes to the pipeline facility, but in every case requires a thorough system audit and design review to determine the impact of the intended change and measures required to mitigate such impact. This essentially follows the same process as for rehabilitation, but with the outcome to achieve a change in design intent as opposed to validating status against the original design intent.

As a minimum, any change to any of the following parameters shall be classified as Change of Use:

- a. Fluid conveyed (e.g. oil to gas or vice versa, etc.) or physical state of fluid conveyed (single to multi-phase or vice versa).
- b. Design pressure of all or part of the pipeline system.
- c. Design temperature of all or part of the pipeline system.
- d. Change in flow direction.

Changes in process operating parameters that fall within the process design limits may not necessarily be classified as Change of Use provided integrity level of the pipeline is known to comply with the original design intent.

4. Symbols and abbreviations

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

a.c.	Alternating Current
CIPS	Close Interval Potential Survey – measurement of pipe to soil potential with a reference cell at regular close intervals along the pipeline to determine the coating integrity
CP	Cathodic Protection – application of galvanic device or process to change the electropotential of the pipeline relative to the ground in which it is laid to prevent corrosion
DCGV	Direct Current Ground Voltage – measurement of cathodic protection current leakage to ground



ESD	Emergency Shut Down – process of shutting down the pipeline or process in a short a time as is safely possible in the event of an emergency
MAOP	Maximum Allowable Operating Pressure – the maximum pressure that the pipeline is designated as being allowed to operate. Usually lower than the design pressure to allow for predicted transient overpressures to remain within the design pressure
MOC	Management of Change
NDT	Non Destructive Testing – inspection and testing of materials without damaging them or rendering them unserviceable
ILI	In Line Inspection - inspection of the pipeline by running an intelligence gathering inspection tool (often called “smart pig”) through the pipeline – usually in the conveyed fluid with minimum or no disruption to the pipeline operation
PTO	Permit to Operate – permission from the regulatory authorities to operate the pipeline following satisfactory verification of fitness for purpose of the pipeline design and construction and due diligence of the pipeline operations management system.
SMYS	Specified Minimum Yield Stress – the minimum stress specified at which the pipe material will plastically yield.

5. Design verification

- a. Fundamental to the rehabilitation or change of use process is the verification that the original and revised design basis is adequately documented and understood. The objective of the design basis verification process is similar to that applied to a new pipeline design in that the intent is to ensure that the risk levels of the pipeline are understood and that no fluid is conveyed in a pipeline unless its structural integrity has been determined to the extent that, it can be demonstrated to be able to withstand:
 1. Forces arising from its operation;
 2. The fluids that may be conveyed in it; and
 3. The external forces and chemical processes to which it may be subjected.

This applies equally to any modifications to a pipeline that may be undertaken.

- b. A clear statement of the original and future design basis shall be defined to provide the platform for the MOC process to support the rehabilitation or change of use of a pipeline.

6. Management of change process

- a. Both rehabilitation and change of use shall follow similar MOC processes.
- b. The operating asset that results from the rehabilitation or change of use process shall conform to the overall requirements of the pipeline and related ETPs. In particular, any pipeline subjected to rehabilitation or change of use shall undergo a risk assessment in line with the guidance in GP 43-17 to ensure that the risks associated with the proposed new



operating conditions are adequately documented, understood, and appropriate, effective mitigation measures are in place.

- c. Rehabilitation or change of use of a pipeline shall follow the relevant formal MOC procedures adopted by the relevant Business Unit.
 1. The process shall be managed by a competent pipeline engineer with appropriate experience and access to relevant specialist input if required.
 2. The MOC process shall be prepared by the Pipeline Technical Authority and approved by Engineering Authority responsible for the pipeline before implementation.
- d. In order to satisfactorily rehabilitate a pipeline or change the use of a pipeline, a thorough understanding of the facility as it exists shall be attained with regard to current structural integrity status, remnant life, and the impact of future operation on pipe wall fatigue characteristics. In order to attain this understanding, a comprehensive baseline audit of the facility and its history shall be made covering the key steps found in Table 1.
- e. The proposed rehabilitation or change of use shall be assessed through the MOC process to identify and mitigate any change in risk profile or potential environmental impacts. The environmental impact of the rehabilitation or change of use process itself should be assessed.

For example large scale in situ coating rehabilitation of buried pipelines may introduce environmental impacts similar in scale to the original construction.

Table 1 - Review Process Summary

Data Gathering	- Pipeline history and condition/ status – Baseline audit
Data Review	- Review of completeness of data and identify shortfalls
Technical Analysis	- Level of technical compliance with objectives and works required to achieve acceptable technical compliance with objectives
Risk Analysis	- Shortfalls in available information / technical compliance
Feasibility	- Review of risk and economic criteria acceptability

- f. The objective of this baseline audit is to define the condition of and limitations to the facilities as they stand in order to provide a reference baseline for planning of the intended rehabilitation or modification/ change of use.

Table 2 - Analysis Process Summary

Why was the pipeline constructed?	- Design basis
What was constructed?	- Construction records
What has happened to the pipeline since construction?	- Operation/ maintenance history
What is the current condition/status of the pipeline?	- Inspection/ analysis
What objective is to be achieved with the pipeline?	- Rehabilitation or Change of Use
What needs to be done to achieve the objective?	- Remedial works

- g. Current and future regulatory and legislative requirements shall be understood to determine their impact upon the works so that the economic and technical feasibility of the design include for any changes and, if necessary, make provision for future phased implementation.



- h. Once the status of the facility is fully understood from detailed analysis (See Table 2) of the audit findings, comparisons may be made between the design basis, target risk level, proposed future pipeline duty and the known condition and status in order to appraise the feasibility, engineering, and methodologies (and any alternates) of implementing the works.
- i. The rehabilitated or changed pipeline shall have a Pipeline Integrity Management (PIM) system, prepared in accordance with GP 43-49 and defined as part of the MOC process for integrity management.

7. Baseline audit

7.1. General

- a. A Baseline Audit shall be carried out to gain a comprehensive understanding of the current condition and status of the pipeline facility as it stands and provide the basis for risk assessment of the proposed future duty of the pipeline.

The Baseline Audit may require some additional inspection and testing works to supplement or confirm the audit findings. The extent of additional surveying, inspection, and testing works is dependent upon a number of factors including:

- *Completeness and availability of records.*
- *Reliability of records.*
- *Recent inspection and testing history.*
- *Time and type of service in relation to original design and design life.*

- b. On completion of the baseline audit and any further inspections, any shortfalls in available information on the condition shall be clearly identified. When such shortfalls in available information have been identified, the missing information shall be assessed to ensure that any assumptions that need to be made do not present an unacceptable level of risk.

The analysis approach is the same for both rehabilitation and change of use in that the desired outcome is an assessment of the pipeline's fitness for purpose against a target design code or, in the case in which risk and reliability techniques are to be applied, a specified target risk level.

7.2. As built data

7.2.1. General

The original design, procurement, materials, construction, inspection, testing, and commissioning records of the pipeline shall provide the start point of the audit. If the records are incomplete, inadequate, or in some cases of uncertain accuracy, they shall be highlighted so that alternate provision may be made for the shortfall either during the audit or during the subsequent analysis of the available data.

7.2.2. Enabling legislation

The regulatory or planning approvals that apply to the pipeline, together with any amendments, shall be confirmed to ascertain the basis of the pipeline legislative requirements and how these affect the rehabilitation or change of use.

