

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

TECHNICAL SPECIFICATION

WELDED AND SEAMLESS DUPLEX AND SUPER DUPLEX STAINLESS STEEL LINE PIPE (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC)

PTS 31.40.20.34
JANUARY 2009



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PTS No:	31.40.20.34
PTS Title:	WELDED AND SEAMLESS DUPLEX AND SUPER DUPLEX STAINLESS STEEL LINE PIPE (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC)

This revision of PTS **31.40.20.34** - WELDED AND SEAMLESS DUPLEX AND SUPER DUPLEX STAINLESS STEEL LINE PIPE (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC) (**January 2009, Revision 1**) has been updated to incorporate PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards. All updates in the document are highlighted in *italic* font.

The previous version of this PTS **31.40.20.34 (December 1998)** will be removed from PTS binder / e-repository from herein onwards.

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Document Approval

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Revision History

Rev No.	Reviewed by	Approved by	Date
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PREFACE

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TABLE OF CONTENTS

PART I	INTRODUCTION	6
1.1	SCOPE	6
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	6
1.3	DEFINITIONS	6
1.4	ABBREVIATIONS	7
1.5	CROSS-REFERENCES	8
1.6	INFORMATION TO BE SUPPLIED BY THE PRINCIPAL	8
PART II	AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC	9
SECTION 1	SCOPE	10
1.1	COVERAGE	10
1.3	MEASURING DEVICES	10
1.5	CERTIFICATION	10
1.6	QUALITY SYSTEM	10
2.4	REFERENCED STANDARDS	10
	RETENTION OF RECORDS	12
SECTION 5	PROCESS OF MANUFACTURE AND MATERIAL	13
5.1	PROCESS OF MANUFACTURE	13
5.2	COLD EXPANSION	13
5.3	HEAT TREATMENT	14
5.5	SURFACE FINISH	14
SECTION 6	CHEMICAL PROPERTIES AND TESTS	15
6.1	COMPOSITION	15
6.2	HEAT ANALYSES	15
6.3	PRODUCT ANALYSES	15
6.6	CHEMICAL ANALYSES PROCEDURES	15
SECTION 7	MECHANICAL PROPERTIES AND TESTS	16
7.1	MECHANICAL PROPERTIES	16
7.2	TENSILE TESTS - GENERAL	16
7.3	TENSILE TESTING	16
7.4	LONGITUDINAL TENSILE TESTS	16
7.5	TRANSVERSE TENSILE TESTS	17
7.15	GUIDED BEND TEST	17
7.17	WELD DUCTILITY TEST FOR ELECTRIC-WELDED PIPE	17
7.20	HARDNESS TESTS (LC52-1200)	17
7.20	HARDNESS TESTS	17
7.21	FRACTURE TOUGHNESS TESTING	18
SECTION 8	SPECIAL TESTS	21
8.1	FERRITE/AUSTENITE RATIO FOR DUPLEX STAINLESS STEEL	21
8.2	INTERGRANULAR CORROSION TEST (STRAUSS TEST)	21
SECTION 9	HYDROSTATIC TESTS	22
9.1	INSPECTION HYDROSTATIC TEST	22
9.3	TEST PRESSURES	22
9.4	SUPPLEMENTARY HYDROSTATIC TESTS	22
SECTION 10	DIMENSIONS, WEIGHTS AND LENGTHS	23
10.1	DIMENSIONS AND WEIGHTS	23
10.2	DIAMETER	23
10.3	WALL THICKNESS	24
10.5	LENGTH	24
10.6	STRAIGHTNESS	24
10.7	JOINTERS	24
10.8	PIPE ENDS	25

