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| <p><b>KLM Technology Group</b></p> <p><b>Project Engineering Standard</b></p>   |  <p><b>Solutions, Standards and Software</b></p> <p><a href="http://www.klmtechgroup.com">www.klmtechgroup.com</a></p> | <p>Page 1 of 34</p> |
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| <p>KLM Technology Group<br/>#03-12 Block Aronia, Jalan Sri Perkasa 2<br/>Taman Tampoi Utama<br/>81200 Johor Bahru<br/>Malaysia.</p> | <p><b>Pipeline Construction</b></p> <p><b>(PROJECT STANDARDS AND SPECIFICATIONS)</b></p>   |                     |

KLM Technology Group has developed; 1) Process Engineering Equipment Design Guidelines, 2) Equipment Design Software, 3) Project Engineering Standards and Specifications, 4) Petrochemical Manufacturing Reports and 5) Unit Operations Manuals. Each has many hours of engineering development.

KLM is providing the introduction to this guideline for free on the internet. Please go to our website to order the complete document.

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## 1.0 SCOPE

- 1.1 This document covers the minimum requirements the Contractor shall consider in supply of materials and the construction of the pipelines and ancillary facilities for installation at the Facility.
- 1.2 The construction of the pipelines shall fully comply with all relevant contractual requirements specified in the Scope of Work and the Technical Specification of the Contract.

## 2.0 STANDARD SPECIFICATIONS

- 2.1 The construction of pipelines and ancillary shall conform, except where specified otherwise, with the current issue and amendments of the following prevailing on the effective date of the Contract:

### 2.1.1 International Standards

|                   |   |
|-------------------|---|
| ASME Section IX   | Qualification Standard for Welding and Brazing Procedures, Welders, Brazers and Welding and Brazing Operators |
| ASME Section VIII | Boiler and Pressure Vessel Code   |
| ASME B1.20.1      | Pipe Threads  |
| ASME B16.5        | Pipe Flanges and Flanged Fittings   |
| ASME B16.9        | Factory-made Wrought Steel Buttwelding Fittings   |
| ASME B16.25       | Buttwelding Ends  |
| ASME B31.8        | Gas Transmission and Distribution Piping Systems  |
| ASME B31.4        | Liquid Petroleum Piping Systems   |
| ASME B36.10       | Welded and Seamless Wrought Steel Pipe  |

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|--|--|
| ASME B46.1                                       | Surface Texture  |
| API 5L   | Specification for Line Pipe  |
| API 6A   | Specification for Valves and Wellhead Equipment  |
| API 6D   | Specification for Pipeline Valves (Gate, Plug, Ball and Check Valves)  |
| API 6FA  | Fire Testing of Valves   |
| API 594  | Wafer Type Check Valves  |
| API 598  | Valve Inspection and Testing   |
| API 600  | Steel Gate Valves-Flanged and Butt Welding Ends  |
| API 602  | Compact Steel Gate Valves  |
| API 609  | Lug-and Wafer-type Butterfly Valves  |
| API RP 1110                                      | Pressure Testing of Liquid Petroleum Pipelines   |
| API RP 1102                                      | Pipeline Road Crossing   |
| API RP 1104                                      | Welding of Pipelines and Related Facilities  |
| ASTM Specifications for Ferrous Piping Materials |  |
| MSS-SP-25  | Standard Marking System for Valves, Fittings, Flanges and Unions   |
| MSS-SP-44  | Steel Pipeline Flanges   |
| MSS-SP-75  | High Test Fittings   |
| NACE MR0175                                      | Sulphide Stress Cracking Resistant-Metallic Materials for Oilfield Equipment                                 |
| NACE RP01-77-83                                  | Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems |

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### 2.1.2 British Standards

|         |  |
|---------|--|
| BS 5146 | Specification for Inspection and Test of Steel Valves for the Petroleum, Petro-Chemical and Allied Industries                        |
| BS 5351 | Steel Ball Valves for the Petroleum, Petro-Chemical and Allied Industries  |
| BS 5352 | Specification for Steel Wedge gate, Globe and Check Valves 50mm and Smaller for the Petroleum, Petro-Chemical and Allied Industries. |
| BS 449  | Specification for the Use of Structural Steel in Building  |
| BS 5950 | Structural Use Steelwork in Building   |

2.2 Compliance with this specification shall not relieve the Contractor of its responsibility to supply equipment suited to meet the specified service and applicable regulations.

2.3 Where conflicts exist between this specification and other Drawings, standards, codes or specifications, the most stringent shall be applied.

## 3.0 SERVICE CONDITIONS

3.1 The construction of the pipelines and ancillary shall be suitable for continuous operations under high ambient temperatures and humidity. The atmosphere at the Facility is generally dusty and corrosive and may contain traces of hydrogen sulphide.

3.2 The installed pipelines shall in all respects be suitable for continuous operation in service conditions.

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#### **4.0 TECHNICAL REQUIREMENTS**

- 4.1 The Contractor shall establish a chainage marking survey for the Crude Oil Transit System, low-pressure (**LP**) gas lines, high-pressure (HP) gas lines and Fuel Gas System.
- 4.2 The survey control shall be staked at a maximum of 50-m intervals on the tangents and 10-m intervals on curves. The numbering system shall be continuous. Staking shall be on the ditch centre line with reference stakes established for each centre line stake, but offset by 20 m from the ditch centre line.
- 4.3 The survey shall locate all buried services, which shall then be shown on the alignment sheets. This survey shall also establish the depth of the services.

#### **5.0 RIGHT-OF-WAY (ROW)**

- 5.1 The Contractor shall not start any construction work on the ROW until control staking has been approved by the Company.
- 5.2 The Contractor shall clear and level the construction ROW to the degree required to support all work scope activities.

#### **6.0 GRADING OF CONSTRUCTION ROW AND CARE OF EXISTING FEATURES**

- 6.1 The Contractor shall perform such grading of the ROW as is required to properly perform the pipeline construction, and to provide access to the pipeline during the construction period.
- 6.2 The Contractor shall grade the ROW to eliminate sharp high points, minimise bending and maximise laying within the limits permissible for elastic bending. In rocky sections, the Contractor shall excavate rock or other material that cannot be graded with normal grading equipment in