



GS 142-2

LINE PIPE AND FITTINGS

PART 2: SEAMLESS PIPE TO API 5L

October 1997

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING			
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CONTENTS

Section	Page
FOREWORD	iv
1. INTRODUCTION.....	1
1.1 Scope	1
1.2 Application of this BP Group RPSE.....	1
1.4 Quality Assurance and General Requirements	1
2. PROCESS OF MANUFACTURE AND MATERIAL	3
2.1 Process of Manufacture	3
2.3 Material	3
2.4 Heat Treatment.....	3
2.5 Skelp End Welds	3
3. CHEMICAL PROPERTIES AND TESTS	4
3.1 Composition.....	4
3.2 Heat Analyses.....	4
3.3 Product Analyses.....	4
3.4 Recheck Analyses.....	5
3.5 Mill-Control Analyses.....	5
4. MECHANICAL PROPERTIES AND TESTS.....	6
4.1 Mechanical Properties.....	6
4.2 Tensile Tests.....	6
4.3 Testing Frequency	6
* 4.4 Longitudinal Tensile Tests	6
4.5 Transverse Tensile Tests.....	6
4.6 Weld Tensile Tests	6
4.7 Mill-Control Tensile Tests	7
4.8 Retests	7
4.10 to 4.19 Flattening Tests, Bend, Arc, Tensile - Elongation, Guided Bend and Weld Ductility Tests	7
4.20 Fracture Toughness Tests	7
4.21 Hardness Test.....	7
* 4.22 Sour Service	7
5. HYDROSTATIC TESTS.....	8
5.1 Mill Inspection.....	8
5.2 Verification of Test.....	8
5.3 Test Pressures	8
5.4 Supplementary Hydrostatic Tests.....	8



6. DIMENSIONS, WEIGHTS AND LENGTHS	9
6.5 Length	9
6.6 Straightness	9
6.7 Joints	9
Table 6.3 Tolerances on Dimensions and Weights.....	9
7. PIPE ENDS AND THREAD PROTECTORS	10
7.1 Pipe Ends	10
7.2 Threaded Ends.....	10
7.3 Plain Ends	10
7.4 Belled Ends	10
7.6 Thread Protectors	10
7.7 Bevel Protectors	10
8. COUPLINGS.....	10
9. NON-DESTRUCTIVE INSPECTION	10
10. WORKMANSHIP, VISUAL INSPECTION AND REPAIR OF DEFECTS	11
10.2 Plant Access	11
10.3 Rejection	11
10.5 Workmanship	11
10.6 Visual Inspection	12
10.7 Defects	12
10.8 Repair of Defects.....	12
10.9 Procedure for Repair of Parent Metal of Welded Pipe	12
10.10 Procedure for Repair of Weld Seam.....	12
11. MARKING AND COATINGS	13
11.1 Pipe and Pipe Couplings	13
APPENDIX A.....	14
DEFINITIONS AND ABBREVIATIONS	14
APPENDIX B.....	15
LIST OF REFERENCED DOCUMENTS.....	15
APPENDIX C.....	16
API APPENDICES A, B, D, E, F, & G.....	16
APPENDIX D.....	20
MANUFACTURING PROCEDURE SPECIFICATION.....	20



APPENDIX E	21
MANUFACTURING PROCEDURE QUALIFICATION	21
APPENDIX F	22
PIPELINE DATA SHEET	22
APPENDIX G.....	23
HAZ HARDENABILITY TEST	23



FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory Volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory Volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Guidance for Specification

This is a new BP Group RPSE, first issued in 1985. It specifies BP general supplementary requirements for [API 5L](#): Line Pipe that are within its stated scope, and is for use with a supplementary specification to adapt it for each specific application. Note that local or national statutory regulations in the country of operation must be complied with, and may impose additional or limiting requirements.

The value of this BP Group RPSE to its users will be significantly enhanced by their regular participation in its improvement and updating. For this reason users are urged to inform BP of their experiences in all aspects of its application.

This Guidance for Specification is based upon an industry specification.

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Application

This Guidance for Specification is intended to guide the purchaser in the use or creation of a fit-for-purpose specification for enquiry or purchasing activity.

Text in italics is Commentary. Commentary provides background information which supports the requirements of the Specification, and may discuss alternative options. It also gives guidance on the implementation of any "Specification" or "Approval" actions; specific actions are indicated by an asterisk (*) preceding a paragraph number.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.



Principal Changes from Previous Edition

This document is an update of BP Standard 166 Part 2 (May 1985). No technical changes have been made, the update comprises only re-formatting into the Guidance for Specification (GS) style. Users should be aware that this document retains the prescriptive requirements of BP Standard 166 Part 2.

Feedback and Further Information

Users are invited to feed back any comments and to detail experiences in the application of BP RPSE's, to assist in the process of their continuous improvement.