SECTION 11	NON-DESTRUCTIVE INSPECTION.....	26
11.1	INSPECTION METHODS FOR WELDED PIPE	26
11.4	RADIOLOGICAL INSPECTION	27
11.5	FLUOROSCOPIC OPERATOR QUALIFICATION	27
11.6	OPERATOR CERTIFICATION	27
11.7	REFERENCE STANDARDS	27
11.9	FREQUENCY	27
11.10	PROCEDURE FOR EVALUATING IN-MOTION OPERATION OF THE FLUOROSCOPE	27
11.11	ACCEPTANCE LIMITS	28
11.12	IMPERFECTIONS	28
11.13	DEFECTS	28
11.15	ULTRASONIC AND ELECTROMAGNETIC INSPECTION OF WELDED PIPE	28
11.16	ULTRASONIC AND ELECTROMAGNETIC INSPECTION OF SEAMLESS PIPE	29
11.17	ULTRASONIC INSPECTION OF CENTRIFUGALLY CAST PIPE	29
11.18	LIQUID PENETRANT TESTING OF BEVEL FACES	30
11.19	PERSONNEL QUALIFICATION	30
SECTION 12	WORKMANSHIP, VISUAL INSPECTION AND REPAIR OF DEFECTS.....	31
12.3	WORKMANSHIP	31
12.5	DEFECTS	31
12.6	REPAIR OF DEFECTS	32
12.8	PROCEDURE FOR REPAIR OF WELD SEAMS OF ELECTRIC WELD AND INDUCTION WELDED PIPE	32
12.9	PROCEDURE FOR REPAIR OF WELD SEAM OF GAS METAL-ARC WELDED PIPE	32
12.10	GAUGE PIG	32
SECTION 13	MARKING AND SURFACE TREATMENT	33
13.1	MARKING - GENERAL	33
13.3	SEQUENCE OF MARKINGS	33
13.5	DIE STAMPING	33
13.6	SURFACE TREATMENT	33
SECTION 14	HANDLING, STORAGE, PACKAGING, AND DELIVERY	34
14.1	HANDLING	34
14.2	STORAGE	34
14.3	PACKAGING	34
14.4	DELIVERY	34
SECTION 15	DOCUMENTATION	35
15.1	LANGUAGE	35
15.2	PRE-MANUFACTURING DOCUMENTATION	35
SECTION 16	FIRST-DAY-PRODUCTION TESTS	36
16.1	GENERAL	36
16.2	NON-DESTRUCTIVE TESTING	36
16.3	CHEMICAL COMPOSITION	36
16.4	MECHANICAL TESTING	36
16.5	SPECIAL TESTS	36
APPENDIX A	SPECIFICATION FOR WELDED JOINTERS	37
A1.	METHOD	37
A2.	WORKMANSHIP	37
A3.	MARKING	37
A4.	NON-DESTRUCTIVE TESTING	37
APPENDIX B	REPAIR WELDING PROCEDURE	38
B.2.	REPAIR WELDING PROCEDURE QUALIFICATION	38
PART III	REFERENCES	39

APPENDICES

APPENDIX 1	DETERMINATION OF THE VOLUME FRACTION OF FERRITE IN DUPLEX STAINLESS STEEL BY SYSTEMATIC POINT COUNT 42
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PART I INTRODUCTION

1.1 SCOPE

This new PTS specifies requirements and gives recommendations for the manufacture and supply of seamless and longitudinally welded duplex and super duplex stainless steel line pipe for use in oil and gas operations under both sour and non-sour service conditions.

NOTE: Sour service is defined in PTS 31.22.20.31-Gen.

Part II of this PTS gives amendments and supplements to API Spec 5LC *Third Edition July 1998 (Reaffirmed 2006)* which are considered necessary to ensure pipeline integrity in accordance with PETRONAS Group requirements. The clause numbering in Part II of this PTS follows that of API Spec 5LC. Where clauses of API Spec 5LC are not amended or supplemented by this PTS, they shall apply in their entirety.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of the PETRONAS Group or managed by a Group company, and to Contractors and Manufacturers nominated by them.

This PTS is primarily intended to be used for oil and/or gas pipelines, flowlines and related facilities. It is intended for use by Exploration and Production, Manufacturing, Chemicals or Supply/Marketing companies which require the use of line pipe.

