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**MANAGER RELIABILITY AND
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| TITLE |
| PURCHASE SPECIFICATION FOR PIPE |

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| PURPOSE |
| This specification is a supplement to the Purchase Order, defining the technical requirements for the manufacture, examination, testing, identification, protection and documentation for pipes. |

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1. PURPOSE AND SCOPE

This specification together with the "item description" in the "Request for quotation" or "Purchase Order" covers the purchase requirements for pipes.

2. OBJECTIVE

The requirements outlined herein are supplementary to the Purchase Order. Together, they define the technical requirements for the manufacture, examination, testing, identification, protection and documentation for pipe.

3. DEFINITIONS

3.1 **Approval** - Approval or approved by Purchaser, Owner/User and Authorised Inspection Authority (A.I.A) shall mean written agreement or authorization by Purchaser, Owner/User and A.I.A. All requests for approval shall be submitted in writing and any proposed deviation from specified requirements shall be fully motivated & **subject to prior written approval by the Owner/User.**

3.2 **Purchaser** - may be the **Owner/User** or his designated representative e.g. Engineering Contractor.

3.3 **Manufacturer** - shall be the Vendor of equipment, a fabricator, assembler or contractor. They shall be **approved** in accordance with a recognized quality system such as ISO 9001 or the ASME "U" stamp and be **subject to the prior written approval of the Owner/User.**

3.4 **Owner/User** - PetroSA (SOC) Limited.

3.5 **Authorised Inspection Authority** - An Inspection Authority approved by the Department of Minerals and Energy of the Government of the R.S.A. for the certification of "Vessels under Pressure". **The A.I.A. shall be appointed by the Owner/User.**

3.6 **Shall** - The word "shall" is to be understood as **mandatory** to comply with the requirements of this Specification.

3.7 P.M.I

Positive Material Identification by such methods as alloy analyser, metal scope or re-check of chemical analysis.

3.8 RFQ

Request For Quotation

3.9 PO

Purchase Order

3.10 ITEM PURCHASE DESCRIPTION

The Item Purchase Description is the individual detailed description for each pipe on the RFQ or PO. Each item Purchase Description has a PetroSA Material Number and a PO or RFQ item number. The Item Purchase Description specifies pipe type, size, rating, etc...

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4. REFERENCES

Where reference is made to a Code, Specification or Standard, the reference shall be taken to mean the latest edition of the Code, Specification or Standard, including addenda, supplements and revisions thereto unless specified otherwise in the Contract.

Deviations from requirements set forth in this specification shall only be permitted with the prior written approval of the Owner/User.

4.1 Statutory Regulations (As applicable)

| NO. | DOC NO. | TITLE |
|-----|----------------|--|
| 1 | Act 26 of 1996 | Mine, Health and Safety Act and Regulations |
| 2 | Act 85 of 1993 | Occupational Health and Safety Act and Regulations |
| 3 | Act 50 of 1991 | Minerals Act and Regulations |

4.2 American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code)

| NO. | DOC NO. | TITLE |
|-----|-----------------|--|
| 1 | ASME Section II | Part A, Ferrous Materials |
| 2 | ASME Section II | Part C, Welding Rods, Electrodes and Filler Metals |
| 3 | ASME Section II | Part D, Material Properties |
| 6 | ASME Section IX | Welding and Brazing Qualifications. |

