IGEM/TD/1 EDITION 5
COMMUNICATION 1735
2008

The following amendments (February 2009) apply to all copies of IGEM/TD/1 Edition 5 published in December 2008 and are still current.

Figure 6 Delete key entirely and substitute as follows to amend the values for C_2

		C_1	C_2
A	Wall thickness < 9.52 mm	0.12	12
B	Wall thickness ≥ 9.52 mm	0.08	5
C	Wall thickness ≥ 11.91 mm	0	3

The following amendments (October 2010) apply to all copies of IGEM/TD/1 Edition 5 published in December 2008.

Clause 6.7.10.1 **Delete Note entirely. Substitute:**

Note: BS EN 1998 states that there are, generally, no requirements in the UK to consider seismic loading, and the whole of the UK may be considered an area of very low seismicity in which the provisions of BS EN 1998 need not be applied. However, the UK National Annex to BS EN 1998, PD 6698, states that certain types of structure, including large diameter high pressure gas pipelines and the associated installations, by reason of their function, location or form, may warrant an explicit consideration of seismic actions.

Sub-Section A5.6 **Delete equations for Unrestrained Pipework and Restrained Pipework and substitute:**

For unrestrained pipework i.e. free to move:

$$dP = \frac{10(A - 3B)}{\frac{Dm}{4E.tn}.(5 - 4\nu) + \frac{1}{C}}$$

For restrained pipework i.e. buried or anchored:

$$dP = \frac{10(A - 2B)}{\frac{Dm}{E.tn}.(1 - \nu^2) + \frac{1}{C}}$$

The following amendments (July 2016) apply to all copies of IGEM/TD/1 Edition 5 published in December 2008 and are still current.

Clause 3.2.1 **Delete Note entirely and substitute:**

Note 1: It is recommended that all materials and components be obtained from suppliers operating a quality system in accordance with an appropriate standard such as BS EN ISO 9001 to ensure that products achieve consistently the required levels of quality.

Note 2: It is recommended that material certification is critically reviewed to avoid procurement of counterfeit components. Guidance is provided in EEMUA Publication 224, A guide to risk-based procurement

Clause 4.2.2.13 **Delete clause entirely and substitute:**

Rivers, canals and foreshores

Part 1 of the Environment Act established the Environment Agency (EA) (Scottish Environment Protection Agency in Scotland) (SEPA), and provided for the transfer of functions from the National Rivers Authority (NRA). The EA and SEPA determine and grant consents to discharge wastes into controlled waters and charge for such work – this includes the discharge of water which has been used for hydrostatic testing. In England and Wales, the EA also regulates the abstraction of water (which requires an abstraction licence).

The EA and SEPA also undertake pollution control and have the power to prosecute where "poisonous, noxious or polluting matter" is allowed to enter controlled waters. This includes the discharge of silty water from construction sites. Guidance on how to manage sites is obtainable from either agency in the form of Pollution Prevention Guidelines (PPGs), in particular PPG6 "Working at Construction and Demolition Sites".

The Canal & River Trust is a statutory body established by the Transport Act. It owns and manages approximately 2000 miles of canals and river navigations. The Canal & River Trust Code of Practice (COP) for works affecting the canal & river trust governs works that might affect its waterways and properties.

Consultation is required with relevant statutory water bodies including drainage boards where applicable.

Where works are to be constructed in, under or over the seashore below the high water mark of ordinary spring tides, the consent of the Secretary of State is required under Section 34 of the Coastal Protection Act. Where the works are to cross the foreshore, an easement must be obtained from the owners, generally, the Crown Estate Commissioners.

Clause 5.2.1 **Delete first paragraph and substitute:**

For the majority of a buried transmission system, the normal operating temperature will be constant and, in the UK, will exceed 5°C. The minimum design temperature should be 0°C.

Clause 5.2.1 **Delete Note 2.**

Clause 5.2.2 **Delete Note and substitute:**

Materials should have adequate fracture toughness at or below the minimum design temperature.

Note 1: It is normal to carry out impact testing below the design temperature.

Note 2: In GB, the minimum design temperature of above-ground pipework is usually taken as -10°C. However, materials that are impact-tested at 0°C and have a wall thickness of 20 mm or less may be used at a design temperature down to -10°C (see EEMUA Publication 153).

Clause 5.3.1 **Delete clause entirely and substitute:**

5.3.1 Specification

The quality of linepipe should be verified with respect to strength and toughness, for example measured using the Charpy V Notch impact test and the Drop Weight Tear Test (DWTT), and if required, weldability, by testing in accordance with the appropriate linepipe specification.

Steel linepipe is available in a range of grades, defined by specified minimum yield strength (SMYS). The strength should be selected in conjunction with other design parameters to provide an optimum pipeline design.

Note 1: The material standard most commonly specified for linepipe worldwide is API 5L and BS EN ISO 3183. In Europe, increasing use is now being made of ISO BS EN 3183:2012 Annex M which applies to onshore gas transmission pipelines and is the linepipe standard referenced in BS EN 1594. ISO 3183 is referenced in ISO 13623 which has been adopted as BS EN 14161. Other industry specifications may be used to specify additional requirements, for example with respect to toughness, dimensions, fatigue etc. to the above national and international standards.

Note 2: Minimum toughness levels ensure that a pipeline has adequate resistance to fracture initiation and can be operated within its design limits without risk of propagating brittle or ductile fractures.

Note 3: Where necessary, requirements for steel weldability may be agreed to ensure the maximum opportunity for high quality construction under field welding conditions.

Clause 5.3.2 **Delete Note 2 and Note 3 and substitute:**

Note 2: The supply of pipes containing strip end welds (where one strip of steel is welded onto the adjoining strip during the manufacturing process) is not permitted.

Note 3: Recommended wall thickness < 20 mm and recommended grade X65 and below (BS EN ISO 3183 grade L450 and below). See Table 4.

Clause 5.3.3 **Delete first paragraph entirely and substitute:**

SMYS and specified minimum tensile strength (SMTS) of commonly used grades of pipe to BS EN ISO 3183 and API 5Lare given in Table 4 which should be referenced and used when selecting pipe.

Clause 5.3.3 **Delete Table 4 entirely and substitute:**

API 5L/ISO 3183 (PSL 2)			ISO 3183:2012		
Grade	**SMYS N mm^{-2}**	**SMTS N mm^{-2}**	**Grade**	**SMYS N mm^{-2}**	**SMTS N mm^{-2}**
L245[1] or B[1]	245	415	L245[3] B	245	415
L290[2] or X42[1]	290	415	L290[3] B	290	415
L320[2] or X46[2]	320	435			
L360[2] or X52[2]	360	460	L360[2] B	360	460
L390[2] or X56[2]	390	490			
L415[2] or X60[2]	415	520	L415[2] B	415	520
L450[4] or X65[4]	450	535	L450[4] B	450	535
L485[4] or X70[4]	485	570	L485[4] B	485	570
L555[4] or X80[4]	555	625	L555[4] B	555	625
L625[5] or X90[5]	625	695			
L690[5] or X100[5]	690	760			
1. Grade suffix: N, Q, M 2. Grade suffix: N, Q, M 3. Grade suffix: N, M 4. Grade suffix: Q, M 5. Grade suffix: M (see Note below)			Grade suffix: N = normalized or normalized rolled/formed Q = quenched and tempered M = thermomechanically-rolled		

Clause 5.3.4.1 **Delete clause entirely and substitute:**

Testing shall be carried out in accordance with Annex M of BS EN ISO 3183.

Clause 5.3.4.3 **Delete clause entirely and substitute:**

For linepipe of diameter exceeding 323.9 mm, a full wall thickness DWTT shall be used to assess resistance to prevent propagating brittle fracture**.**

Clause 5.3.4.4 **Delete clause entirely and substitute:**

5.3.4.4 For linepipe of diameter not exceeding 323.9 mm, extraction of a sample for DWTT is not possible and Charpy testing at an appropriate test temperature to guard against brittle fracture should be substituted.

5.3.4.5 The Charpy test pieces shall be prepared in accordance with BS EN ISO 148-1 (using a 2mm radius striker) without flattening. The axis of the notch shall be perpendicular to the pipe surface.

Where pipe dimensions are such that transverse Charpy specimens of at least 10 x 5mm cannot be obtained, see API 5L / BS EN ISO 3183 Table 22, longitudinal Charpy impact test pieces shall be used instead. Pipes of specified thickness less than 6.3mm need not be impact tested.