For feedback and further information, please contact Standards Group, BP Engineering or the Custodian. See Quarterly Status List for contacts.



1. INTRODUCTION

1.1 Scope

1.1.1 This BP Group RPSE specifies BP general requirements, supplementary to [API Specification 5L](#): Line Pipe, Thirty Fifth Edition, May 1984, for critical pipe line duties as specified by BP.

1.1.2 It does not apply to low-criticality pipelines, e.g. water or effluent duties or pipework for general refinery and chemical plant. For these duties BP requirements for [API 5L](#) pipe will be covered by the supplementary requirements of BP Group [GS 142-6](#) or equivalent.

1.1.3 Composition and property requirements for [API 5L](#) Grade B to Grade X70 inclusive are specified. Note that pipe manufactured simply in accordance with API Specification 5L is unlikely to meet the restrictive limitations of this BP Group RPSE.

1.2 Application of this BP Group RPSE

1.2.1 To apply this, supplementary specification and approval actions are required by BP to adapt it to each specific project application. These are indicated by an asterisk (*) preceding a paragraph number.

1.2.2 Additionally, BP may select options or waive requirements in this BP Group RPSE, depending on the nature of the project concerned.

1.2.3 From Section 2 onwards, the clauses in this BP Group RPSE have the same numbers as the relevant clauses in [API Specification 5L](#) but it should be noted that not all clauses of [API Specification 5L](#) have headings, and not all headings relate to a single clause number. New clauses have been given additional consecutive numbers.

* 1.2.4 This BP Group RPSE shall be used in conjunction with a pipeline data sheet, detailing the design conditions and mechanical property requirements. A typical example is given as Appendix F. To conform with manufacturing convention, the pipeline data sheet may refer to line pipe nominal sizes in inch units, but metric units shall be used for all dimensions and tolerances, unless otherwise specified by BP.

1.4 Quality Assurance and General Requirements

1.4.1 The manufacturer shall operate a quality system which ensures that the requirements of this BP Group RPSE are achieved.



- * 1.4.2 Unless otherwise stated in a purchase order, the manufacturer's quality system shall be based on [BS 5750](#) parts 2 and 5 (or an equivalent) and shall be described in a quality plan. It shall include provision for the QA of all raw materials, pipe manufacture and final inspections. The plan shall be submitted to BP with the tender documents and shall be subject to approval by the BP Materials Engineer prior to manufacture.
- 1.4.3 The effectiveness of the quality system and the manufacturer's compliance with it will be subject to monitoring by BP and in addition may be audited following an agreed period of notice.
- 1.4.4 The manufacturer shall ensure that all documents related to this BP Group RPSE and the purchase order are collated, indexed and retained for subsequent presentation to BP.
- These shall be:
- (1) List of pipes, identification and heat numbers
 - (2) Chemical and mechanical properties
 - (3) NDT results
 - (4) Weights
 - (5) Purchase order
 - (6) Test certificates
 - (7) Other documents required in the purchase order (e.g. inspection release forms).
- The documentation shall be presented in data folders in chronological order, edited into sections and indexed for ease of recovery and traceability.
- 1.4.5 In making an offer to manufacture linepipe in accordance with this BP Group RPSE, a manufacturer shall submit a separate manufacturing procedure specification in accordance with Appendix D. The offer shall also state any proposed deviations from the requirements specified by BP.
- * 1.4.6 Following agreement on the manufacturing procedure specification and receipt of an order, but prior to the start of main production, a manufacturer shall carry out a manufacturing procedure qualification in accordance with Appendix E, witnessed by BP (except as in 1.4.7). No change may be made to a successfully qualified manufacturing procedure without the approval of the BP Materials Engineer and, after such approval, BP may require a manufacturing procedure qualification to be carried out on the new manufacturing procedure.
- * 1.4.7 Where a manufacturer has previous experience of manufacturing linepipe of the grade, size and quality ordered, he may submit



appropriate production statistics to BP. In the light of such information, the BP Materials Engineer may waive the requirement for a prior manufacturing procedure qualification and accept testing, in accordance with Appendix E, of a pipe from the first day of production.

- * 1.4.8 Unless otherwise specified by BP, all test certificates and other formal documents shall use SI metric units. Where necessary, the conversion factors listed in the Foreword of [API Specification 5L](#) shall be used to achieve this. Regardless of the actual units of measurement, the accuracy of all measuring and testing equipment shall be demonstrated to BP prior to the start of production.

- 1.4.9 The manufacturer shall submit full details of the suitability of the proposed material for field welding this shall include authenticated data that pipes of similar chemical analysis, carbon equivalent and manufacturing procedure have been satisfactorily welded by manual and automatic methods without the need for post weld heat treatment. Details of the cold cracking susceptibility of the material and confirmation that the hardness of the field heat affected zone did not exceed 248 HV 10 is required.