4.3 EN 10204: Metallic materials: Types of inspection documents

4.4 American National Standards Institute (ANSI) Standards

| NO. | DOC NO. | TITLE |
|-----|------------------|--|
| 1 | ASME/ANSI B1.1 | Unified Inch Screw Threads (UN and UNR Thread Form). |
| 2 | ASME/ANSI B2.1 | Pipe Threads (except Dry-seal). |
| 3 | ASME/ANSI B16.5 | Pipe Flanges and Flanged Fittings. |
| 4 | ASME/ANSI B16.9 | Factory-Made Wrought Steel Butt-welding Fittings. |
| 5 | ASME/ANSI B16.11 | Forged Steel Fittings, Socket-Welding & Threaded. |
| 6 | ASME/ANSI B16.20 | Metallic Gaskets for Pipe Flanges - Ring-Joint, Spiral Wound and Jacketed. |
| 7 | ASME/ANSI B16.21 | Non-metallic Flat Gaskets for Pipe Flanges. |
| 8 | ASME/ANSI B16.25 | Butt welding Ends. |
| 9 | ASME/ANSI B16.47 | Large Diameter Steel Flanges. |
| 10 | ASME SA-578 | Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications |
| 11 | ASME SA-388 | Standard Practice for Ultrasonic Examination of Heavy Steel Forgings |

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5. GENERAL REQUIREMENTS

5.1. Precedence

5.1.1. In the event of any conflict between the various relevant documents, the order of precedence shall be:

- a) The Purchase Order (PO), including terms, conditions and legal requirements 'THE CONTRACT'.
- b) Purchaser's data sheets, and/or drawings.
- c) This Specification including all references therein.
- d) Other relevant documents, i.e. Authorised deviations and exclusions.

5.1.2. It shall be the responsibility of the Vessel Manufacturer to call attention to any conflicts between Specifications, the ASME Code, the Purchase Order, or Purchaser's drawings, and request a written interpretation from the Owner/User. The Manufacturer is not at liberty to assume which instructions shall govern.

5.2. Deviations

No substitution or deviation from the requirements of this Specification shall be permitted without approval by Principal. All approved deviations and/or substitutions shall be stated in the Purchase Order.

5.3. QA/QC Program

Every Supplier/Sub-supplier/manufacturer/vendor shall be accredited in accordance with a recognized quality system such as SABS/ ISO 9000. Any exception to this requirement shall be clearly addressed in the RFQ.

6. MATERIALS

6.1. Requirements for Carbon Steel

6.1.1. The steel for seamless, electric resistance welded or electric fusion welded carbon steel pipe shall be made by the open-hearth, basic oxygen or electric furnace process.

6.1.2. "Cold expanded" pipe is not permitted without Principal's approval except that cold expansion is permitted for final sizing and shall not exceed 1½% of pipe outside diameter.

6.2. Specific Requirements for Low Temperature Materials

6.2.1. Pipe specified to ASTM A671, Grade CC60, Class 32, shall be fabricated from normalised plate material and shall have the deposited weld metal and the heat affected zone (HAZ) tested for impact resistance at a test temperature of -45°C in accordance with ASTM A671 supplementary requirement S2.

6.2.2. Pipe specified to ASTM A671, Grade CF66, Class 32, shall be fabricated from normalised plate material and shall have the deposited weld metal and the HAZ tested for impact resistance at a test temperature of -85°C in accordance with ASTM supplementary requirement S2.

6.2.3. Impact testing shall be conducted on the plate material, deposited weld metal and the HAZ. Impact test results shall be submitted as part of the welding

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procedure specification (WPS) and procedure qualification records (PQR) to the Principal for approval prior to fabrication of pipe. Production impact tests shall be conducted on the plate, weld metal and the HAZ at the rate of one test for every 150m of pipe.

6.3. Special Requirements for Austenitic Stainless Steel

6.3.1. All austenitic stainless steel pipes shall be furnished in the solution annealed condition.

6.3.2. The heat treatment temperature for the "straight" grades (all grades other than NL" grades and NH" grades) and OLN grades of austenitic stainless steel shall be within the following ranges:

- a) Type304, 304L, 316 and 316L: 1050°C to 1100°C.
- b) Types 321, 347 and 348: 1030°C to 1070°C

7. DESIGN AND DIMENSIONS

7.1. Wall Thicknesses

7.1.1. Pipe specified as Schedule 10, 20, 30, 40, 60, 80, 100, 120, 140, 160, standard weight, extra strong, or double extra strong shall be in accordance with ASME/ANSI B36.10.