If national and/or local regulations exist in which some of the requirements may be more stringent than this PTS, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this PTS which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this PTS as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project, or operation or maintenance of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Defect (in NDT)	An imperfection or group of imperfections whose indication(s) do not meet specified acceptance limits.
Electric-welded	Term used in API Spec 5LC which shall be understood to mean HFW.
Finished pipe	Pipe passed through all stages of production and inspection.
Imperfection (in NDT)	An interruption, which may be either intentional or unintentional, in the physical structure or configuration of a pipe.
Indication (in NDT)	Evidence of an imperfection that requires interpretation to determine its significance.
Lot	A unit of pipes from the same heat and, for batch heat treatment, heat treatment batch, having the same dimensions. For pipes with OD < 508 mm, a lot shall be a maximum of 100 pipes. For other sizes, a lot shall be a maximum of 50 pipes.
Pipe end	Complete pipe segment of 100 mm length measured from the end face of the finished pipe.
Plate or Coil	The flat starting material for welded pipe before forming into the shape of a pipe.
Purchaser	Term used in API Spec 5LC which shall be understood to mean Principal.
Radiological	Term used in API Spec 5LC which has the same meaning as radiographic. The term radiographic is used in this PTS.

1.4 ABBREVIATIONS

CRA	Corrosion Resistant Alloy
FL	Fusion Line
HAZ	Heat Affected Zone
HFW	High Frequency Welded
ID	Inside Diameter
LBW	Laser Beam Welded
NDT	Non-Destructive Testing
OD	Outside Diameter
PREN	Pitting Resistance Equivalent Number
PT	Liquid-Penetrant Testing
RT	Radiographic Testing
SSRT	Slow Strain Rate Test
t	Wall thickness
T	Minimum design temperature
UNS	Unified Numbering System
UT	Ultrasonic Testing
WCL	Weld Centre Line

1.5 CROSS-REFERENCES

Where cross-references to other parts of this PTS are made, the referenced section number is shown in brackets. Other documents referenced in this PTS are listed in (Part III).

1.6 INFORMATION TO BE SUPPLIED BY THE PRINCIPAL

The information shown in the section of API Spec 5LC entitled "Suggestions For Ordering API CRA Line Pipe", with the following additional information, should be provided by the Principal at the enquiry stage of the order.

- Nominal ID (and whether constant ID is required).
- Minimum design temperature.
- Maximum design temperature.
- Design pressure.
- Service environment (gas, oil, water, multiphase, sour, non-sour).
- End preparation required if different from the standard API bevel.
- Whether pipe is to be used as mother pipe for induction bends.
- Whether mechanical property restrictions for reeling are to be applied.
- Whether elevated temperature tensile testing is required and the acceptance criteria.
- Length requirements if different from Part II - 7.5 of this PTS.
- Whether supply of jointers is acceptable and the welding requirements if different from this PTS.
- Surface roughness requirements where the pipe is to be coated under a separate contract Part II - 2.5 of this PTS.
- Which of the Manufacturer/Supplier's quality control procedures are to be submitted for agreement.
- Level of inspection to be deployed by the Principal.
- Whether inspection reports in accordance with ISO 10474 type 3.2 are required instead of inspection certificates in accordance with ISO 10474 type 3.1.B.
- Specific marking requirements.
- Specific packaging requirements.
- Other specific requirements amending or supplementing this PTS.

PART II AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC

SECTION 1 SCOPE

1.1 COVERAGE

Delete the first two paragraphs and replace with:
See Part I - 1.1 of this PTS.

1.3 MEASURING DEVICES

Add the following:

*Amended per
Circular 41/06*

The Manufacturer/Supplier shall control measuring devices within the requirements of ISO 10012.

