

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

TECHNICAL SPECIFICATION

WELDABLE MARTENSITIC STAINLESS STEEL LINE PIPE FOR USE IN OIL AND GAS OPERATIONS (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC)

PTS 31.40.20.36

DECEMBER 2009



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PTS No:	31.40.20.36
PTS Title:	WELDABLE MARTENSITIC STAINLESS STEEL LINE PIPE FOR USE IN OIL AND GAS OPERATIONS (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC)

This revision of PTS **31.40.20.36** – NON- METALLIC WELDABLE MARTENSITIC STAINLESS STEEL LINE PIPE FOR USE IN OIL AND GAS OPERATIONS (AMENDMENTS/SUPPLEMENTS TO API SPEC 5LC) 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 (**31.40.20.36**) will be removed from PTS binder / e-repository from herein onwards.

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Document Approval

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PREFACE

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They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPU in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardisation.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use PTS they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the PTS. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal or its technical advisor.

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PART I INTRODUCTION

1.1 SCOPE

This new PTS specifies requirements and gives recommendations for the purchase of both seam-welded and seamless weldable martensitic stainless steel (known generically as weldable 13Cr and weldable Super 13Cr) line pipe for use in oil and gas operations. The requirements are considered necessary to maintain technical integrity of pipelines and to ensure that a suitable specification exists in the absence of standardised grades of these materials.

NOTE: This PTS applies under non-sour conditions. The PETRONAS definition of sour service is given in PTS 31.22.20.31, however, as the application limits of these materials have not yet been determined, qualification testing in project-specific environments may be required even when the expected H₂S is

insufficient to give a sour service definition.

Part II of this PTS gives amendments and supplements to API Spec 5LC *Third Edition July 1998 (Reaffirm 2006)* and shall be read and used in conjunction with that document. The section numbering in Part II follows that of API Spec 5LC. Where sections of API Spec 5LC are not amended or supplemented by this PTS, they shall apply as written.

NOTE: Both API Spec 5LC and this PTS adopt sampling as a method to determine batch compliance. Nevertheless, all pipes supplied shall meet all requirements of this PTS.

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/Suppliers nominated by them.

This PTS is intended to be used for the purchase of line pipe for the construction of oil and gas production flowlines and related facilities.

If national and/or local regulations exist in which some of the requirements may be more stringent than in 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)	A discontinuity or group of discontinuities whose indication(s) do not meet specified acceptance criteria.
Electric welded	Term used in API 5LC, which shall be understood to mean HFW.
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.
Pipe end	Complete pipe segment of 100 mm length measured from the end face of the finished pipe.
Plate or strip	The flat starting material for welded pipe before forming into the shape of a pipe.
Purchaser	Term used in API Spec 5LC, which has the same meaning as Principal.
Qualified Manufacturer	A Manufacturer whose product has been previously demonstrated to be suitable for the intended service, and formally accepted by the 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

CTOD -Crack Tip Opening Displacement

DN -Nominal Diameter

FL -Fusion Line

GTAW -Gas Tungsten Arc Welding

HAZ -Heat Affected Zone

HFW -High Frequency Welded

ID -Internal Diameter

KV -Charpy V-notch impact energy

LBW -Laser Beam Welded

MT -Magnetic particle testing

NDT -Non-destructive testing

OD -Outside Diameter

PAW -Plasma Arc Welded

PT -Liquid penetrant testing

RT -Radiographic Testing

SAW -Submerged Arc Welding

SMAW -Shielded Metal Arc Welding

UT -Ultrasonic Testing WCL -Weld Centreline

WPS -Welding Procedure Specification

1.5 CROSS-REFERENCES

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

1.6 ITEMS TO BE SPECIFIED/AGREED BY THE PRINCIPAL

The following 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;
- Requirement for mechanical tests in simulated post-weld heat-treated condition;
- Length requirements if different from (Part II - 10.5) of this PTS;
- Whether supply of jointers is acceptable and the welding requirements if different from this PTS;
- Whether the passage of a gauge pig is necessary; -Which of the Manufacturer/Supplier's quality control procedures are to be submitted for agreement;
- Time period for submission of contract quality plan;
- 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

1. SCOPE

1.1 COVERAGE

Delete this section and replace with the following:

This specification covers the supply of proprietary grades of welded and seamless martensitic stainless steel line pipe by qualified Manufacturers/Suppliers. The primary product is bevelled pipe having a standard API bevel. Should a different end finish be required, it shall be clearly stated by the Principal in the contract document.

