Petroleum & Energy Infrastructures Ltd.
Oil Products Pipeline Ltd.
Engineering Department

#174236-v1

APPENDIX -C

TECHNICAL SPECIFICATION FOR 12" PIPE API 5L X52 (SMLS)

PROJECT NAME - 12" TRANSMISSION PIPELINE FROM BET KAMA TO THE ESHEL

The manufacturer's and/or coater's signature on this Technical Specifications document shall not in any way relieve the Supplier from any of its obligations and/or liabilities under the Tender Documents including without limitation with respect to compliance of the Goods' with the Technical Specifications.

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1 Scope

1.1 This specification defines the minimum technical requirements for the manufacture and supply (including third party inspection) of seamless (SMLS) carbon steel line pipe (WITH COATING), said line pipe being manufactured by manufacturer licensed to use the API monogram

1.2 In principal, this specification is valid for line **STEEL PIPE API 5L L360 (X52) 12 3/4" x 0.375" or 12 3/4" x 0.406"** (acc to bill of quantities), Seamless pipe (SMLS) which will be used for oil Pipeline Service with operating pressures up to 100 bar g and in the temperature range from 5°C to 55°C.

The pipe shall be manufactured in the grades specified in accordance with API 5L 45th edition

Pipe Grade X52 PSL 1-inspection & documentation in accordance with **EN 10204- 3.2**

Third party inspection shall be executed by an independent certified authority (the "Certified Authority") in accordance/compliance with EN 10204 3.2 and this Technical Specifications document. The Supplier shall submit with his proposal the details and certifications of the third party inspection agency.

Further specific details shall be issued in the Scope of Work.

1.3 All material shall comply with the requirements of this Specification and with ANSI/API Specification 5L 45th Edition

1.4 The edition of each code and standard current at the date of enquiry shall apply (unless a specific version is clearly stated in this Specification or in the Scope of Work)

1.5 Where conflict occurs between the requirements of this Specification and referenced codes and standards, the Specification requirements shall apply. Where any of the documents are revised and the revision affects the scope of supply, Manufacturer shall notify COMPANY in writing immediately. Written clarification must be given by COMPANY before Manufacturer commences work.

1.6 Pipe furnished to this Specification shall be readily weldable using automatic or manual welding equipment in common usage for pipelines without the need for post weld heat treatment.

1.7 The Specification of steel used, Manufacturer and the Laboratories in which the testing is performed shall be approved by COMPANY

1.8 The Manufacturer shall:

- Prior to manufacturing procedure qualification tests and within 3 weeks of contract award submit to Company for its written approval a Manufacturing Procedure Specification containing the information stipulated in this specification.
- After receiving the approval, carry out manufacturing procedure qualification and first day production tests to the satisfaction of Company and the Certifying Authority and all in accordance with the requirements of this specification
- Production tests shall be performed regularly as required during the pipe manufacture and in accordance with this specification.
- The entire amount of pipes ordered by Company shall be manufactured and tested in strict accordance with this specification.
- The details of each pipe shall be identified and recorded to ensure its traceability throughout the production process and subsequent load out.
- Document and submit to Company all required information concerning the manufacturing and testing of base material and pipe within the time stipulated in this specification.
- Fit Company approved end protectors to each pipe; load-out the pipe onto the designated transport.

1.9 COMPANY shall be notified by manufacturer of any production, of base material or pipe, being performed outside the approved plant and shall furnish a production schedule for it. In no case shall pipe production, that forms part of the COMPANY order, take place outside approved manufacturing plant.

2 Quality Assurance

2.1 Quality Plan

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 and/or Certifying Authority

2.2 Inspection Notice

The manufacture shall give the Company at least five working days' notice of the time and location of fabrication, inspection and testing work. All line-pipe production shall be subject to running mill inspection by COMPANY and/or a third party Certifying Authority.

Intermediate inspections and/or examinations carried out or stage approvals given by COMPANY or a third party do not absolve the manufacturer from his responsibility that the material(s) have to comply fully with all rules, regulations and specifications.

3 Manufacturing Process

3.1 Manufacturing Procedure Specification (MPS)

3.1.1 A complete and detailed MPS (the "MPS" or "Manufacturing Procedure Specification") shall be prepared by , manufacturer and submitted to Company for its written approval prior to the pre-production meeting. The MPS shall include an outline of the manufacturing procedures performed to ensure that the pipe meets all of the requirements of this specification (see section 11.2)

3.2 Manufacturing Procedure Qualification

3.2.1 For each diameter and wall thickness of pipe, one completely finished pipe shall be subjected to full non-destructive and mechanical testing prior to the start of production or immediately after any changes in the approved manufacturing procedure. Production of pipe should not commence until the results of the testing have been accepted, and approval has been given to proceed, by Company and the Certifying Authority.