5.3.4.6 The impact test shall be carried out at the minimum design temperature (usually 0°C) unless a lower test temperature is specified (reference Note 2 clause 5.2.1).

5.3.4.7 The Charpy impact test shall be carried out in accordance with BS EN ISO 148-1 using a 2 mm radius striker, and the DWTT in accordance with BS EN 10274 or API RP 5L3.

Clauses 5.3.4.5 5.3.4.6 **Delete clauses and substitute:**

5.3.4.8 When linepipe is intended to operate at a design factor exceeding 0.3, the possibility of propagating ductile fractures shall be minimised by ensuring that the material possesses an adequate ductile fracture energy absorption.

The specified energy absorption should be based on past experience and the service conditions. In some cases pipeline specific analysis or experimental studies may be required. These cases include:

- Where there is no existing full scale fracture propagation test data to confirm that crack arrest will occur.
- Where there has been a change in the pipeline parameters or in the fluid being transported which will result in an increased likelihood of fracture propagation.

If such studies show that the anticipated margins are small, validation by full scale crack arrest testing may be required.

Note 1: The energy absorption can be measured using the Charpy impact test. Acceptance levels can be determined from Annex M of BS EN ISO 3183 or from published formulae for pipelines of strength grades up to and including L450 (X65). For higher grades, the guidance and published formulae may be unconservative and specialist advice is needed.

Note 2: For high strength steels it might be necessary to use integral or mechanical crack arrestors to ensure arrest of a running ductile fracture. An alternative to the use of crack arrestors would be to conduct a project-specific full-scale fracture propagation test to demonstrate that the proposed toughness requirements are sufficient to ensure crack arrest.

5.3.4.9 The specified frequency of testing shall be designed to ensure that the proportion of pipe reaching the required toughness level is sufficient to restrict the length of a fracture to acceptable levels.

Note: The practice in GB has been to achieve a minimum 95% probability of arrest in 5 pipe joints or fewer.

Clause 5.3.5 **Delete Note after first paragraph entirely and substitute:**

Note: The preferred approach is for the tests to be performed on full pipe lengths.

Clause 5.5.1.4 **Delete Note entirely.**

Clause 5.5.2.1 **Delete Note 1 entirely and substitute:**

Note 1: Bends made from pipe by the induction bending process are covered by ISO 15590-1 and API5LIB.

Clause 5.5.2.5 **Delete Note entirely,**

Clause 5.5.2.6 **Delete Fourth bullet point and substitute:**

- full encirclement branch fitting

Clause 5.6.1.1 **Delete clause entirely and substitute:**

For flanged components, the safe maximum working pressure of each component shall be checked to ensure it is at least that the class rating of its flanges and the design pressure of the pipeline.

Clause 5.6.2 **Delete first paragraph entirely.**

Clause 5.6.3.1 5.6.3.2 **Delete clauses entirely and substitute:**

5.6.3.1 Any valve body shall be of cast steel or of forged steel construction, have weld ends or flanges to BS EN 1759-1, and shall be manufactured from fine-grained steel in accordance with BS EN 10028 and BS EN 10029.

Reference should be made to ISO 14313/BS EN 13942 and to an appropriate standard for detailed design recommendations for high-pressure valves.

5.6.3.2 Performance testing of valves should be carried out in accordance with ISO 14313/BS EN 13942.

Clause 5.7.4 **Delete first paragraph entirely and substitute:**

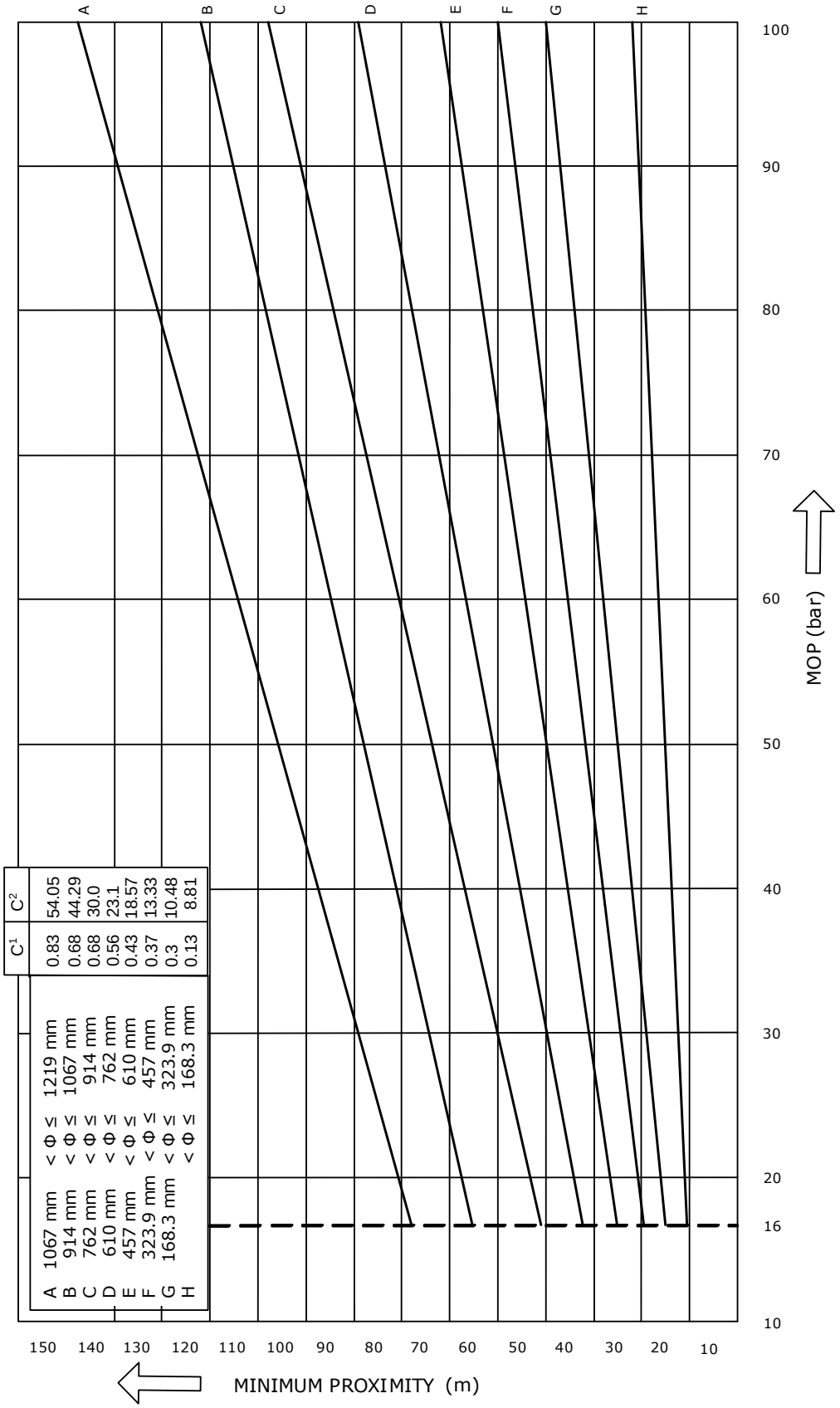
Coatings shall be tested according to the requirements of the relevant standard for physical durability and resistance to chemical attack.

New Clause 6.4.3 **Insert after clause 6.5.1.1**

Nominal wall thickness values up to 0.05 mm below the calculated or stated value may be considered acceptable.

Note: In previous editions of TD/1 some wall thickness values were derived using exact conversions to metric values of nominal values expressed in inches. In Edition 5 and later, values have been given using a precision appropriate to the manufacturing capability. This difference in practice may result in apparent discrepancies in requirements which are not significant.

Clause 6.7.4.3 **Delete figure 5 entirely and substitute:**


A
B
C
D
E
F
G
H
100
90
80
70
60
50
40
30
20
16
10
MOP (bar)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
MINIMUM PROXIMITY (m)
A 1067 mm < Φ ≤ 1219 mm 0.83 54.05
B 914 mm < Φ ≤ 1067 mm 0.68 44.29
C 762 mm < Φ ≤ 914 mm 0.68 30.0
D 610 mm < Φ ≤ 762 mm 0.56 23.1
E 457 mm < Φ ≤ 610 mm 0.43 18.57
F 323.9 mm < Φ ≤ 457 mm 0.37 13.33
G 168.3 mm < Φ ≤ 323.9 mm 0.3 10.48
H < Φ ≤ 168.3 mm 0.13 8.81
C1
C2

Clause 6.8.4 **Delete Note 2 and 3 entirely and substitute:**

Note 2: The safety evaluation and risk analysis must be specified and accepted by the duty holder responsible for managing risks posed by the pipeline.