2. PROCESS OF MANUFACTURE AND MATERIAL

2.1 Process of Manufacture

Pipe furnished to this supplementary BP Group RPSE shall be made by the 'Seamless' process.

2.3 Material

All steel shall be fully killed and made to fine grain practice. Vacuum degassed steel is preferred for pipe wall thickness above 20 mm (3/4 in).

(Additional to [API 5L](#))

2.4 Heat Treatment

Quenched and tempered pipe shall be supplied for grades X56 and above. Pipe of lower grades shall be supplied either normalised or quenched and tempered.

(Additional to [API 5L](#))

2.5 Skelp End Welds

Not applicable to this part of BP Group GS 142-2.



3. CHEMICAL PROPERTIES AND TESTS

3.1 Composition

The manufacturer shall advise BP of any deviations from the limits placed on ladle and product analyses in the manufacturing procedure specification.

Re-qualification of the manufacturing procedure may be required if the deviations are considered significant.

3.2 Heat Analyses

The manufacturer shall furnish a report to BP giving the heat analysis of each heat of steel used in the manufacture of pipe supplied to a purchase order. This report shall also list the pipe numbers of those pipes made from each heat of steel. The report shall give the analysis for each of the elements listed in 3.3, together with analysis for any other elements whose addition has been approved by the BP Materials Engineer. Where several samples are taken for analysis during the pouring of one heat, the reported heat analysis shall be the average of these, but each individual value shall meet the requirements of 3.3 for product analyses.

(Substitution for [API 5L](#))

3.3 Product Analyses

The results of all product analyses shall be made available to BP. The full analysis shall be carried out on the first pipe rolled from each heat. Where more than 50 pipes are rolled from one heat, another full product analysis shall be carried out every 50 pipes. (If the pipes are rolled as multiple lengths, the analysis shall be carried out on the first cut length from every 50 multiple lengths from each heat).

Unless alternative proposals are approved by the BP Materials Engineer prior to the start of production, the product analysis shall conform to the following limits:

Carbon	0.17 % maximum
Manganese	0.8 % to 1.5 %
Silicon	0.15 % to 0.40%
Sulphur	0.010 % maximum
Phosphorus	0.025 % maximum
Nitrogen	0.012 % maximum
Vanadium	0.10 % maximum
Niobium	0.05 % maximum
Titanium	0.03 % maximum
Aluminium	0.025 to 0.050%



Nickel plus copper	0.45 % maximum
Chromium plus molybdenum	0.30 % maximum
Boron	0.0003% maximum
Calcium	0.0006% maximum

No other element shall be added to the steel without the approval of the BP Materials Engineer.

When the pipeline data sheet defines the service as sour, the limit on sulphur shall be reduced to 0.005% maximum, additional limitations on manganese may be necessary and inclusion control parameter(s) shall be reported.

The product analysis shall also meet the following requirements:

$$(i) \quad C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} = 0.42\% \text{ max}$$

$$(ii) \quad C + \frac{V}{10} + \frac{Mo}{15} + \frac{Cr + Mn + Cu}{20} + \frac{Si}{30} + \frac{Ni}{60} + 5B = 0.21\% \text{ max}$$

When the pipeline data sheet defines the service as sour additional limitations on (i) and (ii) may be necessary.

(Substitution for [API 5L](#))

3.4 Recheck Analyses

If any part of the product analysis fails to meet the requirements of 3.3, either the whole heat shall be rejected, or each individual pipe shall be fully analysed, and all pipes failing to meet the requirements of 3.3 shall stand rejected.

(Substitution for [API 5L](#))

3.5 Mill-Control Analyses

Any mill control analyses carried out in addition to the above requirements shall meet the same requirements as the compulsory tests.

(Additional to [API 5L](#))



4. MECHANICAL PROPERTIES AND TESTS

4.1 Mechanical Properties

The maximum permitted transverse yield strength shall be 600 MPa for grades X65 and above, 550 MPa for grades X52, X56 and X60 and 500 MPa for lower grades.

(Additional to [API 5L](#))

4.2 Tensile Tests

Strip specimens shall be used for longitudinal tests.

(Additional to [API 5L](#))

4.3 Testing Frequency

Transverse and, when required, longitudinal tensile tests shall be carried out on the first pipe from each heat. Where more than 50 pipes are made from one heat, another set of tests shall be carried out every 50 pipes. Where the pipes are rolled as multiple lengths, the tests shall be taken from the extreme ends of the multiple length, and the additional test is required only where the number of multiple lengths exceeds 50.

(Additional to [API 5L](#))

*** 4.4 Longitudinal Tensile Tests**

When the pipeline data sheet defines the service as submarine, longitudinal tensile tests are required in addition to the transverse tests regardless of pipe diameter. Longitudinal tests are also required when round bar transverse tests are not practicable. BP will confirm the maximum allowable tensile strength prior to contract.

