
	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>							
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طرح نگهداشت و افزایش تولید ۲۷ مخزن

SPECIFICATION FOR METALLIC PIPES

نگهداشت و افزایش تولید میدان نفتی بینک



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 IFC: Issued For Comment
 IFA: Issued For Approval
 AFD: Approved For Design
 AFC: Approved For Construction
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 AB-R: As-Built for CLIENT Review
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1. INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.



GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields CLIENT (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2. SCOPE

This specification completes the description given in the requisitions and stipulates the particular requirements for the fabrication, inspection and shipment of pipes made of carbon steel and stainless steel.

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3. NORMATIVE REFERENCES

The latest edition of following codes & standards are applicable in this project (unless otherwise mentioned):



3.1 LOCAL CODES AND STANDARDS



- IPS-E-PI-221 Engineering Standard for Piping Material Selection
- IPS-M-P-190 (4) Material and Equipment Standard For Line Pipe

3.2 INTERNATIONAL CODES AND STANDARDS

- ASME B31.3 Process Piping
- ASME B1.20.1 Pipe Threads (Except Dryseal)
- ASME B16.25 Butt-Welding Ends
- ASME B36.10 Welded and Seamless Wrought Steel Pipe
- ASME B36.19 Stainless Steel Pipe
- ASTM American Society for Testing and Materials
- A 53 Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless
- A 106 Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
- A 312 Seamless and Welded Austenitic Stainless Steel Pipe
- A 358 Electric-Fusion-Welded Austenitic Chromium - Nickel Alloy Steel Pipe for High-Temperature Service
- A 370 Mechanical Testing of Steel Products
- EN 10204 Metallic products - Types of inspection documents
- NACE MR 0175/ISO 15156 Petroleum and Natural Gas Industries. Materials for use in H₂S Containing Environments in Oil and Gas Production
- NACE TM 0284 Evaluation of pipeline and pressure vessel steels for resistance to hydrogen-induced cracking
- NACE TM 0177 Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H₂S Environments

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- API 5L Specification for Line Pipe

3.3 THE PROJECT DOCUMENTS

- BK-SSGRL-PEDCO-110-PI-SP-0001 Piping Material Specification
- BK-PPL-PEDCO-320-PI-SP-0001 Piping Material Specification
- BK-GCS-PEDCO-120-PI-SP-0001 Piping Material Specification

3.4 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001".

3.5 ORDER OF PRECEDENCE

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

4. MATERIALS

The pipe materials shall be in accordance with project Piping Material Specification with Doc No. BK-SSGRL-PEDCO-110-PI-SP-0001, BK-PPL-PEDCO-320-PI-SP-0001, BK-GCS-PEDCO-120-PI-SP-0001.

4.1 CARBON STEEL PIPES

The carbon steel used for the fabrication of seamless pipe and pipes welded by Electric Resistant Welding process (ERW-HF) shall be produced in a MARTIN furnace, in an electric furnace or by the basic oxygen process.

All carbon steels used, including normalized steels, used for the fabrication of pipes shall have a maximum carbon content of its related standard.

The carbon equivalent of these materials, calculated using the formula:

$$C_E = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$



Shall be less than 0.5 (ladle analysis).

Carbon Equivalent based on product analysis for seamless and welded pipes shall be 0.43.

The carbon equivalent for sour service material shall be in accordance with API 5L Annex H Table H.1

All carbon steels materials must be impact tested in accordance with IPS-M-PI-190(4) para. 9.8.



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4.2 GALVANIZED PIPES

Couplings for galvanized pipes shall also be galvanized.

4.3 AUSTENITIC STAINLESS STEEL PIPES

The 316L stainless steels shall have carbon content up to or equal 0.03%.

Austenitic stainless steel pipes shall undergo an annealing heat treatment in accordance with the corresponding ASTM standards.

5. SUBSTITUTION OF EQUIVALENT MATERIALS

In general, carbon steel pipes for which grade B is specified shall in no case be replaced by grade A pipes.

However, some other substitutions of materials may be accepted:

5.1 POSSIBLE SUBSTITUTIONS REQUIRING PRIOR APPROVAL BY THE CONSULTANT

Stainless steel pipes to ASTM A 312, welded by electric fusion (SAW) may be replaced with welded stainless steel pipes to ASTM A 358 and vice-versa, subject to prior approval by Client.