3.2.2 Failure of any of the qualification tests shall be cause for rejection of the manufacturing procedure and all pipes produced to it. Company reserves the right to require re-qualification in the case of any changes to the MPS .

3.3 Steel Making Process

3.3.1 The steel shall be made by either a basic oxygen or an electric arc furnace process.

3.3.2 Other processes used in the steel making shall be included in the MPS provided for review.

3.4 Chemical Composition

3.4.1 manufacturer shall include a chemical composition range in the mps. This range shall be within the limits specified in Section 5.1 of this Specification. All pipes shall meet the chemical composition limits in the agreed MPS.

3.5 Pipe Tracking

3.5.1 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.

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

3.5.3 All parent metal shall be from a single source and come from an identical manufacturing/processing route.

4 Inspection

4.1 An inspection and test plan shall be included as part of the MPS.

This plan shall include, but not be limited to, the following information:

- A list of inspection and testing actions.
- The order and related time period in which each action shall take place.
- Whether the action should be monitored or witnessed by Company and/or Certifying Authority.

Manufacturer shall endeavor to adhere as closely as possible to the submitted planning. Should significant changes in the MPS be unavoidable a revised and updated copy shall be given to Company without delay. In order that Company and/or Certifying Authority may, at their discretion, witness any inspection or testing, the Supplier shall give Company at least ten (10) days written notice stating date, time and location of such actions.

4.2 Company, at its discretion, reserves the right to inspect the pipe or base material at all or

Any of the manufacturing stages; accordingly, free access to the pertinent sections of Manufacturer's premises for this purpose shall be available at all times during the production of Company's Order.

Manufacturer shall provide suitable office space and inspection facilities as required by Company and/or Certifying Authority in the plant where the pipe or base material is being produced.

4.3 Company reserves the right to conduct or require Manufacturer to perform additional testing should it be deemed necessary. The testing methods and procedures shall be confined to those outlined in this Specification.

4.4 In the event that particular defects are continuously found in the finished product, Company and manufacturer shall mutually agree on, and Manufacturer shall implement any additional procedures and inspection methods which may be necessary to correct the faults and to ensure that the particular type of defect does not re-occur during subsequent production. In such a case, the cost of implementing any additional procedures and inspection shall be borne by Supplier. Under no circumstances shall any action or omission of Company relieve Supplier and/or Manufacturer of his responsibility for the quality of the finished pipe. In all cases where Company and/or the Certifying Authority has rejected pipes, the burden of proof that the rejected pipes do meet the requirements lies solely with manufacturer and/or supplier.

4.5 Ample lighting, both overhead and at pipe ends (for internal inspection) shall be provided for Company's inspector at the final inspection bench. The possibility of rolling each pipe for inspection purposes shall be provided.

Manufacturer shall have personnel and ultrasonic or other suitable equipment available for use on Company inspector's instructions to examine remaining wall thicknesses after defects are ground out.

4.6 If 10% or more pipes from any one shift's production are rejected for any re-occurring type of defect, this shall be sufficient reason for Company's inspector to refuse any more pipes for final examination until the cause of the defect has been established and eliminated.

4.7 It shall be manufacturer's responsibility to remove pipes not meeting the requirements of this Specification.

4.8 Company shall have the final decision as to the acceptability of the finished pipes meeting the requirements of this Specification.

4.9 Company's Representative shall, after final inspection and acceptance, release the pipes for shipment.

Copies of the written release notes shall be distributed as follows:

- Original to Company.
- One copy to supplier

One copy to the Certifying Authority.

4.10 3.2 certificates to EN 10204 shall be required to cover all pipes that pass final inspection.

5 Chemical Requirements

5.1 Cast (Ladle) Analysis

5.1.1 The chemical composition of the steel grade specified shall be in accordance with the table 4 at API 5L 45ed (Seamless pipe). Elements not mentioned in this table shall not be added intentionally without Company approval except for elements which may be added for DE oxidation and finishing the heat (see note a) in table)

5.1.2 Should manufacturer propose that vanadium, niobium and titanium be added to the steel to obtain the required mechanical properties, the proposed quantities of each element shall be stated at the time of submitting the tender documents. In any case the total percentages of these elements shall not exceed 0.15% without prior written approval from Company which will only be given after agreement has been obtained from the Certifying Authority.

5.1.3 The chemical check analysis shall show the actual percentages of all elements referred to in this Specification.

5.1.4 The results of the cast (ladle) analysis for each heat of steel used for Company's order shall be recorded by means of 3.2 certificates according to EN 10204.

5.2 Frequency of Cast (Ladle) Analysis

Manufacturer shall provide the cast (ladle) analysis for each heat of steel. The cast analysis shall not exceed the chemical composition requirements as specified in section 5.1.

5.3 Product Analysis

5.3.1 A product analysis shall be performed and taken from the mechanical test samples. All specified elements and shall be reported and meet the specified limits.