(Additional to [API 5L](#))

4.5 Transverse Tensile Tests

Round bar transverse tensile specimens shall be used when practicable.

(Additional to [API 5L](#))

4.6 Weld Tensile Tests

Not applicable to this part of BP Group GS 142-2.



4.7 Mill-Control Tensile Tests

Any mill-control tests which the manufacturer may carry out in addition to the above requirements shall meet the same requirements as the compulsory tests.

(Additional to [API 5L](#))

4.8 Retests

If any specimen fails to conform to any of the specified requirements, then (subject to the allowances of 4.9 for defective specimens) the whole heat shall stand rejected. The manufacturer may then offer individual pipes from that heat/lot for acceptance by the test which was failed by the original test pipe (i.e. the full tensile test, the guided bend test, or Charpy test on the failed area). Any deviation from this approach must be approved by the BP Materials Engineer.

(Substitution for [API 5L](#))

4.10 to 4.19 Flattening Tests, Bend, Arc, Tensile - Elongation, Guided Bend and Weld Ductility Tests

Not applicable to this part of BP Group GS 142-2.

4.20 Fracture Toughness Tests

Charpy V-notch impact testing in accordance with SR-8 is required in all cases. The retest procedure of 4.8 shall apply.

(Additional to [API 5L](#))

4.21 Hardness Test

One piece of pipe from each heat of steel shall be subjected to the weldability test defined in Appendix G . A hardness survey shall be carried out on one hardenability test per heat using a Vickers diamond pyramid hardness tester with a 10 kg load. Where a pipeline data sheet defines the service as sour, no individual hardness value in the HAZ shall exceed 248 HV10. For non-sour service, this figure is relaxed to 300 HV10. For sour and non-sour service the hardness in the parent pipe material shall not exceed 220 HV10. If any result exceeds this limit, two further sections shall be cut from the same weld, and if either of these gives results over the limit, they shall be immediately investigated and reported to BP.

(Additional to [API 5L](#))

*** 4.22 Sour Service**

Where the pipeline data sheet defines the service as sour, the pipe shall comply with the requirements of BP Group [GS 136-1](#) based on [NACE](#)



Standard [MR-01-75](#) (1980 Revision). BP will confirm testing frequency and acceptance criteria prior to contract.

(Additional to [API 5L](#))

5. HYDROSTATIC TESTS

5.1 Mill Inspection

Hydrostatic testing shall be carried out on the pipe in its final condition and prior to final inspection.

For all pipe sizes, test pressures shall be held for not less than 20 seconds.

(Additional to [API 5L](#))

5.2 Verification of Test

Each test record shall be marked with the number of the pipe to which it refers. Any pipe which leaks or bursts during test shall be retained for inspection by BP.

(Additional to [API 5L](#))

5.3 Test Pressures

The test pressure shall not exceed the minimum test pressure by more than 5%. Unless a lower value is given on the pipeline data sheet, the minimum test pressure shall be computed by the formula $P = 2St / D$ where:-

P = minimum hydrostatic test pressure
S = specified minimum yield strength
t = specified minimum wall thickness
D = nominal outside diameter.

(Additional to [API Spec 5L](#))

5.4 Supplementary Hydrostatic Tests

Not applicable to this part of BP Group GS 142-2.



6. DIMENSIONS, WEIGHTS AND LENGTHS

6.5 Length

No pipe shall be shorter than 10.0 metres (33 ft). Where the pipeline data sheet defines the duty as submarine, all pipe lengths shall lie in the range 11.5 to 13.0 metres (38 to 43 feet) inclusive.

(Amendment to [API 5L](#))

6.6 Straightness

The pipe straightness measured in accordance with [API 5L](#) shall not deviate from a straight line by more than 1/600 of the actual pipe length.

(Amendment to [API 5L](#))

6.7 Joints

Joints shall not be supplied.

(Amendment to [API 5L](#))

Table 6.3 Tolerances on Dimensions and Weights

(Outside Diameter of) Pipe Body: As [API 5L](#).

(Inside Diameter of) Pipe Ends: The tolerance on the internal diameter within 100 mm (4 in) of the pipe ends shall be ± 1.5 mm (1/16 in). The internal diameter shall be defined as the nominal metric outside diameter minus twice the nominal metric wall thickness.

Out-of-Roundness: Along the whole length of the pipe, the maximum outside diameter, measured at any point, shall not exceed the minimum outside diameter, measured by the same technique at the same point, by more than 1%. Out-of-roundness at the pipe ends shall be assessed using an internal ring gauge of diameter 3 mm (1/8 in) less than the nominal internal diameter. This gauge shall pass freely 100 mm (4 in) into each end of the pipe when held normal to the pipe axis.

