



Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.

Engineering Department

#195429- v4

TECHNICAL SPECIFICATION FOR STEEL PIPE **API 5L (SAWL OR HFW)**

This is the enquiry specification for pipe for the construction of an oil pipeline steel.

The steel pipes shall be produced in accordance with API 5L 45th (or last rev) by a manufacturer licensed to use the API monogram.

Process of manufacture, materials, chemical properties and tests, mechanical properties and tests, hydrostatic tests, dimensions, weights and lengths, tolerances of dimensions and weights, pipe ends, non-destructive inspection, workmanship, visual inspection and definition of defects, marking, color identification shall be performed in accordance with:

- a. Requirements of API 5L 45th edition or last rev;
- b. Additional requirements as detailed under paragraphs below.

Pipe Requirements :

1.Type & Size – according to bill of quantities

- STEEL PIPE API 5L L290 (X42) 14" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 16" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 18" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 20" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 24" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 14" x 0.5", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 16" x 0.5", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 18" x 0.5", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 20" x 0.5", (SAWL/HFW)
- STEEL PIPE API 5L L290 (X42) 24" x 0.5", (SAWL/HFW)
- STEEL PIPE API 5L L245 (B) 14" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L245 (B) 16" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L245 (B) 18" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L245 (B) 20" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L245 (B) 24" x 0.375", (SAWL/HFW)
- STEEL PIPE API 5L L245 (B) 14" x 0.5", (SAWL/HFW)



Engineering Department

#195429- v4

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- STEEL PIPE API 5L L245 (B) 24" x 0.5", (SAWL/HFW)

2. Product specification level –

PSL 1 - inspection & documentation in accordance with EN 10204- 3.2

PSL 2 - inspection & documentation in accordance with EN 10204- 3.2

3. General requirements :

- Pipe length shall be, with min. pipe length 11,65m, and max. pipe length 12,15 m.
- The pipe shall not be cold expanded
- Jointers shall not be accepted
- Repair of defects in the body of pipe will not be accepted.
- Pipes containing lamination of any size shall be rejected.
- Full length (100%) non – destructive ultrasonic inspection
- **Pipe end inspection –**

ultrasonic inspection in accordance with ISO 10893-8 or ASTM A578 and ASTM A435 shall be used to verify that the 25 mm (1.0 in) wide zone at each pipe end is free of laminar imperfections > 6,4 mm (0.25 in) in the circumferential directions. Cutting down of uncontrolled pipe ends can also be accepted.

4. Dimensions, Weights, and Lengths

Diameter - Pipe Body

The tolerances for diameter shall be in according to paragraph 9.11.3 & table 10 of API 5L.

The inside diameter of every 50th pipe shall be measured at both ends. The minimum and maximum value shall be determined using a rod gauge or similar measuring device capable of measuring with an accuracy of minimum 0.1mm. The measurements shall be taken at least 10mm from the pipe end inside the pipe and shall reflect the actual minimum and maximum value by multiple measurements within the same plane. The measured minimum and maximum values shall be recorded and included in the material test report.



Engineering Department

#195429- v4

Out of Roundness - Pipe Body

The difference between the maximum and minimum outside diameters on any one-pipe length shall in accordance to requirement at API 5L table 10 – 0.02D.

Wall Thickness

The allowable tolerance on wall thickness over the complete pipe length shall be in according to table 11 of APL 5 L standards for Welded pipe ($\pm 10\%$ to a minimum of $\pm 0.5\text{mm}(\pm 0.02\text{in})$).

Nominal Mass & Weight

The weight & mass of each pipe (including tolerance) shall be recorded and listed in the pipe tally. Manufacturer shall provide the accuracy of weight measurements for review by Company. The weight shall not vary by more than - 3.5 / +10% of the nominal pipe weight

The tolerances for mass shall be in according to paragraph 9.14, 9.14.1c, 9.14.2, 9.14.3b of APL 5L standard

Length

The length of each pipe shall be measured and recorded.

Jointers shall not be permitted.

Straightness

The total deviation from a straight line, over the entire pipe length, shall be $\leq 0,2 \%$ of the pipe length

The local deviation from a straight line in the 1,0 m (3.0 ft) portion at each pipe end shall be

$\leq 4,0 \text{ mm } (0.156 \text{ in})$. A minimum of 2 pipes per 50 shall be measured for straightness with the frequency increasing for out-of-straightness above 0.2%.