Carbon steel pipes to ASTM A 106 B may be replaced with carbon steel pipes to API 5L B where ever have been specified in IPS-PI-221.

6. DIMENSIONS

6.1 SCHEDULES

Pipes for which schedules 10, 40, 80, etc. are specified must be in accordance with the standard ASME B 36.10.



Pipes for which schedules 10S, 40S and 80S are specified must be in accordance with the standard ASME B 36.19.

6.2 LENGTHS

The standard pipe lengths shall be based on IPS-M-PI-190 (4) standard.

6.3 SIZE

Pipe smaller than DN 15(NPS $\frac{1}{2}$ ") should not normally be used. The use of steel pipe in sizes: DN 32 (NPS $1\frac{1}{4}$), DN 65 (NPS $2\frac{1}{2}$), DN 90 (NPS $3\frac{1}{2}$), DN 125 (NPS 5), DN 175 (NPS 7), DN 225 (NPS 9) and DN 550 (NPS 22) should be avoided.

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7. ENDS

7.1 PLAIN (OR SQUARE) ENDS

Pipes less than 2" in diameter and made of carbon steel (except for galvanized carbon steel) and stainless steel, regardless of diameter, shall have plain (or square) ends.

7.2 BEVELED ENDS

Pipes 2" or more in diameter and made of carbon steel and stainless steel shall be delivered with ends beveled as per the standard ASME B 16.25.

7.3 THREADED ENDS

The ends of galvanized steel pipes must be threaded in accordance with the standard ASME B1.20.1.

Threads of galvanized pipes and couplings shall be free of galvanizing.

8. MANUFACTURE

8.1 CARBON STEEL

Except as otherwise indicated in the requisitions issued by EPC Contractor, seamless pipes shall be hot drawn.

Pipes 20" and over in diameter may be produced by rolling and longitudinal SAW or ERW-HF. This process shall never be used for diameters less than or equal to 8".



8.1.1. FABRICATION OF PIPES

A seamless pipe shall be made in a single section. The length of the section shall lie within the limits stipulated in paragraph 5.2.

Only the SAW or ERW (HFW) welding process is acceptable for welded pipes. The welds shall be made using an approved process. The weld seam shall also be welded on the inside if the welding process employed does not ensure full penetration, with the internal weld bead of uniform thickness, free of appreciable distortion. The weld seams shall be subjected to 100% radiographic inspection, in accordance with the requirements of API 5L; by the X-ray method onto radiographic films (Fluoroscopic inspection is not acceptable).

8.1.2. MACHINING

Bevels

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Any beveling of the ends of the pipes shall be performed by machine. The process used shall assure the production of clean, square, burr-free bevel cuts.

Reinforcement

The inside reinforcement of the weld must be ground-off at each end of the pipe. This machining shall be done over a length of 10 cm and must leave a gradual transition.

8.2 STAINLESS STEEL

Pipes up to 4" shall be seamless. Pipes 6" and over in diameter may be produced by rolling and welding.

8.2.1. FABRICATION OF PIPES

The pipe shall be manufactured by one of the following processes:

- Seamless (SML) pipe shall be made by a process that does not involve welding at any stage of production.
- Welded (WLD) pipe shall be made using an automatic welding process with no addition of filler metal during the welding process.

8.2.2. MACHINING



Any beveling of the ends of the pipes shall be performed by machine. The process used shall assure the production of clean, square, burr-free bevel cuts. For stainless steel pipe, cutting and beveling shall be performed by mechanical means only; flame cutting is not permitted.

8.3 GALVANIZED STEEL

The ends of galvanized steel pipes must be threaded in accordance with the standard ASME B1.20.1.

Galvanized pipe ordered under this specification shall be coated with zinc inside and outside by the hot-dip process. When pipe ordered under this specification is to be galvanized, the tension, flattening, and bend tests shall be made on the base material before galvanizing.

If it is impracticable to make the mechanical tests on the base material before galvanizing, it shall be permissible to make such tests on galvanized samples, and any flaking or cracking of the zinc coating shall not be considered cause for rejection. When galvanized pipe is bent or otherwise fabricated to a degree that causes the zinc coating to stretch or compress beyond the limit of elasticity, some flaking of the coating is acceptable.

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9. PIPE PRODUCTION TESTS AND INSPECTIONS

Finished pipes shall be submitted to production tests and inspections as defined below.