Note 3: The documented safety evaluation, including the results of such a risk analysis may need to be considered by the relevant statutory body.

New Clause 6.9.10 **Insert after clause 6.9.9:**

When designing impact protection for installation on existing pipelines to provide risk reduction, the UKOPA Specification for Impact Protection Slabs shall be applied for the risk reductions factors given in IGEM/TD/2 to be achieved. Alternative specifications may be used where appropriate risk reduction factors are justified.

Clause 6.10.4 **Delete clause entirely and substitute:**

6.10.4 **Changes to traffic routes (roads and railways)**

Additional traffic routes or modifications to existing routes on a pipeline represent a significant increased risk of third party damage throughout the construction and over the remaining life of the pipeline. The additional traffic also increases the population exposure to risk from the pipeline. The pipeline design and integrity shall be reviewed in order to manage the additional risks over the life of the pipeline.

Where the addition of a new traffic route or construction work to upgrade an existing traffic route impacts upon the design of a pipeline, the pipeline shall be modified to meet the requirements of clauses 6.10.2 to 6.10.3.

If it is not reasonable or practicable to modify the pipeline to meet the requirements of clauses 6.10.2 to 6.10.3, appropriately designed and specified protection agreed by the operator may be installed.

Note: Appropriate protection includes the use of specially designed epoxy sleeves.

If it is not reasonable or practicable to carry out the required modifications to the pipeline or the installation of appropriately designed and specified protection, a documented safety evaluation, including a quantified risk analysis, may be carried out in accordance with Section 6.8.

Clause 6.11 **Delete title and insert:**

PIPELINES RUNNING PARALLEL TO OR CROSSING OTHER MAJOR PIPELINES

Pipelines running parallel to other major pipelines

New Clause 6.11.2

Insert after 6.11.1:

Pipelines crossing other major pipelines

Where the route of a new pipeline crosses an existing major accident hazard pipeline, a minimum vertical separation distance of 600mm between the pipelines shall be required to:

a. ensure electrical interference is minimised
b. mitigate the potential for damage to the existing pipeline during construction of the new pipeline
c. mitigate any transfer of loading between the two pipelines

Where this cannot be achieved the separation distance and any additional mitigation measures shall be agreed between both parties.

The design shall incorporate a crossing using thick wall pipe i.e design factor ≤ 0.3.

Note: Where the pipeline nominal wall thickness is 19.1mm or greater, the design factor may be increased to 0.5

The potential for escalation as a result of leakage should be assessed and limited by appropriate design taking into account both vertical separation and angle of crossing. Where practicable and to reduce the level of risk, the design should accommodate a crossing perpendicular to the existing pipeline.

The need for a physical barrier or marker tape above the pipe at the crossing point shall be considered.

6.11.3 For pipelines running parallel to, or crossing other major pipelines, due consideration shall be given to the possibility of the interaction of CP current and the location of transformer rectifier and ground-bed locations. Where possible a new pipeline should not be routed such that it is between an existing pipeline and its ground-bed(s).

Note: The typical influence from a ground bed is between 150-200m but this can vary significantly and is dependent on soil resistivity and other geological conditions e.g. coal seams etc.

Clause 6.12.1.1

Delete Note entirely and substitute:

Note: Existing sleeves which meet the Class 1 or Class 2 design requirements of IGEM/TD/1 Edition 2 may continue to be used to allow the pipeline to operate up to its original design factor.

Clause 6.12.10.2

Delete Note entirely and substitute:

Note: Cementitious grout is recommended for filling sleeves. Construction sleeves may be filled with cementitious grout, inert thixotropic material, water filled (fresh or sea water), sand.

Clause 6.14.5

Delete first bullet point and substitute:

- where a branch connection diameter exceeds 25% of the pipeline diameter, guide bars should be incorporated in the branch connection.

  The design of guide bars should be to a suitable standard.

Clause 6.16 **Delete first and second paragraph entirely and substitute:**

In certain circumstances, specification of linepipe wall thickness, use of specific components or requirements for specific design details, may result in local wall thickness requirements greater than 30 mm. In such cases, heat treatment of site fabrications may be necessary. The designer shall give consideration to the selection of materials to which post weld heat treatment (PWHT) may be applied and the specific requirements for stress relief using post-weld heat treatment on thick sections. Alternatively an engineering critical assessment (ECA) may be used to demonstrate that PWHT is not required. The ECA should confirm (or specify) the material toughness requirements, determine the critical crack sizes and define relevant inspection requirements.

Clause 7.12.1 7.12.2 **Delete clauses entirely and substitute:**

7.12.1 **General**

Prior to any welding operation, whether on a pipeline or an associated installation, welding processes and systems shall be assessed and approved. This should include the testing, qualification, approval of welding procedures and welders as well as arrangements for inspection, acceptance criteria and rectification of welds.

➤Pipe and fittings shall be prepared, welded and inspected in accordance with BS 4515-1. Cut pipes should have details of pipe reference numbers transferred to the inside of the pipe on each cut end.➤

Where pipe is welded above ground prior to lowering into the trench, the pipe shall be supported on suitably placed padded timbers. The support should be designed so as to prevent movement of sections of pipe.

Where tie-ins are being undertaken, for example at special crossing locations, particular care shall be taken to ensure that the support is designed to suit the specific requirements at the location. Support shall remain in place until all welding operations have been completed.

7.12.2 **Non-destructive testing (NDT)**

7.12.2.1 All welded joints shall be inspected using NDT procedures in accordance with a suitable specification.

7.12.2.2 Where radiographic inspection is required, it should be planned in relation to other work to ensure safety and avoid delay.

7.12.2.3 Final NDT shall be performed after any repair welding and/or stress relief treatment, if required, has been performed.

Clause 7.20.4 **Delete clause entirely and substitute:**

7.20.4 Wherever reasonably practicable, excavated materials shall be replaced such that the original soil sequence is preserved.

Clause 7.29 **Delete first paragraph entirely and substitute:**

On completion of pipeline installation, a coating defect survey shall be carried out using an appropriate technique to locate any areas of coating damage on the buried pipeline. Any damage found shall be investigated, assessed and, where appropriate, repaired.

Clause 8.2.2.2 **Delete first paragraph entirely and substitute:**

Except as permitted by the Note below, a pipeline designed for operation at a design factor not exceeding 0.3 shall be tested to a pressure of at least 1.5 x MOP (see Table 10) except when subject to daily stress cycles exceeding 35 N mm^{-2}, the pipeline shall be tested to a test level determined by a fatigue assessment.

Clause 8.2.2.4 **Insert after table 11 title add:**

Where a test section includes pipe of the same diameter but of different wall thickness or material grade, the test level should be determined by the combination giving the lowest test pressure.

Clause 8.4.2.3 **Delete clause entirely and substitute:**

In all other cases, the hydrostatic test pressure should be measured by a dead weight gauge ,Budenberg figure 80 having resolution of 0.02 bar between 30 and ~~3~~600 bar and an accuracy of 0.03% ± 0.05~~7~~ bar at the pressure being read.

Clause 8.4.3.1 **Delete clause entirely and substitute:**

The accuracy of the equipment used to measure the water which is added or removed during the test is of paramount importance, as this equipment will be the basis of the accuracy of the air content plot.

Clause 8.13.2.3 **Delete first paragraph entirely and substitute**

Gauges and recorders shall be calibrated ~~and certified~~ within the preceding 12 months and checked for accuracy by comparing gauge readings against an approved deadweight gauge immediately prior to each pressure test.

Clause 9.4.1 **Delete second paragraph entirely and substitute:**

This method utilizes an air drying unit and compressors to produce dry, oil-free air or a dry inert gas which is used to propel pigs through the pipeline. These pigs absorb water, remove pools of water at low points and distribute any residual water as a thin film on the internal pipe wall to facilitate faster evaporation. On completion of the drying/purging operation, the pipeline can be gassed up immediately or sealed off for gassing up at a later date.

