UKOPA

United Kingdom Onshore Pipeline Operators' Association

Good Practice Guide

Verification of Features Identified by In-line Inspection

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The guidance in this document represents what is considered by UKOPA to represent current UK pipeline industry good practice within the defined scope of the document. All requirements should be considered guidance and should not be considered obligatory against the judgement of the Pipeline Owner/Operator. Where new and better techniques are developed and proved, they should be adopted without waiting for modifications to the guidance in this document.

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1	30/01/2019	9	Edition 1 produced by UKOPA PIWG
2	05/02/2026	7	Editorial update, scope expanded to include crack defects

CONTENTS

1 INTRODUCTION

1.1 Background

This UKOPA good practice guide (GPG) has been developed by the UKOPA Pipeline Integrity Working Group to provide guidance on the verification of features identified by in-line inspection (ILI).

Pipelines are long life assets, and their safe operation is controlled by legislation, which requires integrity assessments to confirm fitness for operation. An important aspect of pipeline integrity management is in-line inspection (ILI). UKOPA good practice for ILI is given in UKOPA/GPG/021 [1], which states that it is important that reported features are verified through field investigation in order to confirm the accuracy and reliability of the inspection data, which determines future actions for the management of pipeline integrity. Feedback of the field inspection results to the ILI service provider also helps the ILI service provider to continuously improve the validity and accuracy of the data analysis. Verification of ILI feature identification is essential in confirming the accuracy of inspection data in relation to feature sizing and feature location, and therefore in establishing future actions for the management of pipeline integrity.

1.2 Scope

The guidance in this document is applicable to all buried pipelines operated by the UKOPA member companies, which are able to be inspected using ILI tools. These pipelines can be categorised as:

- Natural gas transmission and distribution pipelines.
- Petrochemical liquids and gas pipelines.
- Oil and refined liquid pipelines.

For gas pipelines the guidance is generally applicable to pipelines with maximum operating pressures above 7 bar, however the principles of the document can be equally applied to gas pipelines operating at lower pressures.

1.3 Application

This document provides guidance to pipeline operators on a consistent approach for the minimum requirements for the confirmation and prioritisation of features identified by ILI for field investigation, in order to provide verification of the accuracy of the ILI tools used for pipeline inspection. The document also provides guidance on the requirements for the field investigation procedure.

This document supports UKOPA/GPG/021 on in-line inspection of pipelines.

Within this document:

Shall: indicates a mandatory requirement.

Should: indicates good practice and is the preferred option.

2 SELECTION OF FEATURES FOR VERIFICATION

The accuracy of ILI is influenced by various factors. ILI vendors calibrate the accuracy of inspection tools through pull through tests to validate the tool specifications provided to operators. Most ILI vendors will provide support for field verification activities, in order to ensure the ILI tool has performed to specification, and to obtain good quality field data to help verify the tool performance specifications for a range of feature types. In this respect, ILI vendors use field verification data to supplement pull through tests to validate tool accuracy.

Operator verification of the ILI accuracy through field investigation and inspection of a sample of detected features for comparison with the ILI results enables the accuracy of the feature sizing (depth, length and width) and location (external/internal, distance from referenced girth weld and reference points, GPS coordinates) to be established. It is of value in:

- Confirming the reported feature dimensions and locations can be used to assess the condition of the pipeline, so allowing any required actions to be identified and justified;

- Providing information on tool performance for use at locations where field verification is not possible.

The approach applied to identifying and selecting the features for field investigation depends upon the inspection history of the pipeline, the findings of any previous field investigations, the operator's requirements and the features detected by the ILI and can vary from the simple selection of the feature of maximum size to selection of features screened using fitness for purpose assessment.

2.1 Actions following ILI

The ILI report should be reviewed to identify the size, location and severity of identified features, which should be evaluated against acceptable limits.

Features may be selected for field investigation by the operator where:

i. The first ILI run identifies features which if investigated, would verify the accuracy of the inspection tool and assist in future integrity management actions, or

ii. Comparison of the location and size of identified features with those identified in a previous ILI run using a verified tool indicates an increase in the number and size of identified features.