9.1 DESTRUCTIVE TESTS

The vendor shall perform all of the tests described below on a pipe selected at the frequency stated in para. 8.1 h). The inspector reserves the right to select the pipes to be tested and to witness the tests.

All the noted tests for pipes manufacturing shall be added to the related standard test

a) Tensile test

One tensile test specimen shall be removed from one end of the selected pipe. The test shall be transverse to pipe axis for 0.0. equal to or greater than 8 5/8". Strip specimens shall be used for longitudinal and transverse tests. Round bar specimen may be used when practicable for transverse tensile tests, only when so agreed at the bid stage. The test shall include Yield Strength, Ultimate Tensile Strength and Elongation. The Yield Strength to Ultimate Tensile Strength ratio shall also be reported.

The Yield and Ultimate Tensile Strength plus percentage Elongation shall be determined according to ASTM A 106 Gr.B. The Yield Strength (YS) to Ultimate Tensile Strength (TS) ratio shall be calculated.

b) Impact test (Charpy V-notch test)




One impact test (one set of three specimens) shall be cut at one end of the selected pipe. The specimens shall be cut transverse (for pipe 0.0. equal to or above 4.5") to the pipe axis and the axis of notch shall be perpendicular to pipe surface.

In addition, full transition temperature curves shall be produced, showing impact energy (in Joules) and percentage shear (fibrous) of the fracture surface, plotted against temperature, over

c) Hardness test

Two macro sections shall be cut, one from either end of the pipe. They shall be polished and etched to show the metallurgical microstructure and to allow for grain size evaluation. Photographs of microstructure shall be supplied at three locations minimum, namely at mid-thickness and below internal and external surface. On each macro section, three Rockwell B or Vickers Hardness measurements shall be carried out (one below outer surface and one below inner surface at 1.5 ± 0.5 mm from surface, and one at mid-thickness of pipe).

Rockwell B or Vickers hardness measurements shall be carried out on external and internal

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original pipe surfaces (only a slight grinding may be performed on tested surfaces). The readings shall not exceed 250 HV10 for sour services, unless otherwise specified in the Particular Specification.

For non-sour services no hardness measurement shall exceed 280 HV10.

Pipes shall be in accordance with Appendix H of IPS-M-PI-190 (4) and API-5L requirements.

d) Chemical analysis

A chemical analysis shall be carried out on the pipe. At this stage, one heat shall be analyzed for residual elements. However, the ruling composition shall be that proposed by vendor and approved by Client at the bid stage.

Note: A ladle analysis shall be carried out for each heat of steel used in the manufacture of the seamless pipes supplied in the order. The results shall be shown on all documentation/certificates covering the related heat of steel.

e) Deleted.

f) Sulphide Stress Corrosion Cracking Tests (S.S.C.C. Tests)

This specification is for the testing of both the base metal and circumferential weld of pipe by means of stress corrosion cracking tests.

One length of pipe shall be girth welded under the responsibility of the pipe supplier. The pipe Supplier shall also be responsible for machining test coupons, conducting and supervising the tests and reporting the results.



The pipe Supplier shall write a fully detailed test procedure proposal based upon this specification and forward to the Client for approval.

f-1) Welding Requirements

Welding shall be done by the pipe supplier or by a sub-contractor of the pipe supplier under the responsibility of the pipe supplier as for the weldability tests and at same time as weldability tests.

One circumferential butt weld shall be carried out from the selected cast and pipe for the weldability tests. The weld coupon shall comprise two pipe sections of 200 mm minimum making a total minimum welded pipe length of 400 mm.

Welding shall be carried out in the 5G position.

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Butt welds shall be carried out using the appropriate Company approved welding procedure for the weldability tests.

The pipe shall be stamped by the Company's representative and marked with:

- Cast number.
- Unique pipe number.

The top of the pipe at time of welding shall be marked with a paint line and stamped TOP at each end.

f-2) Specimen Preparation

Specimens shall be removed from the locations shown in Figure 1. Test numbers shall be marked on each specimen by an approved method, using the identities shown.

Each specimen shall measure 115 x 15 x 5 mm and shall be prismatic. Specimens shall be as close as possible to the surface, with the minimum depth of machining possible to obtain flat surfaces. All machined surfaces shall be ground smooth following machining.

In addition to the SSCC test specimens a machined tensile test specimen shall be prepared with its axis longitudinal to the pipe axis and of maximum possible diameter.

External SSCC specimens shall have the centreline of the loading span through the weld fusion line. They shall be removed from weld cap side.