5.3.2 The acceptable deviation of the product analysis from the heat (ladle) analysis shall comply with the following table;

Element	Limiting value for the cast analysis according to 5.1 % by mass	Permissible deviation of the product analysis %by mass
C	≤0.28	+0.02
Mn	≤1.4	+0.1
P	≤0.03	+0.005
S	≤0.03	+0.005
V	Table 4 – API 5L	+0.01
Nb	Table 4 – API 5L	+0.01
Ti	Table 4 – API 5L	+0.01
V + Nb + Ti	Table 4 – API 5L	+0.02

5.3.3 Product analysis methods shall be submitted for Company review.

5.4 Frequency of Product Analysis

5.4.1 A product analysis shall be performed on one of the first pipes from each heat, and each batch of 50 pipes if there are more than 50 pipes in a heat. The elements listed in 5.1.1 and 5.3.2, and any other intentionally added elements, shall be reported by manufacturer.

5.4.2 A product analysis shall be performed on at least 2 samples per heat, taken from the mechanical test samples. All specified elements and shall be reported and meet the specified limits .

5.5 Test Failures

If any product analysis falls outside the agreed limits two further determinations shall be made from the same test coupon. If either of these falls out of the agreed limits, then the

analysis shall be undertaken on each pipe from the heat and only those which meet the agreed limits will be deemed acceptable.

6. Manufacturing Procedure Qualification Tests

6.1 General

One completely finished pipe shall be subjected to full non-destructive and mechanical testing as noted below prior to the start of production or immediately after any changes in the approved MPS. Production of pipe should not commence until the results of the testing have been accepted, and approval has been given to proceed, by Company and/or Certifying Authority.

However manufacturer may, entirely at his own risk, elect to qualify the manufacturing procedure whilst first day production is in progress. This means that if the manufacturing procedure qualification tests are rejected by Company and/or Certifying Authority for any reason all pipes produced up until that time shall also be rejected. Qualification of the manufacturing procedure in parallel with the first day's production does not eliminate Company's requirement for first day production tests (see 7.1.1). Testing shall be performed at a certified testing facility or an approved alternative.

6.2 Non-destructive Testing Requirements

Visual: complete internal and external pipe surface . full dimensional control	Sections 8.0 and 12.0
After acceptance of visual examination the following inspections and checks shall be performed on the test pipe:	
Ultrasonic: 100mm wide full circumferential band at each end of the pipe Full length (100%) non – destructive ultrasonic inspection	Section 8.2
Residual magnetism: around the circumference of each pipe end	Section 8.6
Hydrostatic: Full pressure test	Section 10

6.3 Mechanical Testing Requirements

The test pipe shall be subjected to the following tests:

Longitudinal Tensile test
Tensile Test
Chemical Analysis

6.4 Testing Details

Full details of the tests stated above, including acceptance criteria, are given in the referenced Sections of this Specification.

6.5 Surface Quality

The surface quality shall be checked on an ongoing basis to confirm lack of surface defects and its suitability for coating.

6.6 Test Results

The test results shall be verified by means of original test reports and 3.2 certificates according to EN 10204.

7 FIRST DAY AND PRODUCTION TESTS

7.1 First Days Production Tests

7.1.1 Pipe Selection

Two pipes from the first day's production, if possible from different heats, shall be selected at random by Company and/or Certifying Authority for testing.

The first day production tests shall be repeated after any change in the MPS or prolonged break (more than 7 days) in production.

Should it be the intention of the manufacturer to carry out Manufacturing Procedure Qualification Tests during actual production then the "First Day" Production Tests shall be carried out at the 50th Pipe stage of production. In this case only one pipe needs to be tested as "First Day Production" in addition to the MPQ pipe. The selected pipe(s) shall be tested as follows:

7.1.2 Non-destructive Testing Requirements

Visual: complete internal and external pipe surface . full dimensional control	Sections 8.0 and 12.0
After acceptance of visual examination the following inspections and checks shall be performed on the test pipe:	
Ultrasonic: 100mm wide full circumferential band at each end of the pipe Full length (100%) non – destructive ultrasonic inspection	Section 8.2
Residual magnetism: around the circumference of each pipe end	Section 8.8
Hydrostatic: Full pressure test	Section 10

7.1.3 Mechanical Testing Requirements

Longitudinal Tensile test
Tensile Test
Chemical Analysis

7.1.4 Testing Details

Full details of the tests stated above, including acceptance criteria, are given in the referenced Sections of this Specification.

7.1.5 Test Results

The test results shall be recorded by means of 3.2 certificates according to EN 10204.