Squareness

The squareness of the ends of finished pipes shall be checked in accordance with the requirements of EN 10208-2 section 8.6.4 on pipes selected by Company. Full details of



Engineering Department

#195429- v4

the method used shall be provided to Company for review. The results of the squareness test shall be recorded and shall include pipe numbers and all dimensions.

Pipe Ends

All pipes shall be supplied with beveled beveled end 30° with a tolerance of +5° -0°, and the width of the root face of the bevel shall be 1,6 mm (0.063 in), with a tolerance of ± 0,8 mm (0.031in). and be free from harmful burrs.

Bulges and Flat Areas

All dimensions shall match to clause 9.11 at API 5L.

Tolerances for the weld seam

Radial offset of strip/plate edges acc. to 9.13.1 and Table 14 of API 5L for SAW pipes, to a maximum of 1.5mm(0.060in).

Height of the flash or weld bead shall be acc. to 9.13.2.2 and Table 16 of API 5L. The outside weld bead shall be removed by grinding to a distance of 150mm(6.00in) from each pipe end, such that it does not extend above the adjacent adjacent pipe surface by more than 0.5mm(0.020in).

Maximum premissible weld bead height acc. to Table 16 of API 5L for SAW pipes, 3.5mm(0.138in) for internal and external bead.

5. Pipe Tracking -

Manufacturer shall operate a pipe tracking system, which ensures full traceability of each individual pipe to its particular heat number and to inspection records of all stages of the manufacturing process.

Manufacturer shall provide full details of the pipe tracking system for review by Company.

6. Markink –

It is manufacturer responsibility that all materials supplied to this Specification are correctly marked for identification against the certificate. When material is stored, the identification marking shall be easily accessible Materials, which cannot be identified, shall be rejected.

Marking shall, in general, comply with the requirements of ISO 3183:2007.



Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.

Engineering Department

#195429- v4

- The following data shall be stenciled on the inside of the pipe close to the pipe end, at both ends of the pipe, in clearly legible letters and figures.
 - COMPANY (and Project name)
 - Purchase Order Number
 - Type of material.
 - Pipe number
 - Heat number
 - Specified Outside Diameter
 - Pipe length, wall thickness and weight
 - Month and year of manufacture
 - Manufacturer's mark
 - Pipe Grade
 - Product Specification Level Designation (PSL 1/PSL2)

A painted rectangular frame shall enclose and clearly indicate the location of this data. The digits shall be at least 22 mm high and shall be stencilled in black paint. Manufacturer shall submit details of stencil format for COMPANY approval prior to use. All pipe markings shall be inspected prior to dispatch and any pipe lengths not correctly marked shall be rejected until identity is verified and the pipe correctly marked.

Die Stamping

In addition Manufacturer shall low stress die- stamp, on both pipe ends, the pipe number and heat number.

Alternatively the heat number can be represented by code letters, or like, which will allow easy identification when reference is made to supporting documentation.

These numbers shall then be coated with clear lacquer to maintain visibility

7. Pressure tests:



Engineering Department

#195429- v4

- The hydrostatic test of each pipe length shall be performed at a pressure generating a fiber stress equal to 95% of specified minimum yield strength (SMYS) of steel. The tests pressure shall be held for not than 10 seconds on each pipe length.
- The pressure tester shall be equipped with both:
 - Recording gauge that will record the test pressure and duration of time applied to each length of pipe.
 - An automatic device that will prevent a pipe from being classified as tested, until the test requirements (pressure and time) have been complied with.
 - All recording equipment and gauges shall have a current certificate of calibration. Calibration reports to be submitted to Company.
- The pressure test chart recorder shall be calibrated against the master gauge at least twice per working shift. All hydrostatic pressure tests shall be chart recorded and log sheets. The frequency of master gauge calibration shall be increased if shown to be unstable.
- Test information shall be recorded on suitable log sheets/pressure charts, which shall identify each pipe against its record, and these shall be made available to Company or its representative on request. The log sheets/pressure charts shall be retained as a record.
- Any pipe which leaks (or bursts) during test shall be rejected, quarantined and returned for a joint investigation by manufacturer and company. All other pipes from the same heat shall be quarantined pending the results of the investigation.
- For every batch of pipes tested, an overall Hydrostatic Test Report shall be compiled showing all essential information, i.e. the pipes tested (pipe numbers), the pressure used, holding time, the test results, etc.
- In cases where a pressure test is discontinued because of a temporary failure of the test equipment, the pipe number of the pipe under test at the time of failure shall be recorded on the log sheets/pressure charts and it shall be shown clearly that the pipe has later received its proper test. Both records shall be retained as evidence.
- Hydrostatic testing shall be performed after NDT



8 . Corrosion Protection

pipes shall be cleaned on outer surface by blasting and painted with one coat of primer prior to shipment. Said primer shall be fit for field coating polyethylene coating material and shall protect the pipe surface against corrosion during shipment. 50 mm of each welding end shall not be coated by primer.