Internal SSCC specimens shall have the centerline of the loading span through the weld centerline at weld root.

f-3) TEST REQUIRED

The tensile tests shall be carried out and yield (or 0.2% proof stress) and ultimate tensile strength shall be recorded. This actual yield strength will be the reference for the SSCC tests.

The SSCC tests shall be conducted at the following stress levels for the outside (specimen E) and inside (specimen I) of the pipe:

- 80% actual yield,
- 100% actual yield,
- 110% actual yield.

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Each test shall consist of three specimens chosen from the locations marked in figure I. The total number of tests of pipe shall be:

$$3 \text{ (specimens per test)} \times 3 \text{ (stress levels)} \times 2 \text{ (locations)} = 18$$

However, spare test pieces shall be taken as shown and shall be available for additional tests for any particular stress level and location.

f-3) Test Arrangement

This shall be as shown in figure 2. Loading direction is shown in figure 1.

The test solution shall be the NACE solution as described in NACE STD TM-01-77. H₂S shall be bubbled through the solution throughout the test.

Tests shall have duration of 30 days (720 hours) minimum.

The temperature of the solution shall be recorded at start of test and then once per week (assuming temperature control is applied).

The pH of the solution shall be recorded at sufficient frequency to show change of pH with time plus at the start and end of each test. pH shall be controlled within the limits of NACE TM-01-77. The pipe supplier shall verify that saturation of the solution is attained after 1 hour.

The pipe supplier shall present proposals for monitoring time to failure, for approval.

f-4) Specimen Examination



Following failure or at the end of the test (whichever happens first) photographs shall be taken of the surfaces of each specimen.

In addition, one edge of each specimen shall be polished and etched. Photomicrographs shall be taken. Any SSCC cracks need to be categorized by location namely : Base metal, HAZ, Weld metal It shall be metallurgically examined and the metallurgical features recorded with photomicrographs. The pipe supplier need not carry out exhaustive metallurgical examination of HIC cracks.

f-5) Test Acceptance Criteria

No crack or rupture shall occur on any of the test specimens within the 30 days period of test for tests carried out at 80% actual yield or lower yield.

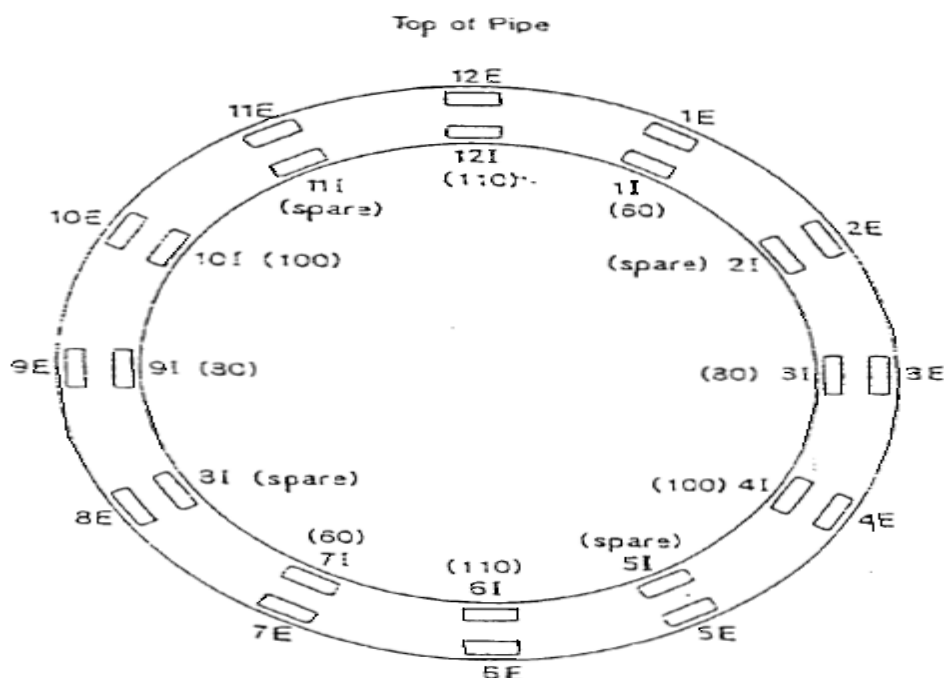
f-6) Reporting Of Results

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Any specimen failures which occur within the 30 days period shall be reported to the Client. Following the conclusion of testing, the pipe Supplier shall prepare and submit a draft report within seven working days of their completion and shall propose the date for a discussion of the results. Following this meeting the report shall be finalized and submitted to the Client.