1.5 CERTIFICATION

Delete this section and replace with the following:

Inspection certificates in accordance with ISO 10474 type 3.1.B shall be supplied unless the Principal specifies inspection reports in accordance with ISO 10474 type 3.2., in which case the Manufacturer/Supplier shall issue and validate the inspection reports and they shall be counter-validated by the Principal's authorised representative. The Manufacturer/Supplier shall provide a listing of all pipes supplied detailing for each pipe the unique pipe number, heat number, test number, certificate number, length and weight. These data shall also be supplied to the Principal on a computer disc in an agreed format.

Add the following new section:

1.6 QUALITY SYSTEM

*Amended per
Circular 41/06*

The Manufacturer/Supplier should maintain and operate a quality assurance system in accordance with ISO 9001. The Manufacturer/Supplier may maintain and operate a quality assurance system based on an alternative standard which may be considered for agreement by the Principal.

SECTION 2 REFERENCED STANDARDS

2.3 *Equivalent standards.*

Delete this item.

2.4 REFERENCED STANDARDS

a. General

Add the following:

Other standards and publications referenced in this PTS are listed in (Part III).

SECTION 3 DEFINITIONS AND TERM

Add the following:

- 3.1 **Heat** : *The metal produced by a single cycle of batch*
- 3.2 **Heat analysis** : *The chemical analysis representative of a heat as reported by the producer*
- 3.3 **Inspection**: *The process of measuring, examining, testing, gaging, or otherwise comparing the unit of product with the applicable requirements.*
- 3.4 **Inspection lot**: *A definite quantity of product manufactured under conditions that are considered uniform, for the attribute to be inspected.*
- 3.5 **Inspection lot size**: *The number of units of product in an inspection lot.*
- 3.6 **Inspection lot sample**: *One or more units of product selected from an inspection lot to represent that inspection lot.*
- 3.7 **Manufacturer**: *Refers to the firm, company, or corporation responsible for marking the product to warrant that the product conforms to the specification. The manufacturer may be either a pipe mill or a processor, as applicable. This manufacturer is responsible for compliance with all of the applicable provisions of the specification.*
- 3.8 **May**: *May is used to indicate that a provision is optional.*
- 3.9 **Pipe mill**: *A firm, company, or corporation that operates pipe-making facilities.*
- 3.10 **Processor**: *A firm, company, or corporation that operates facilities capable of heat-treating pipe made by a pipe mill.*

SECTION 4 MISCELLANEOUS-RETENTION OF RECORDS

RETENTION OF RECORDS

Delete this section and replace with the following:

Contract records, and any other records requiring retention by the Manufacturer/Supplier's quality assurance system, shall be retained by the Manufacturer/Supplier and made available to the Principal on request for a period of five years after completion of the order.

SECTION 5 PROCESS OF MANUFACTURE AND MATERIAL

5.1 PROCESS OF MANUFACTURE

Add the following:

Plates or coil shall be formed into pipe when at ambient temperature.

b. Welded processes

1. Welding without filler metal

Add the following:

The HFW welding process shall employ a minimum frequency of 150 kHz.

2. With filler metal

Add the following:

The longitudinal seam welds shall be full penetration welds using a welding procedure specification which is in accordance with the requirements of this PTS.

3. With or without filler metal

Add the following:

b.1 Laser beam welding

A welding process that produces coalescence with the heat from a laser beam impinging on the joint.

c. Pipe making processes

Delete the fourth column of Table 2.1.

6. Combination welding

Delete "or double".

7. Double seam

Delete this section.

d. Tack welding

Add the following:

Tack welding shall be continuous.

5.2 COLD EXPANSION

Add the following:

Where appropriate to the manufacturing process, seam-welded pipe shall be subjected to cold expansion. Expansion shall be by a mechanical process.

The % expansion is defined as follows:

$$\% \text{ expansion} = \frac{D_a - D_b}{D_b} \times 100$$

D_a OD (ID) after expansion

D_b OD (ID) before expansion

Alternative sizing methods may be considered by the Principal.