Manufacturers/Suppliers should have satisfactorily qualified their products in accordance with the upstream qualification requirements detailed in report SIEP 97-5763. Alternative data may also be considered by the Principal for qualifying a Manufacturer/Supplier.

1.2 METRIC UNITS

Replace first paragraph with the following:

Metric units are used throughout this specification.

1.3 MEASURING DEVICES

Delete this section and replace with the following:

The Manufacturer/Supplier shall control measuring devices within the requirements of ISO 10012-1.

1.4 SPECIAL PROCESSES

Delete the part of the table pertaining to centrifugally-cast pipe. Delete reference to repair welding procedures and add the following text:

Applicable special processes shall also include those identified and documented in the quality assurance system of the Manufacturer/Supplier. Procedures for all special processes shall be produced by the Manufacturer/Supplier and supplied to the Principal ([see Part II – Section 15](#)) when requested.

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 new section:

1.6 QUALITY SYSTEM

The Manufacturer/Supplier should maintain and operate a quality management system in accordance with ISO 9001 or ISO 9002 or an alternative standard if approved by the Principal.

The quality assurance system shall employ statistical process control and have documented procedures for its application.

2. REFERENCED STANDARDS

2.1 GENERAL

Add the following: See also (Part III) of this PTS.

2.3 EQUIVALENT STANDARDS

Delete this section.

3. DEFINITIONS AND TERMS

3.1 HEAT

Add to the existing section:

Where the size of the secondary refining vessel is less than that of the primary steel producing vessel, the heat shall be considered to be the metal produced by a single cycle of the secondary refining vessel.

3.4 INSPECTION LOT

Delete this section and replace with the following: A unit of pipes from the same heat and, for batch heat treatment, heat treatment batch,

having the same dimensions.

3.5 INSPECTION LOT SIZE

Delete this section and replace with the following: For pipes with OD < 508 mm, the maximum lot size shall be 100 pipes. For other sizes, the maximum lot size shall be 50 pipes.

4. MISCELLANEOUS - RETENTION OF RECORDS

Amend the second sentence of the first paragraph as follows:

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

5. PROCESS OF MANUFACTURE AND MATERIAL

PROCESS OF MANUFACTURE

Delete the first paragraph and replace with the following: Pipe furnished to this specification shall be seamless or welded manufacture as defined below. Welded pipe shall be welded using the processes described below. Combination welded pipe shall be subject to the limitations given in item 6.

The manufacturing process shall be described in accordance with the requirements of (15.2.2) and the material produced by the process shall have been prequalified in accordance with SIEP 97-5763.

Plates or strip shall be formed into pipe at ambient temperature.

a. Seamless and Centrifugally-Cast.

1. Seamless is defined as wrought tubular product made without a welded seam. It is manufactured by hot working steel or, if necessary, by subsequently cold finishing the hot worked product.

b. Welded processes

1. Without filler metal

Place the existing text under a new sub-heading:

a. High Frequency Welding

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

b. Laser beam welding

A welding process that produces coalescence with the heat from a laser beam focussed on the joint. *The beam provide a concentrate heat source for narrow , deep welds and high welding rates.*

NOTE Some Manufacturer/Suppliers may use HFW equipment to provide preheating for the laser welding process.

2. With filler metal

Delete sub-section (b) relating to Gas Metal-Arc Welding.

c. Pipe making processes

2. Centrifugally cast

Delete this sub-section.