The number of test reports shall be advised but there shall be a minimum of three full originals.

Pipes shall be in accordance with Appendix H of IPS-M-PI-190 (4) and API-5L requirements.





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عمومی و مشترک



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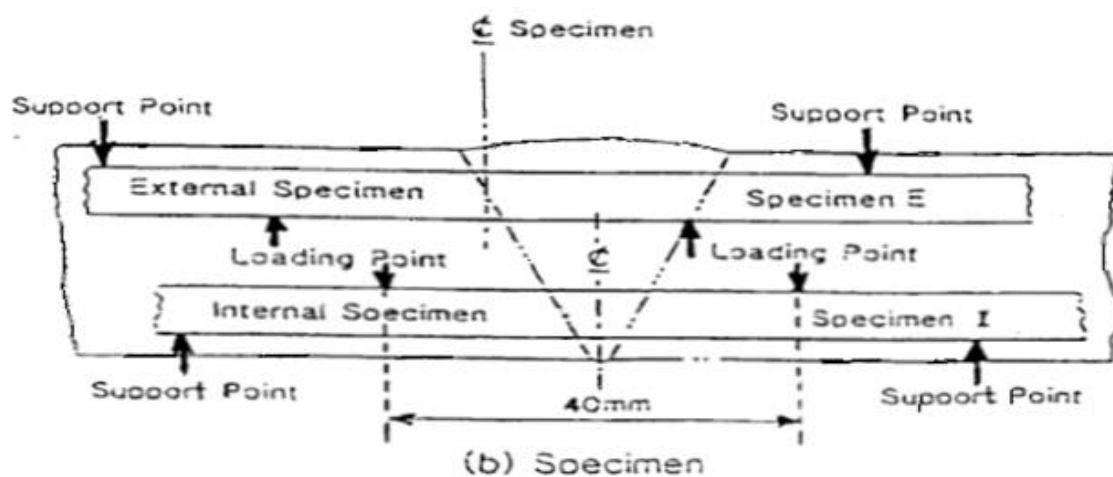
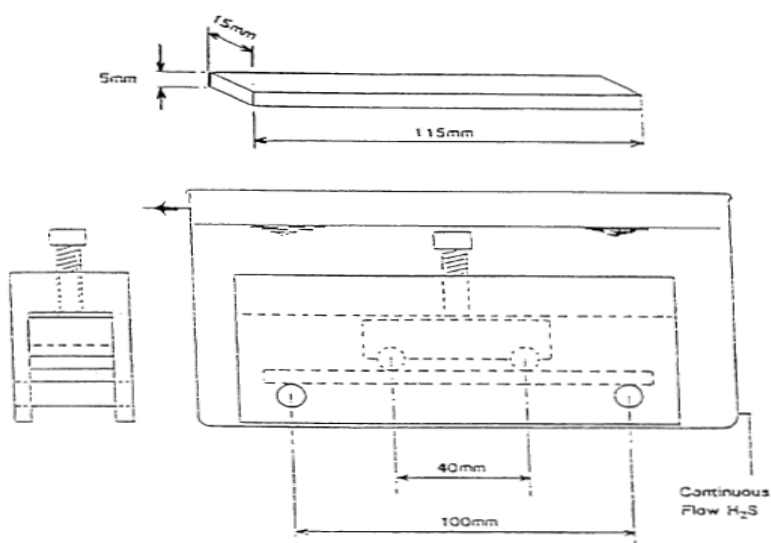




Figure 1 Removal of specimens



ingement

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g) H.I.C. Tests

H.I.C. tests shall be carried out using uncoated specimens on one test pipe from each of the first two heats (i.e. 2 test pipes).

The pipe selected for manufacturing procedure qualification shall be one of the 2 test pipes. The procedure for determining HIC sensitivity and acceptance criteria shall be in accordance with NACE STD TM-02-84; test solution acidified with acetic acid.

Pipes shall be in accordance with Appendix H of IPS-M-PI-190 (4) and API-5L requirements.

h) Weld ability Tests

One test shall be conducted per steel grade, pipe size and steel source on pipes produced at an early production stage.

i) Frequency of destructive tests

The above destructive tests and product analyses shall be carried out in accordance with API 5L.

j) Retests

Where one specimen fails to conform to the specified requirements, a retest on four (4) additional pipes from the same lot/heat of pipes shall be carried out.