7.2 Production Tests

7.2.1 Non Destructive Tests

Visual: complete internal and external pipe surface . full dimensional control	Sections 8.0 and 12.0
Ultrasonic: 100mm wide full circumferential band at each end of the pipe	Section 8.2
Residual magnetism: around the circumference of each pipe end	Section 8.8
Hydrostatic: Full pressure test	Section 10

7.2.2 Destructive Tests

In addition to the above tests Company and/or Certifying Authority shall select one pipe from each heat of steel, with a minimum of one pipe out of every 50 pipes, which shall be subjected to the following mechanical testing:

Longitudinal Tensile test
Tensile Test
Charpy V-Notch Test
Chemical Analysis

7.2.3 Frequency and extent of Pipe Production Tests

As per table 17 of API 5L 45ed

7.2.4 Testing Details

Full details of the tests stated above, including acceptance criteria, are given in the referenced Sections of this Specification.

7.2.5 Test Results

The test results shall be recorded by means of 3.2 certificates according to EN 10204.

8 NON-DESTRUCTIVE TESTING

8.1 General

8.1.1 Non-destructive testing, as outlined in this section, shall be performed on all pipes that comprise part of Company's order without exception. These inspections shall conform to ANSI/API 5L

8.1.2 Complete and detailed procedures for all non-destructive testing shall be submitted to Company for review prior to commencement of testing.

8.1.3 All operators of NDT equipment shall have a thorough knowledge of the operation of the equipment to be used and may be required to demonstrate their ability to carry out NDT to the satisfaction of Company before the start of manufacture. Operator qualification shall be to a minimum of EN 473 Level 2. An examiner qualified to EN 473 Level 3 in all NDT techniques used, shall be available.

8.2 Ultrasonic Testing

8.2.1 Prior to beginning ultrasonic testing, on production pipes, Manufacturer shall, in the presence of Company and/or a third party, perform ultrasonic testing for the purpose of establishing the production testing procedure.

8.2.2 Prior to ultrasonic inspection it shall be ensured that the pipe surface is free of any loose scale, dirt, grease or other foreign substance that may affect the test results. Manufacturer shall use a suitable couplant between probe and pipe to provide optimum conductivity of signals

8.2.3 The equipment shall be regularly calibrated using reference specimens prepared from production pipe, or standard reference blocks.

8.2.4 The ultrasonic equipment shall be re-calibrated as a minimum:

- at the start of each shift
- at the middle of each shift
- at the end of each shift
- at the end of each shift
    - whenever a malfunction is suspected
- After any break in production of more than two hours.

8.2.5 Calibration of ultrasonic equipment shall be performed at production speed using a test/master pipe with known defects in accordance with ANSI/API 5L. If the equipment is

found to be faulty or to require re-calibration all pipes tested since the previous calibration shall be re-inspected. The results of all calibrations shall be recorded and made available to Company.

8.2.6 Ultrasonic testing shall be carried out after all heat treatment, expansion operations and hydrostatic pressure testing have taken place.

8.2.7 The full circumference of each pipe end over a width of 100 mm shall be ultrasonically tested, either manually or automatically, using a Company approved ultrasonic procedure, for defects outside the acceptance levels. The ends of all pipes shall be examined for imperfections by an ultrasonic method using probes for laminar defects and by an angle probe method for cracks. Procedure and defect acceptance levels shall be as specified in ANSI/API 5L. If the pipe is subsequently cropped, the new end shall be examined.

8.2.8 In case of continuous occurrence of signals outside the acceptance limits in areas where, upon subsequent investigation, no defects are detected, further investigations using other methods shall be executed to establish the cause of the signals.

8.2.9 All inspection and testing equipment shall be calibrated and certificates of calibration made available for Company review.

8.2.10 Locations where defects are indicated shall be re-examined by hand held Ultrasonics and Magnetic Particle or radiography.

8.3 Visual Inspection

8.3.1 Visual inspection of both external and, as far as possible, internal surfaces of the pipes shall be carried out to ensure that they are free of laminations, gouges, dents, nicks or any other surface defects. Minor surface irregularities caused by the manufacturing process are permissible provided that the wall thickness falls within the allowable tolerances stipulated elsewhere in this Specification. Defects found outside the stipulated tolerances shall cause the pipe to be rejected

8.3.2 The manufacturer shall submit details of procedures used for visual inspection of the finished pipe and also the reference standards for acceptance/rejection.

8.4 Magnetic Particle inspection of Pipe Ends

8.4.1 The surface of pipe ends shall be smooth and free from tool marks. The ends and faces of all pipes shall be completely inspected for laminations by a Company reviewed magnetic particle inspection procedure, which is at least in accordance with ASME V, Article 7, on the inside and outside surfaces.

8.4.2 Acceptance levels shall be in accordance with ASME VIII, Division 1, Appendix 6.4

8.4.3 The inspection shall consider both circumferential laminar indications on the face and longitudinal indications within 200 mm of the pipe ends.

8.4.4 Any longitudinal indications in the pipe body shall be further evaluated using ultrasonic equipment. Circumferential indications on the face may be accepted in accordance with.