Clause 9.4.1.1 **Delete Paragraph (a) entirely and substitute:**

(a) Super-dry air

The air drying/super-dry air equipment should be located at the launching end of the pipeline and connected to allow the repeated dispatch of pigs during the operation. The air-drying unit should have sufficient capacity to suit the pipeline size and be able to achieve a dewpoint temperature below that specified. The unit should have two absorption vessels with fully automatic change over facilities for regeneration to allow for continuous working. Dewpoint temperature measuring instrumentation should be installed at both the pig launching and receiving stations to allow continuous monitoring to take place. This should be calibrated and checked in accordance with an agreed procedure and check list.

Clause 9.4.1.2 **Delete Note 1 and Note 2 entirely and substitute:**

Note 1: The mechanism of air drying is such that the exhausted air will be saturated until very close to the end of the operation. If the dewpoint sensors come into contact with free water, they will take a considerable time to recover and, if contaminated by particle matter, will need to be replaced.

Clause 9.4.1.3 **Delete clause entirely and substitute:**

9.4.1.3 *Completion of the drying cycle*

Shortly before drying is concluded, the block valve cavities should be purged with dry air/nitrogen by closing partially the mainline valve and venting to atmosphere. The pipeline can be considered to be dry along its whole length when the required dewpoint has been reached at the receiving end. Upon reaching a dew point throughout the system better than –20ºC the system shall be isolated and initial readings taken from the end locations. Following a soak period of 12 hours minimum dew point measurements should be taken from the same end locations. Air should be vented at the measurement point for a minimum period of 5 minutes before a measurement is taken. The dewpoint should remain equal to or greater than –20ºC but should not have reduced by more than 5ºC or 20% of the original readings. All dewpoint readings should be taken at or around atmospheric pressure. The line should then be closed off and the air drying equipment removed.

Clause 9.4.2 **Delete Note 1 entirely and substitute:**

Note 1: Typically, a dewpoint of –20°C is equivalent to a saturated vapour pressure of 1.032 mbar.
Note 2: For accuracy, dewpoints are to be measured at or around atmospheric pressure.

Clause 9.4.3 **Delete second paragraph entirely and substitute:**

Having established that all the water vapour has been removed, pressure should be reinstated to atmospheric pressure + 1 bar with a dry medium, and a "soak test" should be conducted following system isolation, to monitor any decay in the dewpoint over an agreed period, up to 24 hours.

Clause 10.1.1 **Delete second paragraph entirely and substitute:**

External corrosion of a buried pipeline may arise from the nature of the surrounding ground, from contact with other buried metallic structures or from the pick up and discharge of stray DC electric earth currents, such as may occur with a DC operated electric traction system or incorrect operation of DC welding equipment, or by AC discharge.

Clause 10.1.2 and 10.1.3 **Delete clauses entirely and substitute:**

10.1.2 Reference should be made to the relevant parts of the appropriate standards for guidance on the selection of coating materials and requirements for their application, for example BS EN 12944 for above ground pipe and pipework and BS EN ISO 21809 for buried pipeline coating systems.

10.1.3 All internal and external painting and coatings systems shall be in accordance with an approved specification. The coatings should be tested for physical durability, cathodic disbondment and the resistance to chemical attack.

Clause 10.2.1 **Delete clause entirely and substitute:**

10.2.1 **Avoidance of known corrosion hazards**

At the route planning stage, consideration shall be given to the avoidance of the more obvious corrosion hazards, for example by routing to avoid:

- stray DC earth current areas
- groundbeds associated with CP systems of other buried assets
- paralleling of high voltage overhead power lines
- electricity towers (pylons)
- wind farms
- contaminated ground
- naturally aggressive ground, for example peat.
- rock or other ground conditions which may limit CP current

Where it is not possible to avoid such hazards appropriate consideration should be given to the effectiveness of CP and the risk of stray current interaction both in terms of transient fault evens and normal operation.

Clause 10.2.2 **Delete Note entirely and substitute:**

Note: Such suitable materials include thermosetting powders and liquids and three layer systems with a polypropylene or polyethylene outer sheath.

Clause 10.2.3 **Add second paragraph, insert after note:**

If a pipeline is considered to be at risk of stress corrosion cracking (SCC) an assessment of the risk should be carried out in accordance with a recognised standard e.g. NACE SP 0204. Further information is available from the UKOPA GPG Managing SCC.

Clause **Delete first paragraph entirely and substitute:**

10.3.2.1

Factory-applied external coating systems shall be such as to provide long term electrical and mechanical characteristics, which are suited to the diameter and operating conditions of the pipe and the nature of the environment. The coatings shall adhere strongly to the pipe and have a sufficient resistance to cathodic disbondment.

Clause 10.3.2.1 **Delete 4th and 5th paragraph and substitute:**

If pipes are to be installed by a trenchless crossing technique e.g. HDD, thrust or auger boring, appropriate coatings shall be used. A reinforced thickness dual layer system should be employed to provide increased resistance to mechanical damage and a suitable wear resistant field joint coating system with a proven track record for use in trenchless crossings should be employed.

A current drainage test shall be conducted in accordance with an agreed procedure on all new trenchless crossing sections before they are tied into the remainder of the pipeline to confirm the extent of coating damage and that current density necessary to achieve CP is within defined limits. Care should be taken to ensure that the pipeline is fully contained within an effective conductive electrolyte during testing.

Clause 10.4.1 **Delete clause entirely and substitute:**

10.4.1 **General**

As soon as possible during construction, CP shall be applied to the pipeline in accordance with standards such as BS ISO 15589. CP may be applied either by means of sacrificial anodes or by the impressed current method.

The CP system shall be designed to ensure that the minimum protection criteria defined in BS EN 12954 for the soil conditions are achieved. For aerobic soil conditions the required polarised potential should be -0.85V vs $Cu/CuSO_4$ and for anaerobic soil conditions the required polarised potential should be -0.95V vs $Cu/CuSO_4$.

Attention shall be, particularly, paid to standards such as BS EN 12954:2001 in relation to:

- the need for electrical insulation joints at offtakes and other installations
- other forms of electrical isolation
- the provision of permanent monitoring facilities
- possible secondary effects such as coating disbondment or electrical interference with adjacent buried structures
- the possibility of DC and AC stray current interference
- the protection of sleeves (see Sub-Section 6.12)
- the need to avoid inadvertent earthing of the CP system through such items as pipe supports, instrument connections, electrically operated valve actuators, reinforced concrete piles remaining after construction, etc.

A CIPS of the entire pipeline shall be undertaken as soon as possible after complete commissioning of the CP system, in order to fully validate and provide a "fingerprint" of the CP system.

As part of the commissioning process for areas where it is not possible to conduct a CIPs survey eg motorways, special crossing, railways, rivers etc due consideration should be given to employing alternative techniques to provide

assurance of effective protection i.e. current gradient survey, diver towed reference electrode surveys etc.

On all new pipelines an approved coating defect survey shall be conducted along the entire pipeline length following backfill.

Temporary CP arrangements should be made where the commissioning of the permanent CP system is delayed or advanced works, for example crossings, are undertaken prior to the main pipeline construction.

The design, installation and monitoring of CP systems should be carried out by personnel having the necessary level of competency defined in BS EN 15257, equivalent CP certification schemes or the pipeline operator's internal verification and training processes.

10.4.2 Due consideration should be given to ensuring that appropriate CP monitoring facilities are installed at regular intervals so as to ensure that routine maintenance and inspection can be conducted to confirm the effectiveness or otherwise of the level of CP current being applied along the pipeline route. Consideration should be given to providing enough monitoring facilities to ensure that CIPs and other trailing wire surveys can be conducted along the entirety of the pipeline with particular attention being paid to the risk of stranded sections i.e. physical barriers where a wire cannot be trailed across e.g. rivers, railways, motorways. Due consideration should be given to the installation of AC and DC coupons at pipe level to provide additional information.

Clause 10.4.2 **Delete clause entirely and substitute:**

10.4.2 **AC corrosion**

When pipelines are routed parallel to overhead high voltage power lines, voltages and current can be induced into the buried pipeline. Long parallelisms with overhead power lines of 132 kV or greater should be avoided or at least minimized:

- separation distance > 500 m should be maintained for parallelisms > 3 km
- separation distance > 200 m should be maintained for parallelisms ≤ 3 km.

The guidance on the measures to evaluate the risk of AC corrosion on buried pipelines given in BS EN 15280 shall be followed.