Should all retests give acceptable results, then only the pipe which gave the unacceptable result shall be rejected.



Should one (or more) of the retests give unacceptable results, then the complete lot of pipes may be rejected unless each of the remaining pipes of the said lot is tested individually. The pipes which will give acceptable results according to this specification will not be rejected.

Note: Re-heat treatment of pipe is accepted. However, no more than 2 heat treatments shall be permitted (in case of quenched and tempered pipes, heat treatment means both quenching plus tempering)

k) Defective specimens

If both the vendor and the inspector are of the opinion that a specimen fails due to improper machining or preparation, then it may be discarded and another specimen substituted.

If any test specimen fails due to some defect in the material, it may be substituted by another test specimen with prior approval of the inspector. The nature of the defect shall be made clear and

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the inspector shall specify additional non-destructive testing to ensure that the defect is an isolated case.

l) DWT test for welded pipes

The drop-weight tear test shall be carried out in accordance with clause 9.9 of API 5L.

9.2 NON-DESTRUCTIVE INSPECTIONS

All the noted tests for pipes manufacturing shall be added to the related standard test.

a) Type and extent of non-destructive inspections

- Visual examination

Visual examination of the entire inside and outside surfaces shall be carried out on each pipe.

- Dimensional inspection

All specified dimensions shall be checked on each pipe. Recording of dimensional measurements shall be carried out, as a minimum, 3 times per shift.

Additional wall thickness measurements shall be carried out in ground areas, except for cosmetic grinding.

- Ultrasonic testing

The vendor shall produce a technical document describing all the inspection procedures he intends to use, his equipment capabilities, the reference standards for calibration of sensitivity, and the acceptance criteria he proposes. These procedures shall be submitted at bid stage and shall be subject to qualification testing prior to pipe production.



Each finished pipe shall be 100% inspected along its entire length by ultrasonic testing.

All pipe ends not scanned by the full automatic technique as above shall be inspected by manual ultrasonic examination.

The inspection shall be efficient in detecting both axial defects and circumferential defects.

The vendor's operators employed in ultrasonic testing inspection shall be subject to prior approval of the inspection agency.

Alternatively, when nominal wall thickness of pipes is 6 mm and lower, the pipes may be inspected by the flux leakage method, provided that the related inspection procedure is submitted to and approved by Client at the bid stage.

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Flux Leakage test is acceptable instead of Ultrasonic Test for pipes with the thickness of 6mm and lower.

- Electromagnetic testing

The vendor is requested to state at the bid stage if the intends (or does not intend) to use electromagnetic testing (in addition to ultrasonic testing) on the full length of pipes for the detection of defects on the internal and external surfaces of the pipes (defects orientated in both the axial direction and the circumferential direction).

Where this testing is to be used, the vendor will supply the Company with the equipment specifications, its location in the production line, the inspection procedure and the reference standards for calibration of sensitivity.

Electromagnetic testing is required in addition to ultrasonic testing where the ultrasonic testing procedure is unable to detect transverse defects.

- Magnetic Particle Inspection (MPI)

All bevel surfaces shall be checked by MPI using the wet method. The sensitivity of the method shall be checked using a recognized calibration block or using a pipe containing appropriate defects, to the satisfaction of the inspector.




- Hydrotest

Each length of pipe shall withstand, without leakage, an inspection hydrostatic testing such that the hoop stress, calculated on the basis of the specified wall thickness and including stresses from end loading, is at least 95% of the specified minimum yield strength (SMYS). Hydrostatic testing shall be performed after cold expansion (if applicable). The test pressure for all sizes and types of pipe shall be held for not less than 10 seconds.

b) Acceptance limits

- Any crack or suspected crack and any linear discontinuity shall be considered unacceptable defects.
- Any imperfection having a depth greater than 5% of the specified nominal wall thickness measured from the surface of the pipe, or encroaching on the minimum wall thickness shall be considered as an unacceptable defect.
- The size of any lamination shall not exceed 6 mm x 15 mm within 50 mm of pipe ends, and 16 mm x 30 mm in pipe body, measured as circumferential x longitudinal.

Also Table K.1 of IPS-M-PI-190 (4) shall be considered for lamination.