Wall Thickness: The specified maximum wall thickness shall be calculated by applying the tolerance to the nominal metric wall thickness and rounding down to the next 0.1 mm (0.004 in) multiple. The specified minimum wall thickness shall be calculated by applying the minus tolerance to the nominal metric wall thickness and rounding up to the next multiple of 0.1 mm (0.004 in).

Weight: As [API 5L](#).



(Amendment to [API 5L](#))

7. PIPE ENDS AND THREAD PROTECTORS

7.1 Pipe Ends

All pipe shall be furnished with plain ends as defined in 7.3.

(Amendment to [API 5L](#))

7.2 Threaded Ends

Not applicable to this part of BP Group GS 142-2.

7.3 Plain Ends

The root face shall be 1.5 ± 0.5 mm (0.059 ± 0.02 in). There shall be no internal taper.

(Amendment to [API 5L](#))

7.4 Belled Ends

Not applicable to this part of BP Group GS 142-2.

7.6 Thread Protectors

Not applicable to this part of BP Group GS 142-2.

7.7 Bevel Protectors

When required, bevel protectors will be specified in the purchase order.

(Additional to [API 5L](#))

8. COUPLINGS

Not applicable to this part of BP Group GS 142-2.

9. NON-DESTRUCTIVE INSPECTION

Examination of each length of pipe shall be carried out in accordance with [API Appendix E,SR4](#).



10. WORKMANSHIP, VISUAL INSPECTION AND REPAIR OF DEFECTS

10.2 Plant Access

Once a manufacturing procedure has been specified, approved and qualified, BP shall have access to steelmaking, casting dressing, rolling, pipemaking and all other processes connected with the production of pipe for the order. All relevant production records and data on relevant technical investigations shall be made available to BP.

(Addition to [API 5L](#))

10.3 Rejection

The BP Materials Engineer may require the main production to be stopped at any stage of the order if:-

- (a) The total of heats rejected exceeds 10% of the total heats offered.
- (b) More than 10% of the pipes are rejected in any day's production (other than by chemical or mechanical tests) or re-routed for repairs or re-processing.

Production shall not proceed until the cause of the difficulty has been established, and corrected as approved by the BP Materials Engineer.

(Addition to [API 5L](#))

10.5 Workmanship

- (a) Dents: Not permitted.
- (b) to (f) Not applicable to this part of BP Group GS 142-2.
- (g) Grinding: Defects in the body of the pipe, including laps, shell and slivers, shall be removed by grinding. A smooth curved surface shall be obtained. Thickness measurements shall be made on all areas where grinding has been carried out. The final thickness after grinding shall be not less than the specified minimum wall thickness.
- (h) Hard Spots: The hardness limitation of paragraph 4.21 shall apply to all parts of the pipe.

(Amendments and Additions to [API 5L](#))



10.6 Visual Inspection

When specified on the pipeline data sheet, all pipes shall be blast cleaned to Sa 2 1/2 (Swedish Standard SIS 05 59 00) for final inspection. Visual examination shall be undertaken on the internal, external and weld bevel surfaces. Apart from the presence of the hard stamped pipe number, the bevel shall be smooth and free from tool marks.

(Additional To [API 5L](#))

10.7 Defects

- (a) Cracks and Leaks: All cracks, sweats and leaks shall be clearly marked, and the pipe length set aside for inspection or investigation by BP.
- (b) Laminations: Pipe bevels containing laminations shall be cut back until all laminations detectable by wet magnetic particle inspection have been removed.
- (c) Arc Burns: Burns on the weld bevel (produced during magnetisation) shall be removed by re-bevelling. Repair by welding is not permitted.
- (d) Undercuts: Not applicable to this part of BP Group GS 142-2.
- (e) Other Defects: All sharp edged imperfections shall be considered as defects, regardless of depth.
- (f) Disposition: As [API Specification 5L](#).

(Amendments and Additions to [API 5L](#))

10.8 Repair of Defects

- (a) Seamless Pipe: Repair by welding is not permitted.

(Amendment to [API 5L](#))

10.9 Procedure for Repair of Parent Metal of Welded Pipe

Repair by welding is not permitted.

(Amendment to [API 5L](#))

10.10 Procedure for Repair of Weld Seam

10.12 Not applicable to this part of BP Group GS 142-2.



11. MARKING AND COATINGS

11.1 Pipe and Pipe Couplings

- (d) Unique pipe numbers shall be allocated sequentially, and marked on the pipes by cold die stamping on the weld bevel at each end of the pipe.
- (e) SI metric units shall be used for all pipe markings.
- (f) All pipe shall be supplied free from coatings, except that the area on which the paint stencilled marking is to be made shall first be blast cleaned (if necessary for permanence and legibility) then stencil marked, and finally coated with a protective varnish.
(Additions to [API 5L](#))



DEFINITIONS AND ABBREVIATIONS

Definitions

Standardised definitions may be found in the BP Group RPSEs Introductory volume.