Where AC corrosion has been identified as a risk the protection criteria to mitigate the AC corrosion risk defined in BS ISO 18086 shall be adopted.

Case studies indicate that, where the AC discharge current density is above 30 Am^{-2} (measured on a 1 cm^2 coupon) there is an enhanced risk of AC corrosion under certain conditions.

Where AC corrosion is identified as a risk suitable coupons should be installed with an exposed surface area of 1cm^2 so that the AC and DC coupon current density can be recorded.

The DC pipe to soil potential, DC current density, AC current density and AC pipe to soil potential can all affect the AC corrosion risk and the methods of assessment and protection criteria defined in BS ISO 18086 should be applied to mitigate the AC corrosion risk.

The first step in mitigating the AC corrosion and safety risk is to ensure that the rms AC voltage on a pipeline is less than 15V, and then ensuring the AC current

density is less than $30Am^{-2}$ and or that the DC current density is $1Am^{-2}$ if the AC current density is in excess of $30Am^{-2}$, or maintaining the AC to DC current density ratio on a 1 cm^2 coupon to be less than 5.

It should be noted that in low resistivity soils, even at very low AC pipe to soil potentials of less than 4V, AC corrosion can occur. Thus, the AC voltage system should be as low as possible.

Clause 10.4.3 **Delete clause entirely and substitute:**

10.4.4 **Mitigation measures**

10.4.4.1 AC Interference

Specialist modelling software packages may need to be applied at the pipeline design phase on new pipelines or if AC interference is detected on existing pipelines. The software packages will be used to identify the areas on the pipeline system where there may be high AC discharge current densities and where additional earthing may be required to discharge the AC current to earth. Guidance on relevant calculations is given in BS EN 50443.

An empirical approach may sometimes be adopted where earthing locations are selected based upon experience of AC interference in similar situations. Where such an approach is conducted, testing shall always be carried out to confirm that the AC interference levels are within prescribed limits.

Following measurement of the induced current, current densities greater than 30 Am^{-2} measured on AC coupons will require mitigation measures to be undertaken.

Earth gradient wires, installed as part of an AC mitigation scheme, should be connected via solid state DC decoupling devices irrespective of the gradient wire material. In the event of failure of the decoupling device then the earth gradient wire material shall not have a detrimental effect on the levels of CP afforded.

1 cm^2 coupons should be installed at fixed test posts along the parallelism in addition to the usual corrosion coupons to facilitate subsequent monitoring of the AC current density. Data logging should be considered over representative periods of time not less than 24 hours to determine the variation of AC pipe to soil and AC discharge current density over time.

Note 1: Areas of uncoated pipeline may also result in erroneous AC current readings.

Where AC mitigation earth gradient wire is installed, due consideration should be given to how effective future monitoring of polarised CP level shall be conducted.

10.4.4.2 DC Interference

DC interference can result in high rates of corrosion on cathodically protected pipelines. During the design of a pipeline CP system the risks of DC interference should be considered and the guidance given in BS ISO 15589-1 and BS EN 50162 followed. It is particularly important to identify the location of third party groundbeds along a new pipeline route to ensure that the pipeline is not routed in close proximity to these.

The effect of a new pipeline CP system on third party pipelines shall be considered at the design phase, and details of the pipeline CP system should be advised to third party pipeline or metallic structure operators at an early stage. The

requirements for stray current interference testing shall be agreed with the third party operator.

Sources of stray DC current should be identified and where appropriate suitable mitigation and monitoring measures implemented. Sources of DC stray current interference include DC traction and DC transit systems, DC welding systems, third party pipeline CP systems, HVDC transmission systems and DC operated solar farms.

Clause 10.5 **Delete clause entirely and substitute:**

10.5 **RECORDS**

Permanent records should be maintained of all corrosion control measures. These should include:

- type of internal coating
- types of external factory/field applied coating
- disposition and type of CP components and bonds
- CP monitoring results
- state of interference bonds and shared schemes
- stray current interaction testing results of inspection surveys, for example DCVG, CIPS, nitrogen sleeves etc.
- results of inspection surveys, for example DCVG, CIPS, nitrogen sleeves etc.
- remedial work carried out
- sleeve protection details, including any auxiliary anodes.

Note: An integrated computer/pipeline management system may require additional specific information.

Clause 11.7.4 **Delete clause entirely and substitute:**

Linepipe and fittings shall be selected from appropriate standards (suitable example references are provided below) in accordance with the specification required to meet the design requirements.

- API 5L
- ASTM A 53
- ASTM A 106
- ASTM A 333
- ASTM A 671
- ASTM A 672
- BS EN 10216
- BS EN 10217
- BS EN 10255
- BS EN ISO 3183.

Clause 11.7.13 and 11.7.14 **Delete clauses entirely and substitute:**

11.7.13 It may be necessary for some components and fittings to be stress-relieved during fabrication and, possibly, after installation. The requirements for stress relief shall

be determined by reference to the fabrication standard or an appropriate standard such as PD 5500.

Note: It is not possible to carry out stress relief on some materials such as thermo-mechanically controlled rolled line pipe, or when welding to a pipeline under pressure. In such cases a fitness for purpose assessment should be carried out to demonstrate that the stress relief is not required. Annexes D and U of PD 5500 and BS 7910 provide guidance.

11.7.14 Where fittings are fabricated to standards other than BS 1640, the fittings shall be of the appropriate strength for the proposed test pressure. They shall be qualified with respect to strength, fracture toughness and weldability in a similar manner to pipe.

Clause 11.7.17 **Delete table 13 entirely and substitute:**

Fitting type	Material*	Limitations	Construction in accordance with
Forged or extruded bends, tees, reducers, caps etc.	Steel		BS EN 10253 BS 1640-3 for ø ≤ 600 mm MSS SP 75 for ø > 600 mm
Weldolet branches	Steel	d/D ≤ 0.3	ANSI/ASME B 31.11 BS EN 10253
Threadolet branches	Steel	ø ≤ 50 mm/ 2 in screwed	ANSI/ASME B 31.11
Weldoflange branches	Steel	ø ≤ 50 mm	BS EN 10222
Sweepolet branches	Steel	d/D ≤ 0.6	BS 1640-3 or ANSI/ASME B 31.11
Full encirclement branches	Steel		PD 5500 or ANSI/ASME equivalent BS EN 13445
Fabricated tapers	Steel		PD 5500
Forged components (whole or part)	Steel		BS EN 10222-1 to 5
Flanges	Steel - according to relevant flange standards	ø ≤ 600 mm ø > 600 mm	ANSI/ASME B 16.5 BS 3293

Delete Note entirely and substitute:

Note: Fittings used shall have equivalent wall thickness and mechanical and chemical properties to those of the pipe.

Clause 11.7.20 **Delete clause entirely and substitute**

Fittings and piping for use on pressure-containing instruments and impulse pipework shall be to standards appropriate to the duty required, such as ASTM A 312 and BS EN 10216-5 with fittings to BS 4368-1.

Clause 11.7.21 **Delete Note 1 entirely and substitute:**

Note 1: Examples are:

- *flanges to BS EN 1759-1, BS 3293, ANSI/ASME B16.5, ANSI/ASME B16.47, MSS SP-6, MSS SP-44,*
- *reducers to BS 1640-3, end caps to BS 1640-3,*
- *screwed and socket welded fittings to BS 3799.*

Clause 11.9.1 **Delete clause entirely and substitute:**

Suitable protection against external corrosion shall be provided unless the material is, in itself, resistant to corrosion.

Clause 11.12.1 **Delete clause entirely and substitute:**

Account shall be taken of the damaging effects of acoustic fatigue caused by high frequency vibration.

Note: This can affect components installed within the pipework itself and small bore instrument connections. Specific precautions to secure small-bore pipework against vibration, or even to alter its natural excitation frequency, may be necessary. Further guidance is given in IGE/TD/13 and the Energy Institute's Guidelines for the Avoidance of Vibration Induced Fatigue.

Clause 11.14.2.4 **Delete second paragraph and substitute:**

Coke or other carbonaceous materials should not be used as part of the electrode systems.

Clause 11.19.3.2 **Delete clause entirely and substitute:**

Radiography should be carried out in accordance with an appropriate standard, such as BS EN ISO 17636 Parts 1 and 2. During construction, arrangements should be made for the scrutiny of all radiographic film. All other non-destructive examination (NDE) and NDT should be witnessed and recorded. The external surfaces of all pipework and fittings should be inspected to ensure that they are free from imperfections, for example notches, weld burns, corrosion.