8.5 Acceptance Criteria

8.5.1 Pipe Ends:

Laminations or other injurious defects found in the inspected areas shall cause the pipe to be rejected.

8.6 Checks for Residual Magnetism

The total circumference of each pipe end shall be checked for residual magnetism at the final inspection bench. Pipes found with magnetism above 30 Gauss shall be demagnetized and rechecked prior to load out.

9 MECHANICAL PROPERTIES AND TESTS

9.1 General

9.1.1 manufacturer shall be responsible for the performance, evaluation, reporting and recording of all required tests.

9.1.2 Production testing of finished pipes shall be performed as indicated in Section 7.2 of this Specification.

9.1.3 In order to determine the mechanical properties of the pipe, various specimens shall be cut from the selected test pipes and shall be subjected to mechanical testing, and meet the acceptance criteria, stated below. No mechanical testing shall take place on any pipe until the pipe has successfully passed the stipulated non-destructive and Hydrostatic Pressure Tests.

Company shall have the right to select pipes for production testing.

9.1.4 Test coupons shall be removed from alternating pipe ends.

A set of test specimens shall be taken from the selected test pipes in accordance with the requirements of API 5L 45th edition and as detailed below. The samples shall be tested at room temperature.

9.2 Longitudinal Tensile Properties

9.2.1 Two Longitudinal tensile specimens per 100 lengths of pipe, or as a minimum once per heat, shall be machined from the pipe body as indicated in API 5L 45th edition and tested at room temperature (20°C).

9.2.2 The actual yield strength of the base material shall be as close as possible to the specified minimum yield strength but shall, in no case, be more than that stated in 9.2.1.

9.3 **Transverse Tensile Properties** 9.3.1 At least one transverse tensile test per 50 lengths of pipe, or as a minimum once per heat, shall be required from the pipe body. The use of the ring expansion method for determination of transverse yield strength shall not be acceptable 9.3.2. Transverse tensile properties shall conform to section 9.2.1. and 9.2.2. Reduction of Area shall be reported. Round bar tensile test specimen may be used for transverse tensile tests.

9.6 Re-Heat Treatment

Re-heat treatment is not allowed, unless agreed in writing with COMPANY and after submittal of justifiable reasons such a course of action. In this case the cost of any further (extra) testing required by COMPANY shall be met by manufacturer.

10 Hydrostatic Testing

10.1 Each finished pipe shall be satisfactorily tested at the mill in accordance with API 5L 45th edition Section 10.2.6.

The required minimum test pressure shall be calculated using the formula in API 5L 45th edition, section 10.2.6.5, at a hoop stress of 90% of SMYS.

10.2 The full test pressure shall be maintained for a minimum of 10 seconds on each pipe.

10.3 All recording equipment and gauges shall have a current certificate of calibration. Calibration reports to be submitted to Company and to be included in the MRB (see 12.2 and 12.3)

10.4 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.

10.5 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.

10.6 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.

10.7 For every batch of pipes tested, an overall Hydrostatic Test Report shall be compiled showing all essential PO information, i.e. the pipes tested (pipe numbers), the pressure used, holding time, the test results, etc. This report to be stamped/signed by the Company and/or Certifying Authority and included in the MRB (See 12.3.1)

10.8 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.

10.9 The preferred timing for NDT is after performing the Hydrostatic testing.

11 DIMENSIONS, WEIGHTS AND LENGTHS

11.1 Diameter - Pipe Body

11.1.1 The outside diameter of every 50th pipe shall be measured, using a diameter tape in accordance with a procedure approved by Company, at a minimum of two locations equally spaced along the length of the pipe. The O.D. of the pipe body and ends shall not deviate from the specified nominal value allowed by the standard (API 5L 45th edition Table 10). .

11.2 Diameter - Pipe Ends

11.2.1 The inside diameters of both ends of every pipe shall be checked using a "Go - No Go" gauge. The size of the "Go" plate shall be the nominal inside diameter minus 3.2 mm and the size of the "No-Go" plate shall be the nominal inside diameter plus 3.2 mm.

11.2.2 The "Go-No Go" gauge shall be of a design approved by Company. At the start of every shift the dimensions of the "Go-No Go" gauge shall be checked. Alternatively and for the purpose of this requirement only the nominal diameter may be replaced by a fixed reference internal diameter deviating from the specified nominal internal diameter. This fixed reference internal diameter shall not deviate more than +/- 1.5mm from the specified nominal internal diameter and shall be constant for the whole Contract. Company shall approve the value of this fixed reference diameter before the manufacturing of the gauges.

11.2.3 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 MRB.

11.3 **Out of Roundness - Pipe Body**

11.3.1 The outside diameter of every 50th pipe shall be measured, using a diameter tape in accordance with a procedure approved by Company, at a minimum of 3 locations on the body of the pipe. The out of roundness of pipe body and ends shall not deviate from the specified nominal value allowed by the standard (API 5L 45th edition Table 10).