Where features identified in a first ILI run are deemed as not significant, or where those identified in repeat ILI runs are consistent with features identified in previous inspection runs, field investigation is unnecessary.

Features selected according to i) or ii) above may be prioritised for field investigation using the following approach:

1. Any feature that represents an immediate or short-term integrity threat at the ILI reported dimension; this involves consideration of the calculated safe operating pressure which is discussed in section 2.2.

2. Features that cannot be accurately identified and accounted for from pipeline design or operational records.

3. Dents meeting the criteria in UKOPA/GPG/04 [2].

4. Any feature that represents an integrity threat within two ILI intervals, based on the assessed degradation rate.

5. Consideration of and comparison with previous ILI results or investigations carried out by the operator.

6. Any other criteria identified by the operator.

Pipeline specific specifications for flaw size limits based on fitness for service should be applied where possible.

Typical limiting feature sizes for pipelines operating at a maximum design factor of 0.72 that may be used to identify features for field verification are:

- General corrosion (including cluster features) of maximum depth > 20% nominal wall thickness (NWT).
- Pitting corrosion of maximum depth greater than 50% NWT.
- Cracks of any size.
- Dents of maximum depth > 7% pipeline outside diameter (OD).
- Dents associated with welds > 2% OD.

Note: UKOPA/GPG/04 highlights that if a constrained dent is excavated, the constraint will be removed, and a permanent repair should be considered.

Further guidance is given in Table 1.

The following actions should be considered:

- Check close interval potential survey (CIPS) levels at any possible corrosion features to confirm the location is adequately protected by the CP system.
- Carry out a direct current voltage gradient (DCVG) survey at any dents located on the top of pipeline (TOL) to confirm possible coating damage. If coating damage is confirmed:
    - Check the CIPS readings at the location to confirm the location is protected.
    - Carry out a site investigation and inspect and assess areas of damage.
    - Where associated gouging and/or cracking is identified carry out a permanent pipeline repair.
- Review historical ILI records to identify any changes in the reported feature description or dimensions.
- Review historical field investigation records, repair records and 1st, 2nd and 3rd party activity reports for any relevant information relating to the location of the feature.

- Prioritise dent features for investigation, inspection and repair in accordance with UKOPA/GPG/04.

- If the pipeline is subject to cyclic pressure, carry out a dent fatigue analysis in accordance with UKOPA/GPG/04.

- Carry out a feature growth analysis involving the comparison of results with those from the previous inspection to estimate the degradation rate (e.g. corrosion or crack growth rate).

2.2 Selection of features for investigation

The selection of features for field investigation following an ILI run for verification of the ILI results depends upon the safe operating pressure calculated by the ILI vendor and results of any previous investigations carried out by the pipeline operator.

Prioritisation is based on the Estimated Repair Factor (ERF), defined as the ratio of the pipeline maximum allowable operating pressure (MAOP) to the safe operating pressure:

$$ERF = MAOP/P_{safe}$$

Where P_{safe} is the safe operating pressure calculated using an assessment method agreed between the ILI provider and the pipeline operator as part of the ILI contract (e.g. ASME B31G, modified ASME B31G, RSTRENG, DNV-RP-F101, PDAM).

Note: ILI vendors typically report ERF values for corrosion features only, but the principle is applicable to any feature for which a safe operating pressure can be calculated, including crack and crack-like features.

Features with calculated ERF values equal to or greater than 1.0 are not considered safe for continued operation at the MOP and should be prioritised for investigation. Features with calculated ERF values less than 1.0 are then prioritised in decreasing importance with reducing ERF values.

Requirements that should be taken into account in selecting features detected by ILI to be investigated for verification of the ILI accuracy are summarised in Table 2-1.