9. Quality Assurance -

The Manufacturer shall have in operation a Quality System based on the requirements of ISO 9002 or API Q1.

manufacturer shall submit a Quality Plan (Test and Inspection Plan), based on the manufacturing Quality Manual, covering (as a minimum) all production, pipe tracking system, inspection and testing operations, for review and approval by company not less than 21 days prior to the commencement of any production work. Manufacturer's subsequent Quality Control of the work shall strictly adhere to the agreed Quality Plan.

The Quality Plan shall show hold, witness, re-view and monitor points for company

10. purchaser representative -

The purchaser may delegate his representative to witness all stages of manufacturing and tests for steel plates and pipes. The presence of purchaser's representative shall in no way relieve the manufacturer of any responsibility for the quality of pipes, steel plates included.

11. Inspection documents –

As soon as possible, but not later than three weeks after completion of production, manufacturer shall prepare and submit to company two original plus two copies on CD- Rom of a Production Report which shall contain, as a minimum, details of the following:

- Purchase Order (PO) and variations to PO.
- Approved Quality / Inspection and Test Plan
- all approved queries and concessions



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Oil Products Pipeline Ltd.

Engineering Department

#195429- v4

- Manufacturing procedures.
- Quality control/inspection procedures.
- tensile test results and the type, size, location and orientation of the test pieces
- Non-destructive testing procedures.
- All ORIGINAL inspection and mechanical test reports and certification recording the results of inspection and testing.
- heat treatment records
- Mill 3.2 Test Certificates
- Pipe lists
- Ladle analyses for each heat of steel.
- Lengths and pipe identities of all rejected pipes.
- Other special reports reasonably requested by the company
- Details of mill tallies and cutting lengths, etc.

Mill test certificates – acc to bill of quantities

Mill test certificates to EN 10204 3.2, shall include, but not be limited to, the following information:

- PROJECT Nr
- manufacturer Identification
- Company's name, purchase order number and item
- Heat Number and test number
- Identification of Steel Type and Grade
- Steel-making process
- Heat treatment condition
- Ladle analysis



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Engineering Department

#195429- v4

- Product analysis
- pipe dimensions and tolerances
- full tensile testing results, including;
 - Yield Strength
 - Tensile Strength
 - Yield to Tensile Ratio
 - Elongation
 - Reduction of area
- Ultrasonic test reports references.
- Hydrostatic test reports references.
- Surface Inspection Results

Pipe Tally Lists

Manufacturer shall provide company with detailed pipe lists for the complete production of the order stating:

- Pipe identification numbers (referenced to heat numbers)
- Heat numbers.
- Dimensions of pipes.
- Weights of individual pipes.
- Purchase order number(s)
- Types of certificates issued.

The Pipe mill tally sheet shall be supplied on a CD-Rom, in a spread-sheet format (i.e. Excel) as well as on a paper hard copy

12. Storage, Loading and Shipment

- Pipe shall be supplied with pipe end caps.



Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.

Engineering Department

#195429- v4

- No welding of temporary attachments for handling, stacking or securing shall be permitted
- All handling, loading and unloading shall be done in such a manner as to prevent mechanical damage and corrosion.
- Rail cars, trucks, lighters, ships or other conveyances shall be cleaned of debris, or any substance that might damage the pipes, prior to loading.
- Suitable timber or other dunnage shall be used to protect the pipes against damage in transit.
- Loading onto or into rail cars, track, lighters, ships or other conveyances shall be performed in accordance with API RP 5L, API RP 5L5 or API RP 5L6 as appropriate.
- Finished pipes to be stored for a significant period of time at Manufacturer's works or marshaling yard, shall be stored in such a manner as to prevent corrosion or any other damage occurring.
- Pipe shall not rest on projections, which could result in point stresses or be allowed to rub on an adjacent object. Pipe loading shall be limited to prevent stresses, which result in out-of-roundness.