11.3.2 The difference between the maximum and minimum outside diameters on any one-pipe length shall be less than 1%.

11.3.3 If a pipe fails to meet the requirements of 11.3.1 or 11.3.2, the previous 49 pipes shall be measured and every following pipe shall be measured until such time that 20 consecutive pipes have been accepted, at which stage the inspection may revert back to every 50th pipe.

11.4 **Wall Thickness**

The allowable tolerance on wall thickness over the complete pipe length shall be in according to Table 11 of APL 5L 45th edition for SMLS pipe (-12.5% + 15%).

11.5 **Nominal 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 45th.

11.6 **Length**

11.6.1 The length of each pipe shall be measured and recorded.

11.6.2 A linepipe joint length range (Min/Max) of 12.15m +/- 0.3m with an average length of 12.15 m is required.

11.6.3 Pipes outside of this range MAY be considered for use as Weld Procedure Qualification pipes provided that they meet the relevant requirements.

11.6.4 Jointers shall not be permitted.

11.7 Straightness

- The total deviation from a straight line, over the entire pipe length, shall be ≤ 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
  ≤ 4,0 mm (0.156 in) . A minimum of 2 pipes per 50 shall be measured for straightness with the frequency increasing for out-of-straightness above 0.2%. All pipes shall be rolled over a flat inspection bench to visually demonstrate straightness. Any pipe visually exhibiting out-of-straightness shall be measured

11.8 **Squareness**

The out-of-squareness, measured as shown in Figure 3 of API 5L 45th , shall be ≤ 1,6 mm (0.063 in).

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 the

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

11.9 **Pipe Ends**

All pipes shall be supplied with bevelled beveld 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.

11.10 **Bulges and Flat Areas**

Deviations from the original contour of the pipe shall not exceed 3 mm in height or depth or extend in any direction for a distance greater than 25% of the pipe diameter. Devia¬tions are not allowed within 100 mm of the ends of the pipe.

12 REPAIRS AND SURFACE FINISH

12.1 Dents

Dents are not allowed.

12.2 Defects

Any imperfections outside those allowed by API 5L 45th , shall be considered a defect. Manufacturer shall provide details of the procedure to be used for visual inspection of internal and external surfaces of the finished pipe.

12.2.1 Pipes containing lamination of any size shall be rejected

12.3.2 manufacturer shall state in the MPS the steps taken in production to prevent the presence of hard spots.

12.4 **Repair of Defects**

12.4.1 The repair of dents shall not be permitted.

12.4.2 Minor defects in the base metal may be removed by grinding, provided the remaining wall thickness falls within the wall thickness tolerances laid down in this Specification. The transition between the ground area and the original surface shall be smooth.

12.4.3 No repair(s) or surface grinding shall be performed after hydrostatic testing. If repairs/grinding have been carried out after hydrostatic testing, the said pipe shall be retested.

12.5 **Rejections**

If, at any stage in production, the pipe failure rate exceeds 5%, the quality control programme shall be increased. If the total of test failures exceeds 10% of those tested or if,

on any one day, more than 10% of the production is rejected, manufacturer shall identify and eliminate production problems immediately.

12.6 **Surface Finish**

12.6.1 Acceptance criteria for surface finish shall be agreed between manufacturer and Company prior to commencement of production.

12.6.2 The pipe shall be free of all extraneous material such as oil, grease, metal turnings, etc.

13 Pipe Marking

13.1 Identification and Marking

13.1.1 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.

13.1.2 Materials, which cannot be identified, shall be rejected.

13.1.3 Marking shall, in general, comply with the requirements of API 5L 45th , but die stamping shall be used as specified in 13.2.

The following data shall be stencilled on the inside of the pipe close to the pipe end, at both ends of the pipe, in clearly legible letters and figures.

.1 COMPANY (and Project name)

.2 Purchase Order Number

.3 Type of material.

.4 Pipe number

.5 Heat number

.6 Pipe length, wall thickness and weight

.7 Month and year of manufacture

.8 Manufacturer's mark

.9 Certifying Authority's mark

.10 Pipe Grade

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 white 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.

13.2 **Die Stamping**

13.2.1 In addition to the stenciled data mentioned in 13.1 Manufacturer shall low stress die-stamp, on both pipe ends, the pipe number and heat number.

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

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

14 Coating and Corrosion Protection – polyethylene or polypropylene acc to bill of quantities :

14.1 **Polyethylene External Coating -**

The coating shall be External 3-layers extruded polyethylene coating (HDPE/ TRIO) including Fusion Bonded Epoxy, Copolymer Adhesive, Polyethylene as a whole complete system should conform to the requirements of the standard DIN 30670 (Polyethylene coatings of steel pipes and fittings) or standard NF-A-49710.