BP Materials Engineer: a BP specialist engineer appointed to ensure that the provisions of this Standard are met.

BP Pipeline Engineer: a BP specialist engineer appointed to design or approve the design of the pipe line.

Manufacturer The manufacturer of pipe to which this standard applies.

Abbreviations

API American Petroleum Institute

HAZ Heat Affected Zone

HV Vickers Hardness

SI Systeme International D'Unites

SIS Swedish Standards Institution



LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

British Standards

[BS 5750](#): Part 2 Quality Systems Specification for Manufacture and Installation

[BS 5750](#): Part 5 Quality Systems Guide to Use of Part 2

American Standards

[API 5L](#): 1984 API Specification for Line Pipe

International Standards

[SIS 05 59 00](#) Pictorial Surface Preparation Standards for Painting Steel Surfaces

BP Group Documents

BP Group [GS 136-1](#) Materials for Sour Service to Nace Standard MR- 01-75 (1980 Revision)

BP Group [GS 142-6](#) Piping Specifications

BP Group [GS 118-10](#) Field Welding of Cross Country Pipelines

Industry Standards

[NACE Std MR-01-75](#) Material Requirement Sulphide Stress Cracking
(1980 Revision) Resistant Metallic Material for Oil Field Equipment



APPENDIX C

API APPENDICES A, B, D, E, F, & G

API APPENDICES A AND B - SPECIFICATION FOR WELDING JOINTERS, REPAIR WELDING PROCEDURE AND WELDER PERFORMANCE TESTS.

Not applicable to this part of BP Group GS 142-2.

API APPENDIX D - METRIC TABLE 6.2 DIMENSIONS, WEIGHTS AND TEST PRESSURES.

Test Pressures shall be in accordance with Paragraph 5.3.

API APPENDIX E - SUPPLEMENTARY REQUIREMENTS

SR3: COLOUR IDENTIFICATION

Not required for this part of BP Group GS 142-2.

SR4: NON-DESTRUCTIVE INSPECTION OF SEAMLESS LINEPIPE

SR4.1 Supplementary Non-destructive Inspection. The full length of each pipe shall be inspected by multiprobe automatic ultrasonic examination after the hydrostatic test.

The purpose of this test is to:

- (1) measure wall thickness
- (2) detect pipe body laminations
- (3) detect longitudinal defects for normalised pipe, detect longitudinal and transverse defects for quench and tempered pipe.

If the ultrasonic equipment is unable to detect transverse defects, quenched and tempered pipe shall also be examined by an electromagnetic technique. Any pipe-end region not scanned by the full automatic technique shall be inspected by manual ultrasonic examination. Any pipe which has a defect removed by grinding shall then be re-inspected by the technique which originally indicated the defect, and in addition BP may specify wet magnetic particle inspection.

SR4.2 Magnetic Particle Inspection. The equipment shall indicate the presence of any imperfections, such as laminations in the weld bevel. The wet method shall be used. Pipe containing appropriate defects shall be made available so that checks on the efficiency of the magnetic field and magnetic ink may be made at any time during processing of the order. Any imperfection detected on the



weld bevel shall be cause for re-bevelling. Any imperfection in the pipe surface shall be removed by grinding, followed by a check that the remaining wall thickness is not less than the specified minimum.

*** SR4.3 Ultrasonic or Electromagnetic Inspection**

(a) Equipment

All equipment techniques and procedures shall be subject to approval by BP prior to its use. Before such evaluation is carried out the manufacturer shall supply a document outlining the capabilities of the equipment and the calibration procedure to be adopted.

BP may require to evaluate the performance of the equipment under production operation conditions.

The automatic ultrasonic probe array shall scan the pipe along an axial or helical path with a separation not exceeding 20 mm (3/4 in) between adjacent paths. It shall record wall thickness, and shall also examine the pipe for defects on the internal and external surfaces using a probe array which scans the pipe in two opposing circumferential directions. The equipment shall be fitted with an automatic paint spray, or similar technique, for marking areas giving ultrasonic indications above the reference level, and with a distinct warning of loss of ultrasonic coupling with the pipe. A permanent record containing a trace of each probe channel shall be produced for each pipe, and submitted to BP for examination.

(b) Reference Standards

The ultrasonic reference standard shall contain a 1.6 mm (1/16 in) diameter radially drilled hole and four V-notches with a depth not exceeding 5% of the nominal wall thickness. One longitudinal and one transverse notch shall be machined on the inside surface, and one of each on the outside surface.

The electromagnetic reference standard shall consist of a pipe with three radially drilled holes, 3.2 mm (1/8 in) diameter. These shall be separated circumferentially by 120 deg., and longitudinally by sufficient distance for each one to produce a separate signal.

Sensitivity shall be adjusted so that all five standard defects trigger the paint spray. If any of the standard defects produces a signal below the reference level, the sensitivity shall be re-adjusted, and all pipes passed since the previous calibration shall be re-examined.