Clause 11.19.3.11 **Delete clause entirely and substitute:**

On completion of construction, a coating survey should be carried out to locate any areas of coating damage on buried components. Any damage deemed unacceptable should be repaired. Above-ground pipework should be inspected and any coating damage repaired.

Clause 11.22 **Delete paragraph and substitute:**

In certain circumstances, specification of pipework or component wall thickness may result in local wall thickness requirements greater than 30 mm. In such cases, heat treatment of site fabrications may be necessary. The designer shall give consideration to the selection of materials to which post weld heat treatment may be applied, the specific requirements for stress relief using post-weld heat treatment on thick sections, or alternatively the need to carry out an ECA to confirm (or specify) the material toughness requirements, determine the critical crack size and define relevant inspection requirements. Reference should be made to documents such as PD 5500, BS 7910 and BS 2633.

Clause 12.2.3.10 **Delete Note entirely and substitute:**

Note: Attention is drawn to the possibility of induced currents being present which are independent of CP systems e.g long line AC currents. In addition, CP systems can take time to depolarise after isolation and some stored energy may be present. It is advisable to allow 24 hours after isolation of a CP system for all stored energy to dissipate.

Clause 12.4.3.1 **Delete note 2 entirely and substitute:**

Note 2: Pressure variations are caused by the characteristics of automatic control systems (see BS 1523-1). The relevant characteristics are:

- *steady oscillation which occurs when a pipeline system is in a steady state and the pressure deviation oscillates equally about the set pressure*
- *pressure overshoot which occurs when a pipeline system is not in a steady state and the pressure regulating system is caused to take correcting action which results in a maximum pressure deviation.*

Clause **Delete figure 14 entirely and substitute:**

12.4.5.6

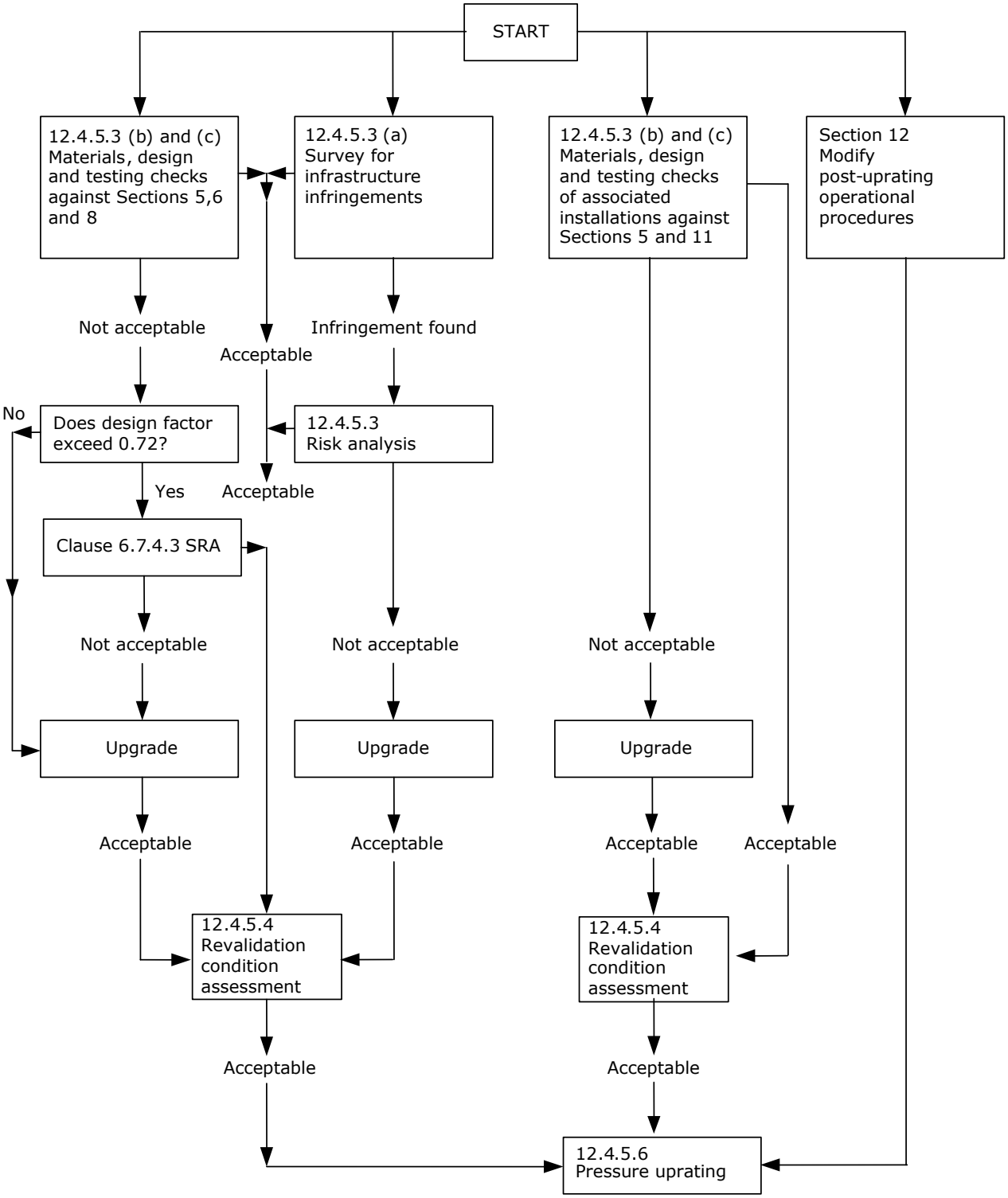


FIGURE 14 - OVERVIEW OF UPRATING PROCEDURE

Clause 12.5 **After Figure 15 add Note:**

Note: In assessing the fatigue life of pipelines containing dent features, reference should be made to the UKOPA good practice guide Managing Pipeline Dents.

Clause 12.7.3.4 **Delete Note entirely.**

Clause 12.7.3.6 **Delete clause entirely and substitute:**

12.7.3.6 *External inspection*

(a) These techniques shall be used on installations and on those pipelines (or sections of pipelines) which cannot be monitored using internal inspection devices and to provide additional intermediate inspections where necessary on pipelines normally monitored using internal inspection devices.

For the types of inspection techniques, reference shall be made to BS ISO 15589-1

Note: Additional impact protection can affect the efficiency of above ground surveys, such as DCVG and CIPS.

(b) For any pipeline/associated installation having a design factor not exceeding 0.3, survey procedures shall be adopted to assess the effectiveness of CP. For other pipelines/associated installations, survey procedures shall be adopted which are designed to detect areas of mechanical damage.

(c) For any pipeline/associated installation having a design factor not exceeding 0.3 or pipelines of nominal wall thickness 19.1 mm or greater at a design factor not exceeding 0.5 which are not internally inspected, the following monitoring methods shall be used:

- a CIPS carried out over the entire length of pipeline/pipework being monitored. Where the polarised potential does not meet the criteria for effective CP, as specified in BSEN 12954, a DCVG or similar survey for coating defects should be carried out
- where electrical interference makes CIPS inaccurate, a separate, simultaneously recorded static data logger shall record the pipe-to-soil potential at an appropriate point on the pipeline and located at least 3 km from the section being surveyed to determine calculate a compensation required in the CIPS data for the amount of interference
- where a pipeline/associated installation is protected by sacrificial anode groups, a CIPS measuring "on" pipe-to-soil potentials may be used where it is not practical to switch off all anode current sources, and supported by polarised potentials measured from buried coupons at test points.

Note: This will enable a polarised potential profile to be estimated for the pipeline.

Consideration shall be given to excavating all locations of coating defects where the CP is not effective and to carry out external pipe wall

inspections. Following any repair work and after consolidation of the backfill, necessary remedial action should be taken to ensure that the pipeline meets the criteria for effective CP.