Requirements for testing coating materials:

Resistance to shock loads no less than 18 N × m (test according to DIN 30672)

Peeling insulation resistance at 23±5°C no less than 35 N / cm (test according to DIN 30672)

Electrical inspection (Holiday Detection) with Testing Voltage 25 kV.

Elongation – at least 200% .

Thickness of external coating shall not be less than **3 mm**

The external coating shall be interrupted at a distance of 15 cm with a tolerance of ± 10 mm from the pipe ends and shall be beveled at 30°.

The manufacturer shall recommend:

Method and materials to be used for field coating of joints and for coating repairs.

Pipe ends prepared for field coating.

The coating system will be applied after sandblasting cleaning of the pipe surface to Sa 2½ of the SVENSK STANDARD SIS 05-59 00 (ISO 8501-1).

A recognized laboratory is required to test the pipe and coating materials supplied under this specification. Quality certificates issued by the laboratory will be fully complied with all requirements of standards and will be submitted to the purchaser.

14.1.1 **Polypropylene External Coating –**

External 3-layers extruded polypropylene coating (P.P.). minimumThickness - **4.0 mm** (ISO21809-1 Class A3). Included Fusion Bonded Epoxy, Copolymer Adhesive. Polypropylene as a whole complete system should conform to the requirements of the standard DIN 30678 (Polypropylene coatings for steel pipes) or standard NF-A-49711.

Requirements for testing coating :

- Vicat softening point (°C, ISO 306) - 116.
- Specific gravity (g/cm³) – 0.94 - 0.97.
- Hardnees (Shore D) – 63.
- Indentation resistance at 23±5°C (mm) – 0.1.
- Electrical inspection (Holiday Detection) with Testing Voltage 20 kV minimum .
- Elongation at break (%) - 500 .

The coating system will be applied after sandblasting cleaning of the pipe surface to Sa 2½ of the SVENSK STANDARD SIS 05-59 00 (ISO 8501-1).

The external coating shall be interrupted at a distance of 15 cm. from the pipe ends and shall be beveled at 30°.

The manufacturer shall recommend:

- Method and materials to be used for field coating of joints and for coating repairs.
- Pipe ends prepared for field coating.

A recognized laboratory is required to test the pipe and coating materials supplied under this specification. Quality certificates issued by the laboratory will be fully complied with all requirements of standards and will be submitted to the purchaser.

14.2 **Corrosion Protection**

If coating shall take place at Israel then Bare 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.

All bevel ends from the pipe shall be protected temporarily against corrosion by a protective layer, which can be easily removed on site, e.g. by a wire brush.

15 Documentation

15.1 General

Manufacturer shall provide COMPANY with comprehensive documentation as outlined below, covering all the phases of work concerned with fulfilling the order. All documentation shall be written in the English language and shall bear clear reference to COMPANY purchase order number(s) and project name.

15.2 Manufacturing Procedure Specification

Prior to Manufacturing Procedure Qualification Tests, manufacturer shall submit to COMPANY for approval a Procedure Specification stating, but not limited to, details of the following for both coil and/or pipe as applicable:

a. Name of steel mill

b. Steel making method

c. De-oxidation practice

d. De-sulphurisation practice

e. Anticipated pipe steel specification and intended chemical composition range

f. Special additions

g. Ladle treatments

h. Method of hydrogen content control

n. Pipe manufacturing procedure and subsequent heat treatment.

q. Hydrostatic testing procedure and pressure

r. Mechanical Properties and testing Procedures

s. Chemical Properties and testing Procedures

t. Pipe Tracking System

u. Inspection Plan

v. Non-destructive inspection procedures (including visual inspection)

w. Dimensional check methods

x. Handling, transport and storage procedures

y. Marking and Coding

z. Strip feed pipe

aa. Handling, storage and transportation.

bb. Reporting

cc. Certifying Authority,

15.3 Manufacturing Procedure Qualification Test Reports

On successful completion of the Manufacturing Procedure Qualification Tests, carried out in accordance with this Specification, manufacturer shall, within three weeks of the date of testing, prepare and submit to COMPANY the original plus two copies on CD-Rom of a test report which shall include, but not be limited to, details of the following:

(1 WINZ Project name and Purchase Order Number

(2 Pipe identification.

(3 Results of tensile, yield and elongation tests and yield/tensile ratio

(4 Results of surface quality inspections.

(5 Results of all non-destructive testing.

(6 Chemical analyses (ladle and product check.(

(7 Results of dimensional and visual checks.

(8 Results of residual magnetism checks.

(9 Results of hydrostatic testing.

(10 Any further pertinent information.

15.4 Periodic Reporting

During the production of COMPANY ordered pipes, Manufacturer shall submit to COMPANY by telefax/Mail regular information as follows:

15.4.1 **Daily Production Report**

Each day during the production run of COMPANY order, manufacturer shall submit to COMPANY office by telefax/Mail a Daily Production Report. The report shall contain at least the following information:

(1 Number of pipes produced.