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- No defects are permitted on the bevel surface.
- Dimensional requirements

9.3 SURFACE CONDITIONS, IMPERFECTIONS, AND DEFECTS

All pipes shall be free from defects in the finished condition. All pipes shall be free from cracks, sweats, and leaks. Requirements of ANNEX E and ANEX C of API 5L shall be met for acceptance and treatment of surface conditions, imperfections, and defects.

10. QUALITY CONTROL

ITP and QCP shall be submitted for CLIENT'S approval before manufacturing. Beside QC the approved TPI shall supervise the manufacturing process. The supervision by the TPI does not mean disclaiming of manufacturer for quality of goods.

Documents and certifications shall be reviewed in accordance with Inspection Procedure for purchasing and manufacturing of commodity, document No.: ICE-EID_MI_SD01-REV01.

The inspection and tests necessary to confirm that the products meet the requirements of the standards, specifications and requisition shall be carried out in the vendor's plant by personnel of the plant. These specially-qualified personnel shall be independent of the production department of the plant.

Products shall be guaranteed by an inspection certificate (conformity, material, test, etc.).

If the vendor does not have the necessary means of examination, these tests may be carried out by an agency and at a place approved by the CLIENT.




The inspection agency shall conduct inspections in the vendor's plant so as to make sure of the proper execution of the order and of the quality controls. It shall also witness final shop acceptance.

10.1 ACCEPTANCE

The inspection agency shall not grant any acceptance unless the certificates concerning the products submitted have been made available to it in advance.

In addition to checking the certificates, the inspection agency shall check the quantities presented and shall have checked, by sampling, the following characteristics:

- any radiographic and ultra-sonic examinations reports ;
- shapes and nominal dimension ;
- dimensional tolerances ;

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- surface treatment and finish conditions ;
- marking and finishing conditions.
- typical metallographic structure of base metal with supporting documentation such as microphotographs, grain size, etc;

This sampling shall cover at least 5% of each of the items submitted for acceptance.

The non-conformity of any or all of the products submitted for acceptance may give rise:

- either to a second submission after the products have been corrected, if this is possible ;
- or to final rejection.
- Sampling for mechanical tests shall include longitudinal weld seam of welded pipes.

11. REPAIR OF DEFECTS

Repair by welding on pipe base metal is not permitted.

Defects may only be removed by grinding provided that the wall thickness is not reduced locally below the minimum specified wall thickness.

After grinding the pipe shall be inspected by the process which detected the defect, to ensure that the defect is completely removed and that the repair is acceptable. Wall thickness measurements shall be made in the ground areas, except for cosmetic grinding.

12. DOCUMENTATION

12.1 CERTIFICATES OF CONFORMITY

The vendor shall submit certificates of conformity with the ASTM standard specified in the requisitions for pipes made of carbon steel and stainless steel.



12.2 MATERIAL CERTIFICATES

The vendor shall submit EN 10204- 3.1.B material certificates giving the results of the chemical analysis and of the mechanical tests carried out in accordance with the requirements of the reference codes and standards.

13. PREPARATION FOR SHIPMENT

13.1 MARKING

13.1.1. Identification of Materials

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All the noted tests for pipes manufacturing shall be added to the related standard test.

The following information shall be marked by cold stamping on each length of pipe, for diameters 2" and over, and on two labels attached to each bundle of pipes, for diameters less than 2":

- specification and grade of material ;
- heat number ;
- Batch number.
- Vendor's name
- pipes number
- pipes Length
- pipes Diameter
- pipes Thickness
- Type of Heat Treatment
- Seamless or Welded

13.1.2. Markings Specific to The Order

All lengths of pipes shall be identified by marking with color marks and code numbers as and if specified in the order.

13.2 PROTECTION



13.2.1. Carbon Steel Pipes

Threaded pipe ends shall be greased and protected by female caps.

Beveled carbon steel pipe ends shall be protected by a peel-off varnish.

13.2.2. Austenitic Stainless Steel Pipes

All stainless steel pipes shall be protected against the risks of saline corrosion during cleaning, transport, fabrication, testing and/or storage. If paint is used to protect these pipes, it must not contain chlorides or other substances that might damage the stainless steel.

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13.3 PACKING

Sea-packing shall be used for all pieces of pipes; in the case of austenitic stainless steel, the packing must also be water-proof. It must meet the conditions of all stages of transport (rail, road, air and sea).

The packing must comply with the requirements of owner specifications such as Sea-Packing and Shipping Markings, applicable to this type of equipment.