(d) For any pipeline/associated installation having a design factor exceeding 0.3, or pipelines of nominal wall thickness 19.1 mm or greater operating at a design factor exceeding 0.5, the following monitoring methods shall be used:

- a CIPS carried out over the entire length of pipeline being monitored
- a DCVG or similar coating defect survey for coating defects carried out over the entire length of pipeline being monitored which is not internally inspected, and at specific locations where defects are indicated for pipelines which are internally inspected,
- where electrical interference makes the polarized potential survey inaccurate, a separate simultaneously recorded pipe-to-soil potential at an appropriate point on the pipeline should be used to calculate a compensation for the amount of interference
- where a pipeline/associated installation is protected by sacrificial anode groups, a CIPS measuring "on" pipe to soil potentials may be used where it is not practical to switch off all anode current sources, and supported by polarised potentials measured from buried coupons at test points.

  Note: This will enable a polarised potential profile to be estimated for the pipeline.

Consideration shall be given to excavating all locations of coating defects identified by the coating defect survey and to carry out external pipe wall inspections.

Where the potential survey does not meet the criteria for effective CP specified in BS EN 12954 or an equivalent standard, remedial action shall be taken.

(e) Other survey methods shall be considered where particularly difficult faults are unable to be resolved by normal survey procedures.

- Current attenuation survey

  Similar to the Pearson survey this detects loss of an injected ac signal through measurements of the magnetic field with pairs of coils. The method will also identify the current strength and direction of flow and is a useful technique in locating uninsulated contacts as well as coating defects.

- Direct current voltage gradient (DCVG)

  The voltage gradient that exists at coating defects is measured between two reference electrodes using a voltmeter with an accuracy of +/- 10 mV as the pipeline is traversed. This method will provide information on the relative sizes of coating defects and other sources of current loss but will not determine whether the applied CP is effective.
  The DCVG technique can be used in areas where measurements may be susceptible to AC interference. The DCVG survey technique can also, in some circumstances, determine the shape of a coating defect (from which a cause may be inferred e.g. backfill or mechanical damage), the location of the defect on the pipeline (top, bottom or side) and whether the defect is actively corroding.

The following alternative survey techniques may be considered for application in place or in addition to CIPS.

- Current drainage test (CDT)

  Coating defects can often be introduced during the construction process. At some locations, such as trenchless crossings, these defects will not be able to be detected by coating defect surveys. A current drainage test at these locations can give a qualitative assessment of coating quality from the determination of the current density necessary to achieve CP and an indication of whether additional cathodic protection will be required at the location. In the context of managing CP systems, CDT is also employed to provide an indication of coating quality, for the identification of shorted insulating joints/flanges, pipeline to sleeve shorts, and to confirm cathode faults.

  The principle of a CDT is to use an external power source to provide current to the pipeline and coating defects on the pipeline/pipework via a temporary groundbed and to measure the current required to achieve CP along the length of pipeline under test. Although the current required to achieve CP can be calculated for new systems, this can be unreliable for existing systems, where the level of coating breakdown is unknown or other current drain sources exist. In such cases, the current requirement can be accurately determined by the application of a CDT.

- Electromagnetic current attenuation surveys

  The electromagnetic current attenuation survey technique can be used to indicate where buried steel pipework is free from significant coating defects in a situation where a complete CIPS is not possible. CIPS can be especially difficult where pipes are laid below concrete, tarmac etc., making it impossible to obtain reliable pipe to soil potential readings due to either poor ground contact of the reference electrodes or at locations such as railways, busy road crossings and in towns and cities where the safety of the public and CIPS operatives due to the use of trailing cables can be compromised.

  The technique can also locate cathode faults on cathodically protected pipelines. A cathode fault is present when the current demand to achieve CP is excessive due to an inadvertent contact with another metallic structure such as a cast iron water main, concrete reinforcing bar contact or an insulation joint failure.

  The technique requires an AC signal to be applied between the coated pipe and remote earth by means of a battery-powered transmitter connected between the pipe and one or more earth spikes. The strength of the AC signal is measured along the pipe with an antenna (not connected to the pipe). A coating defect or metal to metal contact with a foreign structure can be identified through an observable drop in the signal gradient.

- Long range ultrasonics (LRU)

  LRU is based on guided ultrasonic waves which are transmitted along a section of pipe to detect metal loss. Typically, it is used where it is difficult to gain access to pipework or pipeline sections, for example road crossings.

  The reliability of LRU is not established, and the user should ensure the technique is suitable for their particular application and materials.

  Note: When carrying out an inspection of below-ground pipework which has a coal tar coating, the wave strength may diminish rapidly. Similarly, some soils may have the same effect.

  In addition, the image may be affected by wave background noise for areas of inspection within 1 metre of the transmitter contacts.

Clause 12.7.4.2 **Delete Note and substitute:**

Note 1: It may be necessary to justify a risk-based approach to a regulatory body.

Note 2 Reference to the UKOPA good practice guide Inspection and Maintenance of Buried Pipelines is recommended.

Clause 12.7.4.3 **Delete clause entirely and substitute:**

A risk-based approach shall take into account those factors which influence the probability and consequences of failures occurring in pipelines/associated installations. The following shall be taken into consideration:

- age and standard of construction
- design assumptions for pipelines and associated installations having a design factor exceeding 0.72
- previous inspection results
- the results obtained from CP monitoring
- any evidence of ground movement
- ground conditions
- operating temperature history of the pipeline/associated installations
- density of population surrounding the pipeline
- pipeline sleeves.

Note: Reference to the UKOPA good practice guide Managing Pipeline Sleeves is recommended

Clause 12.7.4.5 **Add note:**

Note: For the investigation of dent features, reference to the UKOPA good practice guide Managing Pipeline Dents is recommended.

Clause 12.7.5.1 **Delete paragraph (d) and substitute:**

Suitable procedures can be found in BS ISO 15589-1. The following minimum routines shall be considered:

(i) for sacrificial anode systems, pipe/soil potentials at representative points and points of low protection should be checked at 6 monthly intervals. For impressed current systems, a status check should be made monthly where there is just one T/R unit or three monthly where there are a number of T/R units to establish that the CP system power source(s) are functioning within limits that have previously been shown to give the required levels of protection throughout the system. Checks should also be made on the integrity and accessibility of the means of electrical isolation.

Delete paragraph (d) (iii) entirely and substitute:

(iii) after the commissioning period, and where practicable, a CIPS should be carried out over the total length of the pipeline and thereafter at intervals not exceeding 10 years. Ideally CIP surveys should be conducted at the midpoint between in line inspections.

Clause 12.7.5.2 **Delete paragraph (b) entirely and substitute:**

(b) The paint coating system on atmospherically exposed pipe shall be examined on a planned and regular basis and rectified as necessary in an approved manner.

Clause 12.7.5.3 **Delete Paragraph (b) entirely and substitute:**

(b) Pipelines designed, constructed and maintained to either Edition 1 or Edition 2 of IGE/TD/1 may have sleeves that were constructed to give additional protection either to the public, or to the pipeline, from third party activities. These sleeves were built to either Class 1, 2 or 3 standards and shall be maintained depending upon their type.

Paragraph (i) delete 3rd bullet point of the first bullet point and substitute:

- the resistive device should ensure that the current drained provides a sleeve to soil polarised potential in the range –0.85 V to –0.95 V vs $Cu/CuSO_4$. However, the carrier pipe to soil polarised potential should be at least 0.1 V more negative than the sleeve to soil polarised potential.

A 1.2 **Delete Page 168 entirely and substitute:**

AC	Alternating current.
ACoP	Approved Code of Practice.
AGA	American Gas Association.
ALARP	As low as reasonably practicable.
ATEX	Atmospheric Explosibles.
BPD	Building proximity distance.
CAD	Chemical Agents Directive.
CBA	Cost benefit analysis.
CDM	Construction (Design and Management) Regulations.
CDT	Current drain test.
CIPS	Close interval potential survey.
CNE	Combined neutral earth.
CONCAWE	Conservation of Clean Air and Water in Europe.
CoP	Code of Practice.
COPA	Control of Pollution Act.
COSHH	Control of Substances Hazardous to Health Regulations.
CP	Cathodic protection.
DC	Direct current.
DCVG	Direct current voltage gradient.
DECC	Department of Energy and Climate Change.
DEFRA	Department of Environment, Food and Rural Affairs.
DETR	Department of Environment, Transport and the Regions.
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations.
DTLR	Department of Transport, Local Government and Regions.
DWTT	Drop Weight Tear Test.
EA	Environment Agency.
EC	European Community.
ECA	Engineering Critical Assessment.
EGIG	European Gas Incident Group.
EIA	Environmental Impact Assessment.
EPA	Environmental Protection Act.