(2 Number of pipes passed non-destructive testing.

(3 Number of pipes passed hydrostatic testing.

(4 Number of pipes (and overall length) accepted at end bench (by Manufacturer)

(5 Number of pipes rejected.

(6 Total number of pipes (and overall length) accepted at end bench to date (by Manufacturer)

(7 Details of any production tests performed.

(8 Number of pipes ready for dispatch.

(9 Number of pipes dispatched.

15.4.2 Weekly Production Report

Manufacturer shall, during the production run of COMPANY order, submit to COMPANY office by mail a Weekly Production Report . The report shall contain at least the following information:

(1 Total number of pipes and overall length produced to date.

(2 Total number of pipes and overall length accepted by Manufacturer to date.

(3 Total number of pipes and overall length accepted by COMPANY to date.

(4 Updated bar chart production planning showing progress achieved to date against scheduled progress.

(5 Total number of pipes ready for dispatch.

(6 Total number of pipes dispatched to date.

(7 Predicted end date.

15.5 **Final Documentation**

15.5.1 Manufacturing Data Book (including first day production tests)

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:

(1 Purchase Order (PO) and variations to PO.

(2 Approved Quality / Inspection and Test Plan

(3 all approved queries and concessions

(4 manufacturer daily/weekly/monthly reports issued to COMPANY

(5 manufacturing procedures.

(6 quality control/inspection procedures.

(7 non-destructive testing procedures.

(8 copies, in sequential order, of all COMPANY issued approvals.

(9 all ORIGINAL inspection and mechanical test reports and certification recording the results of inspection and testing and where relevant the COMPANY and Certifying Authority stamps for witnessing and approval.

(10 heat treatment records

(11 Mill 3.2 Test Certificates

(12 Pipe lists

(13 Ladle analyses for each heat of steel.

(14 Deoxidization process(es)

(15 Results of residual magnetism checks.

(16 Lengths and pipe identities of all rejected pipes.

(17 Number of repairs with relevant pipe identities.

(18 Other special reports reasonably requested by the COMPANY inspector.

(19 Details of mill tallies and cutting lengths, etc.

(20 manufacturer Letter of Guarantee/conformity (see 15.5.4)

manufacturer shall store 1 copy of the MRB for a period of 7 years.

15.5.2 Mill test certificates

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

(1 PROJECT Nr

(2 manufacturer Identification

(3 Company's name, purchase order number and item

(4 Heat Number and test number

(5 Identification of Steel Type and Grade

(6 Steel-making process

(7 Heat treatment condition

(8 Ladle analysis

(9 Product analysis

(10 pipe dimensions and tolerances

(11 full tensile testing results, including;

- Yield Strength
- Tensile Strength
- Yield to Tensile Ratio
- Elongation
- Reduction of area

(12 Ultrasonic test reports references.

(13 Hydrostatic test reports references.

(14 Surface Inspection Results

(15 Any further items specifically indicated on the purchase order

(16 COMPANY approval

(17 Certifying Authority approval confirming witnessing of testing

15.5.3 **Pipe Tally Lists**

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

(1 Pipe identification numbers (referenced to heat numbers)

(2 Heat numbers.

(3 Dimensions of pipes.

(4 Weights of lots or of individual pipes.

(5 Purchase order number(s)

(6 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

15.6 **Delivery Documentation**

15.6.1 Extra copies of the Material's Mill Test Certificates shall be furnished by SUPPLIER simultaneously with delivery of the order or part quantities thereof to COMPANY

15.6.2 During the construction phase, extra copies of the in 15.5.1 listed documentation shall be furnished by Supplier, upon the request of COMPANY and/or Certifying Authority, e.g. NDT and inspection reports.

16 Storage, Loading and Shipment

16.1 manufacturer shall submit to COMPANY for its written approval, information detailing the proposed methods for handling, storage and protection of the pipes for transportation. Such activities shall be subject to verification by COMPANY or its appointed inspector.

16.2 Pipe shall be supplied with pipe end caps (end caps shall be subject to approval by company) .

16.3 No welding of temporary attachments for handling, stacking or securing shall be permitted

16.4 All handling, loading and unloading shall be done in such a manner as to prevent mechanical damage and corrosion.

16.5 All handling shall be done with slings, or padded hooks approved by COMPANY.

16.6 Rail cars, trucks, lighters, ships or other conveyances shall be cleaned of debris, or any substance that might damage the pipes, prior to loading.

16.7 Suitable timber or other dunnage shall be used to protect the pipes against damage in transit.

16.8 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.

In all cases loading shall be in accordance with a procedure reviewed by COMPANY.

16.9 No on-deck overseas shipment is allowed without prior written approval by COMPANY.

16.10 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.

16.11 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.

16.12 manufacturer shall be held responsible for all damage that occurs, subsequent to final mill acceptance, resulting from loading, storage or shipping.