(c) Acceptance Limits

Any imperfection that produces a shear wave signal greater than by the reference level shall be considered a defect.

Any imperfection that manifests itself on compression wave testing by either (i) or (ii) below shall be considered a lamination.

(i) Giving rise to an indication, the amplitude of which exceeds half the backwall signal.

(ii) Reducing the back wall signal by more than a half.

The size of acceptable laminations shall be determined in the procedure specification.

SR4.4 Marking.

Relevant marking of the pipes is not required.

(Additional to [API 5L](#))

SR5 AND SR6: CHARPY IMPACT TEST (FOR SHEAR AREA ONLY) AND DROP WEIGHT TEAR TESTING.

Not applicable to this part of BP Group GS 142-2.

SR7: THROUGH-THE-FLOWLINE (TFL) PIPE

Not applicable to this part of BP Group GS 142-2.

SR8: FRACTURE TOUGHNESS TESTING OF LINEPIPE

SR8.6 Charpy V-notch impact test specimens shall be taken from each pipe selected in accordance with paragraph 4.3 for tensile tests. They shall be notched and all sets tested at the temperature, and against the requirements given on the pipeline data sheet. The shear area shall also be estimated on the fracture surface of each test specimen. In the event of failure, the retest requirements of 4.8 of this BP Group RPSE shall apply. Relevant marking of the pipes is not required.

(Additional to [API 5L](#))



API APPENDIX F - GUIDED BEND TEST JIG DIMENSIONS

Not applicable to this part of BP Group GS 142-2.

API APPENDIX G - LIST OF AUTHORISED MANUFACTURERS

Since this BP Group RPSE contains requirements more stringent than those of [API spec. 5L](#), authorised users of the API monogram are not automatically acceptable to BP.

(Amendment to [API 5L](#))



MANUFACTURING PROCEDURE SPECIFICATION

The manufacturing procedure specification shall include all factors which influence the quality and reliability of production. In particular, the specification shall include the following:-

- (i) Steelmaker and plant at which steel is produced.
- (ii) Steelmaking process and nominal weight of each heat.
- (iii) Any techniques proposed for de-sulphurising or degassing and limits on inclusion control parameter.
- (iv) Limits on heat and product analysis, including residual elements, to be placed on steelmaker.
- (v) Any techniques proposed for sulphide shape control.
- (vi) Casting technique, size and weight of ingots, slabs or skelps and methods for control of centre line segregation.
- (vii) Ingot or billet soaking and finish working temperatures (with tolerances and method of control).
- (viii) Ingot or billet piercing and forming techniques.
- (ix) Method of controlling thickness of finished pipe.
- (x) Straightening techniques and heat treatments on finished pipes.
- (xi) Pipe end ultrasonic testing technique, with acceptance criteria.
- (xii) Method and frequency of calibrating pipe end ultrasonic tester.
- (xiii) Full details of full body ultrasonic and electromagnetic testing equipment, techniques and calibration frequency, including length at the pipe ends not scanned by all probes, and methods of marking defects and indicating loss of coupling. Acceptance criteria for pipe body laminations.
- (xiv) Method of measuring pipe wall thickness, including sensitivity and calibration technique.
- (xv) Techniques for wet magnetic particle inspection, including reference standards.
- (xvi) Techniques proposed for measuring end squareness.
- (xvii) Expected ranges of all mechanical test results.
- (xviii) Definition of "Lot" as used in this BP Group RPSE.
- (xix) Pipe identification scheme.

MANUFACTURING PROCEDURE QUALIFICATION

- A2.1 At least one pipe of each size shall be manufactured in accordance with the agreed manufacturing procedure specification, and be in accordance to all of the inspection and testing required for a pipe representing one heat of steel (including a hydrogen-induced cracking test to the requirements of 4.22 where appropriate).
- A2.2 The following additional tests shall also be undertaken on the manufacturing procedure qualification pipe:
- (i) Additional Charpy tests to the requirements of [API Appendix E](#), SR8 are required at temperatures 20°C (36°F) and 40°C (72°F) above and below the routine test temperature (the lower temperature tests are for information only). Shear area shall be recorded in all cases.
 - (ii) The mechanical test requirements of Section 4 shall be met additionally by test pieces taken from a section of the pipe after a heat treatment of one hour at 600°C ± 10°C (1112°F ± 18°F).
 - (iii) The pipe body Charpy test requirements of [API Appendix E](#), SR8, shall be met by longitudinal test pieces taken from a section of the pipe after it has been machined flat, and subjected to a 3% tensile strain in the longitudinal direction, and a heat treatment of one hour at 280°C ± 5°C (536°F ± 9°F).
 - (iv) Four longitudinal and four transverse tensile tests shall be taken at intervals of two metres (79 in) along the pipe, in addition to the normal specimens at each end.
 - (v) An additional set of three Charpy specimens tested in accordance with API Appendix E, SR8 is required at each place along the pipe where the additional tensile tests are taken.
 - * (vi) When a pipeline data sheet defines the service as sour a full pipe weldability trial shall be completed. The purpose of this test is to ensure the pipe can be welded under field conditions at typical heat input levels.