EPM	Emergency Procedures Manual.
ES	Environmental Statement.
FBE	Fusion bonded epoxy.
GB	Great Britain.
GPS	Global positioning system.
GS(M)R	Gas Safety (Management) Regulations.
GT	Gas transporter.
HDD	Horizontal directional drill
HAZID	Hazard identification.
HAZOP	Hazard and Operability Study.
HMSO	Her Majesty's Stationery Office.
HSC	Health and Safety Commission.
HSE	Health and Safety Executive.
HSWA	Health and Safety at Work etc. Act.
IET	Institution of Engineering and Technology
IGEM	Institution of Gas Engineers and Managers.
LRU	Long range ultrasonics.
LUP	Land use planning.
MAPD	Major Accident Prevention Document.
MHSWR	Management of Health and Safety at Work Regulations.
MIP	Maximum incidental pressure.
MOP	Maximum operating pressure.
NACE	National Association of Corrosion Engineers
NDE	Non-destructive examination.
NDT	Non-destructive testing.
NRA	National Rivers Authority.
NRSWA	New Roads and Street Works Act.
NRV	Non-return valve.
NTSB	US National Transportation Safety Board.
OD	Outside diameter

A 2.1.2 Delete bullet points and substitute:

- Borehole Sites and Operations Regulations 1995
- Conservation (Natural Habitats etc) Regulations 1994 as amended by the Conservation (Natural Habitats, etc Amendment Regulations 1997)
- Construction (Design and Management) Regulations 2015
- Construction (Health, Safety and Welfare) Regulations 1996
- Control of Substances Hazardous to Health Regulations 2002
- Dangerous Substances and Explosive Atmospheres Regulations 2000 (and ACoPs HS(L)134, HS(L)135, HS(L)136, HS(L)137, HS(L)138)
- Deregulation (Pipelines) Order 1999
- Electricity at Work Regulations 1989 (and Guidance HS(R)25)
- Foot and Mouth Disease Order 1983 as amended
- Gas Safety (Management) Regulations 1996 (and Guidance HS(L)80)
- Health and Safety Information for Employees Regulations 1996
- Health and Safety (Safety Signs and Signals) Regulations 1996
- Hedgerows Regulations 1997
- Ionising Radiation Regulations 1999
- Management of Health and Safety at Work Regulations 1999 (and ACoP HS(L)21)
- Manual Handling Operations Regulations 1992
- Noise at Work Regulations 1989 SI 1989
- Personal Protective Equipment at Work Regulations 1992
- Pipelines Safety Regulations 1996 (and Guidance HS(L)82)

- Pipeline Works (Environmental Impact Assessment) Regulations 2000
- Pressure Systems Safety Regulations 2000 (and ACoP HS(L)122 and Guidance HS(R)30)
- Provision and Use of Work Equipment Regulations 1993 (and ACoP HS(L)22)
- Public Gas Transporter Pipeline Works (Environmental Impact Assessment) Regulations 1999
- Reporting of Injuries, Disease and Dangerous Occurrences Regulations (RIDDOR) 2013 (and Guidance HS(L)73)
- Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999
- Town and Country Planning Act (General Permitted Development) Order 1995.

A 2.4 Delete clause entirely and substitute:

- BS 593 Laboratory thermometers
- BS 1041-4 Temperature measurement
- BS 1523-1 Terms used in automatic controlling and regulating systems
- BS 1377 Methods of test for soils for civil engineering purposes. Consolidation and permeability tests in hydraulic cells and with pore pressure measurement
- BS 1640-1 Steel butt-welding pipe fittings (imperial)
- BS 1640-3 Steel butt-welding pipe fittings (metric)
- BS 2633 Class 1 arc welding of ferritic steel pipework
- BS 3293 Carbon steel pipe flanges (over 24 in nominal size)
- BS 3799 Steel pipe fittings, screwed and socket-welding
- BS 4368Metallic tube connectors. Split collect compression fittings.
- BS 4515-1 Specification for welding of steel pipelines on land and offshore. Carbon and carbon manganese steel pipelines
- BS 5228 Noise and vibration control
- BS 5911 Pre-cast concrete pipes, fittings and ancillary products
- BS 5930 Code of practice for site investigations
- BS 6031 Code of practice for earthworks
- BS 6990 Welding on steel pipelines containing process fluids or residuals
- BS 7671 IET Wiring Regulations
- BS 7910 Assessing the acceptability of flaws in metallic structures
- BS 8004 Foundations
- BS 8110-1,2 Structural use of concrete
- BS EN 437 Test gases
- BS EN 837-1,2 Pressure gauges
- BS EN 1127 Explosion prevention and protection
- BS EN 1435 Non-destructive examination of welds. Radiographic examination of welded joints
- BS EN 1514 Flanges and their joints
- BS EN 1998-4 Design of structures for earthquake resistance
- BS EN 1594 Pipelines for MOP over 16 bar

- BS EN 1759-1,3 Flanges and their joints
- BS EN 10028 Flat products of steel
- BS EN 10029 Steel plates for pressure purposes
- BS EN 10045 Charpy testing
- ISO 3183:2012 Steel pipe for pipeline transportation systems
  - Annex M PSL 2 pipe ordered for European onshore natural gas transmission pipelines
- BS EN 10216 Seamless tubes
- BS EN 10217 Welded steel tubes
- BS EN 10222 Steel forgings for pressure purposes
- BS EN 10255 Non-alloy steel tubes.
- BS EN 12954 Cathodic protection of buried or immersed metallic structures. General principles and application for pipelines
- BS ISO 15589-1 Petroleum, petrochemical and natural gas industries. Cathodic protection of pipeline systems. On-land pipelines
- BS ISO 18086 Corrosion of metals and alloys. Determination of AC corrosion. Protection criteria
- BS ISO 21809-1 Petroleum and natural gas industries. External coatings for buried or submerged pipelines used in pipeline transportation systems. Polyolefin coatings (3-layer PE and 3-layer PP)
- BS ISO 21809-2 Petroleum and natural gas industries. External coatings for buried or submerged pipelines used in pipeline transportation systems. Single layer fusion-bonded epoxy coatings
- BS ISO 21809-3 Petroleum and natural gas industries. External coatings for buried or submerged pipelines used in pipeline transportation systems. Field joint coatings
- BS EN 13445 Unfired pressure vessels
- BS EN 13509 Cathodic protection measurement techniques
- BS EN 14161 Petroleum and natural gas industries. Pipeline transportation systems
- BS EN 15257 Cathodic protection. Competence levels and certification of cathodic protection personnel
- BS EN 15280 Evaluation of a.c. corrosion likelihood of buried pipelines applicable to cathodically protected pipelines
- BS EN 50162 Protection against corrosion by stray current from direct current systems
- BS EN 50443 Effects of electromagnetic interference on pipelines caused by high voltage a.c. electric traction systems and/or high voltage a.c. power supply systems
- BS EN 23270 Temperature and humidities for conditioning and testing paints etc.
- BS EN 60079 Electrical apparatus for explosive gas atmospheres
- BS EN ISO 2813 Paints and varnishes
- BS EN ISO 5167 Measurement of fluid flow
- BS EN ISO 9001 Quality Management Systems
- BS EN ISO 12944 Corrosion protection of steel structures by protection paint systems

PD 5500 Unfired fusion welded pressure vessels

A 2.6 **Delete ISO 15590-1,2 pipeline transportation systems entirely and substitute:**

ISO 15590-1,2 Induction bends, fittings and flanges for pipeline transportation systems.

A 2.7 **Delete ANSI/ASME B31.85 and substitute:**

ANSI/ASME B31.8S

Insert:

Energy Institute Guidelines for the Avoidance of Vibration Induced Fatigue Failure in Process Pipework. 2 ed. 2008

NACE SP0204 Stress Corrosion Cracking (SCC) Direct Assessment Methodology

A 2.8 **Delete section entirely.**

A 2.11 **Insert new section on UKOPA references:**

A 2.11 UKOPA

UKOPA/GP/001	Managing Pipelines with Reduced Depth of Cover
UKOPA/GP/004	Managing pipeline dents
UKOPA/GP/005	Managing pipeline sleeves
UKOPA/GP/006	Impact Protection Slabs
UKOPA/GP/009	Near Neutral and High pH Stress Corrosion Cracking
UKOPA/06/0032	Recommendation for Pipeline Maintenance and Inspection

END OF AMENDMENTS TO IGEM/TD/1 EDITION 5.