Guidance note	Type of damage	Guidance	Action	
1	General corrosion	Includes clusters, See guidance note 3	D ≤ 20% NWT, monitor	D >20% NWT, Inspect, assess & repair as required
2	Pitting corrosion	See guidance note 3	D ≤ 50% NWT monitor	D >50% NWT, Inspect, assess & repair
3	Corrosion associated with weld	Corrosion associated with a seam or girth weld is coincident with welding defects, repair	As for general or pitting corrosion	
4	Crack	Not acceptable	Inspect & repair ASAP	
5	Kinked dent	Not acceptable	Inspect & repair ASAP	
6	Dent, TOL	If new feature, may be due to external interference, carry out DCVG	Assess and rank using UKOPA/GPG/04 Inspect, assess and plan to repair if required	
7	Dent, BOL	Do not excavate, monitor, carry out static and fatigue assessment assess as unconstrained	Assess and rank using UKOPA/GPG/04 **Excavate to repair only** (failure may occur when constraint is released)	
8	Dent associated with weld	Apply guidance notes 6 & 7 above. If pipeline is pressure cycled, carry out fatigue assessment. Assess weld quality in accordance with UKOPA/GPG/04	If weld is poor quality, repair. Otherwise, if D ≤ 2% monitor	D > 2% OD Inspect and repair if subject to fatigue
9	Dent associated with metal loss	Apply guidance notes 6 & 7 above. If feature is due to external interference, inspect and repair	Dent depth ≤6% OD and metal loss due to corrosion ≤ 20% NWT, monitor	Dent depth > 6% OD or metal loss due to corrosion > 20% NWT, inspect and repair

Table 2-1 Selection of ILI features for investigation (inspection and repair)

Note: The guidance on the size of features to be considered for field verification given in Table 2-1 applies to pipelines operating at a design factor of 0.72.

In the absence of any defects that are equal to or greater than limiting dimensions for fitness for service as applied by the operator, it may be advisable to excavate and inspect a sample of these smaller defects.

2.3 Recommendations for the procedure for field investigation of ILI features

The primary objective of ILI is to obtain data which enables the pipeline condition and integrity to be confirmed and/or revalidated. A key part of this process is verification of the ILI tool performance and analysis of the recorded data through field investigation. It is essential that field investigations are carried out to a reliable level of quality and consistency.

Guidance on field verification for ILI is published by the Pipeline Operators Forum (POF) [3]. It is recommended that the POF guidance is considered when developing the procedure for field investigation, and as a minimum the following are included:

1. Arrange land access and agree work site and reinstatement criteria with the landowner or tenant.
2. Establish the exclusion zone for the feature investigation site.
3. Before commencing excavation, prevent pressure from exceeding the level at date of inspection, or apply pressure reduction if feature size exceeds limiting criteria. The pressure reduction should consider the expected damage, any additional loading from excavating, time elapsed between excavation and inspection and potential consequences of failure.
4. Design trench stability and egress.
5. Excavate damage location in accordance with relevant operator safe working procedure.
6. Monitor trench stability as required.
7. Restrict access within exclusion zone and into trench to appropriate personnel only.
8. Inspect and categorise feature. Note, where the feature is categorised as external interference damage, the time at which the damage occurred should be established.
9. If feature size exceeds limiting criteria, reduce pressure to a level which will reduce operating stress to a maximum of 30% SMYS and carry out repair.
10. Record all data in accordance with the UKOPA FR1 form and log data in the appropriate operator and UKOPA databases.
11. Ensure appropriate pressure restrictions are in place throughout work.
12. Assess need for permanent support of the pipeline on completion of work.
13. Apply reinstatement requirements.
14. Keep full records of inspection activities and repair.

3 REFERENCES

[1] UKOPA, “UKOPA/GPG/021 ED 2, In-line Inspection (ILI),” United Kingdom Onshore Pipeline Operators Association, 2026.

[2] UKOPA, “UKOPA/GPG/004 Ed 2, Managing Pipeline Dents,” United Kingdom Onshore Pipeline Operators Association, 2022.

[3] POF, “POF 310, Field verification for in-line inspection,” Pipeline Operators Forum, 2023.