The welding procedures (manual and automatic) shall be approved by the BP Materials Engineer. The mechanical testing methods and acceptance criteria, including hardness testing shall comply with BP Group [GS 118-10](#).



PIPELINE DATA SHEET

PROJECT

Part One (for completion by the responsible BP Pipeline Engineer)

Nominal Pipe Diameter	 mm	 in
Nominal Wall Thickness	 mm	 in
Specified Minimum Yield Strength	 Mpa	 psi
Approximate Length	 km	 miles
Maximum Design Pressure	 bar(ga)	 psig
Vapour Pressure at Atmospheric Temperature and Pressure	 bar(ga)	 psig
Maximum Field Hydrostatic Test Pressure	 bar(ga)	 psig
Minimum Design Temperature	 °C	 °F
Maximum Design Temperature	 °C	 °F
Submarine or Land Pipeline		
Nominal Pipeline Contents		
Maximum Impurity Levels	 %H ₂ O	 %H ₂ S %CO ₂
Signature and Name of the BP Pipeline Engineer	 ()	
Date of Completion of Part One	19.....	

* * *

Part Two (for completion by the responsible BP Materials Engineer)

Service (sour or non-sour)	
Charpy VNotch Impact Tests:	
Test Piece Size	10 x.....mm
Test Piece Orientation (Transverse or Longitudinal)	
Test Temperature	 °C
Required Energy:	
Average of 3 test pieces	J
Any single test piece	J
Welding Consumables Batch Test (required or not required)	
Minimum Mill Hydrostatic Test Pressure psig	bar(ga)
Blast Cleaning (internal/external required or not required)	

All manufacturing procedure specifications and manufacturing procedure qualification test results shall be submitted to the undersigned for evaluation.

Signature and Name of the BP Materials Engineer	()
Date of Completion of Part Two	19.....



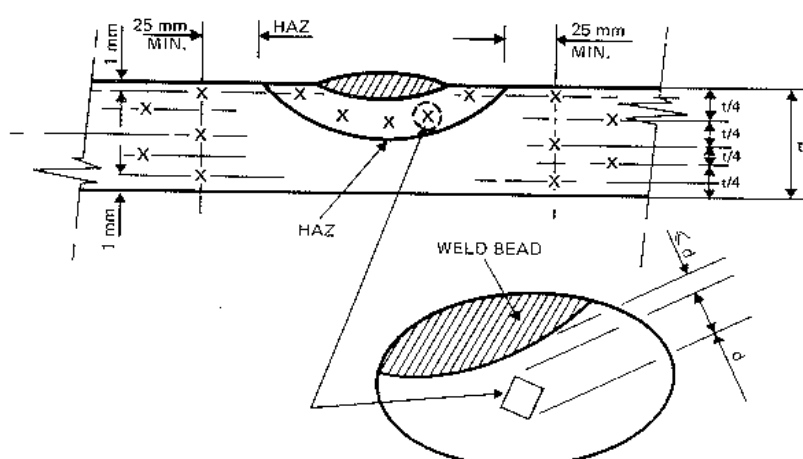
HAZ HARDENABILITY TEST

A4.1 This test shall be carried out on a pipe coupon measuring not less than 150 mm (6 in) wide by 300 mm (12 in) long. A line shall be scribed in the centre of the coupon width and parallel to the long axis. Before welding, the weld line shall be cleaned by grinding or with emery paper. Tungsten inert gas welding shall be used to fuse the plate full length along the scribed line, forming an autogenous bead. Automatic travel is preferred but manual control may be accepted provided the actual speed remains within the permitted tolerance. The welding parameters are as follows:

Welding position	Flat
Preheat	None
Voltage (V)	10 ± 0.5 d.c. negative
Current (A)	200 ± 5
Travel Speed (mm/min)	240 ± 10

A4.2 After welding and cooling in still air, two sections [100 mm (4 in) and 200 mm (8 in) along the weld] shall be cut, ground and polished to a one micron finish or better. The sections shall be etched to clearly identify the fusion line using a dendritic type etch (e.g. Saspa Nansa).

A4.3 A hardness survey using a Vickers diamond pyramid hardness tester with a 10 kg load shall be carried out on each section as detailed below. The HAZ hardness traverse does not sample the fused metal but the distance between the fusion line and the edge of any indent shall not exceed the indent diagonal. The indents shall be equally spaced and shall be clear of the fusion line.



HARDNESS TEST LOCATIONS
(See DOGS Drawing ES_166PT2_20_FX_1)