7.1.2. Pipe specified as Schedule 5S, 10S, 40S and 80S shall be in accordance with ASME/ANSI B36.19.

7.1.3. Austenitic stainless steel and non-ferrous pipe specified as Schedule 10, 40 or 80 (without the suffix "S") shall be in accordance with ASME/ANSI B36.10, not ASME/ANSI B36.19.

7.1.4. The wall thickness of pipe larger than NPS 48 specified as "standard weight" or "extra strong" shall be in accordance with the following:

| | |
|-----------------|--------|
| Standard Weight | 9,53mm |
| Extra Strong | 12,7mm |

7.1.5. ASTM B16.7, seamless, hot finished annealed and pickled Inconel 600; ASTM B337 alloy B-2Ti; ASTM B407 alloy 800; and Incoloy alloy 802 pipe larger than NPS 6 shall have tolerances the same as NPS 6.

7.2. Unless otherwise specified in the item description, pipe shall be furnished in accordance with the following

- a) NPS 1½ and smaller plain ends, cut square.
- b) NPS 2 and larger: bevelled ends per ANSI B16.25.
- c) Bevelled ends prepared by flame cutting are not permitted

7.3. Threaded and coupled steel pipe to SABS Specification shall be furnished with taper pipe threads in accordance with ASME/ANSI B2.1. Couplings for galvanised pipe shall be galvanised.

7.4. Circumferential weld joints (jointers) are not permitted.

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8. EXAMINATION, INSPECTION AND TESTING

- 8.1. Examinations and/or tests may be reviewed and/or witnessed by the Principal or Principal's authorized agent at the suppliers and or Manufacturers facility. The extent of reviewing and/or witnessing will be defined in the PO.
- 8.2. The Supplier shall, on request, submit examinations and test reports to the Principal to determine compliance with requirements. When random examination results in rejection, additional pipe shall be examined on the basis of two additional tests for each failure to assure compliance with the PO.
- 8.3. Upon receipt, Principal will apply a PMI program on all materials furnished by mill/vendor/supplier. Any and all non-conforming materials shall be returned to mill/vendor/supplier for replacement at no cost to Principal.

9. IDENTIFICATION AND PROTECTION

9.1. Marking

- 9.1.1. Each length of pipe shall be marked in accordance with the specification referenced for manufacture in the item purchase description (i.e. ASTM, API, etc...) and the requirements specified herein.
- 9.1.2. All marking shall be applied by the pipe mill. Application of marking by supplier (local or foreign) is not allowed.
- 9.1.3. Mill marking shall always include the heat number (or manufacturer's number by which the heat can be identified).
- 9.1.4. All Mill marking shall be marked on each length of pipe and neither on bundle tags nor shipping boxes except as follows:
 - a) ASTM A106 Grade B pipe in sizes 3/4" and smaller may be furnished without mill marking.
 - b) Pipe manufactured to SABS specifications shall be marked in accordance with the applicable SABS specification.
- 9.1.5. Any exceptions to these requirements shall be clearly stated with bid. Any Principal approved exceptions will be clearly noted in resultant purchase order. Any and all pipe not marked in accordance with these requirements, except as specifically allowed by Purchase Order, will be rejected.

9.2. Colour Coding

The following requirements for colour coding are applicable only when pipe is purchased as a mill run and shall be so specified in the P.O. Application of colour coding shall be by pipe mill. Pipe furnished from a supply house (local or foreign) shall not be colour coded by supplier.

- 9.2.1. Pipe shall be colour coded as per the colour code specified in Paragraph 9.2.7 of this Specification.
- 9.2.2. Colour coding is intended to supplement not replace, normal identification marking required by ANSI, ASTM, MSS or other specifications
- 9.2.3. The paint shall be resistant to salt water atmosphere, tropical or freezing climates or similar attack. It shall not cause corrosion of the pipe to which it is applied. The manufacturer's trade name and a chemical analysis of the paint

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to be used for colour coding austenitic and/or ferritic stainless steel and non-ferrous alloys shall be submitted for the Principal's approval.

9.2.4. When specified to be colour coded, each length of pipe shall be painted over the entire length with a 12mm to 25mm wide stripe. The Supplier shall select width depending on size of pipe. For NPS 2 and smaller, pipe may be painted with 25mm wide bands at 1 metre intervals over the entire length of the pipe in lieu of stripes.

9.2.5. When specified to be colour coded with two (or three) colours, adjacent stripes shall be applied as specified in Paragraph 9.2.7 of this Specification.

9.2.6. Paint shall not be applied to the following:

- a) Inside of pipe.
- b) Threads.
- c) Weld bevels.
- d) Symbols or markings which would obliterate identification.

9.2.7. The colour code shall be as follows:

| | | |
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| a. | RED | Carbon steel material specified to an ASME-SA material specification. |
| b. | GREEN | Carbon steel to ASTM A672 Class 22 or 32 |
| c. | YELLOW / RED | Low temperature carbon steel to ASTM A333 Grade 6, A671 Grade CC-60 Class 32. |
| d. | YELLOW / PURPLE | Low temperature 3,5% Ni to ASTM A-333 Grade 3, A671 Grade CF66 Class 32 |
| e. | YELLOW / GREEN | 11/4 Cr - 1/2Mo to ASTM A335 Grade P11, A691 Grade 11/4 Cr Class 22. |
| f. | YELLOW / BLUE | 5 Cr - 1/2 Mo alloy steel pipe to ASTM A335, Grade P5 and A691, Grade 5Cr, Class 22. |
| g. | YELLOW / BROWN | Austenitic stainless steel Type 304. |
| h. | YELLOW / WHITE | Austenitic stainless steel Type 304L. |
| i. | YELLOW / BLACK | Austenitic stainless steel Type 316L. |
| j. | YELLOW / GREY | Austenitic stainless steel Type 321. |
| k. | YELLOW / PINK | Austenitic stainless steel Type 347. |
| l. | YELLOW / ORANGE | Monel pipe to ASTM B165. |
| m. | BLACK / GREEN | Alloy 20 pipe to ASTM B464 & B474, UNS N08020. |
| n. | YELLOW / GREEN / RED | Carbon-Moly to, ASTM A335 Grade P1, A691 Grade CM65 Class 22. |
| o. | YELLOW / BLUE / RED | 21/4 Chrome - 1/2Moly pipe to, ASTM A335 Grade P22, A691 Grade 11/4 Cr Class 22. |

9.3. Protection during Handling and Shipping

9.3.1. Exposed ends shall be closed with plastic protectors to exclude dirt and other foreign matter.

9.3.2. Exposed threads shall be fitted with a thread protector.

10. CERTIFICATION AND RECORDS

10.1. Mill Certificates

The Supplier shall furnish mill certificates giving the chemical analysis and physical tests for all pipes except that specified to a SABS specification. Material test certificates shall comply with the requirements of EN10204 type 3.1 unless specified otherwise in the PO.

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10.2. Heat Treatment Reports

10.2.1. Post weld heat treatment charts shall be furnished for pipe specified to ASTM A671, ASTM A672, and ASTM A691.

10.2.2. The solution annealing temperature for austenitic stainless steel (as per the requirements of Paragraph 6.3.1 of this Specification) shall be included on the mill certificate.

10.3. Supplementary Reports

10.3.1. The Supplier shall furnish a certified report giving the results of all tests and examinations specified in the item description and this Specification that are supplementary to the material specification referenced for manufacture.

10.3.2. These reports shall include, but are not limited to, supplementary requirements for radiographic examination, mechanical tests and heat treatment, but need not duplicate any other required reports.

10.4. Submission of Documents

10.4.1. Unless otherwise specified in the PO, two copies of all documentation and material certification required by this Specification, shall accompany each deliver.

10.4.2. All documents shall include the PO number and Principal's item code number(s) and shall be signed as authentic by the Supplier or his authorised agent.

10.4.3. The PO shall state whether reports, other than those specified in this Specification, are required.

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